

Draft Initial Environmental Examination (Main Report – Part 1 of 4)

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Environmental and Social Impact Assessment of 35 MW Solar Power Project, Manikganj, Bangladesh

Spectra Solar Park Limited

Draft ESIA Report

12 April 2019

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Environmental and Social Impact Assessment of 35 MW Solar Power Project, Manikganj, Bangladesh

Draft ESIA Report

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Acronyms and Abbreviations

Name	Description
ADB	Asian Development Bank
ARIPA	Acquisition and Requisition of Immovable Property Act
BBS	Bangladesh Bureau of Statistics
BDT	Bangladeshi Taka
BMD	Bangladesh Meteorological Department
BOO	build-own and operate
BPDB	Bangladesh Power Development Board
CPR	Common Property Resources
DC	Deputy Commissioner
DEG	German Development Finance Institution
DG	Diesel Generator
DoE	Department of Environment
DPHE	Department of Public Health Engineering
E&S	Environment and Social
EA	Executing Agency
ECA	Environmental Conservation Act
ECC	Environmental Clearance Certificate
ECR	Environmental Conservation Rules
EHS	Environment, Health and Safety
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPC	Engineering, Procurement and Construction
EPFI	Equator Principles Financial Institution
EQS	Environmental Quality Standard
ERM	ERM India Private Limited
ESIA	Environmental and Social Impact Assessment
FGD	Focused Group Discussion
GoB	Government of Bangladesh
GRM	Grievance Redressal Mechanism

HFL	High Flood Level
HH	Household
HR	Human resources
IEE	Initial Environmental Examination
IEE	Initial Environmental Examination
IFC	International Finance Corporation
ILO	International Labour Organisation
IP	Indigenous People
IPP	Indigenous Peoples Plan
IR	Involuntary Resettlement
KLD	Kilolitre per Day
LLA	Land Lease Agreement
MSL	Mean Sea Level
MW	Megawatt
NGO	Non-Government Organization
NOC	No Objection Certificate
NOC	No Objection Certificate
O&M	Operation and Maintenance
P&HC	Population and Housing Census
PAP	Project Affected Person
PD	Project Director
PPA	Power Purchase Agreement
PPE	Personal Protective Equipment
PS	Performance Standards
PTW	permit to work
PV	Photovoltaics
PWD	Public Works Datum
R&R	Resettlement and Rehabilitation
RHD	Roads and Highways Department
ROU	Right of Use
ROW	Right of Way
SCADA	Supervisory control and data acquisition
SCC	Site Clearance Certificate
SEP	Stakeholder Engagement Plan
SHS	Solar Home System
SOP	Standard operating procedure
SPS	Safeguard Policy Statement
SR	Safeguard Requirements
SSPL	Spectra Solar Park Limited
T/L	Transmission Line

ToR	Terms of Reference
WB	World Bank

EXECUTIVE SUMMARY

Introduction and Background

Spectra Solar Park Limited (SSPL) is proposing to set up 35 MW solar power project (hereinafter referred to as “the project”), which is proposed to be constructed on build-own and operate (BOO) basis in Shibhalaya Upazilla of Manikganj District of Bangladesh. Project location map is presented in **Figure 0.1**.

This non-technical summary (NTS) presents salient features of the project, the main findings and the conclusions of the Environmental and Social Impact Assessment (ESIA). The ESIA has been prepared in accordance with the following:

- The Environment Conservation Act, 1995 and The Environment Conservation Rules, 1997 and amendments thereof by the Ministry of Environment and Forest, Government of Bangladesh;
- Applicable Bangladesh national, regional and local regulations;
- International conventions and agreements ratified by Bangladesh;
- ADB's Safeguard Policy Statement (SPS) (2009) and specific requirements;
- IFC Performance Standards for Environmental and Social Sustainability (2012);
- Equator Principles III (2013).

Project Description

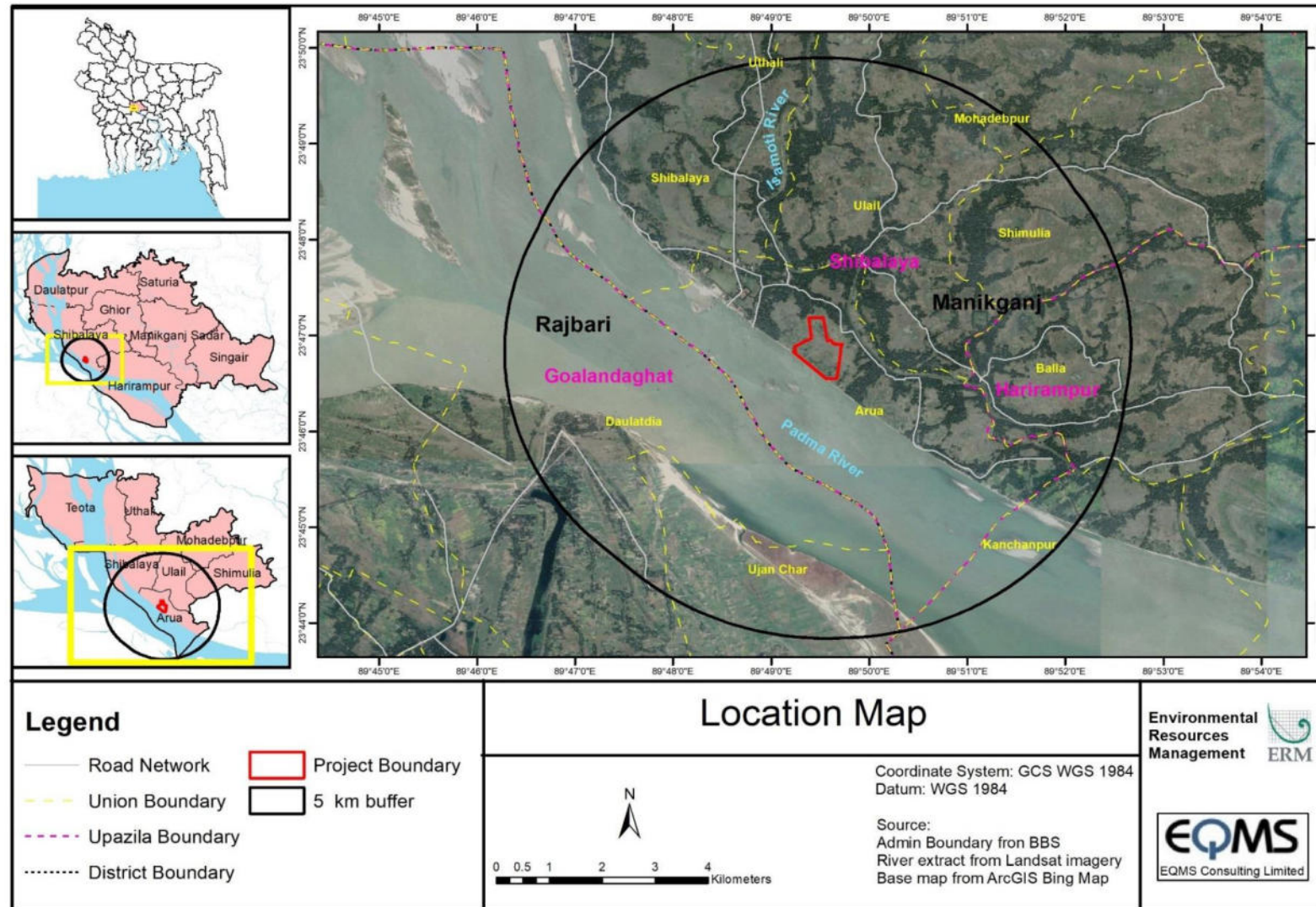
Project Features

Project will utilize Polycrystalline Silicon modules on fixed structures. The modules will be fixed type. The type of modules and mounting systems used is as follows:

Table 0.1 PV Modules, Inverter and Mounting system

S. No.	Main Equipment	Solar Modules
1	PV Module Type	STP-330/24 Vfw
2	Mounting Type	Fixed
3	Number of modules	1,34,400
4	Number of modules per string	20
5	Rating	330 Wp
6	Total No. of Strings	6720
7	Total No. Brackets	3360
9	Total no. of Inverters	15

Figure 0.1 Project Location



Project Components

Solar PV Modules

Polycrystalline Silicon Module is being used for capturing solar energy. The details area as follows:

- Fixed type.
- Module tilt angle has been computed to be 14° (modules facing true south)
- Adhere to International Electro technical Commission (IEC) specifications for Crystalline Silicon modules.

Power Conditioning Unit (PCU) or Inverter

Convert the incoming DC received from PV modules into AC with suitable power quality. The inverter produces sinusoidal AC waveforms with low harmonic distortion. The inverter also has to act as a protective device of the system. It needs to trip if the voltage, current or frequency goes outside acceptable ranges. The details area as follows:

- Used in grid-connected solar PV systems consist of an inverter and other electronics for Maximum Power Point Tracking (MPPT), Synchronization and remote monitoring.
- As the PV array output varies with the solar radiation the inverter has to effectively interface with the grid to remain synchronized.

Transmission Line

Power generated from the Project will be evacuated to proposed Barangail Grid Sub-Station. Before commissioning of Barangail, Manikganj 132/33 kV grid substation, power generated from Solar Power Plant will be evacuated through 33 kV double circuit line to bus-bar of Paturia 33/11 kV substation (by one circuit) and tapping another circuit with existing 33 kV line near Gheor 33/11 kV substation. Spectra Solar Park Limited (SSPL) will construct 7.2 km power transmission line from project site to existing Pauria Sub-station.

Resource Requirement

The resource requirement for proposed project is presented in following table.

Table 0.2 Resource Requirement for the project

Resource	Description
Land	<ul style="list-style-type: none"> ■ Solar Power Project <ul style="list-style-type: none"> ○ The land requirement for the solar power project site 138.78 acres. Additionally 1.30 acres of land (1.0 acre for site approach road and 0.3 acres for residential unit). ○ 140.08 acres (138.78 + 1.30 acres) of land is private land ○ The land for the project is located in the Boruria mouza in Shibhalaya Upazila of Manikganj district. ○ Land has been procured through negotiated purchase. ■ Transmission Line <ul style="list-style-type: none"> ○ Power evacuation transmission line -7.2 km, ROU- 6.0 m ○ 3.5 km is the Government Land and remaining 3.7 km in private land. ○ Transmission line ROU will be utilised for the project. ○ Transmission line ROU compensation has been given to affected land owners from crop damages and devaluation of land due to restriction on land use.

