Батлав. БОАЖЯ-ны Ерөнхий шинжээч

Г.НЯМДАВАА

Шүүмж хийсэн: БОАЖЯ-ны шинжээч

Б.МӨНХТУЯА

"САТУ" ХХК

САЛХИТЫН САЛХИН ЦАХИЛГААН СТАНЦЫН БАЙГАЛЬ ОРЧНЫ НӨЛӨӨЛЛИЙН НАРИЙВЧИЛСАН ҮНЭЛГЭЭНИЙ НЭМЭЛТ ТОДОТГОЛЫН ТАЙЛАН

Төсөл хэрэгжүүлэгч: "КЛИН ЭНЕРЖИ" ХХК

Нарийвчилсан үнэлгээ хийсэн:

"САТУ" ХХК –ийн захирал

/Р.Туваансүрэн/

Тайланг зөвшөөрсөн:

"КЛИН ЭНЕРЖИ" ХХК-ийн гүйцэтгэх захирал

/Ц.Сүхбаатар/

Улаанбаатар хот

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"CLEAN ENERGY " LLC

SUPPLEMENTARY REPORT OF SALKHIT WIND FARM'S DETAILED ENVIRONMENTAL IMPACT ASSESSMENT

2018

Ulaanbaatar

APPROVED:

GENEREL EXPERT OF MNET

/G.NYAMDAVAA/

Reviewed by:

Expert of MNET

/B.MONKHTUYA/

"SATU" LLC

SUPPLEMENTARY REPORT OF SALKHIT WIND FARM'S DETAILED ENVIRONMENTAL IMPACT ASSESSMENT

Project implementor: "CLEAN ENERGY" LLC

Prepared by: SATU LLC

Director **G.TUVAANSUREN**

Submited: "CLEAN ENERGY"LLC

Executive director

Ts.SUKHBAATAR

Ulaanbaatar 2018

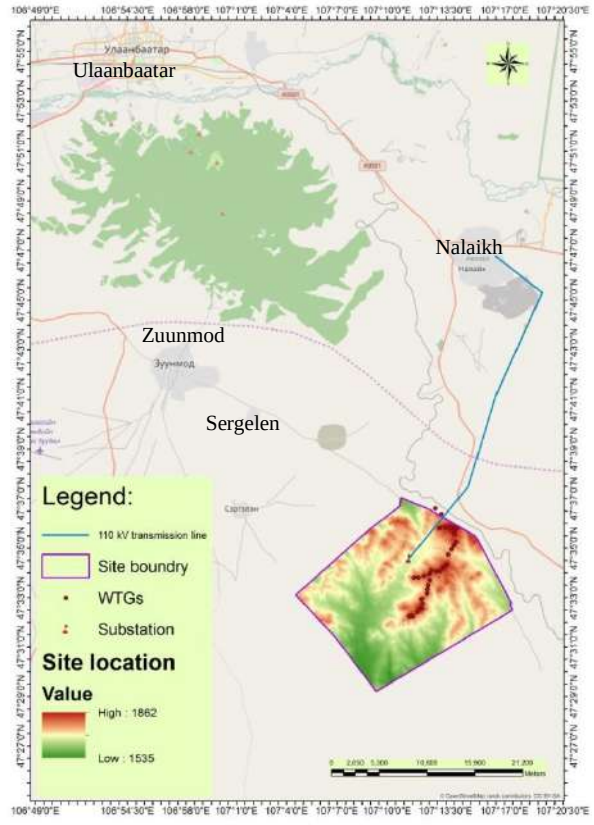
NON-TECHNICAL SUMMARY OF SUPPLEMENTARY ENVIRONMENTAL IMPACT ASSESSMENT OF "SALKHIT" WIND FARM

Introduction

To implement the 50 MW wind farm project, Newcom Group, GE Pacific Private Limited, European Bank for Reconstruction and Development, and The Netherlands Development Finance Corporation jointly invested 120 million USD, and this plant will produce annually 168.5 kWh/year.

The wind farm annually produces clean power which is equivalent of 100 thousand households' power consumption, cuts greenhouse gas emission, emitted from thermal power production, by 180,000 tons; and, annually, it reduces coal burning by 122 thousand tons and saves 1.6 million tons of fresh water. The wind farm brought technological advancement in the energy sector of Mongolia.

The wind farm is at 70 km southeast from Ulaanbaatar city, in the territory of the Sergelen soum, Tov aimag.



Wind farm location in Sergelen soum

Project Background

The wind farm construction was completed from 2011 to 2013 and was opened in June, 2013. The wind farm will produce electricity for approximately 25 years.

Clean energy LLC employs engineers, technicians and assistants, totaling 34; and some employees work in shifts. In other words, at any given time there are up to ten employees at the wind farm.

31 pieces of GE 1.6-82.5xle model wind turbine generators (WTG) with each capable of 1.6 MW (in total 50 MW) were installed.

Main equipment of the wind farm consist of WTG which generates electricity, transformer which transfers electrical energy, gas insulated switchgear, automatic control system, and power and data transmission cables under various facilities; in addition, it includes a 100 kV overhead lines.

To produce power wind farms does not require raw materials. Only utilizes kinetic energy of the air movement.

The wind farm will not use water for technology and services.

In 2016-2017, the wind farm produced 138,777,754-157,538,385 kw*h/y energy and supplied 136,070,748-153,892,200 kw*h/y to the heat transmission network.

Impact analysis

Environmental impact assessment has been conducted prior to construction of Salkhit's wind farm. To define a current condition comparison of previous study and assessment reports has been conducted, as changes in the environmental baseline occurred due to power plant construction. The changes in the environmental baseline due to construction of plant can be seen as impact result and residual impact on the environment.

To conduct clarification analysis of impact assessment, we set goals to idendify and evaluate operation impacts based on findings of environmental changes after wind farm construction.

Appraoch and methodlogy

Supplemental clarification of Environmental assessment was conducted based on professional expertise of consultants, participating parties, studies, assessment reports, satellite image, and research materials on the internet.

Furthermore, this report is based on the assessment implementation sheet given to general environmental impact assessment /screening/ provided by Ministry of Environment and Tourism.

Evaluation of Significance of the project environmental and social impact during operational phase is evaluated by supplemental clarification of detailed environmental impact assessment.

Environmental impacts

As for wind farm, greenhouse gas emission is reduced by 180,000 tons by making use of natural inexhaustible resource such as wind power to produce above mentioned amount of electricity. This wind farm within 25 years of its operation will reduce greenhouse gas emission by 4.5 million tons. This wind farm's effect can be considered as a contribution to mitigation of region, national, as well as global warming. Because this impact is not direct (D), positive (P), and moderate magnitude (M); project implementation duration is longterm (L); impact is certain (H); and this effect's positive impact is irreversible (IR) and constant (H), because it isn't high capacity wind farm.

Therefore, produced energy amount is assessed as fully positive, significant impact (Sp) on climate change mitigation.

The positive impact in reduction of air pollution is evaluted as significant (Sp).

Potential negative noise impact can be mitigated. Therefore, noise impact is evaluted as insignificant (Ns). Eventhough noise is below permissible level, it can increase because of equipment malfunction. Monitoring should be conducted to prevent potential adverse impacts.

No surface water is used in project operation. Therefore, there is no impact (0) on surface water regime, reservoir change and surface water pollution during Salkhit's wind farm operation.

It is considered that positive impact (P) on water resouces in the region (L) is indirect (ID), impact magnitude is high (H), long term (L), certain (H). Moreover, impact is irreversible (IR), and impact probability is high (H). Thus, this project is evaluted to have a significalt posivite impact (Sp) on the underground water.

The condition of soil is assessed to eventually reverse (R) to its native state due to revegetation to the damaged soil of the wind farm construction phase. In other words, project residual impacts are in limited area, and it will reverse to normal condition; there is no significant impact created to the local biodiversity.

Therefore, "significance evalution" of project impact occurrence is assessed as insignificant (Ns) considering that the soil residual impacts, during project construction phase, are restoring by vegetation based on current soil.

Wind farm facilities do not disrupt beauty and appearance of the nature (0) based on above information and people's opinion.

During plant operation, formation of additional base soil deformation/base soil damage which is foundation of WTG's, transformers and other facilities/ is possible with a low occurrence probability (L) and in terms of this negative impact /N/ it is assessed and concluded as significant /Sn/.

It is concluded the plant, saving a 3 million tons of coal to produce energy over 25 years, will have considerably positive significant /Sp/ impact.

Given the current baseline of vegetation, the residual project impact will not have dwindling effect on future pasture and "important significance" report of project impact on vegetation is evaluted to have no important significance /Ns/, as vegetation is recovering due to restoration on utilized land.

The impact of once built and running wind farm's facility to animal habitat as a whole concluded as "Insignificance".

Social impact

Medical service provided for wind farm's few employees would increase medical service which will not cause load on the operations of health organization.

Even if there is a low probability /L/ of potential risk occurrence to regular employee safety, getting involved in accident is evaluted as a significant negative impact /Sn/.

Due to risks associated with population health, the impact is evaluted as having a negative significance /Sn/.

The amount of toxic substance leakage can be kept low and measures can be taken to mitigate negative impact. Therefore, negative impact is evaluted as insignificant /Ns/.

It is possible not to impact on local residents mentality /Ns/.

Wind farm will create positive impact /Ns/ by contributing to national and local budget income.

Supplying stable energy increases energy capacity in the local area, due to stabilized supply, manufacturing and service organization florishes and it creates favourable conditions to increase new manufacturing and services; and this is the main contribution /Ns/ to local development in the long term.

Main usage of the land by the residents basically haven't changed, thus it can be seen that plant does not affect negatively /0/ on their livelihood.

If the protection procedure and regime are followed, project activity may not adversely affect (0) the national and local protected areas.

The land ownership conflict is created locally /L/, directly /D/ and negatively /N/, and it is medium-term /M/. Since this conflict can be solved it has been concluded that this project had less significant impact /Ns/ to the land use.

It can be regarded that there is no impending obstacle (0) to conducting pastoral cattle breeding.

During the project operation, power will be produced in a way that has positive effect to the global warming, and it does not release toxic waste, which is an evidence that the project impact is positively significant (Sp).

Risk assessment

This wind farm's risk assessment is conducted using "Risk assessment procedure for hazardous and dangerous chemical substances" approved by the joint order 28/40/29 of Environment and Tourism Minister, Minister of Health, and the director of National Emergency Management Agency dated February 3, 2009, and "Methods of environmental impact assessment" and "Failure Modes, Effects & Criticality Analysis" approved by the order 11 of January 10, 2014 of the Minister of Environment and Green Development.

When considering the potential accident risk level of wind power station by the areas with potential risks of production system, it is evident that vehicle usage and operation, power distribution facilities and wind farm may affect human health and life, their risks level is considered unacceptable and that mitigative options need to be developed by special professionals, and that actions with an aggressive schedule to mitigate risks to a tolerable level as a minimum need to be implemented. Furthermore, natural disaster /lightning, earthquake/ occurrence is the main factor that magnifies the risks.

Also, wind power station affects ecology slightly negatively, thus it is seen that risk to the ecology is slight from the station.

You should consider that the risks to the vehicles of wind power station, power distribution facilities and wind farm may disturb the station operation and damage property and that natural disasters such as lightning and earthquakes create conditions for risk occurrence that damages property.

Environmental Mitigation

During conducting additional clarification of wind farm EIA, Change in project site environmental baseline, current baseline study and potential project negative impact on environment, society, human health are determined, assessed then concluded to provide recommendations for project proponent by relevant field experts.

Environmental management plan

Environmental management plan for wind farm is based on following data and information: guideline of the environmental impact assessment /2nd attachment of No. 374 th order of Government, 2013, developing environmental management plan, review and approval, presenting guideline /Attachment of No. A-05th order of the Minister of Environment and greend development, 6th of January 2014/, field study of the project area, and additional clarification of EIA.

Environmental monitoring program

It is necessary to conduct observations, analysis, measurements and monitoring at regular intervals at the certain baseline environmental dimension in order to discover negative environmental impacts during wind farm operation and environmental changes, and to mitigate and eliminate these impacts and changes. Based on these, during operation, it is necessary to evaluate the changes in environmental components and impacts (its size and scope) occurring on nature, and further measures needs to be planned and implemented in detail.

Organization of This Report

The remainder of this report is organized as follows:

Chapter 1 describes environmental law and regulations.

Chapter 2 describes project capacity, equipment, technology, production volume, natural resource usage, material volume, and waste.

Chapter 3 describes project impact analysis result.

Chapter 4 describes project alternative comparisons.

Chapter 5 provides recommendations on prevention, reduction, elimination and avoidance of the project adverse impacts.

In the environmental management plan for the project, environmental and social measures are planned to be implemented in 2017-2021. Measures to be implemented are specified in the environmental monitoring program in 2017-2021.

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Foreword

In 2008 Black & Veatch Co. and in 2012 Sunny trade LLC has conducted detailed environmental impact assessment for Salkhit's wind farm. Wind farm construction project has been completed and started producing electricity in June, 2013.

In total of 120 million dollar investment has been made by Newcom group, General electric pacific Co., European Bank for Reconstruction and Development and Netherlands Development Finance Corporation for wind farm construction.

The wind farm's installed capacity is 50MW and equipped with 31 pieces of GE 1.6-82.5xle series wind electricity generators, voltage raising transformer, gas insulated switchgear, automated control system. Also there are underground power and data transfer cable networks and 110KV overhead power transmission line.

The wind farm is situated in the vicinity of Tov aimak's Sergelen soum's Salkhit mountain on 12910.9 hectares of licensed land which is 70 km from Ulaanbaatar.

In November 2016 "SATU" LLC's staffs visited the site and conducted environmental baseline change, current condition. In 2017 we have completed supplementary clarification work on Power plant's detailed enviromental impact assessment based on conclusion of the general enviromental assessment /screening/ which is released by the Ministry of Enviroment and Tourism.

The project is enviromentally friendly and had a positive significance to mitigate climate change by supplying 168.5 million kWh electricity, preventing 180000 tn carbon dioxide emission, saving 122000 tn coal and 1.6 million tn water annually.

Enviromental management plan and measures to mitigate and eliminate potential negative environmental impacts has been developed based on the supplementary clarification assessment.

This report has 6 chapters, … page, 67 figures, 18 tables.

Hydrologist, engineer geologist, Mongolian state honored teacher, Sc.D, professor Batsukh N., botanist M.Sc Tungalag R., zoologist, Ph.D Batsaikhan N., soil scientist, Ph.D Batbayar D., meteorologist Ph.D Namkhaijantsan G., "SATU" LLC director, Ph.D Tuvaansuren G., asssessment specialists M.Sc Ganchimeg Kh, and M.Sc Delgermaa T, specialist Davaanyam T., Gerelt-Od T., these professionals, scientists and researchers of our company has been involved to conduct the enviromental baseline study and impact assessment work.

This supplementary clarification will act as an main document for conducting enviromental protection plan and activities over the next 5 years from power plant side. The supplementary clarification work is based on the prior enviromental study and assessment materials, it should be noted that prior metarials will not be invalidated but will stay as a basis for implemetning future enviromental protection plan.

We express our deepest gratitude for assisting us to successfully complete this job to Amar A., and Tumurbaatar Kh., who are professionals at "Clean energy" LLC.

CHAPTER 1. ENVIRONMENTAL LAW AND REGULATIONS

Issues regarding project environmental law and regulations has been mentioned in the previous environment/social impact assessment reports therefore only revised "Environmetal impact assessment law" since 2012 will be stated.

According to revision of this law in environmental impact assessment:

- Environmental strategy assessment
- Environmental baseline assessment
- Environmental impact assessment
- Cummulative impact assessment

covers as stated.

According to law Environmental baseline assessment and environmental impact assessment needs to be conducted on the new project.

Environmental impact assessment:

- General environmental impact assessment/screening
- Detailed environmental impact assessment

consists from.

Project proponent must have the environmental baseline assessment conducted by authorized entity/organization according to law.

Afterwards request central environmental state administrative organization to conduct general environmental impact assessment. Assessment expert conducts general environmental impact assessment within working 14 days and produces following conclusion.

The domestic entity authorized by the main guideline of general assessment will conduct detailed environmental impact assessment.

Utilizing result of detailed environmental impact assessment, accredited entity will develop environmental management plan.

Comments and notes of regional administration and local public conferences on the project will be included in this work.

Project proponents are responsible for the cost of conducting detailed environmental impact assessment.

Environmental management plan is the integral part of the detailed environmental impact assessment.

Environmental management plan consists of environmental protection plan and environmental monitoring program.

Within 18 working days expert will conduct assessment analysis and provide conclusion on received detailed environmental impact assessment and will decide whether to implement the project based on conclusion of professional council.

Organization which conducted environmental impact assessment will receive that year's environmental management plan implementation report from the project proponent within a month of december and will approve the scope of the next year's plan and its required implementation expense.

For the purpose of implementing above law proceeding revised methodologies and procedures are in effect. Here:

- Environmental impact assessment methodology /2nd attachment of No. A-11 order of the Minister of Environment and green development, 10th of January 2014 /
- Regulation on the environmental impact assessment /2nd attachment of No. 374 th order of Government, 2013/
- Regulation on developing environmental management plan, review and approval, presenting /Attachment of No. A-05th order of the Minister of Environment and greend development, 6th of January 2014/
- Regulation on providing public involvement in the environmental impact assessment /Attachment of No. A-03rd order of the Minister of Environment and greend development, 6th of January 2014//

CHAPTER 2. BRIEF PROJECT DESCRIPTION

2.1 Project name, category, number

"Wind farm" project, its additional clarification of environmental impact assessment.

Pursuant to the Mongolian Law on Environmental Impact Assessment, this aforementioned project is categorized in the "Infrastructure Development Project".

2.2 Project proponent

- "Clean Energy" LLC, Registration number 2851741. 801, 8th floor Naiman Zovkhis Building, Seoul Street 21, Ulaanbaatar, Mongolia, Phone: 976-75951331, 70111331, Fax: 976-70111341, Email: contact@cleanenergy.mn, Web: www.cleanenergy.mn

2.3 Address of project proponent

Ulaanbaatar city, Sukhbaatar district, Seoul St-21, Naiman Zovkhis building, 8th floor, #801, phone: 976-75951331, 70111331, fax: 976-70111341, e-mail: contact@cleanenergy.mn

2.4 Project objective

Main project objectives are to ensure reliable operation of centralized power system by developing renewable energy which is prioritized by the Mongolian Government and to meet the rising electricity demand of central region by using wind energy resource which has little to no impact on environment.

2.5 Project scope

This project, which increases production of renewable energy, while producing energy, covers integrated stable developmental policy framework which includes environment protection, economy and community development, thus, closely associates with current green development policy. Presently, the percentage of renewable energy has just reached only 4.52 % of total energy consumption of our country. 50 MW wind farm of Salkhit ensures power supply reliability of the central region, and it plays a role in reducing greenhouse gas emissions.

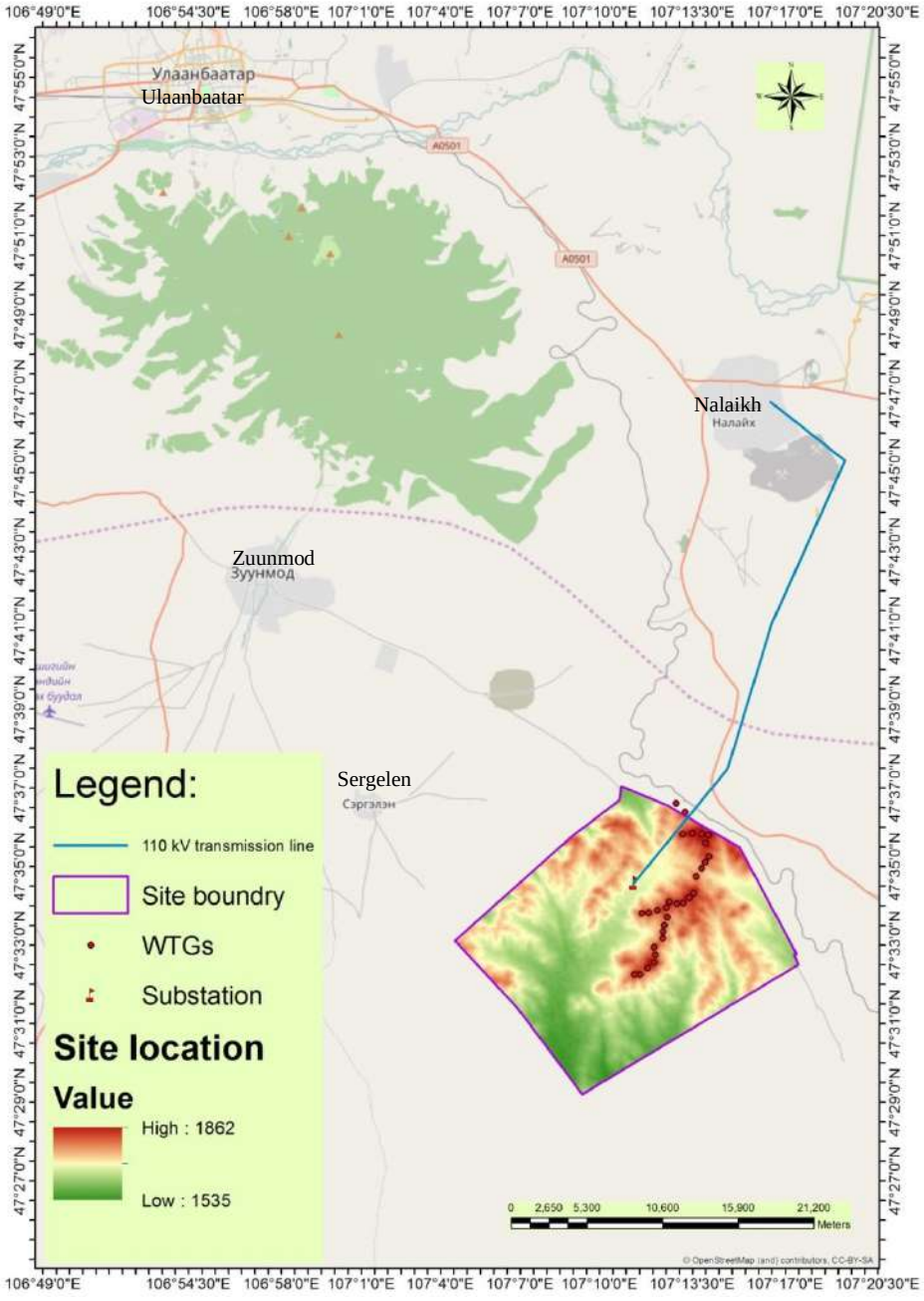
To implement the 50 MW wind farm project, Newcom Group, GE Pacific Private Limited, European Bank for Reconstruction and Development, and The Netherlands Development Finance Corporation jointly invested 120 million USD, and this plant will produce annually 168.5 million kWh/year.

By constructing 50 MW wind farm, the load of thermal power plant in the central energy system will decrease by certain amount; therefore, power source supply in the system will increase. Nowadays during peak load period, the wind farm decreases excessive load of thermal power plant in the central energy system by certain degree.

The wind farm annually produces clean power which is equivalent of 100 thousand households' power consumption, cuts greenhouse gas emission, emitted from thermal power production, by 180,000 tons; and, annually, it reduces coal burning by 122 thousand tons and saves 1.6 million tons of fresh water. The wind farm brought technological advancement in the energy sector of Mongolia.

2.6 Project location

The wind farm is at 70 km southeast from Ulaanbaatar city in the territory of the Sergelen soum, Tov aimag. To get to the wind farm, take a highway Ulaanbaatar to Zamiin-Uud, take an exit to Zuunmod highway and drive for 5.5 km, exit south to unpaved road and drive for 15 km to reach destination.



Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 2.1 Wind farm location in Sergelen Soum

The closest wind turbine generators (WTG) are located at 750 meters away from Ulaanbaatar - Zamiin-Uud railroad, and the WTGs are located from east to west across the Salkhit Mountain top. Substation is situated on the right of the WTGs within 1.7-4.2 km, and there is a 28 km long 110 kV overhead power line from this substation to Nalaikh substation. Permitted area of

the wind farm is 12,910.9 ha (according to Governor's order No 1/387, 28 Aug of 2009, Tov aimag).

Table 2.1 Wind farm coordinates

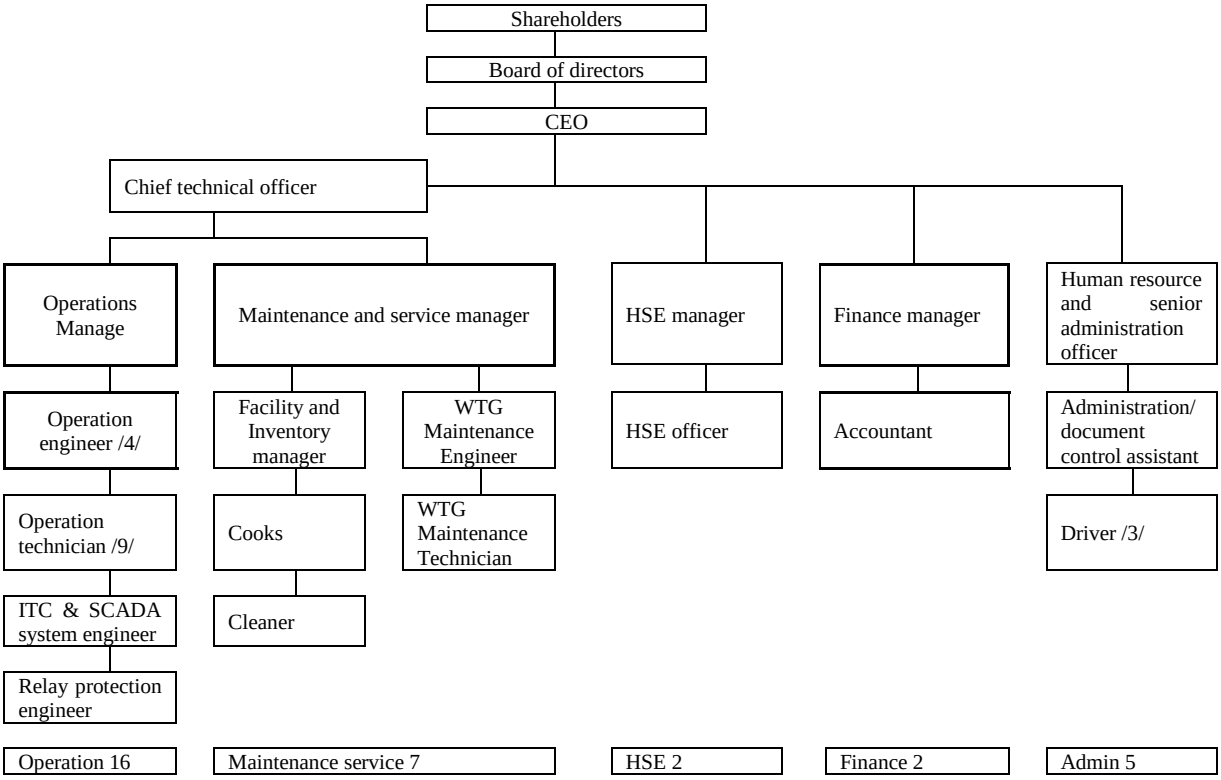
№	Longitude	Latitude
1	662394	5261508
2	659214	5265489
3	656163	5268589
4	661484	5273594
5	663769	5275429
6	663831	5276076
7	666055	5275230
8	669513	5273367
9	672344	5268415

2.7 Project duration

The wind farm construction was completed from 2011 to 2013 and was opened in June, 2013. The wind farm will produce electricity for approximately 25 years.

2.8 Workforce

Clean energy LLC employs engineers, technicians and assistants, totaling 34; and some employees work in shifts. In other words, at any given time at the wind farm there are up to ten employees.



Source: Clean Energy LLC, 2016

Figure 2.2 Organization Chart of Clean Energy LLC

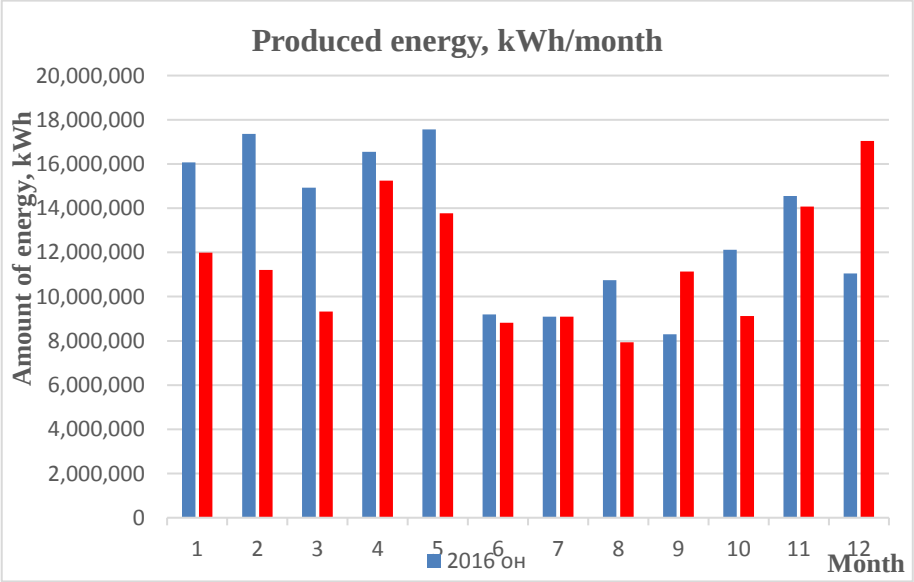
2.9 Project capacity

31 pieces of GE 1.6-82.5xle model wind turbine generators (WTG) with each capable of 1.6 MW (in total 50 MW) was installed. The wind farm was established based on the fact that the site's average wind speed is 8.2 m/s and it is possible to produce 50 MW. To implement this wind farm project, 120 million USD was invested. 50 MW wind farm project capacity's some indicators are shown in the following table.

Table 2.2 Wind farm production indicators

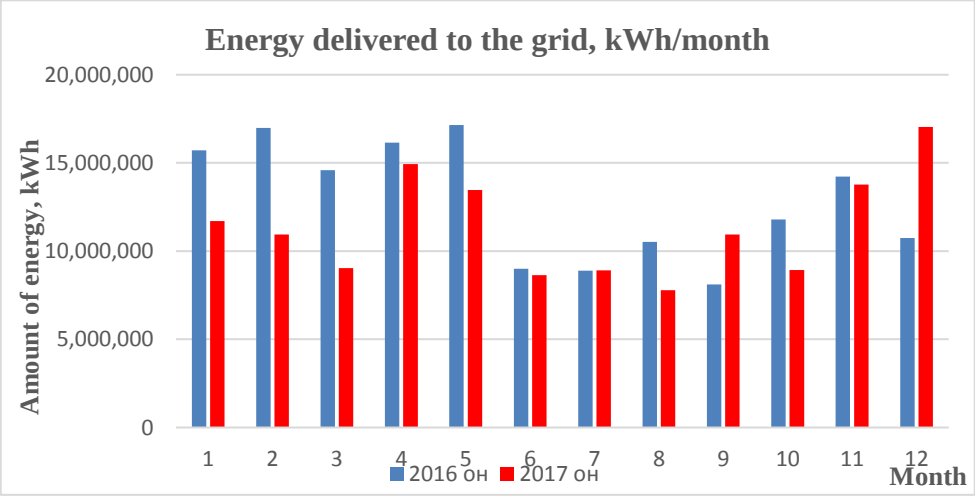
Wind farm project indicator	Units	2016	2017
1. Project capacity (MW)	**MW**	50	50
2. Annually produced energy	kW h/year	157,538,385	138,777,754
3. Energy delivered to the grid	kW h/year	153,892,200	136,070,748

Source: Clean Energy LLC, 2018



Source: Clean Energy, 2018

Figure 2.3 Energy produced (monthly)



Source: Clean energy LLC, 2018

Figure 2.4 Energy deliverd to the grid, kW h/month

Wind farm provides 4-5 % of integrated energy network of central region and 100,000 households' annual needs.

WTGs' electric power is transformed in the substation near control building of the wind farm and distributed to the central region's substation via overhead lines.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 2.5 Control building, substation of the wind farm

2.10 Project equipment

Main equipment of the wind farm consist of WTG which generates electricity, transformer which transfers electrical energy, gas insulated switchgear, automatic control system, and power and data transmission cables under various facilities; in addition, it includes a 100kV overhead lines. The following table shows the main and auxiliary equipment.

Table 2.1. Main and auxiliary equipment list

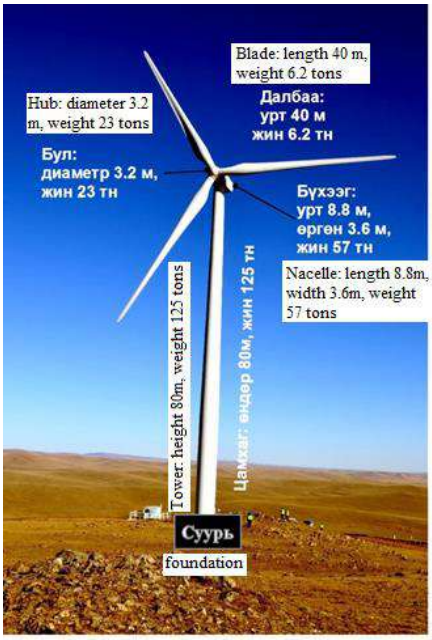
№	Equipment name	Units	Capacity	Amount
1	110 kV overhead line/dual stranded/	km		28
2	110 kV Gas insulated switchgear			1
3	110/35 kV 50 mva transformer	mva	50	2
4	110 kV Neutral point switch			2
5	35 kV Vacuum breaker			14
6	35 kV Sectional dry switch			1
7	110 kV transformer			2
8	35 kV transformer			2
9	35/0.4 kV internal usage transformer	kVa	800	2
10	35 kV stabilizer	MVar	8	2
11	35 kV arc dissipating coil			2
12	35/0.69 kV kiosk transformer	kVA	600	31
13	Cable	kV	35	27
14	Wind turbine	MW	1.6	31
15	SEL relay			42
16	Diesel generator			1
17	Lightning rod			5
18	Portal	kV	110	2
19	Accumulator battery	kV	2	108
20	Grounding facility			1
21	UPS power battery	kV		36
22	Substation Scada			1
23	Wind Scada system			1
24	Straightener			2

Source: Clean energy LLC, 2016

Wind turbine generator. WTG's tower is 80 m tall, blade is 40 m long, total weight is 211.2 ton. Main material of blade is foam. Each blade has angle adjuster (Pitch motor), there is a monitoring device/special power supply source for excess load. With the help of angle adjuster, it is possible to reduce speed of a rotor. The WTG starts up, when the wind speed reaches 3.5 m /s and above; and it generate electricity at full capacity when the wind speed reaches 12.5-25 m/s and blade rotates 9-18 cycles per minute. At the wind speed 25 m/s and above, blade rotation automatically stops. Generally, WTG withstands top wind speed of 77.2 m/s. It's normal operating temperature ranges from -40°C … to +50°C.

