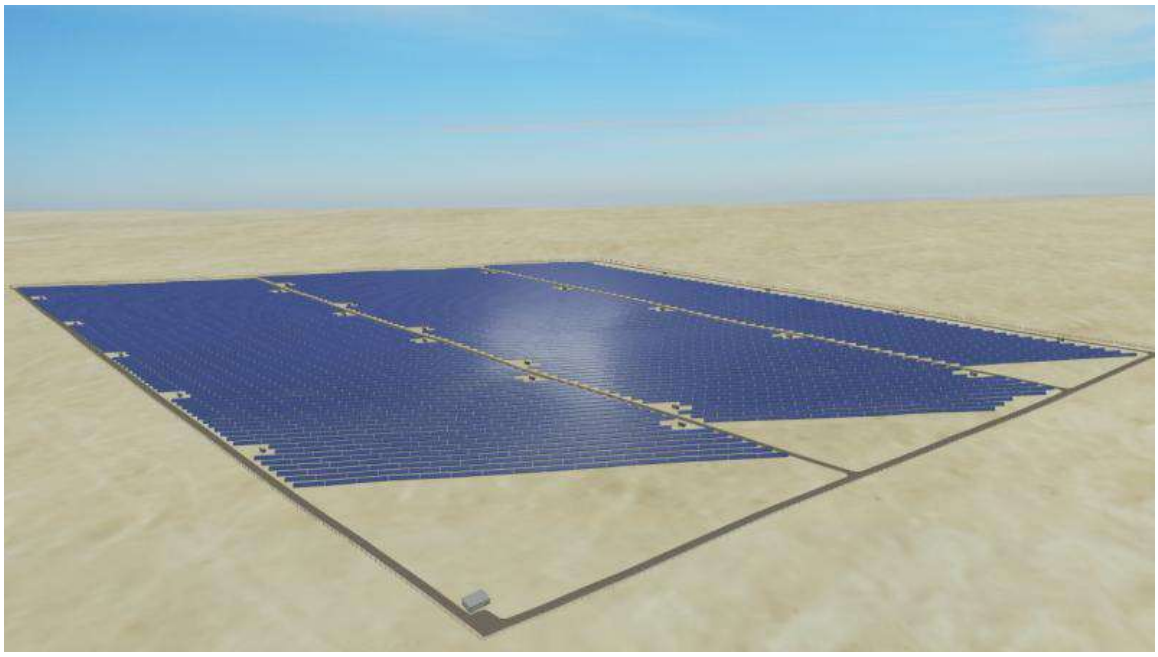
Environmental and Social Impact Assessment (ESIA)

For Photovoltaic Power Plant Sainshand, Mongolia

30/9/2016

By **Desert Solar Power One LLC**



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Glossary and List of Abbreviations and Acronyms

pv	Photovoltaic
LLC	Limited Liability Company
GmbH	Gesellschaft mit beschraenkter Haftung(in German) means Limited liability Company
IFC	International Financial Corporation
Aimag	Province (Mongolian administrative unit)
ESIA	Environmental and Social Impact Assessment
PPA	Power Purchase Agreement
EHS	Environmental, Health and Safety Guidelines
^0C	degrees Centigrade
CO_2	carbon dioxide
dBA	decibels (sound pressure level)
EAP	Environmental Action Plan
EBRD	European Bank for Reconstruction and Development
EIA	Environmental Impact Assessment
ESMP	Environmental and social Management Plan
ERA	Mongolian Energy Regulatory Authority
NDC	National Dispatching Center
EU	European Union
Ha	hectare
Ger	Traditional dwelling of Mongolians (also known as yurts)
Km	kilometers
Kv	kilovolts, or 1,000 volts
kW	kilowatts, or 1,000 watts of energy, equal to 1 joule of energy per second
kWh	kilowatt hour
LAeq	equivalent sound pressure level
mm	millimeters
m/s	meters per second
MW	Megawatt – one million watts of energy
NGO	non-governmental organizations
soum	Mongolian administrative unit roughly analogous to county
UN	United Nations

UNDP	United Nations Development Program
v	volt, a measure of resistance or potential difference
WHO	World Health Organization
BEEP	Building Energy Efficiency Project
BCNS	Building codes, norms and standards
GEF	Global Environment Facility
KEMCO	Korean Energy Management Corporation
DC	direct current
AC	alternating current
LCC	Local Control Centre
SO	sulfur dioxide
CO	carbon monoxide
NO2	nitric oxide
O3	ozone
PM 10	particulate matter less than 10 micrometers in diameter

CHAPTER 1 INTRODUCTION & PROJECT BACKGROUND

1.1 Introduction

Desert Solar Power One LLC (DSP One LLC), a project company owned by the family owned United Green Group and the German family office Tucher & Schmied GmbH, is intending to construct a Photovoltaic (PV) Power Plant in Sainshand in south-eastern Mongolia (figure 1-1) with a capacity of 30 megawatts (MW). DSP One LLC, as one of the first project companies for large-scale solar PV development in Mongolia, is seeking financing from European Bank for Reconstruction and Development (EBRD). As part of their decision making process, EBRD requires that the proposed project be evaluated in an Environmental and Social Impact Assessment (ESIA) that meets international guidelines. The draft ESIA shall be disclosed to project stakeholders and the public in compliance with Equator principles (EPs) and EBRD guidelines as best practice. All stakeholder and public comments on the draft ESIA were considered in developing the final ESIA, and will be considered in the final decisions made by EBRD.

Figure1-1 Map of Mongolia with Project location

1.2 Project Background

The Government of Mongolia promotes electric power generation from renewable energies to further increase its domestic total power generation capacity. Today the main part of energy in Mongolia is produced by coal-fired plants. These plants cause significant short-term and long-term environmental damages. For example in Ulaanbaatar the particulate matter pollution during winter is over 20 times as high as valid international values (Data source: Ministry of Energy Mongolia). Economic growth and a boom in the mining sector are leading to a higher energy demand for the whole country. Furthermore, especially during peak demand expensive electricity has to be imported from Russia.

Therefore, the existing energy generating situation needs to be reinforced with new climate friendly power plants like PV Power Plants in order to ensure the availability of energy and to avoid brownouts or blackouts. Mongolia has tremendous renewable energy resources available, in particular the energy of the sun. Mongolia has very convenient climatic conditions for effective use of these resources. Due to PV plants Mongolia is able to reduce the energy import expenses from Russia significantly. This has been the political target of Mongolian Ministry of Energy, said M. Sonompil on April 29, 2013, to make Mongolia energy self-sufficient and plans to expand energy production further to eventually become an energy exporter. As an option to tackle the increasing energy demand and also to foster a clean energy development, the Government of Mongolia enacted a "National Renewable Energy Program(2005 – 2020)" and launched the "Renewable Energy Law" in 2007 with the target to increase the renewable energy share to 20 – 25 % by 2020 (currently 5%).

On-site investigations were conducted since January 2013 on several sites in Mongolia and feasibility study for developing PV power plant in Sainshand was prepared in March 2013 based on a more than five-year ongoing research on the solar power yield in Sainshand. In September 2013 the PV solar power project was approved by Technical & Science Committee of Ministry of Energy Mongolia, and in February 2014 the construction license was issued by Mongolian Energy Regulatory Commission. In September 2014, the Feed-In Tariff has been approved to be 16 USD cents / kWh for 20 Years and both the Power Purchase Agreement (PPA) and Dispatch Agreement have been signed in July 2015. All necessary approvals and licenses have been obtained. Additional details of the legal framework and project development are provided in Chapter 3, and the proposed solar PV project is described in Chapter 2.

Please refer to the following table for milestones in regards to this project:

No.	Research/approvals/licenses	Date
1	Lead study on renewable energy usage in rural areas (financed by KfW Bankengruppe)	Dec. 2005
2	Further studies on the Mongolian renewable energy market	Dec. 2010
3	Memorandum of Understanding with Ministry of Energy	Dec. 2012
4	On-site investigation (German geologist and PV specialist) of seven potential project sites	Jan. 2013
5	Feasibility study for the most suitable project location	Apr. 2013
6	Project approval by the Technical & Science Committee of the Ministry of Energy and grid capacity study prepared	Sep. 2013
7	Land permission on city level	Dec. 2013
8	Construction license	Mar. 2014
9	Power Purchase Agreement and Dispatch Agreement signed	Jul. 2015
10	Construction start	Q2 2017

Table1-1 Sainshand PV Power Project milestones

1.3 Scope of the ESIA

In order to successfully development this project, the following requirements must be met:

• The project would meet Mongolian national requirements and international lending standards.
• The project would include all necessary mitigation measures to minimize any significant adverse change in environmental, health and safety, and socioeconomic conditions.
• Appropriate public consultation and disclosure are undertaken in line with EBRD Performance Standards, ensuring all reasonable public opinions are adequately considered prior to a commitment for financing.

To ensure compliance with international lending requirements, the overall scope of this assessment includes:

• Scoping and identification of key issues.

• Definition of baseline conditions of key environmental and social resources.

• Assessment of positive and negative impacts of the proposed project.

• Consultation with people who may be affected by the prospective project and other stakeholders.

• Development of design and operating practices that are sufficient to avoid, reduce, or compensate for significant adverse environmental and social impacts.

• Development of such monitoring programs as are necessary to verify mitigation is effective in accomplishing its goals, and to develop and refine the effectiveness of mitigation measures.

These requirements are discussed further in the following sections.

1.4 Methodology for the ESIA

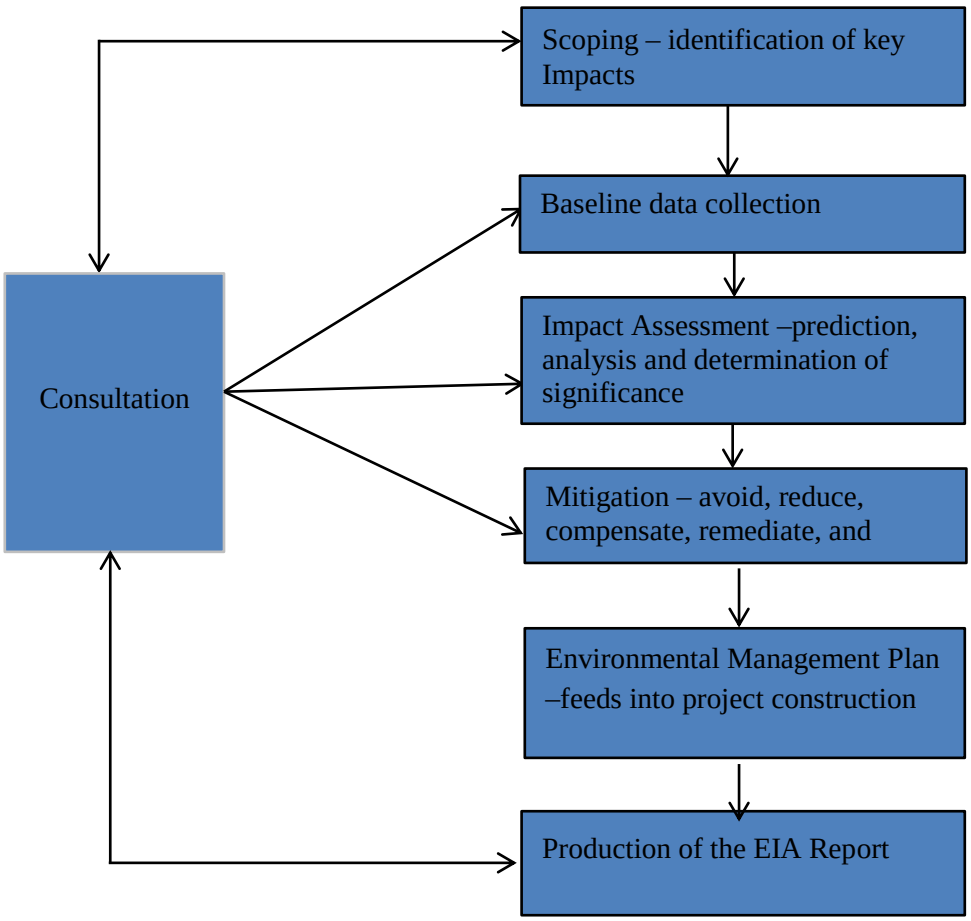

Figure 1-2 Overall ESIA process

This section describes the ESIA process in the context of the Sainshand PV Solar Power Plant. The overall approach for the ESIA and reporting used the following sources of guidance:

• European Union Council Directive 85/337/EEC on the Assessment of the effects of certain public and private projects on the environment, as amended by Council Directive 97/11/EC (Council of the European Union, 1985; 1997).

• IFC Guidelines, including Environmental, Health and Safety (EHS) Guidelines for solar Energy (IFC, 2007b), General EHS Guidelines (IFC, 2007a), Draft EHS Guidance for Roads (IFC, 2006), and Operational Policy 4.01, Content of an Environmental Assessment Report for a Category B Project (World Bank, 2007).

1.4.1 Scoping

The aim of the scoping process is to identify the potentially significant environmental and socioeconomic issues that are associated with a project, covering the full range of possible effects, both beneficial and adverse, and to ensure that potentially significant issues are considered fully in the ESIA. The method used for scoping the potentially significant impacts of this project comprised:

• Consultation with and feedback from government and private organizations and members of the public.

• Professional knowledge of PV Solar Power Plant development and operation, and the types of impacts this could cause.

• Preliminary knowledge of the existing environment and areas of sensitivity.

• The scoping process identified the following key issues to be assessed within the ESIA:

- Environmental benefits of using solar-generated energy to meet Mongolia's demand for electricity as opposed to other methods, particularly coal.
- The vulnerability of local soils, in particular their susceptibility to erosion and desertification.
- Potential effects on local communities, including visual and cultural effects.
- Potential effects on water from the generation and management of waste.
- Potential economic effects from employment during construction and operation.

The environmental and social impact assessment Chapter 6 of this ESIA determines whether or not a potential impact of the proposed scheme could be considered "significant." An identification and assessment of environmental, socio-economic and health & safety issues potentially arising from the project have been undertaken, and mitigation measures were proposed aiming to reduce the potential impacts that may result from the project. Details of impact assessment and impact significance as well as

mitigation measures are provided in chapter 6 of this ESIA. In addition, an Environmental and Social Management Plan (chapter7) have been developed to ensure that potential impacts are sufficiently monitored and mitigation measures are implemented.

The ESIA activities have been carried out jointly by a multi-disciplinary team of experts, including environment team, and from relevant fields in house. A brief summary of the key potential impacts and their corresponding mitigation measures and monitoring requirements are presented in the Tables below.

Environmental Parameter	Level of Impact	Reasons	Mitigation Measures
Air Impact	Low	No atmospheric Emissions from the process.	Use of PV based solar power technology
Water	Low	1. Plant will require a very low amount of water. 2.No effluent is envisaged to be discharged from the plant that may have impact.	1. In the case of wet cleaning, the amount of water needed is insignificant. There would be no need of water if DSP One LLC manages to successfully implement dry cleaning of Modules. 2. Drinking water requirement shall be met from the water reservoir of Sainshand city.
Land	Medium	Impact of change in land use	1.Site selection has been made in consideration of avoidance of sensitive habitats and species and without conflicts with other land holders
Noise	Low	1.No Sources of Noise within the project area. 2. No sensitive receptors in the vicinity of the project site.	1. Noise barriers will be provided to neutralize the noise. 2. Noise level of machines shall be below 60- 80 dB (A)
Flora and Fauna	Low	1. The site area is partially covered with small grass parts however an arid sandy area in general. 2. Animal species that lives in such open flat terrain are not threatened or restricted on their	1.Although there is no significant vegetation cover within the study area, plantation activities will be carried out. 2. Holes will be left in the surrounding fence of the solar plant so small animals are able

		environment.	to pass through.
Socioeconomic	Low	1. The land identified for the project belongs to Mongolian Government and the PV site is marked and reserved at the related authority in Sainshand. So there are no conflicts with other landholders. 2. Influx of Labors	1. No resettlement involved as there were no residents within the project area. 2. Construction labors will be housed on temporary construction camps specially developed for this purpose with all basic amenities.

Table 1-2 Overall Environmental Impact Findings

1.4.2 Baseline Data Collection

(The study area was defined initially by the proposed locations of solar panels, and then by the area that could be affected by construction and operation of the solar panels.)

Baseline data collection for the PV Solar Power Plant included a combination of desk studies and site visits. Desk studies used existing sources of information, including data available on the internet, reports, and data provided by the project proponent, DSP One LLC. Site visits were undertaken in January 2013, in order to supplement and verify information provided by desk studies.

Chapter 4 of this ESIA provides information on the baseline environment, including natural processes that may affect the baseline over the course of project development.

1.4.3 Methodology and Approach of ESIA

Once all of the project environmental and socioeconomic impacts have been assessed, the significance of the impacts was ranked by considering the following elements:

- **The consequence** of identified events: the resulting effect (positive or negative) of an activity's interaction with legal, natural and/or socioeconomic environments; and
- **Likelihood**: the likelihood that an activity will occur. Agreed criteria were defined for each level of consequence and each level of likelihood and the significance of the impact associated with each identified aspect is the product of the consequence and likelihood. It should be noted that the assessment has been conducted by considering the mitigation measures normally designed into / included in the project.

The following sections briefly describe the consequence, likelihood, and significance criteria.

1.4.3.1 Consequence

To assign a level of consequence to each environmental and social impact, criteria are defined for environmental and socio-economic consequence or severity. Legal issues are embedded in both criteria sets. The consequence categories and their ranking are presented in the following Table.

Consequence	Ranking	Description
Catastrophic	5	Massive effect – Persistent severe environmental damage or severe nuisance extending over a large area. In terms of commercial or recreational use or nature conservation, a major economic loss for the Company. Constant, high exceedance of statutory or prescribed limits, high profile community outrage.
severe	4	Major effect – Severe environmental damage. The Company is required to take extensive measures to restore polluted or damaged environment to its original state. Extended breaches of statutory or prescribed limits, and serious community concern and complaints.
Critical	3	Localized effect – Limited discharges of known toxicity, considerable community concern and/or complaints. Repeated breaches of statuary or prescribed limit. Affecting neighborhood. Spontaneous recovery of limited damage within one year.
Marginal	2	Minor effect – Contamination. Damage sufficiently large to damage the environment, some community concern raised. Single exceedance of statutory or prescribed criterion. No permanent effect on the environment.
None	1	Slight effect – Local environmental damage. Within the fence and within systems. Negligible financial severity.
None	0	No impact
Positive	+	Beneficial impact – enhances the environment

Table 1-3: Consequence Categories and Rankings

It should be noted that it is often difficult to compare impacts consistently across different natural and socio-economic environments. When evaluating the environmental and socioeconomic aspects, emphasis was placed on specific cause and effect relationships. Scientific evidence as well as predictions based on observation of previous similar activities can and have been used in the impact assessment process. Where it has not been possible to fully quantify the effect that an activity may have on the environment or a component of the environment, or where there is a lack of scientific knowledge, qualitative judgment has been used. Such judgments is based on a full understanding of

the project activities, and the team's knowledge of the environment, social structure and general health aspects of the region in which the project's activities will occur.

1.4.3.2. Likelihood

To assign likelihood to each activity, five categories are defined and ranked. The criteria for likelihood are shown below.

Category	Ranking	Definition
Certain	5	The activity will occur under normal operating conditions
Very Likely	4	The activity is very likely to occur under normal operational conditions
Likely	3	The activity is likely to occur at some time under normal operating conditions
Unlikely	2	The activity is unlikely to but may occur at some time under normal operating conditions
Very Unlikely	1	The activity is very unlikely to occur under normal operating conditions but may occur in exceptional circumstances

Table 1-4 Likelihood Categories and Rankings

1.4.3.3. Significance

The significance of the impact is expressed as the product of the consequence and likelihood of occurrence of the activity, expressed as follows:
Significance = Consequence x Likelihood
Figure below illustrates all possible product results for the five consequence and likelihood categories.

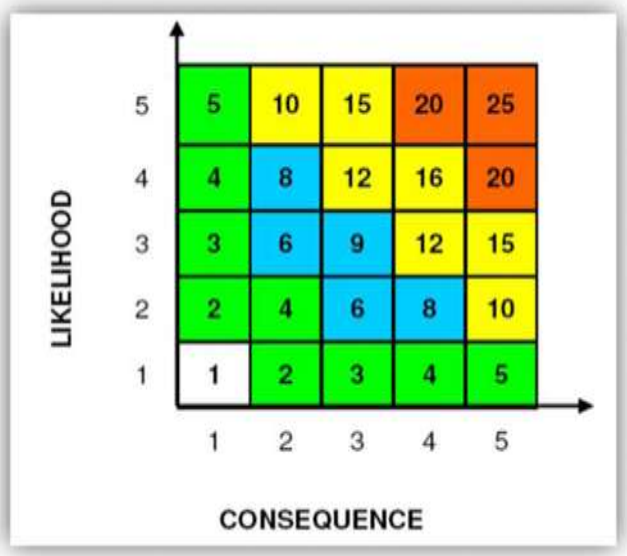

Figure1-3Product Results for Consequence & Likelihood Categories

Based on its consequence-likelihood score, each environmental aspect has been ranked into five categories by order of significance as illustrated below.

Ranking (Consequence X Likelihood)	Significance
>16	Extremely dangerous
10-16	High
6-9	Medium
2-5	Low
<2	Very low or Negligible

Table1-5: Significance Categories

1.4.4 Environmental Mitigation and Enhancement

Where significant impacts are identified, mitigation measures were developed. These measures are intended to avoid, reduce, compensate, and/or remediate adverse impacts, or to enhance potentially beneficial impacts. Wherever possible, this is undertaken as part of the project design, so the measures will feed back into impact assessment.

The mitigation and enhancement which should be undertaken as part of the project are set out as an Environmental and Social Management Plan, which can then be applied in order to manage different phases of the project. For this project, the Environmental and Social Management Plan is presented as Chapter 7.

1.4.5 Environmental Monitoring

Where there is uncertainty over the potential significance of an impact, mitigation may include monitoring of that impact to determine whether additional measures are required. Sainshand Environmental monitoring is described in Chapter 7. Furthermore,a Stakeholder Engagement Plan (SEP) has been developed separately to identify and address all stakeholder concerns and a Non-technical Summary (NTS) has also been included in a separate document.

1.5 Organization of this Report

The report consists of seven chapters (including the present chapter) and the contents of the remaining chapters are briefly described in this section.

•Chapter 2 **The Proposed Project**.
This chapter provides information related to various feature of the proposed power plant including power generation process, utilities, water and power requirement and other proposed infrastructure facilities. It also provides the glimpse of project schedule for approval and implementation.

•Chapter 3 **Legal and institutional Framework**.
This chapter describes the legal and institutional framework and context in which the project is being proposed and developed.

• Chapter 4 **Environmental and Socioeconomic Baseline Conditions**.
This chapter describes the environmental setting of the solar power plant area and the baseline environmental and socioeconomic conditions of aspects of the area.

• Chapter 5 **Analysis of Alternatives**.
Alternatives considered for the proposed project are evaluated and discussed with particular emphasis on environmental considerations.

•Chapter 6 **Anticipated Environmental and Social Impacts and Mitigation Measures.**
This chapter provides details of the environmental and social impact assessment of the project during construction, operational and decommissioning phases. It expresses the impacts of the proposed project on the various components of environment. Mitigation measures are suggested along with the impact prediction.

•Chapter 7 **Environmental & Social Management Plan.**

This chapter deals with Environmental and Social management plan incorporating recommendations to implementation of the suggested mitigation measures to minimize adverse environmental and social impacts during construction, operation and decommissioning phases.

CHAPTER 2 THE PROPOSED PROJECT

DSP One LLC proposes to construct and operate a PV Solar Power Plant in south-eastern Mongolia to generate up to 30 MW of electricity for the national grid. In 2014, the project land of 714,000 sqm has been approved by the city council of Sainshand. This chapter describes the project in sufficient detail to allow an evaluation of the potential environmental and social impacts that could result from project construction and operation, and to allow development of appropriate mitigation measures to control, reduce, or compensate for such impacts where necessary. DSP One LLC is in the process of developing detailed designs for the project, and some specifications of the final project could be somewhat different than described here. However, differences are expected to be relatively minor and should not result in increased impacts.

2.1 Project location

The location for the proposed PV Power Plant is sketched in Figure 2-1. The area lies in south-eastern Mongolia situated next to the Sainshand city in Dornogovi Province. Around 80ha of unused land which is owned by the city of Sainshand is explored for its aptitude for PV power generation. A general overview of the proposed PV area is presented in Figure 2-1.

Figure2-1 Overview of proposed PV Area

2.2 Accessibility & Transportation

Mongolia has an emerging infrastructure. For the accessibility of Mongolia from abroad, which is required to transport equipment like inverters and modules, the railroad can be used. The fact, that there is a railroad connecting Mongolia with China (refer to Figure2-2), offers an ideal opportunity to transport all relevant components of a PV Power Plant. The proposed location is very close to the rail station of Sainshand (refer to Figure 2-3).

Figure 2-2 Railroad Mongolia-China

After reaching the rail station the equipment shall be loaded onto trucks, respectively heavy-duty trucks. Generally the accessibility to the specific site must be guaranteed for the heaviest equipment. For photovoltaic installations such equipment is normally the transformer. This transformer requires a crane for uploading on the site. The modules will be transported in containers, whereby approximately 270 20-feet containers for 30 MW photovoltaic modules will be required. The logistical efforts shall be planned sufficiently.

Transformers with a weight up to 30 tons shall be considered and at both locations (rail station and onsite) a suitable crane shall be available for unloading the cargo from trucks and train. The route of the trucks from the rail station to the site is shown in Figure 2-5. The distance between both locations is approximately 8.5 km only. All related existing roads are in adequate conditions.

Figure 2-3: Route from rail station to PV site

2.3 Project components

The PV project contains three major components, which are PV modules, Mounting system and Invertors. The detailed description of the main components is in the following sub-sections:

2.3.1 PV modules

The PV modules are the main component of a PV Power Plant. The modules must with-stand all environmental influences over the whole life time of the plant. The predefined module manufacturer is Canadian Solar, and the module type is CS6P - 250P. One module consists of 60 cells of polycrystalline technology. Each cell has a size of 15.6 cm x 15.6 cm. The modules are certified according to IEC 61215 and IEC 61730. The maximum allowed DC voltage is 1,000 V. The main module data is shown in the following tables.

Electrical Data at Standard Test Conditions (STC)	
Optimum Operating Voltage	30.1 V
Optimum Operating Current	8.30 A

Open Circuit Voltage	37.2 V
Short Circuit Current	8.87 A
Nominal Maximum Power	250 W
Module Efficiency	15.54%
Power Tolerance	-0 W to +5 W

Table 2-1: Electrical Data at Standard Test Conditions

Temperature Characteristics	
Nominal Operating Cell Temperature	45°C
Temperature Coefficient Power	-0.43%/°C
Temperature Coefficient Voltage	-0.34%/°C
Temperature Coefficient Current	+0.065%/°C

Table 2-2: Temperature Characteristics

2.3.2 Mounting system

The designed system is presented in Figure 2-4. The modules are mounted with a tilt angle of 35° (α) according to the horizontal. The orientation is 0°, meaning the modules face in south direction. The row distance (between two tables) is 6.00 m, which is presented as (b). The modules lower edge is 0.80 m above ground and the upper edge (h) reaches a height of 2.685 m. The length of the module table is 3.286 m (a) including frames.