Resource	Description
Site Development	<ul style="list-style-type: none"> ■ The entire project site was on low land. ■ The site has been filled up with white sand from river. The estimated volume of fill material required for the site is approximately 50.4 million cubic feet to raise the site level about 2 to 2.5 m from original level. ■ The project has obtained permission from the Office of Deputy Commissioner for landfilling using Bulgate dredging sand (dated 30 April 2018).
Water	<ul style="list-style-type: none"> ■ Construction phase: 5 to 6 KLD and sourced from private bore well from the nearby village ■ Operational Phase: not estimated the requirement of water; it was informed the two bore well will be constructed within the site and for that NOC from Union Parishad will be taken.
Manpower	<ul style="list-style-type: none"> ■ Land Development- activity already completed ■ Civil construction (3-4 months duration) - 112 ■ Electrical work (1-2 months duration) – 62 ■ Operational phase 20 years
Power supply	<ul style="list-style-type: none"> ■ Construction phase: 3 DG sets (2 x 16 KVA, 8 KVA) ■ Operational Phase: Back up DG sets for emergency operation

Operation and Maintenance

The list of activities to be carried out in the operation and maintenance phase would be:

- Monthly cleaning of PV modules;
- Control of vegetation viz. weeds, bushes etc. within the site and those immediately surrounding it;
- Routine inspection of all PV modules and associated structures viz. cables, transformers, inverters, mounting structures etc.;
- Operation and maintenance of ancillary facilities such as power substation;
- Inspection and maintenance of transmission lines; and
- Inspection and maintenance of internal site pathways/access roads.

Project Lifecycle and Timelines

Site Development

The site development includes the filling of land, compaction and fencing of site. The filling activity was started from September 2018 and it was reported during the site visit that 94% filling activity was completed.

The total periphery of the site is approximately, 3.846 km. Construction of retaining wall (box cutting, cut of wall casting, base casting and wall casting) along the periphery was started from January 2019 and currently approximately 50% of the work has been completed.

EPC Works

Spectra will engage the Jiangsu Akcome Industrial Group Co., Ltd as the EPC contactor for this project. The scope of work of the EPC shall involve the following:

- Erection of Solar PV Panels
- Erection of Inverters and SCADA Facility
- Construction of underground and/or overhead electrical collection lines to connect PV modules to the pooling substation
- Erection of other associated facilities (control room, office, etc.)

Construction of related structures will involve civil and steel work for installation of pooling stations, transformers, substation, and electric cables and signal wires. After site development activity civil work will be initiated.

Operation of Plant

The design life of the solar power project is estimated to be 20 years. If retrofitting is not feasible and the operational life of the plant expires, the plant will be decommissioned according to the requirements of the authorities at that time.

Workforce & Labour Camp

Site Development Activity: The average workforce working under this contractor is 60 and maximum up to 150. A Labour Camp has been provided to accommodate 40 labourers within the project site. The Labour Camp has drinking water facility (water filter system), toilet facility and access to separate Kitchen.

EPC Work: Akcome is the EPC contractor and Akcome will start the civil construction work. It was also reported that during this construction phase, maximum 200 workforce will be working in the site. A 100 people capacity Labour Camp will be developed within the project site.

Project Alternatives

The ESIA has reviewed the process by which specific considerations into the location, design and extent of adverse impacts were assessed and the alternatives that have been considered during the development and pre-feasibility process.

No Project

Actual electricity demand in the country has not been met due to a shortage of available generation capacity. In addition, due to a shortage of gas supply, some power plants are unable to reach their full generation capability. The current supply-demand in Bangladesh also has a knock on effect on all other key sectors including agriculture, industry, commercial and domestic sectors. There is therefore no alternative to adding more power generating units to the existing power system of Bangladesh, to help improve and meet the energy demand for both domestic and industrial requirements.

The 'No Project Scenario' is also likely to have a negative effect on opportunities for employment, both directly from the proposed power project and its dependant sectors such as agriculture, industries and manufacturing that require stable power supply in order to operate and be competitive.

Site Location

SSPL has conducted the siting study for setting up of the solar plant. As per GoB requirement, any solar plant project should be constructed on non-agricultural land. The Project has procured approximately 138 acres land, which is categorised as non-agricultural land. The discussion with land sellers also reveals that major part of the site was low laying land and inundated during monsoon and post-monsoon season, approximately 5-6 month. The local people also confirmed that land was not suitable for agriculture purpose. There was no residential unit within the project site; therefore, R&R is not applicable for this project.

Technical

- Access to road and transportation networks;
- Existing power evacuation infrastructure;

Social and environmental

- No major sensitive environmental receptors (such as hospitals, schools, etc.) in close proximity;
- No physical cultural resources on site and in close proximity;
- No resettlement requirements

BASELINE ENVIRONMENT

Project Area of Influence

- The area affected by the Project and the infrastructure to be built includes the following:
- The project activities and facilities that are directly owned, operated or managed by the project proponent (including by contractors);
- Impacts from unplanned but predictable developments caused by the project that may occur later or at a related location such as increase in traffic on the approach road;
- Impacts on biodiversity or on ecosystem services upon which affected communities' livelihoods are dependent;
- Associated facilities, that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable.

In order to ascertain the project's area of influence, a study area of 5 km from the project site was considered.

Land Environment

Land Use

The land use pattern shows that agricultural land (39.37%) occupies most of the area within the 5km buffer zone of the project site. The river occupies 34.47% of the land whereas settlement with homestead vegetation inhibits about 22.03%. Sand bar occupies 2.83% of the land while aquaculture, river bank, pond, beel (wetlands) and baor (stagnant wetlands) consist 1.3% of the lands within the 5km buffer zone of the project site.

Physiography

The project site and study area is situated on the lower region of the Ganges floodplain. This region includes the western part of the Ganges River Floodplain which is predominantly highland and medium highland. Most areas have a complex relief of broad and narrow ridges and inter-ridge depressions, separated by areas with smooth broad ridges and basins.

Topography

The overall topography of the Manikganj district is medium terrain with undulations. The proposed project site is also medium to plain land with undulations. Most of the proposed project site located close to the Padma river side is high but the eastern sections are low.

Geology

This geology is mostly characterized by the rapid subsidence and filling of a basin in which a huge thickness of deltaic sediments were deposited as a mega delta built out and progressed towards the south..

Soil Quality

Soil quality of the project was analysed through primary soil quality monitoring in one location. The pH level in soil sample was 8.17 indicating neutral. Texture of soil sample was found to be sandy in nature. EC was 36.6 micro Siemens/cm. Available nitrogen, phosphorus and potassium content was 22 mg/kg; <3.0 mg/kg and 29 mg/kg respectively. SAR value in the soil was 0.01. The concentration of heavy metals in the soil was below detectable limit; like– Hg <0.1 mg/kg, Pb- <2.0 mg/kg, Cd <2.0 mg/kg, Co- <2.0 mg/kg, Cr+6- <2.0 mg/kg. The concentration of PAH was <2.0 mg/kg. The concentration of TPH was <10.0 mg/ kg.

Water Environment

Drainage

The study area falls within the watershed of Padma River. Padma River flows north- west to south-east within the study area at a nearest distance of 0.05 km west of the site. The natural drainage of the micro-watershed is from north to south and southeast, while within the Site area is from west to northeast direction. The ground slope leads the drainage from the Site area to natural drainage channel, low lying areas located in east of the Site and ultimately to the Padma River in the downstream.

Surface Water Quality

Surface water quality of the study area was analysed through primary water quality monitoring in three locations- pond near project site and up-stream and down-stream of Ichamati River. The pH of the surface water samples varied from 7.58 to 7.81. The DO levels at all locations exhibited values ranging from 5.6 to 6.1 mg/l. BOD values of the sample collected from upstream of Ichamati River and surface waterbody near site was found to be < 2.0 mg/l. The other samples reveal BOD values of 3.8 mg/l.

Presence of contaminants in the form of oil and grease in all surface water samples was found to be negligible (<1.4 mg/l). Concentrations of heavy metal like lead (<0.005 mg/l), chromium (<0.01 mg/l), cadmium (<0.001 mg/l), mercury (<0.001 mg/l), arsenic (<0.005 mg/l) and vanadium (<0.2 mg/l) were found to be below detection limits in the surface water sample.

Ground Water Quality

The quality of surface water was assessed through primary monitoring and collection of secondary data from various sources. Groundwater samples were collected from 2 locations within the project site.

pH of the groundwater samples were found in the range of 5.61 to 8.13 within drinking water standard (6.5-8.5). The concentration of TDS was varied from 28 to 150 mg/l. The chloride concentration in the ground water samples (13.7-59 mg/l) was found to be in compliance to the acceptable limit. Total hardness in the groundwater samples varied from 19.6 mg/l to 88.0 mg/l and were in compliance to the acceptable limit of 200 mg/l. Concentration iron in ground water sample ranged from <0.05-0.43 mg/l. Fluoride concentration of the samples varied between 0.13-0.30 mg/l. Mercury, cadmium, lead, zinc and chromium contents in all ground water samples were found to be below detection limits.

Organic pollutants like phenolic compounds, mineral oil, anionic detergent, polychlorinated biphenyls (PCBs) and poly-aromatic hydrocarbons (PAHs) and cyanide contents were found to be below detection limit for all the samples. Coliform are indicators of contamination from sewage and faecal matter. Total coliforms contents of all the samples were found to be <1.8 MPN/100 ml. Faecal coliform were not detected in any of the ground water samples.

Climate and Meteorology

Climate

Manikganj District falls in South-Western Region. In this zone rainfall is abundant, averaging 2,376 mm (93.5 in) per year.

Temperature

The maximum temperature varies from 33.0°C to 39.0°C whereas monthly minimum temperature varies from 6.1°C to 21.7°C.

Humidity

The month of March is the driest with relative humidity around 79%. Relative humidity normally varies in the range of 79-85% throughout the year.

Rainfall

The annual average of total rainfall is recorded as 2,376 mm (93.5 in). According to the analysis of the historical data, a monthly highest average of total rainfall occurs in July 679.9 mm whereas monthly minimum rainfall is recorded 4.5 mm during the winter season (December and January)

Natural Hazards

Earthquakes

Manikganj is moderately vulnerable to earthquake because of its close proximity to Madhupur Fault (75km far) and Dauki Fault. In the generalized tectonic areas of Bangladesh, Manikganj is also located in the medium risk zone.