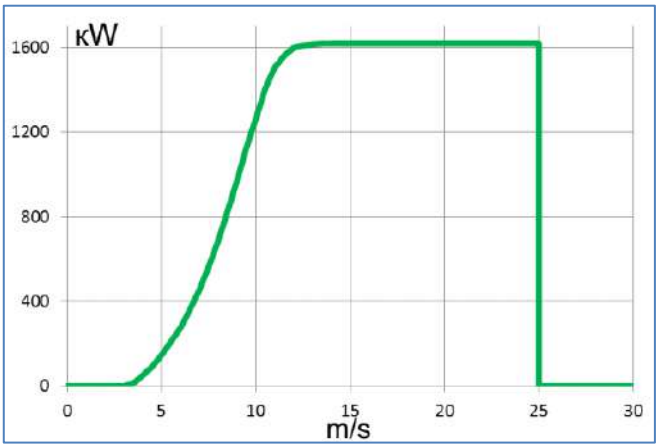
The hub is fixed on the rotor shaft which drives the generator directly or through a gearbox. Main shaft bearing is attached to support bearing housing. The pitch bearing is attacked to the pitch motor. With the help of this pitch motor, it is possible to change blade angle. The bearings inside the gearbox are shaped as cylinder, round and wedge. These bearings provide ratio/proportion to the inner shafts and manage radial and axis load.

The WTG has a double-feed induction generator, and this generator is assembled and fixed onto the foundation, in order to reduce vibration and noise transmission.



Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 2.6 Wind turbine generator



Source: Clean Energy LLC, 2016

Figure 2.7 Capacity curve of the model CE1.6-82.5 WTG

1.6sle model generator's gearbox provide more rotation momentum than previous generation gearboxes, and also it was updated in order to provide high bearing. Power transformer consists of transformer, positioned next to the rotor, DC intermediate circuit and inverter.

Using 1.6xle generator, the yaw system orients the rotor in the general direction of the wind with assistance of wind vane, located on nacelle, which measures wind direction. Brake operates when the controller reads high wind speed. Brakes start working when strong wind is read by control panel. Furthermore, mechanical brakes are also used as an auxiliary brake for the aerodynamic blade, which is placed on the high-speed reading of the gearbox. Brake can be used during repair and maintenance services.

Single WTG foundation used 260 m^3 of concrete mix and 50 tons of rebar, was insulated and protected from water and moisture, and then was covered with soil and rammed down.

Source: Clean Energy LLC, 2016

Figure 2.8 Foundation of wind turbine generator

The inverters that changes alternating current (AC) to direct current (DC) and DC to AC are installed inside the WTG tower, and also 35/0.69 kV amplifying transformer are installed outside the tower.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 2.9 Inverter inside the tower

Figure 2.10 35/0.69 kV amplifying transformer outside the tower

WTGs, bundled into four separate groups, are connected to the substation by 35 kV underground cables. Cable total length is 27 km. And, data transmission fiber optic cables are installed in the cable canal of the wind farm.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 2.11 Cable installing process

Figure 2.12 After cable installation

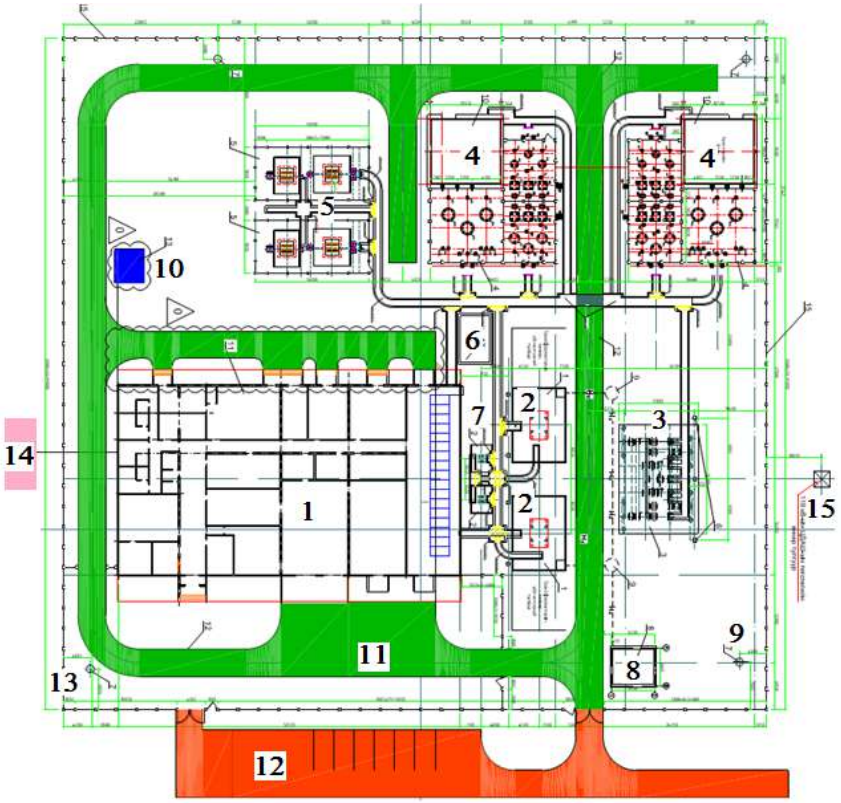
15 km improved unpaved road connects WTGs. Three separate roads from substation connect to the WTGs improved unpaved road. Each WTG has a parking space.

Substation. Wind farm ensured operational stability by installing necessary equipments for stabilizing incoming 35kV of voltage from the wind farm to sub-station, for dissipating emitted electric-arcs, for reducing voltage for domestic energy usage in the control building. Receiving 35kV of voltage in the substation raised through 110/35kV 50MVA transformer and supplied to 110kV lines via gas insulated switchgear.

Control building. Wind farm's control station is built with light and high heat retaining capability "Thermoblock". The station has a high efficiency electric heating system.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 2.13Wind farm's control building



Source: Clean Energy LLC, 2016

Figure 2.14 Substation blue print

1-Control building, 2 -110/35 kV transformer, 3- 100kV gas insulated switchgear, 4- 35kV voltage stabilizer, 5-kV electric arc dissipating coil, 6- diesel generator, 7- 35/0.4 kV domestic usage transformer, 8- oil safety well /BAK/, 9- lighthing rod, 10- drilled well, 11- asphalt-concrete road space, 12 – parking space, 13- fence, 14- cleaning facility, 15- 100kV beginnig of overhead electric transmission line.

Substation equipments are shown in the below figure.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 2.15 35kV voltage stabilizer

Figure 2.16 35kV electric arc dissipating coil

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 2.17 35/0.4Kv domestic usage transformer

Figure 2.18 Diesel generator

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 2.19 110/35 kV 50MVA - Transformer /from the front and left side, 2 pieces/

Gas insulated switchgear. Gas insulated switchgear(GIS) is the newly introduced technology in the Mongolian energy sector. The switchgear takes less space, highly reliable, with low maintenance cost and have a long lifetime. The facility is environmentally friendly since it doesn't use insulating oil. Sulfur hexafluoride (SF6) gas has minimal environmental impact as it is world piloting new eco-efficient gas mixture.


Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 2.20 110kV gas insulated switchgear from the right and front side


Source: Assessment team of supplementary clarification of DEIA, 2016

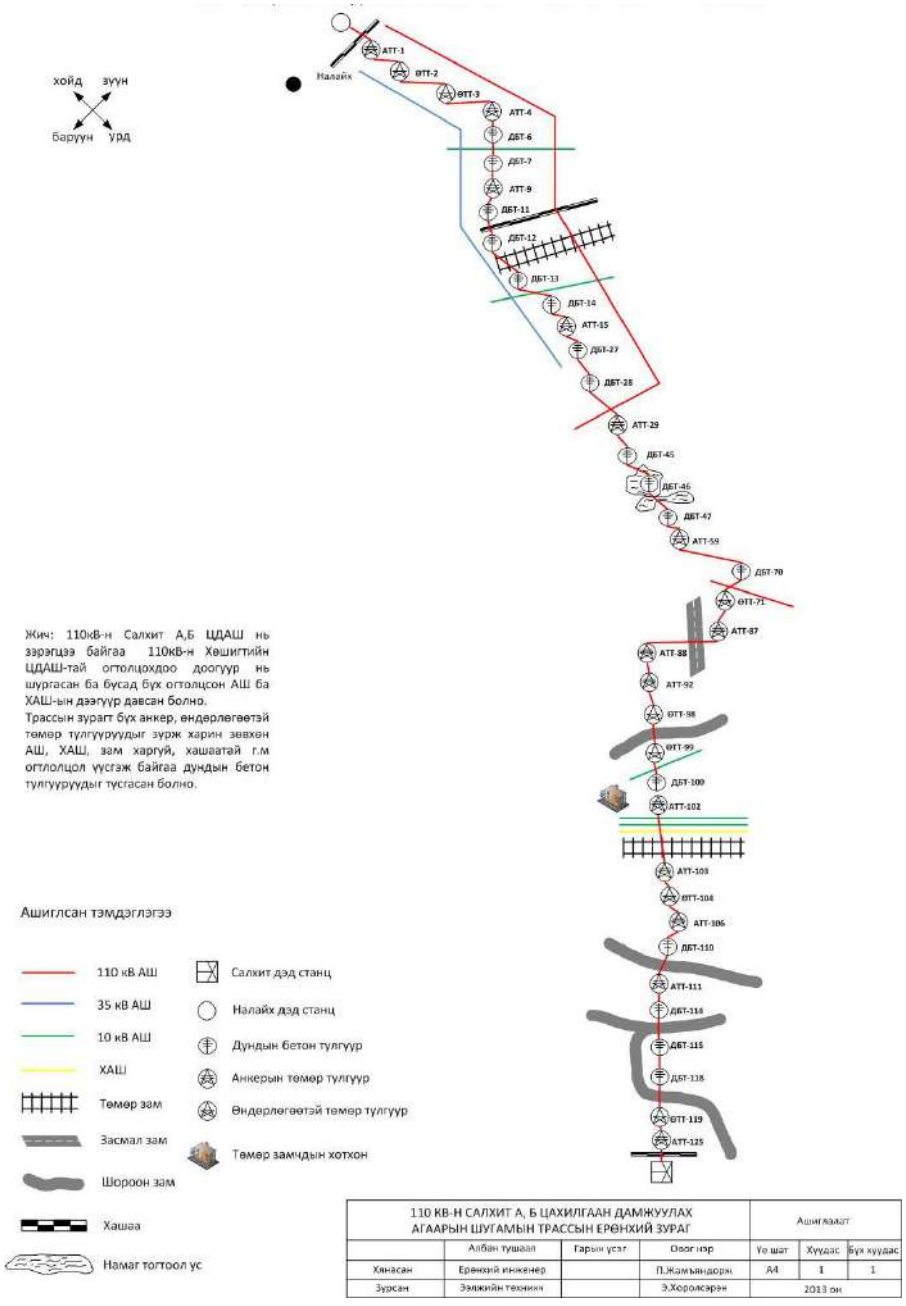
Figure 2.21 110kV double circuit overhead transmission line has been built to Nalaikh's substation from the gas insulated switchgear.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 2.22 lightning rod next to substation

Figure 2.23 Automatic weather station

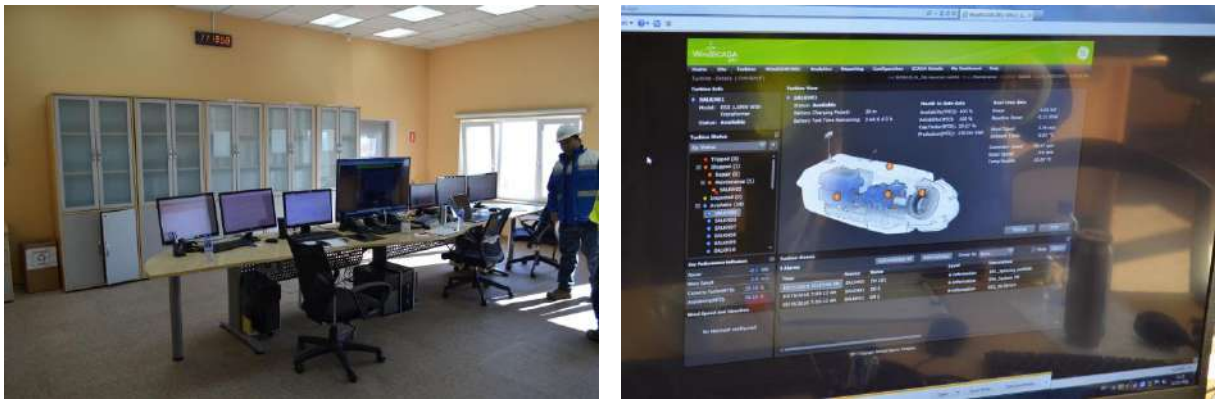
5 pieces of lightning rod with grounding facility have been installed and assembled next to substation. We conducted wind research and obtained results with 50 m tall 5 automatic weather stations since 2004.



Source: Clean Energy LLC, 2016

Figure 2.24 Figure of 110kV overhead transmission line trace

Electronic control system of wind farm. There are 2 SCADA systems to control wind turbines and substation's equipments remotely, which are Wind-SCADA and Substation-SCADA respectively.



Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 2.25 Control system is run by rapid operation employees.

Communication. Beside fiber optic cable connection to internet, the station is equipped with Mobicom Co.'s mobile commucation station.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 2.26 Mobicom's station

2.11 Technology of wind farm

Wind farm is employing 31 pieces of WTG model-XLE.6*82.5 from General Electroc Co. to produce electricity.

WTG starts operating at wind speed of 3.5 m/s and from 12.5 m/s and above it will work at full capacity moreover at wind speed exceeding 25 m/s operation automatically stops. When WGT's blade revolves 9-18 times a minute transforming mechanical energy to electrical energy which produces 690V voltage of alternating current from generators.

Produced 690V of voltage reaches WTG control distribution board.

690V of alternating current produced from the WGT's blade revolution converted to direct current via inverter equipment later filtering from direct to alternating current that voltage transmitted through WGT power distribution board and cable is to be given on the low side of 690V/35kV transfomer, positioned outside WGT, and its amplified to 35000v while passing through the transformer.

Total of 31 WTGs, bundled in 4 groups as 1-7, 8-15, 16-23, 24-31, are connected to substation with 35kV underground cable.

Total of 17 cells are feed by the 35kV voltage coming on the 1st and 2nd section of the substation's 35kV closed distribution facility.

35kV of voltage coming from the WTG's 4 bundle, transmitted through №1,2 input of 35kV of the 1st and 2nd sections, is connected to low side of the main 50mVA transformer and amplified to 110kV. The voltage is transmitted through 110kV gas insulated switchgear and fed to Nalaikh's substation, Central region's integrated power system, at 28km distance via 110kV double circuit overhead transmission line.

Operational objectives are to utilize full capacity and maintain reliability of equipments. In order to provide continuous, effective and reliable operating condition during wind farm's lifetime is to perform technical inspection and services at regular basis.

By preliminary inspection/service to perform exterior examination of equipments to check operational functionality,if necessary take measures to replace certain parts.

To provide availability of spare parts, material and tools for technical service in order to assure continuous operational readiness and safety necessary technical service

Inspection and operation during the lifetime of the wind farm should be done according to repair instruction.

Wind farm's operational cost is low comparatively to other energy sources. Although wind farm has reliable operation and low operational cost it is necessary to perform full techincal services according to schedule in order to maintain normal reliable operation.

Mandatory technical inspection, services and appropriate activites during the lifetime of wind farm are included as follows:

- Monitoring all wind farm activities ensuring normal operation
- Ensuring wind farm's normal operation, regular inspection and services to be provided
- Preliminary inspections should be conducted, damages to be repaired and reduce incurred loss according to schedule.
- Daily/monthly production specification data (production, damage and malfunction analysis) of the wind farm to be compiled and saved in a cyber form to be assessed and concluded whether station operating normally
- According, preliminary inspection, repairing damages and mitigating incurred loss, schedule to calculate cost of necessary spare parts, work force and transportation and kept ready
- Damages and malfunctions of the wind farm to be informed immediately
- The wind farm to have 24 hour security
- To insure wind farm, wind farm's main equipment's damage and other risk should be covered by insurance according to standard procedure
- To insure and obtain certificate for the vehicles used for wind farm operation
- To update regularly accounting register and administration documents.

2.12 Basic raw materials and chemicals

To produce power wind farms does not require raw materials. Only utilizes kinetic energy of the air movement.

Natural resource exploitation. The power is produced by exploiting wind which is infinite natural resource. For example: The average wind speed of 8.2 m/s in the vicinity of Salkhit mountain in Tov aimak's Sergelen soums's will be used to generate power. Wind farm with 50 MW capacity will produce 168 million kWh electricity annually.

Water usage. Wind farm technology will not use water for repair and services. Drinking water is transported from Nalaikh. Water from the well next to substation will be used for housefold usage. Well is equipped with water meter.


Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 2.27 Well equipments

Table 2.3 Volume of water used from the well, м^3

Month	1	2	3	4	5	6	7	8	9	10	11	12	Year
2015	65	69	41	41	94	93	76	47	48	60	68	46	748
2016	46	46	43	87	90	107	65	107	105	75	98		869
2017	30	60	63	49	43	88	133	97	68	112	65	51	859

Source: Clean Energy LLC, 2016

From the table above, household water usage is calculated as 2.0-2.6 м^3 a day.

Wind farms's WTGs and other equipments use oil and lubricants. Those items delivered by order.

2.13 Energy demand

Wind farm's supplies its own domestic energy necessity from its own energy production. For example: in 2015, 152,553,180 kWh is used for domestic necessity which is 1.56 percentage or 3,540,625 kWh of produced energy. During cold season heating for wind farm's control building is provided electricity.

2.14 Output

In 2016-2017, 138,777,754-157,538,385 kW h/year energy produced, and 136,070,748-153,892,200 kW h/year is supplied in the energy transmission grid. Ammount of supplied monthly energy and annual production to the central region's integrated energy grid is shown in the below table.

Table 2.4 Energy production and supply in 2016-2017, kWh/monthly

Mont	1	2	3	4	5	6	7	8	9	10	11	12	Year
Energy produced													
2016	16,079,917	17,367,932	14,924,819	16,547,188	17,561,057	9,198,114	9,098,874	10,751,592	8,291,759	12,115,857	14,558,310	11,042,966	**157,538,385**
2017	11,990,811	11,214,095	9,323,405	15,252,719	13,771,211	8,820,632	9,087,454	7,937,536	11,136,596	9,124,337	14,076,768	17,042,190	**138,777,754**
Supplied energy to Central region's integrated power grid													
2016	15,721,992	16,984,770	14,593,260	16,149,012	17,153,466	9,008,406	8,883,138	10,518,354	8,113,446	11,802,384	14,225,046	10,738,926	**153,892,200**
2017	11,700,744	10,949,136	9,028,866	14,926,296	13,459,512	8,645,340	8,905,116	7,777,506	10,944,054	8,920,890	13,771,098	17,042,190	**136,070,748**

Source: Clean Energy LLC, 2018

2.15 Key economic indicators

Wind farms economic indicators are shown by the final result of the year 2015 and displayed in the table below.

Table 2.6. Key economic indicators

№	Indicators	Ammount (thousand.tugrik)
1.	Investment	
	a. Assets	159,955.306.40
	б. Current assets	125,258,792.10
2.	Production cost	32,696,514.30
3	Total environmental protection cost	13,618,925.90
4	Land rent	81,128.41
5	Total revenue	14,813.71
6	Net profit	39,560,078.30

Source: Clean Energy LLC, 2016

2.16 Various waste and its treatment, recycling and disposal methods.

Solid waste. Solid and organic waste emitted from wind farm's industrial maintenance and control building is sorted out then deposited in purpose built plastic container. According to contract made with Nalaikh's landscaping and services company, waste is disposed twice a month.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 2.28 Solid waste storing containers

Oil from equipment and rotating mechanism is replaced on scheduled time; and waste oil is temporally stored in special containers and sold to the market. For example in 2016, 1 ton waste oil from WTG was transported to Altan Orshikh Group LLC's Akhui Mandal oil refinery, located in Bagakhangai district, according to contract.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 2.29 Waste storing containers for lubricanting oil materials

It has become possible to pour accidentally leaked lubricating oil into underground 40 m^3 drainage BAK, located under transformer base, to prevent substation transformer lubricating oil leaking into the soil.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 2.30 Underground reinforced concrete oil BAK (for safety)

CHAPTER 3. ENVIRONMENTAL BASELINE CHANGE, CURRENT CONDITION

Environmental impact assessment has been conducted prior to construction of Salkhit's wind farm. To define a current condition comparison of previous study and assessment reports has been conducted, as changes in the environmental baseline occurred due to power plant construction. The changes in the environmental baseline due to construction of plant can be seen as impact result and residual impact on the environment.

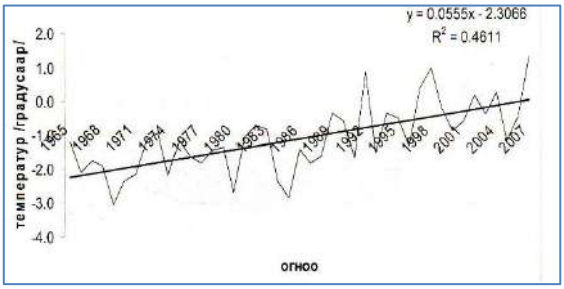
In October 2016, specialist team of "SATU" LLC has conducted related site study on project area and basing on this study, supplemental clarification research/assessment work based on the related research conducted by the on the area. To define the changes in the environmental baseline the relative information of buildings stationed on the plant, previously conducted environmental impact assessment reports[1,2] and environmental monitoring information[3] produced for the plant has been utilized.

3.1 Climate

It is seen as unreasonable to run production process in accord with climate change, considering on previous detailed environmental impact assessment report is used only multi-year averages of the key climate indicators. Therefore, the effort is made to define the past and future climate change.

Past climate change. Mongolia's climate conditions has a extreme characteristics, and climate change is distinguishable by a daytime/night-time, day, month, season, year. Climate change stays within a scope of main rule despite high fluctuations. Climate conditions varies year to year. Any production and service activities are run in accord with this kind of climate conditions.

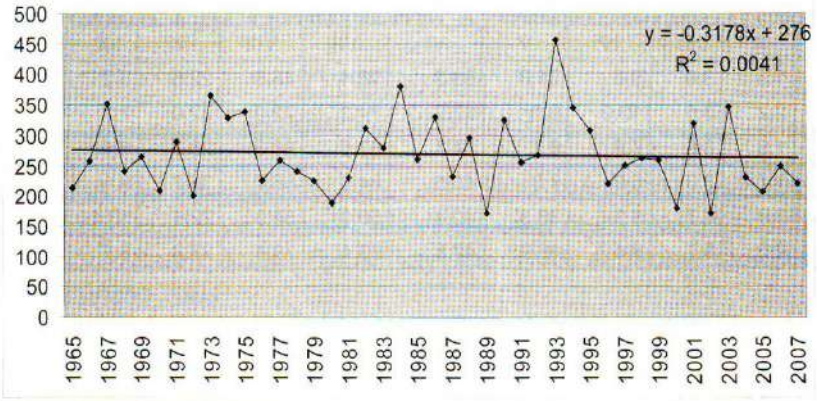
It has been observed for over many years that there is a tendency for change in basic weather and climate conditions due to global warming. For example the annual average atmospheric temperature has risen 2.3 degrees between the year of 1965-2007[4]. Depending on the yearly distinction the total amount of precipitation ranged between 171.5-380.7 mm, however the amount of precipitation per year has fallen with definite interval /Figure 3.1, 3.2/.



Source: Oyuntsetseg, O., 2008

[1] Report of Environmental Impact Assessment of the Wind Farm (Sany trade LLC, 2012)
[2] Environmental and Social Impact Assessment of the Salkhit uul Wind Park (Black & Veatch Special Projects Corp, 2008)
[3] Environmental monitoring study of "Salkhit" Wind Farm. 2016
[4] Oyuntsetseg, O. 2008, Distribution and Change of Precipitation in Vicinty of Zuunmod. Workshop Proceeding on Climate Resources and its Change of Western Region of Mongolia. UB., 56-64

Figure 3.1 Annual average temperature progress of the Zuunmod city vicinity /1965-2007/



Source: Oyuntsetseg, O., 2008

Figure 3.2 Annual total precipitation trend of Zuunmod city vicinity /1965-2007/

Although the above change in temperature appears over long time, the sudden changes of weather are relevant to it, particularly frequency and intensity of weather phenomena are changing significantly. For example: Due to global warming, the number of hot days increased by 16-25 days, number of cold days increased by 13-14 days[1].

In addition, directly affecting regions by the changes in earth's atmospheric flow is experiencing catastrophic weather phenomena that never occurred there before. For example: During the 2nd ten days of November 2016, catastrophic weather phenomena took a place in the north region of the country as a warm air flow pushing to arctic ocean caused cold air flow to intrude into Mongolian territory resulting in heavy snow fall, snowstorm and greatly rising wind speed[2].

Therefore, it becomes necessary to run a production process in a way to be less affected as possible from above conditions. It happens when any production process utilizes weather, climate information constantly.

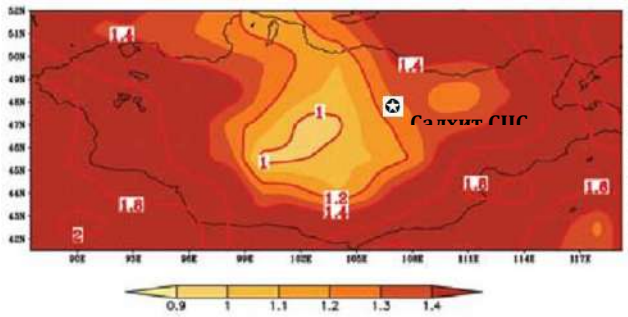
Future trend of climate change. Initially the wind farm will operate for over 20 years. This shows, it is necessary to include future trend of a climate change in the strategic planning of business activity.

Research results of the future trend in climate change /until year of 2030/ has been taken into consideration below, as the past climate change trend continues to future[3].

As demonstrated on the research results, the region project taking place will get warmer by 1.2-1.3 ºC in winter and by by 1.2-1.3 ºC in summer until year of 2030.

[1] MARCC 2009 MONGOLIA: Assessment Report on Climate Change 2009
[2] http://www.tsag-agaar.gov.mn

[3] MARCC 2009 MONGOLIA: Assessment Report on Climate Change 2009



Source: MARCC 2009 Mongolia

Figure 3.3 Winter air temperature change, ºC

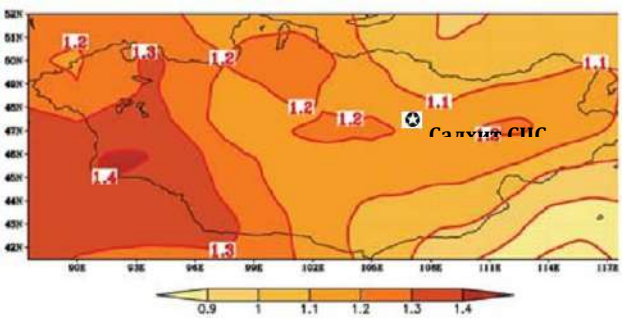
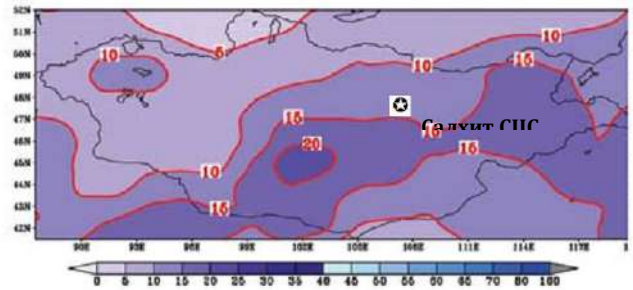


Figure 3.4 Summer air temperature change, ºC

Over the region of project implementation, precipitation may increase 10-15% during the winter, but it is expected to be in the current amount during the summer season.



Source: MARCC 2009 Mongolia

Figure 3.5 Winter precipitation change, %

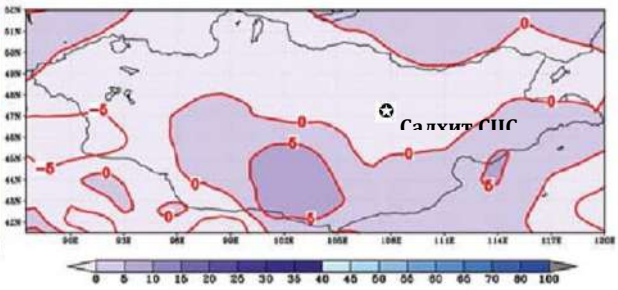


Figure 3.6 Summer precipitation change, %

Above study demonstrates that due to climate change, it is anticipated that winter will become milder and have more precipitation than the current level, meanwhile summer will get hotter and drier than ever in the project implementation area.

3.2 Air quality

In term of project location it is distant from settlement, thus no air pollution gets in the project site. As it is a rural area, the environment tends to be free of air pollution.

The sources of air pollution in the vicinity of the project's main facilities, WTG's, control building and sub-station, are unpaved road leading to plant, unpaved road between those facilities, the unimproved track passing by the 10th WGT and the vehicles using those roads. The air in the vicinity is getting polluted by the dust rising from uncovered road surface, the dust and toxic gases from vehicles on the road nonetheless, even its insignificant. Small concentration and frequency of these pollutants have a minimal polluting impact on ambient air.

According to air quality monitoring survey[1] conducted on May 2016 on 7th, 22nd WTG and control building site had a 4-8 μg/m^3 of fine particulate matter /$PM_{2.5}$/ with small concentrate, 5-67 μg/m^3 of large particulate matter or total of 12-20 μg/m^3 measurable substance concentrate which is within a scope of air quality standard (MNS4585:2007). The low concentration of

[1] Salkhit wind farm environmental monitoring survey, 2016

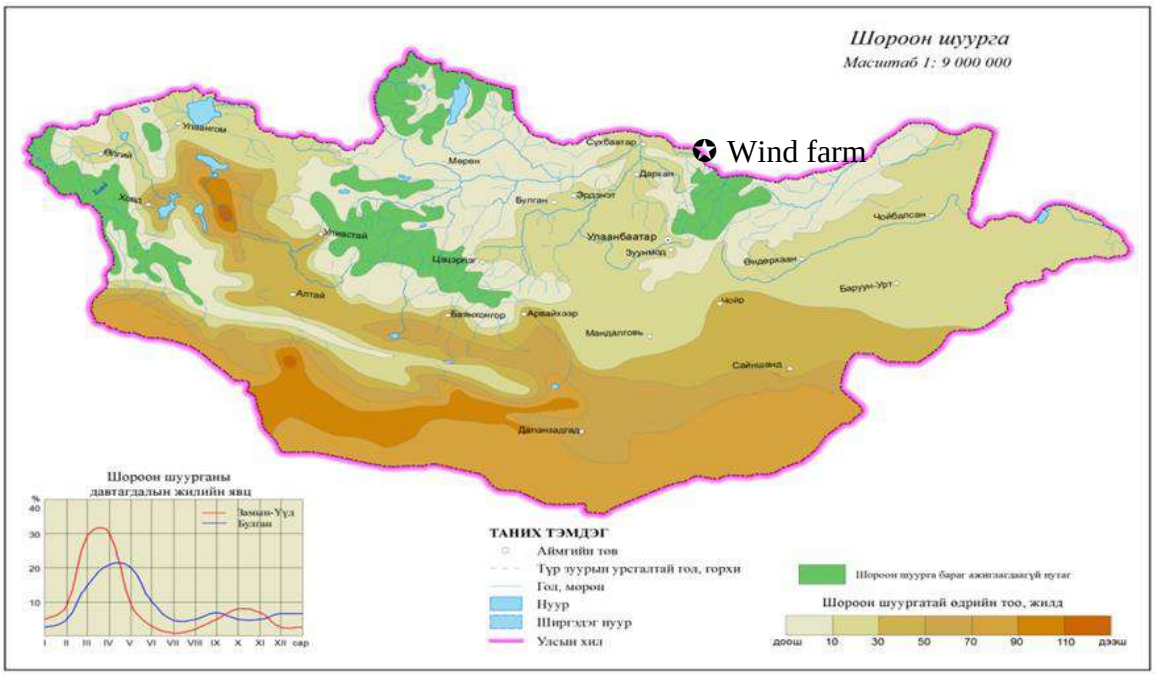
small and large particulate matter /$PM_{2.5}$, PM_{10}/ and total dust concentration demonstrates that air in the project site is normal level.

The above indicators measured next to 10th WGT, which is unpaved road crossing through the project site, had a higher concentration than standard MNS4585:2007. The small and large particulate measurements along the project site crossing unpaved road are exceeding standards due to constant use by the vehicles of "Monkhiin bayangal" LLC's cement factory, and this indictates there is a medium degree of pollution. In addition, emission and dispersion of those pollutant contained in the exhaust smoke of vehicles will remain along the road. Along this road amount of pollutant concentration and dispersion can be minor within the limited area, as the traffic concentration is low.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 3.7 Vehicles passing 7th WGT by unpaved road

In last few years throughout this region the frequency of dust storm occurrence during spring months has risen and the amount of dust particles and particulates in the air rises drastically when annually there are 10-30 days of occurence on average annually[1].



Source: National Atlas of Mongolia, 2009

Figure 3.8 Number of days with dust storm in a year

[1] Institute of Meteorology and Hydrology, 2010

It can be seen that above factors having major influence on air pollution are non project related, but effects regional transportation road and dust storm.

3.3 Noise

The high level of noise is a harmful physical impact to human health and considered one of the indicating physical ambient air quality pollutant. The noise is produced as the frequency and amplitide of a sound increases, even though there are sound with wide range of frequencies in the natural environment.

In terms of project implementation location it is a rural steppe, therefore there wont be any perceptible sound except the ocassional sound of birds, the noise of coming and going vehicles to wind farm, the noise of passing vehicles through the site and noise of grazing lifestocks. No sound could be heard from a railway and A0101 highway UB-Zamin-Uud at a distance of 1.3-4 km away from the vicinity of a power plant control building with regular staff.