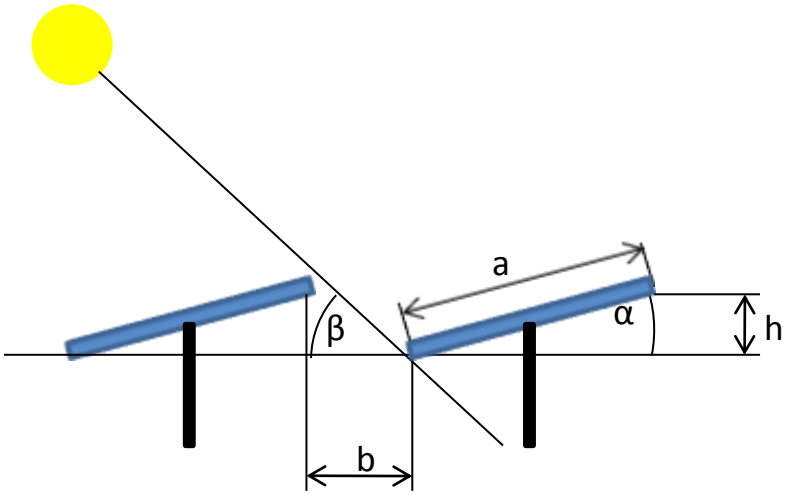

Figure 2-4: System design

*Figure*2-5shows the Sun Orbit Diagram for the location of the PV Power Plant.

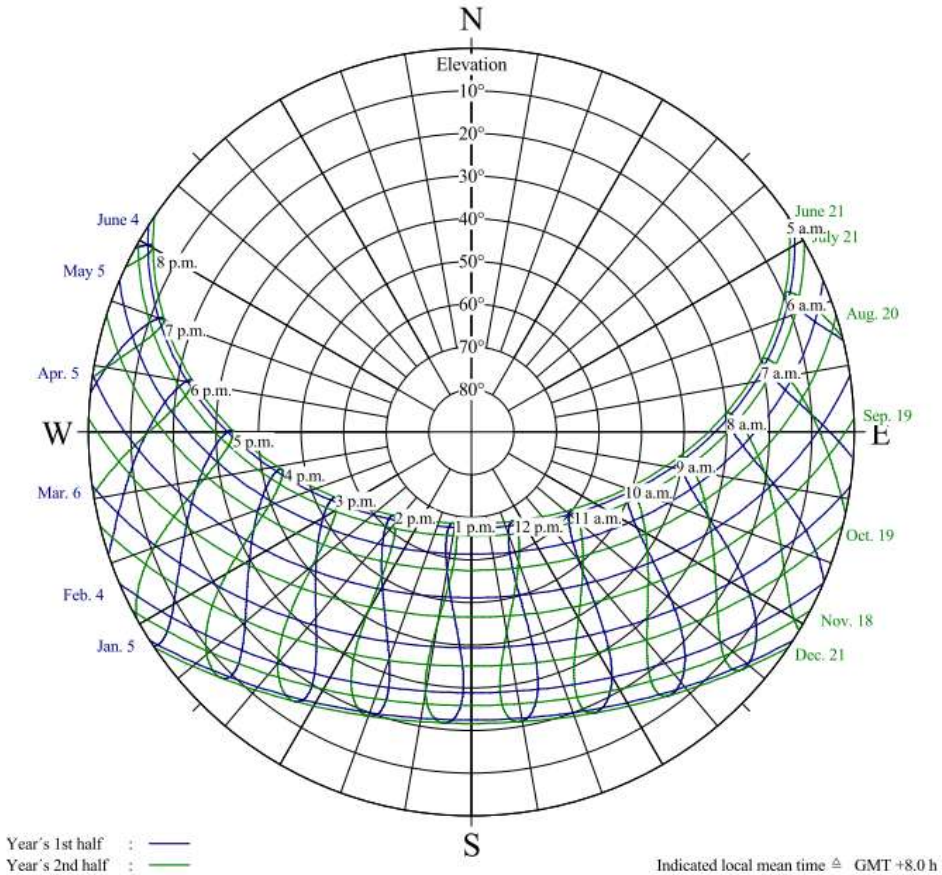

Figure 2-5: Sun Orbit Diagram Sainshand

2.3.3 Inverters

The inverters transform the DC current of the PV modules into AC current in order to feed the electrical power into the public grid. The development of the power electronics in the last decade allowed to reach very high level of DC/AC conversion and can reach up to 98% (depending on the inverter type and manufacturer).The selected inverter with a capacity of 630 kW is from the manufacturer SMA and the specific type is Sunny Central 630CP. The following tables present the key data for the predefined inverter.

Input (DC)	
Type	Sunny Central 630CP
Maximum PV Power	713 kW
Input Voltage Range MPPT	500 to 820 V
Maximum Input Voltage	1,000 V
Maximum Input Current	1,350 A

Table 2-3: Inverter DC

Output (AC)	
Type	Sunny Central 630CP
Nominal Output Power	630 kVA
Nominal Output Voltage	315 V
Nominal Output Current	1,155 A

Table 2-4: Inverter AC

Efficiency	
Type	Sunny Central 630CP
Maximum Efficiency	98.7 %
Euro-eta	98.5 %

Table 2-5: Inverter Efficiency

2.4 Monitoring and controlling system

The photovoltaic PV Power Plant in Sainshand shall be provided with a Local Control Centre (LCC) with monitoring functions located in the monitoring respectively equipment room in the Control & Security Building. The Local Control Centre will be permanently staffed. For maintenance and repair activities additional staff will be present in the LCC.

Parameters to be monitored:

- Data from inverters and string monitors
- Logging of events and released commands
- Weather station data
- Module temperature
- Fiscal meter
- Power network analyzer (to monitor high and low voltage conditions and interruption)

The complete list of monitored data will be defined in the specification of the Monitoring system in a later stage of the project. A compilation of collected data shall be made available at least daily at the respective LCC. If possible more frequent updates are preferred.

All monitored data shall be archived for the whole lifespan of the PV Power Plant and shall be made available for analysis on a central archive in the respective LCC. Any alarms or non-normal operational conditions identified in the equipment shall be displayed in the respective monitoring system immediately. The performance data of the PV plant shall be updated in a secured web server mini-mum once per day. In order to load the data to the web server (PV PORTAL) a connection to the public telecommunication network (internet) by modem, GSM, UMTS, ADSL, etc. is necessary. For a schematic overview of the monitoring system please refer to Appendix 3.

2.5 Civil Engineering

The civil engineering is defining the required constructions such as buildings and roads for the proposed PV Power Plant Sainshand. As main construction requirements due the photovoltaic Power Plant all buildings, fences and roads will present by the specific plant layout.

The following listed constructions must be realized to ensure a complete photovoltaic system.

- Buildings (Transformer Buildings, Field Substation, Monitoring and Security Building,Gatehouse)
- Roads
  Gravel roads are foreseen. The width of main and branch roads shall be 3.0 m. All roads shall be designed for vehicles of the constructor staff and with a low frequency for vehicles for delivering of the heavy transformer (only during construction phase). The roads should have turning round areas for trucks.
- Drainage
  Based on the slightly steady inclined surface to north-west and due to the low precipitation rate a drainage system against rain water and flooding is not necessary.
- Water Supply, Sewage
  If existing wells cannot be used a new well will be drilled or the water will be delivered by trucks. Enough water shall be provided for the staff located on site. An adequate waste water sewerage system shall be constructed where sanitary installations are foreseen.
- Mounting System including foundations.

For the PV Power Plant a fixed mounting structure is foreseen. Using standardized structures from renowned manufacturers (e.g. Schletter, Krinner, Habdank, etc.) assures a short construction time and a reliable PV module integration. In general a distance of 10 cm between two tables has been considered. The mounting structure shall be designed with a minimum elevation of 80 cm (Figure 2-6). This typical distance is used to reduce the frequency of required landscaping.

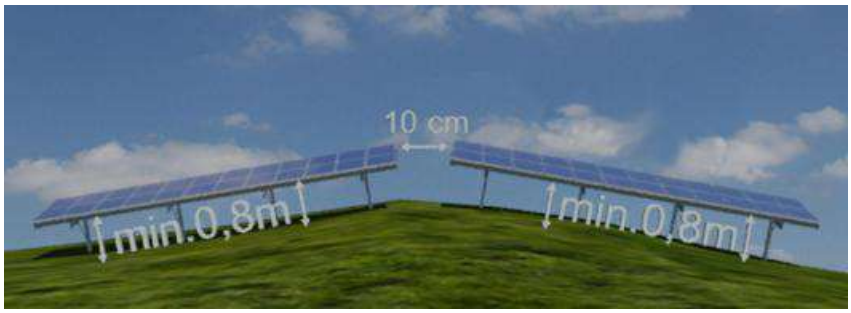

Figure 2-6: Typical sketch for changing table inclinations (*)

(*) Shown figure is used for illustrative purposes and do not reflect site conditions.

- Fences: A double-rod fence and gates with bard wire and concrete foundation will be mounted around the PV plant as border with a minimum distance of 5m to the mounting structure.

- Provide temporary load and unload facility at rail station and on site.

2.6 Area Layout

The Area Layout presents the Power Plant with a total capacity of 30 MW. The following Figure is presenting the Conceptual Area Layout as preview of the large scale drawing of Appendix 1.

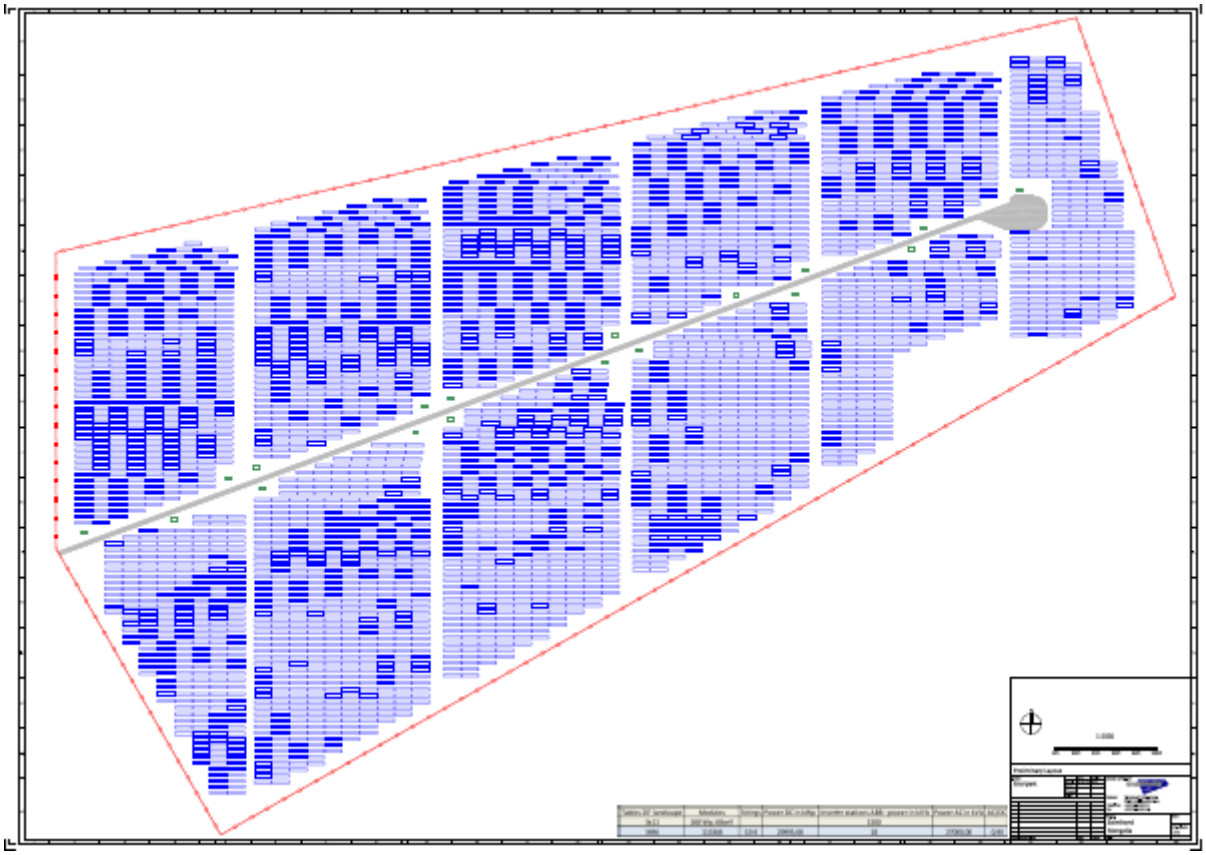

Figure 2-7: Conceptual Area Layout

2.7. Water Consumption and wastewater Generation

The project is expected to use limited quantities of fresh water during the three project phase-construction, operation, and decommissioning, since such this type of projects considered as a low water consumption projects, the project will be supplied by the water through Sainshand city water reservoir.

Wastewater is any water that is contaminated by anthropogenic / industrial processes with solids, temperature, chemicals and other impurities. The effluent management scheme would essentially involve collection, treatment and recirculation / disposal of various

effluents. Since, water is used only for the cleaning purpose of solar PV modules to remove dust from it. The discharge water does not include any chemical or hazardous material. Water runoff / discharge from the panels is likely to get evaporate or absorbed into the arid ground below the panels, and no drainage canal is required. As for the wastewater from the trailers where the construction workers will be accommodated, it shall be collected and regularly transported offsite for appropriate treatment and disposal. Wastes will be collected and separated for appropriate disposal too. There may be a security building with a kitchen or lavatory on site. If so, all kitchen and lavatory wastes will be either transported offsite for appropriate treatment or else a fit-for -purpose water treatment plant will be built.

2.8. Construction and Implementation Schedule

The proposed time schedule of the following project phases of the 30 MW PV Power Plant is shown in Appendix 2.The time schedule includes the following phases:

2.8.1 Implementation schedule

I. Finance and PPA phase: (*approx. 14 months*)

1. Conversation with banks (*approx. 5 months*)
    - First talk to banks (EBRD, IFC, DEG, FMO)
    - Detailed talks and meeting with banks
    - Negotiation term-sheet
    - Advisor selection regarding legal / tax / insurance / due diligence
2. Financial approval process with banks, including negotiation of PPA (*approx. 4 months*)
3. Due diligence process (*approx. 3 months*)
4. Working on pre- and subsequent conditions, including obtaining of local permits (*approx. 3 months*)
5. EPC Contracting (*approx. 2 months*)
    - EPC Contract negotiations
    - EPC bankability check

- Contract award

II. EPC construction phase: (*approx. 6 months*)

1. Engineering and procurement phase (*approx. 3 months*)
    - Construction engineering
    - Procurement
    - Technical design approval
2. Construction phase (*approx. 3months*)
    - Mobilization / start of construction
    - Earth works
    - Foundations, buildings, roads, fencing
    - Mounting structure
    - PV Module mounting
    - Electrical installations
    - Demobilisation
3. Commissioning and acceptance phase: (*approx. 2 months*)
    - Commissioning
    - Acceptance tests
    - Authority acceptance
    - Plant acceptance
    - Final documentation
    - Plant start-up

2.8.2 Plant Operation and Maintenance

The operation of solar power plant is relatively simple and restricted to daylight hours. With automated functions of inverter and switchyard controllers, the maintenance will be mostly oriented towards better upkeep and monitoring of overall performance of the

system. The solar PV system requires the least maintenance among all power generation facility due to the absence of fuel, intense heat, rotating machinery, waste disposal, etc. However, keeping the PV panels in good condition, monitoring and correcting faults in the connected equipment and cabling are still required to get maximum energy from the plant.

2.9 Power Transmission Line

The photovoltaic Power Plant shall feed the generated energy into the public grid. The suitable voltage level is once indicated by the maximum installed photovoltaic power as well as by influences of the public grid onto the photovoltaic Power Plant such as frequency of switching on the grid connection.

The next suitable possibility to connect the PV plant to the local grid is a 110kV/35kV/10kV substation located in the east of Sainshand. The distance to the proposed PV area is approximately 2.75km (refer to Figure 2-8).

Figure 2-8: Distance of substation to PV site

The PV Power Plant shall be connected via a 35 kV overhead line. Such recommendation is based on the installed PV power of 30 MW. The interconnection point will be at the 35kV switchgear located in the local substation of Sainshand (if enough space is

available on the busbar). Based on the location of the local substation, the connection point on site (field substation) will be in the southern corner of the proposed site. The field substation consists of one 35kV switchgear including an outgoing circuit breaker for 35 kV. The incoming voltage level to the field substation onsite will be 35 kV as well. 24 x 1.25 MVA Transformers distributed onsite transforms already the produced energy from the PV plant up to a voltage level of 35 kV. The medium voltage part of the existing local substation of Sainshand shall be extended with a new incomer including and cubicle metering. The borderline between PV Power Plant Operator and Grid Operator is proposed to be the incoming medium voltage over-headline from the local substation Sainshand to the field substation on PV site. The proposed borderline is although shown in Appendix 4.

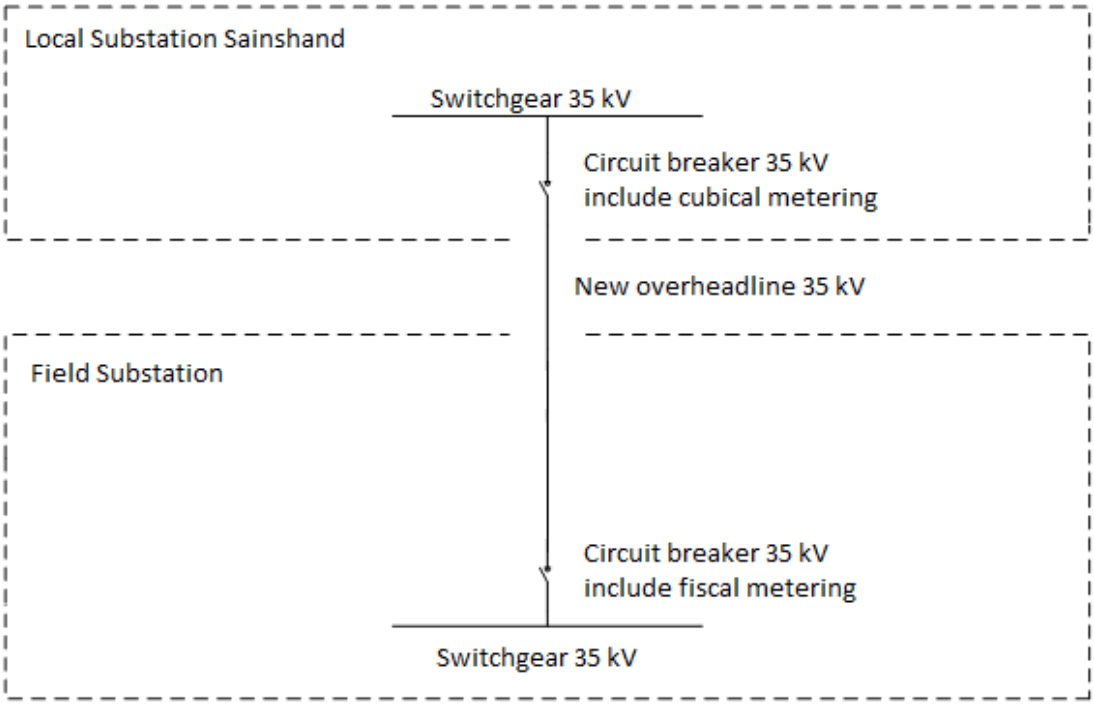

Figure2-9: Power Transmission Concept

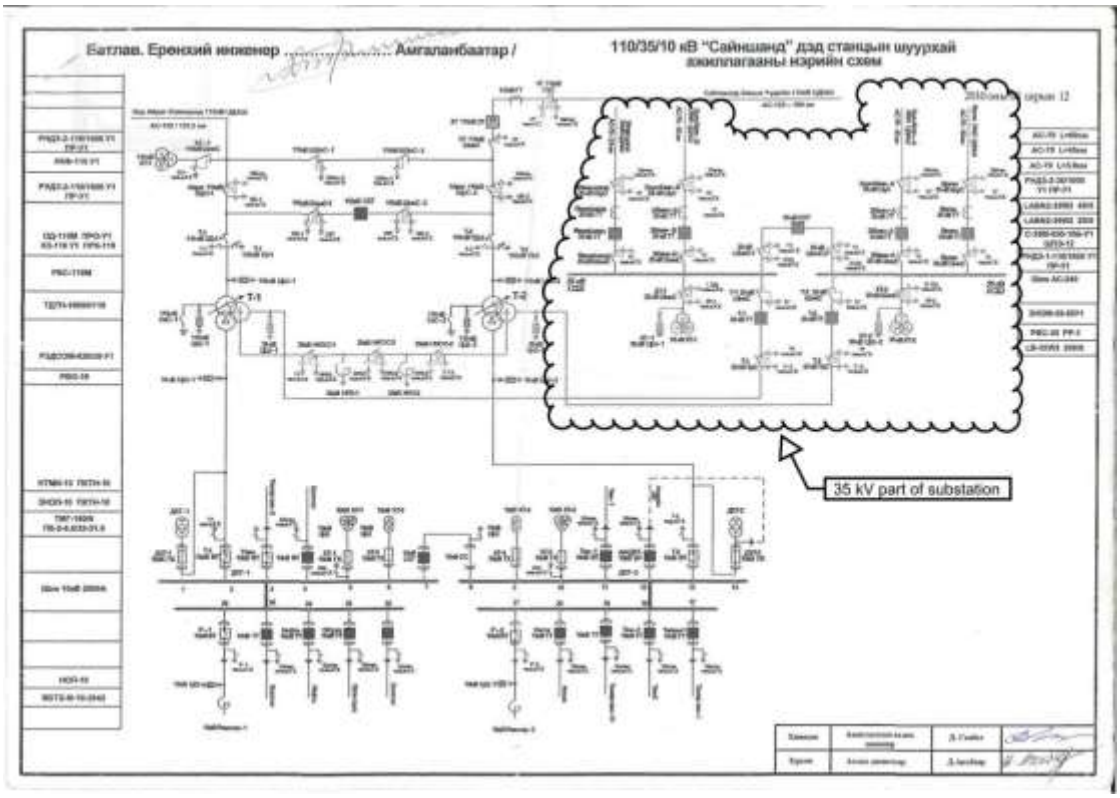

Figure2-10: Existing local substation

CHAPTER 3 LEGAL AND INSTITUTIONAL FRAMEWORK

This Chapter outlines Mongolian legislative environment for the project implementation and particularly describes overall local and internationally accepted legal framework for the renewable energy generation which was adopted in Mongolia.

3.1 Key Mongolian Laws and Policies in the Energy Sector and Key Governmental Institutions

At present the following laws, regulations and legal documents relate to the energy regulation process in Mongolia. Specific characteristics of certain laws will be discussed below in the relevant section.

Laws of Mongolia:

1. Energy Law;
2. Economic Activity License Law;
3. Civil Code;
4. Minerals Law;
5. Renewable Energy Law;
6. Competition Law;
7. Environmental Protection Law;
8. Foreign Investment Law.

* *The Parliament in Mongolia is also on the verge of approving the Energy Conservation Law in 2015.*

In addition there is a regulatory framework governing the unbundled power sector. In broad terms the responsibility for licensing is vested with the Ministry of Energy, and for price regulation with the Energy Regulatory Commission.

Besides, Mongolian Government promulgated various environmental policies in the energy sector and the following are the major documents that form the base for the legislative development:

1. National Program of Renewable Energy 2005-2020;
2. Mongolian Integrated Power System Program 2007-2040;
3. Building Energy Efficiency Project (BEEP) started 2009
4. Mongolian Energy Sector Master Plan 2000-2020

1. On 9 June 2005, the Parliament of Mongolia approved "A National Renewable Energy Program" for the period 2005-2020, to facilitate the wider use of renewable energy in Mongolia. The Program's goals include: a total installed capacity generated by renewable energy power sources of 3-5% by 2010 and 20-25% by 2020 of the total energy production; and a program for increased decentralized electrification of remote rural villages to provide electricity to 100,000 households by 2010 and all rural families by 2020.

   In Mongolia utilization of renewable energy has been emphasized as one of the priority areas of the energy industry in the Government policy documents (some major ones are mentioned herein) such as the Government Action Plan (Master Plan), millennium Development Goals, Sustainable Development Program of Mongolia for 21st century, and Regional Development Concept etc.). The Government of Mongolia attaches great importance to the use of renewable energy for improving power supply through research and use of environmentally friendly and new sources of energy for the benefit of rural households who are not fully provided with power and soums and settlements that would require significant amount of resources to get connected to centralized power grids.

2. The Government has adopted Mongolian Integrated Power System Program policy to ensure the reliable power throughout the country and its capital city and will develop new generation capacity to meet increasing demand. 2007 Program on integrated power energy system was adopted by the Parliament with the following objectives:

- To create independent and reliable power system with efficient energy generation facilities with as less as possible loss;
- To secure power supply reliability in regions by constructing hydro power plants and high voltage transmission lines to connect the plants;
- To restructure energy sources and make power supply in urban and settled areas by introducing new and efficient technology and equipment and utilizing renewable energy sources;
- To develop laws and legal basis and management principals applicable in the market economy principals and increase participation of private sector in the energy sector.

3. The "Building Energy Efficiency Project" (BEEP) started in 2009 to support the Government of Mongolia in enhancing energy efficiency in the wider Mongolian building sector by removing the barriers, including noncompliant and outdated building codes, norms and standards (BCNS). The project is funded by the Global Environment Facility (GEF), the Korean Energy Management Corporation (KEMCO)

and UNDP Mongolia. Its goal is the reduction in the annual growth rate of GHG emissions from the buildings sector. BEEP will contribute to the reduction of greenhouse gas emissions through the transformation of the Mongolian buildings market towards more energy-efficient building technologies and services, sustainable private house insulation and energy efficiency financing mechanisms.

4. The Energy Sector Master Plan for Mongolia (2000–2020) was prepared under two Asian Development Bank's supported projects in 1994 and 1999, respectively. During later energy sector assessment many discrepancies were noted in the power demand forecast for the period 2000-2010, where the actual demand grew much faster than what was projected earlier. In addition, the Government of Mongolia has announced some specific plans and targets to this effect: (i) to attain 20% – 25% renewable energy in the mix; (ii) to promote energy efficiency; and (iii) to realize cross-border power supply to neighboring countries to enhance revenues through power export. In view of these developments, there was an urgent need to comprehensively analyze, refine and update the existing energy sector master plan for the 2010–2020 period. The project "Updating Energy Sector Development Plan in Mongolia" was divided into six sections as follows:

    - Section 1. Master Plan Assumptions / Strategic Objectives
    - Section 2. Macroeconomic Outlook
    - Section 3. Electricity Load Forecasts
    - Section 4. Aimag Heating Systems
    - Section 5. Primary and Secondary Energy Resources
    - Section 6. Generation and Transmission Expansion

The aims of the Strategy include: sustainable development of the energy sector, reduced poverty and increased involvement of the private sector and public interest in the sector through a more secure energy supply. Moreover, Mongolia's energy sector should be developed within the regional energy context, while the same time taking advantage of new technologies and sources of energy that might further promote economic efficiency and environmental sustainability.