Cyclones

Devastating cyclones hit the coastal areas of Bangladesh almost every year usually accompanied by high-speed winds and high waves, causing extensive damage to life, property and livestock. The proposed project site is away from coastal area and cyclonic risk is very less.

Storm Surge

The proposed project has no risk of storm surge based on cyclone affected map of Bangladesh.

Flooding

The projects site lies at the low river flooding to moderate River flooding zone. As per the consultation during baseline survey, the proposed project site was submerged during the floods that occurred in 1988, 1998 and 2004. Flooding in the area mainly arises due to bank spillage from the Padma River as well as intense rainfall during the monsoon seasons. A flood risk assessment having proper adaptation and mitigation measures need to be carried out by the proponent.

Air Environment

Ambient air quality

Ambient Air quality was monitored at 2 locations across the study area. The concentration of SPM in the study area varies from 172 to 186 $\mu\text{g}/\text{m}^3$. The concentration of PM_{10} in the study area varies from 64.3 to 86.8 $\mu\text{g}/\text{m}^3$. The concentration of $\text{PM}_{2.5}$ in the study area varies from 47.25 to 48.17 $\mu\text{g}/\text{m}^3$. The concentrations of NO_x , SO_2 , CO and O_3 were with the NAAQS.

Noise quality

Ambient noise quality was monitored in 5 locations in the study area. The daytime equivalent noise levels observed at different residential areas ranged between 46.97 to 52.74 dB(A) in the study area and the night time equivalent noise levels ranged between 37.02 to 41.04 dB(A). These noise levels were in compliance to the Bangladesh ambient day time and night time noise standards [55dB(A) and 45 dB(A) respectively] for residential areas.

The daytime and night time equivalent noise levels were found to be 54.48 dB(A) and 49.45 dB(A) respectively for the noise monitoring location in the mixed zone; which is in compliance to the Bangladesh ambient day time and night time noise standards [60 dB(A) and 50 dB(A) respectively] for industrial areas

Ecological Environment

The study area has no natural forests; it is modified habitat like homestead plantation, agricultural or crop field vegetation and roadside Plantation.

Flora

Homestead plantation was observed on marginal and fallow lands of villages. Common planted tree species are Common planted tree species are Aam (*Mangifera indica*), Lychee (*Litchi chinensis*), Shal (*Bombax ceiba*), Narikel (*Cocos nucifera*), Eucalyptus (*Eucalyptus camaldulensis*), Mehogani (*Swietenia mahagoni*), Banana (*Musa sp*) etc. Raintree (*Samanea saman*), Narikel (*Cocos nucifera*) and Supari (*Areca catechu*) occupied the top canopy.

Agricultural land- The most common agricultural crops cultivated in the study area are Ropa Aman, Jute, Maze, Sugarcane, Egg Plant tree, Pumpkin, Cucumber, Mustard, Garlic, Mere Trifle (Kochu), Onion, Wheat, Lentil (Masur), Pea (Motor), Chili, Turmeric, Ginger, Coriander, Cotton.

Roadside Plantation:- Most common floral species were *Dalbergia sissoo*, *Azadirachta indica*, *Swietenia mahagoni*, *Shorea robusta* *Mangifera indica*, *Artocarpus heterophyllus*.

Fauna

Herpetofauna: 10 species of reptiles and 04 species of amphibians were being reported from the study area.

Avifauna: A total of 42 species of birds were identified belongings to 26 families at the study area. The highest number of birds dominated in the study area belonging to the *Sturnidae* family.

Mammals: Six species of mammals belonging to 4 families were reported within the study area and all of them are considered as Least Concern according to IUCN Bangladesh, 2015.

Protected Area

There is a Sanctuary namely Nogorbari-Mohongonj Dolphin Sanctuary situated from approximately 22.60 km far from the project location. Nazirganj Shushuk Sanctuary (Najirgonj Dolphin Sanctuary) is a wildlife sanctuary located in Pabna district of Bangladesh. It was established on 01 December 2013. This duck is made up of 146 hectares of wildlife sanctuary Map of the protected areas.

Plankton & Benthos Diversity

The planktonic diversity studies reveal that 30 species of phytoplankton and 13 species of zooplanktons were recorded from the fresh water bodies, which are commonly found in these types of water bodies.

Nine (9) genera of benthos has been recorded from the study area.

Fish Diversity

A total of 55 species has been found in and around the river, ponds, and oxbow lakes.

Socio-economic Environment

Study area

This study area comprises of the area within the 5 km radius of the proposed project site boundary. The preliminary assessment shows that the potential direct socio- economic impacts would be restricted within 1 km. The Buffer zone includes eight unions under three Upazillas. The core Zone have nine villages (Dhaturabari, Chhota Dhaturabari, Darikandi, Nali, Trilochan Patti, Teghari, Baruria, Nayakandi, Lakshimpur) under Arua Union.

Demography

The demography profile of the core and buffer zone are as follows:

Particular	Core Zone	Buffer zone
Population	9282	77695
Sex ratio	108	97

Particular	Core Zone	Buffer zone
Literacy	86%	43.9%

Occupation & Livelihood

The major livelihood in the study area is related to agriculture. Majority of the population in the study area villages depends on agricultural activities and work as agricultural labourers.

In the core zone, labour agriculture and non-agriculture is an important source of livelihood for many in the adjoining 1 km area villages. Major livelihood in the core area villages is related to agriculture. 62% male population are engaged in agriculture activities followed by 33.3% in service sector. A large number of female population are engaged in service sector (74%) followed by 23.3% in agriculture activities. A large number of population are engaged with fish selling business. In Trilochan Patti village, most of the households are engaged with fishing activities.

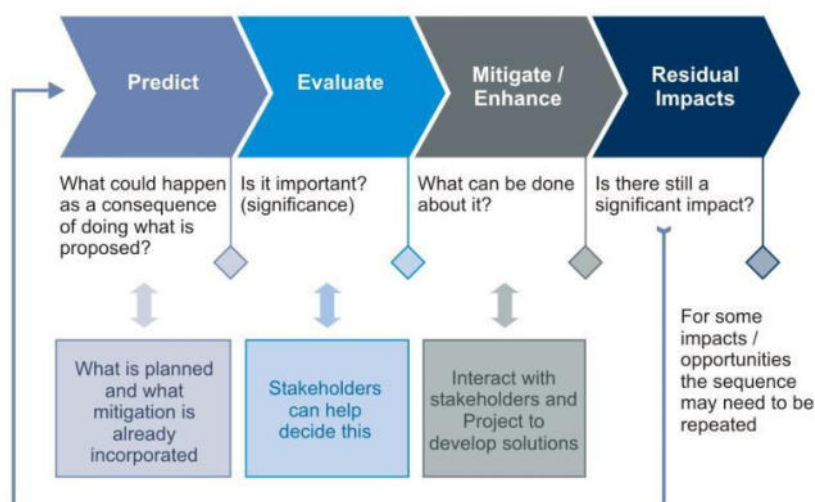
Key E&S Impacts for Decision Making

Approach

The impact assessment process comprised of the following steps:

- The potential impacts of 35 MW solar power project were initially identified during the scoping phase;
- Thereafter, environment, ecological and socio-economic baseline studies were undertaken to understand the likely changes that may occur during the construction and operations of plant within a defined study area;
- Meetings were held with local communities and key informants to share information, answer questions and understand and respond to concerns about the Project (a process called 'Stakeholder Engagement' which is described further below);
- Measures of reducing the adverse changes and enhancing project benefits were also identified and discussed with the project proponent;
- Based on the above, a project and context specific Environmental and Social Management Plan was prepared for SSPL and their contractors.

Figure 0.2 Impact Assessment Process



Impacts were assessed by specialists to understand their significance or importance for those affected by the project. The significance levels used for this assessment are described subsequently:

Box 0.1 Implication of Impact Significance

Significance	Levels
Negligible	There will be no or very limited impact.
Minor	There will be a small impact of limited concern or interest.
Moderate	There will be a moderate change to the environment and people that will be of some concern, and efforts will need to be made to manage these to the extent possible.
Major	There will be a very large change to the environment or people which will be of great concern, and which will need a great deal of effort to be managed.
Positive	There will be a positive impact.

Environmental Impacts

Impact on Land Use

The land procured for the project site was low-lying agricultural land. The site and neighbouring agricultural land parcels reported water logging and poor drainage. Site was part of natural drainage of the area which is historically water logged for 4 – 6 months in a year. The establishment of the solar plant will convert low –lying mono single crop agricultural land (138.78 acres) to industrial use for long term (25 years). Further, the project will require new link road- about 1.0 acre (existing access road to project site) and residential unit (0.3 acres), which will cause permanent changes in land use. The impact in this respect is assessed to be of **moderate** significance.

Impact on Soil

The proposed site was developed by filling up of river sand/ earth to raise the site above highest recorded flood level. The entire land was low-lying agricultural land. The top has not stripped and stored for future use. The top soil already been affected. The analysis of soil sampling in the Project area indicates that the soils are mainly sandy (river silver sand used for filling activity). The land adjacent to the project site is fertile land, mostly single-cropped land. Heavy metal concentrations were also found well below the intervention values. Therefore, the sensitivity of soil resources was considered to be low and impact significance of soil contamination due to accidental leaks, spillage and waste handling is assessed to be of **minor** significance.

Impact on Drainage

The proposed project was low-lying area. The runoff the site and its adjacent agricultural land drains into Ichamati River through small drainage channel. The site and its surrounding agricultural field has been inundated for 5-6 months during monsoon period. High water level in Ichamati River is likely to cause backflow, inundation and waterlogging the site and surround area. The site filling activity may not disturb the natural drainage of the site but construction of site link road may disturb the drainage of south eastern side agricultural land. Significance of impact is assessed to be **moderate**.

Impact on Ambient Air Quality

During construction phase, the sources of emission will be fugitive emission from construction material handling, earth work, and emission from machinery and vehicles. The pollutant especially particulate matter will be settled in areas surrounding proposed project site, however this activity will take place during the construction phase only. The impact in this respect is assessed to be of **minor** significance.