However, noise is created near some facilities of the wind farm, namely WTGs and transformers, and noise is reduced further away from them. During our field study, noise level around the WTG was 52-60 dBA, and it was 52-58 dBA around the transformers. Furthermore, in 2016 according to Clean Energy LLC's monitoring measurement[1], the noise equivelant level next to WTG number 7, 10, and 22, during 07:00-23:00, was approximately 37-55 dBA, in particular at distance of 50m – 34-42 dBA, 100m – 40-42 dBA, 200m – 41-45 dBA, 200m – 41-45 dBA, 500m – 18-30 dBA. These values are below the acceptable limit standtard of the Air Qualilty, Technological General Requirement MNS 4585:2007.

The recipients of noise impact of the wind farm field are employees and herders. There are few herders that settle regularly near the WTGs, for example, herder households of Battsukh and Chuluuntsetseg. These 2 households' winter and spring quarters are located at 2-4 km from the WTGs. Apart from these two, during summer and fall seasons, 3-4 herder households migrate to the surrounding field in order to utilize the pastures. In summer and fall season, herders build their yurts at 700 m from the WTGs; they even can build further away depending on surface features; the safe area from the WTGs are at 500 m and further. Therefore, this shows that they potentially avoid the noise impact of the WTGs.

Moreover, there is no noise impact for the residents of railroad station/crossroad, located 600 meters from WTGs. As for WTGs noise, it is in compliance with regulation standard set by Environment Health Safety (HSE) of International Financial Corporation[2] which was stated in previous Detailed Environmental Impact Assessment.

3.4 Surface water

There are no perennial streams or permanent surface water bodies in the vicinity of the project site. A small spring is located at 150 meters southwest from the wind farm control center.

[1] Clean Energy LLC's monitoring measurement, 2016

[2] Black and Veach Environmental and Social Impact Assessment of the Salkhit uul Wind Park, Mongolia, 2008

According to people's oral report, it has been gushing slowly for the last 2 years. This spring did not any create definite watercourses; it was not possible to take a water sample for testing, because livestock has stepped on and defecated on the oozing part of the spring. Spring yield cannot be measured, no watercourse was not created. Water spreads over a distance of 30 meters. Spate forms in winter. Sprint does not have a protection.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 3.9 Spring near control building

Other ephemeral flowing springs will not be affected by project impact because of sufficient distance, thus their assessment does not need to be done.

Wind farm main facilities is located over hill tops, hence, they do not affect surface water. Wind farm other facilities did not change natural water system.

3.5 Groundwater

During project building construction, 2 wells were drilled to use groundwater. Well yield is 1.5-1.0 l/s. Presently, production well is prepared to be transferred community. On the other hand, control center's well is being pumped for only everyday usage.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 3.10 Well located southwest off control building

In particular, daily water usage of control center is minor, averaging 2.0-2.6 m^3. Drinking water is transported from Nalaikh district. Therefore, groundwater reserve possibly has not changed. Well water test came out as fresh and clean and somewhat hard water[1].

[1] "Salkhit" wind farm environmental monitoring study, 2016

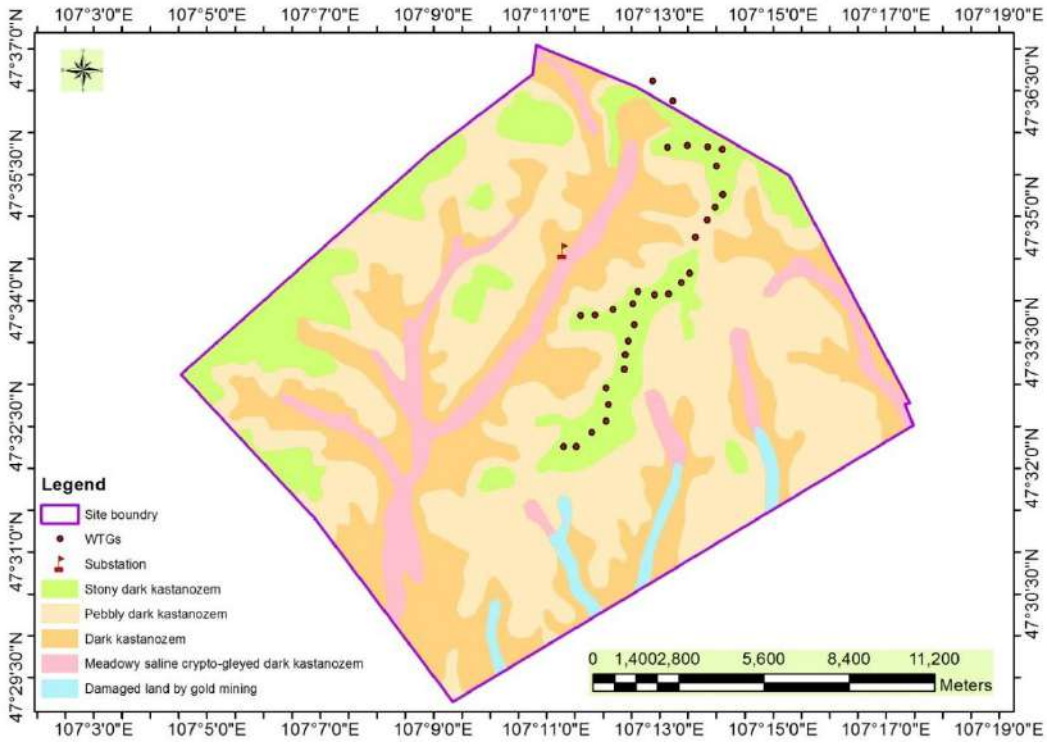
Water treatment facility with technology treating water seep to bedrock is built underground. In order to test whether the water from this treatment facility polluting the groundwater, a sample from a spring, located not far from the treatment facility, can be tested. As it was stated before, there are no definite spring bed formed and it was not possible to take a water sample for testing, because livestock has stepped on and defecated on the oozing part of the spring.

3.6 Soils

Soils cover condition. Researchers, who conducted ESIA and environmental monitoring of the wind farm, determined that dark soil is dominant in the soil based on soil profile recording, soil sample, and physical chemical analysis.

However, they did not make a soil mapping of the lisenced wind farm site.

Therefore, we used 1:100000 scale topographic map and Google-earth map to develop an outline soil map in conjunction with soil distribution concave convex elevation, soil layers condition, surface slope, bedrock depth, soil water, vegetation separated by soil feature types as rocky, pebbly, normal, meadowy, and some major soil humus layers were divided by thin, medium, and thick. This map is useful for future soil study and monitoring project.



Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 3.11 Soil map

Moreover, damaged soil from gold mining, located southern part of licensed area, is marked on this map.

Concise description of physic-chemical features of soil is provided by noting morphological structure characteristics of dominant soil, from above-mentioned soil types, and based on laboratory soil sample analysis results collected by previous researchers.

Stony dark kastanozem. This soil spreads across northeast of the project site the tops in vicinity of the Mt. Tsagduult (1882.1 m) where WTGs are located; and it extends from here to southwest of the Mt. Salkhitai (1873.3 m) with many WTGs and spreads through watershed along some rocky outcrop hilltops.

In this mountainous area, noteworthy soil to be mentioned is chernozem gravelle which is located behind the slopes of the Mt. Tsagduult, where WTG number 3,4,5,6 are situated and where one or two birches and many calligonums were grown; and this area is most suitable environment for wildlife.

Stony dark kastanozem spreads from the mountain (above sea level 1808.0 meters), located near project site's northern edge, to the mountain (above sea level 1786.3 meters), located southwestern edge of the site, and it spreads across western edge of the site's watershed and their neighboring hilltops alongside the straight slope side.

This soil's bed rock is exposed here and there on the surface; because it spreads across mountain ridge eluvial clastic and over pebbly moraine, thus, total soil profile is stony, thin, does not exceed 8-12 cm, and humus accumulation A layer is less developed. Generally, this underdeveloped rocky soil in most cases spreads creating combination between thin humus layer and stony dark kastanozem.

This main physic-chemical characteristics of sample analysis particle makeup of soil in vicinity of Mt. Tsagduult at elevation of 1871 m, 1826 m (sample 12-01, 12-02) and in vicinity of Mt. Salkhit at elevation of 1842 m (sample KEM-03) is silt loam, and the soil top layer mechanical particle is prevailed by sand (39.6-57.2%) and followed by dust section (30.7-48.3%).

Humus content of this top soil layer is relatively uniform (4.07-5.49%), where carbonate was not discovered and it did not contain easily soluble, therefore, salt soil reaction environment changes from neutral to weak in alkalinity (pH 6.47-7.45). Chemical elements of fertile top layer, which are beneficial to plants, such as mobile phosphorus (1.5-2.2 mg/100g) and mobile potassium (22-25 mg/100g), are assessed few in this this stony soil spreading along the ridge, and so this soil layer is rich with stones and the mechanical particles are dominated by sand fraction.

Pebbly dark kastanozem. This soil extends around the hilltops in vicinity of Mt. Tsagduult and along hilltop ridge slopes of consecutive watersheds with rocky exposures of Mt. Salkhit. Furthermore, other watersheds with stony dark kastanozem in the lisenced site and slopes of neighboring hilltops have pebbly dark kastanozem.

Table 3.1 Soil's main physic-chemical characteristics indicators.

Sample number	Depth, cm	Mechanical particles. % (particle size, mm)			Humus %	CaCO3 %	$EC_{2.5}$ дS/m	pH (H20)	Mobile mg/100g	
		Sand (2-0.05)	Dust (0-05-0-002)	Clay (<0.002)					P_2O_5	K_2O
Stony dark kastanozem										
12-01	0 - 8	39.6	48-3	12.1	5.06	0.0	0.141	6.63	2.2	25 1

КЭМ-03	0-15	57-2	30-7	12.1	5.49	0.4	0.108	7.45	5.0	46 1
	15-30	55-7	29-3	15.0	3.96	0.0	0.074	7.27	4.0	39 1
12-02	0 - 8	51-3	38-0	10.6	4.07	0.0	0.127	6.47	1.5	77
	8- 60	49-9	38-0	12.1	3.50	0.0	0.163	6.92	1.6	17
Pebbly dark kastanozem soil										
КЭМ-02	0-10	52-8	32-2	15.0	1.78	7.3	0.134	7.56	1.9	18 1
КЭМ-04	0-5	61-6	29-3	9.2	4.10		0.041	7.61	4.2	42 1
	5 -20	57-2	29-3	13.6	7.18	0.0	0.070	7.41	5.1	49 1
	20 -30	58-6	30-7	10.6	2.40	4.2	0.095	7.61	2.5	23 1
КЭМ-01	0-12	58-6	29-3	12.1	4.86	1.8	0.109	7.93	4.9	52 1
	12-30	60-1	29-3	10.6	3.07	0.4	0.182	7.66	3.2	30
Dark kastanozem										
12-03	A 0-27	39-6	48-3	12.1	4.17	0.0	0.045	6.63	1.7	12 1
	AB27-65	42-5	46-8	10.6	2.18	0.0	0.038	7.87	1.3	9 1
	Вк 27- 65	44-0	43-9	12.1	0.47	11.2	0.340	8.30	0.2	-
КЭМ-05	0-6	52-8	33.7		8.57	0.0	0.050	6.97	5.2	50 1

Source: Environmental monitoring study of "Salkhit" wind farm, 2016. Detailed environmental impact assessment of "Salkhit" wind farm project, 2012.

Pebbly dark kastanozem is divided into thin and moderately thick humus layered soil in relation to slope spread; considering that it is hard to differentiate each one in entire site size thus it is shown as one in soil topography because pebble content of humus layer is not distributed uniformly in their deluvial and deluvial-proluvial sediment emergence depth.

Since pebbly thin humus layered dark kastanozem borders above mentioned stony dark kastanozem and stabilizes around and on top parts of hills, so, in terms of morphological structure, it contains fragments and various pebbles in large quantity (30-40%) with thin humus accumulation layer (A=14-19 cm), beneath it not so thick carbonate layer is found unevenly and in most cases it is padded with eluvia-deluvial deposits rich in weathered broken fragment.

Moderately thick humus layered pebbly dark kastanozem. This soil even out until from upper part of slope to lower middle part of slope of a hill spread with thin humus layered pebbly dark kastanozem. As for soil morphological structure, layer A is more think than thin humus layered soil, pebble content is always less which does not exceed 20-30%.

Dark kastanozem. This soil is found in mountain passes of surrounding hillsides of "Uvur shar huviin" valley.

Looking into our soil utilization survey, previous study team's morphological structural description (КЭМ-01, КЭМ-04, КЭМ-02), this soil indicates the characteristics of moderately pebbly dark kastanozem. For instance, the soil in vicinity of wind farm control center generally has light loam texture but mechanical texture is dominated by sand (52.8-61.6%). Humus accumulation, which is 4.10% in virgin soil's upper layer, is decreased until 1.78% in places where soil is eroded because of temporary housing, yurt office situated during process of construction. Therefore, in relation to decline in humus of fertile soil layer, decreased indicators of simple mobile nutrient elements which used for plant can be seen in the table 3.1.

Main indicator of this soil erosion is soil degradation; due to land leveling, carbonate horizon (7.3%) is exposed. This situation is detected at control point (КЭМ- 01) of soil restoration process where concrete batch plant was located. The surface area of soil is largely fossilized because surface of these areas is leveled for technical rehabilitation.

Meadowy saline crypto-gleyed dark kastanozem. Meadowy dark kastanozem stabilize around concave foot of mountain slopes of "Uvur shar huv" valley and from endings of linear depression and ravine, which are facing from high to low part of valley, to hollow areas where environmental water supply is abundant from occasional flow of rainwater. Thus, due to humidity condition, humus layer is ashy dark brown in color, and it has kept main morphological characteristics of meadow soil where ochre spots/veins are found in bottom layer. The numerical value of humus content of this soil is more than the typical dark kastanozem. Within dispersion of meadow dark kastanozem in the "Uvur shar huv" valley hollow part, slightly saline soil spreads in some uneven damp areas (south of the control center of the wind farm and vicinity around well located northeast of control center) where predominant vegation is sedge.

The soil analysis results are written by using ESA and environmental monitoring study of the wind farm in table 3.1 (Soil's main physic-chemical characteristics indicators) of this additional clarification.

In terms of location, soil profile cut and sampling points (12-03, КЭМ-05) both are on lower part of back slope, slightly different in elevation levels, as for numerical indicator of texture composition, it is same silty loam; it is appropriate to call the soil as moderately think dark kastanozem in EIA; the humus content, primary characteristics of soil analysis, is in compliance with numerical value (4.17 %) of top layer of dark kastanozem of the region.

But in the soil analysis of environmental monitoring study, this soil was probably named incorrectly because humus content came out high (8.57 %). Retrospectively, nutrient elements of dark kastanozems of this assessment, except soil in КЭМ-02, came out questionably high such as phosphorus 4-5.2 mg/100g, potassium 39-52 mg/100g; it should be mentioned that this occurs very rarely in this soil.

During project construction process in place where worker's temporary residences and offices were located and in site where concrete were being made, soil reduced from technical rehabilition (land leveling), fertile soil is mixed, humus content of this soil is reduced by 56.6 %, increase in surface loose rocks, carbonated sand is exposed on most area - these considered as **residual impact**. Currently these two areas of biological rehabilitation have grown adequate vegetation cover, meaning there is a possibility for indigenous characteristics of vegetation cover to restore.

In order to determine the current level of heavy metal pollution of lisenced site's soil, lets take a look at the test results from sample taken from soil monitoring point which was assessed by Institute of Geography's Soil Research Laboratory of Academy of Science (table 3.2).

Table 3.2 Soil heavy metals size, mg/kg

Sample number (depth, cm)	**Pb**	**Cd**	**Cr**	**Zn**	**As**
КЭМ- 04 (0- 6)	< 0.3	1.6	62.0	84.7	13.7
КЭМ- 02 (0-15)	< 0.3	1.5	55.0	86.9	13.6
КЭМ- 01 (0-12)	< 0.3	1.6	63.4	85.7	8.9
КЭМ- 05 (0- 6)	< 0.3	1.5	49.6	94.8	5.0
Tolerable maximum amount in soil					

M N S 5850: 2008	**100**	**3**	**150**	**300**	**6**

Source: Environmental monitoring study of "Salkhit" wind farm, 2016

Looking into heavy metal soil analysis in vicinity of the wind farm, content of toxic elements such as lead (Pb), cadmium (Cd), chromium (Cr), zinc (Zn) was below permissible concentration of Mongolian standard (MNS 5850:2008) silty loam soil textured composition in this region, revealing in small numerical quantity shows that the soil is not contaminated with these inorganic pollutants. Due to being far from road and city impacts, heavy metal content, which was taken from soil monitoring points from moderately pebbly and dark kastanozems located near each other, is below permissible concentration. However, arsenic concentration (As) is above permissible amount in several soils by 1.5-2.3 times; this element concentration generally considered high in Mongolian soil; it should be noted that this is in consort with the findings of other researchers.

3.7 Landscape

In term of landscape, the surrounding territory of project site consists of valleys and hills. Mt. Tsagduult is formed from east to west (local people call it Mt. Tsarduult), which is above Mt. Salkhit sea level by 1733-1888 meters and where WTGs are positioned on top of hills.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 3.12 View of eartern hilltops, WTGs located along the ridge from WTG N28

Substation is built south of "Uvur shar huviin" valley, 1.4-4.4 km from WTGs, and 1654 meters above sea level.

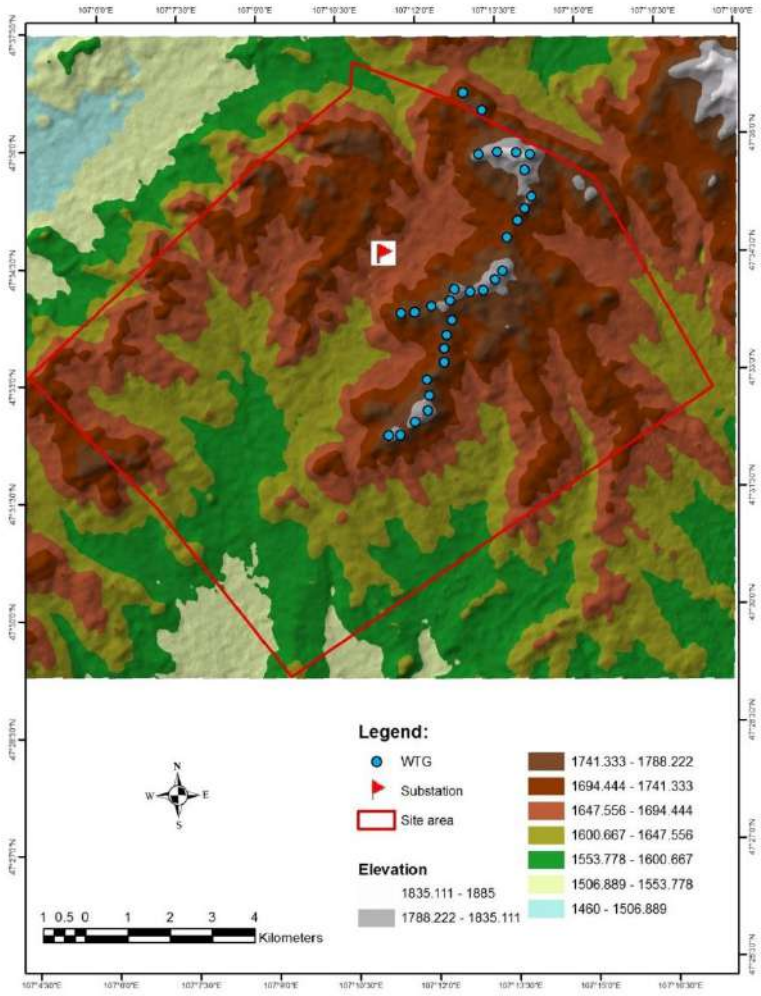
Above mentioned hills are 90-190 meters above they valley, and WTGs (80 meters tall) are located on them.

Source: Assessment team of supplementary EIA, 2016

Figure 3.13 View from the northwest valley of WTGs N3,4,5

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 3.14 View from the hilltop of WTGs N7-28



Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 3.15 Locations of WTGs and substation of the wind farm.

Mountain tops flattened to build WTGs, and road has been constructed between them.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 3.16 WTG's car parking space, unpaved road.

110 kV overhead power transmission line has been built from north east of the substation to Nalaikh's substation through hilly areas and flat steppe.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 3.17 Location of 110 kV overhead power transmission line

The project area is mostly covered with dry steppe vegetation, and on north eastern side of some hills is occupied by small birch grove.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 3.18 There is birch grove on the north eastern side of the 5th WTG's mountain; further 1st and 2nd WTGs can be seen.

Unpaved roads formed across the project site in the direction of north-south and west-east route. Also 3 routes of unpaved roads formed from substation to WTGs. There are few buildings along the railway which passes through the south eastern side of the project site.

The project site is utilized primarily for livestock grazing. Few herder families set up their yurts around the site. Livestock graze everywhere. It is observed as a vast untouched landscape with few Mongolian rural buildings and households.

Following changes occurred on the ground surface due to installment of the main project equipment during the wind farm construction.

- Uneven hilltop areas has been flattened
- On the hilltops tall white towers with rotating blades were erected
- In some places, lanscape is changed drastically due to high dams, built on roads between WTGs.
- Technogenic landscape has been formed in the vicinity of the substation and control building.
- Overhead transmission lines can be seen across the hills and steppes

However, the desolate appearance of this landscape can be seen without much change, as the project buildings and facilities are located far from each other.

3.8 Subsoil

In terms of geological formation, the project site consists of Mesozoic, Cenozoic bare mountains and alluvial steppe, and project building construction work has been done between their transition zone. For example: Built facilities such as WTGs, control center, substation, road, underground power lines, waste water treatment facility and high voltage overhead power lines has affected soil, and the negative engineering geological effects forming from those impacts has not been observed. There has not been an occurrence of deformation and damages to the foundation of the most strained WTGs.

Soil is affected by gold mining operation in the 4 dry riverbed or south western part of the "Clean energy" LLC's owned land. These damaged lands are situated at a distance of 1.7-2.9 km from the western WTG's. Gold mining operations are held during warm season.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 3.19 Damaged land by gold mining

3.9 Vegetation

By 2016, 47 vascular plant species belonging to 14 family has been recorded in the conclusion of wind farm's project environmental impact assessment and other additional monitoring reports. Rare, endangered, endemic plants have not been recorded. In terms of vegetation, forb-grasses, Gleistogenes-Stipa, Artemisia frigida-Stipa and Festuca-Artemisia which belonging to steppe formation occurs on mountain steppe. Humid mountainside valleys have meadow steppe. Mountain backs and slopes have small birch groves.

The vegetation, like fields above, has been wiped out due to construction of facilities such as WTGs, control center, substation, roads between facilities, underground power lines, waste water treatment facilities.

Project implemented measures to mitigate environmental impact has been witnessed on site.

Continuous normal /matrix/ habitat dominate in the main project activity region.

The habitat is recovering relatively fast back to its initial condition, as this region is dominated by perennial grasses with robust root system, which are resilient and able to withstand degradation.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 3.20 Camp location restoration

Implementation of biological reclaimation on damaged land due to project construction work is successful, as of now reclaimedareas are safe, formed sustainable landscape and covered with appropriate amount of vegetation. There can be seen /Figure 3.20/ an increasing natural plant participation as some species of plants /*Cleistogenes squarrosa, Stipa Krylovii, Poa botroides, Koeleria macrantha* etc./ are growing intrusively into some parts of the reclaimed areas.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 3.21 Implemented land restoration between WTGs.

Due to definitive roads and tight monitoring on wind farm's project site prevented negative impacts on carrying capacity, therefore currently no specific negative impacts on environment are observed /Figure 3.22/.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 3.22 Road between WTGs.

During four seasons, most territories of steppe regions in our country are utilized for livestock grazing. Over the region relating to wind farm, two herding families settle in and around 1000 livestock graze throughout the year. Also other herding families come to pass summer and autumn. As pastures go through degradation due to utilizing it without rotation over long period of time, an annual goosefoot plant family starts to grows abundantly where Artemisia spp and Needleleaf sedges /*Carex duriuscula/* are dominant.

Utilizing seasonal pasture rotation, and adjusting pasture capacity and recovery potential is necessary, and it consequently improves quality and main component of natural vegetation hence preserving resiliency of ecosystem.

As a result of implementing environmental protection measures through definitive steps after completing construction work on this project, residual impacts of construction activities being gradually mitigated. Plant diversity increased throughout reclaimedfields and there can be seen a trend of gradually increasing participation of natural pasture plant.

Currently there are no fields left bare with destroyed plantation and without biological reclaimation.

After completion of project construction, there are no signs of impact on vegetation from wind farm's operation.

Presently, there isn't any specific study about regional ecosystem destruction.

3.10 Animal status

Very little has been mentioned about fauna in the "Wind farm" project's detailed environmental impact assessment report conducted by "Sunny trade" LLC in 2012, for example: widely spread 6 species of mammal, widely encountered and including some threatened ones total of 18 species of birds, representatives of invertebrate taxonomy groups have been stated. Therefore there is basically no possibility of comparing pre and post project implementation period fauna status in the vicinity of Salkhit Mountain. We have conducted field monitoring and research in person on the owned field of Salkhit power plant on 21st of October, 2016. Considering direct steppe observation and oral information from local citizen Batsukh and station workers, within national and regional scale such mammals including red deer (Cervus elaphus) with threatened population and recorded in "Regional red list" under "Endangered" category, gazelle (Procarpa gutturosa) under "possibly endangering" category and Mongolian marmot (Marmota sibirica) dwells grazing seasonally here and evidence (deer droppings, marmot burrow etc.) of permanent inhabitation has been observed. Wind Farm's workers carrying out operational safety inspections on WTG on daily basis may have indirect positive impact limiting illegal hunting of endangered mammals. One of the manifestations of this can be seen on the back slopes of the mountain hill which 3, 4, 5, 6th WTGs are installed, sightings of doe seeking shelter in the dwarf birch groves during summer breeding season has been observed in last 2 years consequently (according station workers and herder Batsukh's oral information). At the same, it should be noted that there are few active marmot burrows scattered. As relatively few families with livestock resides in the vicinity of Salkhit Mountain pasture deterioration is fairly minor; this low density of livestock creates favorable condition for gazelle to move in seasonally, therefore need to restricti other herders with large number of livestock to settle in; and executing sustainable pasture rotation management will have important significance to support and protect regional biodiversity. The head count of red deer, Mongolian marmot, gazelle are threatened on a national scale as stated on this report, thus mammal in the vicinity of the Salkhit Mountain is considered significantly. Bradt's vole (Lasiopodomus brandtii), Mongolian gerbil (Meriones unguiculatus) are widespread in the steppe ecosystem and main prey for carnivores such as bird of prey upland buzzard (Buteo hemilasius), saker falcon (Falco cherrug), steppe eagle (Aquila nipalensis) and predatory mammalian corsac fox (Vulpes corsac), fox (Vulpes vulpes), Pallas' cat (Otocolobus manul), steppe polecat (Mustela eversmanni), least weasel (Mustela nivalis); small mammalians with periodically spiking population are possibly going through declining phase. Predatory mammalians and birds as an indicator for these two species rising population, location and density have not been observed. Mongolian silver vole (Alticola semicanus), daurian pika (Ochotona dauurica) such grassy vegetation diversity is quite dependent on growth; settlements of animal species prefer a land with relatively little livestock overgrazed pasture has been seen on rocky Mountain top area, back slopes in the vicinity of 28th WTG installed area. Characteristically above mentioned two small mammal's settlements indirectly indicates condition of the regional pasture. Abundance

of tolai hare (Lepus tolai) has been observed near wind farm's control building and substation which indirectly demonstrates weak pressure from predators. Salkhit Mountain's biodiversity condition is dry steppe; mountain steppe's ecosystem appears natural which indicates human built wind farm's facilities are having low direct impact pressure.

Bat (Chiroptera). It has been observed that water inside herder's livestock watering hand well's tank and stagnant water outside it creates condition for bats to feed and drink. According to researchers study[1],[2],[3] in steppe and Gobi where desert water is scarce bats has been recorded near hand well even though few in numbers. In the vicinity of Salkhit Mountain, below mentioned species of bats could be recorded. Including:

1. Myotis aurascens
2. Eptesicus gobiensis
3. Vespertilio murinus
4. Plecotus ognevii such species can be stated.

Above mentioned 4 species of bat commonly encountered [4, 5, 6, 7] in surroundings of river, spring, lake and well existing in such ecosystems as dry steppe, desert steppe, semi-desert and desert.

3.11 Cultural heritage

According to previously conducted environmental assessment[8] there is a grave on a mountaintop affixed with stone, and it is concluded that no buildings will be built in its surrounding. On that assessment report, researchers of Archaeological Institute of Science Academy made an archeological excavations on two graves /fixing coordinate values of -47^{0}35'49.4", 107^{0}13'51.1" on GIS Figure/ according to zoologists observation between 4 and 5 WTGs, also it has been informed that the grave on 47^{0}32'35.5", 107^{0}11'57.6" is located distant enough to be not affected by construction of WTGs/at a distance of 130 m north from 28th WTG by fixing coordinate values on GIS Figure/.

[1] Batsaikhan et al., 2010

2 Nyambayar, B., Ariunbold, J., & Sukhchuluun, G., (2010). A Contribution to the bats in habiting arid steppe habitats in central Mongolia. Erforsch. Biol. Ress. Mongolei. 11: 329-340

3 Davie et al., 2012

4 Dolch, D., N.Batsaikhan, K.Thiele, F.Burger, I.Scheffler, A.Kiefer, F.Mayer, R.Samjaa, A.Stubbe, M.Stubbe, L.Krall and D.Steinhauser (2007). Contribution to the Chiroptera of Mongolia with first evidences on species communities and ecological niches. Erforschung Biologischer Ressourcen der Mongolei (Halle/Saale), vol. 10: 407-458

5 Nyambayar et al., 2012

6 Davie et al., 2012

7 Batsaikhan, N., Samiya, R., Shar, S., Lkhagvasuren, D. & King, S.R. (2014). A field guide to Mammals of Mongolia. Munkh Useg Publisher, Ulaanbaatar, 326 pp.

[8] "Windpower plant" project Detailed environmental impact assessment report, "Sunny trade" LLC, 2012

CHAPTER 4. PROJECT IMPACT ANALYSIS

In order to conduct an analysis of impact assessment's supplemental clarification, objectives are set to define impacts during operational phase, based on environmental change study conducted after wind farm's construction.

4.1 Assessment approach and methodology

Supplemental clarification of Environmental assessment was conducted based on professional expertise of consultants, participating parties, studies, assessment reports, satellite images, and research materials on the internet.

Furthermore, this report is based on the assessment implementation sheet given to general environmental impact assessment provided by Ministry of Environment and Tourism.

Significance of the project environmental and social impact during operational phase is evaluated by supplemental clarification of detailed environmental impact assessment. For this purpose, project impact types are defined according to assessment criteria /given on table 4.1/. Impact types of the project operation are defined by assessing geographical extent, nature, magnitude, duration, recovery ability, confidence rating and probability of occurrence. After this, the determination of whether an environmental impact is "significant" or not will be evaluated.

Criteria for assessing environmental and social impact of the project are shown in the following table.

Table 4.1 Evaluation criteria for assessing the significance of environmental and social impacts of the project

Criteria	Impact symbol	Criteria definition
Geographical extent of impact	L - Local	Effects occurring mainly within or close proximity to the proposed development area
	R&N – Regional and national	Effects occurring not only in regional surroundings but also in national surroundings
Nature of impact	D - Direct	Disturbance created by direct correlation of environment and socio-economic component of procedures
	ID - Indirect	Project impact is indirect, result of many impacts, or produced on 2nd and 3rd levels
	P – Positive N - Negative	Net benefit to the resource, community, region of province. Net loss to the resource, community, region and province
Magnitude of impact	Nil	No change from background conditions anticipated after mitigation
	L - Low	Disturbance predicted to be somewhat above typical background conditions, but well within established or accepted protective standards and normal socio-economic fluctuations, or to cause no detectable chance in ecological, social or economic parameters.
	M - Moderate	Disturbance predicted to be considerably above background conditions but within scientific and socio-economic effect thresholds, or to cause a detectable

		change in ecological, social or economic parameters within range of natural variability.
	H - High	Disturbance predicted to exceed established criteria or scientific and socio-economic effects threshold associated with potential adverse effect, or to case a detectable change in ecological, social or economic parameters beyond the range of natural variability.
Duration of impact	M - Medium	Effects occurring within developmental phase
	L- Long	Effects occurring during operation of facility
	E - Extended	Effects occurring fater facility closes but diminishing with time
Confidence rating	H- High	Based on good understanding of cause-effect relationships and data pertinent to study
	M - Moderate	Based on good understanding of cause-effect relationships using data from elsewhere or incompletely understood cause-effect relationship using data pertinent to study area
	L - Low	Based on incomplete understanding of cause-effect relationships and incomplete data pertinent to study area
	UC – Uncertain/unrealistic	Not based on cause-effect relationships and data pertinent to study area
Ability for recovery	R – Reversible	Effects which are reversible and diminish upon cessation of activities
	IR - Irreversible	Effects which are not reversible and do not diminish upon cessation of activities and do not diminish with time
Probability of occurrence	L - Low	Unlikely
	M- Medium	Possible or probable
	H - High	Certain

Source: Assessment team of supplementary clarification of DEIA, 2016

In the evaluation table (table 4.1) by above criteria, to evaluate each environmental and social impact components of the project, the impacts are noted with corresponding letters such as L, H, etc.

At the end of the evaluation table, the impact significance of the project was rated as being nil, insignificant, and significant.

As for the project, nil is considered when mitigation measures are not required for environment and social component. In the evaluation table, it is noted as "0".

"Insignificant" impact are determined by the post residual impacts. In the evaluation table, it is noted as "Ns".

- Where the residual project effect in combination with the existing environmental and social baseline conditions is not predicted to result in the exceedance of established provincial or federal guidelines, thresholds or criteria
- Where the residual project effect in combination with existing baseline conditions as well as future (disclosed) project effects is not predicted to result in the exceedance of established provincial or federal guidelines, thresholds or criteria

- Where the residual Project effect occurs to a population or species in a localized manner, over a short period of time, and/or similar to natural variation, and/or which are reversible and have no measurable effects on the integrity of the population as a whole
- Where established standards, guidelines, or thresholds against which to evaluate significance were not available, a transparent, step-wise process was employed that utilizes the outcome of individual effects descriptors to arrive at an overall conclusion for significance

1. Significant impact cannot be evaluated as insignificant impact, project effects are predicted to result in the exceedance of established provincial or federal guidelines, thresholds or criteria; if positive effect occurs, and it is proven greatly beneficial by study, or above negative and posivite effects are determined by certified assessment of analysis results of professional study, noted as "Sn, Sp".