Key Policy Making Government Institutions and bodies

The key institutions involved in policymaking, managing and operating the energy sector according to the Energy Law as of 2001 are:

- *State Ikh Khural* (Mongolian Parliament) which formulates state policy on energy;

- *Ministry of Energy* which is in charge of the development of policy, including the development of energy resources, energy use, import and export of energy, construction of power plants, transmission lines, energy conservation, use of renewable resources, regulation and international cooperation. It plays a key role in shaping a green development strategy to suit Mongolia.

- *Energy Regulatory Commission* which is in charge of issuing licenses, approving tariffs and protecting the rights of consumers and licensees;

- *The National Dispatching Center* which is responsible for coordinating daily system operation of all power and heat sector entities including real time coordination of power plant operation, transmission and distribution switching operation, and operation of the heat transmission network in coordination with combined heat and power operation. The NDC is also responsible for providing the information necessary for settlement of spot market transactions within the context of the wholesale electric power market.

3.2 Energy Law

Primary statute to regulate energy generation, transmission, distribution, consumption and dispatching activities in the country is the Energy Law, passed in February 2001, with all subsequent amendments thereto.

Energy Law provides for the legal framework for the energy sector restructuring from being centrally planned to market-based. This law introduced the independent energy regulator, the Energy Regulatory Authority, and vested powers and responsibilities to key institutions involved in managing and operating the energy sector. With the 2001 establishment of the Energy Regulatory Authority (Energy Regulatory Committee since 2012), energy regulation has been in place for over a decade. Energy Law aimed to create competition and increase private participation and investment.

Energy Law provides for method of price creation. Hence, Energy Law fixes the power of the Energy Regulatory Commission to develop methodology of tariff determination, definition of the tariff structure and review, approval, inspection and publishing tariffs. Tariffs are discussed at the Board meeting and final decisions are issued in the form of resolutions. By setting tariffs, the Energy Regulatory Commission aims to ensure the financial viability and sustainable operations of the licensees, while balancing their interest with those of the consumers.

3.3 Renewable Energy Law

A Renewable Energy Law was adopted in 2007. This law sets forth feed-in tariff ranges for renewable energy, categorized by type. Pursuant to the framework established by the Renewable Energy Law, Energy Regulatory Commission developed and approved long term Power Purchase Agreement signed between the "Central Regional Electricity Transmission Network" State Owned Stock Company and private investor "Desert Solar Power One LLC". Approval of this agreement was in line with the green and environmental policies.

According to the Renewable Energy Law the State Ikh Khural is the competent body for policy development in the renewable energy sector and for ownership transfer of state funded independent renewable energy power sources. The Cabinet is responsible for the implementation of the Renewable Energy Law and for the approval of a list of soums to be supplied with electricity and heat generated by the renewable energy power source. The Ministry of Energy is the main government body in charge for the development of implementing regulations under the Renewable Energy Law.

The main provisions of the law are as follows:

- Energy Regulatory Commission shall issue licenses for construction of Renewable energy sources and for generation and transmission of renewable energy;

- The transmission licensee shall purchase the electricity supplied by a generator at tariffs approved by the law;

- Power Purchase Agreement between generator and a transmission licensee shall be developed in compliance with the a model agreement approved by the Energy Regulatory Commission and shall specify capacity of electricity generated and delivered, its quality, amount, tariff, location of commercial meters, payment and settlement conditions, duties of the parties and provisions for termination.

3.4 Environmental Policies and Laws Related to the Sector

Since 1992 the Parliament of Mongolia has passed several laws designated for the protection of environment. Also, the State Policy on the Environment 1997 has been formulated and constitutes the legal basis for the protection of environment and natural resources. In 1995 the Mongolian Environmental Action Plan was presented. The Mongolian Action Program for the 21st Century, the National Action Plan to combat desertification, the national biodiversity action plan, the action program to protect air, the

national action program to protect ozone layer were developed. The Mongolian Action Program for the 21st Century includes specific considerations and recommendations concerning the adaptation to the climate change and mitigation of GHGs emissions. The Law on Air and Law on Environmental Protection are the main instruments for protection of air and environment of the country.

Among other laws governing the environmental protection are:

- Environmental Impact Assessment Law
- Special Protected Areas Law
- Land Law
- Law on Fauna
- Water Law
- Subsoil Law
- Forest Law
- Household and Industrial Waste

Environmental Protection Law aims to protect the land and soil, underground resources and mineral wealth, water, plants, animals, and air from any adverse effects in order to prevent ecological imbalance. 2012 amendments introduced the "polluter pays" principle and collective management of the natural resources. Polluters are liable to pay compensation for damage caused to the environment and natural resources. The amount of compensation payable depends on the particular resource. Natural resources in Mongolia are all to be assessed by private environmental assessors based on procedures which are currently being formulated by the Government. After the assessment each type of resources is to be assigned an intrinsic value.

Besides there is a requirement on any organization whose activities involve the use of natural resources at their own cost, to commission an environmental assessor to conduct an environmental audit every two years, and to implement the recommendations proposed in the audit.

Environmental Impact Assessment Law. According to the Law a person proposing a project which will have an impact on the environment must inform and report on the implementation of environment management plans to the local population, local government and other stakeholders within the deadline specified by the related ministry.

Water Law as of 2004 has been revised and replaced by the revised Water Law 2012. The Law of Fees for Use of Water and Minerals Water has been consolidated with other laws on the use of natural resources and is replaced with the Law on Natural Resources Use Fee 2012.

3.5 International Requirements

Mongolia has signed several of international conventions which are relevant to the project.

The country ratified the United Nations Framework Conventions of Climate Change in 1996. Mongolian also announced its association with actions of the Copenhagen Accord in January 2010. Major mitigation actions include energy efficiency and renewable energy.

Mongolia has accepted the Kyoto Protocol on 15 December 1999. Special National Bureau was established and registered with the Secretariat of United Nations Framework Convention on Climate Change.

In addition there are Convention to Combat Desertification 1996, Convention Biodiversity 1993 and Convention on International Trade in Endangered Species of Fauna and Flora 1996.

Guidelines and policies of the international institutional lenders such as EBRD and IFC can also be applicable. Those policies are designed to promote sustainable development and contain environmental and social impact criteria for a financing approval process.

3.6 Current Legal Status of Sainshand Solar PV Power Plant Project

Currently Desert Solar Power One LLC obtained the following approvals necessary for the project implementation:

1. Feasibility Study Approval by the Science and Technology Committee at the Ministry of Energy;
2. Grid Capacity Study conducted by the National Dispatching Center (from 2014 and 2015);
3. General Environmental Impact Assessment approved by the Ministry of Environment and Urban Development;
4. Environmental protection action plan approved by the Ministry of Environment and Urban Development;
5. Electricity Tariff (Feed-in-Tariff) approved by the Energy Regulatory Commission according to the Law of Mongolia on Renewable Energy; and
6. Construction License for constructing the Solar PV Power Plant granted by Energy Regulatory Commission.

Desert Solar Power One LLC entered into the Power Purchase Agreement with the Central Region Electricity Transmission Company ("PPA"). Also Dispatching Agreement with the National Dispatching Center has been signed shortly after the PPA.

During the course of the project construction Desert Solar Power One LLC will obtain:

1. Technical Conditions for construction of Interconnection Line and all permits associated with the Interconnection Line;
2. Full Land Use Rights in respect of the land necessary for the Solar PV Power Plant and Interconnection Line;
3. Electric Power Generation License issued by the Energy Regulatory Commission;
4. State Commission Act in respect of the Solar PV Power Plant and the Interconnection Line;
5. Immovable Property Certificate issued by the State Registration Office for all facilities relating to the Solar PV Power Plant and the Interconnection Line;
6. And other civil engineering permits required for the project construction.

In conclusion, considering the above described legal framework Solar PV Power Plant Project of Desert Solar Power One accords with the promulgated green policies and brings desired technological know-how to the country.

CHAPTER 4 ENVIRONMENTAL AND SOCIOECONOMIC BASELINE CONDITIONS

To characterize baseline environmental and socioeconomic conditions, information was acquired through desk studies and was supplemented with field surveys and observations.

4.1 Climate

The climate of the region is an intercontinental climate with a broad temperature range between winter and summer. This region has cold winters and hot summers and most of its rains fall during the summer. It is generally a region of high atmospheric pressure.

4.1.1 Temperature

The temperature changes radically throughout the year. Coldest temperatures of the year are measured in December, January and February. The average temperature is determined between -13.7 °C and -18.1 ° C, sometimes reaches -30 °C and -33 ° C, but from time to time it can reach - 36° C and - 40 ° C.The cold season of the year starts from the 20th of September and lasts until the mid-May of the next year. The warm season of the year starts accordingly in May. The air temperature can reach +20°C, but sometimes +30°C and higher. Total number of such warmer days in a year can reach between 30-39 days. The annual average temperature falls into the range between +2.8° C and +6.8° C.

Year	T	TM	Tm	PP	V	RA	SN	TS	FG	TN	GR
1970	3.5	9.9	-3.4	-	15.2	25	17	5	5	0	1
1971	-	-	-	-	-	-	-	-	-	-	-
1973	-	-	-	-	-	-	-	-	-	-	-
1974	3.4	10.0	-3.4	-	16.5	34	9	9	5	0	0
1975	5.0	11.6	-1.7	-	16.0	36	9	6	1	0	6
1976	3.0	9.7	-3.4	-	17.1	34	15	4	4	1	0
1977	3.9	10.6	-3.0	-	14.9	35	14	4	3	1	3
1978	4.2	11.5	-2.9	-	13.5	21	13	1	2	0	0
1979	4.2	11.0	-2.9	-	14.7	28	12	6	1	0	2
1980	3.8	10.4	-3.1	-	16.7	20	9	8	1	0	1
1981	3.4	10.0	-2.9	-	16.7	23	14	3	1	0	1
1982	4.6	11.1	-2.0	222.51	16.7	20	11	4	0	0	1
1983	4.3	10.9	-2.2	70.61	17.1	27	10	1	2	0	1
1984	3.4	9.9	-3.1	105.41	17.7	30	9	3	3	0	0
1985	2.8	9.2	-3.7	167.65	17.3	28	17	8	2	0	0
1986	3.6	9.7	-2.7	259.06	16.4	32	17	5	1	0	0
1987	3.1	9.0	-3.3	193.81	17.5	42	20	8	2	0	0
1988	3.6	10.1	-3.1	96.79	18.7	41	11	5	6	0	0
1989	4.6	11.2	-2.5	38.11	17.2	26	14	6	9	0	0

1990	4.2	10.7	-2.4	1.27	16.8	35	15	8	4	0	0
1991	4.1	10.6	-2.6	0.00	16.7	30	19	2	2	1	1
1992	-	-	-	-	-	-	-	-	-	-	-
1993	3.9	10.1	-2.7	0.00	14.9	32	14	5	4	0	1
1994	5.0	11.6	-1.9	89.92	14.6	24	10	4	1	0	1
1995	4.8	11.2	-2.2	0.51	16.2	22	8	2	0	0	2
1996	-	-	-	-	-	-	-	-	-	-	-
1997	5.0	11/7	-2.1	24.89	15.5	20	5	4	1	0	0
1998	5.3	11.6	-1.3	0.00	14.6	36	14	2	7	0	0
1999	5.1	11.7	-1.9	-	13.8	27	15	8	0	0	1
2000	3.9	10.3	-2.7	146.27	12.9	29	14	9	2	0	0
2001	4.6	11.1	-2.1	397.73	13.9	25	14	3	1	0	0
2002	-	-	-	-	-	-	-	-	-	-	-
2003	4.2	9.9	-2.4	148.60	14.8	43	19	6	6	0	0
2004	5.7	12.4	-1.3	38.85	15.6	23	11	3	0	0	0
2005	-	-	-	-	-	-	-	-	-	-	-
2006	5.4	12.0	-1.8	-	16.2	32	13	2	2	0	0
2007	6.8	13.2	-0.1	-	15.4	19	15	2	3	0	0
2008	5.4	12.0	-1.8	-	15.4	40	12	3	1	0	0
2009	5.1	11.7	-2.1	-	15.8	33	15	7	1	0	0
2010	4.2	10.7	-2.9	-	16.3	36	32	2	2	1	0
2011	4.0	10.3	-2.9	117.35	14.4	31	15	5	5	0	0
2012	4.2	10.4	-2.6	-	16.2	37	17	4	4	0	0

Table 4-1 Average weather data of Sainshand city for 1970-2012

Description:

T - Annual average temperature (°C)
TM - Highest annual average temperature (°C)
Tm - Lowest annual average temperature (°C)
PP - Total volume of the annual precipitation /rain, snow/ (mm)
V - Annual average wind speed (km/h)
RA - Number of rainy days in a year
SN - Number of snowy days in a year
TS - Number of rainy days in a year with thunder and lightning
FG - Number of days with dense fog
TN - Number of days with heavy dust storms
RA - Number of rainy days with hails

4.1.2 Precipitation

In regard of the precipitation, Dornogovi Province, where the project is located, belongs to the area with low humidity. The average precipitation in July is measured by 40-60 mm, whereas in October it reaches only 5 mm and during the winter in March the air

humidity is about 50-60%. It rains approximately 30 days of the year, the average volume of the precipitation are recorded at 100 mm. In a year there are approximately 112 cloudless and 40 cloudy days, whereas in the lower layer of the stratosphere approximately 267 days were cloudless and 3 days were cloudy. It snows occasionally from October until April around two days per month. The average snow layer thickness reaches only 1-2 cm. while the thickest snow layers can reach up to 14 cm.

Month	January	February	March	April	May	June	July	August	September	October	November	December	Year
Highest value°C (°F)	1.1 (34)	13.1 (55.6)	21.6 (70.9)	29.4 (84.9)	36.7 (98.1)	40.0 (104)	39.5 (103.1)	38.4 (101.1)	32.6 (90.7)	26.6 (79.9)	14.3 (57.7)	6.2 (43.2)	40
Highest average value°C (°F)	−11.8 (10.8)	−6.7 (19.9)	3.0 (37.4)	14.1 (57.4)	22.5 (72.5)	27.5 (81.5)	29.4 (84.9)	27.5 (81.5)	20.8 (69.4)	12.0 (53.6)	−0.6 (30.9)	−9.8 (14.4)	10.66 (51.18)
Daily average °C (°F)	−18.1 (−0.6)	−13.7 (7.3)	−4.2 (24.4)	5.9 (42.6)	14.5 (58.1)	20.4 (68.7)	22.7 (72.9)	20.9 (69.6)	13.6 (56.5)	4.4 (39.9)	−7.0 (19.4)	−15.6 (3.9)	3.6 (38.56)
Lowest average value °C (°F)	−22.8 (−9)	−19.5 (−3.1)	−10.9 (12.4)	−1.1 (30)	7.2 (45)	13.6 (56.5)	16.8 (62.2)	15.0 (59)	7.5 (45.5)	−1.4 (29.5)	−12.3 (9.9)	−20.4 (−4.7)	−2.36 (27.77)
Lowest value °C (°F)	−35 (−31)	−35.8 (−32.4)	−27.1 (−16.8)	−22.6 (−8.7)	−10.2 (13.6)	3.2 (37.8)	7.2 (45)	5.6 (42.1)	−4.4 (24.1)	−17.1 (1.2)	−28 (−18)	−34.3 (−29.7)	−35.8 (−32.4)
Precipitation, (inches)	0.5 (0.02)	1.1 (0.043)	1.5 (0.059)	3.1 (0.122)	8.1 (0.319)	16.1 (0.634)	31.0 (1.22)	30.9 (1.217)	10.9 (0.429)	4.6 (0.181	2.1 (0.083	1. (0.055)	111.3 (4.382)
Daily average precipitation (≥ 1.0 mm)	0.1	0.3	0.4	0.7	1.6	2.8	5.4	4.4	1.8	1.0	0.6	0.4	

Source: NOAA (1961-1990) [3]

Table4-2 Temperature and precipitation data for Sainshand city (1961-1990)

4.1.3 Wind

It is constantly windy throughout the year and according to data and record of the weather observation station of Sainshand city the wind direction comes mostly from the north and northwest, less from the west and southeast. The wind speed can reach in January, April and October 6 - 8 m/second. The lowest wind speed is measured in July and reaches 2 m/second. There are 20-30 days in a year with the wind speed over 15 m/second and over 10 days in a year with black blizzard and dust storms. In average there are 13-20 days in a year without any wind. The strongest winds are measured mostly during the spring, whereas the lowest winds are occurring only during the summertime - the wind speed can reach 4.2-4.3 m/second. The average wind speed reaches accordingly

4 m/second. (Please refer to the following tables for the wind speed. Data source: Information and Research Institute of Meteorology, Central Databank, 20130917)

Station	Year	January	February	March	April	May	June	July	August	September	October	November	December
Sainshand city	2008	3.8	4.2	4.6	4.9	6.5	4.4	3.4	3.9	4.0	4.4	4.0	4.2
Sainshand city	2009	4.1	4.5	4.5	4.4	5.8	5.3	4.0	3.7	4.6	4.0	4.0	3.9
Sainshand city	2010	5.0	4.4	5.3	5.4	5.6	3.8	4.2	4.4	3.7	3.9	4.0	5.0
Sainshand city	2011	4.0	3.2	5.9	4.8	6.0	4.4	4.1	3.3	4.0	3.3	2.8	2.6
Sainshand city	2012	3.4	4.4	4.5	5.9	5.6	5.2	3.8	4.2	3.6	4.6	4.6	4.5

Table4-3 Average wind speed (m/second)

Station	Year	January	February	March	April	May	June	July	August	September	October	November	December
Sainshand city	2008	12	14	18	20	28	20	20	14	14	16	10	14
Sainshand city	2009	18	24	24	16	24	20	18	14	20	20	14	28
Sainshand city	2010	20	14	20	20	20	16	14	16	16	14	16	20
Sainshand city	2011	16	16	16	20	28	16	16	16	14	14	14	12
Sainshand city	*2012*	*16*	*14*	*18*	*24*	*20*	*26*	*16*	*16*	*21*	*24*	*28*	*17*

Table 4-4 Highest wind speed (m/second)

Station_id	year	calm	N	NE	E	SE	S	SW	W	NW
Sainshand city	2008	25.8	22.1	5.1	4.6	3.8	16.2	4.6	23.9	19.7
Sainshand city	2009	25.1	24.6	5.5	5.7	4.3	15.2	5.0	22.9	16.9
Sainshand city	2010	24.2	25.7	5.7	5.7	4.5	12.8	3.6	24.9	17.1
Sainshand city	2011	30.5	30.5	5.4	3.5	3.5	13.9	3.3	24.1	15.8
Sainshand city	2012	16.8	21.9	6.3	4.9	6.2	13.3	4.7	24.0	18.7

Table4-5 Repetition of the wind speed at the Sainshand Power Plant (%) - 2008-2012

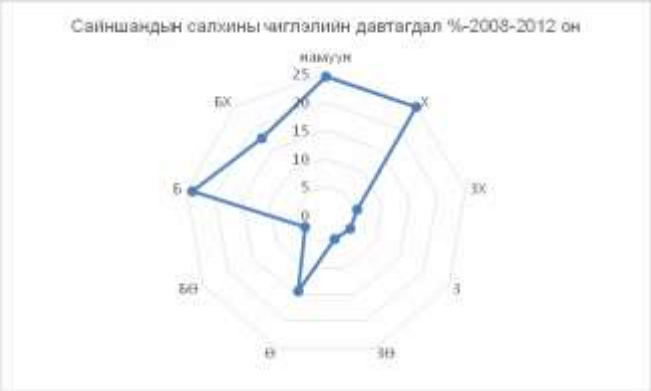

Figure 4-1Repetition of the wind speed

4.1.4 Air Quality

Currently there is no major air pollution, before the implementation of the Solar PV Power Plant project.

The following table shows the data of air pollution for the 3rd of October.

Dornogovi Province					
Average data of the air pollution for the 3rd of October					
Quantitative indices	Quantitative indices for Sainshand city		Air quality	Remarks	Impact on human health
	SO_2	NO_2			
0-50	20		Very good	Green	Does not have any negative impact on human health
51-100		55	Good	Yellow	The air quality fulfills all requirements. However, hypersensitive people may be influenced by some particular polluting substances. For example, hypersensitive people may suffer under respiratory diseases caused by ozone or fine dust particles.

Table 4-6 Average data of the air pollution for the 3rd of October

4.1.5 Solar irradiation

Solar power is one of the major and crucial factors in the formation of the atmosphere, circuit flow of the atmosphere, like land concave and convex in the formation of the weather in any region. Furthermore, transformation of the solar light into heat energy has enormous impact on the soil color, texture, plant height, density, porosity and snow layer. In the particular area the sun shines in average during 3338 hours of the year. During the winter season the sun shines less, e.g. during 256 hours, whereas during the summertime the sun shines longer, e.g. during 309 hours. The total volume of the average annual radiation in the particular province is equal to 434.5 MJ/m^2. In regard of geographical location, the Solar PV Power Plant is situated at coordinates 44.9° North 110.1° East and at 940 meters above the sea level. The selected project area is cloudless during 257 days throughout of the year. Horizontal sun ray shading on the earth surface is one of the most important factors of the Solar PV Power Plant. Total volume of the solar radiation determines also the capacity and other technical specifications of installed technical equipment and appliances. Annual total volume of the solar radiation per field unit is 1638 KW/h, whereas diffused solar radiation per field unit is equal to 516 KW/h.

4.2 Landscape and Geology

4.2.1 Landscape

Dornogovi province has the total size of 114.5 thousand km^2 and is located in the southern part of Mongolia with steppe surface. Dornogovi province belongs to the desert region of the country, including vast steppes, such as Ovoo, Daintovog, Baast, Naiman, Tuulai, Tarmag and wide valleys, such as Gurvanbayan, Uneget, Tukhum, Hoer Zaan. Its northern part is situated in the intermediary area with prairie and desert. Furthermore, mountains and hills, such as Otsol Sansar, Ikh Baga Dulaan, Khutag Uul, Argal, Argalant, Bayan and Arvan Naiman Bogd are located within the territory of the particular province. The lowest point is located in the Bayangiin Desert at 703 meters above sea level. Southern part of the province is slightly sandy.

Sainshand city is the municipal and administrative center of Dornogovi province with the total size of 109,472.30 km^2(234.6 thousand hectares) and is located 463 kilometers from Ulaanbaatar and 245 kilometers from Zamiin-Uud border point (TN: Southern border to China), at the altitude of 938 meters above sea level. The project area is located at approximately 940 m above sea level, at a distance of 4 km north-west of Sainshand city

and generally on a level earth surface. Within the project area there are very few plants. High and tall grass doesn't grow at all.

Figure 4-2: Map of Mongolia - Dornogovi province

Figure4-3 On site view in south-west direction Figure 4-4 On site view in west direction

4.2.2 Geological structure and stratigraphy of the region

Within the sandstone deposit area rocks and stone pieces from Higher Proterozoic and Lower Cretaceous periods, such as in Tsagaantsav, Manlai, Shinekhudag, Khukhteeg formations. Also rocks and stone pieces from the upper fourth-modern sedimentary

period and metamorphic rocks from upper Proterozoic period are represented in the area.

Proterozoic formation (PR)
Higher embodiment (PR2)

A.N.Rasskazchikov (TN: Russian geologist) has estimated the age of metamorphic rocks and stone formations, discovered and widely spread in the neighboring territory to the Proterozoic period. This sediment along a latitude north of tectonic faults, Lower Cretaceous period of Khukhteeg, the upper Jurassic sediments in the top layer of liparit, quartz, dacite porphyry and flanks with its hassock layer. This sediment structure, composition and metamorphism are relatively stable and consists of epidote-quartz-chloride and epidote-quartz and sericite-quartz crystalline schist (slate).

Jurassic structure (J)
Higher embodiment (J a)

Jurassic consolidation is located in the upper middle and mafic effusive is spread in area of 1140, 5m high Suul hill, situated to the south-east of the region. This sediment consists of basalt, andesite-basalt, andesite porphyritic and rare earth elements and its hassocks. The prevalence in spreading is recorded in case of andesite and andesite-basalt. Particularly effusive andesite porphyritic is spread mainly around the Suul hill. Basalt and andesite-basalt has mostly dark gray, dark brown, rosy reddish and sometimes amugdalaceous rock textures and has the appearance of slag. Almonds or blister have the size between 1-2 mm and 10 cm, and is often filled with chalcedony. Dust accumulation of chalcedony occurs in the region. The main mass of basalt is dark-colored with glazing structure and plagioclase crystals with andesite-basalt are observed as well. The thickness of the base medium effusive thickness is estimated by researchers and scientists at the range of 80-300 m.

Lower Cretaceous structure (K1)
Tsagaantsav formation (K1ss)

This sediment was initially named "tuffogen" and classified by V.K. Chaikovskii in 1934 as an independent svita. In 1955 the Russian geologist I.Ye.Turishyev has implemented new dissection in the depression of Dornogovi province, nearby to Tsagaantsav well and named it since then Tsagaantsav svita. Previous researchers allocated these sediments based on their origin and lithological composition divided in two sub-levels, including the lower sub-layer formation widely spread in this region.

Manlai formation (K1mn)

Previous researchers and scientists have determined that sediments of this formation are spread from the mountain to the west, from Oni plateau to the east, surrounded by sediments of Tsagaantsav formation from the north and east sides of the area. This sediment is generally slopes from the toe red, reddish brown, red colored stones, conglomerates, gravels and sandstones. They mostly consist of sand rocks, sandstones, clay, neutral elements, aleurolite, stones of a thin layer and lenticularis derived from surrounding rivers and lakes.

Shinekhudag formation (K1sh)

Sediments of this formation were discovered in the north side of Tsogt steppe along to the hills with height of 1076.0 m and 1026.4 m. Sediments are spread in a small area stretching from east to west across the area. Sediments of this formation are mainly of a black and dark gray, dark gray, gray, green or gray green color dominated by mud and naangijin, "paper" schist, grained sandstones of different sizes and particles. It also contains aleurolite, gravel of small and medium size, gravel with good and medium smoothness on the surface, conglomerates with small amounts of stones, limestone and shale from brooding.

Khukhteeg formation (K1ht)

Sediments of Khukhteeg formation were classified by Mongolian geologists G.Bömböröö and B.Lkhündev within the framework of 1:200.000 scale geological mapping works in this region during 1986-1988. Previous researchers have classified the area initially only to the Lower Cretaceous period. Sediments in this region are belonging in regard of their spreading to the most widespread sediments. Sediments on the earth surface have all different appearances; however the way how they are spread in the area is similar with any other formation sediments.

Upper Cretaceous structure (K2)

Bayanshiree formation (K2bs)

Sediments of this formation are spread in the northwestern region, has around the western edge relatively small area. Of the sediment in the bottom of gray, light gray, checkered gray color predominantly sandstone, gravel, small and medium pebble conglomerate and aleurolite, and mud and stones at the top, a small pebble conglomerate gravellite, with clay delicate stage and containing lenticular reddish, yellowish, pale, greenish sandstone, dominated by clay, sand and pebble. In the

sediments of the Lower Cretaceous major depression hanging around to be spread over the surface and the occurrence is not very common.