During operational phase, the only sources of air emission will be from back up DG set. From back-up DG set major pollutants are NO_x, SO₂ and PM. The impact in this aspect is assessed to be of **negligible** significance.

Impact on Noise Quality

The major sources of noise emission during construction phase are operation of machineries, vehicles, backup DG sets. It is assessed that noise will be attenuated within 200-300 m from construction site. The impact on this aspect is assessed to be of **minor** significance.

During operational phase, the sources of noise emission are from operation of pumps and backup DG sets. The noise impact from proposed plant during day time is expected to be **negligible**.

Impact on Surface Water Quality

The domestic waste water from construction site will be treated through single pit soak pit. The surface runoff from construction site during rainy season will be channelized into storm water drainage system and same will be treated through sedimentation tank. The impact on surface water quality is assessed to be **minor**.

During operational phase, there will be no generation from the project. The solar panel cleaning water will be minimum and it will be disposed on land. The domestic waste water from plant will be treated through septic tank & soak pit/ STP. The surface runoff from the plant during rainy season will be channelized into storm water drainage system and same will be treated through sedimentation tank. The potential impact on surface water quality due to surface runoff is assessed to be **minor**.

Impact on Ground water Quality

Possibility of ground water contamination from accidental spillage of fuel, lubricants and chemicals from storage areas, vehicles and machinery shall be contained through spill management. Impact significant is considered **minor**.

Ecological Impacts

Impact on Terrestrial Habitat

There were no trees in the solar power project site. The site is already developed. Fugitive emission and noise related disturbance due to operation of machineries may have impact on terrestrial habitat of the nearby habitat. The impact on terrestrial habitat is assessed to be **minor**.

Impact on Aquatic Habitat

The surface runoff from project site during construction and operation phase of the project may increase the suspended solid in the receiving surface water body- this may have impact on primary productivity of the aquatic eco-system. The impact on terrestrial habitat is assessed to be **minor**.

Social Impacts

Potential Impact on Land Procurement

The project involves procurement of approximately 140.08 acres of privately owned mono-cropped agricultural land. SSPL has procured land on the left bank of the mighty river Padma. SSPL directly purchases Land required for the project from 161 land owners. SSPL has indicated that Land has been purchased through willing seller - willing buyer approach. It was reported by the land owners,

In addition, 3.7 km of the transmission line is passing through private land. Transmission lines RoW compensations are given to 48 land owners for crop damages and devaluation of land due to restriction on land use. These affected land owners have received one-time compensation.

Impact on Livelihood

The land acquired for the solar power plant were low-lying, however, cultivation was done during the dry season that is in winter. Acquisition of the land parcels has reduced their family income to some extent.

The project is expected to provide opportunity to unskilled wage labours in the locality. The wage earning will supplement their earnings from agriculture, fishing and household industries. Hence, the project is expected to impact livelihood of the local unskilled labourers positively.

Local Economic Benefits

Employment Generation: Employment generation will be a significant contribution of the project, especially considering that the employment scenario in project area during the construction phase. The project is expected to employ at least about 200 un-skilled and semi-skilled labours during the construction phase.

Benefits of Local Enterprise: The construction phase influx is likely to provide a stimulus to the local economy. Influx and in-migration and the flurry of construction work is likely to raise wage levels and may also result into localized inflation of the prices for basic goods during a temporary period where demand of consumables may exceed supply.

Increments in cost of living: The presence of a salaried working class population will bring in greater cash income in project area. Hence, the spending capability of this population will be higher than the local population which depends on agriculture or household based small scale industries.

Opportunity for local transporters: The project operation will require a number of transportation services including regular requirement for commuting short term visitors and industrial provisioning of a range of materials.

Occupational Health & Safety

Occupational health and safety impacts during construction phase are anticipated primarily from operation of construction machineries/ equipment during site preparation and operation of labour camps for housing of onsite workers

During construction phase impact on occupational health and safety of contractor workers is anticipated from exposure to high noise generated from operation of heavy machineries /equipment and fugitive dust generated from material stockpiles, earth works and vehicular emission. The impact on occupation health and safety due to above mentioned construction activities is assessed to be **minor**

Community Health and Health & Safety

The community health and safety may arise due to changes in environmental quality, increased prevalence of disease and increase in traffic movement

The potential health impacts due to a change in the environmental conditions are expected to be of a temporary nature, restricted to the project site and their immediate vicinity. Keeping this in mind, the health and safety impact associated with changes in environmental quality is considered to have **moderate** significance when assessed against the receptors location and the various mitigation measures in place.

The construction activities are expected to increase traffic load in the site approach road which may create public safety issues for local residents and school children of nearby primary school. Potential impacts include pedestrian safety issues and safety aspects of slow moving vehicles. Considering project embedded control measures, the impact on community health & safety is assessed to be **moderate**

Influx and In-migration: During the construction phase there will be impact from migration of labour into the Project area, construction activities and increased movement of traffic. The range of impacts identified include: conflicts with the local community, health and safety issues inconvenience due to vehicle movements, risk of spread of communicable and sexually transmitted diseases, waste disposal and unhygienic conditions. The magnitude and significance of most of these impacts would be limited to the construction period, with limited spill over to the operation phase.

As the project intends to have a construction camp outside the premises of the allotted land, the interaction between the community and migrant workers would require to be monitored.

The Project will develop a Labour and Influx Management Plan (LIMP) that addresses how the Project will seek to: minimise Project-induced in-migration as far as possible; manage and direct the flow of in-migrants in accordance with the regional planning objectives; and implement mitigation measures to address the adverse environmental and social consequences, and maximise the benefits, of in-migration.

Project Benefits: The proposed project will enable local economic benefits linked to employment generation, local procurement, encouragement of local enterprise development and skill development within the communities.

In addition, by specific stakeholder engagement activities and community development programs, the Project will further enhance the good will and cooperation of the community. The Project in its entirety can bring prosperity and development into the region and pave the way for further industrialisation in sectors such as food and fish processing, local manufacturing etc.

Environmental and Social Management Plan

A number of mitigation measures to manage adverse impacts and recommendations to enhance benefits are captured in the Environmental and Social Management Plan (ESMP) for the proposed plant.

The ESMP and other management plans have been developed in accordance to the requirements of regulations in Bangladesh, and good international industry practice, notably the ADB SPS (2009) and IFC Performance Standards (2012). The ESMP and other plans will be implemented during construction and operation of the project. The ESMP takes each of the impacts identified in the impact assessment of the ESIA and sets out the management measures needed to deal with the impacts as well as describing responsibility for implementing these.

Conclusion

Most of the E&S impacts identified in the project are of minor significance and can be mitigated through proper implementation of the ESMP. Impact on land use, drainage, road infrastructure and community health and safety are having moderate significance. To conclude, implementation of ESMP will help SSPL to comply with national/state regulatory framework as well as to meet IFC Performance Standard requirements as well as to mitigate the environmental and social risks and impacts.

1. INTRODUCTION

1.1 Background

The Bangladesh Power Development Board (BPDB) and the Government of the People's Republic of Bangladesh (GoB) have taken initiatives to encourage private investment in the power sector with recent focus on new sources of power generation options using renewable power. Development of Renewable Energy is one of the important strategies adopted as part of Fuel Diversification Program. In Bangladesh, the share of renewable energy in national power generation mix is very low. The power generation by fuel type (2016-17) of Bangladesh shows that along with Hydro RE consist of only 3.28% where other fossil fuel based resources make up more than 96%. Global reserve of these fossil fuel is gradually declining for heavy dependencies on them. In addition, burning of fossil fuel emits CO₂ which imparts severe environmental hazards. In line with the Renewable Energy policy 2009, the Government of Bangladesh is committed to facilitate both public and private sector investment in Renewable Energy projects to substitute indigenous non-renewable energy supplies and scaling up contributions of existing Renewable Energy based electricity productions.

The Renewable Energy Policy envisions that 5% of total energy production will have to be achieved by 2015 and 10% by 2020. To achieve this target, GOB is looking for various options preferably Renewable Energy resources. Under the existing generation scenario of Bangladesh, Renewable Energy has a very small share to the total generation. The share of Renewable Energy in Bangladesh is 3.16 % till now. The Government is placing priority on developing Renewable Energy resources to improve energy security and to establish a sustainable energy regime alongside of conventional energy sources.

Considering this immense opportunity in power sector, Spectra Solar Park Limited (SSPL) is striving to establish a solar power project, in Shibabaya Upazilla of Manikganj District of Bangladesh (Refer to **Figure 1.1**).