Based on above assessment, analysis was written on each environment and social component's effects. For example, impacts for each environmental component were evaluated and compiled based on impact features study and explained by approved result, hypothesis, analysis, observation, and study result.

4.2 Impact assessment and evaluation

4.2.1 Environmental impact assessment and evaluation

4.2.1.1 Physical resources

Climate change

The climate change of past and present is happening because impacts from excessive earth greenhouse gas emission. The coal energy industry has the most negative rating of greenhouse gas generating production sectors. The massive greenhouse gas from burning coal is still a factor in global warming. 50 MW coal power plant annually produces 168.5 million kWh of electricity, burns 122000 tons of coal, and emits 180,000 tons of greenhouse gas[1].

However as for wind farm, greenhouse gas emission is reduced by 180,000 tons by making use of natural inexhaustible resource such as wind power to produce above mentioned amount of electricity. This wind farm within 25 years of its operation will reduce greenhouse gas emission by 4.5 million tons. This wind farm's effect can be considered as a contribution to mitigation of region, national, as well as global warming. Because this effect is not direct (D), positive (P), and medium magnitude (M), project implementation duration (L) effect is certain (H) and this effect's positive impact is irreversible and constant because it isn't high capacity wind farm.

Therefore, produced energy amount is assessed as fully positive, significant effect /Sp/ on climate change mitigation.

[1] "Salkhit wind farm" project's DEIA report, "Sunny trade" LLC, 2012

Air quality

During this project process, air pollution source consists from dust from unpaved road and toxic elemets of gas produced from limited movement from few maintenance vehicles (not exceeding 4-5; car/passenger). The negative impact is considered very little from the use of transportation of 50 MW wind farm. This farm's facilities does not have air pollution source.

However, as seen above, in order to produce 168.5 million kWhr energy per year coal 50 MW power station emits 180,000 tonn greenhouse gas (carbon dioxide, sulfuric gas, and nitrogen oxide); wind farm does not, in other words, to produce above mentioned energy without polluting air/without emitting 180,000 tonn greenhouse gas, it is a indication of positive impact on air pollution reduction.

This positve (P) impact is regional (R), indirect (ID), medium magnitude (M), long term (L), high in confidence rating (H), irreversible (IR), constant (H).

Thus, the positive impact in reduction of air pollution is assessed as significant (Sp).

Noise

During normal operation at the project area, noise is mainly created by WTGs and transformers; since the noise level is not high it does not travel far. For example, when we were conducting field study, noise level at the WTG was 52-60 dBA; noise level at the transformer was 52-58 dBA. Noise monitoring measurement conducted by the wind farm at the WTG was 37-55 dBA noise equivalent level. These measurements are below the acceptable limit of the standards of "Air quality, technical general requirement – MNS 4585:2007", hence it is considered as no effect. As well as, at 50, 100, 200, 500 meters from WTGs the noise level is calculated in diminishing manner from 34-42 dBA to 18-30 dBA. This result shows that the wind farm's noise does not effect people and animals negatively. Noise is created at the project area (L) and if there is an impact then it will be direct (D). Impact is negative (N) but the level can be at very low (Nil). During long term (L) project implementation confidence rating (H), no impact during normal operation however there is low (L) probability for negative impact. Potential negative impact can be mitigated. Therefore, noise impact is assessed as insignificant (Ns).

Eventhough noise is below permissible level, it can increase because of equipment malfunction. Monitoring should be conducted to prevent potential adverse impacts.

Surface water

The project main facilities situated on top of hilltops of mountainous area; the road between them is built also on high grounds which in return does not hinder natural run-offs. In addition, the other facilities similarly do not hinder the run-offs. No surface water is used in project operation. Therefore, there is no impact (0) on surface water regime, reservoir change and surface water pollution during Salkhit's wind farm operation.

However, the spring near the the southwest of substation needs to be fenced from animal; it should be freed of pollution.

Underground water

Wind farm facilities does not use water. Water is only required for only water consumption and household usage. In 2014-2015, daily water usage from well drilled near the control building is approxemately 2.0-2.6 m^3. This well yields 1.5 l/s. Because water was not drained after this well was drilled, water yield percentage and water resource usage percentage cannot be measured. But, the water usage is minimal, hence, it is considered that underground water resource will not be effected. Water for consumption is brought from Nalaikh district. Water usage will not increase in the future. Therefore, it is possible to not effect underground water.

However, there is a statistics that 1.6 million ton water is used for coal 50 MW power station to produce 168.2 million kWh energy[1]. 51 l/s of water is needed to meet this demand. There is no such water resource near project area.

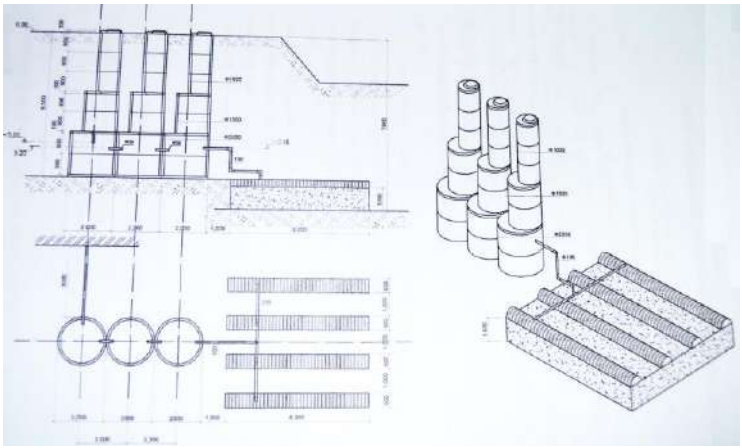
Wind farm will save 40 million tonne of water in 25 years of its operation to produce 4212.5 million kWhr. It is reasonable to assume that it has a posivite impact on saving natural water resources.

Therefore, it is considered that positive impact (P) on water resouces in the region (L) is indirect (ID), impact intensity is high (H), long term (L), certain (H). Moreover, impact is irreversible (IR), and impact probability is high (H). Thus, this project is assessed to have a significalt posivite impact (Sp) on the underground water.

Groundwater pollution may not be impacted during the implementation of the project, but groundwater pollution may occur throughout the life of the project.

The possible sources of contaminant to the underground water are wastewater, trash, and used technical oil.

Small scale biological treatment plant is assembled by "Plambin" LLC with "Arts suvarga" LLC's project design. This wastewater treatment facility is intended for the purification and disinfection of household waste.



Source: "Clean Energy" LLC

Figure 4.1 Small scale biological treatment plant

[1] "Salkhit wind farm" project's DEIA report, "Sunny trade" LLC, 2012

Source: "Clean Energy" LLC

Figure 4.2 During treatment plant assemply

The sewage system consists of three compartments, each with 2 pcs of 2000 mm diameter, 2 pcs of 1500 mm diameter and 3 pcs of 1000 mm diameter. In addition, 4 pcs of 600 mm 6 m long pipes designed to permeate purified water into soil were assembled. Concrete pads were made at the base of well, 2 layers of liquid glass were applied to the internal sides of the well. PVC pipes were installed for sewage connection lines.

1-2 times a month substance to activate anaerobic bacteria is introduced through the toilet in order to improve biological cleansing. Well has a technology that permeate purified water into soil. Disinfectant container should be cleaned off of sludges depending on its contamination once in 4-8 years according to instructions.

The Wind Farm's control building will use 2.0-2.6 m^3 water daily; waste water is treated and permeated into soil.

Using biological wastewater treatment plant assembled by qualified entity properly according to guidelines, underground water and soil pollution will not happen.

If underground water pollution were to happen, scope is low (L), nature and intensity of the impact is irrelevent (Nil), impact duration is medium (M), probability of occurrence is low (L), impact is assessed as not significant (Ns).

Soil

The residual impacts, such as mixing of fertile soil, decrease in humus content, surfacing of loose rocks, and surfacing of carbonated layer in many parts because of project construction and technical rehabilitation leveling of the damaged soil, will gradually dissapear by rehabilitation; and the soil cover will shift to normal condition.

The geographical scope of impacts is local (L). The benefits of the wind farm project is to have positive impact (P) on the nature and soil by protecting soil cover and rehabilitating damaged soil.

The impact magnitude is assessed as low (L) based on lack of significant changes on ecological indications after changes in soil cover did not exceed environmental protection standards eventhough soil cover was heavily disturbed during construction of wind farm infrastructures, such as buildings and improved road, and rehabilitation.

The impact duration on nature and soil begins from the project construction phase, and it will be reduced gradually (E) by having safety and stability created on the damaged soil as a result of the mitigation measures such as avoiding, mitigating, and restoring impacts in stages.

The study was conducted by observing soil stabilization and soil utilization on-site and by reviewing result of soil heavy metal analysis, physical-chemical properties, morphological records, soil dispersion of environmental monitoring reports, and DEIA of the project area. Due to these findings, we consider having complete understanding and data on the consequences of environmental impacts. Therefore, project confidence rating is assessed as certain (H).

The condition of soil is assessed to eventually reverse (R) to its native state due to revegetation to the damaged soil of the wind farm construction phase. In other words, project residual impacts are in limited area, and it will reverse to normal condition; there is no significant impact created to the local biodiversity.

Therefore, "significance assessment" of project impact occurrence is assessed as irrelevant (Ns) considering that the soil residual impacts, during project construction phase, are restoring by vegetation based on current soil.

The project impact on soil erosion, damage, and pollution is assessed as local (L), direct (D), in small amounts (Nil), possible (L) short-term (M), and it is reversible (R) to normal condition, and probability of occurrence is small (L).

2016 wind farm soil vegetation monitoring report concluded, "Currently, WTGs are unlikely to affect negatively on vegetation species and cover. It is expected to continue as is", about vegetation cover which is relevant to the soil cover as well.

The flora researchers noted that pasture degradation symptoms are occurring due to the overgrazing at the wind farm project area which is related to the fact that many herders settle in summer and fall, and pasture degradation affects by compacting soil surface layer causing changes in plant species composition.

Landscape

As for landscape, there are traces of influences such as hilltops are flattened during wind farm construction, tall dams/roads are built between some WTGs, roads are built between the wind farm and the control building, and technogenic landscape is created in the vicinity of the substation and the control building. These can be seen in the photos of the previous chapter. Fixed road area will gradually fit the landscape as a new element.

Highlighting environmental impact during wind farm procedure, this time we reckon that assessment main objective is whether there is a procedure which changes natural visual amenity in the future. Wind farm construction process is permanently finished; based on no further construction activity, the impact on landscape and land form is evaluated insignificant (Ns) because the created landscape can gradually adapt to nature.

Upon completion of the wind farm construction, view is changed as white towers with rotating blades are erected on the hilltops, and overhead power lines can be seen across hilltops and steppes. Nevertheless, WTGs located on the top of the mountains far away can be seen by rural

herders and railway workers, and the natural view change is not noticed by them. Nearby passengers and tourists are often interested in the wind farm, besides Clean Energy LLC gets many requests for a visit and see the operations so they receive them on site. There was no complaints about change of natural view from the visitors.

Our team of assessment experts, who have visited the wind farm facilities and have seen its operation in person, considered that there were no adverse impacts on the beauty and appearance of the nature.

Wind farm facilities do not disrupt natural visual amenity (0) based on above information and people's opinion.

Subsoil

In terms of subsoil and geological formation, it has sustained direct impact /D/ of irreversible /IR/ static and dynamic load over long period of time /L/ on a certain locations such as foundation of WTG's and other facilities due to building facilities to implement project within a scope of local region /within a specific field/, hereafter this kind of impact will remain. During plant operation, formation of additional base soil deformation/base soil damage which is foundation of WTG's, transformers and other facilities/ is possible with a low occurrence probability and in terms of this negative impact /N/ it is assessed and concluded as significant /Sn/.

Natural mineral resource

The power plant, with a technological solution to convert inexhaustible natural resource of wind kinetic energy to electric energy, is utilizing wind power with average speed of 8.2 m/s to produce energy in the vicinity of Salkhit Mountain. Producing energy without using any other natural resources is the uniqueness of this plant. In order to generate 168.5 million kWh electricity per year, 50 MW coal-fired power plant burns approximately 122,000 tons of mineral coal. The plant saves above mentioned amount of coal by abandoning traditional energy production method. Coal savings or positive impact /P/ is certain to remain indirectly /R/ within a scope of local region /R/ over a long period of time /L/. It is concluded the plant, saving a 3 million tons of coal to produce energy over 25 years, will have considerably positive significant/Sp/ impact.

4.2.2 Ecological resource

Vegetation

During plant construction, due to biological restoration on the field where workers camp, vehicle parking, concrete batch plant located, the landscape formation has become safe and covered with certain amount of vegetation and some neighboring dominant species of natural vegatation has grown on these fields.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 4.3 Reclaimed field boundary /some dominant species grown in natural vegetation/

Considerable impact of livestock is having a dampening effect on the process of vegetation of this field gradually turning to natural pasture.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 4.4 Livestocks graze a lot over reclaimed field

Geographical coverage of the impact is /L/ on a local level. Henceforth, the net profit of wind farm project is to show positive impact, such as protecting and restoring natural vegetation, providing an opportunity to operate in an environmentally friendly way.

No sign of negative impact on vegetation cover from wind farm's current and future operation is observed. Specifically the vegetation surrounding WTG's have been meticulously observed whether there is a change. In other words, air vortex formed by wind turbine between people increases air flow which dries soil and it is understood as having a negative impact on plant growth. It is noted that there is no negative impact on plant species and its growth by vegetation monitoring, which has been conducted deliberately to provide an answer for this. Even though some areas are removed from pasture resource for the wind farm's buildings and roads, to prevent affecting negatively on pasture capacity, definitive roads are established and well monitored. Based on above circumstances, wind farm's operational impact is assessed as negligible /Nil/.

Ever since project construction phase environmental impact duration will start and continue; as a result of step by step mitigation measures by avoiding, mitigating and restoring potential impact to biological diversity, which turns damaged land to safe and stable state where assessed as impact will gradually diminish until its eliminated.

The impact is assessed as definite /H/, based on the full understanding gained during field vegetation condition study about consequences of environmental impact and also vegetation information of wind farm's detailed environmental impact report, environmental management and monitoring reports during construction phase and post construction operational phase.

Due to plantation of vegetation, the eroded land during wind farm's project construction phase is turning to normal pasture gradually /R/. In other words, project residual impact is within limited region, it is returning back to normal and there is no impact to have noticeable change in the biological diversity of the region.

Given the current baseline of vegetation, the residual project impact will not have dwindling effect on future pasture and "important significance" report of project impact on vegetation is assessed to have no important significance /Ns/, as vegetation is recovering due to restoration on utilized land.

Based on detailed environmental impact assessment's conclusion stating that there are no rare and endangered plants on the project site, it is assessed as no impact /0/ on endangered and rare plants.

It is noted that conclusion of above assessment is comparable to the conclusion of wind farm's vegetation monitoring report 2016 stating "Currently no negative impacts have been observed on natural vegetation and vegetation cover by wind turbines. The trend is expected to remain in the future".

Project operations creating no impacts /0/ causing pasture shortage and a very small area is involved for project facilities/roads, eventhough project owns considerably large area /12.9 thousand hectares/ for operational purpose.

However there are signs of pasture degradation on project site due to livestock grazing load. And this is associated with grazing livestocks brought by moved in herders during summer/autumn season. In other words, it is not associated with project operation.

Animal

Near WTG pika, Mongolian silver vole, marmot seeks shelter in the ground; besides occurrences of small sedentary mammals, deer and does which usually avoid human settlement grazing in the surroundings of WTG indicates relatively weak residual impact of the project construction phase.

Brandt's vole, Mongolian gerbil such small species scatters around vast areas and proliferates from time to time and when the proliferation period occurs, birds of prey such as upland buzzard, saker falcon, steppe eagles settles following their prey animal enters and settles within one kilometer buffer zone from west and central part of WTG installed strip land which creates a condition to increase potential risk of getting hit by turbine blades and collision.

If number of citizens and families owning livestock rises from current level, there is a possibility of increased number of remains of livestock died from various reasons which will entail the risk of big carnivorous scavenger birds such as black vultures and Himalayan vultures gathering and getting hit by turbine blades and colliding.

Increasing settlements and families with livestock will create conditions for owned or stray dogs to migrate or even settle in and proliferate following animal remains and this will lead to possible risk of threatened mammal species to be displaced as dogs may feed off on offsprings of these mammals which seeking shelter in thick shrubs, woody plant groves until their young calves (ilii) grow and stretch their Achilles tendons. Monitoring is needed around scattered birch groves on the back slopes of the Salkhit Mountain and special attention needed when deer, does calves and raises their offspring from June to July. Mature and young marmots have even higher chance suffering stray dog attack.

Deterioration of animal habitat. Once limited number of WTG installed and they will not be moved. There is chance of mortality among birds during their migration period on the air space above that particular land, thus essence of the impact is assessed as "direct" and "negative". The impact duration time is considered in terms of technical lifespan of WTG's and determined that it will have long term effect. Impact certainty level is considered as birds "can be affected" by any particular WTG's blade.

During monitoring on past October settlements of Mongolian silver vole and daurian pika has been spotted at a distance of 20-100 m from 28th WTG's surrounding, the scenery of small mammals resettling detected near once built facility which demonstrates project impact *"**reversal**"*. Even though its few, dwelling and hibernating marmot families indirectly indicates that project impact is showing "signs of reversal". On the other hand deer and doe, usually flee from human settlement, technical noise and movement, are grazing and sheltering in dwarf birch groves neighboring WTG's surrounding proves again that project impact is *"**reversing**"*.

During our field observation and study process we have not encountered any bird remains or feathers within a distance of 50-100 m from turbine, but according to station employee there was one case of golden eagle getting hit by blade and based on this sole evidence of incident, the impact is assessed as having *"**low probability of occurence**"*.

Based on above mentioned point the impact of once built and running wind farm's facility to animal dwelling environment as a whole concluded as *"**having no significance**"*.

Endangered, threatened animal. Mammal and bird species belonging to "Endangered" red list category of Mongolian state red book[1] has not been recorded[2]. But one species of mammal recorded under "threatened" category in above mentioned book, the red deer which does not dwell and graze permanently in the vicinity of the Salkhit Mountain, but only encountered when migrating seasonally from Bogd Mountain. If "regional red list[3] of mammal and birds" is used then red list category will be different as considering "endangered" and "threatened" mammal, bird species here will be very problematic and will have contradicting content. Regardless, we

[1] Mongolian Redbook. UB., 2013

[2] Batsaikhan, N., Samiya, R., Shar, S., Lkhagvasuren, D. & King, S.R. (2014). A field guide to Mammals of Mongolia. Munkh Useg Publisher, Ulaanbaatar, 326 pp.

[3] Clark, E.L., Munkhbat, J., Dulamtseren, S., Baillie, J.E.M., Batsaikhan N, Samiya R and Stubbe M (compilers and editors) (2006). Mongolian Red List of Mammals. Regional Red List Series Vol. 1. Zoological Society of London, London. (In English and Mongolian).

will consider animals dwelling in the vicinity of Salkhit Mountain by "Regional red list" as it is accepted and used worldwide and conducted by scientific methods. Under "critically endangered" category red deer (*Cervus elaphus*), and under "possibly endangered" category recorded Mongolian gazelle (*Procapra gutturosa*), Mongolian marmot (marmot sibirica) in the "regional red list" of mammals dwell and graze here permanently and seasonally. However researcher Tseveenmyadag N. mentioned in the report[1] about encountering saker falcon which is under category of "vulnerable" in the "regional red list" of birds.

Below Impact explanation is looked at according to assessment guideline taking example of only species, red deer, under "threatened" category in the vicinity of Salkhit Montain. Impact scope has regional characteristics, as red deer dwells in the Salkhit Mountain's dwarf birch groves seasonally; since deer is a land migrating hoofed animals they will be startled and disturbed by the regular operational monitoring "car patrol" of station workers since WTG's are already built, and this is considered having an indirect minor impact. Stray dogs seeking shelter in human settlements and herders dogs may hunt and kill calves (ilii). Indirect impact effect duration is problematic to determine as in some years doe stays during short summer season to give birth to offspring and raise them. When technical lifespan of WTG's expires, indirect project impact on red deer will cease to exist and impact will start reversing. Red deer settlement characterized as seasonal, besides this the fixed road used by "car patrol" is relatively far from the birch groves, therefore the probability of an encounter is considered to be very low. Based on the above mentioned points, the impact of wind turbine facility on red deer, the representative of "threatened" animals, is concluded as "having no significance".

Dry steppe ecosystem change. Dry steppe ecosystem exists in very dynamic state therefore it is dry and has high fluctuation and amplitude figure of precipitation, as a result of this plant growth from year to year differs vastly; very fragile formation of this ecosystem is indicated by these transformational processes occurring regularly where mammal and bird diversity diminishes, population decreases and spatial distribution drastically shrinks. Therefore prospect of assessing baseline changes of steppe ecosystem with constant criteria is very limited. This is explained by existence in dynamic state of the mentioned ecological system. Once wind farm's facilities built and completed; the detected direct and indirect impact affecting steppe ecosystem will be very low. From taxonomic group, birds as a mammal utilizes air space for movement and may suffer coincidental risk because of constantly rotating WTG's blades. Therefore project impact on animal diversity and its mortality is prioritized to limit consideration to birds utilizing air space for movement. As WTG's main operation runs high up from the ground surface therefore impact on taxonomic group of animals seeking shelter in ground and soil will be very low, basically non-existent, thus assessments given are respectively as "negligible" or Nil.

[1] 2012 ESIA report of wind farm project, Sunny trade LLC, 2012

Table 4.2 Assessed results of potential project impact and its important significance on environment and social components

Impact characteristic		Scope		Impact characteristics and intensity							Impact duration			Impact certainty rating				Recovery state		Occurrence probability			Significance of impact		
Environment and social components		Local (L)	Regional and national (R&N)	Direct (D)	Indirect (ID)	Positive (P), Negative (N)	Slight (Nil)	Low (L)	Medium (M)	High (H)	Medium term (M)	Long term (L)	Extended (E)	High (H)	Moderate (M)	Low (L)	Uncertain, unlikely (UC)	Reversible impact (R)	Irreversible impact (IR)	Low (L)	Medium (M)	High (H)	No impact (0)	Insignificance (Ns)	Significant (Sp, Sn)
0		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Environmental impact assessment																									
Physical reserve	**Climate change**		N	D		P			M			L		H					IR			H			Sp
	Air pollution		R		ID	P			M			L		H					IR			H			S
	Noise pollution	L		D		N	Nil					L		H					IR	L				Ns	
	Changes of surface water regime and reserve																						0		

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	Surface water pollution																						0		
	Underground water regime and reserve changes	L			ID	P				H		L		H						IR		H			Sp
	Underground water pollution	L					Nil				M					L		R		L				Ns	
	Soil composition and nutritional changes	L		D		N	Nil						E			L		R			M		Ns	
	Soil erosion, pollution	L		D		N	Nil				M					L		R		L				Ns	
	Changes in landscape	L		D		N	Nil					L		H					IR					Ns	
	Change in natural visual amenity																						0		
	Subsoil, changes in geological formation	L		D		N						L		H					IR	L					Sn
	Natural mineral resource loss		R		ID	P			M			L		H					IR			H			Sp

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
ecology	**Plant growing environmental degradation**	L				N	Nil						E	H				R						Ns	
	Extinction of a rare and endangered plants species																						0		
	Pasture plants, pasture depletion																						0		
	Habitat destruction	L		D		N		L				L				L		R		L				Ns	
	Extinction of rare and endangered species	L			ID	N		L				L				L		R		L				Ns	
	Change in ecosystem	L			ID		Nil					L				L		R		L				Ns	
Social impact assessment																									
Health	**Improvement of health care service quality**		R		ID	P			M			L		H					IR			H		Ns	
	Loss of worker safety	L		D		N				H							Uc			L					Sn
	Loss of population safety	L		D						H				H						L					Sn
	Population exposure to toxic substances and materials	L		D	ID	N			M		M						Uc	R		L				Ns	

0		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	Citizens subjected to emotional stress, mental illness	L		D		N		L			M						Uc	R		L				Ns	
Life valuables	**Increase employment opportunities and improving living standards**	L		D		P			M			L		H					IR			H		Ns	
	Improve the living and working environment of the population		R		ID	P			M			L		H					IR			H		Ns	
	Favorable business environment		R	D		P			M			L		H					IR			H		Ns	
	Increase of state and local budget income	L	R & N	D		P		L				L		H					IR			H		Ns	
	Support for local development	L		D		P			M			L		H					IR			H		Ns	
	Raising resettlement issues																						0		
	Loss of livelihood of locals																						0		

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	Destruction of historical, cultural heritage, archeological things and monuments																						0		
	Affecting state protected areas																						0		
Human consumption valuables	**Land utilization**	L		D		N				H	M			H				R				H		Ns	
	Issues encountered in animal husbandry																						0		
	Difficulty rising to reach water sources																						0		
	Increasing energy supply	L	R	D		P			M			L		H					IR			H			Sp
	Increase in manufacturing areas	L	R	D		P			M			L		H					IR			H			Sp
	Increase in highway traffic load	L		D		N	Nil					L		H					IR			H		Ns	
	Intefering civilian, organization communication and collaboration	L		D		N	Nil				M									L				Ns	

Source: Assessment team of supplementary clarification of DEIA, 2016

4.2.3 Social impact

4.2.3.1 Health

Health care service

The project operations are not affecting social health negatively but improves energy supply and reliability in the region /R/ thus have positive /P/ influence on health service quality and capacity. Eventhough medical service provided for wind farm's few employees will increase medical service, it will not cause load on the operations of health organization.

Employee safety

Everyday employees commute to work by plant employee bus from Ulaanbaatar. Employees may suffer loss of health and life by potential road accidents. Road accidents occur due to unfavourable road and weather conditions /slippery road, snow, icy, muddy/, weather phenomenon /snowing, raining, snow and dust storms, sudden drop of temperature, fog causing poor visilibity/. Specifically, above conditions occur during autumn, winter, spring season usually. On the other hand, road accidents mainly depend on driver's skillfulness and responsible conduct of road safety rules. Therefore, it's very important to ensure vehicle transportation safety.

Employees may suffer risk of injury and loss of life due to falling from high ground and getting struck by high voltage. This will mainly depend on operational safety guideline compliancy.

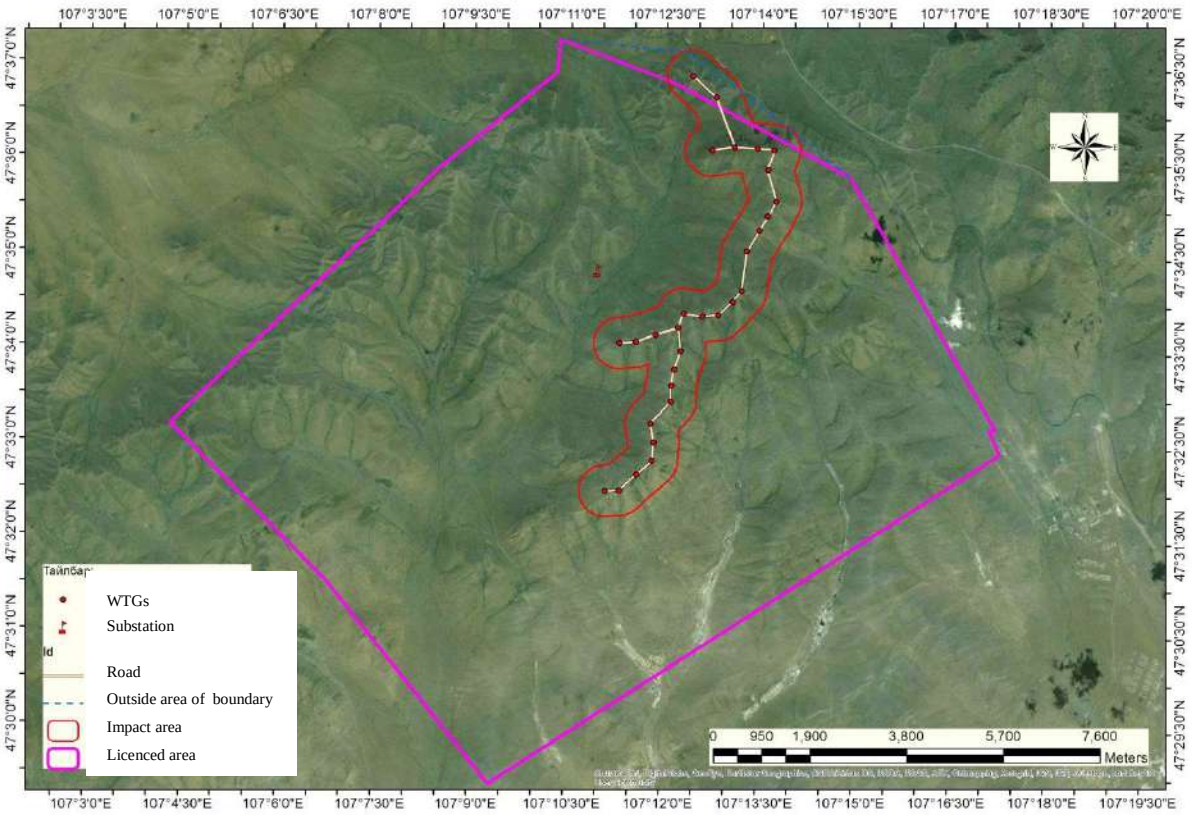
Getting involved in accident is assessed as a significant negative impact /Sn/, even if there is a low probability /L/ of potential risk occurrence without ensuring regular employee safety.

Population safety

Local residents may suffer accident and injury during operational phase of the project. Risks arising conditions make come together from plant's vehicle traffic, high voltage facilities, transmission lines and icing of WTG's blades. For example: road accidents may pose a risk for local residents as plant vehicles using local roads. It cannot be denied to have instances where residents, not knowing the impact of possible malfunction of safety measures, getting affected by the electro magnetism in the vicinity of high voltage facility and electrocuted by contacting it without authorization.

In spring and autumn, rain/wet snow form icicles on the blade of WTG are which gets thrown by the rotation and may cause loss of life and injury to people and animal in the surrounding. The plant has established safety distance at 300 m and working on establishing a safety zone of 500 m which inhibits entry of local residents during autumn, spring when icicles form. The risk arising impact within local region /L/ is direct /D/ with high magnitude /H/ and can have low probability /L/ of temporary occurrence seasonally. Evaluation is made on the basis of specific information /H/ that icicles form during spring, autumn and incurred injuries and health loss by the impact.

Due to risks associated with population health, the impact is assessed as having a negative significance /Sn/.



Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 4.5 Risk impact zone

Impact of toxic substance, material

After certain period of time, lubricants used in wind farm's equipments need to be replaced and removed. Plant's operational waste oil is stored in a purpose built containers located in security court and delivered to "Altan Orshih Group" LLC's "Ahui mandal" oil processing plant in accordance with contract. There will not be any negative impact when replacing and removing equipment oil and lubricants according to operational safety guidline. If above operation fail, then the leakage in the vicinity will have contaminating effect on water and soil where people and livestock will be impacted toxically by this contaminated environment. Plant is equipped with underground safety container to collect potential oil leakage via pipe from substation's equipments. The amount of toxic substance leakage can be kept low and measures can be taken to mitigate negative impact. Therefore, negative impact is assessed as insignificant /Ns/.

Impact on resident mentality

Plant's WTG's daily operation is limited to repairs, services and monitoring inside its own field, control building, substation or outside by fixed routine. In other words, no activities are held to

directly affect outdoor activities of local residents. Regular communication is not necessary with locals. Herders are prohibited to reside within the forbidden zone during spring and autumn. It will not cause psychological stress for locals as its purpose is to protect their lives and health. In terms of pasture utilization, it is beneficial to herders as the pasture in the vicinity of WTG's can be used with the exception of icicle forming phase in above seasons.

The noise level, to railway workers residing nearest to WTG's at 600 m distance, is meeting standard set of the environment, health and safety /EHS/ guideline by international finance corporation, as stated[1] on the previous environmental assessment. The noise level at 500 m distance from the WTG is determined at equivalent of 18-30 dB (A) by calculating measurements of monitoring conducted by the plant. This is within acceptable level of MNS 4585:2007 standard. However it cannot be denied that noise level could increase due to equipment failure and damage.

In addition, annual time of WTG's Blade shadow flickering frequency is calculated by simulation and concluded that it will not have considerable impact on the nearby residences. However, monitoring is in need, whether it's affecting residents.

Based on above assessment, it is possible not to impact on local residents mentality /Ns/.

4.2.3.2 Life valuables

Employment, standard of living

A large number of people have been employed to construct wind farm. In total, "Clean energy" LLC employes more than 30 people during operational phase. The company is contributing to improve livelihood of these people by providing permanent employment.

Living and working environment

As power supply becoming more stable and reliable; power shortages such as power outage and low voltage decreases; thus improving home, workplace conditions which resulted in a beneficial way increasing work productivity for the consumer receiving energy from the Nalaikh's electric substation. It is certain to have positive /P/ impact over long time /L/ indirectly /ID/ within the region /R/.

Business environment

Conditions to expand business environment and to increase service and production are coming together, as power supply improves and population receives stable source of power.

On the other hand, income created from spare parts, lubricant materials and food supply services for other enterprises and enterpreneurs in association with plant operation.

[1] ESIA report of wind farm project, Sunny Trade LCC, 2012

National, local budget income

Investment payback process continues as plant operational net income amounted to 24 billion MNT in 2015, further will create positive impact /Ns/ by contributing to national and local budget income.

Local development

Supplying stable energy increases energy capacity in the local area, due to stabilized supply, manufacturing and service organization florishes and it creates favourable conditions to increase new manufacturing and services; and this is the main contribution /Ns/ to local development in the long term.

Resettlement issues

Wind farm will not carry out new construction activities; therefore will not affect /0/ resident settlements.