Neogene period (N)

Sediments classified to the Neogene period are spread around the Suul hill, including the wide surrounding area.

Miocene period (N1)

Sediments of the Miocene period are mostly particolored, but also sometimes red colored with clay, loam, sandy loam, sandy and gravel, pebble, grainy sand structure. Sediments derived from the lap of rivers, such as gravel and debris, pebble-dominated lake, river originating from clay, loam, sandy loam, sandy and grainy dominated. Fragments of the gravel composition vary depending on the results of the surrounding rocks of different structures and compositions.

Quaternary period (Q)
Sediments of the Upper Quaternary period (QIII- IV)

Theses sediments widely, including lower Cretaceous sediments covers the whole spread. It is spread with more thickness especially in marginal areas without any hills and mountains. These sediments are originated from talus proluvial, proluvial-proluvium lake and the north-east area, south-west areas, for the most part of the talus proluvium is mostly sandy loam, sand, clay aggregate, and rare earth elements with gravels and pebbles.

Modern sediments (QIV)

Modern sediments of the area are mostly of alluvial proluvial, elyuvi-proluvial, over preserved from sediments are the most common. Alluvial-proluvium sediments usually ravine, along the valleys and narrow ravines and rare earth element containing mud stage sand or sandy loam moderate smoothness aggregates, small and medium-size pebbles composed pebbles. Elyuvi proluvium sediments of the northwestern half of the area is fairly widespread in various smoothness. Over preserved sediments are widespread in the south and southeast area, and is more prevalent in the east.

Late Paleozoic complexes (PZ3)

This region of the Late Paleozoic spread complexes based acidic and alkaline ingredients interactive with epi-meso-abyssal phases' sediments complex. This mountain area is 300 km^2 wide and has a right-sided triangle shape. The boundaries are not even, with the upper Proterozoic crystalline schist to the left and Jurassic-year-old basalt to the north, longitude direction of tectonic faults borders. Crystalline schists bound the boundary of chert has held strong shape.

Sediments of the Medium and Upper Quaternary period (QIII-IV)

These sediments are widely distributed across the area. Along the Erdenetsogt valley dry riverbed between the convex smart and fills the lateral side of hill slopes flattened surface with low or medium smoothness, smooth boulders and gravel of various sizes, pebble and debris and sand mixture of clay, silt, clay and sand.

4.3 Noise

Noise can be defined as unwanted sound. The sound pressure level emitted from any activity that is audible by a receiver is dependent upon a number of factors. The impact of the noise depends not only on the sound pressure level but on elements such as the frequency spectrum, the duration of the specific noise, the time of day, the activity, and the attitude of the receiver.

All these aspects must be taken into account in assessing the impact of noise. There is no information on existing background noise levels in the study area. However, the area is largely desolate and from social interviews and the site visit, it was determined that the wind was the dominant source of noise in the project area. They are no other sources of noise, apart from the occasional bird call, vehicles visiting or passing the existing site, and grazing livestock.

Noise is measured in units of decibels (dB). However, to take account of the varying sensitivity of people to different frequencies, a weighting scale has been universally adopted called 'Aweighting', the results of monitoring being expressed as dB(A). In general, the minimum perceived difference in noise level is 3dB(A) and an increase of 10dB(A) is perceived as a doubling of loudness.

Sound Environment Pressure Level (dBA)	Subjective Evaluation	Environment	
		Outdoor	**Indoor**
140	Deafening	Jet aircraft at 25m	
130	Threshold of pain	Jet aircraft during takeoff at a distance of 100m	
120	Threshold of feeling	Elevated Train	Hard rock band
110		jet flyover at 300m	Inside propeller plane
100	Very Loud	Power mower, motorcycle at 8m, car horn at 3m, crowd noise at football game	
90		Propeller plane flyover at 300m, noisy urban street	Full symphony or band, food blender, noisy factory
80	Moderately Loud	Diesel truck (65kph) at 16m	Inside auto at high speed, garbage disposal, dishwasher
70	Loud	B-757 cabin during flight	Close conversation, vacuum cleaner, electric typewriter
60	Moderate	Air-conditioner condenser at 5m, near highway traffic	General office
50	Quiet		Private office
40		Farm field with light breeze,birdcalls	Soft stereo music in residence
30	Very quiet	Quiet residential neighborhood	Bedroom, average residence(without TV and stereo)
20		Rustling leaves	Quiet theater, whisper
10	Just audible		Human breathing
0	Threshold of hearing		
Source: Ramsey and Sleeper, 1994.			

Table 4-7 Typical Sound Pressure Levels Associated with Common Noise Sources

Specific Environment	Critical health effect(s)	LAeq [dB]	Time base [hours]
Outdoor living area	Serious annoyance, daytime and evening	55	16
	Moderate annoyance, daytime and evening	50	16
Dwelling, indoors	Speech intelligibility and moderate annoyance,	35	16

	daytime and evening		
Inside Bedrooms	Sleep disturbance, night-time	30	8
Industrial, commercial and traffic	Hearing impairment	70	24
Source: WHO, 1999			

Table 4-8 Guideline Values for Community Noise in Specific Environments

4.4 Soils

The particular area of Sainshand soum (municipal center) of Dornogovi province is consisting of grasslands with brown, light brown colored soil and having the structure of the soil, concave and convex slopes containing sandy, loamy soil. During a site visit dated 30th of January 2013 the proposed area next to Sainshand has been evaluated by means of trial pits distributed over the area. All eight trial pits have been documented with a handheld GPS (refer to Figure4-5) and have a maximum depth of approximately 2m. The soil profiles have been recorded and evaluated on site from a geological expert (refer to Figure4-6).

Figure 4-5: Trial pits

Figure 4-6 Soil profiles

The soil encountered in the trial pits consists of silty sand and sandy silt, partly with 20-30cm thick gravel intercalations. Due to the fact that the trial pits have been performed in January in frozen ground, the soil layer density appears to be higher than during the summer months. In the southeast of the investigated area, the terrain is ascending to a hill ridge. In this part, the sandy-silty soil diminishes, and the gravel content of the soil is higher due to the nearness of the underlying rock.

The groundwater has not been encountered in the trial pits which have reached an average depth of 2m.

The soil encountered in the trial pits consists of medium dense silty sand and sandy silt layers from top to bottom (approx. 2m below ground surface), with 20-30cm thick gravel intercalations. Depending on the results of pile ramming tests which are recommended to determine the pile stability, the soil is regarded as suitable for rammed pile foundations. A higher ram force may be required in order to penetrate gravel layers.

4.5 Water bodies

Hydro-geological conditions:

Khukhteeg (K1ht) formation of the Lower Cretaceous period contains pore-water complex layers of water-bearing sediments of various coarse and loose cemented

sandstone, gravellite and brown coal generation, floor, gray, dark gray siltstone and mud stone, small and medium-sized rounded gravel conglomerates, sometimes carbonated mixture and iron oxide and tight sandstone, coal argillite formation.

According to hydro-geological survey implemented in 2010 Khukhteeg (K1ht) formation of the Lower Cretaceous period water contained in the water complex belongs to Ages 2-3 and Ages of insulation in the muddy rocks (silty mud stone, siltstone) terms.

However, weak cemented mainly contains water and various grains sandstone, gravellite and coal joints, seams and water between layers of different hydraulic for creating a water complex.

Sediments of the Quaternary (QIII-IV) period are of the origin of the middle-upper quaternary slopes and foothills, modern classification of Quaternary sediments from the river lap boulders, gravel and various grains of sand, loam, clay and silty sediments consist mainly of rock type compositions depending on the species similar to a water phase synthesis and the accumulation of sediments in the pore-layer type properties.

Geological, hydro-geological formation of underground water depending on the hydraulic characteristics of surface, mostly in air pressure, and precipitation and deposits in places around the watershed fed by the state of flow direction and north-east, east and east to the south.

Underground water reserves:

Groundwater resources in the south of Mongolia are not studied certainly therefore we have no definite information and data about specific features and volume of groundwater resources in the named regional area. These sedimentary rocks and bedrocks embrace tidal and non-tidal water layers. Surface water layers contained in sedimentary rocks are generally regarded by rainfall infiltration but here are very little renewable chances in underground water layers. Moreover some groundwater layers in this regional area are defined as “closed aquifer” and it is cut off from the renewable source and considered as depleted resources.

No shortage of underground water resources is expected within the project implementation area or surroundings due to construction of the Solar PV power plant and its later operation. But there is high risk of potential fuel leak of the petrol distributing cars used in equipment transportation or construction work; another reason is the indiscriminate release of household solid and liquid waste which has an impact on

temporary runoff pollution and groundwater layers.

Mongolian Law on Water was debated and ratified last time in April 2004 by the Parliament. The current Law on Water is in force since July 2004. Mongolian law on water's surface and groundwater resources is to protect these resources over the use of defined management responsibilities. The amount of water used will vary depending on the license level. If the amount of water used per day is more than $100m^3$, the use shall be authorized by government authority. If the amount of water used per 50-$100m^3$, a water use permit shall be obtained from provincial or municipal environmental department. However, if the amount of water used per day is less than $50m^3$, it shall be regulated and authorized by the related administration of soum or district. Water-use permit, the 5-year contract extension, as well as the right to 20-year term shall be issued.

Following requirements shall be fulfilled according to the law by applicants (legal body or entity):

- Waste not up to the required standard of wastewater treatment facilities;
- To reduce the amount of waste water recycling technology;
- Have paid all the fees associated with the use of water; and
- Water pump to be put on the water meter.
- Biological soil conservation measures are not taken, or in the future be able to salt marshes and ponds, canals, lakes, dams and water cleaning facilities to capture and use is prohibited.
- Water used to send the request along with the environmental impact assessment.

4.6 Biodiversity

Occasional friable sand, steppe deserts with various plant species, foothills of low and stony mountains and dried water beds can be found in this region. However, the solar power plant to be built is located 4 km north-west of the town and the exact location has a rough, rocky terrain with the characteristics of a steppe desert.

Most of the plant species in the region belong to the dry-rocky ecological communities and a few others belong to the dry-salt marsh ecological communities, which can be seen as a distinguishing feature of the area. In general, the land on which the power plant is to be built has more or less degraded and has been widely covered by antropophilus plants.
As of fauna that represents the region in which Sainshand town is located, only few species of vertebrates observed in addition to few ground and soil-inhabiting insects that

is typical to extreme arid environment. The project area has avian representatives of Passeriformes of the steppe-desert and the chance of migratory birds passing over is low.

This research on biodiversity of the region was based on the results of the field survey that was conducted by a steppe research team between 16th -20th September, 2016 and also in comparison with observation notes from other research activities conducted in the region earlier.

4.6.1 Environment Climate Conditions, Methods and Methodologies

4.6.1.2 Summary of climate conditions that affect animal life

This land is one of the driest areas in Mongolia with steppe deserts, as well as unstable sandhills. The Sainshand town area comprises of foothills of low mountains within the desert steppe, a slightly muddy, sandy desert steppe area, and steppe of low productivity with abundant Anabasis brevifolia. Primary plant species of the region include Stipa glareosa, Anabasis bervifolia and Allium polyrrhizum. However, the project located area is mainly represented by Reaumuria soongorica, Nitraria sphaerocarpa, Salsola rasserina or plant species of desert types of saxaul-marsh, semi-bushes and marshy-bushes of desert area with sandy brown steppe soil (Zygophyllum xanthoxylon) of foothills of Gobi mountains and dried water bed marsh area of desert steppe low land. In addition to the plant communities described above, typical Mongolian steppe with low hills and smooth slopes are observed and prevalent plant species are Stipa glareosa, S. gobica, Ajania trifida.

Additionally, in some areas, typical Mongolian steppe with plant species of Saltwort or *Salsola tragus* occur in high and low bouldery hills, between mountains and hillsides, in areas of rocky semi-producitve soil, and in particular, in the Dornogovi province, steppe zones are observed predominantly with *Ajania fruticulosa, Anabasis brevifolia, Krascheninnikovia ceratoides, Kochia prostrata, Ptilafrostris pelliotii, Caragana leucophloea, C. pygmaea, Stipa gobica, S. Glareosa.*

4.6.1.2 Research methods and materials

This preliminary research has been conducted to assess the state of vertebrate species in the region where the solar power plant is to be built. Methods include commonly used methods in field research, traditional research methods used for collection and observation of invertebrate, amphibians, reptiles and birds, along with other methods such as collecting animals from their nests, night-time research, estimating populations using extrapolation method, gathering mammals, and using live-catchers and other

methods for various types of research on animal biology, ecology and their distinctive way of life.

This report was written using materials from previous studies and print materials through literature review and other resources collected from many years of field research activities including Joint Mongolian-Soviet Biological Expedition of the 1971 summer-fall and 1985 spring-summer; and results of the Field stationary research of the Ecology Laboratory of the Institute of Biology from 1990-1992 and summer field research of 2002.

4.6.2 Plant Communities, State of Pasture Condition

The Sainshand soum area where the solar power plant is to be built upon is a steppe desert area and its vast valleys are covered with plants, such as *Stipa gobica, Anabasis brevifolia, Allium polyrhizum, Scorzonera radiata Fisch. L,* Saltwort or *Salsola, Heteropappus altaicus, Artemisia frigida, Artemisia rutifolia, Caragana bungei, Caragana leucophloea and Salsola rosacea* and pasture types such as *Stipa glareosa-ajania, Stipa glareosa-artemisia-allium, Stipa glareosa-allium, allium-stipa glareosa, Stipa glareosa-atremisia, Stipa glareosa-caragana, Stipa glareosa- Anabasis brevifolia, artemisia, Anabasis brevifolia-salsola* and *Peganum harmala-allium salsola-stipa glareosa*

ID	Plant Community (latin)	Plant Community (mongolian)
1	*Stipa gobica-Allium polyrhizum*	Таана-Говийн хялганат бүлгэмдэл
2	*Stipa glaerosa-Salsola passerina*	Борбударгана-Сайрын хялганат бүлгэмдэл
3	*Stipa gobica-Cleistogenes soongorica*	Зүүнгарын хазааргана-Говийн хялганат бүлгэмдэл
4	*Caragana leucophloea – Stipa glaerosa*	Алтан харгана – Сайрын хялганат бүлгэмдэл
5	*Stipa gobica-Convolvulus ammanii*	Сэдэргэнэ-Говийн хялганат бүлгэмдэл

Table 4-9 Plant Communities in Project Area

№	Prominent species
1	*Говийн хялгана (Stipa tianschanica subsp. gobica)*

2	*Таана сонгино (Allium polyrrhizum)*
3	*Бор бударгана (Salsola passerina)*
4	*Caragana leucophloea (Алтан харгана)*
5	*Зүүнгарын улаанбударгана (Reaumuria soongorica)*

Table 4-10 Prominent species in Project Area

The project area has no endemic plant species, but 5 semi-endemic species (*Stipa gobica, Stipa glaerosa, Salsola passerina, Reaumuria songarica, Thymus gobica*), no endangered species, and 2 rare species (*Ephedra sinica, Stellaria dichotoma*) 3 relict species (*Amygdalus pedunculata, Ulmus pumila*) and no species that have entered the Red List (2013, 2011)

4.6.3 Summary of Research on Vertebrate Species

Amphibians

The only amphibian spotted (Table 4-11) in the Sainshand area, Central Asia, due to the severity of the climate conditions, is the Mongolian Toad (*Bufo raddei*). However, there is no possibility that this animal exists on the land that the Solar Power plant is to be built. They may move to steppe-deserts on autumn nights and may find shelter in abandoned rodent burrows. This particular species was found in many areas of Dornogovi province, and the western edge of its distribution range reaches along the Valley of the Lakes and stops just before the Great Lakes Basin. However, it can be found in the mountainous parts of the Khangai and Khentii regions, and also commonly found in steppe, steppe-deserts and desert areas throughout Mongolia (Munkhbayar Kh., 2001 – Мөнхбаяр Х., 2001). The Mongolian Toad was found in Sainshand area during rainy weather and also in wet and humid areas of human settlements. They affect the population number of invertebrates in the region greatly and become a food source for other animals, and thus, are connected to the food chain of animals in extreme conditions significantly.

Reptilians

Reptiles are usually endemic to the Gobi region. According to the Herpetological population distribution classification of Mongolia, observed and surveyed by us reptiles belong to the Central and East Mongolian Districts (N. B. Ananyeva, Kh. Munkhbayar et al., 1997 - Ананьева Н. Б., Мөнхбаяр Х. нар 1997).

In Sainshand area, 3 species of reptiles from 3 families can be found (Table 4-11). Most of them were found in settled areas and villages and, additionally, very few Toadhead Agama have been seen in the area that is planned for the Solar Power Plant. However in the Sainshand area, the *Phrynocephalus versicolor* of the *Agamidae* family, The *E. Argus* of the *Lacertidae* family, The *Agkistrodon halys* of the *Crotalidae* family can rarely be seen. Among these Reptiles, lizards in particular play a crucial role in the food chain, particularly affecting the population of insects that feed on plant roots (for example the Kasaby's ladybugs).

№	Species name	Zuunbayan	Ugii	Tsagaan nuur	Altan Khokhii	Sandy	Rocky	Steppe	Damp place	Common /rare
AMPHIBIA										
	Bufonidae									
1	*Bufo raddei*	+	+	+	-				+	ñ
	REPTILIA									
	Agamidae									
2	*Phrynocephalus versicolor*	+	+	-	+	+				c
	Lacertidae									
3	*Eremias argus*	+	+	+	-	+		+		ñ
	Colubridae									
	Crotalidae									
4	*Aqkistrodon halys*	+	+	+	+	+	+	+	+	ñ

Table 4-11. Species of Amphibia and Reptilia

Birds

Among the vertebrates of the Gobi region, one of the most widely existing, likely to come across with humans, and likely to be found in settlements are birds. Avian studies in the territory of Mongolia including findings and collections done by the members of the Russian Geological Society, such as famous N. M. Przewalski and P. K. Kozlov on their way through Mongolia are still kept today. Additionally, bird research that has been done by various other studies including The Joint Mongolian - Soviet (*former*) Biological expedition from 1971 to 1980. According to the Ornithofauna geographical distribution classification of Mongolia (A. Bold, 1990 – Болд А., 1990), birds of this area belong to the Zamyn Uud Depression of the Northern Gobi District.

In Sainshand town and surrounding areas, according to our research 59 species of birds of 45 genera from 2 families of 11 orders (Table 4-12) were found. None of those birds are included in the Mongolian Red List (1987, 1997, 2013), as endangered in "the Law on Fauna", as well as the Government Resolution No. 164 (2000) as rare bird species (2001) and its revision of 2012.

№	Species name (Latin)	Species name (English)	Resident Breeder	Migrant	Breeding visitor	Passage Migrant	Vagrant	Winter Migrant	Common/rare/very rare
	ANSERIFORMES								
	Anatidae								
	Tadorna								
1	*Tadorna ferruginea*	Ruddy Shelduck		+	+				r
	FALCONIFORMES								
	Accipitridae								
	Milvus								
2	*Milvus migrans*	Black Kite		+	+				c
	Accipiter								

3	*Accipiter nisus*	Eurasian Sparrowhawk		+			+		Rr
	Buteo								
4	*Buteo hemilasius*	Upland Buzzard	+		+				c
	Aquila								
5	*Aquila nipalensis*	Steppe Eagle		+	+				Rr
	Aegypius								
6	*Aegypius monachus*	Cinereous Vulture		+	+				Rr
	Falconidae								
	Falco								
7	*Falco cherrug*	Saker Falcon		+	+				Rr
8	*Falco peregrinus*	Peregrine Falcon		+			+		Rr
9	*Falco naumanni*	Lesser Kestrel		+	+				r
10	*Falco tinnunculus*	Common Kestrel	+		+				c
	GALLIFORMES								
	Phasianidae								
	Perdix								
11	*Perdix dauuricae*	Daurian Partridge	+		+				r
	GRUIFORMES								
	Gruidae								
	Anthropoides								
12	*Anthropoides virgo*	Demoiselle Crane		+	+				r
	CHARADRIIFORMES								
	Charadriidae								

	Charadrius								
13	*Charadrius dubius*	little Ringed Plover		+	+				r
	Vanellus								
14	*Vanellus vanellus*	Northern Lapwing		+			+		Rr
	Actitis								
15	*Actitis hypoleucos*	Common Sandpiper		+	+				r
	Calidris								
16	*Calidris ruficollis*	Rufous-necked Stint		+			+		Rr
	Laridae								
	Larus								
17	*Larus argentatus*	Herring Gull		+			+		Rr
	COLUMBIFORMES								
	Pterocliaidae								
	Syrrhaptes								
18	*Syrrhaptes paradoxus*	Pallas' Sandgrouse	+		+				r
	Columbidae								
	Columba								
19	*Columba livia*	Rock Pigeon	+		+				c
20	*Columba rupestris*	Hill Pigeon	+		+				Cc
	Streptopelia								
21	*Streptopelia orientalis*	Oriental Turtle Dove		+			+		Rr
	CUCULIFORMES								

	Cuculidae								
	Cucuclus								
22	*Cuculus canorus*	Common Cuckoo		+	+				r
	STRIGIFORMES								
	Strigidae								
	Bubo								
23	*Bubo bubo*	Eurasian Eagle Owl	+		+				Rr
	Athene								
24	*Athene noctua*	Little Owl	+		+				r
	APODIFORMES								
	Apodidae								
	Apus								
25	*Apus apus*	Common Swift		+	+				r
26	*Apus pacificus*	Fork-tailed Swift		+	+				c
	UPUPIFORMES								
	Upupidae								
	Upupa								
27	*Upupa epops*	Eurasian Hoopoe		+	+				c
	PASSERIFORMES								
	Alaudidae								
	Galerida								
28	*Galerida cristata*	Crested Lark	+		+				c
	Melanocorypha								
29	*Melanicorypha mongolica*	Mongolian Lark	+		+				r
	Eremophila								

30	*Eremophila alpestris*	Horned Lark	+		+				c
	Alauda								
31	*Alauda arvensis*	Eurasian Skylark		+	+				r
	Motacillidae								
	Anthus								
32	*Anthus richardi*	Richard's Pipit		+	+				r
33	*Anthus campestris*	Tawny Pipit		+	+				r
	Motacilla								
34	*Motacilla alba*	White Wagtail		+	+				c
	Laniidae								
	Lanius								
35	*Lanius cristatus*	Brown Shrike		+	+				r
36	*Lanius isabellinus*	Rufous-tailed Shrike		+	+				r
37	*Lanius excubitor*	Northern Shrike	+		+				c
	Corvidae								
	Pyrrhocorax								
38	*Pyrrhocorax pyrrhocorax*	Red-billed Chough	+		+				c
	Corvus								
39	*Corvus corax*	Common Raven	+		+				c
	Prunellidae								
	Prunella								
40	*Prunella fulvescens*	Brown Accentor	+		+				r
	Sylvia								

41	*Sylvia curruca*	Lesser Whitethroat		+		+			r
42	*Sylvia nana*	Desert Warbler		+	+				c
	Phylloscopus								
	Muscicapidae								
	Ficedula								
43	*Ficedula parva*	Red-breasted Flycatcher		+	+				r
	Oenanthe								
44	*Oenanthe oenanthe*	Northern Wheatear		+	+				c
45	*Oenanthe deserti*	Desert Wheatear		+	+				c
	Phoenicurus								
46	*Phoenicurus ochruros*	Black Redstart		+	+				Rr
	Tarsiger								
47	*Tarsiger cyanurus*	Orange-flanked Bluetail		+		+			Rr
	Turdus								
48	*Turdus pilaris*	Fieldfare Thrush		+			+		Rr
	Paridae								
	Parus								
49	*Parus montanus*	Willow Tit		+				+	r
50	*Parus major*	Great Tit		+				+	r
	Ploceidae								
	Passer								
51	*Passer domesticus*	House Sparrow	+		+				r
52	*Passer montanus*	Eurasian Tree Sparrow	+		+				Cc

	Petronia								
53	*Petronia petronia*	Rock Sparrow	+		+				r
	Pyrgilauda								
54	*Pyrgilauda davidiana*	Small Snowfinch	+		+				Rr
	Emberizidae								
	Emberiza								
55	*Emberiza citrinella*	Yellowhammer		+		+			r
56	*Emberiza cia*	Rock Bunting		+	+				r
57	*Emberiza godlewskii*	Godlewski's Bunting		+	+				r
58	*Emberiza pallasi*	Pallas' Bunting		+	+				r
	Calcarius								
59	*Calcarius lapponicus*	Lapland Bunting		+				+	r
			19	40	46	3	7	3	

Table 4-12 Aves

However, the Cinereous vulture *Aegypius monachus* and Lesser kestrel *Falco naumanni*, which were included in the Asian Red list can be found in this area. Despite being listed, these two bird species are not rare in these regions, and can be seen commonly as migratory. The Lesser Kestrel is quite common in the Gobi and Gobi steppe areas, however in Central Asia it is regarded as rare. Because they feed on rodents that feed on pasture in steppes and steppe desert regions, they stabilize the rodent populations and have a positive influence on the land. Vultures, on the other hand, are scavengers and thus help clean the environment, but recently, their populations are increasing, resulting in them attacking and snatching livestock as well as Mongolian gazelle and Black-tailed gazelle calves. Around Sainshand town, the increase in the number of vultures is observed because of increase in carcasses, cases of livestock dying and particularly vultures and crows have been sighted while during the slaughtering of domestic livestock as preparation of herders for winter.

In Sainshand and its surrounding areas, there are 59 species of birds that have been noted, of which 19 species are resident and 40 are migratory birds. The 19 resident birds include: The Upland buzzard *Buteo hemilasius*, Lesser kestrel *Falco naumanni*, Daurian partridge *Perdix dauricae*, Pallas's sandgrouse *Syrrhaptes paradoxus*, Rock pigeon *Columba livia*, Hill pigeon *Columba rupestris*, Eurasian eagle-owl *Bubo bubo*, Little owl *Athene noctua*, Crested lark *Galerida cristata*, Mongolian lark *Melanocorypha mongolica*, Horned lark *Eremophila alpestris*, Northern shrike *Lanius excubitor*, Red-billed chough *Pyrrhocorax pyrrhocorax*, Crow *Corvus frugilegus*, Brown accentor *Prunella fulvescen*, House sparrow *Passer domesticus*, Eurasian tree sparrow *Passer montanus*, Rock sparrow *Petronia petronia* and the Small snowfinch *Montifringilla nivalis*. These resident birds, all are anthrophogenic directed and can be sighted in Sainshand (Rock pigeon, hill pigeon, Red-billed chough, Crow, House sparrow, Eurasian tree sparrow). Upland buzzards, Lesser kestrels, Rock pigeons, Hill pigeons, Crested larks, Mongolian larks and Horned larks can be sighed near oil derricks regularly.

Of the above mentioned bird species, the Daurian Partridge and the Pallas's Sandgrouse has the significance of being hunted and regarded as game bird species. However, over the last decade, not only in Dornogovi province and Sainshand, but also in every other Mongolian provinces and soums, such hunting has not been done. Furthermore, the Eurasian Eagle Owl is endangered to their own specific habitats. There are 46 bird species that lay eggs in this region and 19 of them are resident while the other 27 are migratory. In settlements, plant species such as poplar trees and Caragana arborescens are common. Sainshand's trees and bushy plants usually grow in the village center, on the outskirts of army bases and nearby schools, meaning that crows, House Sparrows, Eurasian Tree Sparrows and other birds that lay their eggs might come and nest there.