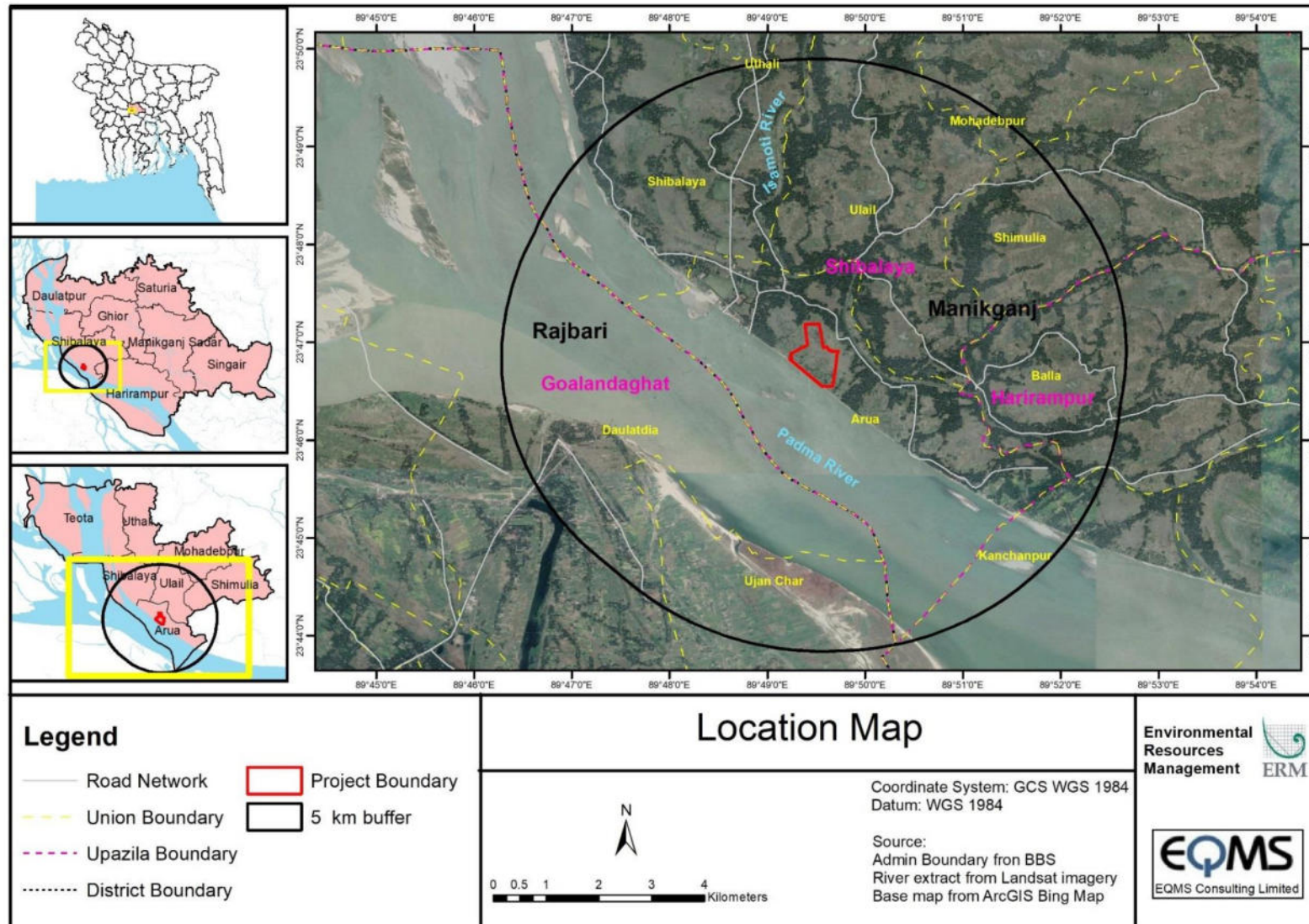
According to the Bangladesh Environment Conservation Rules 1997 (ECR), solar power projects comes under Orange 'B' Category and requires site clearance based on IEE report and EC based on IEE report and Management plan. With respect to the same, SSPL is now preparing the IEE report for approval to Department of Environment (DoE), Bangladesh. However, in parallel, the project is also intended to take project financing from international financial institutes, such as Asian Development Bank (ADB) and German Development Finance Institution (DEG). SSPL has engaged ERM India Private Limited (*hereinafter referred to as "ERM"*) to perform environmental and social impact assessment (ESIA) study of the project along with an environmental and social compliance audit and flood likelihood evaluation of the project site. This report presents outcome of the ESIA study.

1.2 Overview of the Project

1.2.1 Need of the Project

The supply of electricity has a great impact on the national economy of any country. Bangladesh, with its 152 million people in a land mass of 147,570 sq. km, has shown tremendous growth in recent years. A booming economic growth, rapid urbanization and increased industrialisation and development have increased the country's demand for electricity. Presently, 80% of the total population has access to electricity and per capita generation is 348 kWh, which is significantly lower when compared to other developing countries (Power Division 2019). The present installed generation capacity as on April 2019 is 18,242 MW, which includes 1,160 MW of imported electricity. In addition to this, there is captive power generation of about 2,200 MW.

Figure 1.1 Regional Setting Map of proposed Project



1.2.2 Project Background

The GOB has given highest priority to power sector development in the country and has committed to making electricity available to all citizens by 2021. Matching the growth target, the Power System Master Plan (PSMP) has been revised in 2016, which has forecasted demand to increase as high as 24,000 MW by 2021, 40,000 MW by 2030 and 57,000 MW by 2041.

In the power generation plan of Bangladesh due importance has been given to develop renewable energy resources. According to Renewable Energy Policy 2008, 10% of total generated electricity is to be added from renewable energy sources by 2021.

For addressing demand supply gap and reducing the reliance of imported fossil fuel, Government of Bangladesh has accorded high priority to alternative energy sources and formulated favourable policies to spread this energy through various public utility agencies and private sectors. Solar Energy applications constitute the predominant mode of current Renewable practice in Bangladesh. Solar Energy based Solar Home System (SHS) is highly successful and already posted its 5 million implementation mark here. Along with it, government and Utility agencies are focusing formation of grid connected Solar MW projects to be directly connected with national gridline in some of the strategic locations. This project is intended to fulfil this vision of direct power supply to gridlines of private sector Power Generation Policy in the form of IPP (Independent Power Producer).

The GOB has setup high priority to alternative energy sources and formulated favourable policies to spread this energy through various public utility agencies and private sectors. As part of that strategy, the GOB decided that some solar power project would be installed and operated by the private sector.

In line with this strategy, the SSPL decided to implement a new greenfield 35 MW solar power project, which is proposed to be constructed on build-own and operate (BOO) basis in Manikganj District in Bangladesh.

1.2.3 The Project Company

The sponsor of this IPP project is Spectra Engineers Ltd - Shunfeng Consortium, which is a strategic partnership between nationally renowned Rahimafrooz Group and Shunfeng Investment Limited.

Spectra Group

“Spectra Group” is one of the leading and top-ranking Group of Companies in the Country. It started rolling with the inception of “Reza Construction” as a proprietorship firm in 1981, and later incorporated as a Private Limited Company in 1989 as Reza Construction Limited (RCL). Its' primary concentration was in infrastructural development in Bangladesh. Recently, the company name has been changed to Spectra Engineers Limited (SEL).

In ten years after starting in 1981, RCL became a leading construction company in Bangladesh by 1990. In 1991, the scope of work was expanded by having a separate Hospital Engineering (Healthcare) Division that later became “Spectra International Limited” in 1994. Significant business diversification happened in 2000 by setting up the “Spectra Convention Centre”. This international standard specialized hospitality venue; the first such venture by local private sector, provides facilities for private and official meetings and functions of the highest standards.

Pioneered by SEL and subsequent business growth in other sectors led to the “Spectra Group” comprising of Spectra International Limited (1994), Spectra Convention Centre Limited (2000), Spectra Properties Limited and Spectra Fisheries Limited (2005), Spectra Hexa Feeds Ltd. and Spectra Poultry Limited in 2006. Spectra Oxygen Limited in 2007, Sunypun Organics Limited in 2008 and Palm View Restaurant & Green Point Cafe at Golf Garden in 2011. Spectra Marine Limited (2012) and Spectra-Hexa Namsai Ltd is the latest venture of the Group.

Shunfeng Investment Limited

“Shunfeng Investment Ltd” is a subsidiary of Shunfeng Group is a fully integrated photovoltaic service provider engaging in solar power stations constructions and operations, solar products manufacturing SFCET as well as solar energy storage; at the same time the Group is dedicated in research, development as well as operations of other forms of clean energy. Solar power generation is the core pillar of the Group's solar energy business and the Group is working to become a fully integrated new energy enterprise.

The Group is China's largest independent private large scale ground-mounted solar power service provider. As of 2013, the Group's grid-connected solar power generation capacity reached 890 MW. The newly acquired solar power plants projects had 876 MW installed solar power capacity which is currently under construction. Projects are located in regions with abundant daylight and flat landscape including Gangsu, Ningxia, Hainan, Inner Mongolia, Tibet, Shaanxi and Henan etc. The Group is also actively engaging in development and operations of distributed solar power projects via acquisitions and cooperation. These projects are located in various first-tier regions and cities including Zhejiang, Ningbo, Hunan, Anhui, Hubei, Shenzhen, Huizhou, Wuxi, Jiangyin, Xuzhou, Huai'an and Taizhou etc. The Group has also invested in solar power plant projects with an accumulated capacity of 100 MW in Japan.

Through its strategic expansion and acquisitions, the Group has formed the comprehensive solar photovoltaic production chain and has developed the platform for global leading solar power generation technologies. Upon the completion of acquisition of Wuxi Suntech, the Group's solar production abilities are being further strengthened. The Group expects to achieve a total manufacturing capacity of 2.2 GW of solar cells and 2.4 GW of solar modules by 2016.

At the same time, the Group has successfully completed 6 acquisitions and cooperation to speed up the core standard of solar power generation, strengthen the Group's overseas manufacturing abilities of solar products and EPC capabilities as well as to consolidate the Group's leading industry position.

1.3 Purpose and Objective of the Study

The objectives of this ESIA are to:

- Facilitate an understanding of the elements of the existing baseline conditions that are relevant to resources/receptors that could be significantly impacted by the Project;
- Identify the aspects of the Project likely to result in significant impacts to resources/receptors;
- Document how stakeholders have been engaged during the ESIA process, and how stakeholder feedback has been considered in the ESIA;
- Predict and evaluate the significance of the impacts of the Project;
- Identify the (environmental, social and health) aspects of the Project that need to be managed, and recommend appropriate and justified mitigation and enhancement measures;
- Determine the significance of residual impacts, taking into account the implementation of mitigation measures; and
- Generate plans for the management and monitoring of impacts, including plans for ongoing stakeholder engagement.

1.3.1 Scope of work

The detailed scope of the ESIA study is as outlined below:

- Screening of the Project based on applicable reference framework based on reconnaissance survey and desk based review of Project documents;
- Scoping for the ESIA study;

- Development of an integrated project description of the Project components including its sub-components, which are under the purview of the Project Proponent (PP);
- Development of a regulatory, policy and administrative framework relevant to the Project;
- Monitoring, analysis and reporting of the environmental and social baseline data of the study area including consultation with local communities and other stakeholders;
- Assessment of the environmental impacts of the Project in the study area;
- Assessment of social impacts on the local community as well as Project affected people and any other stakeholders, which have been identified during the social consultation process;
- Risk assessment and consequence analysis of the Project;
- Formulation of an Environment and Social Management Plan and associated/specific mitigation plans for identified impacts; and
- Formulation of Public and Stakeholder Consultation and Grievance Redress Mechanism for the Project.

1.3.2 Applicable Reference Framework

The applicable reference framework for this study includes:

- The Environment Conservation Act, 1995 and The Environment Conservation Rules, 1997 and amendments thereof by the Ministry of Environment and Forest, Government of Bangladesh;
- Other relevant Bangladeshi Laws, Rules and Regulations for environment, health, safety and social aspects;
- The IFC Performance Standards (2012) for Environmental and Social Sustainability;
- The ADB Safeguard Policy Statement (2009); and,
- The Equator Principles – III (2013).