Local residents living standard

The area was used only for grazing and local herders mainly come during summer, autumn season to use pasture even though the ownership of the area was transferred to wind farm; two families settle to utilize pasture in the vicinity over the year. Winter settlements of these families located 2-4 km of distance from WTG's.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 4.6 Herder Batsukh's autumn settlement/from west side/, winter settlement can be seen on the north eastern side of the mountain.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 4.7 Herder Chuluuntsetseg spends the winter on the north western side of the Substation

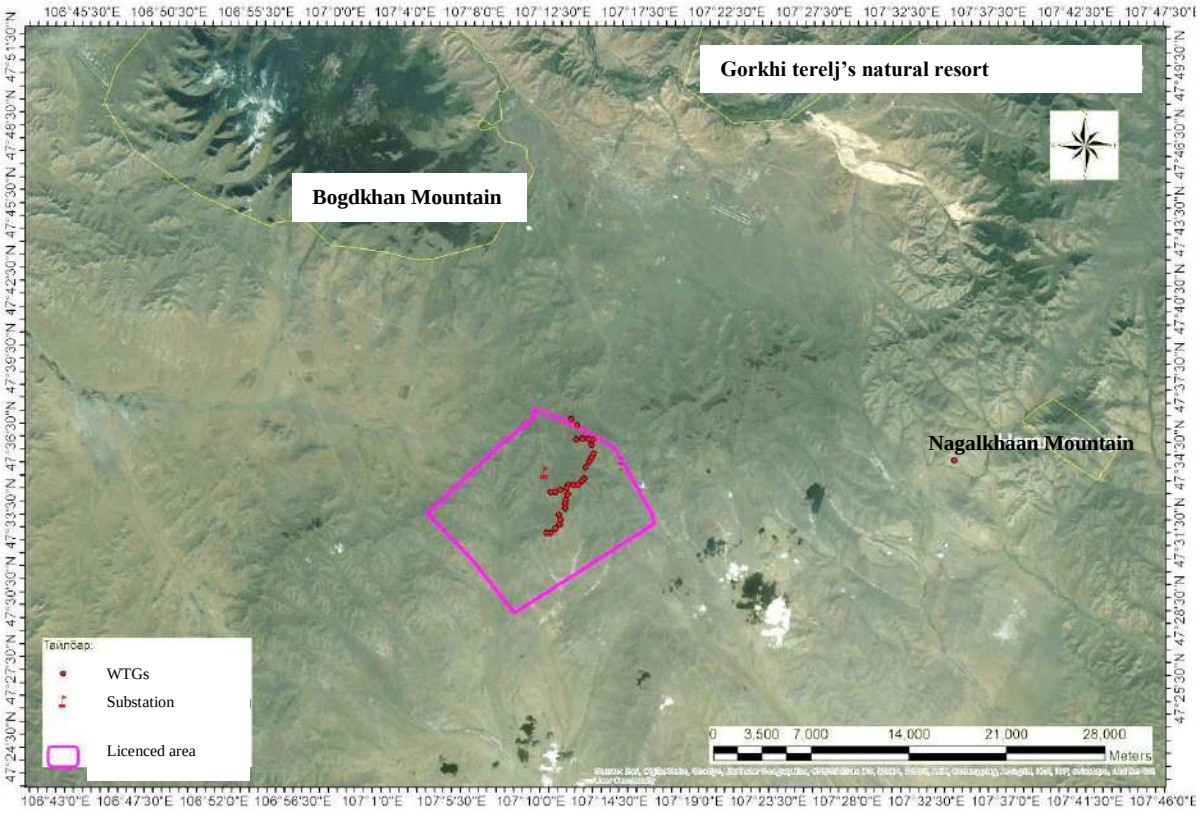
There is almost no change in pasture utilization. Herder's livestocks graze everywhere in plant owned area. Main usage of the land by the residents basically haven't changed, thus it can be seen that plant does not affect negatively /0/ on their livelihood.

Historical and cultural heritage, archaeological objects and monuments

Few cultural heritages existing in the project site has been noted in the previous chapter. Constructing unpawed roads between WTG's in the project owned land during project construction phase and forming fixed route on other roads limiting vehicle/people traffic movement therefore causing no impact /0/ on natural landscape and cultural heritages.

National special protected areas

Protected Bogdkhan Mountain is nearest at 13 km, Gorkhi terelj's natural resort at 24 km, Nagalkhaan Mountain natural reserve located at 28 km. Especially there will be an occurrences of Bogdkhan Mountain animal movements passing through and settling in the project site. For example: there is information of deers coming to calve in the vicinity of birch groves during first month of summer. Therefore this area should be considered as dependent to the protected area. Special consideration is needed as protecting the animals in this area has the same significance as protecting animals inside protected area.



Source: Assessment team of supplementary clarification of DEIA, 2016

Table 4.3 The location of National Protected Areas

Local Protected Territory

Because the protection of the natural wealth and resource of this area is of great importance, Salkhit uul area in Tov aimag is locally protected. In addition, on the south of this place exist other local protected areas such as Khuts Uul, Khuree Zulegt and Zulegt Uul.

Source: http://mne.com/

If the protection procedure and regime are followed, project activity may not adversely affect the national and local protected areas.

4.2.3.3 Human valuables

Land use

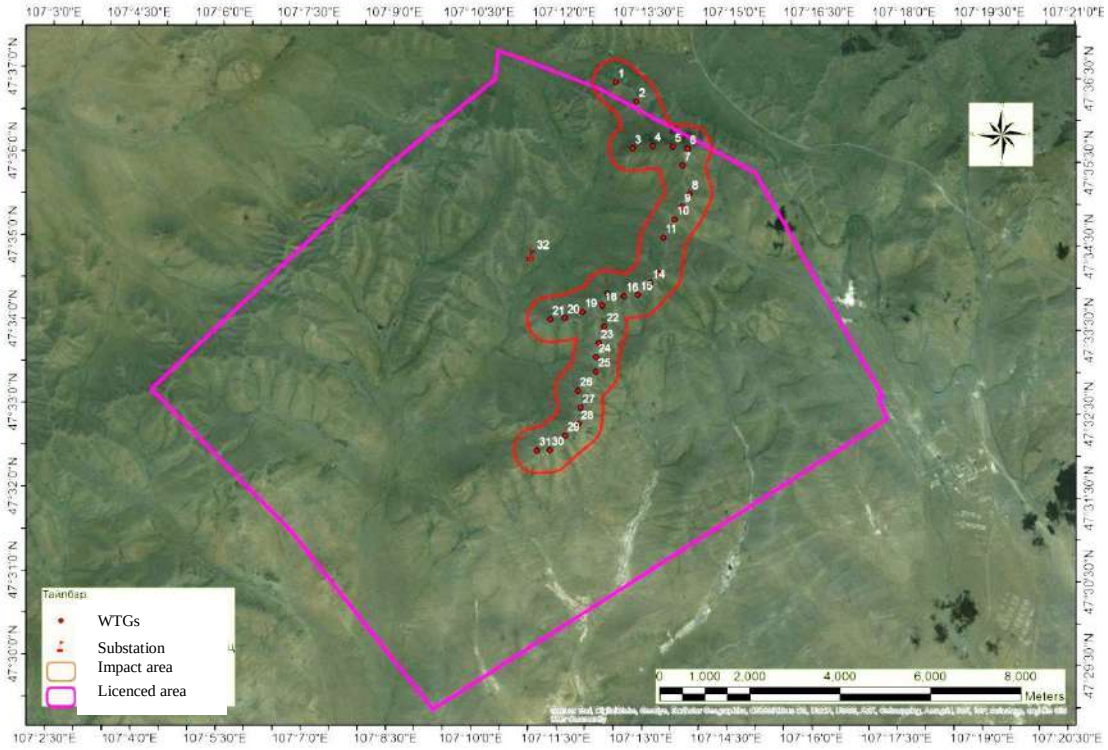
12910.9 hectare area is possessioned by "Newsom" LLC for the construction of wind farm by the ordinance 1/387 of August 25, 2009 of Governor of Tov Aimag. Based on the directive of this owned land, on February 20, 2012, three-party agreement is made between the governor of Sergelen soum of Tov aimag, "Newsom" LLC and its subsidiary "Clean Energy" LLC to use land number НК-КЭ-12/14 for the construction and operation of wind farm. Henceforth, "Clean Energy" LLC is utilizing 12910.9 hectares area owned by "Newsom" LLC.

Furthermore, the ordinance 65 of March 29, 2012 of Sergelen soum of Tov aimag states that "Newsom" LLC own 68 hectares area for the purpose of protection zone for overhead power line.

Also, in accordance with the agreement НК-К9/12-77 of December 17, 2012 of Governor of Nalaikh district for land use, "Newsom" LLC allowed "Clean Energy" LLC to use 14.4 km strip of land for "the protective strip of overhead power line".

Thus, based on above legal document, land is used as a protective strips for the operation of Wind Power Station and overhead power line.

Regarding the land use on the approved area, it appears that 1 and 2nd WTG are built within 150-300 m outside the eastern border of the area for the station operation. This location is in fact violating the norms inidcated in the above legal document of land possession and use. Moreover, hazardous impact zone of these WTG is laid 600 - 800 m outside the border of the possessioned land. This may become a problem for maintaining the normal operation of wind farm and ensuring the safety of the people because the land possession is not in place. From the power station side, there is no legal justification to prohibit individuals and institutions from settling, temporarily camping or herders from inhabiting in this area. However, it is possible for situations where security breach arises and people suffer occur.



Source: Assessment team of supplementary clarification of DEIA, 2016

4

Due to the fact that wind farm, the main component of the power station, are situated at the top of hills and roads connecting them are also located on upland area, the land in use is not a high degree in terms of biological productivity of pastureland and usage importance. In the previous environmental impact assessment it was calculated that approximately 30 hectares area would be taken out from the pastureland during the station operation. Above facilities location, road and parking cover the largest section of the area used by the station operation[1]

Special license is obtained for this area for the purpose of producing power, construction work is completed and the operation stage is in process for this station, thus, no activity will be carried out to use more area in the future. Unless vehicles run on the fixed route, pastureland will be reduced through plants overgrazing and soil erosion. If such situation is not created, pastureland will not be reduced in the future.

Some gold mines are situated on the south of the owned land, proving that there is an overlap of land ownership in this area. In other words, the land ownership conflict is created. Above conflicts affect land use locally /L/, directly /D/ and negatively /N/ and it has been a few months /M/. Since this conflict can be solved it has been concluded that this project had less significant impact /Ns/ to the land use.

[1] Black and Veach Environmental and Social Impact Assessment of the Salkhit uul Wind Park, Mongolia, 2008

Livestock farming

Herders come to use this place to graze and tend their livestock as they used to before. In spring and autumn, they herd their livestock 500 meters away from wind farm. That is the only restriction they apply. Nearby herders spoke that this restriction did not weaken the pastureland. This limitation is designed to ensure the health and safety of herders, thus there is no violation of their rights. That is why, we can regard that there is no impending obstacle to conducting pastoral cattle breeding.

Source: Assessment team of supplementary clarification of DEIA, 2016

4

Pasture water supply

There is no facility that hinders the path the grazing livestock take to reach their water supply. Grazing livestock are watered using hand-dug well and springs.

Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 4.8 Hand-dug well at the wind farm possessioned land

Station staffs are preparing to hand over the well drilled and used during the construction of wind power station to the local community. This will help the herders herd their livestock in a place with rare source of water as there will be a new source of water. Thus, it is possible that there is no adverse impact to the water source of pastureland.

Power supply

Approximately 170 million kilowatt hours power is produced per year and the capacity of power supply network is increased by 50 MW to ensure the stability and reliability. Since the impact of increased power supply will be local /L/, direct /D/, positive /P/ and long-term /L/, during the project operation, power will be produced in a way that has positive effect to the global warming and does not release toxic waste, which is an evidence that the project impact is of significant importance.

Industrial places

The wind farm supplies the produced power to the power distribution substation in Nalaikh district. Industrial and technology park of construction materials is planned to be established in Nalaikh district in the future; coal mine of Nalaikh is being prepared for operation; many industrial objects are planned to be built in Bagakhangai district. Power produced from the wind farm will be greatly necessary for the implementation of those above developmental projects. That is, necessary power resource required for starting new industrial places will be available and will provide opportunity for the growth of industrial places.

This positive impact /P/ will be local /R/, direct /D/ and long term /L/ so it is viewed to be significant /Sp/.

Road

Although road traffic slightly increases as a result of the station activity, there will be a very limited number of vehicles in a day that go for the direction of power station. Because of this, herders convenience, livestock grazing and path leading to the pastureland are not significantly affected /Ns/. In addition to using road between Nalaikh-Zuun mod, earth road going up to the substation

is used and some sections of this earth road had been extensively improved, so that local residents were able to use the road. Henceforth, this is a good impact that improved the local road network.

Organization and the community relations and cooperations

The station is located away from the local residential area, but close to the herders who use pasture rotation, which means that the station's daily activities do not affect other facilities, but do have close relationship with the herders. There is no direct business relationship between herders and the station workers, however, vehicle movement to and from the station may scare away animals grazing. The station requires to be outside the hazardous impact zone in the spring and fall, but herders who have not understood the requirement may show opposition.

Unless the station works cooperatively with the herders on the proper use of pastureland in the station owned area, the owned area may get overgrazed due to the fact herders come to the owned area in great numbers for grazing their livestock. On the other hand, the station can buy meat and dairy products from the herders for their consumption.

Because the wind power station is built for the first time in Mongolia and the station is located near the central part of the country with lots of population including interested people, it is possible that people coming in great numbers to see the station may hinder the station operation. For example, a large number of visitors visited the plant since the station was established.

4.3 Cumulative Effects

Cumulative effect assessment has been conducted by the previous environmental and social impact assessment. On that assessment, project impact is categorized into direct and indirect and the impact was assessed in relation to other projects. For example, the potential impacts were assessed and determined by relating to the projects such as International Airport Project at Khushgiin Hundii and Expansion project of wind power station.[1]

During the project activities there was no additional impacts on the impacts identified in the previous assessment, so it was thought that there was no need to change this assessment.

[1] Black and Veach Environmental and Social Impact Assessment of the Salkhit uul Wind Park, Mongolia, 2008

CHAPTER 5. RISK ASSESSMENT

5.1 Potential risk assessment

Risk assessment is a flexible management method for preventing from potential incident and is a complex process for making analysis on the hazards and potential accidents arising from the implementation of the project, planning measures to reduce and eliminate risk and preventing risk.

This risk assessment of wind farm is conducted using "Risk assessment procedure for hazardous and dangerous chemical substances" approved by the joint order 28/40/29 of Environment and Tourism Minister, Minister of Health, and the director of National Emergency Management Agency dated February 3, 2009, and "Methods of environmental impact assessment" and "Failure Modes, Effects & Criticality Analysis" approved by the order 11 of January 10, 2014 of the Minister of Environment and Green Development.[1]

The objective of risk assessment:

- Determine the risk of any incidents arising from the project activities affecting the people, environment and project operation.
- Determine whether emerging situation is considered as risk, identify the risk level
- Determine the management issues to mitigate potential risks.

It is sufficient only to perform industrial incident and risk assessment since the wind power station does not use chemicals.

Risk assessment is updated upon 2012 DEIA.

The following works are included in the analysis to be conducted on the incident of WF, its consequences and situation.

1. Specify the impacts of project environment and activities on the workers, population health, safety and environment, identify the critical incident and its consequences from the project activities
2. Estimate the potential incident on the station workers, population health and safety, and environment and its critical consequences using risk matrix and expert prognosis for the project operation.
3. Take into account the risk criteria in accordance with the risk matrix .
4. Identify which risk level is acknowledged so that mitigation measures can be taken, determine which risk level is not acceptable.

[1] http://fmea-fmeca.com/

5. Record and make a list of potential risks

Risk mitigation condition and recommendation on measures to undertake during and after the mitigation

Likelihood of potential accident

In addition to considering the buildings, machinery, equipment technology, employees and population settled near into the production system of WF, environmental hazards affecting the station are also taken into account. In order to consider, each risk instance for each section with potential risk from the WF system is registered as per corresponding issues. For instance, name of the element with potential risk, incident occurence, causes, forecasting of incident, the worst possible outcome, incident prevention meansures, incident frequency are included.

Main condition that incident may occur in the WF:

- Current voltage of network between the wind farm and substation is 0.69-35 kB
- Amplifying transformer voltage is 35-110 kB
- The voltage of substation to be connected to transmission network 35 - 110 kB
- Overhead line voltage 110 kB
- Materials for WF and employee transportation
- Thunder
- Flood
- Earthquake

We performed this assessment by relating the effects on employee, population health, environment, ecological component, and property to the potential risk likelihood in accordance with the instructions of detailed environmental impact assessment.

The first step of the assessment was to register potential incidents and risks by the main elements of the WF system.

Table 5.1 Accident risk assessment data

System element		Potential accident occurence	Potential accident cause	Predictibility (1...5)	Worst potential consequence	Prevention measure	Frequency
№	Name						
0	1	2	3	4	5	6	7
1.1	Transportation vehicle	Accident	Road condition negligence, over speeding, operating broken/incomplete vehicle, etc	1	Health worsening, death, damage to property	Doing technical inspection and repair service regularly, complying with traffic safety rules	Once in 2 years
1.2	Vehicle fuel tank and pipe	Fire	Damaged fuel tank and pipe, causing sparks by using wrong tools, violating fire and safety rules	1	Equipment setting on fire, damage to human health, fuel loss, environment contamination	Complying with safety rules when doing techical inspection and repair service	Once in 2 years
2.1	Wind farm's cable connection	Fire break out	Making incorrect connection incidentally, short circuiting	1	Loss of human health and life, damage to the property, decline in production	Connection, cable testing, conducting inspection, following operational safety guideline	Once per 2 years
2.2	Substation	Short circuiting equipment and facility of substation causing explosion and fire break out	Improper operation, weakening connection, heating, relay safety automation option, inadequate calculation and debugging, reconnection errors,	1	Loss of human health and life, damage to the property, decline in production	Correcting bad habits, introducing and implementing MNS OSDAS 18001:2012 standard, making operational safety signs/OPS/, wearing special arc lighting safety gear	Once per 2 years

0	1	2	3	4	5	6	7
2.3	Electrical testing equipment, management control system	Fire breakout and stop of the main and auxiliary equipment	Gauges and automatics getting out of order or not having information	1	Decline in production, failure and stoppage of main and auxiliary equipment	Tuning gauges and automatics within scheduled time, improve monitoring	Once per 3 years
2.4	WTGs	During autumn Icicles covering blades gets thrown	Interrupting normal operation	1	Human injury and loss of life, livestock and property damage	Prohibiting citizens entering hazardous impact zones during spring autumn season	More than one per year
3.1	Lightning, Fire	Fire, overvoltage, loss of health and life,	Deteriorated lightning protection, grounding, overvoltage protection, and not taken precautionary measures to counter fire break out.	3	Industrial facilities exposed to fire, destruction of properties, loss of human health and life, pasture exposure to fire	Monitoring integrity of lightning rods and grounding within stated date according to technical safety guideline /TSG/, developing lightning protection plan, testing and tuning overvoltage protection, to develop disaster emergency plan /DEP/.	Once per 20 years

0	1	2	3	4	5	6	7
3.2	Flood	Electrical grounding, underground connection short circuit causing equipment damage	Losing integrity of grounding, unprotected and deteriorated connections.	3	wind farm's Severed connections causing equipment's to stop and production to decline	Monitoring and inspecting the state of grounding and other connections, and developing disaster emergency plan.	Once per 20 years
3.3	Earthquake	Fire break out, environment polluting disaster	Power line connection break, short circuiting due to earthquake exposure measuring magnitude of 7 according to MSK rating of earthquake activation	5	Loss of human health and life, destruction of property, environmental pollution	Inspecting equipment and connection fitting integrity, monitoring and repairing power line connections, developing disaster emergency plan	Once per 500 years
3.4		Collapse of buildings, hazard due to plant equipment damage, plant stoppage	Equipment damage caused by collapse of building roof and walls due to earthquake impact exposure	5	Loss of human health life, destruction of property	Inspecting building and facility earth quake tolerance and making reinforcements in necessary locations, developing disaster emergency plan	Once per 500 years

Source: Assessment team of supplementary clarification of DEIA, 2016

Above registered and identified potential risks have been assessed and determined through specific criteria.

Risk assessment is made by dividing risk in 3, which are relative to human health, ecology and project operation. In doing so, incident index and impact consequence recipient index criteria are determined and used in the assessment.

Incident frequency index are determined according to following criteria.

Table 5.2 Criteria for determining incident frequency index

Incident frequency index		
Incident/year	Frequency index, and its description	
>1/1	5. Repeatable	May occur more than one within a year
From 1/10 to 1	4. May repeat	Up to 10 times of incidents may occur within 10 years
From 1/100 to 1/10	3. probable	May not occur during the project period
From 1/1000 to 1 /100	2. Maybe impossible	very rare case
From 1/10000 to 1/1000	1. Almost impossible	May occur in exceptional circumstances

Source: Assessment team of supplementary clarification of DEIA, 2016

Impact consequence recipient index are determined according to following criteria.

Table 5.3 Index describing criteria for event consequence

Receptor category	Consequence severity index				
	(А) Negligible	(Б) Low	(В) Moderate	(Г) High	(Д) Very high
Community health and safety	No effects on human health and safety. environmental phenomenon may occur.	Accidental injury and health effects to people requiring first aid treatment. Little inconvenience to the affected people	People injured and their affected healths require treatment. Serious environmental inconvenience may occur to affected people	People injured and their affected healths require long-term medical treatment and may result in fatality	Multiple fatalities and serious disabling illness to more than one people injured and their healths affected
Ecological componnent	Although there are occasional effects on the flora and	Reduction of abundance/ biomass of flora and fauna of the affected	Reduction of abundance/biomass of flora and fauna of the affected area, confined	Reduction of abundance/biomass of flora and fauna of the affected area, serious effects to	Irreversible non-recoverable change to the abundance/biomass of the flora

	fauna of the affected area, no ecological consequence is present	area, no change in the ecosystem	impact and damage to the ecological processes	ecological processes and biological species, though ecological system is recoverable, it will not be the same as the previous one before the impact	and fauna of the affected area
Project operation	Negligible financial damage to the property, value is less than 1 million tugrug	Financial damage of property is between 1 and 5 million tugrug.	Financial damage of property is between 6 and 10 million tugrug	Financial damage of property is between 11 and 20 million tugrug	Financial damage of property is more than 21 million tugrugs.

Source: Assessment team of supplementary clarification of DEIA, 2016

Above determined incident frequency index, impact consequence index criteria human health safety, ecological, project operational risk assessed in assessment matrix.

Table 5.4 Human Health Risk level assessment

Event Frequency Index		Event consequence severity index				
Events/Year	Frequency Index Descriptor	(А) Negligible	(Б) Low	(В) Moderate	(Г) High	(Д) Very high
> 1/1	5. Frequent	0	0	0	2.4	0
From 1/10 to 1	4. Repeated occurrence	2.3	1.2	0	1.1, 2.1, 2.2	0
From 1/100 to 1/10	3. May occur Once	0	0	0		0
From 1/1000 to 1/100	2. Unlikely to occur	0	0	0	3.1	0
From 1/10000 to 1/1000	1 Extremely unlikely to occur	0	0	0	3.3, 3.4	0
Notes:						
	Negligible risk					
	Tolerable risk					
	Risk Mitigation advisable					
	Risk Mitigation Mandatory					

Source: Assessment team of supplementary clarification of DEIA, 2016

The result of the risk level assessment for the human health shows that technical and technological condition during the operation of wind power station can create a risk level that affects human health and life. Repeated incidents, serious injury and fatality may occur due to the station

operation. Particularly, it is possible that damage can be done to human health and life during vehicle operation, high voltage work, flying ice from the WTG blade, thunder and earthquake.

Table 5.5 Ecological Receptor Risk level assessment

Event Frequency Index		Event consequence severity index				
Events/Year	Frequency Index Descriptor	(А) Negligible	(Б) Low	(В) Moderate	(Г) High	(Д) Very high
> 1/1	5. Frequent	0	0	2.4	0	0
From 1/10 to 1	4. Repeated occurrence	1.2	0		0	0
From 1/100 to 1/10	3. May occur Once	0	0	0	0	0
From 1/1000 to 1/100	2. Unlikely to occur	0	0	3.1	0	0
From 1/10000 to 1/1000	1 Extremely unlikely to occur	0	0	0	0	0
Notes:						
	Negligible risk					
	Tolerable risk					
	Risk Mitigation advisable					
	Risk Mitigation Mandatory					

Source: Assessment team of supplementary clarification of DEIA, 2016

As for the ecological receptor, in the fall and spring, there can be potential event where livestock pasturing near the wind farm may get hit by flying ice from the wind mill blade and environment may get polluted due to vehicle fuel loss.

Table 5.6 Project Operation Risk level assessment

Event Frequency Index		Event consequence severity index				
Events/Year	Frequency Index Descriptor	(А) Negligible	(Б) Low	(В) Moderate	(Г) High	(Д) Very high
> 1/1	5. Frequent	0	2.4	0	0	0
From 1/10 to 1	4. Repeated occurrence	0		1.2, 2.1, 2.3	1.1	2.2
From 1/100 to 1/10	3. May occur Once	0				0
From 1/1000 to 1/100	2. Unlikely to occur	0		3.2		3.1
From 1/10000 to 1/1000	1 Extremely unlikely to occur	0	0	0	0	3.3
Notes:						
	Negligible risk					
	Tolerable risk					

	Risk Mitigation advisable
	Risk Mitigation Mandatory

Source: Assessment team of supplementary clarification of DEIA, 2016

According to the result of the risk level assessment for the project operation, accident may occur in a way techniques and technology get damaged and economical difficulties due to accident may be significant. This is associated with the high cost of the techniques and technology. The accident may also cause shortage in spare parts and financial difficulties. In other words, it is possible to cause economical difficulties.

5.1.1 Accident risk level

The level of potential risk to the wind farm is assessed by the following criteria and management measures to be implemented for the risk is discussed.

Table 5.7 Criteria for assessing risk level and defining risk management

Risk level		Risk management strategy
	Negligible Risk	Relative risk level is considered negligible and therefore acceptable. No mitigative action warranted, but periodic monitoring warranted to document and verify stability of risk level.
	Tolerable Risk	Relative risk level is considered tolerable. No mitigative action warranted, but regular monitoring warranted to document and verify stability of risk level.
	Risk Mitigation advisable	Relative risk level is considered unacceptable. Reassess to verify, consider uncertainties, and develop options to mitigate risks to a tolerable level as a minimum.
	Risk Mitigation Mandatory	Relative risk level is considered unacceptable. Develop mitigative options, select and implement the preferred option with an aggressive schedule to mitigate risks to a tolerable level as a minimum.

Source: Assessment team of supplementary clarification of DEIA, 2016

By the risk assessment of WF, high-level risk affecting the human health and project operation must be mitigated.

Risk assessment summarised result is listed and shown in the following table.

Table 5.8 Incident risk assessment summary

System element		Potentially adverse event	Reason(s) for potential event	Event predicability (1...5)	Plausible worst case consequence	Existing protective measures	Frequency index	Risk level assessment		
№	Name							Risk to community health and safety	Risk to ecology	Risk to project operation
0	1	2	3	4	5	6	7	8	9	10
1.1	Vehicle	Accident	Not considered road condition, exceeding speed limit, performing work with incomplete vehicle	1	Human health worsening, fatality, property damage	Perform regular inspection, control and maintenance, comply with road safety rules	4			
1.2	Vehicle fue container, hose	Fire	Vehicle fuel tank and hose damaged and punctured, used improper tools in maintenance work causing sparks, violated fire and safety rules	1	Vehicles caught up in fire, damage to human health, fuel loss, environmental pollution	Follow safety rules when performing inspection and maintenance on vehicle	4			

0	1	2	3	4	5	6	7	8	9	10
2.1	Cable connections of wind power station	Fire	Accidentally misconnect the cables, short-circuit	1	Damage to human health and life and property, reduced production	Check and inspect the connections and cables, follow safety rules	4			
2.2	Substation	Short-circuits to substation equipment and facilities causing blasts and fire	Malfunction, connections weakened and got heated, incomplete correction of automatic selection and calculation of relay protection, switch error	1	Damage to human health and life, damage to property, reduced production	Correcting wrong habits, introducing and implementing the standard MNS OSDAS 18001:2012, making safety signage, using arc flash protective clothing	4			
2.3	Electrical measuring equipment, management control system	Main and auxiliary equipment shut down and caught up in fire	Gauges and automatics not functioning or not showing information	1	Reduced production, main and auxiliary equipment damaged and shut down	Perform gauges and automatics adjustment on time, improve control	4			

0		2	3	4	5	6	7	8	9	10
2.4	Wind farm	In the fall, ice is formed on the mill blade and gets flown	Disturbs normal operation	1	Person gets injured, loss of human life, damage to livestock and property	Prohibit people from entering to dangerous impact zone during spring and fall	5			
3.1	Lightning, fire	Fire, overvoltage, damage to human health and life	Lightning protection, earthing, and overvoltage protector are deteriorated, fire preventive measures are not taken	3	Fire on plant facilities, property loss, damage to human health, loss of human life, wildfires	The condition of lightning arrestor and earthing to be checked within the time set in the technical safety rules, design lightning protection plan, check and adjust overvoltage protection, create disaster readiness plan and work as per the plan	2			
3.2	Flood	Short-circuit to electrical earthing and connections causing fire on equipment	Good condition of earthing is weakened, connections deteriorated and unprotected	3	Connection of wind power station gets disrupted, equipment gets in non-working condition, reduced production	Check and inspect earthing and other connections, create disaster readiness plan and work as per the plan	2			

0	1	2	3	4	5	6	7	8	9	10
3.3	Earthquake	Hazards of fire and environmental pollution	belongs to the seismic zone 7 on MSK scale, thus affected by the earthquake resulting in electrical lines disruption and short-circuit	5	Damage to human health, loss of human life, property loss	Inspect the equipment connection adjustments and condition, check and repair electrical lines connections, create disaster readiness plan and work as per the plan	1			
3.4		Buildings collapse, station equipment damage, station operation shutdown	Due to earthquake impacts, building roofs and walls fall and collapse, equipment gets damaged	5	Damage to human health and life, property loss	Inspect buildings for earthquake resistance, put additional reinforcement in required areas, design disaster readiness plan and work as per the plan	1			

Source: Assessment team of supplementary clarification of DEIA, 2016

When considering the potential accident risk level of WF by the areas with potential risks of production system, it is evident that vehicle usage and operation, power distribution facilities and wind farm may affect human health and life, their risks level is considered unacceptable and that mitigative options need to be developed by special professionals, and that actions with an aggressive schedule to mitigate risks to a tolerable level as a minimum need to be implemented. Furthermore, natural disaster /lightning, earthquake/ occurrence is the main factor that magnifies the risks.

Also, wind power station affects ecology slightly negatively, thus it is seen that risk to the ecology is slight from the station.

You should consider that the risks to the vehicles of wind power station, power distribution facilities and wind farm may disturb the station operation and damage property and that natural disasters such as lightning and earthquakes create conditions for risk occurrence that damages property.

Let's consider the risk mitigation method by the areas of wind power station which pose potential risk.

Accident and risk mitigation and prevention measures

Risk management measures that consider each type of potential accidents based on the risk assessment result of the potential production accident should be implemented. Herein:

1. *Usage and operation of vehicles*. It is important to regularly carry out technical inspection and maintenance and to always follow the road safety rules. Developing and complying with the safety rules are the main ways to prevent potential accident and to protect human life and property loss.
2. *Cable connections of wind power station.* Current voltage is high /0.69-35 kW, so check and inspect connections and cables, following the safety rules will reduce the risks of electric shock and damage to human health and property.
3. Substation. Electric current voltage is 35 kW...110 kW. Therefore, it is important to use arc flash protective clothing and develop the habit of protective clothing usage, to work according to the safety rules and regulations and work instruction, to strictly maintain the practice and fulfillment of work discipline, correct the bad habits, introduce and implement standard MNS OSDAS 18001:2012, and to prevent from potential risk by making safety signages.
4. *Electrical test equipments,, management monitoring system.* Fine-tuning of gauges and automatics needs to be done within scheduled time, improve monitoring, operate in compliance with operational safety guideline.
5. *WTG's.* In spring and autumn, icicles formed on the blade can be thrown to cause injury to health,life of human and lifestock, and damage to property. Therefore, residents needs to be prohibited to enter danger zone during the spring and autunm seasons.

6. Lightning, fire. Due to high lightning activity in the region, the integrity of lightning rod, grounding has to be inspected within a stated timeframe as shown on the technical safety rule, developing lightning protection plan, inspecting and tuning over voltage protection, and needs to develop emergency response plan. Also there is a posibility of wild fire or becoming a source of fire, therefore fire safety equipments, equipments to extinguish fire, precautionary measures, trainings and spreading awareness needs to be stated in the emergency response plan and should be implemented.
7. *Flood.* During flood, monitoring and inspections needs to be carried out for grounding and underground connections; emergency response plan needs to be developed and ran.
8. *Earthquake.* Grounding and other connections needs to be monitored and inspected; buildings and facilities should be inspected for earthquake durability and additional reforcemenets has to made on necessary pl.aces; ; emergency response plan needs to be developed and ran.
9. Emergency fund. Preventing from potential risk, mitigating risk, founding a "emergency fund" for management activities and financing relevant activities.

5.2 Risk assessment for hazardous and toxic chemicals

Gas and liquid chemicals are used in equipment installed in this WF and assessing the potential risks arising from potential accidents, hazards and toxic substances that may be produced during receiving, usage, storage and destroying those chemicals is considered as one of the important works of environmental impact assessment.

Delineating the characteristics, spread, receiver and exposure for the two materials used in wind power station and measures for assessment test performance, risk level identification, risk prevention and adverse impact mitigation should be determined in the order mentioned above.

Given that sub-station is located in areas with secure fences wild animals and small animals in food chain are not vulnerable to exposure. Therefore ecological risk assessment and calculation are not required.

Since the application range of chemical material covers the equipment installed within the secure fences of substation, only workers may get exposed to sulfur hexafluoride while changing transformers oil, thus risk assessment of hazardous and toxic chemicals can be included in the population /workers/ risk assessment.

5.2.1 Population risk assessment

Population risk assessment is considered in the following order:

1. Determine the risk issues
    a. Analyze chemical substance
    b. Identify the spread of contaminants in environment
    c. Determine exposure ways
    d. Analyze the receivers

2. Perform exposure assessment
    a. Carry out toxicological assessment
3. Risk characterization

Identify measures to reduce and eliminate risk harmful effect and define recommendation

5.2.1.1 Risk issues

GIS-gas insulated switchgear of 110 kW used in WF is the latest technology that is recently introduced into Mongolian Energy Sector. The switchgear uses gas sulfur hexafluoride (SF6), so it is considered as ecologically efficient with minimal environmental impact. We made an effort to determine the characteristics and effects of this gas. Furthermore, we determined the characteristics of special oil that is used in 110 кВ 50 MBA transformer.

A contract is made with professional organization for the service to replace above gas and oil within specific intervals.

Characteristics of above mentioned gas and oil used in this station and properties and impacts of substances are determined using chemical data sheet.

Sulfur Hexafluoride

Sulfur hexafluoride is used in GIS-gas insulated switchgear of this WF. This gas is inspected every 3 years and replaced if necessary. The gas is replaced as per the maintenance contract of State-owned joint stock company and "National center for Power Transmission". Only professional organization carry out this activity.