Of all total birds, 3 species (Sylvia curruca, Tarsiger cyanurus, Emberiza citronella) pass through the region, 7 species (Accipiter nisus, Falco peregrinus, Vanellus vanellus, Calidris ruficollis, Larus argentatus, Streptopellia orientalis, Turdus pilaris) appear in the region by accident and 3 species (Parus montanus, P. major, Calcarius lapponicus) enter the region to escape from the cold.

Mammals

Mammals have their own special characteristics. According to the Mammalogical Geographical distribution classification of Mongolia (A. G. Bannikov, 1954 – Банников А. Г., 1954) Sainshand town and its surroundings have the characteristics of Mongolia's Northern Gobi District. Even though a number of mammal species have been observed there, large mammals in the Sainshand area (larger than hares) can be considered to be nonexistent.

According to study, it can be concluded that there are 29 species but no large mammals in the area where the solar power plant is to be built. From these mammals(Table 4-13), the Wild Ass or Khulan (Equus hemionus), the Grey wolf Canis lupus, and the Eurasian lynx is listed thus protected by the international convention on the trade of animals and plant specimen.

No	Species name (Latin)	Species name (English)	CITES	CMS	Red book of Mongolia	sandy	pebbly	Saxaul, bush	Small hill	Common/ rare//very rare
I	**INSECTIVORA**	**INSECT-EATERS**								
1	*Hemiechinus auritus*	Long-eared Hedgehog				+	+	+	+	c
II	**CHIROPTERA**	**BAT`S**								
2	*Plecotus austriacus*	Grey long-eared bat						+		c
3	*Eptesicus nilssoni*	Northern bat				+		+		c
III	**LAGOMORPHA**	**LAGOMORPHS**								
4	*Ochotona daurica*	Daurian pica					+		+	r
5	*Lepus tolai*	Tolai hare				+	+	+	+	Cc
IY	**RODENTIA**	**GNAWING ANIMALS**								
6	*Citellus erythrogenus*	Red-cheeked souslik				+		+		r
7	*Phodopus campbell*	Dwarf hamster				+			+	r
8	*Phodopus roborovskii*	Roborowsky`s dwarf hamster								c
9	*Cricetulus sokolovi*	Sokolovi`s hamster						+		r
10	*Cricetulus obscurus*	Govi hamster				+		+		c
11	*Cricetulus*	Grey hamster						+	+	r

	migratorius									
12	*Allocricetulus curtatus*	Mongolian hamster				+		+		r
13	*Ellobius tancrei*	Mole lemming				+				r
14	*Alticola argentatus*	Royle`s mountain vole							+	r
15	*Meriones unguiculatus*	Clawed jird				+	+	+		r
16	*Meriones meridianus*	Midday gerbil				+		+		c
17	*Rhombomys opimus*	Great gerbil						+		c
18	*Mus musculus*	House mouse				+	+	+	+	Cc
19	*Allactaga sibirica*	Siberian jerboa					+	+	+	r
20	*Allacraga bullata*	Gobi jerboa				+	+	+		r
21	*Dipus sagitta*	Feather-footed				+		+		Rr
22	*Cardiocranius paradoxus*	Satunin`s jerboa				+				Rr
Y	**CARNIVORA**	**CARNIVORES**								
23	*Canis lupus*	Grey wolf	II	-	-	+	+	+	+	r
24	*Vulpes vulpes*	Common red fox				+	+	+	+	r
25	*Vulpes corsac*	Corsac fox				+	+	+	+	r
26	*Felis lynx*	European lynx	II	-	-			+		Rr
YI	**PERISSODACTYLA**	**ODD-TOED MAMMALS**								
27	*Equus hemionus*	Asiatic Wild Ass	I		+	+				Rr
28	*Gazella subgutturosa*	Goitred gazelle			+	+		+		Rr
29	*Procapra gutturosa*	Mongolian gazelle				+	+			Rr
				Rr	2	20	11	21	11	6
				r					r	14

				Cc					Cc	2
				c					c	7
						Summary				29

Table 4-13 Mammalia

There are no mammals inhabiting the project area, and depending on the environment which the animals live in, the animals in the Sainshand area can be categorized as: 20 species living in sandy terrain, 11 species in stony terrain, 21 in bushy terrain, and 11 in rocky terrain. Some mammal species' distribution can be overlapped in these biotopes or terrains and the most common animals are the long-eared hedgehog (Hemiechinus auritus), the Tolai hare (Lepus tolai), the house mouse (Mus musculus), the grey wolf (Canis lupus), the red fox (Vulpes vulpes) and the corsac fox (Corsac vulpes). The long-eared hedgehog is endemic to the Gobi region and while previously could be sighted frequently, has since left human settlements following the transition to a market economy. This can be explained that the Chinese demand for use of their meat for food. Other mammal species commonly distributed are all hunted for their fur and meat, and all except hares are now near endangered.

In the Sainshand area, in terms of occurrence, the animals can be categorized into: 7 endangered species, 14 rare species, 2 abundant species (Lepus tolai, mus musculus) with other animals being at normal levels. The Tolai hare, which is the most common species in the area, can be seen around bushes and during the night. However the animal may come out only during the night in the solar power plant area. The house mouse, on the other hand, can be seen in settlements regularly.

4.7 Historic and Cultural Resources

Currently no historical and cultural heritage was discovered within the territory of the project site.

4.8 Social and Economic conditions

Here in this section the existing social conditions at and surrounding the project site including population, employment, economy, health and well-being are described.

4.8.1 Population and Demographics

The last census of population of Mongolia was done in 2000 which includes data of population up to soum level. However, the Mongolian National Statistical Office prepares annually the population report collected on aimag level. According to data of population in aimags reflected in the reports for year2000-2008, total population of Mongolia is 2.7 million people and intensity of the total population growth is 1.56 percent[1].

[1] Asian Development Bank (2009)

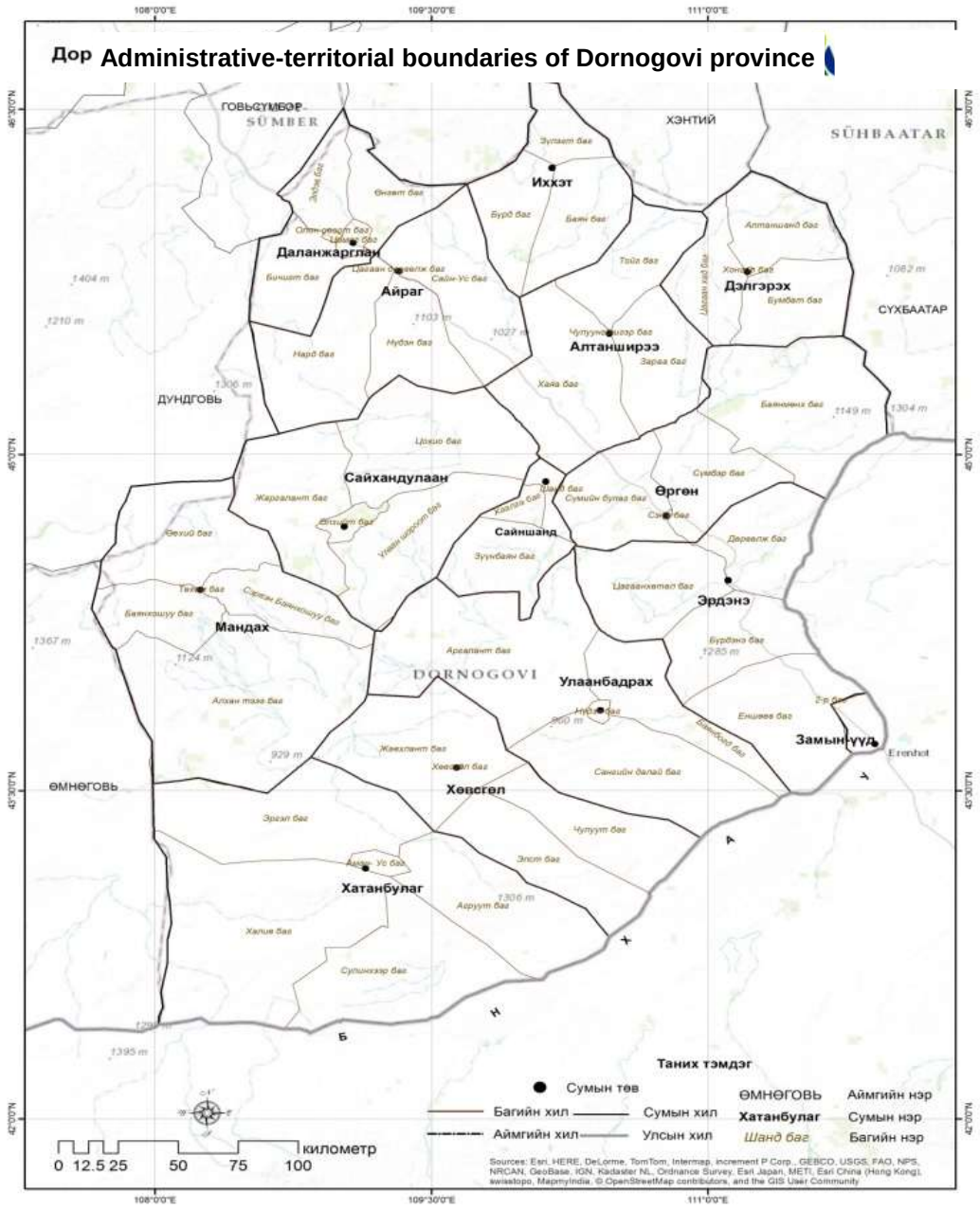

Figure4-7Administrative-territorial boundaries of Dornogovi province

Population growth and changes in Sainshand soum: the number of population is growing from day to day and there are government decisions behind to build the industrial complex in this area. Mining resources and strategically important mineral deposits in this region have high impact on the population of Sainshand soum. The number of households and population as of the end of 2013 is shown in the graphics below.

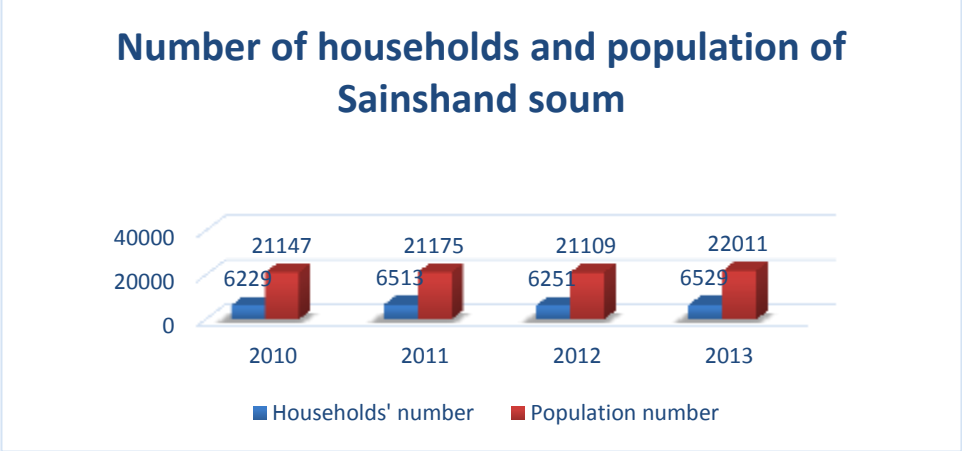

Figure 4-8 Population number of Sainshand soum

/at the end of year 2013/

There are 22,011citizens in Sainshand soum, of which 65 percent or 14,314 are at the age of employment, 7,334 people are employed among which 366 are herders. As of the end of 2013, 668 people are registered unemployed in the whole Sainshand soum. 28 percent of the total population is children. By age group 63.4 percent of the total population are at the age of 16-59; 30.5 percent are at the age of 0-15 and about 6 percent are at the age of over 60.

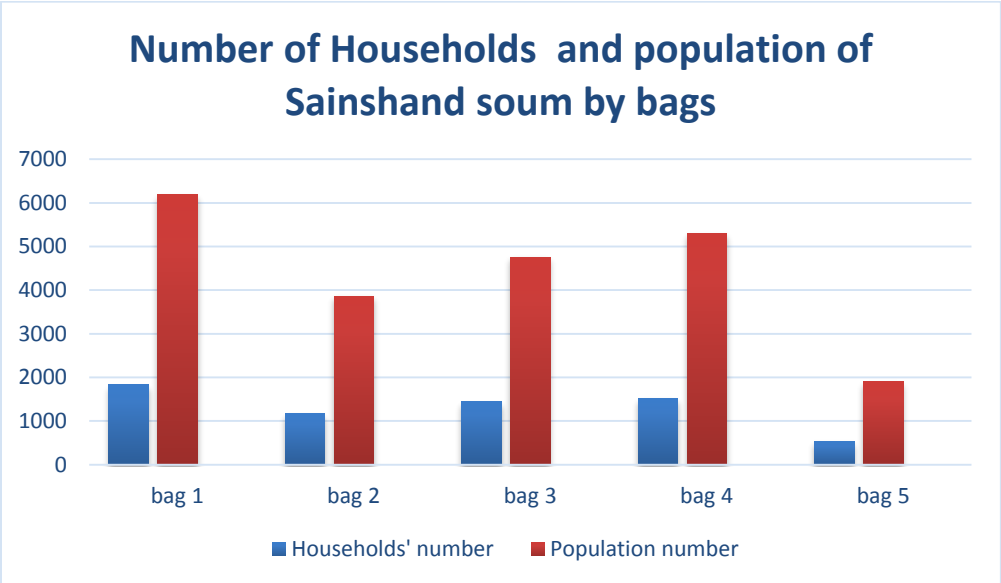

Figure 4-9Population and number of households shown by bags

/at the end of 2013/

Bags (local administrative-territorial units) 1-3 belong to the soum's center and the 4th Bag is named the Railway Station Region, which is located in Ar shand. The 5th Bag is located in Zuunbayan,around 50 km away from the soum.

As a result of the Census on Population and Housing in 2010, the majority of the population in Sainshand soum lives in proper homes.

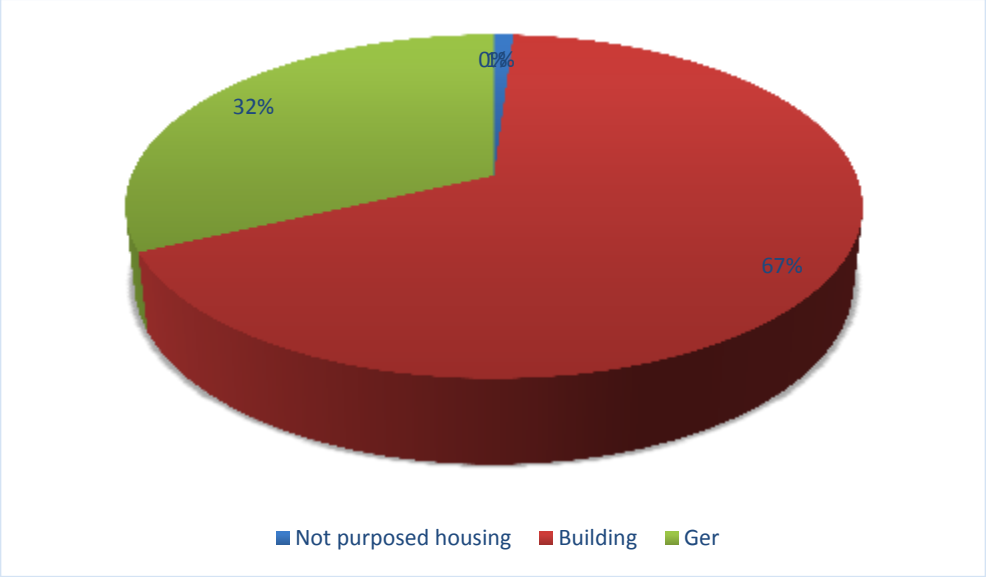

Figure 4-10. Family housing conditions /Census in 2010 /

	Indicator	Measurement unit		Bag's name					Soum result
				I	II	III	IV	V	
1	Volume of the territory		thousand	38482,5	13712,5	29713,5	5495,5	146876	234280
2	Population	Total	number	6189	3863	4758	5304	1897	22011
		Male	number	2976	1784	2287	2650	971	10668
		Female	number	3213	2079	2471	2654	926	11343
3	Household	Total	number	1836	1178	1451	1523	540	6523
4	Working-age population	Total	number	4046	2475	3054	3486	1253	14314
5	Employed	Total	number	2152	1298	1404	1770	710	7334

	population								
6	Number of civil servants	Total	number	473	460	308	200	295	1736
7	Working-age unemployed people	Total	number	759	457	635	835	210	2896
		Male	number	361	200	286	322	95	1264
		Female	number	398	257	349	513	115	1632
8	Registered unemployed citizens	Total	number	143	116	221	93	95	668
		Male	number	67	41	73	45	40	266
		Female	number	76	75	148	48	55	402
9	Industrial products		thousand	0	0	0	0	978000	978000
10	Enterprises		number	45	45	75	42	7	214

Table 4-14 Indicators by Bags

Sainshand soum is widening every year. The Millennium road vertical axis, the vertical axis of the railway station that connects the northern and southern neighbors passes through this soum,and it is connected to the central power system. With such good conditions of the infrastructure, the government of Mongolia has decided to build "The Industrial Complex" in Sainshand. As a result, the tourism has been rapidly developing, with increasing population growth from the migration process along the large mineral deposits and significant construction works take place from year to year. Sainshand is a self-reliance soum in terms of development in the Dornogovi region and has a great potential to become a city.

As a self-reliant soum of the Dornogovi region, the most acute problem of its infrastructure is water, which remains to be solved today. It has only groundwater resources and there is no surface water, therefore it is necessary to develop a plan for water management, for the rational use and protection of water which is crucial for the future development of the soum.

	Total	**1-9**	**10-19**	**20-49**	**50+**
Dornogovi province	650	501	72	57	20
Sainshand	348	271	37	26	14

Table 4-15 Number of operating entities and organizations by bags

4.8.2 Employment

Labor force: According to the methodology of the International Labor Organization the labor force is the sum of the number of employed people registered in the Labor and Social Welfare Department. People at the age of employment and yet not registered in the Labor and Social Welfare Department, pupils at the age of employment and military officers and prisoners are not included in the labor force. As of 1995 there are 23447 people at the age of employment, among which 16777 are workers, 17786 are economically active and 1287 are unemployed. The employment rate was72% and 5.7% of the people were registered unemployed.

By branches the highest 44% or 7310 people are employed in the Agricultural branch, followed by employment in the State administration with 11% or 1925, 1633 or around 10 percent are employed in the transportation and warehouse business sector.

4.8.3 Economic Development Level

4.8.3.1 Agriculture

As to agriculture in this soum, it is dominated by livestock and crop farming. As of the end of 2013, potatoes and vegetables were grown on 16.3 thousand hectares of land with yield of 128.3 thousand tons. Furthermore, 178 thousand tons of hay were harvested.

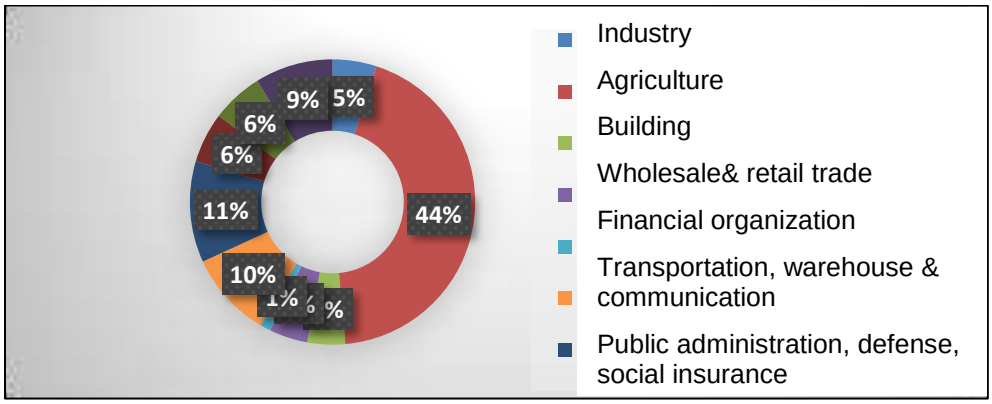

Figure 4-11Employees by branch, at the end of year 2013

4.8.3.2 Livestock industry

Basic sources of the Mongolians' livesare livestock, therefore in comparison with other branches the Livestock Registration Statistics are more developed. Livestock Census was first provided in 1918 but was limited to Khalkh 4 provinces, servants and apprentices, which caused the census incomplete. Since 1924 when the Modern Statistics Service was established, the Livestock Census began to adopt integrated methodology, data and program. Livestock Census was conducted in summer and autumn seasons or in August and September, but since 1961 animal husbandry has been counted at the end of the year or in December annually.

As of the end of 2013 in the whole Sainshand soum 77446 livestock were counted. Mainly small animals were counted in the census whereas and camel and cows only account for ta small part. Out of totally 199 herder households in Sainshand soum 366 herders are at the age of employment.

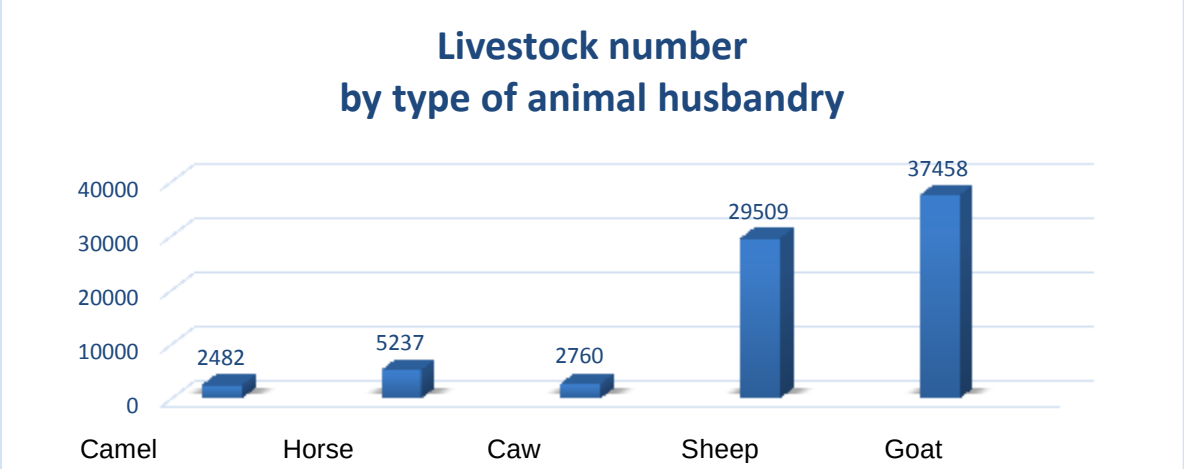

Figure 4-13 Livestock number by type of animal husbandry

4.8.4 Health level

There is Polyclinic – 1, Specialized clinic – 0, Health Center – 1, Soum's hospital - 15, Hospital of the Traditional Mongolian Medicine – 0, Military Hospital - 0, Bag's and Doctor's sector – 30, Family Hospital – 6, Private Hospital – 7, Maternity Hospital – 16, totally 77 health facilities/organizations are operating in whole Dornogovi province.

As of 2016 in whole province totally 62621 beds are used, 8738 patients were hospitalized which was in comparison with previous year up by 1505 people and now it is 7.2 bed/day in average. 212956 ambulatory medical examinations were given which was in comparison with previous year up by 13561examinations.

4.8.5 Land use

Soums of Dornogovi province are included in the following zoning which takes into account of their geographical location, natural wealth, mineral reserves, status and future economic development priorities, road and communication, power supply as well as existing interconnection.

Region number	Regional Center	Name of soums belonging to the region	Regional development priorities
The first zone	Sainshand	Sainshand, Urgun, Mandakh, Saikhandulaan, Altanshiree, Delgerekh	Industrial, refinery, transport, logistic, tourism, elite cattle breeding, food and agricultural zones

Table 4-16 Regional Development Outlook of Sainshand soum

4.8.6 Social Infrastructure Development Level

Dornogovi province is considered as a region with highly developed road, communication and infrastructure. Linear infrastructure includes railway station, auto road, power lines,etc. 422 km of UB Railway Station that connects the Russian Federation and People's Republic of China passes through the territory of Dornogovi province from the northwest and the southeast. Furthermore the Mongolia Railway Station Shareholding Company is implementing the New Railway Station project in three stages and its first stage nearly 404 km out of 960 km of the railway in Tavan tolgoi – Khuut direction is planned to go through the territory of Dornogovi province from the southwest to the northeast. Therefore, the territory of Dornogovi province is mainly divided into 4 parts by railroad network and they are all connected to the center of Dornogovi province.

With regard to the auto road it is fully connected by the paved road from Ulaanbaatar city to Zamiin-Uud. The paved road in Choir-Sainshand-Zamiin-Uud direction was built and put into operation through financing of the Asian Development Bank, of which the highway in Altanbulag-Ulaanbaatar-Zamiin-Uud direction is planned in the west of existing road.

The railway station and auto road network passing through the territory of Dornogovi province will be the main line of the transit transportation for Mongolia that connects its southern and northern neighbors in the province.

No.	Project name	Project implementer	Project location	Projectduration		
				Implemented	Ongoing	Further planned
Railway station						
1	New railway station	Railway station of Mongolia	Mandakh-Zuunbayan-Sainshand-Baruun Urt			In planning
2	Old railway station	Ulaanbaatar railway station	Dalanjargalan-Airag-Sainshand-Urgun-Erdene-Zamiin Uud		Operated since 1st January, 1956 to today	
3	Branch line	Ulaanbaatar railway station	Sainshand-Zuunbayan about 46 km	Used during oil extraction in Zuunbayan		
4	Branch line		Airag – Bor Undur Mining Processing Plant		Used now	
Auto road						
5	Paved		Dalanjargalan-		Paved road	

	roads from Ulaanbaatar to Zamiin-Uud		Airag-Sainshand-Erdene-Zamiin Uud		from Sainshand to Zamiin-Uud was commissioned in 2013.	
6	Highway 990km	Chinggis Land Development Group LLC concession	Dalanjargalan-Airag-Sainshand-Erdene-Zamiin Uud			In planning
7	Paved roads 432km	Erdenes MGL LLC concession	From Tavan tolgoi mine to Khangi-Mandal port			In planning
8	Paved roads	Khangi Khuder LLC	From Agar mountain iron ore mine located on territory of Khatanbulag soum to Khangi-Mandal port			In planning
9	Paved roads	Ikh Govi Energy LLC	From Tukhum coal mine located on territory of Mandakh soum to			In planning, шороон далан барьсан

			Khangi-Mandal port			
10	Paved roads	Mon Laa LLC	Elsteitumur ore mine - Tugrug valley – in front of Khalic bag – Modot khuren tolgoi – Baga khairkhan mountain - margin angle ponds –Khangi port			In planning
11	Paved roads	COAL LLC	From Ailbayan coal mine located on territory of Huvsugul soum to Khangi port		Conducted gravel roads	
12	Local dirt roads				Used now	
Power and energy						
13	220 kV power line		Oyu Tolgoi-Tsagaan suvarga-Sainshand			In planning
14	110 kV power line		Choir-Sainshand-		Used now	

			Zamiin Uud			
15	35 kV power line		Sainshand-Urgun-Sainshand - Zuunbayan Olon Ovoo-Airag Ikh khet-Altan shiree		Used now	
16	15 kV power line		Galshar-Delgerekh urgun-Erdene Zuunbayan-Huvsugul Zuunbayan-Ulaanbadrakh		Used now	
17	6 and 10kV power line		Zuunbayan-Khamriin Khiid		Used now	

Table 4-17 Information about the infrastructural projects near Sainshand

There are 2 soums out of totally 14 soums in Dornogovi province that host the wind renewable energy. Other soums are fully provided with electricity of 15, 35, 110 kV. Furthermore it is planned to build Choir-Sainshand-Zamiin-Uud 454 km of power transmission lines of 220 kV with substation.