The administrative framework in details is discussed in **Section 3** of this report.

1.3.3 Coverage of ESIA study

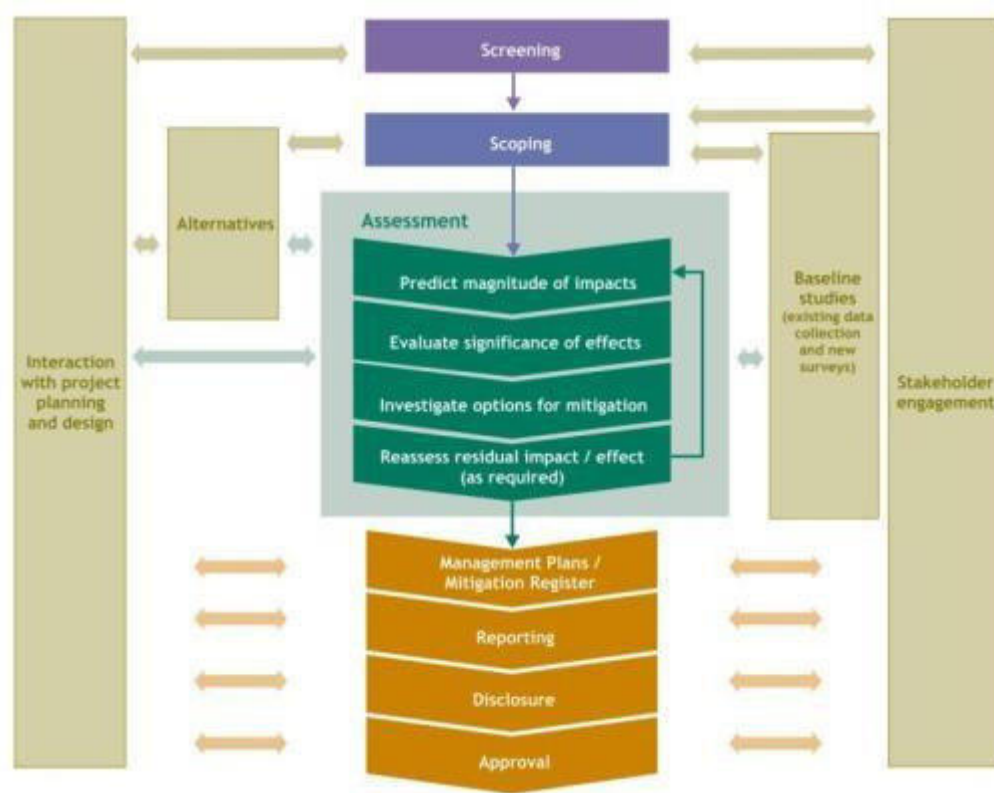
The coverage of ESIA includes the proposed Manikganj Solar power project and its 5 km radius from centre of the Project site.

1.4 Scope of ESIA Study

The ESIA has been undertaken following a systematic process that predicts and evaluates impacts the Project could have on aspects of the physical, biological, social/socio-economic and cultural environment. Further, identifies measures that the Project will take to avoid, minimise/reduce, mitigate, offset or compensate for adverse impacts; and to enhance positive impacts where practicable. The ESIA methodology follows the overall impact assessment approach illustrated in **Figure 1.2**.

The approach and methodology adopted for screening and scoping of the project is discussed below, while the approach and methodology for baseline data collection and assessment has been described in the beginning of the respective chapters of this report.

Figure 1.2 Impact Assessment Process



1.5 Approach and Methodology

Approach and methodology followed as part of the ESIA study is presented below:

1.5.1 Screening

At the initial stage of the ESIA, preliminary information was obtained and discussions held to aid in the determination of what legal and other requirements apply to the Project. This step was conducted utilising a high-level description of the Project and its associated facilities.

1.5.2 Scoping

Scoping was undertaken to identify the potential Area of Influence for the Project (and thus the appropriate Study Area), to identify potential interactions between the Project and resources/receptors in the Area of Influence and the impacts that could result from these interactions, and to prioritize these impacts in terms of their likely significance. **Table 1.1** presents the resources/receptors considered in the scoping stage, together with the changes that could/might indicate a Project-related impact.

Table 1.1 Resources/receptors and impacts considered in scoping

Resources/Receptors	Impacts
Environmental	
Land Forms/Profile	Changes to <ul style="list-style-type: none"> • Geology • Geomorphology • Topography
Soil Quality	Changes to <ul style="list-style-type: none"> • Physical and chemical properties • Soil ecology • Erosion

Resources/Receptors	Impacts
Land use	<ul style="list-style-type: none"> • Changes in Land use/land cover profile • Logistics
Air Quality	Emissions of <ul style="list-style-type: none"> • Gaseous pollutants (e.g. NO_x, SO_x); and • Particulate matter (e.g. PM₁₀ and PM_{2.5})
Drainage Pattern	Changes in the <ul style="list-style-type: none"> • Drainage pattern, • Submergence, • Floods etc.
Surface Water Quantity and Quality	Changes to <ul style="list-style-type: none"> • Physical, chemical or biological quality of surface water bodies • Changes in surface water quantity • Changes in habitat quality, abundance, diversity; • Contamination of shallow or deep groundwater resources, • Change in ground water resource. • Change in noise levels
Ground water Quality	<ul style="list-style-type: none"> • Generation of wastes-hazardous and non-hazardous
Ambient Noise Levels	
Waste	
Solid Waste and liquid waste	
Terrestrial Ecology	<ul style="list-style-type: none"> • Impact on flora and fauna
Aquatic Ecology (Biodiversity)	<ul style="list-style-type: none"> • Changes in fisheries productivity and impact on aquatic form of various activities
Social/Socio-Economic	
Demographics (i.e. Displacement)	Changes in <ul style="list-style-type: none"> • Population, total population, gender ratio, age distribution. • Physical displacement from residence as a result of Project land take, or activities
Economy and livelihood	Change in <ul style="list-style-type: none"> • Local economy, • Employment, • Standard of living, • Occupation
Social and Cultural Structures	<ul style="list-style-type: none"> • Disruption in local authority and governance structure; • Change in social behaviours; alterations to social and cultural networks; • Intra and inter-ethnic conflict. • Impact in Livelihood pattern.
Economy and Livelihood	
Infrastructure and Services	<ul style="list-style-type: none"> • Improvement or pressure on existing urban/rural infrastructure or services including: transportation; power, water, sanitation, waste handling facilities etc.
Cultural Resources	<ul style="list-style-type: none"> • Physical disturbance of shrines, burial grounds, archaeological resources or other desecration;
Social/Community Cohesion	<ul style="list-style-type: none"> • Any social/community cohesions/ conflicts due to workers from outside or due to Project related activities
Vulnerable Groups	<ul style="list-style-type: none"> • Impact on livelihood, community networks, displacement induced impacts
Health	
Community Health and Safety	<ul style="list-style-type: none"> • Changes in the incidence and /or prevalence of sexually transmitted diseases and the factors that contribute to this (external workforce, transport routes etc. Changes in the incidence and or prevalence of vector borne diseases, the density of these vectors and their breeding grounds. • Changes in availability of and access to health care, nutritional status, food security etc.

1.5.3 Baseline Data Generation

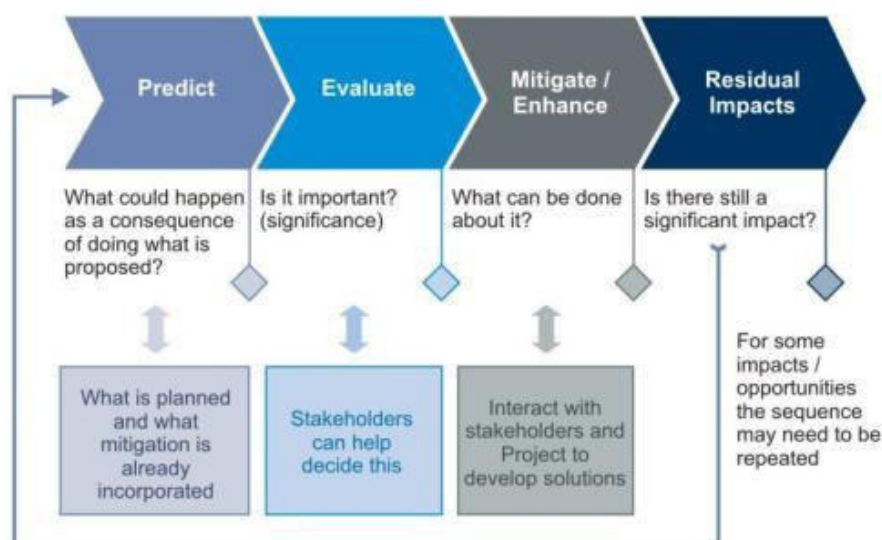
The primary objective of the environmental, ecological and socio-economic baseline study is to provide a baseline against which potential impacts from the construction, operation and decommissioning phases of the Project can be assessed. The methodologies of baseline data collection for the environmental, ecological and socio-economic baseline are presented in **Section 5**.

1.5.4 Impact assessment and management

Impact identification and assessment starts with scoping and continues through the remainder of the IA Process. The principal IA steps are summarized in **Figure 1.3** and comprises of:

- **Impact prediction:** to determine what could potentially happen to resources/receptors as a consequence of the Project and its associated activities.
- **Impact evaluation:** to evaluate the significance of the predicted impacts by considering their magnitude and likelihood of occurrence, and the sensitivity, value and/or importance of the affected resource/receptor.
- **Mitigation and enhancement:** to identify appropriate and justified measures to mitigate negative impacts and enhance positive impacts.
- **Residual impact evaluation:** to evaluate the significance of impacts assuming effective implementation of mitigation and enhancement measures.

Figure 1.3 Impact Assessment Approach



The detailed impact assessment methodology is presented in **Section 7**.

1.6 Report Structure

The ESIA report has been structured based on the scope of work shared by SSPL to meet the applicable reference framework (refer to **Section 1.3.2**). The layout of the Report has been divided into 10 sections as briefly described in **Table 1.2**.