CAS Registry Number 2551-62-4

Phycical and chemical properties:

Molecular formula: SF_6

Composition and information on ingredients: Maximum Impurities < 0.02% None of the trace impurities in this product contribute significantly to the hazards associated with the product.

Sulfur Hexafluoride is a colorless, odorless, non-toxic, nonflammable, liquefied gas.

Gas density: at 20°C and 1 atm: 6.17 kg/m^3

BOILING POINT @ 1 atm (Sublimation Point): -63.7°C

FREEZING/MELTING POINT -50.8°C

SOLUBILITY IN WATER 25°C:0.001

MOLECULAR WEIGHT:146.05

EVAPORATION RATE:Not applicable

TOXICOLOGICAL INFORMATION

Standard human toxicity values are not available.

SUSPECTED CANCER AGENT: not found

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of Sulfur Hexafluoride on the human reproductive system.

The main health hazard associated with releases of this gas is asphyxiation, by displacement of oxygen. The liquefied gas will rapidly boil at standard temperatures and pressures. This product is not flammable or reactive under typical situations, but under emergency situations.

The most significant route of over-exposure for this gas is by inhalation.

INHALATION: High concentrations of this gas can cause an oxygen-deficient environment. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. When oxygen content in the atmosphere decreases below 6% the following can happen: convulsive movements, possible respiratory collapse, and death.

HEALTH EFFECTS OR RISKS FROM EXPOSURE:

ACUTE: The most significant hazard associated with this gas is inhalation of oxygen-deficient atmospheres. Symptoms of oxygen deficiency include respiratory difficulty, ringing in ears, headaches, shortness of breath, wheezing, headache, dizziness, indigestion, nausea, and, at high concentrations, unconsciousness or death may occur. The skin of a victim of over-exposure may have a blue color.

CHRONIC: There are currently no known adverse health effects associated with chronic exposure to this product.

FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS PRODUCT WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus should be worn. Remove victim(s) to fresh air, as quickly as possible. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Only trained personnel should administer supplemental oxygen.

SKIN EXPOSURE: If Sulfur Hexafluoride gas or liquid contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek immediate medical attention. Frozen tissue is painless and appears waxy, with a possible yellow color. Frozen tissue will become swollen, painful and prone to infection when thawed. If the frozen part of the body has been thawed by the time medical attention has been obtained, cover the area with a dry sterile dressing and a large bulky protective covering.

EYE EXPOSURE: If liquid is splashed into eyes, or if irritation of the eye develops after exposure to liquid or gas, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Seek medical assistance immediately, preferably an ophthalmologist. Victim(s) must be taken for medical attention. Rescuers should be taken for medical attention, if necessary.

ECOLOGICAL INFORMATION.

ENVIRONMENTAL STABILITY: The gas will be dissipated rapidly in well-ventilated areas.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Any adverse effect on animals would be related to oxygen deficient environments.

EFFECT OF CHEMICAL ON AQUATIC LIFE: Currently, there is no known adverse effect on aquatic life.

FIRE-FIGHTING MEASURES.

FLASH POINT: Not applicable.

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): Not applicable.

Upper (UEL): Not applicable.

FIRE EXTINGUISHING MATERIALS: Non-flammable, inert gas. Use extinguishing media appropriate for surrounding fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Sulfur Hexafluoride does not burn; however, containers, when involved in fire, may rupture or burst in the heat of the fire. Products of thermal decomposition of this product include toxic gases (i.e. sulfuryl and thionyl fluorides).

SPECIAL FIRE-FIGHTING PROCEDURES: Structural fire-fighters must wear Self-Contained Breathing Apparatus and full protective equipment.

Accidental release measures

LEAK RESPONSE: Evacuate immediate area. Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a leak, clear the affected area, protect people, and respond with trained personnel.

Minimum Personal Protective Equipment should be Level B: Self-Contained Breathing Apparatus. Locate and seal the source of the leaking gas. Allow the gas, which is lighter than air to dissipate. Monitor the surrounding area for oxygen levels. The atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus. If leaking occurs incidentally from the cylinder or its valve, contact your supplier.

DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Return cylinders without any residual product to Air Liquide. Do not dispose of locally. For emergency disposal, secure the cylinder and slowly discharge the gas to the atmosphere in a well-ventilated area or outdoors.

TRANSPORTATION INFORMATION

This material is hazardous as defined by 49 CFR 172.101 by the U.S. department of transportation.

PROPER SHIPPING NAME: Sulfur Hexafluoride, compressed

HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)

Нийлүүлэлтийн тусгай мэдээлэл.

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles present serious safety hazards and should be discouraged.

REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS:

- Sulfur Hexafluoride does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82).
- Sulfur Hexafluoride is not listed as a Regulated Substance, per 40 CFR, Part 68, of the Risk Management for Chemical Accidental Release Prevention.
- Sulfur Hexafluoride is not subject to the reporting requirements of Section 112 (r) of the Clean Air Act.
- Sulfur Hexafluoride is not listed in Appendix A as a highly hazardous chemical, per 29 CFR 1910.119: Process Safety Management of Highly Hazardous Chemicals.

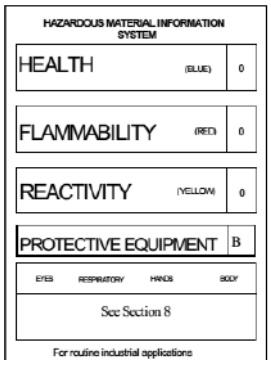
Other information.

NFPA rating

Flammability

Health

Reactivity



Other

Sulfur Hexafluoride is not included in the hazardous and toxic chemical substance classification approved by the appendix of the joint order A/356/396 of the Minister of Environment, Green development and Tourism and the minister of Health and Sports. Thus, risk assessment is not needed.

Sulfur Hexafluoride is used in GIS-gas insulated switchgear that is located outside in the open area and is inside the tight sealed equipment. Professional organization monitors the operation and carries out gas/oil replacement. Main impact is the oxygen deficiency caused by leakage into the surrounding atmosphere. When this gas, lighter than air, easily dissipates and leaks into the atmosphere, above impact may be less. However, complying the safety rules is mandatory. When the latest equipment made by the modern advanced technology is working normally, it is unlikey that loss of gas occurs. Only, it is important to remember to ensure no leakage of sulful hexafluoride into atmosphere and to work with full personal protective equipment.

Transformer oil

Specification of insulating oil as an industrial lubricant with a brand name F&Y made in China is provided and this insulating oil is used as a base oil in transformer oil. Specification of this oil meets the requirement of standard IEC 296. This oil is transparent, dry and has no impurity.

Transformer Oils manufactured by Panama Petrochem Ltd are from selected, severely Hydrotreated Naphthemc & Isodewaxed / Hydrocracked Paraffinic Oils and Naphthenic Oils that are free from polar compounds, having high oxidation stability and ageing properties. The ultra low sulphur and wax free Naphthenic Oils/Paraffinic oils along with low Viscosity Index ensure excellent cooling characteristics, high solvency and low corrosivity. These optimally refined Transformer Oils also possess very good electrical and insulating properties, oxidation stability and controlled low or negative gassing tendency.

Chemical Name : HYDROCARBON MINERAL OILS.

CAS No 8012-95-1

POTENTIAL HEALTH EFFECTS:

EYE : Not expected to cause prolonged or significant eye irritation.

SKIN : Contact with the skin is not expected to cause prolonged or significant irritation. Not expected to be harmful to internal organs if absorbed through the skin.

INGESTION : Not expected to be harmful if swallowed.

INHALATION : Contains a petroleum-based mineral oil. May cause respiratory irritation or other pulmonary effects following prolonged or repeated inhalation of oil mist at airborne levels above the recommended mineral oil mist exposure limit.

ENVIRONMENTAL FATE: This material is not expected to be readily biodegradable.

DISPOSAL CONSIDERATIONS: Oil collection services are available for used oil recycling or disposal. Place contaminated materials in containers and dispose of in a manner consistent with applicable regulations. Contact your sales representative or local environmental or health authorities for approved disposal or recycling methods.

Transformer oil is not included in the hazardous and toxic chemical substance classification approved by the appendix of the joint order A/356/396 of the Minister of Environment, Green development and Tourism and the minister of Health and Sports. Thus, risk assessment is not needed.

However, it is important to take actions to mitigate the adverse impacts mentioned in above descriptions when transformer oil leaks and is being replaced.

CHAPTER 6. AVOIDING NEGATIVE IMPACT, MITIGATING AND ELIMINATING IMPACT, RECOMMENDATION OF MEASURES FOR SUPPORTING POSITIVE IMPACT

Change in project site environmental baseline, current baseline condition and potential project negative impact on environment, society, human health are determined, assessed then evaluted to provide following recommendations for project proponent by relevant field experts.

- Utilizing studies on the previous chapter of the detailed environmental impact assessment's supplemental clarification report, assessment evalution, this recommendation and environmental management plan to scrutinize and implement annual environmental protection work,
- Allocating necessary fund for environmental protection activity in the annual budget,
- In case of expansion and renovation of the wind farm's activites, general environmental impact assessment needs to be conducted and relevant measures should be carried out,
- Introducing environmental protection law to all employees and taking regular measures to implement those in practice,
- Activites to mitigate, eliminate and avoid negative impact arising from wind farm project on environment, population health, needs to be impemented precisely.

6.1 Environment

6.1.1 Weather, climate change

In connection with warming climate, sudden change in weather specifically in frequency and power started fluctuating significantly; therefore it is necessary to regularly utilize weather information for planning and running production work.

In the project implementation region, cold seasons getting warmer by 1.2-1.3 ºC and expected to have more precipitation than current level until 2030, this demonstrates potential increase in chances of icicles formed on the WTG' blades getting thrown during spring and autumn. Thus, it is necessary to focus on prohibiting movement of people in WTG's danger impact zone when required.

The plant utilizes inexhaustible natural resource such as wind to produce power which will reduce greenhouse gas emission by 4.5 million tons in 25 years; promoting and informing public/government agencies about how plant having reasonable positive significance in slowing climate change; running multilateral activities to get assistance from international agreements; leading and expanding production of clean energy from wind in Mongolia; such multilateral measures should be carried out.

6.1.2 Air

Energy production of wind farm does not emit any greenhouse gas or any other pollutants in the atmosphere and there aren't any source of air pollutants with the exception of few service vehicles, therefore special measures for mitigating air pollution is unnecessary.

It is important to regularly promote latest technologies producing energy without causing air pollution.

6.1.3 Noise

Transformers, WTG's are the plant's source of noise and even though their noise level equivalent is below the acceptable limit figure of MNS 4585:2007 standard, regular noise monitoring needed.

Mitigatory measures should be taken in case of rising negative impact of noise.

6.1.4 Water environment

Source of the oozing spring, located on the western side of the substation, should be fenced to protect from livestock and pollution.

Testing spring water will help monitor its pollution; on the other hand it will have monitoring significance whether the water soaking into soil from the treatment facility situated on higher elevation is affecting spring water.

Spring water haven't created watercourse and flowing near underground cable channel from WTG's to substation may affect channel structural integrity, it needs to be closely monitored.

Well water, worthwest from control building, needs to be tested and monitored.

While extracting ground water for use one must comply with Mongolian State Law and relevant rules. For example: To drill a well need to request and acquire permit of local administration, water supply source exploration work should be conducted by professional body; use of water request should be presented to provincial environmental authority and conclusion of use of water should be issued; based on the conclusion, after obtaining water usage permit in accordance with relevant soum's agency's authorization need to make "Water usage agreement" to use water; well needs to be equipped with water meter, payment for the amount of water used has to made and reported; has to follow regular protection zone rules in water basin.

It is appropriate to follow above must be implemented provisions in the legal documents to use underground water.

It is recommended to promote positive significance wind farm saving 40 million ton of water to produce 4212.5 million kW/h of electricity during 25 years of its operation.

6.1.5 Soil

The following measures should be carried out to preserve native soil cover and protect it from damages at the place where the licensed area is located:

- To monitor soil erosion at the vicinity of collapsed water dikes around sloped part of improved road between WTGs across mountain ridges as a result of rainfall runoff. Above mentioned collapsed water dikes should be repaired each time, and measures to should be taken to prevent creation of ravines.
- To avoid road and soil damages, post signs which prohibit creation of additional new roads from the bottom of the slope of improved road.
- Soil erosion is associated with the construction of project facilities. Residual impacts are created when leveling ground to restore the soil, for example, humus content decreased due to the mixtures of fertile soil, surface has many loose big rocks, and carbonated soil is exposed to the surface. The residual impacts will eventually disappear by restoring vegetation, monitoring rehabilitation of the soil and taking appropriate actions for the purpose of supporting the transmission to normal soil cover condition.
- It is possible to continue conducting soil monitoring studies in the licensed wind farm area as it is representing the dominant type of soil, linked to soil use and recovery in choosing the soil monitoring area in 2016.

6.1.6 Subsoil

- During a plant operation sole soil which WTG's, transformers and other facilities founded can be deformed and damaged, thus regular monitoring is required.

6.1.7 Natural mineral resources

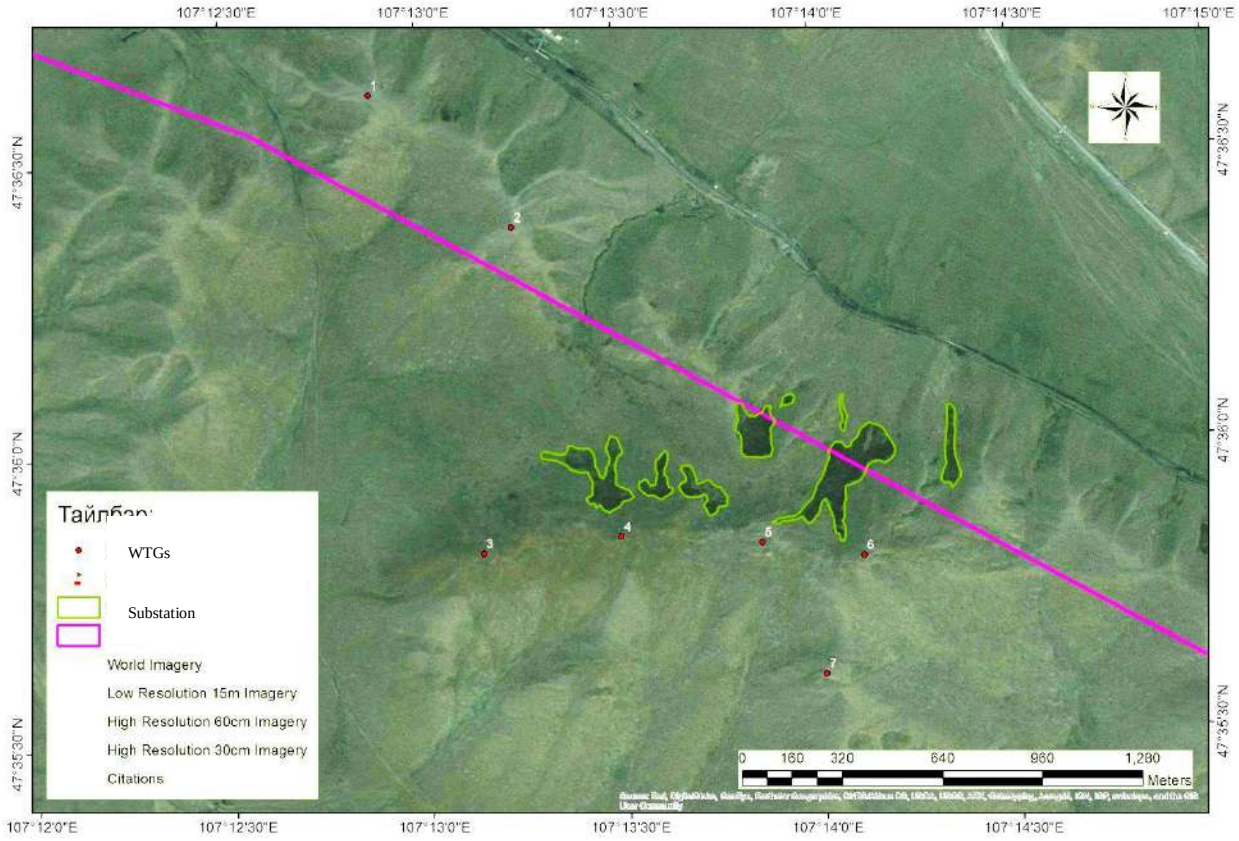
- Important positive significance of plant saving 3 million tons of coal over its 25 year of energy production should be promoted; Government assitance is needed.

6.1.8 Vegetation cover

- Placing address and signs on the biologically reclaimed field and information board with figures containing when and what kind of plant seeds have been planted will have an educational and protectionary significance.
- On biologically reclaimed fields /workers camp, parking space and concrete batch plant were located/ due to livestock impact the process of vegetation turning to natural pasture tends to slow down, therefore these fields has to be protected from human and livestock influence.
- Counting individual immigrated plants growing on the reclaimed field, conducting a soil seed reserve study is needed. Conducting a regular study on a specific interval on specific

reclaimed field, will let monitoring done on vegetation cover which has been adapted to steppe's unique ecosystem and on their lack of species diversity and will be useful for detecting whether the changes taking place in plant community, increased participation of urban plants and how plant productivity is changing.

- The birch groves located on the back slope of 3rd and 6th WTG's Mountain and spread over 10.3 hectars of land in total; and there is possibility of does coming here to calve during spring, therefore these birch groves needs to be protected from human, livestock influences and reclamation process should be supported.



Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 6.1 Area with birch groves

- Due to deteriorating trend of vegetation on possession land, it is necessary to assist herders to develop a pasture utilization plan, rotate pasture seasonally, regulate pasture restorative ability and capacity, by doing this will improve quality and main components of vegetation. Its necessary to implement pasture monitoring with participation of local community and to cooperate with herders on this.

6.1.9 Animal population

- It is appropriate not to alter the paths of already established "car patrol".

- Setting a signs on necessary places for vehicle speed limit and where wild animals may move and cross.
- Bats will come following moths and other prey insects gathering at the lighting during night time, therefore it advised to limit lighting time when possible or using methods to shorten lighting range.
- Bats are attracted to open water to drink from herder's well tank and its spills, also to feed on mosquitos and other insects which follow water to reproduce, therefore attention needed to not create these kinds of condition.
- To prevent from process of increasing population, concentration and extending distribution of Brandt's vole and Mongolian gerbil which proliferate from time to time need to place an artificial nest for birds of prey such as saker falcon, upland buzzard and common kestrel on an open spacious valley with low hills at the minimum distance of 1-2 km from WTG's which will could control population and limit distribution by natural methods; also need to provide assistance by reducing risk of wind turbine blade collision for these birds of prey while they hunting in the proximity.
- Protecting dwarf birch groves scattered around on the back slopes of Salkhit Mountain is one way of support an environment for does to calve and to raise their offspring.
- Paying attention to herders with many livestock using pasture without rotating in order to prevent overgrazing and taking part in pasture management by drilling wells on a distant place from WTG's and not utilized by herders due to water shortage; it is appropriate to consider creating an environment for Mongolian gazelle to seasonally migrate and graze.
- Participating actively in pasture management have very important significance for supporting biodiversity in the vicinity of Salkhit Mountain, limiting conditions of reproduction and spread of rodents which rapidly reproduces from time to time destroying pasture and becoming are main reason for birds of prey gathering in large numbers.
- Employees of the wind farm control center not to accustom stray dogs and foxes from hand feeding with scrap food.
- It is appropriate to take stray dog and cat removal measures.
- Marmot, red deer, Mongolian gazelle poaching act detecting assisting in investigating
- Need to support investigation of poaching activities of marmot, red deer, Mongolian gazelle and measures needs to be taken to inform and collaborate with local authorities.
- Measures to move dead animal remains right away far from WTG's surroundings is recommended as to prevent and avoid risks of big scavenger birds gathering and getting hit by turbine blades.

6.2 Social environment

6.2.1 Health and safety

- Risk may occur from work place and natural disaster such as wind farm transportation vehicle movement, high voltage facilities, power transmission lines, WTG blade icicle, as well as lightning, flood, earthquake etc., therefore follow guidance this report's risk assessment "Risk, risk mitigation, prevention measures".

6.2.2 Waste

- Sorting waste, suppling recyclable waste into market, and transporting burial waste based on agreement by licensed entity to the landfill, these measures should be taken regularly. For exapmle, transporting waste according to agreement of landscaping company of Nalaikh district and suppling waste oil from equipment to the Altan Orshikh group LLC's Akhui Mandal oil refinery according to agreement such activities should be carried out constantly.
- Utilizing small scale biological water treatment plant for purifying and disinfecting household waste water according to guidelines.
- According to guidelines 1-2 times a month anaerobic bacteria activator should be poured into toilet; keeping up waste water treatment level
- Cleaning service should be done by professional because decomposition of waste in the septic tank may result in accumulation of toxic gas such as carbon dioxide and methane.
- Non-domestic waste such as chemicals, petrol, motor oil, and chlorine-containing substances, are strictly prohibited to throw into sewage system.
- It is prohibited to throw tobacco stems, chewing gum, sanitary products, towel, plastic caps, and candy wrap into the sewage system.
- Septic tank sludge should be removed based on the contamination.
- When changing fruoride hydrogen gas 6 and transformer oil which are being used at the wind farm by following safety guidelines without waste.

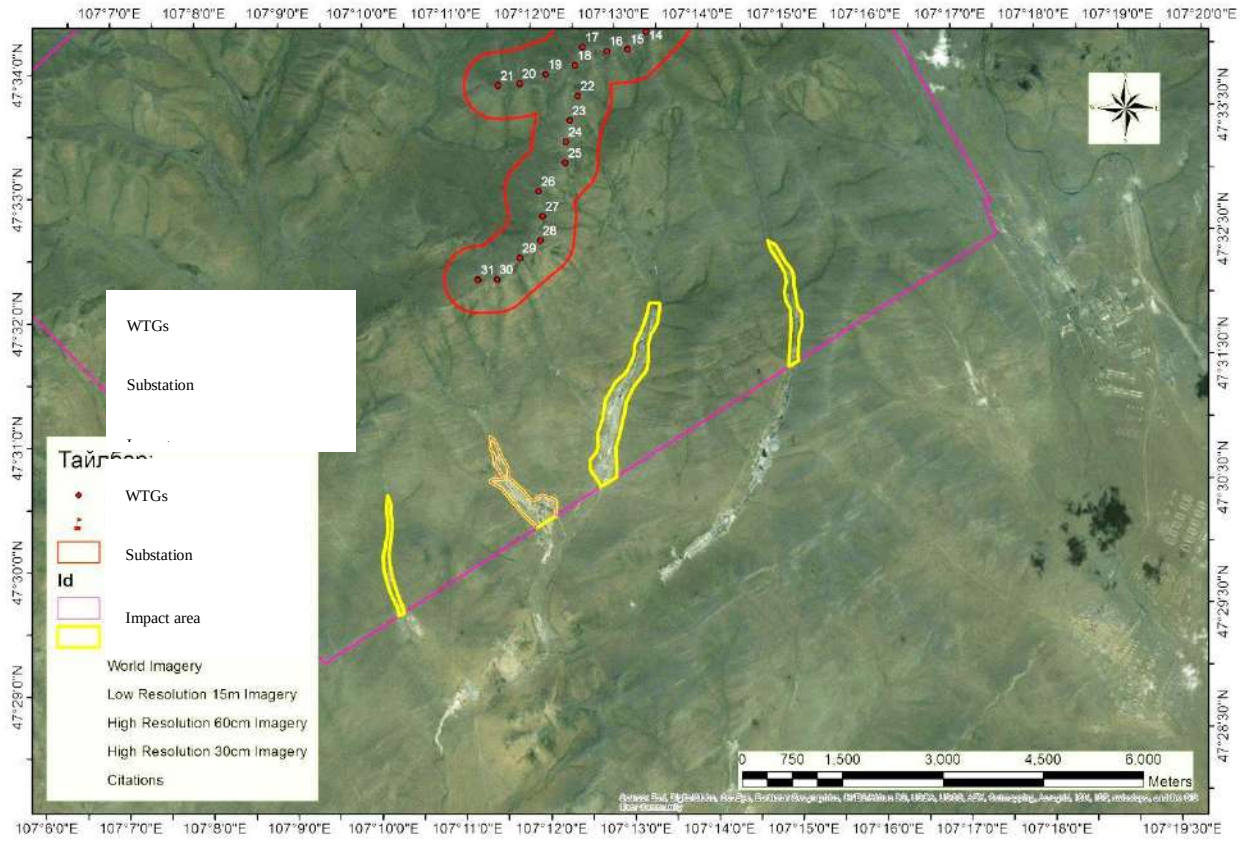
6.2.3 Protected land

- The wind farm territory is near strictly protected area of Mt. Bogdkhan, and it is in the provincial protected land therefore it should follow the rules and guidelines of the protected land.

6.2.4 Land usage

- Measures should be taken to ensure that fixed road and routes are traveled and road traffic is constantly monitored.

The wind farm's southwestern part and gold mining companies licensed territories are overlapping, therefore, overlapped areas need to be monitored, and measures need to be taken to dispell the overlap. This will create legal environment for the wind farm not be responsible for damaged land of gold mining companies.



Source: Assessment team of supplementary clarification of DEIA, 2016

Figure 6.2 Areas where gold is being mined (needs to be removed from the area)

CONCLUSION

The following conclusions were made based on the clarification of DEIA of the wind farm:

1. For long term project, taking account of past and future climate change of the project implementation region, average annual temperature is increased by 2.3 ºC from 1965 until now; in 2030, winter temperature will be increased by 1.2-1.3 ºC and summer temperature increased by 1.1-1.2 ºC. In terms of annual precipitation, it decreased periodically however in winter of 2030 it shows tendency to increas by 10-15%. Due to above mentioned weather events, there is an increased trend of climate change and natural disasters, therefore, climate and weather information needs to be taken into account in the business planning and energy production process.
2. The wind farm will reduce greenhouse gas emission by 180,000 tonne a year and 4.5 million tonne in 25 years; generated energy amount decelerates climate change is assessed as significant positive impact (Sp)
3. Air pollution in the project region is not from the wind farm, but it is from the local road and dust storm. The wind farm generates energy without producing toxic substance and gas, thus the project is assessed significant positive impact (Sp) on reducing air pollution.
4. Due to noise measurements and estimates, workers and local residents may not be affected by noise, however, there should be monitoring to prevent potential adverse impacts.
5. Wind farm facilities did not change the natural hydrological network. The spring seeping out of ground to the southwest of the substation should be fenced and protected; sample of water should be taken and analyzed.
6. The household water consumption from underground water is 2.0-2.6 m^3 per day, which may not affect the underground water resources. The well's analysis showed that quality was fresh, mild to hard, and clean. It is important keep track of the quality of the water in accordance with well's sanitary zone regime.
7. Running wind farm operation with no water for its production and technology for 25 years and producing 4212.5 million kWh of energy, 40 million tonne of water will be saved. This will save the natural water resources which have significant positive impact on them.
8. Measures should be taken not to reduce the quality of cleaning in accordance with technological guidelines while using the small scale waste treatment plant.
9. Measures should be taken to support in forming and repairing road which gradually adapt to new landscape elements. In the future, there will be no activity to change the surface of the land; the impact on surface image was assessed irrelevant (Ns).
10. Dark kastanozem is dominant in the area around the wind farm and for further research and monitoring, it is necessary to draw pictures of dark kastanozem. physical and chemical properties of each soil type is defined.

11. Toxic elements to the soil such as lead (Pb), cadmium (Cd), chromium (Cr), zinc (Zn) was below permissible concentration of Mongolian standard (MNS 5850:2008) silty loam soil textured composition in this region, revealing in small numerical quantity shows that the soil is not contaminated with these inorganic pollutants. However, arsenic concentration (As) is above permissible amount in several soils by 1.5-2.3 times; this element concentration generally considered high in the Mongolian soil; it should be noted that this is in consort with the findings of other researchers.
12. The humus content of 2 parts of the rehabilitated are after project construction has decreased by 56.6%, the surface has many big rocks, carbonated sand is exposed on most area. Currently these areas have grown adequate vegetation cover, meaning there is a possibility for indigenous characteristics of vegetation cover to restore
13. Facilities such as WTGs, control center, substation, road, underground power lines, well, waste water treatment facility, and high voltage overhead power lines has been built on the subsoil, and the negative engineering geological effects forming from those impacts has not been observed. There has not been an occurrence of deformation and damages to the foundation of the most strained WTGs. However, deformation and damage of WTGs foundation, transformer and other facility base or subsoil may occur which is assessed as significant negative effect (Sn), thus periodic observation and monitoring is necessary.
14. The wind farm will save 3 million tonnes of coal in 25 year of its operation which is assessed to have a significant positive effect (Sp).
15. Vegetation is characterized by steppe grassland, breeze-grasshopper, broom-grass, and mountain grasslands. On the licensed area, 47 vascular plant species belonging to 14 family has been recorded. Rare, endangered and endemic plants are not recorded.
16. Biological rehabilitation on the damaged area during construction has been successful and currently rebabilitated areas have formed safe and sustainable landscape and have a sufficient vegetation cover. No signs of impact has been observed on the vegetation cover from the current wind farm operation.
17. Using pasture without alternating for a long time, pasture starts to degrade and an perennial goosefoot plant family starts to grows abundantly where Artemisia spp and Needleleaf sedges/Carex duriuscula/ are dominant. Therefore, it is necessary to assist herders to develop a pasture utilization plan; implementing pasture monitoring with community participation is effective.
18. It is specifically noted that a need for cooperation on developing proposal and basis with local community is necessary for raising current status of regional protected land to State protected land "Natural reserve land" which is currently the most substantial method to improve current environmental baseline, to mitigate residual impact and to support ecosystem baseline.

19. Car patrol run by employees of wind farm's control center and existing settlement with low population could be beneficial as it may limit poaching activities within that region. Furthermore favourable environment to settle and graze for threatened animals such as deer, marmot and gazelle could be created in the vicinity of wind turbine.
20. Sorting waste, suppling recyclable waste into market, and transporting burial waste based on agreement by licensed entity to the landfill, these measures should be taken regularly. For example, transporting waste according to agreement of landscaping company of Nalaikh district and suppling waste oil from equipment to the Altan Orshikh group LLC's Akhui Mandal oil refinery according to agreement, such activities should be carried out constantly.
21. The wind farm territory is near strictly protected area of Mt. Bogdkhan, and it is in the provincial protected land therefore it should follow the rules and guidelines of the protected land.
22. Difficult situation has been created in ensuring the safety of citizens 150-300 meters outside boundary of the licensed area of the 1st and 2nd WTGs. Therefore, it is necessary to acquire addition licensed area in which above WTGs dangerous impact region included.
23. The wind farm's southwestern part and gold mining companies licensed territories are overlapping, therefore, overlapped areas need to be monitored, and measures need to be taken to dispell the overlap. This will create legal environment for the wind farm not be responsible for damaged land of gold mining companies.
24. Risk mitigation measures should be implemented based on the project's risk assessment result.
25. Measures for promoting positive project impacts and for avoiding, mitigating, and eliminating adverse impacts should be implemented in accordance with this report.
26. Current year's environmental management plan should developed according to the project "environmental management plan" and implemented following related rules.

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1 Environmental management plan

The environmental management plan for WF has been developed according to Law on Environmental impact assessment, Environmental impact assessment guideline /374th Government resolution, 2nd appendix, 2013/, Evnironmental management plan developing, review approval, reporting guideline /Environmental green development minister's A-05 order on 6th of January, 2014 / and based on materials such as study conducted on the station's tenure and detailed environmental impact assessment's supplementary clarification report.

The plan determines and considers operation and its potential impact on environment, society, human health, positive, negative impacts and their associated measures during operational period of WF. Also included cost of plan implementation and environmental legal documents to comply.

The project proponent is responsible for developing and carrying out environmental management plan of the year based on this plan and annual production work plan.

Local ranger, environmental inspector, Governers of all levels, the state central administrative body and environmental NGO's have rights to monitor the implementation of environmental management plan and project proponent obliged to make related information transparent and provide opportunities to monitor according to specific schedule.

The related costs of measures stated in the plan is determined in advance and project proponent needs to plan and determine some cost at the time on the basis of designing related budget.

This plan will act as an major document for environmental protection measures within years of 2017-2021.

1.1 Basis for developing environmental management plan

1.1.1 Main objective of environmental management plan

The main objective of the plan is to define measures related to positive and negative impacts arising from project operation; and planning environmental protection measures to be implemented by the company annually.

1.1.1.1 Changes in environmental baseline around project site, current state.

WF is in operation ever since its construction job completion in 2013.

WF is situated 70 km south-east from center of Ulaanbaatar city, on the territory of Tuv aimak's Sergelen soum. The station's permitted property area amounts to 12,910.9 hectares. In addition, there are 28 km of 110 kV overhead transmission lines stretching to Nalaikh's substation.

Showing brief overview of related research results, which has been conducted on WF's possessioned land on November 2016.

Considering long-term operation of the project the regional climate change from past and future has been calculated, whereas average atmospheric temperature has risen by 2.3 ºC since 1965 till now and it is expected to get warmer by 1.2-1.3 ºC in winter and by 1.1-1.2 ºC in

summer until 2030. As for amount of annual precipitation, it has been falling with regular intervals in the past while it expected to increase 10-15% during winter until 2030. Associating with above conditions there is a tendency of increasing occurence of sudden weather changes and catastrophic phenomenons, therefore regular climate and weather information need to be used in business strategic planning and in energy production.

From monitoring study, it can be seen that the main air pollution factors are not arising from project but from local roads and dust storms. Local residents are the noise impact receptors and there is no noise impact in their living space. The average noise equivalent level /Leq/ coming from wind turbine generator /WTG/ during 07-23 hours are 37-55 dB, at 50 m distance 34-42 db, at 100 m distance 40-42 dB, at 200 m distance 18-30db.

Wind farm facilitites have not caused changes in natural hydrological network. There are no running rivers, pools and lakes with perpetual water on the project site. There is a small spring welling up at a distance of 150 m south-west from the field where control center of the station situated. According to people's oral information it is welling up slightly during last 2 years. There is no certain water course formed by the spring.

During project construction process 2 boreholes have been drilled and equipped to use underground water. Borehole flow rate is 1.0-1.5 l/s. Currently the production base well has been prepared to be transferred to local community. And water from the well next to control center is extracted for household use only.

The household water usage of control centre is small; on average 2.0-2.6 m^3 of water used daily.

The household water treatment facility is built underground and has a technology to permeate water into rocks. Whether water from wastewater treatment facility is polluting underground water can be monitored by taking samples from flowing spring below.

Dark kastanozem dominantly spread over WP's surrounding territory and new image has been produced for differentiating dark kastanozem's types considering necessity for further study and monitoring work.