Communication

Mobile phone reception is available in all soums' center but it is unreliable in deserted rural areas. The mobile phone key operators in this rural area are the MobiCom, G-mobile, Unitel and Skytel companies which provide mobile communication services. Every family has at least one cell phone. There is no over ground communications links

in the area where the project will be implemented and this project has no effects on these signals.

Education

In 2008 the school system was transferred from previous 11-year educational system to a new 12-year system. Completion of education in the secondary schools is compulsory for all children in Mongolia. Compared to other regions, this province is mainly high school attendance.

There are 5 Secondary Schools (1-12 years), 12 kindergartens in Sainshand soum, therefore the children usually come to study from other soums.

CHAPTER 5 THE ANALYSIS OF ALTERNATIVES

The analysis of project alternatives is one of the main tenets of environmental impact policy and procedures world-wide. A thorough, unbiased and transparent assessment of alternatives from an environmental, social, technical and economic standpoint is one of the most important contributions an ESIA can make to improve decision making.

The analysis for this project contains options/alternatives which are site selection alternatives, the "With Project" versus "Without Project" alternative in addition to other energy resources alternatives. By considering these alternatives prior to the commencement of project activities, environmental and social project benefits can be maximized and potential challenges can be identified and addressed.

5.1 Site Selection

In identifying a suitable site for solar power developments, various factors need to be taken into consideration. These include factors such as meteorological data, terrain usability, access to public roads, shading analysis and grid connection.

The project site in Sainshand is on an altitude of 940 m above sea level and has a relatively area though slightly oriented towards northwest. The landscape shows very scarce and low vegetation (no tree). Besides, the location has the advantage of having great accessibility to the abroad as there is a railroad nearby connecting Mongolia with China, offering an ideal opportunity to transport all relevant components of a PV power plant. Solar devices were put to collect data on solar conditions and the distance to substation was also weighed as a key element. The other sites that were considered include Dalanzadgad, Arvaikheer, Choir, Mandalgovi, Herlingiin Den, Taishir, Dorgon and Durgun and the energy production capacity was calculated and compared for each site as follows:

Location	Sainshand	Dalanzadgad	Arvaikheer	Choir	Mandalgovi
Hay: Spec. Yield [kWh/kW/Year]	1799	1755	1609	1539	1548
Perez: Spec. Yield [kWh/kW/Year]	1824	1780	1629	1561	1563

Location	Sainshand	Taishir	Dorgon	Durgun	Herlingiin Den
Hay: Spec. Yield [kWh/kW/Year]	1799	1649	1584	1493	1503
Perez: Spec. Yield [kWh/kW/Year]	1824	1669	1608	1513	1534

Table 5-1 Energy production capacity of various sites examined

Overall the project site selection process was based on a 10 year-long research made by professors at Mongolian National University starting from 2005 and also taking into account the careful soil research made by German experts at the site. Having put everything into consideration, Sainshand was chosen as the site where the 30Mw solar project is going to be implemented.

5.2'With Project' VS 'Without Project' Alternative

The table below presents the symbols that denote the various levels of environmental impact to aid in the comparison of alternatives. Each symbol indicates an overall evaluation of the specified environmental component and social aspect.

Symbol	Description
X	Denotes potential for impact, which is not considered significant
S-	Denotes Potential Significant Adverse Impact
S+	Denotes Potential Significant Beneficial Impact
*	Denotes no change to the existing situation

Table 5-2 Evaluation Symbols for Levels of Environmental and Social Impact

The "Without Project" option considers the alternative of not conducting the project at all. It is normally evaluated to assess the impacts if the project does not go ahead. This alternative is evaluated against the implementation of solar power project as one of the renewable energy resources in Mongolia.

Table 5-2 is presenting the methodology of evaluation of the overall impacts and 'symbol' takes into consideration that a degree of mitigation is applied. Going forward with the proposed project alternative is considered the best possible option as opposed to 'No Project' since the proposed project is considered a green and environmental solution for energy generation in Mongolia. Solar energy is considered as renewable clean technology with no emissions and as a global and local trend for energy generation.

Environmental Components	**Project Options**	
	Proposed Project	**Without Project Alternative**
Terrestrial Ecology	S-	*
Air Quality	*	*
Noise Generation	*	*
Wastewater Generation	S-	*
Waste Generation / Disposal	S-	*
Soil & Groundwater	*	*
Health & Safety	S-	*
Socio-economic Impacts	S+	x
Traffic Disturbance	x	*
Archaeology / Cultural Property	x	*
Energy Production	S+	S-
Employment and Job Opportunity	S+	S-
Notes: X : Denotes potential for impact, which is not considered significant S- : Denotes Potential Significant Adverse Impact S+ : Denotes Significant Beneficial Impact * : Denotes no change to the existing situation		

Table 5-3 Comparison of overall environmental impacts as a result of the proposed Project against the 'Without Project' alternative

5.3 Electricity Sources Alternatives

As the energy demand has risen in the past years (see graph below) Mongolia has faced severe energy shortages and blackouts. The International Monetary Fund (IMF) projected a deficit of over 600 MW by 2016.

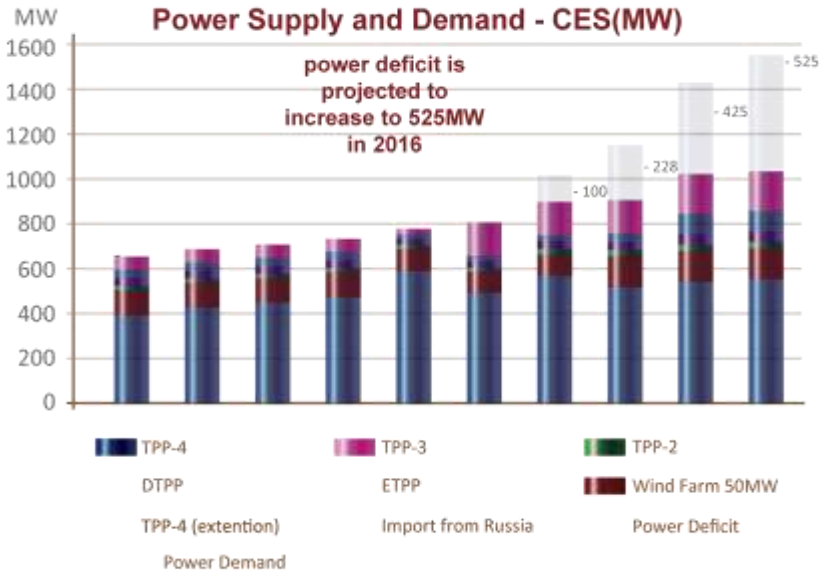

Figure 5-3 Power Supply and Demand Mongolia (Source: Mongolian State Specialized Inspection Agency)

As all above the increasing demand forces the government to find additional energy resources and these resources could be conventional and renewable resources. The use of the solar energy is one of the preferable options with less impact than the conventional resources, furthermore, it is considered as green option for Mongolia with its high sunshine days and land availability. In the following the main reasons to use solar energy instead of conventional resources are summarized:

- Solar power is pollution-free during operation.
- Production end-wastes and emissions are manageable using existing pollution controls.
- End-of-use recycling technologies are under development and policies are being produced that encourage recycling from producers.
- PV installations can operate for 100 years or even more with little maintenance or intervention after their initial set-up.
- Grid-connected solar electricity can be used locally thus reducing transmission/distribution losses.
- Compared to fossil and nuclear energy sources, very little research money has been invested in the development of solar cells, so there is considerable room for improvement.
- High efficiency.

CHAPTER 6 ASSESSMENT OF ENVIRONMENTAL & SOCIAL IMPACTS AND MITIGATION MEASURES

6.1 Introduction

The proposed project may have impact on the environment during construction & operation phases. During the construction phase, the impacts may be regarded as temporary or short-term; while long term impacts may be observed during the operation stage. The site was evaluated on the basis of the following environmental and social criteria:

1. Availability of sufficient area of flat terrain;
2. Avoidance of sensitive habitats and species;
3. No conflicts with other land holders.

The site has a sufficient area of flat terrain. The ground is partially covered with small grass parts however an arid sandy area in general.
Animal species that live in such open flat terrain are not threatened or restricted in their environment. This type of area is available in multiple forms all around the whole region. Nonetheless it has been proposed that holes are left in the surrounding fence for smaller animals to pass through.

The investigated area is in the property of the Mongolian Government and the PV site is already marked and reserved at the related authority in Sainshand. So there are no conflicts with other landholders.

The project has overall positive impacts by providing a competitive, cost-effective, pollution free reliable mode of Solar PV power. It will certainly meet the ever increasing demand of power and bridge the gap between demand and supply of power in Mongolia.

6.2 Impact on the climate and air quality

6.2.1 Assessment of impacts on the climate and air quality

During the operation of the project no air pollution is expected that covers a large area of the local population, flora and fauna, soil and it will not affect the water quality in any way. However, construction of the Solar PV power plant and installation of solar modules and mirrors, toxic gas and dust emerged due to utilization of special machines and equipment during their technical operation may pollute the environment.

Total amount of toxic smoke can be kept within permitted standard level due to proper maintenance, regular technical inspection, utilization of high quality diesel fuel. Applicable Mongolian standard for the air quality in cities and settlements (MNS 4585-98: Air quality. General technical requirements) and World Bank Standard are shown in Tables 6.1 and 6.2, respectively.

Specifications	**Measuring duration**	**Measuring unit**	**Permitted max. level**	**Analyzing method**
Gas mixture				
Sulfur dioxide (SO)	during 20 minutes Daily average	mg/m^3	0.5 0.03	Aero Saline solution MNS- 0017.2.5.12-88 Fluorescence
Carbon monoxide (CO)	during 20 minutes Daily average	mg/m^3	83	Gas correlation
Nitric oxide (NO2)	during minutes Daily average	mg/m^3	0.085 0.04	Griis-Yelovsk, MNS 0017.2.5.11-88 Chemiluminescence
Ozone (O3)	Hourly average	mg/m^3	120.0	Photometric method
Dust				
Dust monitoring	during 20 minutes Daily average	mg/m^3	0.5 0.15	Weighing method Air
Black lead, plumbum	Daily average	mg/m^3	0.001	AC and x-ray fluorescence
Benzopyrene	Daily average	mg/m^3	0.001	Liquid and gas chromatography

Table 6-1 Mongolian standard for the air quality in cities and settlements MNS 4585-98

Specifications	**Average duration**	**Unit**
Sulfur dioxide	1 year 24 hours 1 hour	0.05 0.125 0.35
Nitric oxide	1 year 1 hour	0.4 0.2
Dust particles PM10 PM10	1 year 24 hours	0.5 0.15

Table 6-2 Air Quality Standard of the World Bank (Source: World Health Organization, Instructions for air quality, 2nd edition)

Compared study of values obtained in accordance with the applicable instructions reveals that the data compared with Air quality Standard of Mongolia and World Bank Standard for CO level and dust volume are relatively low and has no impact on the air quality.

Following negative impacts may occur during the construction works based or emerged due to above mentioned possible conditions:

- Exhaust gas and dust emerged during construction works of buildings and facilities from used vehicles and heavy machinery may negatively affect the quality of the air.
- Earth/soil stripping works may cause soil erosion and can damage the soil layer.
- Furthermore, dust may spread in the air, which may have environmental adverse impacts due to increased dust level in the air.

Potential impacts emerged during construction works and operation, which may negatively affect the air quality are summarized and assessed in the table below.

No.	**Impact/effect**	**Assessment of consequence of the impact/effect**				
		Very low Or Negligible	**Low**	**Medium**	**High**	**Extreme**
1	Increase of the airborne dust level due to earth stripping process, utilization of heavy machinery and technical equipment during construction works		X			
2	Toxic fumes and gases exhausted from heavy machinery during construction works may negatively affect the quality of the ambient air		X			
3	Emerged dust and toxic gases may negatively affect the working conditions in the area and adversely affect the health of employees		X			

4	Due to the combustion process and emerged CO (carbon monoxide), HC (hydrocarbons), NO_x (nitrate and nitrite), SO2 (sulfur dioxide) and dust emissions may negatively affect the air quality		X			
5	Dust, toxic gases emerged due to project activities may lay on the earth surface and negatively affect the vegetation and soil quality	X				
6	Increased emission of poisonous gas in the air composition may change the precipitation and its frequency	X				
Conclusion:		33% of the total impact is assessed as "very low" or "effect less", whereas 66% of the total impact is assessed as "low". On the base of the present data and evaluation the total impact of the project on air quality shall be deemed as "low". The main potential negative effects may emerge from toxic gases resulting from the combustion of fuel specifications and can exceed permitted level of applicable air quality standard.				

Table 6-3 Impact on the weather quality and its assessment

6.2.2 Mitigation and elimination of the impacts on the climate and air quality

Construction and installation works of the facility and solar modules may increase the amount of dust in the air. Therefore, in order to prevent dusting during the construction and installation, applicable mitigation measures shall be taken. Special vehicles and trucks for transportation of solar power plant equipment and construction materials shall be used and gravel paved roads shall be sprayed with regular watering. No longer used roads shall be closed after implementation of rehabilitation works.

Building materials, sand and mud shall be kept in suitable places and storages spaces. Precaution measures shall be taken in order to prevent wind-blown dust.

After the completion of the construction works, areas without concrete pavement shall be covered with gravel in order to prevent emerging of dust.

Technical equipment and heavy machinery shall be included in suitable technical inspections and must fulfill applicable standards for exhaust emission. Technical

equipment and heavy machinery shall be regularly inspected according to provisions of technical services and maintenance.

Employees shall be included in regular health check-ups and if necessary provided with special detoxification food and medication.

Vehicle exhaust pipes shall be equipped with special filters in order to suppress dust generation by the combustion. Applicable technical procedures and rules must be strictly followed by all means. Specification of the fuel, emissions of dust and the amount of heavy metals must be considered during the selection of suitable filters.Suitable fuel for technical equipment and heavy machinery must be used in order to reduce the emission of nitrogen oxides and other harmful gases, fumes (CO_2, CH_4, CFCs). Technical equipment and heavy machinery must be correctly adjusted and configured.

6.3 Impact on the Geological condition and the mitigation measures

6.3.1 Impact on the geological condition

Currently, the project's land surface and entrails has no erosion or pollution. Pits and drilling holes excavated for research and analysis purposes has been completely backfilled in accordance with technical rehabilitation procedure.

Soil erosion and pollution may be caused due to human activity within the framework of construction works of the Solar PV power plant and utilization of heavy machinery and other technical equipment. It includes the surrounding area with supply roads between the installed solar panels.

Small sized maintenance and repair shop shall be employed in order to maintain engines and other equipment, technical devices, provision of the regular maintenance and technical services to a variety of materials and spare parts, including fuel, oil reception, storage and distribution. Thus, during their operation the earth surface and entrails may be affected due to technical and human factors. This means that the particular area, including its soil and vegetation, pastures and shrubs of natural habitats, species living there, micro-organisms and ecology may be affected in a certain way.

6.3.2 Mitigation of the negative impact on the geological condition

Due to the impact it may cause to the surface and entrails during the construction

process, earth stripping works and soil stockpile storage, restoration and re-vegetation, preservation of the groundwater shall be executed and performed strictly in accordance with applicable Mongolian rules, regulations and standards.

In addition, in order to protect the surface soil erosion trees, shrubs and planting perennials shall be planted and cultivated to prevent soil erosion around the area as daily duty. Due to works executed within the project arealiquid and solid waste pollution may emerge in this relation. In consideration of household waste suitable toilets, garbage and waste containers shall be installed in the project area. Latrines and drainage points shall be installed downwind side of the settlement in accordance with the "Domestic waste water disposal regulation".

6.4 Impact on the soil layer and the mitigation measures

6.4.1 Impact on the soil layer

The table below indicates the possible impacts on the soil and its severity during the construction and operation of the PV power plant.

No.	**Impact/effect**	**Assessment of consequence of the impact/effect**				
		Very low or Negligible	**Low**	**Medium**	**High**	**Extremely dangerous**
1	Soil of the project area can be damaged due to soil erosion	X				
2	The project area can be damaged due to human activity within the framework of construction works of the Solar PV power plant and utilization of heavy machinery and other technical equipment.		X			
3	Sediments or hard particle dust containing NOx and SOx may lay down on water and soil surface and spread beyond the local flora and fauna, which may havea negative impact	X				
4	Fuel and lubricant leakage, infiltration and soil pollution		X			
Conclusion:		Construction site to prevent soil erosion and 50% to 50% of the total impact because there is little or very little effect in that category.				

Table 6-4 Assessment of the impact on the soil layer

Some parts of the area are covered with thin sand. The particular area is affected throughout the four seasons of the year by low and high speed winds. Therefore, the surface of the soil is fertile brown soil blown and distributed nationwide, but is fed from the corruption of compost plants.Thus, the low humus soil is less common and covered mostly with gypsum, Borzon stone, rocks and pebble.

Concaves and cavities are covered mostly with brackish ponds and marsh soils in addition to abundant piles of sand which may occasionally occur on the surface.

6.4.2 Mitigation and elimination of the negative impact on the soil layer

Environmental fertile soil, plants and livestock grazing of communities will be affected to different extent during the construction, operation and decommissioning of the solar project. However, the influence or impact is not such strong as in the mining sector.

- A total of 80 hectares of the land area will be involved for the project, of which 64 hectares will be excavated.
- Due to depletion of land reserves, excavation of the soil, the landscape shall be changed in a certain way. It includes drilling holes and installation works of solar panels and supporting piles, road stripes between panel rows and supporting facilities.
- Certain parts of the soil and earth surface will be paved, clayed due to emerging of land roads and pathways; soil disturbance may occur.

Following standards and instructions shall be strictly followed in order to reduce or mitigate negative impacts on the soil cover:

- MNS 4915:2000 Environment. Reclamation of land destroyed due to mining activities. General technical requirements.
- MNS 4917:2000 Environment. Requirements for fertile soil removing and its temporary storage during the earth excavation. General technical requirements.
- MNS 4919:2000 Environment. Re-vegetation of destroyed land. General technical requirements.
- MNS 4920:2000 Requirements for fertile soil removing and its temporary storage during the earth excavation. General technical requirements.
- Instructions for re-vegetation and restoration of the land impacted due to exploration and research for minerals (Appendix 3 of the Resolution no. 64/A/62 of the Minister for Environment and Agriculture from 2000)
- It is important and essential to recover the used land area in proper and suitable manner after implementation of the excavation and the completion of stockpiles section and the side of the slope to ensure soil erosion protection.

- Land adjacent underground deposits kept and stored in piles for many years is often one of the sources for soil pollution. Therefore rehabilitation measures shall be taken as soon as possible in order to protect the vegetation.
- Heavy contaminated soil with 50-70 cm in thickness shall be excavated, removed and buried in a prepared earth hole/pit.

6.5 Impact on water bodies and mitigation measures

6.5.1 Impact on the water reserves, its quality and its assessment

The average groundwater mineralization of Gobi region is equal to 1120mg/liter, the average hardness is 5.4mg-eq/liter, which is higher than the appropriate level of drinking water. Drinking water of more than 100 soums of Gobi region does not fulfill the standard requirements of which nearly 60 percent contains high level of mineralization, nearly 40 percent of high hardness and is dominated by more than 80% of magnesium hardness.

After commissioning of the Solar PV power plant in Sainshand estimated 10 technical employees shall have permanent working place. In accordance with standard norms approved through Resolution no. 153 of the Minister of Environment from 1995 one person 15 liter water per day (10 * 15 * 350), which means annually 52500 liters or 52.5 m^3 water. Drinking water is planned to be supplied and provided by water reservoir of Sainshand city.

6.5.2 Mitigation of the impact on the water reserves and its quality

Mongolia is currently facing climate change, drought and desertification caused by activity enlargements. In order to save natural resources and to mitigate the impact on the current environment, lifestyle and farming so as to achieve sustainable economic growth, the most appropriate and comfortable means should be determined to meet the needs of life.

Ministry of Environment and Green Development of Mongolia adhere to environmental policies to reduce water pollution, measures, implementation strategies and outcomes. Contamination of water resources and sustainable conservation of the population use planning ensures adequate water supply. The following strategies will be implemented:

- Legal mechanisms on water conservation and sustainable use to improve the ratio of water resource management and the organizational structure.
- Enhance the availability of surface water circulation through the population and

industrial water supply will be resolved.

Water quality, legal and economic mechanisms and management will be improved through the implementation of following water protection strategies and measures:

- Authorized hazardous waste disposal plant health inspection locations and employees for one person from 1.2 - 2 m area with toilets shall be established with installed hand-washing sinks and drying ovens.
- Station for domestic waste water disinfection, neutralizing bio-oxidation facility.
- Roads shall be built along the mountain chains with installed permanent and temporary run-pass pipes during the spring flood, road barriers against rain water storm and water facilities to dispose waste water in appropriate way;
- Fuel and lubricants storage containers to prevent leakages,environment and contaminated soil treatment and disposal measures;
- Used waste water fees paid by the due date to be settled, and careful use of water resources;
- Workers to prevent loss of water as appropriate precautionary locations.

6.6 Impact of noise and mitigation measures

The solar power as a facility is not considered to exhibit any significant noisy operations, although the facility's inverters and transformers may produce noise, but this is not considered a serious issue, since they will not generate any significant noise. Construction and decommissioning activities for solar power plant, however, will contribute to noise impacts. There are several noise generating activities such as opening access roads to construction personnel camp and facilities (if needed), earthworks, haulage activities, excavation, backfilling, and installation of PV panels, and other equipment within the facility in addition to noise sources generated from machinery and equipment on site.

The closest community to the project area is the city of Sainshand which is approximately 4 km away. Hence, it can be considered that the only people who could potentially be impacted by the noise are the employees working within the project site; these increased noise levels are considered occupational noises that require occupational health and safety measures. In addition to this, some reptiles and mammals, within the project area can potentially be driven away from the site due to the sound levels. However, these noise impacts are not considered to significantly harm animals nor cause impacts on a population level. Since the activities will occur under normal operating conditions and are expected to have only localized and temporary effects within the project area, the impact significance is low.

6.7 Impact on visual amenity and mitigation measures

The construction activities that are likely to create a visual intrusion and a disruption to aesthetics include: materials lay down, excavation, backfilling, and spoil. The project site consists of areas that are sparsely vegetated or have no vegetative covers, and hence no trees or bushes will need to be removed as part of construction. Also, there are no close communities that would be within the visual radius of the project. Therefore visual intrusions are anticipated to be limited to employees. Hence, the visual effects of the construction will be of low significance within the project area.

The main impact during operation is the visual impact of the photovoltaic panels during the day. The panels are geometric and reflective and will clearly stand out from the surrounding natural landscape. This visual impact may be perceived as positive and future-orientated rather than negative. The same has been seen for PV Power Plants in other parts of the world.

Besides the presence of a large area of PV panels is not expected to constitute a risk for glare since it is situated far from any airports, nor residential dwellings. Therefore, it is not anticipated that visual impacts will be generated due to the PV system design.

6.8 Impact on Biodiversity and Mitigation measures

6.8.1 Impact on the flora and the mitigation measures

At the present time the project area is used as the pasture land by nomads and there are no activities which are affecting negatively the particular area due to external factors. Due to construction and installation works of the Solar PV power plant, the vegetation cover can be destroyed.

Flammable and lubricating materials may contaminate the vegetation and change the diversity of flora and fauna species. Building materials used by the construction of the solar power plant, including equipment and transportation vehicles driving along the road may contaminate the ground soil and vegetation.

Assessment of the project impact on the vegetation is shown in the table below.

No.	Impact	Impact intensity, Probability scope	Very low or Negligible	Low	Medium	High	Extremely dangerous
1	May damage or destroy the vegetation within the project area	Certainly		X			
		Very likely					
		Likely					
		unlikely					
		Very unlikely					
	Vegetation within the project area may regress	Certainly					
		Very likely					
		likely		X			
		Unlikely					
		Very unlikely					
2	Vicinity from overgrazing of the vegetation within the project area	Certainly	X				
		Very likely					
		Likely					
		Unlikely					
		Very unlikely					
3	Waste water impact on the plant community	Certainly					
		Very likely					
		Likely		X			
		Unlikely					
		Very unlikely					
	Impact of flammable and lubricating materials on the plant community	Certainly					
		Very likely					
		likely	X				
		Unlikely					
		Very unlikely					
Conclusion:		The overall impact of the project on the vegetation within the project area is classified as "low".					

Table 6-5 Assessment of the project impact on the vegetation

Mitigation measures:

Soil erosion due to reduced soil moisture, structure damage and loss may influence the favorable conditions for plant growth and this influence may result also in migration of wild animals due to poor vegetation. Therefore, the following measures should be taken:

- The most optimal way to reduce the negative impact on vegetation is the optimal choice of the connecting road for car traffic and regular monitoring and control.
- Grade of planting according to appropriate technology and at the suitable time in accordance with norms and standards and their performance in accordance

and collaboration with argo-care professional organizations and units shall be implemented following the previously projected schedule.

- Vegetating of the surrounding area of the Power Plant is an important measure and method to reduce the negative influence on vegetation, soil erosion, desertification prevention, in order to reduce air pollution and mitigating climate change.
- Trees, bushes and shrubs planted perennials sprinkled flower beds shall be planted in order to establish ornamental flower planting within and around the project area.
- Recorded species of plants, its categorization, documentation and long-term monitoring plan will be coordinated with the competent authorities.

6.8.2 Impact on the fauna and the mitigation measures

Direct or indirect effects on plants or shortage of underground water resources are not expected within the project implementation area or surroundings due to construction of the Solar PV power plant and its later operation. But there is high risk of potential fuel leak of the petrol distributing cars used in equipment transportation or construction work; another risk is the indiscriminate release of household solid and liquid waste which has an impact on temporary runoff pollution and groundwater layers.