Table 1.2 Layout of the Report

No.	Chapter Title	Description
1	Introduction	<p>This section includes</p> <ul style="list-style-type: none"> ■ Introduction about the project, ■ Project background, ■ Brief description, ■ Scope of the ESIA study ■ Approach and Methodology ■ ESIA team

No.	Chapter Title	Description
2	Project Description	<p>This section describes</p> <ul style="list-style-type: none"> ■ The proposed project; ■ Its major components; and ■ Its geographic, ecological, social, and temporal context. <p>This section also examines alternatives to the proposed project site, technology, design, and operation—including the no project alternative—in terms of their potential environmental and social impacts; the feasibility of mitigating these impacts; their suitability under local conditions; and their institutional, training, and monitoring requirements.</p> <p>It also states the basis for selecting the particular project design proposed and, justifies recommended emission levels and approaches to pollution prevention and abatement.</p>
3	Administrative Framework	<p>This section discusses</p> <ul style="list-style-type: none"> ■ The national and local legal and institutional framework within which the environmental assessment is carried out. It also identifies project-relevant international environmental agreements to which the country is a party. ■ It also covers the applicable reference framework being used for the ESIA study in addition to the national regulatory requirements for project financing.
4	Environmental and Social Screening and Scoping	<p>This section discusses environmental and social screening of the project, categorisation and scoping for the impact assessment.</p>
5	Environmental and Social Baseline Conditions	<p>This section:</p> <ul style="list-style-type: none"> ■ describes relevant physical and biological conditions within the study area, and ■ looks at current and proposed development activities within the project's area of influence, including those not directly connected to the project. It indicates the accuracy, reliability, and sources of the data. ■ relevant socioeconomic conditions within the study area. ■ looks at current and proposed development activities within the project's area of influence, including those not directly connected to the project. It indicates the accuracy, reliability, and sources of the data.
6	Stakeholder Engagement	<p>This section</p> <ul style="list-style-type: none"> ■ describes the process undertaken during project design and preparation for engaging stakeholders, including information disclosure and consultation with affected people and other stakeholders; ■ summarizes comments and concerns received from affected people and other stakeholders and how these comments have been addressed in project design and mitigation measures, with special attention paid to the needs and concerns of vulnerable groups; and ■ describes the planned information disclosure measures and the process for carrying out consultation with affected people and facilitating their participation during project implementation.
7	Impact Assessment and Mitigation Measures	<p>This section</p> <ul style="list-style-type: none"> ■ predicts and assesses the project's likely positive and negative direct and indirect impacts to physical, biological, socioeconomic (including occupational health and safety, community health and safety, vulnerable groups and gender issues, and impacts on livelihoods through environmental media, and physical cultural resources in the project's area of influence, in quantitative terms to the extent possible; ■ identifies mitigation measures and any residual negative impacts that cannot be mitigated; explores opportunities for enhancement; identifies and estimates the extent and quality of available data, key data gaps, and uncertainties associated with predictions and specifies topics that do not

No.	Chapter Title	Description
		require further attention; and examines global, transboundary, and cumulative impacts as appropriate.
8	Environmental and Social Management Plan	<p>This section deals with</p> <ul style="list-style-type: none"> the set of mitigation and management measures to be taken during project implementation to avoid, reduce, mitigate, or compensate for adverse environmental and social impacts; describes the mitigation, monitoring, implementation arrangements and performance indicators for effective implementation of the ESMP; and Framework management plans for construction phase of the project. <p>This section also describes:</p> <ul style="list-style-type: none"> the grievance redress framework, setting out the time frame and mechanisms for resolving complaints about environmental performance; and structure of the grievance redress cell to be formed for the project.
9	Grievance Redress Mechanism	This section provides information about the existing grievance redress mechanism of SSPL as well as additional requirements.
10	Conclusion and Recommendation	<p>This section provides</p> <ul style="list-style-type: none"> the conclusions drawn from the impact assessment; and recommendations for environmental and social management during the project lifecycle.

1.7 ESIA Team

ERM constituted a team comprising of various experts to carry out the ESIA study, as detailed out in the **Table 1.3**. The team was supported by EQMS Consulting Limited, Bangladesh for baseline data collection, social survey and consultations.

Table 1.3 ESIA team and their roles

S. No.	Name	Specialist
1.	Neena Singh	Project Director and Technical review for Social aspects
2.	Naval Chaudhary	Environmental Specialist (Air and Noise) & Project Manager
3.	Salil Das	Environmental and Ecology & Biodiversity Specialist
4.	Soumi Ghosh	Technical review for Social aspects
5.	Dwaipayan Dutta	Social Survey and Stakeholder Consultation
6.	Dibyendu Chakraborty	GIS and mapping
7.	Kazi Farhed Iqbal (EQMS)	Environmental Specialist
8.	Md. Abdul Halim (EQMS)	Social Development/ Resettlement Specialist
9.	Abu Mohammed Nasiruddin (EQMS)	Social Development Expert/Sociologist
10.	Sadman Khaled Monsur (EQMS)	Environment and Renewable Energy Specialist
11.	Faisal Imran (EQMS)	Bio-ecological Expert/Ecologist
12.	Jahidul Islam (EQMS)	Sr. Environmental Monitoring Expert
13.	Farah Shamima Sultana (EQMS)	Sr. GIS and Remote Sensing Expert

1.8 Limitations

Uses of this report

The Client acknowledges that report provided by ERM in relation to the provision of Services is delivered to the Client solely for the Client's benefit. ERM, its officers, employees, contractors, and agents shall owe no duties, obligations or liabilities to any persons in connection with any use of or reliance on the project information provided by the Client. We make no warranties, express or implied, including without limitation, warranties as to merchantability or fitness for a particular purpose.

ERM is not engaged in social and environmental, health & safety consulting and reporting for the purposes of advertising, sales promotion, or endorsement of any client's interests, including raising investment capital or recommending investment decisions, or other publicity purposes. The Client acknowledges that the report prepared by ERM are for exclusive use of the Client and agrees that ERM's reports or correspondence will not be used or reproduced in full or in part for such promotional purposes, and may not be used or relied upon in any prospectus or offering circular. The client also agrees that none of its advertising, sales promotion, or other publicity matter containing any information obtained from these assessments or reports, either in parts or entirety, will make reference to ERM's trade name.

Nothing contained in this report shall be construed as a warranty or affirmation by ERM that the site and property described in the report are suitable collateral for any loan or that acquisition of such property by any lender through foreclosure proceedings or otherwise will not expose the lender to potential environmental or social liability.

2. PROJECT DESCRIPTION

The 35 MW Solar Power Project in Manikganj District has planned to be set up at Arua Union, Shibaloya Upazilla in Manikganj District of Bangladesh. The details regarding project location and settings, description of solar power site and transmission line, resource requirements etc., have been discussed in the subsequent sections.

2.1 Project Location

2.1.1 Solar Park

2.1.1.1 Location

The proposed 35 MW Solar Project is located at Arua Union, Shibaloya Upazilla in Manikganj District. The proposed project site lies within Latitude 23°47'10.92" N to 23°46'33.07" N and Longitude 89°49'24.70" E to 89°49'40.21" E. The project site location on satellite imagery and coordinates of the project boundary delineated on the satellite imagery is represented in **Figure 2.1**.

2.1.1.2 Accessibility

The project site is well connected with Manikganj District Headquarters to the North-West and Dhaka City to the East and South-East. The Project is well accessible by road from Dhaka at a distance of 65 km. The nearest town Manikganj is located approximately 18 km from the site.

The site can be accessed through Nali- Nayakandi Road (5.5 m width) is situated on the eastern side of the site, which is connected with Dhaka-Paturia Highway (approximate road distance -2.8 km). A 100 m site approach road has been constructed to connect the site to Nali- Nayakandi Link Road. The accessibility map of the project site is presented in **Figure 2.2**.

2.1.2 Power Evacuation Transmission Line

Power generated from the Project will be evacuated to proposed Barangail Grid Sub-Station. Before commissioning of Barangail, Manikganj 132/33 kV grid substation, power generated from Solar Power Plant will be evacuated through 33 kV double circuit line to bus-bar of Paturia 33/11 kV substation (by one circuit) and tapping another circuit with existing 33 kV line near Gheor 33/11 kV substation. Spectra Solar Park Limited (SSPL) will construct 7.2 km power transmission line from project site to existing Paturia Sub-station. The Paturia transmission corridor map is presented in **Figure 2.3**.

The width of Right of Use (ROU) of transmission line is 6 Meter (20 feet). Proposed transmission line route is falling 3.5 km in the Government Land and remaining 3.7 km in private land. The 3.5 km of the government land is the land of Roads and Highways Department (RHD) of Dhaka-Paturia Highway. The transmission line route is passing through Dhutrabari, Nobogram, Kashadoho, Aarpara, Rishadi, Bororia, Treggori villages of Arua and Shivalaya Union.