During project construction phase, fertile soil got intermixed due to technical restoration /ground leveling/ and soil erosion in areas of worker's temporary residence, ger office and 2 concrete batch production places, humus composition of soil in these areas has been declined by 56.6 %, surface has more loose rock and exposure of carbonated soil over most places can be seen as **residual impact**.

Two areas where biological restoration took place have certain amount of vegetation cover and plants growing year to year demonstrates a condition has been created for restoring indigenous soil characteristics.

On project site, the content of toxic chemical elements such as lead (Pb), cadmium (Cd), chromium (Cr), zinc (Zn) has not reached permissible level of Mongolian standard (MNS 5850:2008) and found in small numerical quantity shows the soil is not contaminated with

these inorganic pollutants. However, arsenic concentration (As) is above permissible amount in several soils by 1.5-2.3 times; this element concentration generally found high in Mongolian soil and it should be noted that this is in consort with the findings of other researchers.

Following changes has occured on ground surface due to project main equipments installation during WP construction phase:

- Hill top's raised places got flattened
- High towers with wind rotating blades have been erected on hill tops
- Roads were built inbetween WTG's and high dams in some places, which changed appearance of the vicinity signficantly
- Such environmental appearance has been created where overhead power transmission lines crossing through hills and steppe.

Project facilities situated far from each other, thus it can be seen as not having much change in surface appearance in this desolate land.

In terms of geological formation, the project site consists of Mesozoic, Cenozoic bare mountains and alluvial steppe, and project building construction work has been done between their transition zone. For example: facilities such as WTGs, control center, substation, road, underground power lines, wastewater treatment facility and high voltage overhead power lines has been built by means of affecting soil and negative engineering geological impacts forming from those have not been observed. There has not been an occurrence of deformation and damages to the foundation of the most strained WTGs.

Soil is affected by gold mining operation in four dry riverbeds of Salkhit mountain's or south-western part of the "Clean energy" LLC's tenure land. These damaged lands are situated at a distance of 1.7-2.9 km from the western WTG's. Gold mining operations are held during warm season.

By 2016, 47 vascular plant species belonging to 14 families have been recorded. Rare, endangered, endemic plants have not been recorded. In terms of vegetation, forb-grasses, Gleistogenes-Stipa, Artemisia frigida-Stipa and Festuca-Artemisia which belonging to steppe formation occurs on mountain steppe. Humid mountainside valleys have meadow steppes. Mountain backs and slopes have small birch groves. Implementation of biological restoration on damaged land due to project construction work is successful, as of now reclaimed areas are safe, formed features of stable land and covered with certain amount of vegetation. Plant diversity increased throughout restored fields and there can be seen a trend of gradually increasing participation of natural pasture plant. After completion of project construction, there are no signs of impact on vegetation from WF's operation.

Considering direct steppe observation and oral information from local citizen Batsukh and station workers, within national and regional scale such mammals including red deer (Cervus elaphus) with threatened population and recorded in "Regional red list" under "Endangered"

category, gazelle (Procarpa gutturosa) under "possibly endangering" category and Mongolian marmot (Marmota sibirica) dwells grazing seasonally here and evidence (deer droppings, marmot burrow etc.) of permanent inhabitation has been observed. Wind Farm's workers carrying out operational safety inspections on WTG on daily basis may have indirect positive impact limiting illegal hunting of endangered mammals. At the same, it should be noted that there are few active marmot burrows scattered.

According to previously conducted environmental assessment[1] there is a grave on a mountaintop affixed with stone, and it is concluded that no buildings will be built in its surrounding. On that assessment report, institute researchers of AS made an archeological excavation on two graves /fixing coordinate values of -47^{0}35'49.4", 107^{0}13'51.1" on GIS image/ according to zoologist observation between 4th and 5th WTGs, also it has been informed that the grave on 47^{0}32'35.5", 107^{0}11'57.6" is located distant enough to be not affected by construction of WTGs/at a distance of 130 m north from 28th WTG by fixing coordinate values on GIS image/.

1.1.1.2 Main project objective, capacity, technology, use of raw material, waste, emission type, amount

Project work objective. The main purpose of the project is to achieve objective of ensuring reliable centralized power system through increased use of renewable energy raised by the Mongolian government to develop renewable energy, to supply ever increasing central region's energy demand by utilizing wind energy source profitably which have low negative impact on environment.

Project capacity. 120-million-dollar investment have been made to implement WF project. Some capacity indicators of 50 MW WF project are shown on below table.

Table 1 Some indicators of WF's production

WF's project indicators	Units of measurement	2016	2017
1. Project capacity (MW)	MW	50	50
2. Annual energy production	kW h / year	157,538,385	138,777,754
3. Power supplied to transmission grid	kW h / year	153,892,200	136,070,748

Source: "Clean energy" LLC, 2018

Wind energy in the project implement area is considered sufficient to generate above energy production capacity.

Project technics, technology. WF's main equipment consists of WTG generating electric current from wind, voltage raising transformers, gas insulated switchgear, automated control system, also complex parts comprised of underground power and information transferring cable network, overhead 110 kW power transmission line.

Incoming 35 kW voltage on substation is raised through 110/35 kW 50 MVA transformer and transmitted to 110 kW powerline via gas insulated switchgear.

[1] "Wind farm" project's detailed environmental impact assessment report, "Sunny trade" LLC, 2012

Use of raw material. Wind kinetic energy is the main raw material during operation, which will not require additional material and will not use pure chemicals. Wind energy will become main raw material for producting energy. Domestic consumption will be met by self produced energy.

The final product. In 2016-2017 138,777,754-157,538,385 кW*hours / year of energy has been produced and 136,070,748-153,892,200 кW*hours / year energy has been delivered to thermal transmission networks.

Waste and emission type, amount. Solid waste coming from industrial maintenance and station control building is sorted out and transported twice a month in accordance with contract made with Nalaikh district's municipal service company.

Also, household waste water is cleaned in small wastewater treatment facility, then it gets permeated into soil.

1.1.2 Project impacts

While conducting analysis on each environmental and social component of the project impact, the impact specifics are assessed and compiled with approved results based on study, hypothesis, analysis and monitoring study results.

The station operating for 25 years will reduce greenhouse gas emission by total of 4.5 million tons comparatively to coal-based energy sources. It has been concluded that at the extent of energy produced to decelerate climate change it will have fully positive significant impact.

Running a production to produce energy without polluting air is an indication of positive impact to reduce air pollution.

Noise equivalent level beside WTG was 35-55 dB. Above noise from WTGs at distances of 50, 100, 200, 500 m are calculated by modelling to decrease from 34-42 dB to 18-30 dB. These results show that the noise emitted by WF has no negative impact on human and animal. Eventhough the noise being lower than permissible level, it cannot be denied to have instances of increased noise level due to abnormal operation of technic and equipment.

The project main facilities situated on top of hilltops of mountainous area; the road between them is built also on high grounds which in return does not hinder natural run-offs. During Salkhit's WF operation, there are no changes in surface water regime, reserve and no polluting impact on surface water.

WF's production technology does not use water. 40 million tons of water will be saved operating for 25 years producing 4212.5 million kW hour energy. It is reasonable to assume having positive impact as it is saving natural water reserve.

Plant only requires water for drinking and household use. From 2014 to 2015 on average 2.0-2.6 м^3 of water used for household use daily from the well drilled next to control building.

This well's yield is 1.5 l/s. As water consumption is low, there is a chance of not affecting underground water reserve.

Wastewater treatment facility, waste and used technical oils are potential sources of pollution for underground water.

Small scale biological wastewater treatment facility is installed and running; has a technology to permeate treated water into soil.

Used oil is stored in purpose-built container and supplied to processing factory.

Soil humus content is declined due to fertile soil getting mixed with infertile dirt during technical restoration's ground leveling work, surface has more loose rocks and exposure of carbonated layer over many places; such **residual impacts** will gradually disappear via vegetative restoration and soil cover will transition to normal stabilizing condition.

Road and field built for station operation has been shape fixed, which will blend and gradually become new element of landscape. WF's facilities has not created negative impacts on natural looks and appearance.

On certain spots such as foundation of WTGs, foundation of other facilities of WF exhibits static, dynamic load and in future this kind of impact will persist.

The power station, with a technological solution to convert inexhaustible natural resource of wind kinetic energy to electric energy, is utilizing wind power with average speed of 8.2 m/s to produce energy in the vicinity of Salkhit Mountain. Producing energy without using any other natural resources is the uniqueness of this station. In order to generate 168.5 million kWh electricity per year, 50 MW coal-fired power station burns approximately 122,000 tons of mineral coal. That amount of natural minerals will be preserved. While producing energy over 25 years, the station saves 3 million tons of coal, which is positive impact.

There are signs of pasture degradation detected on project area due to livestock grazing load. This is related with livestock grazing when herders move in during summer, autumn seasons.

Pika, Mongolian silver vole, marmot seeks shelter in the ground near WTG; besides occurrences of small sedentary mammals, deer and does which usually avoid human settlement grazing in the surroundings of WTG indicates relatively weak residual impact of the project's construction phase.

Brandt's vole, Mongolian gerbil such small species scatters around vast areas and proliferates from time to time and when the proliferation period occurs, birds of prey such as upland buzzard, saker falcon, steppe eagles settle following their prey animal enters and settles within one-kilometer buffer zone from west and central part of WTG installed strip land which creates a condition to increase potential risk of getting hit by turbine blades and collision.

If number of citizens and families owning livestock rises from current level, there is a possibility of increased number of remains of livestock died from various reasons which will entail the risk of big carnivorous scavenger birds such as black vultures and Himalayan vultures gathering and getting hit by turbine blades and collision.

Increasing settlements and families with livestock will create conditions for owned or stray dogs to migrate, proliferate or even settle in and also iliis (doe calve) born during June to July in scattered birch groves on the back slopes of the Salkhit Mountain, mature and young marmots may suffer from stray dog attacks.

The plant growth differing vastly from year to year, diminishing diversity of mammals/birds, decline in population and drastically shrinking spatial distribution processes occurs regulary in a dry steppe ecosystem existing in a very dynamic state; this ecosystem has very fragile formation. Once WF's facilities built and completed; the detected direct and indirect impact affecting steppe ecosystem will be very low.

The project operations are not affecting social health negatively but improves energy supply and reliability in the region thus having positive influence on health service quality and capacity.

Everyday employees commute to work by bus from Ulaanbaatar. Employees may suffer loss of health/life from potential road accidents.

In the event of failing to replace and remove equipment oil and lubricants according to operational safety guidline and leaking it into environment will cause polluting impact on soil and water; this polluted environment will have toxic impact on human and livestock.

The company is contributing to improve livelihood of people by providing permanent employment.

As power supply becoming more stable, reliable and shortage decreases, home and workplace conditions improve in a beneficial way resulting in an increased work place productivity.

As power supply improves and population receives stable source of power, conditions to expand business environment and to increase service and production are coming together.

By contributing to national and local budget it will create positive impact. As power supply improves the operations of manufacturing and service organization stabilizes, while creating favourable conditions to increase new manufacturing and services; and this is a contribution to local development in the long term.

WF will not carry out new construction activities, therefore will not affect resident settlements.

There is almost no change in pasture utilization. Herder's livestocks graze everywhere in station owned area. As main usage of the land by residents basically haven't changed, the station has not affected negatively on livelihood of residents.

There are few cultural heritages existing in the project site; unpawed roads have been constructed between WTGs and formed fixed route on other roads limiting vehicle/people traffic movement therefore causing no impact on natural landscape and cultural heritages.

There will be an occurrences of Bogdkhan Mountain's animal movements passing through and settling in the project site. For example: there is information of deers coming to calve in the vicinity of birch groves during first month of summer. Therefore, this area should be considered to relate with specially protected area. Protecting animals in this area has the same significance as protecting animals inside protected area. Also, the area is under local protection.

1st and 2nd WTGs have been installed outside at a distance of 150-300 m from eastern border of the land granted for station's operation.

Gold mines extracting gold on the southern side of the tenure land showing overlap of tenure.

There are no structures blockading path to the water source for pasture livestock. Pasture livestock are watered using hand well and springs. There is a possibility of not affecting negatively on pasture water source.

Approximately 170 million kW hours power is produced per year and the capacity of power supply network is increased by 50 MW to ensure the stability and reliability. There is a basis to conclude evaluating an impact as an important positive significance.

Neccesary power source becomes available for new industrial places to start operating and will provide opportunity for the growth of industrial places.

Some sections of the dirt road leading to substation has been improved, which provides an opportunity for locals to use this road. Thus, it had an impact to improve the local road network.

The station puts requirements to be outside the dangerous impact zone during spring and fall, but herders who have not understood it may show protesting action. Unless the station works cooperatively with the herders on the proper use of pasture land in the station owned area, the owned area may get overgrazed due to herders coming to the tenure land in great numbers for grazing their livestock.

Main condition for incident occurrence in the station:

- Current voltage of network between the WTG and substation is 0.69-35 kW
- Amplifying transformer voltage is 35-110 kW

- The voltage of substation to be connected to transmission network is 35 - 110 kW
- High voltage overhead line voltage 110 kW
- Transportation of employees and materials for WF
- Lightning
- Flood
- Earthquake

such risks may arise.

1.1.3 Measures to avoid, mitigate and remove negative impacts and promoting positive impacts

1.1.3.1 Environment

Weather, climate change

Sudden change in weather in connection with warming climate, specifically in frequency and power started fluctuating significantly; therefore, it is necessary to regularly utilize weather information for planning and running production work.

In the project implementation region, cold seasons getting warmer by 1.2-1.3 ºC and expected to have more precipitation than current level until 2030, this demonstrates potential increase in chances of icicles forming on the WTG' blades and getting thrown during spring and autumn. Thus, it is necessary to focus on prohibiting movement of citizens in WTG's dangerous impact zone when required.

The station utilizes inexhaustible natural resource such as wind to produce power which will reduce greenhouse gas emission by 4.5 million tons in 25 years; promoting and informing public/government agencies about how station having reasonable positive significance in slowing climate change; running multilateral activities to get assistance from international agreements; leading and expanding clean energy production from wind in Mongolia; such multilateral measures should be carried out.

Atmosphere

Energy production of WF does not emit any greenhouse gas or any other pollutants in the atmosphere and there isn't any source of air pollutants with the exception of few service vehicles, therefore special measures for mitigating air pollution is unnecessary.

It is important to regularly promote latest technologies producing energy without causing air pollution.

Noise

Transformers and WTGs are the station's source of noise and even though their noise level equivalent is below the acceptable limit figure of MNS 4585:2007 standard; regular noise monitoring is needed.

Mitigatory measures should be taken in case of rising negative impact of noise.

Water

Source of the flowing spring, located on the western side of the substation, should be fenced to protect from livestock and pollution.

Testing spring water will help monitor its pollution; on the other hand, it will have monitoring significance whether the water permeating into soil from the wastewater treatment facility situated on higher elevation is affecting spring water.

Spring water haven't created watercourse and flowing near underground cable channel from WTGs to substation may affect channel's structural integrity; it needs to be closely monitored.

Well water, north-west from control building, needs to be tested and monitored.

While extracting ground water for use, one must comply with Mongolian State Law and relevant rules. For example: need to request and acquire permit of local administration to drill a well; exploration work of water supply source should be conducted by professional body; request for water usage should be presented to provincial environmental authority and conclusion water usage should be issued; based on the conclusion, need to make "Water usage agreement" to use water after obtaining water usage permit in accordance with relevant soum's agency's authorization; well needs to be equipped with water meter; payment for the amount of water used has to made and reported; have to follow regular protection zone rules in water basin.

It is appropriate to follow above provisions, that must be implemented, in the legal documents to use underground water.

It is recommended to promote positive significance of WF saving 40 million ton of water to produce 4212.5 million kWT/h of electricity during 25 years of its operation.

Soil

In order to preserve indigenious appearance of soil cover and to protect it from erosion following measures need to be implemented on the poject implementation site of WF's licensed field.

Herein:

- Due to damages on some sections of the water protection embankment caused by rain water flow on the sloped side of improved dirt road, which has been built between WTGs on mountain ridges, the surrounding soil is being eroded and this

needs to be taken into consideration. Repairing damages on above embankments on the spot and henceforth taking protective measures to stop deep ravines and trechnes forming from surface linear erosion

- In order to avoid road and soil erosion, need to place signs to stop forming new branching roads from improved road to the lower side of ground surface slope.
- Soil in the area is damaged in relation with project facility construction activity. Derivative **residual impacts** are formed**,** such as decline of humus content in soil due to fertile soil getting mixed with infertile soil during restoration process of ground leveling, more loose rocks on surface and exposure of carbonated soil on surface. Once the area restored by revegetation, the residual impact gradually disappears; taking appriopriate measures and monitoring restoration area is needed in order promote soil cover transitioning to normal stabilizing condition.

- It is possible to continue soil monitoring study on above fields in future as we have considered representative of dominant soil type scattered on WF's licensed field in connection with use of soil and restoration state when making soil monitoring field selection in 2016.

Subsoil

- During station operation, sole soil which is foundation for WTGs, transformers and other facilities can be deformed and damaged, thus regular monitoring is required.

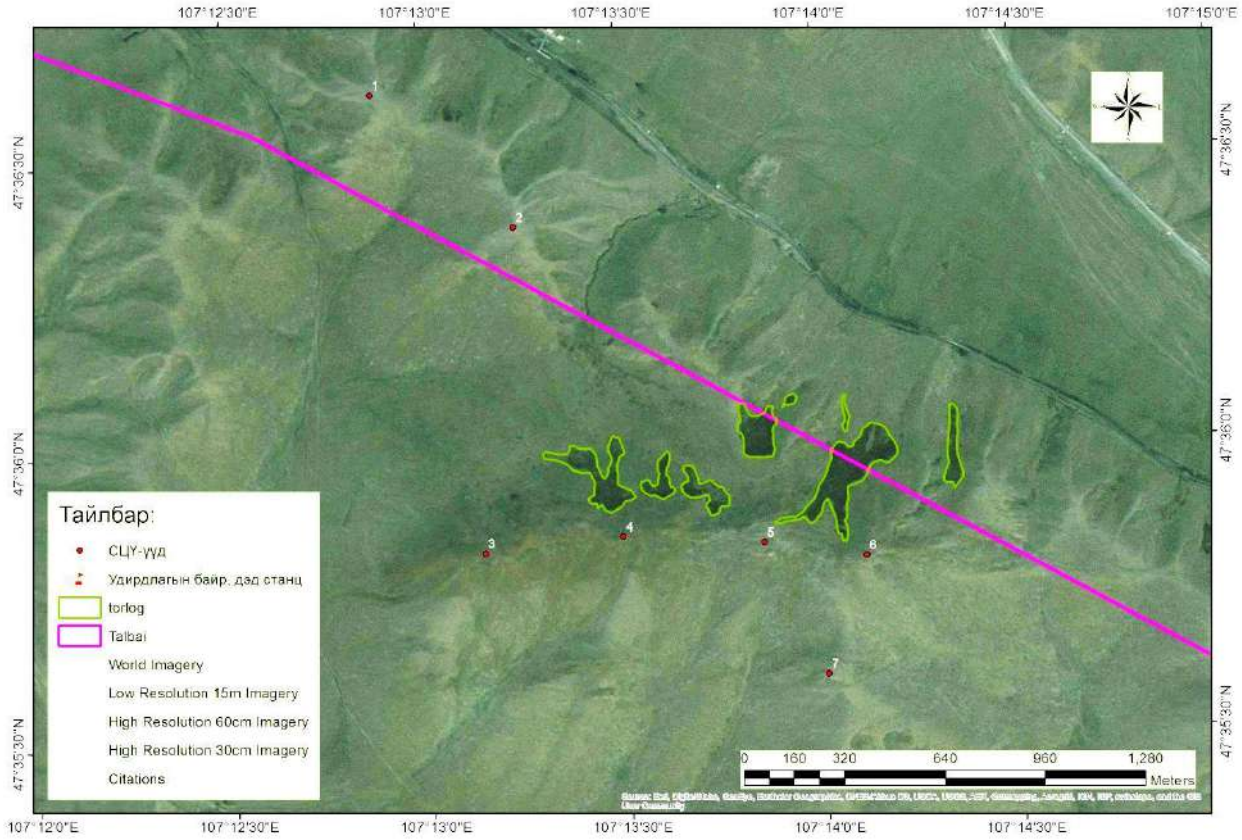
Natural mineral resource

- Important positive significance of station saving 3 million tons of coal over its 25 year of energy production should be promoted; Government assitance is needed.

Vegetation

- Placing address signs/plates on biologically restored field and information board with images showing when and what kind of plant seeds have been planted will have an educational and protectionary significance.
- Due to livestock impact on biologically restored fields /workers camp, parking space and concrete batch plant was located/, the process of vegetation turning to natural pasture tends to slow down, therefore these fields has to be protected from human and livestock influence.
- Conducting soil seed reserve study and counting settled individual plants growing on restored field is needed. It is benefical to conduct regular study on specific interval on specific restored field for monitoring vegetation cover which has been adapted to steppe's unique ecosystem and their lack of species diversity, also for identifying the increase in urban plant participation, the change in plant productivity and whether changes taking place in plant community.

- The birch groves located on the back slope of 3rd and 6th WTG's Mountain are spread over 10.3 hectars of land in total; and there is possibility of does coming here to calve during spring, therefore these birch groves need to be protected from human/livestock impacts and its restoration process should be assisted.



Source: DEIASC's assessment team, 2016

Figure 1 Area with groves

- Due to deteriorating trend of vegetation on tenure land, it is necessary to assist herders to develop a pasture utilization plan, to rotate pasture seasonally, to regulate pasture restorative ability and capacity; doing this will improve quality and main components of vegetation. Its necessary to implement pasture monitoring with participation of local community and to cooperate with herders on this.

Animal

- It is appropriate not to alter the paths of already established "car patrol".
- Setting signs on necessary places for vehicle speed limit and where wild animals may move and cross.
- To prevent from process of increasing population, concentration and extending distribution of Brandt's vole and Mongolian gerbil which proliferate from time to time need to place an artificial nest for birds of prey such as saker falcon, upland buzzard and common kestrel on an open spacious valley with low hills at the

minimum distance of 1-2 km from WTG's, which could control population and limit distribution by natural methods; also need to provide assistance by reducing risk of wind turbine blade collision for these birds of prey while they hunting in the proximity.

- Protecting dwarf birch groves scattered around the back slopes of Salkhit Mountain is one way of supporting an environment for does to calve and to raise their offspring.
- Paying attention to herders with many livestock using pasture without rotating, in order to prevent overgrazing and taking part in pasture management by drilling wells on a distant place from WTG's and not utilized by herders due to water shortage; it is appropriate to consider creating an environment for Mongolian gazelle to seasonally migrate and graze.
- Participating actively in pasture management have very important significance for supporting biodiversity in the vicinity of Salkhit Mountain, limiting conditions of reproduction and spread of rodents which rapidly reproduces from time to time destroying pasture and becoming are main reason for birds of prey gathering in large numbers.
- Employees of the station control center not to accustom stray dogs and foxes from hand feeding with scrap food.
- It is appropriate to take stray dog and cat removal measures.
- Need to support investigation of poaching activities of marmot, red deer, Mongolian gazelle and measures needs to be taken to inform and collaborate with local authorities
- Measures to move dead animal remains right away far from WTG's surroundings is recommended as to prevent and avoid risks of big scavenger birds gathering and getting hit by turbine blades.

1.1.3.2 Social environment

Health and safety

- Risk may arise from station's vehicle traffic, high voltage facilities, power transmission lines and icing of WTGs blades, also from natural disaster phenomenon such as lightning, flood; therefore, the report's risk assessment's recommendation "Measures to mitigate and prevent incident risk" needs to be implemented.

- When replacing used sulfur hexafluoride and transformer oil in the station, make sure to follow safety rules and no leaks or waste occurs.

Waste

- Sorting waste, where recyclable waste needs to be re-distributed back to market and waste going to landfill needs to be delivered to centralized spot by authorized organization regularly according to agreement. For example: Waste should be

transported according to contract made with Nalaikh district municipal service company and waste oil coming from equipments should be delivered to "Altan Orshih group" LLC's "Ahuin mandal" oil processing plant situated in Bagakhangai district according to contract and in future these activities need to be carried out regularly.

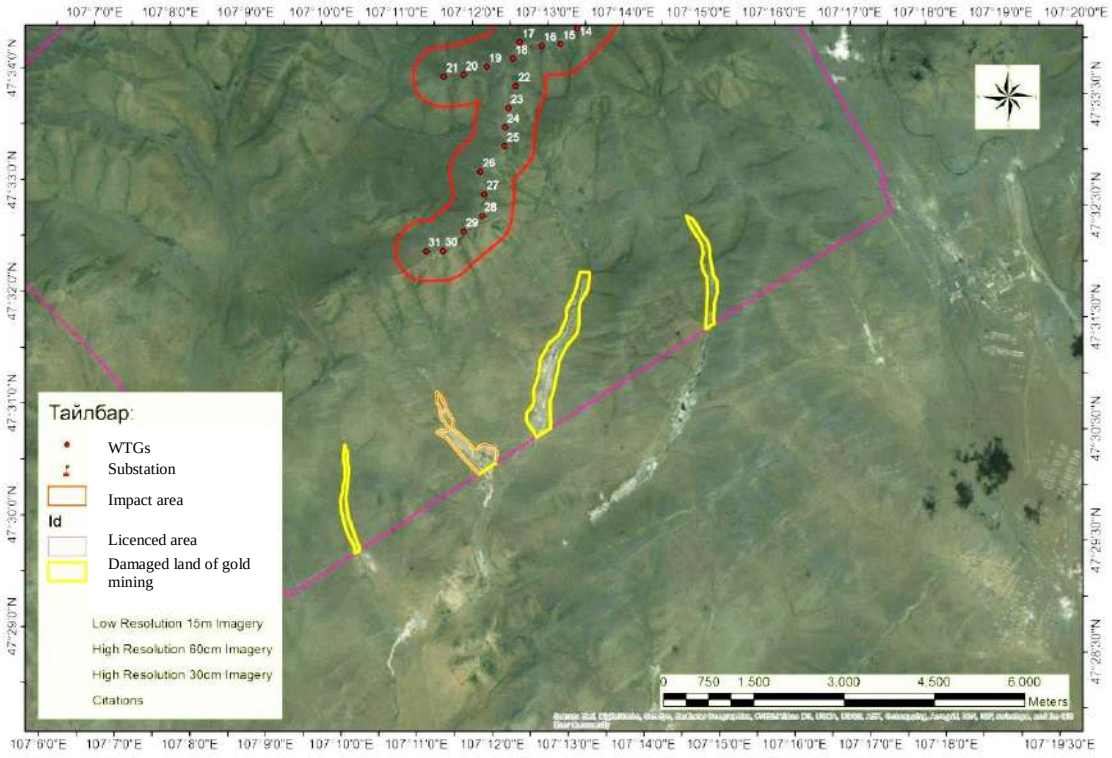
- Small scale biological wastewater treatment plant for purifying and disinfecting domestic waste water needs to be run according to operational manual.
- According to operational manual, a substance activating anaerobic bactery must be flushed through toiled 1-2 times a month in order to maintain waste water cleaning rate.
- There is possibility of accumulation of toxic gases such as carbon dioxide and methane accumulating as bio decomposing process occurs inside septic tank, therefore for cleaning and servicing must be carried out by professionals.
- Inserting domestic waste /chemical substance, petrol, engine oil, substance containing chlorine/ into cleaning system is strictly prohibited.
- Small wastes such as cigarette butts, gums, female sanitary pads, cloth, plastic cap and confectionary paper should not be put into cleaning system.
- Sludge drainage required for disinfecting container depending on contamination level.

Special protected areas

- As WF's tenure land is included in special protected area near Bogdkhan mountain natural reserve, therefore it needs to operate by adhering to special protected area's rules.

Land utilization

- Traffic movement monitoring and measures to enforce traffic movements through already formed route should be implemented.
- As there will be an overlap of station's tenure and specially licensed fields of companies extracting gold on south-west section of the station's tenure, thus tenure overlap needs to be inspected and solved. Doing so, it will create a legal environment where station will not be responsible for gold companies damaged land.



Source: DEIASC's assessment team, 2016

Figure 2 Fields where gold extraction taking place /must be removed from field/

1.2 Environmental protection plan

1.2.1 Plan of measures related with projects positive and negative impacts

№	Environment, society, health issues	Impacts	Related measures	Scale and size of measure	Unit cost	Total cost, million MNT	Duration and interval of implementation	Standards and methodology to follow
0	1	2	3	4	5	6	7	8
Project positive impacts								
1	Water reserve savings	40 million ton of water will be saved in 25 years	Promoting water reserve savings	Company, energy producers, Interested parties.	-	---*---	2018-2020	Water consumption standard
2	Natural mineral resource savings	3 million ton of coal will be saved in 25 years	Promoting natural mineral resource savings	---*---	-	---*---	2018-2020	Coal consumption standard
3	Net benefits	Will produce 4212.5 million kilowatt hours of electricity in 25 years without utilizing exhaustible natural resources.	Contributing in renewable energy production development /Advertising and promotion activities etc/	---*---	-	---*---	2018-2020	-

	1	2	3	4	5	6	7	8
4	Social impact	-Providing employment - As people's home and workplace condition improves, work productivity grows	- Employing people with stable workplace -Supplying sustainable energy	Company, Citizen, Energy production	-	From production cost	2018-2020, annually	-
5	Social impact	-As power supply improves and becomes reliable, health service quality and capacity increases	-Supplying sustainable energy	Company's energy production, health organizations	-	---*---	2018-2020, annually	-
6	Opportunity for business and industry to grow	- Operation of all manufacturing and service organization stabilizes -Will provide power availability for new producers to start operating		Company's energy production, business organizations	-	---*---	2018-2020, annually	-
7	Direct contribution to national and local development	Increasing budget imcome affects national and local development	Contributing to national and local budget significantly	Company, National budget profit		From production profit	2018-2020, annually	-

0	1	2	3	4	5	6	7	8
8	Renewable energy	Awareness about the significance of renewable energy will increase	Making brochure, leaflet and movie about positive project impact and promote with it.	Company, organizations, citizens	-	CIB	2018-2020	-
Project negative impact								
9	Atmosphere	Sudden weather change, especially frequency and intensity of weather phenomenon changed drastically	Regularly using weather and climate information in planning and implementing any production work	Company	-	CIB	2018-2020, annually	-
10		Icicles formed on WTGs blades could be thrown during spring and autumn season	Defining detailed WTGs icicle forming period by using weather information and taking related measures	---*---	-	---*---	2018-2020, annually	-
11		Possible pollution in project site atmosphere Төслийн талбайд агаар орчны бохирдлоос сэргийлэх нь чухал	Conducting regular air quality monitoring and analysis	Company, professional organization	-	From monitoring expenditure	2018-2020, annually	MNS 4585:2016 Air quality. General technical requirement
12	Noise	It cannot be denied to have instances of increased noise level due to abnormal operation of technic and equipment	Conducting regular noise level monitoring of technic and equipments	Company, professional organization	-	From monitoring expenditure	2018-2020, annually	

0	1	2	3	4	5	6	7	8
13	Hydro environment	Legal violation of well water usage may occur	Using well water according to contract under local permit	Company, Governer of Sergelen soum	-	-	2018-2020, annually	Law on water
14			Making regular payment to local budget for water usage	---*---	-	According to contract	2018-2020, annually	
15		Potential lack of well water protection	Using well water according to protected zone regulation	Company	-	-	2018-2020	
16			Testing and monitoring well water quality	Company, professional organization	-	From monitoring expenditure	2018-2020, annually	
17		Spring water pollution	Establishing sanitary zone on a welling up spring source on the south-west side of the substation, fencing to protect from livestock impact and getting rid of pollution.	Company	-	2.0	2018	
18		Water from wastewater treatment facility may pollute spring water	Testing spring water /in order to monitor whether water permeating into soil from wastewater treatment plant is affecting spring water /	Company, professional organization	-	From monitoring expenditure	2018-2020, annually	

0	1	2	3	4	5	6	7	8
19		By newly emerging spring water flow, soil near underground cable lines may get damaged	Monitoring spring water flow runway and taking related measures	Company	-	CIB	2018-2020	Law on water
20		Potential groundwater pollution	Preventing used oil from leaking into soil and groundwater.	Company, employees	-	-	2018-2020, annually	
21	Soil cover	Soil humus content declined on technically restored areas, the surface has more loose rocks, exposed carbonated dirt	Creating normal stabilizing condition in soil cover via vegetative restoration, monitoring restoration and taking related measures.	Project site's damaged soil area.	-	From monitoring expenditure, CIB	2018-2020, on August every year	MNS 5918 : 2008 Environment. Vegetating damaged land. General technical requirement
22		Possible damage to improved road and soil	Placing signs to stop forming new branching roads to the lower side of ground surface slope from improved road leading to substation.	Along project site's improved road	-	0.8	On May 2018	-
23		Due to damages on some sections of the water protection embankment caused by rain water flow on the sloped side of improved dirt road which has been built on mountain ridge, the surrounding soil is about to be damaged	Repairing damages of mountain ridge road embankments on the spot and henceforth taking protective measures to stop deep ravines and trechnes forming from surface linear erosion	Along project site's improved road	-	CIB	2018-2020, Everytime soil gets damaged	MNS 5546:2005 General requirements for determining pasture land soil erosion, damage and plant degradation

0	1	2	3	4	5	6	7	8
24		Soil fertility may decline	Conducting soil monitoring study on fixed spots	Project site	-	From monitoring expenditure	2018-2020, annually	MNS 5916 : 2008 Stripping and storing fertile soil during ground work
25	Subsoil	Additional deformation and damage may occur to foundation soil which is base for WTGs foundation, tranformers and other facilities.	Conducting monitoring on foundation soil which is base for WTGs foundation, transformers and other facilities.	Project site equipments, soil	-	From monitoring expenditure	2018-2020, annually	-
26	Vegetation cover	Results of biological restoration may get delayed	Placing address signs/plates on biologically restored field and photo information board showing when and what kind of plant seeds have been sown	Restored area	-	0.4	2018	-
27			Counting individual natural plants growing on restored field and carrying out a study on seed reserve in soil.	---*---	-	CIB	2018-2020	-
28			Conducting restoration supporting activities based on basis of above study	---*---	-	CIB	2018-2020	-

0	1	2	3	4	5	6	7	8
29			Taking measures to protect restored fields from human and animal impact	---*---	-	-	2018-2020	-
30		Regular state of birch groves, which is an environment of important significance for biological diversity, could be lost due to human and animal impact	To protect birch groves conduct advertising activities	herders	-	-	жил бүр	
31		Due to livestock grazing load on project site, signs of pasture degradation detected	Conducting study for determining restorative capacity and carrying capacity when rotating pasture seasonally	Project site pasture	-	3.0	2018-2020, Annually twice in June and August	MNS 5546:2005 General requirement for defining pasture land soil erosion, damage and vegetation degradation
32			Showing support to improve pasture management and for herders to develop and implement pasture utilization plan in local areas	Project site and to herders in its vicinity	-	3.0	2020-2022	Pasture management handbook Tserendash S., Altanzul Ts.