No.	**Impact**	**Impact intensity, Scope / Probability**	**Very low or Negligible**	**Low**	**Medium**	**High**	**Extremely dangerous**
1	Certain species of the fauna may flee from their habitat	Certainly		X			
		Very likely					
		Likely					
		unlikely					
		Very unlikely					
2	Certain species of the fauna may flee from their habitat or extinct	Certainly		X			
		Very likely					
		Likely					
		unlikely					
		Very unlikely					
3	Waste water impact on the fauna of the project area	Certainly					
		Very likely	X				
		Likely					
		Unlikely					
		Very unlikely					
		Certainly					

4	Impact of flammable and lubricating materials on the fauna of the project area	Very likely					
		Likely					
		Unlikely		X			
		Very unlikely					
5	Impact of the vibration caused due to utilization of heavy machinery and technical equipment	Certainly					
		Very likely					
		Likely	X				
		Unlikely					
		Very unlikely					
6	Hunting effects on the fauna	Certainly					
		Very likely					
		Likely					
		Unlikely					
		Very unlikely	X				
Conclusion:		The overall impact of the project on the fauna within the project area is classified as "low".					

Table 6-6 Assessment of the project impact on the fauna of the project area

Mitigation measures:

Mitigation and elimination of possible adverse impacts of a particular project shall be implemented by individuals, business entities and organizations on human health and the environment.

Protection of the biodiversity through national large-scaled protection programs of wildlife and plants and other related activities shall be implemented in accordance with applicable laws and regulations of Mongolia.

Construction, renovation and expansion of any existing production facilities, including services and maintenance activities related to petroleum extraction, mining and building construction or any other activities towards the use of natural resources may have indirect or direct impact on the environment.

6.9 Impact on historical and cultural memorabilia and mitigation measures

There is no impact on historical and cultural memorabilia, because such historical and cultural heritage or memorabilia was not discovered within the project area. In case of discovery of historical and cultural heritage or memorabilia during the implementation of construction works of the Solar PV power plant, necessary preservation and

protection measures shall be taken in cooperation with provincial and local authorities, including professional organizations.

6.10 Impact on the society and economy and mitigation measures

This section describes potential impacts of the project on socio-economic conditions and amelioration of negative outcomes, aiming to protect the well-being of project affected communities and to identify any potential enhancements to socio-economic conditions.

Generally, the project will have either negligible or minor direct and indirect social and economic effects on the local community and nomadic herders living in proximity to the project area. These effects will commence during the construction and continue throughout the operating life of the project. In short term, benefits will include additional employment and expenditures associated with construction of the project. These same types of benefits would accrue during operation. The overall socioeconomic impacts of project implementation are discussed below.

6.10.1 Traffic

Construction Phase

During the Construction Phase traffic is expected to increase to a certain degree due to the nature of activities that will take place such as the transport of equipment and materials to and from the site through the surrounding road network. Additional traffic load will be evident at certain times during the day, especially if there are slow moving heavy vehicles transporting material to and from the site.

Vehicle traffic can cause congestion on road networks around and within the site and thereby leading to potential accidents.

The above potential traffic impacts can possibly occur during the duration of construction, especially during working hours. However, this is considered a short-term impact. This impact is likely to happen but is not anticipated to cause any permanent effect on the receiving environment. Besides due to the fact that the proposed PV site is located around 4 km away from the eastern end of Sainshand, this temporary disturbance is reduced to a minimum. The construction period is expected to be 3-5 months.

Operation Phase

Impacts from traffic are not expected to occur during the operation phase due to minimal number of personnel present within the project site. Therefore, increased traffic load is not considered a significant impact. As a result, the impact is very low.

Decommissioning Phase

The anticipated impacts during decommissioning are similar to those for the construction phase, where the heavy machinery that transports disassembled parts of the project solar power plant facility might be of more significance than normal vehicles and pickups. Proper management actions with adequate mitigations can reduce significantly such anticipated impacts.

6.10.2 Employment Opportunities

Construction and Operation Phases

Positive benefits of the project may arise either from short-term job opportunities during construction, or long-term job opportunities during operation. It is important that construction and operation jobs to be targeted to the local people within Sainshand city where feasible.

Moreover, DSP One LLC plays a significant role in the training and employment process since it is considered a one-stop-shop for investors who can obtain potential candidates through DSP One LLC according to their need. Furthermore the PV Power Plant enables Mongolian universities and their students to gain hands-on experience in energy production from large scale PV Power Plants.As a result, the impact significance can be considered Positive (+).

Decommissioning Phase

Short-term job opportunities may arise during decommissioning, however, this can negatively impact permanent personnel at the solar power plant since the facility will cease its operations, therefore permanent staff may lose their jobs.

However given the fact that an upgrade is expected for the facility during its post – design life, the significance of the impact is considered low.

6.10.3 Economy

The project is anticipated to have benefits to society since the use of photovoltaic Power Plants in Mongolia is not widespread currently. Implementations of such technology are able to increase the awareness of this alternative electricity generation and could lead to an increased market share in future. It will also provide a clean and pollution free energy and as a result, improve public health.

On a more strategic level, it will increase the supply of electrical energy in Mongolia from a renewable source, which is in line with the aim of the Mongolian government to increase energy supply and reduce the overall CO2 emissions of Mongolia by substituting energy from the predominating coal-fired Power Plants.

The solar project will also lead to upgrading the economic status of the local community in addition to potential increase in land prices and improvement in welfare conditions in the long run. Therefore, this impact is considered to be Positive (+).

6.10.4 Human Health

6.10.4.1 Safety Risks from Traffic

Vehicle traffic, particularly HGVs, will increase as a direct result of the construction phase of the project and this can present a risk of accidents that could result from minor injury to serious injury or death. This could be a negative impact that will be localized and in short term, occurring during the construction and decommissioning phase.

Mitigation measures

To mitigate the potential traffic related impacts from the project, a traffic management plan comprising strategies to manage vehicles and equipment during the execution of the project will be implemented, including the following measures:

- Provide appropriate traffic safety training to all drivers (employees and contractors) as part of their induction and on an ongoing basis.
- As part of pre-construction engagement activities, ensure that traffic and "rules of the road" are discussed with local communities. Discuss and address community concerns. Special sessions may be required for particularly vulnerable groups such as children. At minimum communicate type, frequency and traffic risks before heavy traffic begins for the construction phase.

- Use grievance mechanism or other means to monitor the driver conduct.

6.10.4.2 Increased Risks to Personal Safety from Population Influx

Increased risks to community safety and security are likely as a result of influx of workers and other individuals to the area as posing a threat to security,primarily in relation to their property and potential unruly or destructive behavior.

6.10.4.3 Injury or death from construction activities and unforeseen events

Risks to community health from construction activities such as accidents, chemicals releases or such are low provided the community or their livestock does not trespass within the construction area, particularly the WTG foundation excavations.

6.11.4.4 Respiratory effects from poor air Quality

Construction activity will result in fugitive dust. It will be generated by vehicle traffic on unpaved roads, naturally occurring windblown dust from disturbed lands and dust generated during construction activities.

Impacts will vary depending on the construction activity and the severity of most air related impacts reduce with distance from the source. Fugitive dust will have the greatest potential impact on local herder residents within site boundary, especially during dry periods when there is heavy truck traffic. This could result in respiratory impacts for the local community, ranging from minor irritation of the throat, eyes, nose to chronic irritation, asthma and other respiratory effects.

Unmitigated respiratory effects from construction activities would be direct, negative impacts that are localized but short to medium term. With mitigation these effects would become localized and minor.

Mitigation of Respiratory Effects from Poor Air Quality

To mitigate the potential air quality related impacts from project activities, particularly during construction, the following mitigation measures will be implemented:

- Implementation and compliance with a traffic management plan which should identify the strategies used to manage dust on the road during the execution of the project.
- Implementation and compliance with the Dust Management Plan(part of the

overall ESMP).

- Use of properly maintained vehicles and construction equipment with emission controls.
- Communicate project risk to local communities and address concerns accordingly. Monitor any complaints filed from local stakeholders as an additional tool to monitor dust management measures.

6.10.4.5 Spread of food and water-borne diseases

Population influx and increased project waste and effluents will increase pressure on local waste management and sanitation services and infrastructure. The results could be unplanned settlements, or increased crowding in existing settlements, increasing the likelihood of illnesses from fecal-oral contamination. The spread of food and water-borne diseases will be localized and medium term as there is a potential that it may continue beyond the construction phase.

Mitigation measures:

To mitigate the potential spread of food and water-borne disease related impacts from the project, the following mitigation measures will be implemented:

- Implementation of Waste Management Plan, to make sure that household and project waste is disposed in accordance with relevant Mongolian standards;
- Implementation of a Camp Management and Security Management Plan to ensure the workers' access to a safe and healthy work and living environment.

6.10.4.6 Occurrence and Spread of Communicable Disease

The rapid increase in population, especially male workforces, increases the risk of occurrence of communicable diseases. Close living conditions, poor water quality and sanitation can increase the risk of respiratory disease, as well as food and water-borne diseases, which will be an indirect negative impact, however is local and short to medium term.

Mitigation measures

To mitigate the potential occurrence and spreading of communicable diseases related to the project, the following mitigation measures will be adopted:

- Make sure the health screening is conducted for employees both before their employment and throughout the contract period on an irregular basis;
- Increase awareness on communicable disease prevention by providing training

on communicable disease prevention on a regular basis; collaborate with an on-site medical team to make sure such training is properly provided;
- Seek opportunities to support local public health campaigns that focus on preventing communicable diseases.

6.10.4.7 Increased pressure on water resources

To reduce the impacts on local water quality due to the project implementation, the following mitigation measures will be adopted:

- Make sure that all employees and workers abide by the code of conduct that the community wells should not be used.
- Monitor the compliance through the grievance mechanism to be put in place.

6.10.4.8 Risk to Human health from untreated sewage effluent

The following mitigation measures will be adopted to reduce the potential impacts from the untreated sewage effluent due to the project：

- Implementation of a detailed Waste Management Plan.
- A local effluent collection or treatment system will be put in place in accordance with Mongolian Law.
- Effluent from domestic sewage treatment shall meet relevant standards issued by Mongolian Ministry of Environment.

6.10.4.9 Increased risks to the safety of local community

The following mitigation measures will be adopted to reduce the potential security related impacts from the project:

- Make sure that project security is aware of the project's goals to establish good relationships with local stakeholders; put in place the grievance mechanism for communities to speak out their concerns
- Develop a conduct code for security personnel, who outlines appropriate conduct, engagement and use of force and make sure all security personnel fully informed and abide by it.
- Introduce head of security personnel to neighboring communities and outline the necessary safety precautions that will need to be put in place to ensure the safety of the project and local communities.

6.10.4.10 Injury from Construction Activities

There would be no issues relating to infrastructure safety exposure to diseases, hazardous material or increased exposure to natural hazards. The likelihood and severity of adverse impacts is considered low in terms of the risk identified and there will be management plan in place to further mitigate those risks.

To avoid work injuries, the following measures are to be taken:

- Keep project plant and equipment to pre-defined routes and areas. Use appropriate signage;
- Inform the local communities that they should not enter the construction area

6.10.4.11 Emergency preparedness and response

The increase in HGV traffic and the potential injuries resulted from the project could lead to an increased pressure on the emergency response system. This is an indirect negative impact, which is localized and medium term. To mitigate the risk of severe injury or death from emergency events such as equipment or machinery accidents, the following measures will be adopted:

- Develop an emergency response plan(ERP)
- Communicate ERP with local emergency responders; build local capacity to ensure appropriate local response in case of emergency.
- Communicate potential risks and ERP to those potentially most affected by emergency events.

6.10.4.12 Increased pressure on health services and infrastructure

Project activities will result in an increase of non-resident population and workforce, which in turn could increase pressure on local health services and infrastructure. The impacts of the project on health care infrastructure will depend on the size of locally registered force. The impact will be an indirect negative impact, which will be localized and medium term.

Mitigation measures

To mitigate the potential pressure on health services resulting from population influx, the following mitigation measures will be implemented:

- Ensure that all Contractors are provided with adequate health care (for work-related injuries and off the job related health issues) that is independent of the

local health care system.

- Identify ways together with local professionalsin which the project can provide sustainable investments in the health care facilities used by their workers.

6.10.5 Occupational and Public Health and Safety

This section introduces the potential impacts of the project on occupational and community health and safety. Occupational and public health and safety concerns associated with operation and construction of the project will be similar to those from construction and operation of any industrial facility in a remote area. The major potential hazards include:

- Movement or operation of passenger and construction vehicles,equipment, and materials could cause injury or death to humans(drivers, passengers, pedestrians) or animals(livestock or wildlife).
- Using hand tools or larger equipment could result in accidents that harm or kill workers.
- Falling overhead objects could cause injury or death to workers or trespassers.
- Falls into or collapse of open excavations could cause injury or death to workers or trespassers.
- Falls from heights (buildings, transmission towers, WTGs) could cause injury or death to workers or trespassers.
- Blasting could cause injury or death to workers or trespassers.
- Contact with electrical lines or transformers could cause injury or death to workers or trespassers.
- Noise and vibration could distress or injure workers or distress residents.

Mitigation Measures

DSP and its contractors will comply with International Occupational Health& Safety regulations and standards in addition to Mongolian safety standards regarding construction works, electric works, structural climbing and other hazards. In general, construction operations will be planned and implemented in accordance with these standards and with IFC safety guidelines (2007a).

There will be a workforce manager in charge of all activities, and in charge of compliance with health and safety requirements. He/she will report directly to the project manager and will have independent lines of reporting to the upper management. Before the on-site work, the workforce manager will develop a safety program to cover construction and later the operation. The program will describe the potential hazards and the ways to prevent or avoid them. All construction workers, including contractors will be

required to complete a training program that covers the safety program, and training will cover hazard awareness, job- and site-specific hazards, emergency procedures for fire and for illness or injury and natural disaster.

Besides training, the safety program will include detailed requirements for inspecting, testing, and calibrating safety equipment, for monitoring the working environment for hazards, and for monitoring worker health. In addition, all incidents and accidents will be recorded if they results, or nearly resulted, in damage to equipment or injury or to humans or animals.DSP will report to the lender on the status of the overall safety program, including information on training and on incidents. In addition, DSP will compensate herders for livestock that may be killed as a result of site-related traffic. With regard to the construction workforce, a local labor force will be employed and wages will be paid which are at least average for the area.

6.11 Impacts of Power Transmission Line

6.11.1Technical Characteristics of the Overhead Line (OHL)

The planned power transmission line from the PV-Power station to the substation will meet all required regulations in Mongolia.

Towers

The design of the towers must ensure safe operation in all working climatic conditions, in relation to the used phase conductors, earth wires and insulator sets and for the designed wind and weight spans.

Depending on their position in the OHL, the types of towers could be: Suspension towers, used for straight section of the line or Angle (tension) towers, used where the line changes direction.

The towers will be steel lattice design. Each tower will have four legs and single foundation per leg, i.e. four foundations for each tower. Number of conductors and their disposition on each tower type is three lines in horizontal direction, each with two phase conductors and two lines in horizontal direction with two earth wire conductors.

Foundations

The tower foundations will be undercut pad and chimney type constructed of reinforced concrete. The type of concrete should provide conditions for placing normal foundations and should be suitable to the specific carrying capacity of the terrain. In case of weak carrying capacity of the terrain at certain micro-locations and based on geo-technical investigations, relevant specific technical solutions will be designed and constructed.

Earthlings

In the context of safety and protection at work (reducing the effects from electric shock, etc.) special emphasis will be given to the tower earthling. This procedure should be conducted in compliance with the requirements of the technical regulations.

Earthling of OHL towers will consist of two rings around each tower foundation, made from FeZn wire Ø 10 mm. These rings are connected between them and to the tower steel structure. In cases when earthling needs to be reinforced (e.g. for types of soil with lower conductivity), reinforcement is done by adding two legs (extensions) from FeZn wire or FeZn tapes to existing rings on each tower foundation. Finally, for sites with special earthling requirements (in principal case – near buildings or houses), additional FeZn wire ring is laid around entire tower structure, roughly 1 m away from existing rings and at depth of 0.8 to 1.0 m.

Phase Conductors

For the phase conductors for the planned OHL, pursuant to the current concept for this type of power lines in Mongolia, conductors ACSR will be used with normal cross section of 490/65 mm2. Two conductors per phase are planned at a mutual distance of more than 400 mm.

Insulators

The proposed OHL will belong to the grid with a directly grounded neutral point and a degree of insulation for which the nominated lightning impulse withstands voltage is 1,425 kV. The insulator that is to be used will be of a type approved for such power lines and appropriate assembling procedures will be carried out for the various types of insulator chains.

6.11.2 Construction Works for the OHL

Transportation means used to transport towers to the construction sites mainly depend on the terrain conditions. In general, trucks or heavy tractors will be used. No use of helicopters for construction purposed is planned.

Use of existing access roads to tower location will be preferred. Thus, a combination of access options will be used, using existing roads and tracks to allow access to construction sites wherever possible and constructing new tracks where necessary. Roads for construction access will be prepared using standard road construction heavy machinery, mainly – bulldozers, by upgrading existing roads in order to accommodate construction needs and buildings new access roads. Once construction is completed it is intended to maintain access roads to enable maintenance activities. Any other access road disturbed by construction activities will be improved to better condition in comparison to its original stage.

6.11.3 Access to Construction Sites of the OHL

Access to the works would be gained wherever feasible from the existing main road network. The use of certain unclassified roads would also be required. Those unclassified roads which may be used would be identified in subsequent project stages and during preparation of the project's main technical design.

A combination of access options would need to be considered including making best use of existing roads and tracks as well as new temporary and permanent tracks to allow access to construction sites with the least environmental impact.

The overall operational life of the proposed OHL is approximately 20 years matching the operational life of the solar power park, however the OHL would be technically viable for a period of 70 years. The eventual final termination of operations will involve activities for dismantling the infrastructure and equipment and their dislocation from the area of the corridor of the OHL. The location will be subject of restoration and returning the environment to its original condition.

6.11.4 Impacts and mitigation measures on Archaeology and Cultural Heritage

There are no known archaeological sites, heritage sites, or large cemeteries located within the route of the OHL corridor.

During the construction works, the works contractor shall be obliged to develop and implement a "chance-find" procedure and to comply with national legislation on the protection of cultural heritage. Workers will be trained in the use of these procedures.

If an archaeological site or items of archaeological significance are found during execution of construction works, the work contractor / investor is obliged to:

(i) Inform immediately the competent public institution for protection of cultural heritage about the discovery (ii) Cease operations and to secure the site against eventual any damaging and against unauthorized access, and (iii) Maintain the uncovered items in the location and in condition they were found.

With the implementation of the proposed chance find procedure we do not anticipate any significant residual impacts.

6.11.5 Impacts and mitigation measures on Air Quality

6.11.5.1 Dust and Particulate Matter during Construction Activities

During the construction of the proposed 35 kV OHL, there will be site preparation and

construction activities, all of which have the potential to generate dust. Such emissions can be divided into dust and particulate matter (PM10).

Dust comprises of large airborne particles of material, which are resident in the atmosphere for short periods of time after release, as they are heavy enough to fall out of suspension in the air relatively quickly. Therefore, effects of these emissions will be localized and they do not cause long-term or wide spread changes to local air quality but their deposition on nearby properties causes soiling and may therefore result in complaints of nuisance, which is usually temporary.

The main sources of dust during the construction activities include:

- Construction vehicle movements and other project related traffic on unpaved roads
- Soil excavation, handling, storage, stockpiling
- Site preparation and restoration after completion
- Construction of towers and access roads
- Internal and external construction works on substations.

The majority of the dust emissions are likely to occur during the working hours of construction activity.

The precise behavior of the dust, its presence in the atmosphere, and the distance it may reach would depend upon a number of factors. These include wind direction and strength, local topography and the presence of screening structures (buildings, trees etc.) that may intercept dust before it reaches sensitive locations. Each of these factors would differ along the route of the proposed OHL.

Depending on wind speed and turbulence during construction it is likely that the majority of dust will be deposited in the area immediately surrounding the source (up to 200 m away). Therefore properties within 200 m of the construction site are most likely to experience nuisance, without appropriate mitigation measures. However, the nuisance would be temporary, and provided that site specific mitigation measures are implemented, no significant dust effects are predicted.

6.11.5.2 Emissions from Traffic

The main pollutants of concern associated with road traffic are NO2, PM10, CO, benzene (C6H6) and benzo[a]pyrene (C20H12). Of these pollutants, NO2 and PM10 are the emissions most likely to result in exceeding relevant air quality standards or objectives.

The greatest potential for impacts on air quality from traffic associated with construction of the proposed project would be in the areas immediately adjacent to the principal means of access for construction traffic. In construction zones, the dust generated by vehicle movements and local air pollutant emissions from vehicles may be temporarily elevated during the busiest periods of construction activity, however, given the relatively remote and open nature of much of the OHL route, no significant local air quality effects are

predicted.

Air emissions during operation of the proposed OHL will be minor and only occur during routine inspections and maintenance activities.

6.11.6 Noise and Vibration

The Mongolian standard MNS-4585-2007 has permitted noise limits of 60 dB(A) during daytime, and 45 dB(A) at night. However the WHO provide a more stringent standard of 55 dB(A) and 45 dB(A) which will be applied to this project.

6.11.6.1Construction noise

In a general context, construction activities could be divided into a number of distinct processes. They may be described as follows:

- Construction of tower foundations
- Tower assembly and erection
- Attachment of the conductors
- General road improvements and other similar works.

Based on available project information, there are no blasting requirements during the construction process. Noise and vibration effects associated with blasting are therefore not expected during construction activities. However, any eventual requirement for blasting will be agreed in advance by the EPC contractor with the relevant local authority. There are no plans to use helicopters during construction activities and, therefore no noise implications associated with helicopters are expected. However, any eventual requirement for use of helicopter would make noise audible to people within 2 km. The duration of the noise would be short-term, on the order of minutes to an hour, and over a very limited number of days.

Mechanical equipment which is planned to be involved in the construction of the proposed 35 kV OHL includes, but is not limited to: track loader, excavator, hydraulic hammer and breaker, mobile crane, air compressor, dump trucks, generators, concrete pump, etc.

6.11.6.2 Construction vibrations

Planned construction activities and use of equipment and machinery will be a source of vibration. The response of people to vibrations on the ground is influenced by many factors. Some of those factors are physical, like amplitude, duration and frequency content of vibrations, while other factors like the type of population, age, gender and expectations are physiological. This means that people's reaction to vibrations is subjective and differs for different people. It is generally accepted that for the majority of people, vibration levels in excess of between 0.15 and 0.3 mm/s peak particle velocity are

just perceptible. Previous studies have shown that vibration tends to be perceptible at distances of up to 15 m from the source.

6.11.6.3 Operational Noise

An operational OHL can be a source of a phenomenon known as "corona discharge" (a limited electrical insulation breakdown of the air) which can also occur naturally during storms when highly charged clouds induce high electric fields around tall objects.

Whilst the conductor systems of overhead OHLs are designed and constructed to minimize corona and hence acoustic noise, surface irregularities on the conductors, caused by physical damage such as burrs, or debris such as insects, pollen, industrial pollution, raindrops or other forms of contamination, may locally enhance the electric field strength sufficiently for discharges to occur.

Any corona discharge would act as a source of audible noise i.e. a crackling sound occasionally accompanied by a low frequency hum in certain wet conditions.

Corona noise is generated only when the conductor surface electric stress exceeds the inception level for corona discharge activity. The OHL conductors are designed to operate below this threshold. Surface contamination of a conductor, resulting in a modification to its otherwise smooth profile, would cause a very local enhancement of electric stress that may initiate discharge activity. At each discharge site, a limited electrical breakdown of the air occurs. A proportion of the energy associated with the corona process is released as acoustic energy, which is launched into the air as sound pressure waves.

Highest noise levels generated by an OHL generally occur during rain. Water droplets collect on the surface of the conductor and may initiate additional corona discharges. Fog may also give rise to increased noise levels.

Fog noise is caused by droplets of water condensing onto the line and hence causing discharge activity in a similar way to rain.

Operational noise generated by an OHL increases noise levels in the surrounding environment and may cause nuisance to affected populations. The high variability in the response of individuals to identical noise sources makes the prediction of annoyance very difficult. Each individual's response to increased noise levels is subjective and highly personal.

OHL audible noise is generally categorized as "crackle" or "hum", according to its tonal content. Crackle may occur alone, but hum would usually occur only in conjunction with crackle. Hum is only likely to occur during rain when rates of rainfall exceed 1mm/hr. Crackle is a “broad band” noise containing a random mixture of frequencies, typically ranging from 1 kHz to 10 kHz.

6.12 Summary of Cumulative Impacts

This section investigates the cumulative impacts which could result from the existing and/or planned projects in the area based on the current available information.

Within the project area and its surrounding there are no existing and/or planned developments which would result in cumulative impacts on any of the environmental or social receptors investigated as part of the ESIA. The natures of the potential impacts which have been addressed above are site-specific and relevant mitigation measures will be adopted. This includes impacts such as land use, geology and hydrology, biodiversity, archeology and cultural heritage, air quality, infrastructure and utilities, and occupational health and safety. The assessment of cumulative impacts in that sense is not relevant.

CHAPTER 7 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

7.1 Introduction

The project developer is committed to achieving and maintaining environmental standards, such that Mongolia environmental regulations are met, and potential adverse environmental impacts resulting from the project activities are minimized as practicably as possible. This will be achieved through appropriate project planning and methods of project operation.

Implementation of on-going environmental monitoring programs will enable the assessment and modification, if required, of the Environmental Management program.
Further to the impacts assessed in the previous chapter, this section presents more detailed mitigation measures and monitoring requirements that correspond to the impacts examined in the previous section, thus exploring them in more detail. Mitigation measures aim to offset any negative impacts that may result from the project, and monitoring is the process of measuring the success of mitigation measures in order to assess their effectiveness.

7.2 Objectives

This Environmental and Social Management Plan (ESMP) aims at ensuring the application of the mitigation and monitoring measures needed to reduce and control the various environmental and social impacts associated with the implementation of the proposed project.

The key objectives of the ESMP are summarized below:

- Minimizing any adverse environmental, social and health impacts resulting from the project activities;
- Conducting all project activities in accordance with relevant Mongolian legislation and applicable EBRD guidelines.
- Implementation of on-going environmental monitoring programs;
- Periodic review of the Environmental Management programs to allow for iterative improvement;
- Ensure that all stakeholder concerns are addressed.

Overall, this ESMP aims at ensuring the application of the mitigation and monitoring measures needed to reduce and control the various environmental and social impacts associated with the implementation of the proposed project.

7.3Environmental and Social Management Plan for this project

Depending on the nature of the project, the current plan was made for every 5 years beginning from 2016. The plan shall be updated, reviewed and approved every year by the Ministry of Environment and local authorities.

Before the 15th of February of each year the environmental protection plan and environmental monitoring program shall be updated as detailed case review and approved as environmental assessment by the Ministry of Environment from revoking the Ministry of project implementation plan every year, as verified during the program Performance report.

ESMP for Planning and Construction Phase								
Environmental Attribute	Potential Impact	Impacted Objects	Management Action and Compensation Measures	Type of Action	Monitoring Action	Frequency	Responsible Entity	Standard Permission Level
Landscape and Visual	The construction activities are likely to create a visual intrusion and a disruption to aesthetics including materials lay down, excavation, backfilling and spoil.	All employees of the facility, community members and visitors.	Ensure proper housekeeping and instruct the workforce accordingly. It should be ensured that all machines, vehicles and tools used during construction should be removed on the earliest time possible, waste is collected and evacuated in a timely manner and the project site is left in an orderly state after each working day.	Mitigation	Inspection and briefing of local workforce	Continuous	EPC Contractor	All permissible levels shall be strictly maintained in accordance with applicable norms and standards of Mongolia.
Soil	Soil erosion and pollution may be caused due to human activity within the framework of construction works of the Solar PV power plant and utilization of heavy machinery and other technical equipment.	Livestock, pastures, fertile soil, animals and plants may be impacted.	Due to the impact it may cause to the surface and entrails during the construction process, earth stripping works and soil stockpile storage, restoration and re-vegetation and preservation of the groundwater shall be executed and performed strictly in accordance with applicable Mongolian rules, regulations and standards.	Mitigation	Inspection and briefing of local workforce	Continuous	EPC Contractor	Ministry of Environment, the Minister of Energy, ratified on May 6, 1989, 22 68 / A / 61, Annex 5. MNS 4915:2000, MNS 4917:2000, MNS 4919:2000, MNS 4920:2000, Resolution no. 64/A/62
			Implement a proper waste management plan. Make sure that no solid waste is being dumped on the land and distribute sufficient numbers of bins and containers with respective labeling. Ensure that such containers are emptied or collected by respective contractors in a timely manner in order to prevent overflowing. Further, instruct the local workforce to keep the produced amount of waste at a minimum level by for example reusing materials where possible. Keep track of the produced volume of waste generated onsite and compare with the amount collected by the contractor to	Mitigation	Inspection and briefing of local workforce	Continuous	EPC Contractor	

			prevent illegal dumping.					
			In addition, in order to protect the surface soil erosion, trees, shrubs and perennials shall be planted and cultivated to prevent soil erosion around the area.	Mitigation	Installment	Continuous	EPC Contractor	
			In consideration of household waste suitable toilets, garbage and waste containers shall be installed in the project area. Latrines and drainage points shall be installed downwind side of the settlement in accordance with the "Domestic waste water disposal regulation".	Mitigation	Installment	Once, construction planning	EPC Contractor	
			Hazardous materials shall be stored in appropriate areas and it needs to be ensured that they do not contact land in case of spillage. (Impermeable surface, accessible only by authorized personnel, etc.).	Mitigation	Inspection and briefing of local workforce	Continuous	EPC Contractor	
			Ensure regular maintenance of all equipment and machinery used onsite. If there is a risk of hazardous material spillage during such maintenance, such maintenance shall take place on suitable locations to prevent spilling on the land. Further, dripping pans shall be installed on machinery which is likely to leak hazardous materials such as oil and fuel.	Mitigation	Inspection	Continuous	EPC Contractor	
			Construction and municipal solid and liquid waste fixed-point shall gain temporary disinfection and there should be a specific day determined each month to remove the contaminated area. Heavy contaminated soil with 50-70 cm in thickness shall be excavated, removed and buried in a prepared earth hole/pit.	Mitigation	Inspection	Continuous	EPC Contractor	

			Soil sampling and Environment monitoring shall be reviewed during the test program for the period specified (Soil quality assurance shall be reviewed once a year. Professional examination of the soil quality and level of the contamination shall be performed twice a year).	Mitigation	Inspection	Continuous	EPC Contractor	
Water and Waste Water Management	Improper Management of Water and Wastewater.	People, biodiversity	Mechanisms on water conversation and sustainable use of water in order to improve the ratio of water resource management and reduce the total water usage. Workers shall be instructed to prevent the loss of water.	Mitigation	Inspection and briefing of local workforce	Continuous	EPC Contractor	Joint resolution of State Minister for Environment and State Minister for Health and Social Welfare, Rules and Procedures for Protection of Water Reserves, No.143/A/352 from 1997 shall be taken as guidance and instruction for mentioned activities. Environmental certificate of authorization procedure are not currently available.
			Authorized hazardous waste disposal plant in order to avoid pollution of ground water. Install fuel and lubricants storage containers and prevent leakages.	Mitigation	Installment	Continuous	EPC Contractor	
			Install water facilities to dispose waste water in an appropriate way. Ensure that waste water containers are emptied and collected by wastewater contractor regularly and pay waste water fee by due date.	Mitigation	Inspection	Continuous	EPC Contractor	
			Analysis of the use of ground water supplied from environmental inspection and testing program in appropriate periods.	Mitigation	Inspection	Continuous	EPC Contractor	
			Measures to mitigate the influence from torrential rain and runoff from rainfall and flooding should be considered in the planning. Installment of temporary and permanent run-pass pipes during spring flood and road barriers against rain water storm where necessary.	Mitigation	Reviewing EPC contract, Planning	Once, construction planning	Project Developer	
Flora	Construction activities could disturb and harm existing flora.		Implement management measures to prevent damage to the flora on the site. This may include establishing a code of behavior and ensure the awareness	Mitigation	Inspection and briefing of local workforce	Continuous	EPC Contractor	

			of local workforce and other involved people.					
			Take existing flora in consideration when planning connecting roads for car traffic and regular monitoring and control.	Mitigation	Inspection	Once, construction planning	EPC Contractor	
			Flora shall be replanted within and around the project area. Grade of planting according to appropriate technology and at a suitable time in accordance with norms and standards and in collaboration with professionals.	Mitigation	Inspection	Once, construction planning	EPC Contractor	
			Ensure that flammable and lubricating materials are used in a suitable way and avoid negative impacts on the flora.	Mitigation	Inspection and briefing of local workforce	Continuous	EPC Contractor	
Fauna	Construction activities could disturb and harm existing fauna.		Conduct survey about the existing fauna in the project areas including its habits as breeding, feeding and movement. The study shall be executed by professionals and shall include winter as well as summer season. Thereby, project area shall not be limited to the project site but also to the area around and the transmission line.	Mitigation	Survey	Once, construction planning	EPC Contractor with project developer	
			Use construction material that impacts the observed habits of the local fauna as little as possible.	Mitigation	Inspection	Continuous	EPC Contractor	
			Leave small holes in the fences in order to allow small animals to escape the project site and avoid affecting their natural movements.	Mitigation	Installment and Planning	Once, construction planning	EPC Contractor	
			Implement management measures to prevent damage to the fauna on the site. Establish awareness of the local workforce concerning the exiting fauna and avoid hunting.	Mitigation	Inspection and briefing of local workforce	Continuous	EPC Contractor and Project Operator	

			Take existing flora in consideration when planning connecting roads for car traffic and regular monitoring and control.	Mitigation	Inspection	Once, construction planning	EPC Contractor	
			Ensure that flammable and lubricating materials are used in a suitable way and avoid negative impacts on the flora.	Mitigation	Inspection	Continuous	EPC Contractor	
Archeology and Cultural Heritage	Disturbance of historical and cultural memorabilia through certain construction activities.	Objects of historical and cultural importance	Until now there was no historical and cultural heritage or memorabilia discovered within the project area. In case of discovery of historical and cultural heritage during the implementation of construction works of the solar PV power plant, necessary preservation and protection measures shall be taken in cooperation with provincial and local authorities, including professional organizations.	Mitigation	Inspection	Once, construction planning		All permissible levels shall be strictly maintained in accordance with applicable norms and standards of Mongolia.
			Construction activities should be halted in the case of such founding. The respective areas should be fenced and the responsible authorities should be informed. The construction in the area should not be continued until relevant experts and authorities have been consulted, appropriate mitigation measures are implemented and it is ensured that the historical and cultural memorabilia is not affected by such proceeding. Construction on other areas of the project site where no such founding was made can be continued.	Mitigation	Inspection	Upon occurrence	EPC Contractor	
Air Quality	Construction and installation works may affect the amount of dust in the air and pollute the environment.	Construction and ambient air in the vicinity involving humans, animals, plants, and	The increased amount of dust in the air during construction shall be minimized by using adequate equipment. Special vehicles and trucks for transportation of solar power plant equipment shall be used and such trucks shall be covered when transporting fine and dusty materials outside the project	Mitigation	Inspection	Continuous	EPC Contractor	• Air quality indicators MNS 4585: 98 • Air quality in urban areas with the maximum content of chemicals

		on-site employees.	location.					
			Gravel paved roads shall be spread with watering if necessary during dry times and speed limits shall be conducted on the construction site in order to minimize dust emerging from the roads.	Mitigation	Inspection	Continuous	EPC Contractor	
			After the completion of the construction works, areas without concrete pavement shall be covered with gravel in order to prevent emerging of dust.	Mitigation	Installment	Once, during construction	EPC Contractor	
			Building materials, sand and mud shall be kept in suitable places and storages spaces. Precaution measures shall be taken in order to prevent wind-blown dust.	Mitigation	Inspection	Continuous	EPC Contractor	
			Technical equipment and heavy machinery shall be included in suitable technical inspections and must fulfill applicable standards for emissions.	Mitigation	Inspection	Continuous	EPC Contractor	
			Vehicle exhaust pipes shall be equipped with special filters in order to suppress dust generation. Applicable technical procedures and rules must be strictly followed by all means. Specification of the fuel, emissions of dust and the amount of heavy metals must be considered during the selection of suitable filters. Suitable fuel for technical equipment and heavy machinery must be used in order to reduce the emission of nitrogen oxides and other harmful gases and fumes (CO_2, CH_4, CFCs). Technical equipment and heavy machinery must be correctly adjusted and configured.	Mitigation	Inspection	Continuous	EPC Contractor	

			Implementation and compliance with a traffic management plan. Transportation shall be managed in an efficient way to reduce the overall usage of transportation vehicles. Where possible, train workers shall handle construction materials and debris during construction to reduce fugitive emissions.	Mitigation	Planning and Inspection	Continuous	EPC Contractor	
			Visual monitoring of the dust emissions shall be performed during earthworks and construction activities. The pollutant emissions shall be continuously measured during the construction and if there are extensive levels of air pollution being measured the sources of such pollution shall be identified and adequate measures shall be implemented. Communicate project risk to local community and address concerns accordingly.	Mitigation	Inspection	Upon occurrence	EPC Contractor	
			Ensure that for activities that contain high levels of dust, the workers are equipped with proper protective equipment. Employees shall be included in regular health check-ups and if necessary provided with special detoxification medication.	Mitigation	Inspection	Continuous	EPC Contractor	
Noise	Several noise generating activities during the construction such as earthworks, haulage activities, excavation and installation of PV panels will have an impact on the noise level around the project	All employees and workers on site.	Measures to reduce noise level of technical equipment shall be taken. Therefore, technical equipment with adequate noise levels should be chosen. Technical equipment shall be included in suitable technical inspections and must fulfill applicable standards for exhaust noise emissions.	Mitigation	Inspection	Continuous	EPC Contractor	Noise level shall be measured in accordance with Mongolian Standard MNS 12.1.017 0: 1988/5 x – "Labor Safety, Measurement techniques and standards of external and internal noises at
			The workplace for employees shall be in accordance with the requirements of protective clothing and accessories shall ensure full protection. This shall	Mitigation	Inspection	Continuous	EPC Contractor	

	area and heavy machinery with possible noise emissions will be used.		include providing employees with hearing protection (headset) where necessary.					the working area" (shall not exceed 60-80 dB).
Infrastructure	Increased amounts of traffic during construction can have an impact on the existing infrastructure, especially the road network and local traffic.	Local community	Manage transportation during the construction in order to keep the increase in traffic to a minimum level. Implement a transport plan that enables to keep the impact on the existing infrastructure and the existing traffic on public roads to a minimum. Try to avoid accessing residential areas and main parts of the city with slow moving heavy transportation vehicles.	Mitigation	Inspection	Continuous	EPC Contractor	All permissible levels shall be strictly maintained in accordance with applicable norms and standards of Mongolia.
			Ensure that all trucks and vehicles accessing the facility are operated by licensed operators and all project vehicles and trucks comply with the proposed speed limits.	Mitigation	Inspection	Continuous	EPC Contractor	
Occupational Health and Safety	There could be additional risks arising for workers health and safety during construction due to improper material, maintenance of machines, training etc.	Employees and Workforce on the site	Develop and implement a Workers Health and Safety Plan which ensures the safety of any employee on the construction site. Such plan should, among others, include the proper maintenance of any machines and tools used, the proper instruction and training of personnel to use such machines and the supply of adequate equipment for the workers.	Mitigation	Inspection and Planning	Continuous	EPC Contractor	All permissible levels shall be strictly maintained in accordance with applicable norms and standards of Mongolia.
			Implementation of a Camp Management and Security Management Plan to ensure the workers access to safe and healthy work and living environment.	Mitigation	Inspection and Planning	Continuous	EPC Contractor	
			Make sure that health screening is conducted for employees both before their employment and throughout the contract period on an irregular basis. Increase awareness on communicable disease prevention and collaborate	Mitigation	Inspection and Planning	Continuous	EPC Contractor	

			with an on-site medical team.					
Socio-economic	Positive benefits of the project may arise either from short-term job opportunities during construction or long-term job opportunities during operation.	Local community and citizens of Mongolia.	Construction and operation jobs should be to the highest extent possible be assigned to local people within Sainshand City and other parts of Mongolia.	Enhancement	Inspection	Continuous	EPC Contractor	All permissible levels shall be strictly maintained in accordance with applicable norms and standards of Mongolia.
			Implement a Corporate Social Responsibility (CSR) program. Assess and address the needs of the local community and work together with community members during the construction phase. The Plan should address the aims and objectives of community members and shall give them the opportunity to participate by expressing their concerns and limitations.	Mitigation	Inspection	Continuous	EPC Contractor	

ESMP for Operation Phase								
Environmental Attribute	Potential Impact	Impacted Objects	Management Action and Compensation Measures	Type of Action	Monitoring Action	Frequency	Responsible Entity	Standard Permission Level
Landscape and Visual	Visual impact of the photovoltaic panels and the project site during the day.	All employees of the facility, community members and visitors.	Incorporate the local community members and expound the purpose of the project. The visual impact may be perceived as positive and future-orientated rather than negative.	Mitigation	Inspection	Continuous	Project Operator	All permissible levels shall be strictly maintained in accordance with applicable norms and standards of Mongolia.
			Avoid putting colorful graphics and advertising on the project site.	Mitigation	Planning and Installment	Continuous	EPC Contractor	

Land Use	Operational activities could impact the actual land use.	Community members, famers and nomads	Allow community members and others (including nomadic settlers) to continue with their activities in the project area as normal as far as possible.	Mitigation	Inspection	Continuous	Project Operator	
			Allow nomads and community members to submit complaints if they are unreasonable withhold from their previous activities.	Mitigation	Inspection	Continuous	Project Operator	
Soil	Improper management of solid waste, hazardous waste and other hazardous materials.	Livestock, pastures, fertile soil, animals and plants may be impacted.	Implement a proper waste management plan. Make sure that no solid waste is being dumped on the land and distribute sufficient numbers of bins and containers with respective labeling. Ensure that such containers are emptied or collected by respective contractors in a timely manner in order to prevent overflowing. Further, instruct the local workforce to keep the produced amount of waste at a minimum level. Keep track of the produced volume of waste generated onsite and compare with the amount collected by the contractor to prevent illegal dumping.	Mitigation	Inspection and briefing of local workforce	Continuous	Project Operator	Ministry of Environment, the Minister of Energy, ratified on May 6, 1989, 22 68 / A / 61, Annex 5. MNS 4915:2000, MNS 4917:2000, MNS 4919:2000, MNS 4920:2000, Resolution no. 64/A/62
			Hazardous materials shall be stored in appropriate areas and it needs to be ensured that they do not contact land in case of spillage. (Impermeable surface, accessible only by authorized personnel, etc.).	Mitigation	Inspection and briefing of local workforce	Continuous	Project Operator	
			Ensure regular maintenance of all equipment and machinery used onsite. If there is a risk of hazardous material spillage during such maintenance, such maintenance shall take place on suitable locations to prevent spilling on the land. Further, dripping pans shall be installed on machinery which is likely to leak hazardous materials such as oil and fuel.	Mitigation	Inspection	Continuous	Project Operator	

			Soil sampling and Environment monitoring shall be reviewed during the test program for the period specified (Soil quality assurance shall be reviewed once a year. Professional examination of the soil quality and level of the contamination shall be performed twice a year).	Mitigation	Inspection	Continuous	Project Operator	
Water and Waste Water Management	Improper Management of Water and Wastewater.	People, biodiversity	Mechanisms on water conversation and sustainable use of water in order to improve the ratio of water resource management and reduce the water usage. Workers shall be instructed to prevent the loss of water.	Mitigation	Inspection and briefing of local workforce	Continuous	Project Operator	Joint resolution of State Minister for Environment and State Minister for Health and Social Welfare, Rules and Procedures for Protection of Water Reserves, No.143/A/352 from 1997 shall be taken as guidance and instruction for mentioned activities. Environmental certificate of authorization procedure are not currently available.
			Authorized hazardous waste disposal plant in order to avoid pollution of ground water. Install fuel and lubricants storage containers and prevent leakages.	Mitigation	Inspection	Continuous	Project Operator	
			Ensure that waste water containers are emptied and collected by wastewater contractor regularly and pay waste water fee by due date.	Mitigation	Inspection	Continuous	Project Operator	
			Analysis of the use of ground water supplied from environmental inspection and testing program in appropriate periods.	Mitigation	Inspection	Continuous	Project Operator	
Flora	The operation of the project could disturb existing flora in its natural habitat.		Implement management measures to prevent damage to the flora of the site. This may include establishing a code of behavior and ensure the awareness of local workforce and other involved people.	Mitigation	Inspection and briefing of local workforce	Continuous	EPC Contractor	

			Record species of plants, its categorization, documentation and a long-term monitoring plan will be coordinated with the competent authorities.	Mitigation	Inspection	Continuous	Project Operator	
			Ensure that flammable and lubricating materials are used in a suitable way and avoid negative impacts on the flora.	Mitigation	Inspection	Continuous	Project Operator	
Fauna	The operation of the project could disturb existing fauna in its natural habitat.		Implement management measures to prevent damage to the fauna of the site. Establish awareness of the local workforce concerning the exiting fauna and avoid hunting.	Mitigation	Inspection and briefing of local workforce	Continuous	EPC Contractor and Project Operator	
			Ensure that flammable and lubricating materials are used in a suitable way and avoid negative impacts on the flora.	Mitigation	Inspection	Continuous	Project Operator	
Noise	Noise generating activities during the operation could have an impact on the noise level around the project site.	All employees and workers on site.	Noise measurement experts shall inspect once a year the noise level, including working conditions and take appropriate actions if needed.	Mitigation	Inspection	Continuous	Project Operator	Noise level shall be measured in accordance with Mongolian Standard MNS 12.1.017 0: 1988/5 x – "Labor Safety, Measurement techniques and standards of external and internal noises at the working area" (shall not exceed 60-80 dB).

Occupational Health and Safety	There could be risks arising for workers health and safety during operation and maintenance activities due to improper material, maintenance of machines, training etc.	Employees and Workforce on the site	Develop and implement a Workers Health and Safety Plan for the operation phase which ensures the safety of any employee on the project site. Such plan should, among others, include the proper maintenance of machines and tools used the proper instruction and training of personnel to use such machines and the supply of adequate equipment for the workers.	Mitigation	Inspection	Continuous	Project Operator	All permissible levels shall be strictly maintained in accordance with applicable norms and standards of Mongolia.
			Implementation of a Camp Management and Security Management Plan to ensure the workers access to safe and healthy work and living environment.	Mitigation	Inspection	Continuous	Project Operator	
			Make sure that health screening is conducted for employees both before their employment and throughout the contract period on an irregular basis.	Mitigation	Inspection	Continuous	Project Operator	
Community Health and Safety	Public access to various project components (substation, trenches, and modules) could result in public safety risks.	Local community and visitors	The project site must be fenced in order to avoid unauthorized access. Especially the substation area must be fenced with concrete walls and be locked for unauthorized personnel at all times. An onsite safety guard should be present at all times in order to avoid unauthorized access to the project site. These guards must be adequately trained. Further, set up signs in an adequate distance to the project area warning about the public safety risk of present components (substation, modules).	Mitigation	Inspection and briefing of local workforce	Continuous	EPC contractor and Project Operator	All permissible levels shall be strictly maintained in accordance with applicable norms and standards of Mongolia.
			Make sure that the project security is aware of the projects goals to establish good relationships with the stakeholders. Develop a conduct for security personnel and introduce the head of the security personnel to neighboring communities and outline the necessary safety precautions.	Mitigation	Inspection and briefing of local workforce	Continuous	EPC contractor and Project Operator	

Socio-economic	Positive benefits of the project may arise from the long-term operation of the plant.	Local community and citizens of Mongolia.	Job vacancies for the operation of the plant should be to the highest extent possible be assigned to local people within Sainshand City and other parts of Mongolia.	Enhancement	Reporting on the outcomes	Continuous	Project Operator	All permissible levels shall be strictly maintained in accordance with applicable norms and standards of Mongolia.
			Implement a Corporate Social Responsibility (CSR) program. Assess and address the needs of the local community and work together with community members during the operation phase. The Plan should address the aims and objectives of community members and shall give them the opportunity to participate by expressing their concerns and limitations. It is important to build up a strong socio-economic relationship with the local community before and during the start of construction as well as during the operation of the plant.	Mitigation	Reporting on the outcomes	Continuous	Project Operator	
	The implementation of the project could increase the awareness of alternative electricity generation and increase its market share.		Implement cooperation with local universities. Mongolian universities and their students can gain hands on experience in energy production from the large scale PV Power Plant. Thereby, the project can play a significant role in the training and employment process in Mongolia.	Enhancement	Reporting on the outcomes	Continuous	Project Operator	

ESMP for Decommissioning Phase		
Environmental Attribute	Potential Impact	Management Action and Compensation Measures
Landscape and Visual	The decommissioning activities are likely to create a visual intrusion and a disruption to aesthetics including materials lay down, excavation, backfilling and spoil.	Refer to the respective mitigation and monitoring measures listed in "ESMP for Construction Phase".
Soil	Soil erosion and pollution may be caused due to human activity within the framework of decommissioning works of the Solar PV power plant and utilization of heavy machinery and other technical equipment.	Refer to the respective mitigation and monitoring measures listed in "ESMP for Construction Phase".
Water and Waste Water Management	Improper Management of Water and Wastewater.	Refer to the respective mitigation and monitoring measures listed in "ESMP for Construction Phase".
Flora	Decommissioning activities could disturb and harm existing flora.	Refer to the respective mitigation and monitoring measures listed in "ESMP for Construction Phase".
Fauna	Decommissioning activities could disturb and harm existing fauna.	Refer to the respective mitigation and monitoring measures listed in "ESMP for Construction Phase".
Air Quality	Decommissioning works may affect the amount of dust in the air and pollute the environment.	Refer to the respective mitigation and monitoring measures listed in "ESMP for Construction Phase".
Noise	Several noise generating activities during the decommissioning such as earthworks, haulage activities, excavation and installation of PV panels will have an impact on the noise level around the project area and heavy machinery with possible noise emissions will be used.	Refer to the respective mitigation and monitoring measures listed in "ESMP for Construction Phase".
Infrastructure	Increased amounts of traffic during decommissioning can have an impact on the existing infrastructure, especially the road network and local traffic.	Refer to the respective mitigation and monitoring measures listed in "ESMP for Construction Phase".
Occupational Health and Safety	There could be additional risks arising for workers health and safety during decommissioning due to improper material, maintenance of machines, training and so on.	Refer to the respective mitigation and monitoring measures listed in "ESMP for Construction Phase".

7.4 Environmental Monitoring Program /2014-2018

The exploration sites are located in Dornogovi province of Mongolia. For every exploration license, an environmental monitoring program is put in place to keep track of the impacts on the environment in the area where exploration is being carried out. Each program is reviewed and approved by the Mongolian Government and so far exploration activities have had no impact requiring corrective action, such as:

7.4.1 Air environment pollution - code-J0

7.4.1.1 Monitoring performance
In the atmosphere of CO2, CH4, SO2, O2, NO2, H2S, unsaturated hydrocarbon, pollution

7.4.1.2 Monitoring analysis type
Air sampling and analysis

7.4.1.3 Places
Wind domination in the direction from the lower area

7.4.1.4 Monitoring period, chart
2 times per year, 3rd and 4th quarter

7.4.1.5 Methodology:
UST17.2.3.16-80 "Urban air quality control procedures UST3384-82" and "General Requirements for atmospheric sampling"

7.4.1.6 Equipment
Central Environment Research Laboratory in Ulaanbaatar

7.4.1.7 Performance records and reports:
Monitoring and registration forms prepared by the competent authorities, the permissible size comparison

7.4.1.8 Data collection and reporting process:
Annual II in the 15th inspection agencies and local administrative bodies in the environmental see work report delivered by.

7.4.2 Soil pollution code-S0

7.4.2.1 Monitoring performance:
Soil chemical properties

7.4.2.2 Monitoring type
Soil sampling and analysis

7.4.2.3 Location:
From outside the fence in the direction of the prevailing wind

7.4.2.4 The period for analysis
Monitoring time of 2 times a year by agreement between the competent authorities, 3rd and 4th quarter

7.4.2.5 Methodology
Determination of sanitary evaluation of soil pollution in urban areas, instructions

7.4.2.6 Equipment and machinery
Central Environment Research Laboratory in Ulaanbaatar and other authorized soil analysis laboratories

7.4.2.7 Performance records and reports
Test results issued by the competent authorities submit the form, the permissible size comparison

7.4.2.8 Data collection and reporting process:
Annual II in the 15th inspection agencies and local administrative bodies in the environmental see work report delivered by.

7.4.3 Groundwater pollution-code-J1 analyzes

7.4.3.1 Monitoring Rating:
Drinking water standards

7.4.3.2 The types of monitoring:
Chemical analysis of deep water

7.4.3.3 Location:

Water from groundwater wells

7.4.3.4 Monitoring period
2 times per year, 3rd and 4th quarter

7.4.3.5 Methodology
"UST3534-83" Water sampling methods, conforming to the standards and methods of chemical analysis

7.4.3.6 Equipment

Authorized chemical analysis laboratories

7.4.3.7 Performance records and reports
Test results issued by the competent authorities submit the form,with permissible size comparison

7.4.4 Environmental Monitoring Annual Plan

The amount of the annual plans of monitoring of environmental protection and related annual cost of environmental protection plans to work with the monitoring of staff costs, travel expenses and their respective object to the cost of the travel and necessary costs of sampling and sample delivery cost, the cost of the laboratory analysis consists thereof.

Environmental monitoring work is accomplished in the table below which reflects the yearly plan.

No.	**Name and type of works**	**Measuring unit**	**Work load/volume**	**Cost per unit, in thousand MNT**	**Total cost, in thousand MNT**
1	Cost for experts and advisers	Person/day	1/2 3 times	15.0	30x 3 = 90.0
2	Per diem cost	Person/day	1/2	10.0	20.0
3	Transportation costs	- vehicle	2 3 times	15.0	30.0 x 3 = 90.0
4	Measuring and sampling costs	Amount	1 1 1	- water 3.0 - soil 5.0 - air 10.0	3.0 5.0 10.0

5	Cost for laboratory analysis	Amount	1 1 1	- water 20.0 - soil 15.0 - air 35.0	20.0 15.0 35.0
Total sum					288.0

Table7-8 Environmental Monitoring Yearly Plan

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Appendix 1 Conceptual Area Layout

Appendix 2 Time Schedule

Appendix 3 Typical Monitoring System Block Diagram

Appendix 4 Overview Single Line Diagram