0	1	2	3	4	5	6	7	8
33			Working with herders and locals to implement participatory pasture health monitoring	Company administration, employees, residents, herders, expert	-	1.0+ From monitoring expenditure	2018-2020	---*---
34		Vegetation may get degraded due to disorderly movement of human and technics	Promoting and making signboards about environmental legal requirements in a understandable way for employees and local people.	Project site, its surrounding, employees, residents,	-	0.9	2018-2020, Once in May and June	-
35	Fauna	Due to pasture degradation impact, brandt's vole may proliferate and spread widely. The negative impact may occur as saker falcon, upland buzzard and steppe eagle following this rodent may suffer and perish from WTG's blades.	• Supporting herders with rotation to prevent pasture from degradation, in order not to create pasture condition with stubble vegetation which is favorable environment for Brandt's vole to proliferate. • Restricting herder settlement density by building wells in unused pastureland • To construct an artificial nest at a distance of 2-5 km from WTGs in order to support birds of prey with opportunity to nestle	Vicinity of Salkhit mountain as a whole where WTGs situated, company administration	-	CIB	2018-2020	Model of artificial nest released by Mongolian Wildlife Protection Center NGO

0	1	2	3	4	5	6	7	8
36		Illegal hunting of endangered animals such as marmot, red deer and Mongolian gazelle	• To cooperate with aimak's, soum's and local rangers • To help building capacity for local protected areas • To assist in patrolling and monitoring during active hunting season in the vicinity of Salkhit mountain • To inform violations to related local people at once • To help installing trap cameras in the areas where of dwarf birch stand and marmots inhabit	Salkhit mountain, To include 2km of area in all direction from WTGs situated spot, Company administration	-	CIB	2018-2020	Law on fauna, Law on protected areas
37	Employees health	Employees may develop illness	To provide employees with special work clothes and protective gear	Company administration, expert, all employees	-	From occupational health and safety measure's budget /FOHSMB/	2018-2020	Law on occupational health and safety
38			To follow employee's food hygiene requirements consistently					
39		Employees could get injured	To enforce occupational health and safety rules consistently					
40			To organize a course, training and instruction on occupational safety					

0	1	2	3	4	5	6	7	8
41			A fund to be spent on measures to ensure occupational safety should be included in budget planning					
42	Land utilization	Land degredation may occur	Monitoring traffic movement consistently and taking measures to ensure traveling on already set routes	Company administration, expert, road, drivers	-	-	2018-2020	Law on land Article 35.3.2
43		On the southern side of the tenure, gold mines extracting gold which is an overlap of tenure	Getting inspected and settling land tenure overlap; creating a legal environment where station will not be responsible for damaged land of gold companies	---*---	-	-	2018	
44		Impact of land usage may increase	Getting guaranteed by land status and quality inspection	Company administration	-	By contract	2018	Article 35.3.4 of the Land Law, 1st Annex of the Mongolian Government's 28th decree, 2003
45	Special protected land	Being close to Bogdkhan mountain national park and being included in aimak's specially protected area, the protection regime could be lost	To operate by adhering to specially protected area's regime	Company administration	-	-	2018-2020	Protection regime of Salkhit mountain's protected area

0	1	2	3	4	5	6	7	8
46	Environmental audit	Legal violations on environmental protection may occur	Getting environmental audit done every two years, and taking measures to implement it		4.0	By contract	2018-2020	Law on Environmental Protection, LEP Order No. A-126, 2013
	Total					11.1		

1.2.2 Waste management plan

№	Impacts	Related measures	Scale and size of measure	Unit cost	Total cost, million MNT	Duration and interval of implementation	Standards and methodology to follow
0	1	2	3	4	5	6	7
1	Waste may pollute environment	Sorting solid waste, re-distribute recyclable waste back to market, and taking regular measures to transport landfill waste by authorized organization to centralized spot according to contract	Company administration, Contractor company	-	According to contract	2018-2022, annually	Law on waste
2	When operational regime of small scale wastewater treatment plant fails, soil and ground water will be polluted	To follow operational procedures of wastewater treatment plant	Company administration, expert, wastewater treatment plant	-	-	2018-2022, regularly	

0	1	2	3	4	5	6	7
3	If cleaning quality deteriorates, soil and groundwater will be polluted	To regularly add an activating substance for wastewater treatment plant's anaerobic bacteria	Expert, treatment plant	-	From production cost	2018-2022, regularly	
		To drain and dispose a sludge from disinfecting container of wastewater treatment plant by professional organization	Expert, wastewater treatment plant, professional organization	-	According to contract	2018-2022, at the time	
4	Workers could be affected by septic's toxic gas	Septic's cleaning and servicing should be carried out by professionals	Expert, Wastewater treatment plant	-	---*---	2018-2022, at the time	
6	Failing to change and to dispose equipment oil and lubricant material according to safety guideline and leaking it to environment will have polluting impact on soil and water, from this polluted environment will have toxic impact on human and animal	Inside protective yard, waste oil should be stored in special containers and handed over to the processing plant according to contract	Company administration , expert, waste	-	According to contract	2018-2022	
7	In case equipment oil leaks, soil and groundwater will be polluted	To check the transferring pipe for potential oil leakage from substation equipment and the seal of the underground safety tank	Company administration , expert	-	-	2018-2022	

1.2.3 Historical and cultural heritage protection plan

№	Affecting historical and cultural heritage	Protective measure	Scale and size of measure	Unit cost	Total cost, million MNT	Duration and interval of implementation	Standards and methodology to follow
1.	Cultural heritage could be destroyed	Taking measures to protect cultural heritages	Project site	-	CIB	2018-2022	Law on protection of cultural heritage

1.2.4 Risk management plan

№	Negative impacts of potential accients and hazards	Precautionary measures	Scale and size of measure	Unit cost	Total cost, thousand MNT	Duration and interval of implementation	Standards and methodology to follow
0	1	2	3	4	5	6	7
1	A threat to human health/life, damage to property and pollution in environment due to traffic accident	Conducting regular technical inspection, monitoring and servicing; following traffic safety rules	Company administration, contractor organization, transport vehicles, road, employees, passengers	-	From safety cost	2018-2022 Annually	Traffic safety rule
2	Accidentally making incorrect network cable connections and short circuit, causing fire and harm to human health, damage to property	Following safety rules during assembly, connection, cable check, and inspection	All connection cables, equipments, employees	-	From safety cost	2018-2022 annually	Safety rule
3	Short circuit in substation equipment causing explosion and fire; results in harm to human health/life and damage to property	Inspecting and correcting connections, conducting follow-up checks, correcting bad habits, introducing and implementing MNS OSDAS 18001:2012 standard, making safety sign and symbols /SSS/, using special arc lightining protection gear.	Substation equipments	-	From safety cost	2018-2022 annually	-MNS OSDAS 18001:2012 -Safety rule -Technical safety rule -Safety signs, tags

1	2	3	4	5	6	7	8
4	Fire breakout in electricity measuring instruments and management control system, operation may stop	Making adjustments to gauge and automatics within set time, improving supervision	SKADA electronic control sytems	-	From safety cost	2018-2022 annually	
5	Icicles forming and could be thrown from blade during spring and autumn, may cause harm to human and livestock health/life, damage to property	Prohibiting citizens from entering dangerous impact zone during spring and autumn	WTGs, and their impact zone, citizen, employees	-	From safety cost	2018-2022 annually	
6	Fire break out, over voltage, harm to health/life	As the region is heavily affected by lightning, lightning rod and grounding integrity should be inspected on the set time indicated on technical safety guidline, to develop lightning protection plan, to check and adjust over-voltage protection, to operate by developing disaster preparedness plan /DPP/	Lightning protection, grounding, over-voltage protection	-	From safety cost	2018-2022 inspecting according to technical safety /TSR/ rule annually	Technical safety rule Disaster preparedness plan
7		Gathering fire fighting equipments and ensuring their availability					
8		To organize advocacy and training about fire break out prevention					

0	1	2	3	4	5	6	7
9	Due to flood, electrical grounding and connections make short circuit, and burning up fittings	Conducting monitoring and inspection on the state of grounding and connections in the ground during flood, to operate by developing DPP	Grounding, connections in the ground	-	From safety cost	2018-2022 annually	Disaster preparedness plan
10	Being in the seismic activity zone with up to 7 points in MSK scale; due to earthquake, from things like fire break out and collapsing building human health, life and property may perish	Conducting monitoring and inspection on the state of grounding and other connections, inspecting buildings for earthquake-resistance and making additional fixtures on necessary places, to operate by developing DPP	All equipments, building, employees	-	A From safety cost	2018-2022 annually	Disaster preparedness plan
	During instance of risk, huge damage may occur	To operate by founding a "Risk fund" to finance management measures for preventing and mitigating from potential risk		-		2018-2022 year	Laws on toxic and hazardous chemicals and other legal acts
	Total						

1.3 Environmental monitoring program

During the operation of wind power station, negative impacts and changes to the environment should be identified on every occasion and in order to mitigate and to eliminate those impacts, observation, analysis, measurement and monitoring should be conducted as parts of environmental state within certain location, timeframe and intervals. Based on the above, environmental impacts during the operation and the impact extent, scope and changes to the environmental components will be reviewed and further actions will be detailed and implemented. While implementing the environmental monitoring program, the company is responsible for promptly reaching out to the professional organization and take relevant actions; in case there is a change in the environmental state and contamination level exceeding the level set out by the environmental standard and norms.

Monitoring and analysis indicators	**Unit of measure**	**Location**	**Duration and interval**	**Scale of monitoring and analysis job**	**Unit cost, thousand MNT**	**Total cost, thousand MNT/year**	**Standards and methodology to follow**	**Upper, lower limit**
0	1	2	3	4	5	6	7	8
Air quality -Dust -$PM_{2.5}$ -PM_{10}	mg / m^3	Control building, 7^{th}, 10^{th}, 22^{nd} WTGs	Once each in 4,9 months in years 2018-2022	Total of 40 samples and their analysis, 10 conclusions, assignment, cost in 5 years	Once 400.0	4000.0	MNS 4585:2016 Air quality.General technical requirement	Total dust particles – 500 PM_{10} -100 $PM_{2.5}$ -50
Noise Noise level	dBA	Control building, 7^{th}, 10^{th}, 22^{nd} WTGs	Once each in 4,9 months in years 2018-2022	Total of 40 samples and their analysis, 10 conclusions, assignment, cost in 5 years	Once 240.0	2400.0	MNS 4585:2016 Air quality.General technical requirement	In settlement zone, up to Day 60 dBA, Night 45 dBA

0	1	2	3	4	5	6	7	8
Water quality, use pH, EC, general hardness, TDS Ca, Mg, Na+K, $S0_4$, CL, CO_3 $HC0_3$, NH_4, $N0_2$, $N0_3$, Fe	mg / m^3	Well water	In august 2018-2022	5 specimen sampling, analysis, 5 conclusions, assignment, cost	200.0	1000.0	-MNS (ISO) 4867:1999 Water quality. Sampling, storing and protecting methods -MNS 0900:2005 Drinking water. Hygiene requirements, quality and safety assessment	Within norms of standard MNS 0900:2005
pH, EC, general hardness, TDS Ca, Mg, Na+K, $S0_4$, CL, CO_3 $HC0_3$, NH_4, $N0_2$, $N0_3$, Fe	mg / m^3	Hand well water	In august 2018-2022	5 specimen sampling, analysis	50.0	250.0	-MNS (ISO) 4867:1999 Water quality. Sampling, storing and protecting methods -MNS 0900:2005 Drinking water. Hygiene requirements, quality and safety assessment	Within norms of standard MNS 0900:2005
pH, EC, BOD5, TSS, TDS, TPH, Ca, Mg, Na+K, $S0_4$, CL, HC03, mineralization, hardness, weighable substance, ПИЧ, NH4, $N0_2$, $N0_3$, $P_{minerals}$, F, Fe, e-coli	mg / m^3	Spring water	In august 2018-2022	5 specimen sampling, analysis	50.0	250.0	MNS 4586: 1998 Water quality indicators. General requirements	Within norms of standard MNS 4586: 1998

0	1	2	3	4	5	6	7	8
-Water use calculation and report	$м^3$	Well water	Annually	Tota amount of water used	-	-	- Primary procedure for water record - Procedure to produce report on water record	
Soil Change in topsoil properties -Hummus -pH	Analysis, %, Numeric indicator	On project site's monitoring spots	Once in August in following years 2018, 2020, 2022	2 mixed samples from every spot /total of 30 samples/, 3 conclusions, assignment, cost	580.0	1740.0	By soil analysis methods	Comparing and assessing soil elements with initial base indicators
- erosion /water worn/, degree of damage	Kg / ha	At the spot	At the time	Sampling, measurement	-	Composing and implementing budget /CIB/	Soil damage rating / Environmental damage assessment and compensation methodology 2010, p-83/	
- Pollution /By related indicators/	Sampling, observation, measurement /Percentage of polluted area/	On polluted place	At the time	Taking samples by area's pollution degree	-	CIB	MNS 5850 : 2008 Maximum amount of soil polluting substance and elements	

0	1	2	3	4	5	6	7	8
- Land usage, protection	State certification on land status and quality		2018, 2020, /once every two years/	Relevant research and analysis	-	By contract	Article 58 of the Land Law, Report on land utilization Conclusion of certification on land status and quality	
-Base soil	Observation, measurement, supervision	At the spot	At the time	Conducting observation and measurement on the foundation of WTGs, base soil which is foundation for transformers and other facilities	-	CIB	-	-
Flora In 1 м^2 area - Species composition -coverage - The distance between selected plant -Seed reserve in soil -Topsoil stability assessment		**А.** 2 spots per restored field **Б.** Selecting 2 spots for observing natural plant community **В**. Groves spread on back slope of the mountain	Twice in 6,8th month of 2018-2022, (During period of flowering and growing fruits of plant)	Doing plant recording in every selected field according to methodology.	600.0	2400.0	Science academy's biological institute, , field research method and methodology released by Plant research department of National University of Mongolia	

0	1	2	3	4	5	6	7	8
To identify grazing intensity, to select and study plants that resilient to grazing		In spring, summer, autumn pasture 2018-2022,	In 5,7, 9th month	To determine whether grazing intensity is low, medium, high; to study resiliency of such plants as wheat grass, stipa and blue grass	360.0	3240.0	MNS 5546:2005 General requirement to determine pastureland soil erosion, damage and plant degradation	Within norms of standard MNS 5546:2005
Fauna Monitoring of Mongolian marmot's population status, location, mortality, tightening of distribution and expansion	Observation, census, registration, location mapping	On tenure land	To include the period when marmot leaving hibernation at the end of march until going back to hibernation in autumn	Once in early April, once in late August environmental officer will perform /using binocular, GPS, photo camera and computer software/.	-	2000.0 /equipment cost/	Directly observing, registering and recording.	Species classified as "Endangered" in the regional Red list
Mongolian gazelle seasonal movement pattern, location, herd structure, observable population and mortality	Observation, census, registration, location mapping	On tenure land	To peform through all season, specially when female gazelle delivering offsprings from end of June till mid July, also during mating period from December through next year's January	Car patrol doing everyday checks - patrol officer /using two eyes binocular, GPS, photo camera, and regular registration table/, also environmental officer will perform observation in months of 6,7 and 12,1.	-	1000.0	Directly observing, registering and recording.	Recorded in classification of "Endangered" in the regional Red list

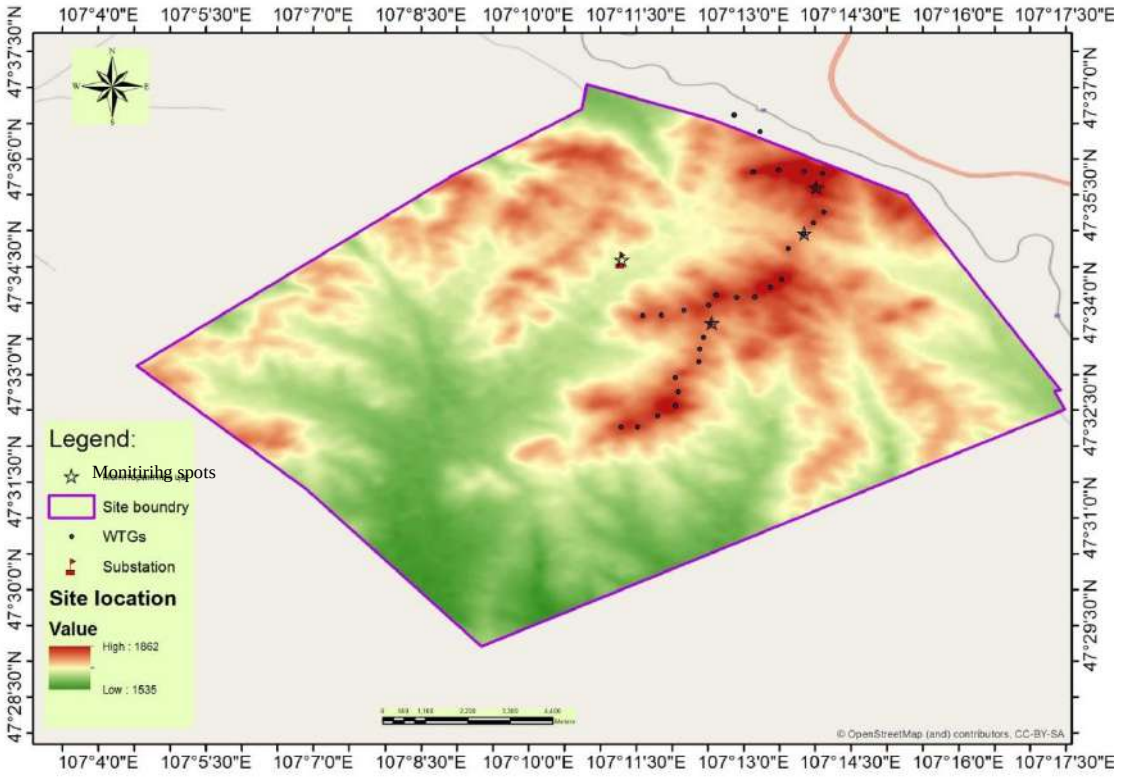
0	1	2	3	4	5	6	7	8
Red deer seasonal location, population, gender, herd composition, movement pattern.	Observation, census, registration, location mapping	On tenure land	To include from June in summer when doe calving until October in autumn when Deer's call and mating begins	Car patrol doing everyday checks - patrol officer, also environmental officer will perform observation in months of 6-11. Installing trap cameras in residing areas to register.		5000.0	Directly observing, registering and recording. Using two eyes binocular, GPS, photo camera and regular registration table	Recorded in classification of "in process of extinction" in the regional Red list
Monitoring of population, density, location and area of distribution of Brandt's vole, daurian pika, and Mongolian gerbil which are main prey for birds of prey	Observation, census, registration, location mapping	On tenure land	Doing observation on daurian pika throughout a year on a specific picked sample monitoring area, for Brandt's vole from April to October on their residing areas	Environmental officer to pick a sample area and to conduct monitoring in months of 4,7 and 10.	-	-	Directly observing and registering. Conducting a density assessment by number of detected small mammalian animal's burrows within 1 hectare of area at a distance of 1km from WTG. As there is a possibility of birds of prey perishing while hunting near WTG, therefore arrangement activities needs to be thought and implemented in such way as monitoring their population status and building nests when they are far	

0	1	2	3	4	5	6	7	8
Monitoring of location, observed population, seasonal movement pattern, hunting pressure and mortality of predatory carnivorous animals such as wolf, fox, corsac fox, Pallas’s cat, skunk, steppe polecat and least weasel.	Observation, census, registration, location mapping	On tenure land	Улирал дамнуулан гүйцэтгэх	Car patrol doing everyday checks - patrol officer, also environmental officer will perform observation	-	-	Directly observing and registering.	Most species are listed as "potentially threatened" in the regional Red List. Also, these animals indirectly indicate steppe ecosystem’s small mammalian animal’s population status, proliferation and spatial distribution
Total						23280		

23280 thousand MNT for environmental monitoring and analysis program.

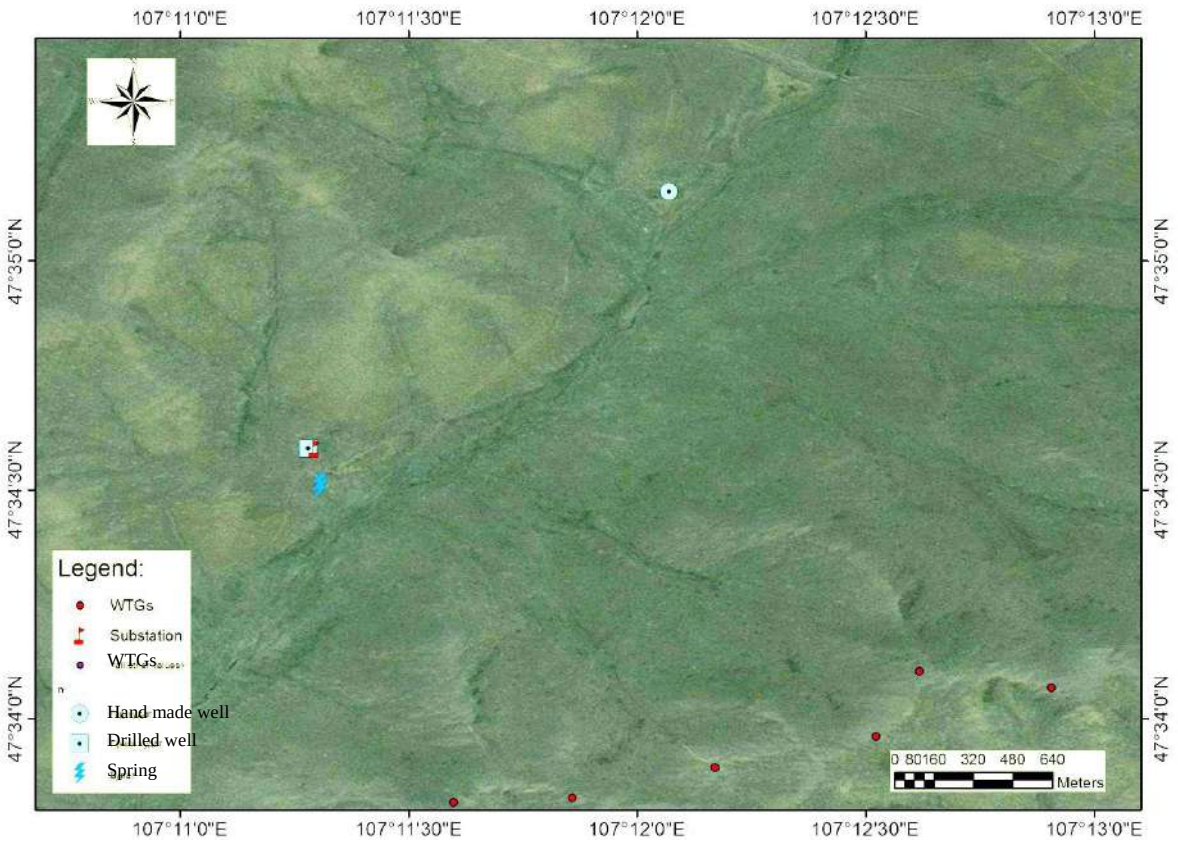
Monitoring survey and spots to perform it

Figure 2 Air quality and noise monitoring spots



Beside 7th WTG	107°14'0.14"E 47°35'36.10"N
Beside 10th WTG	107°13'50.29"E 47°34'57.72"N
Beside 22th WTG	107°12'32.87"E 47°33'42.75"N
Beside of Control center	107°11'17.6"E 47°34'35.4"N

Figure 3 Water environment monitoring spots

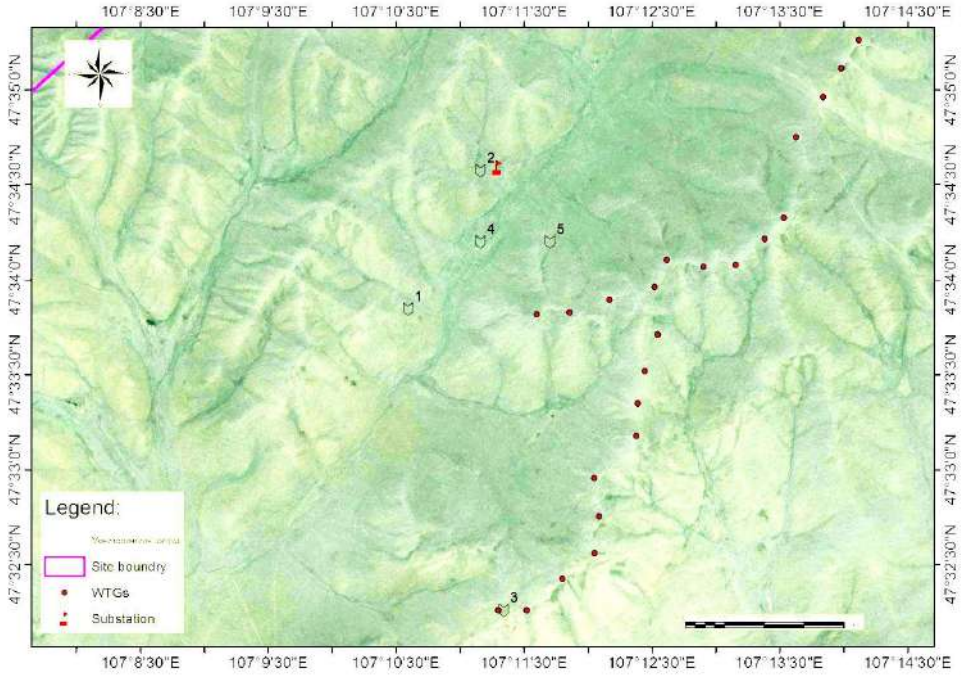


Hand well	107°12'4.19"E	47°35'09.18"N
Worehole /well/	107°11'16.83"E	47°34'35.48"N
Spring	107°11'18.45"E	47°34'30.55"N

Soil monitoring

When selecting the area for soil monitoring, make sure to take the prevailing soil types of the licensed area of WF as a representation and consider the soil usage and restoration. Particularly:

1. Monitoring point (КЭМ-01) for the soil restoration process of the area the concrete batch plant was located and the coordinate is (N 47033'50.7'', E 107010'35.8'').
2. Monitoring point (КЭМ-02) for the restoration of the soil eroded due to the power and water supply for workers' temporary dwellings and home office that are located at the back of the control room and the coordinate is (N 47034'34.5'', E 1070 11'9.8'')



3. Monitoring point (КЭМ-03) for the natural restoration of the rocky soil of mountain ridge that is impacted by the establishment of WF and the coordinate is (N 47032'15.6'', E 107011'20.6'').
4. Monitoring point (КЭМ-04) for the uneroded virgin soil and the coordinate is (47034'34.5'' E 1070 11'9.8'').
5. Monitoring point (КЭМ- 05) for the virgin soil at the mountain backside and the coordinate is (N 470 34'12.0'' E 107011'42.4'')

We selected soil monitoring points on these 5 places and marked them up using GPS, which enables to conduct monitoring study on the soil restoration, the impact to the soil cover from the project activities and the soil alteration.

Figure 4 Soil monitoring spots

Flora monitoring

In order to carry out monitoring study of the flora, sample area should be selected from the rehabilitated area and the adjacent natural communities. Sample area should be 1 meter square. Monitoring point is selected in each area, highlight how much the species within the pristine plant communities that exist alongside on the rehabilitated area increase, count those plant species, and study the planting from seeds and the soil seed reserve. Based on the restoration of the selected plant, it is possible to control the changes of plant cover of the rehabilitated area. Reticulation along the mountain backside is an important environment for the biological diversity and it is suitable here to fully identify plant diversity and carry out research on restoration capability of the plants.

- Restored are on north-west side of office:
  N47^{0}34'3.68" ; E107^{0}11'9.50"
  N 47.578865°; E 07.182274°
- Restored area on mountain leeward slope /concrete mortar was here/
  N47^{0}33'53." ;
  E107^{0}10'38.81"
- Grove 1 (Behind 4th WTG): N 47.598621°; E 107.224200°
- Торлог 2 (Behind 5,6th WTG):
  N 47.598713°; 107.233932°

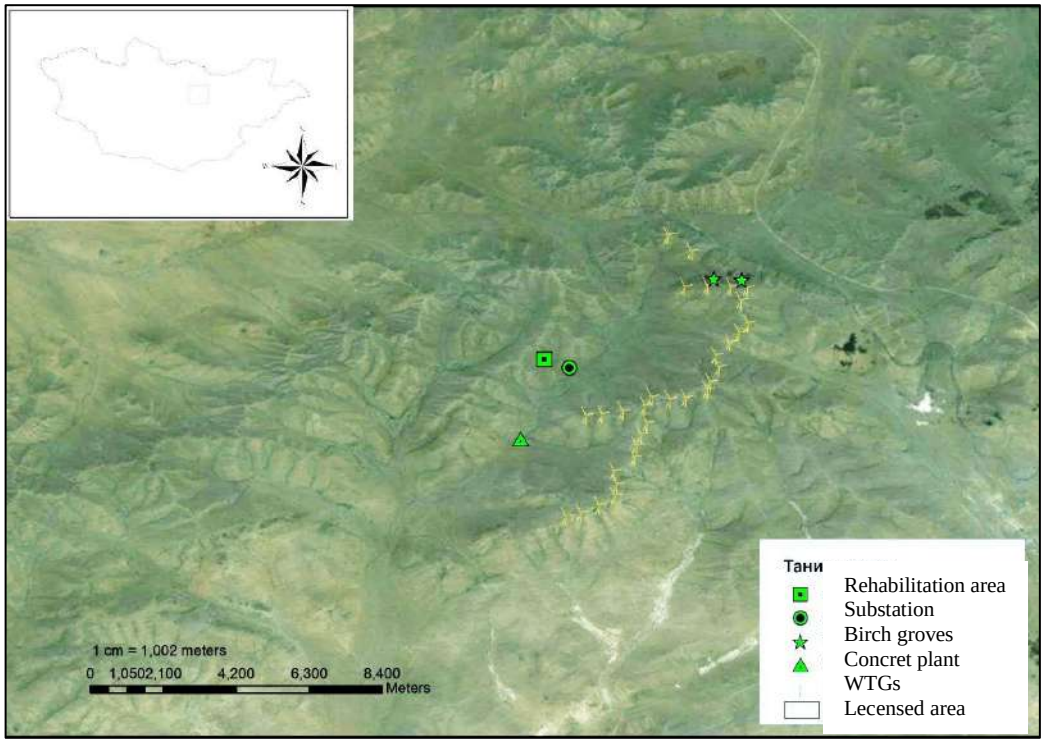


Figure 5 Flora monitoring spots

Animal monitoring, observation and survey

Animal monitoring and study are useful for collecting scientific data, evaluating the animal population and identifying the cause of change. Based on these collected data, protecting animal and maintaining their habitat, and developing management justification will be possible. Therefore, the following directions are recommended. They include:

1. Daily inspector and patrol officers should be provided with binoculars, GPS, digital camera and log sheet and when animals are observed, it should be recorded and contained in the data base.
2. Make these as master's and doctoral degree thesis topics and have students involved in the research during the summer and bring the collected data together to process during the other seasons.
3. Select the speacial area where animals are located, using "automatic camera" with night vision in that area is effective to record and confirm animal diversity and to control and detect illegal hunting.
4. Placing the artificial nest for carnivorous birds, promoting their reproduction and monitoring the population of small rodents are important parts of the monitoring.
5. Detecting and recording the nests of carnivorous birds
6. During the reproduction period for the carnivorous birds /between April and the beginning of July/ or from the time baby birds start to grow up until they are able to fly, record and confirm the bird species decline by digital camera, register its coordinate and collect the residual feathers along the electric power line.
7. Methodically carry out the monitoring study to collect, confirm and register the data on the bird species decline within 100-150 meters from the WF during the spring and autumn when it is migration and reproduction periods for birds.
8. Near the patchy birch forest, put some salt marsh for wild ungulates especially red deer, antelope.
9. When marmots come out of their burrows and enter their reproduction phase, register their head count, number and label the occupied mound, and set and record the location coordinate by GPS. In autumn, count and record the occupied and new mounds and set the location coordinates.
10. Record the burrows and habitats of small rodents, steppe mouse, small carnivores such as stoat, ferret, manul cat and corsac that are located within 10 -200 meters away from WPS and set their location coordinates.

11. Near Salkhit mountain, while a herd of mongolian antelope is grazing through, record their head count approximately, and if there is a place where a herd of female antelope deliver their off-springs during summer, determine the location coordinate. Find out the place where they gather for mating and record and verify the location.
12. Record and confirm the head count of vultures and griffons that crowd over the dead flesh of an animal.

1.4 Environmental protection budget

Job type	Budgeted cost, million MNT ₮
Budget for measures related to positive and negative project impact	11.1, BEC
Budget for waste management	According to contract
Budget for protection measure of historical and cultural heritage	When required BEC
Budget for risk management plan	From safety cost
Budget for environmental monitoring and analysis program	23.3
Total	**34.4**

1.5 Schedule of report and discussion for stakeholders and interested parties for EMP

Organizations to report and discuss the EMP implementation	Reporting and discussing form	Content of information	Timeframe	Voting direction during discussion	Organizing place/location
Ministry of nature, environment and tourism	Environmental management plan for the year	To get approval for an environmental management plan that includes environmental protection and environmental change monitoring program for the year	Previous year's December	To receive local opinion on EMP and to get reviewed and approved by the environmental government administrative central agency	Project proponent, locals, MNET
Environmental department of Tuv	Report on the implementation of the	Implementation and description of each	Within 1st of November of that	Conclusion on plan's completion of	Zuunmod soum, Sergelen soum,

aimak	EMP	plan indicator	year	implementation	MNET
Development policy department of Tuv Aimak's Governor office, environmental agency, professional inspection agency, basin administration, representative of soum 's Governor's Office, state environmental inspector, ranger, land foreman	To report implemented works on project site	To inspect implementation of the plan	Within 1st of December of that year	To inspect implementation of the plan and to receive opinion on the following year's plan	Sergelen soum
MNET– Environment and natural resources department	To validate by getting acquainted with report	To validate implemen-tation report of environmental management plan	To include within December of that years	Approving next year's plan and its required amount for implementation	MNET