Figure 2.1 35 MW Solar Power Project, Manikganj Location Map

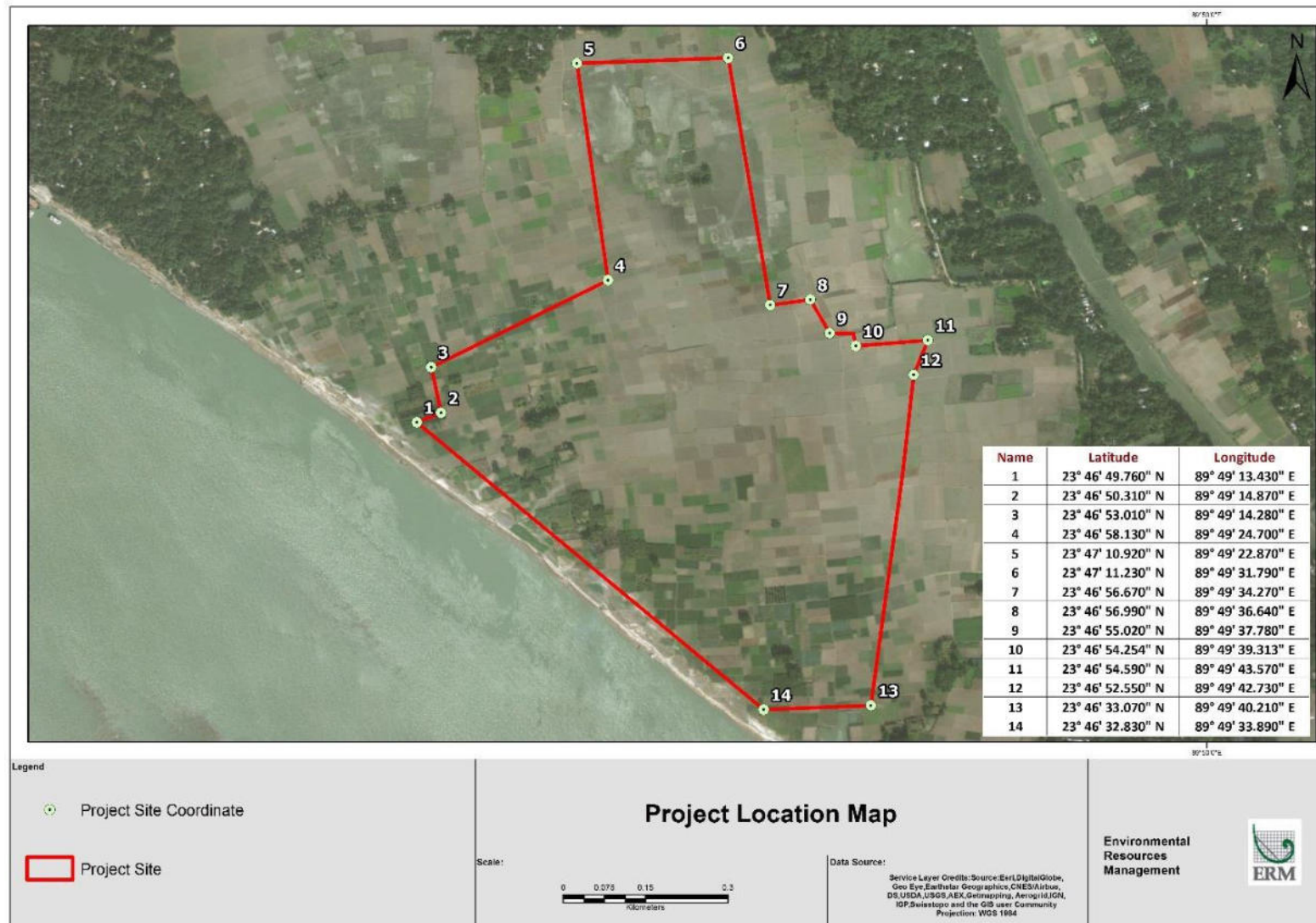


Figure 2.2 35 MW Solar Power Project, Manikganj Accessibility Map

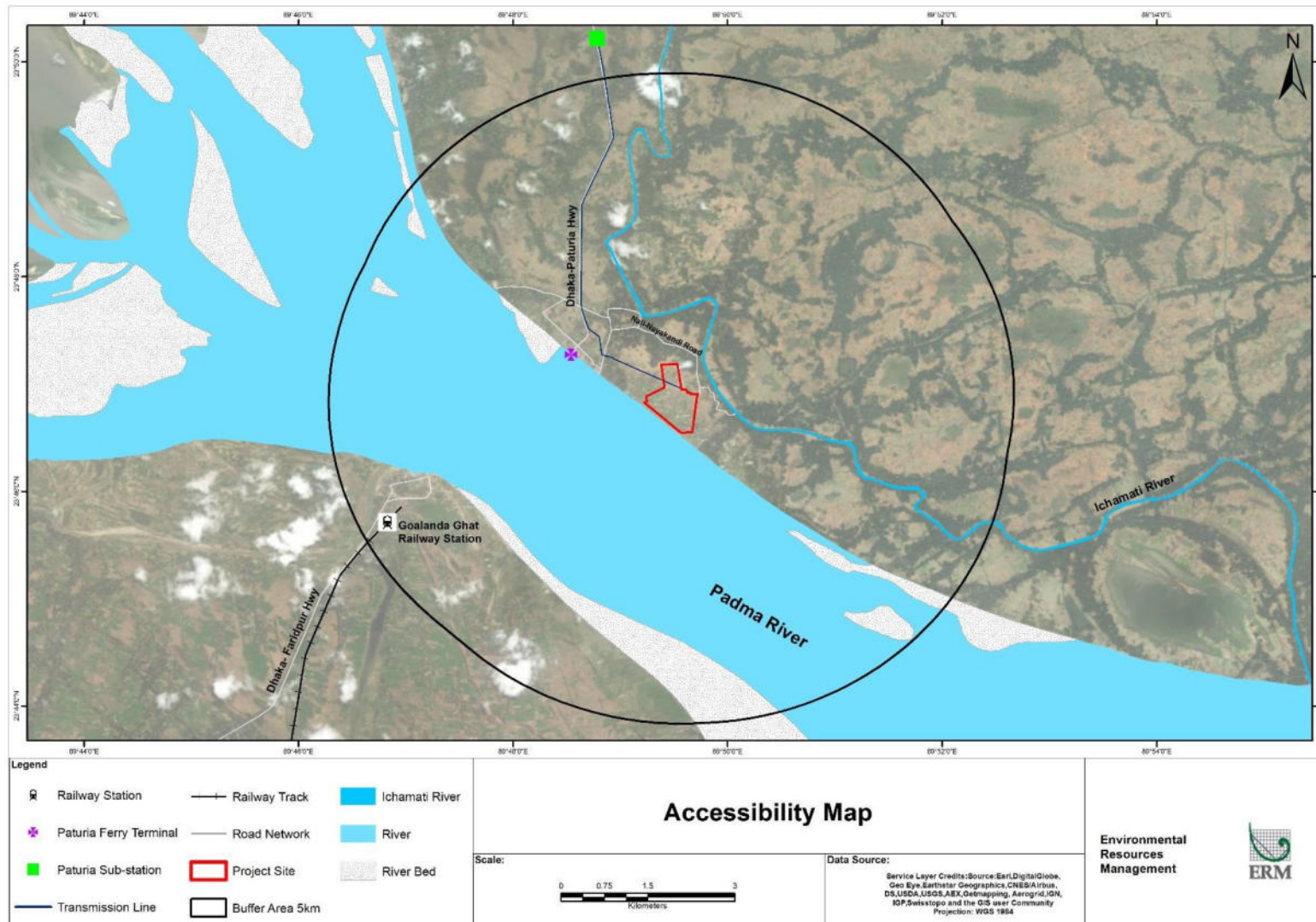
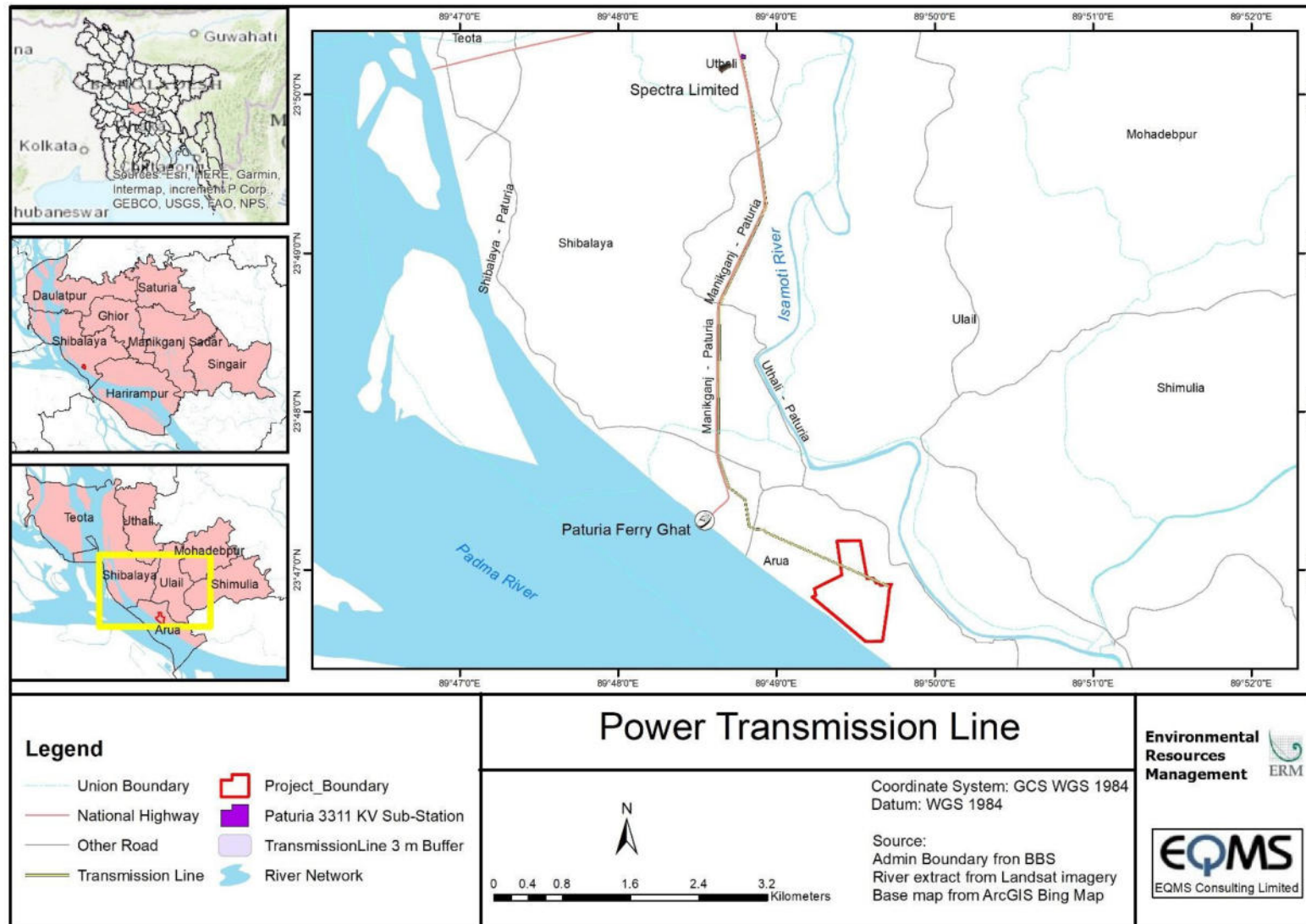


Figure 2.3 Paturia Transmission Corridor Map



2.2 Key features of the site & surrounding

The total area of the Project site is approximately 138.78 acres. As per land records and Manikganj DC office clearance letter, it was a non-agricultural land. The project has also procured 1.0 acre land for site approach road and 0.3 acre land for residential unit. The environmental setting of the site is presented in **Table 2.1**.

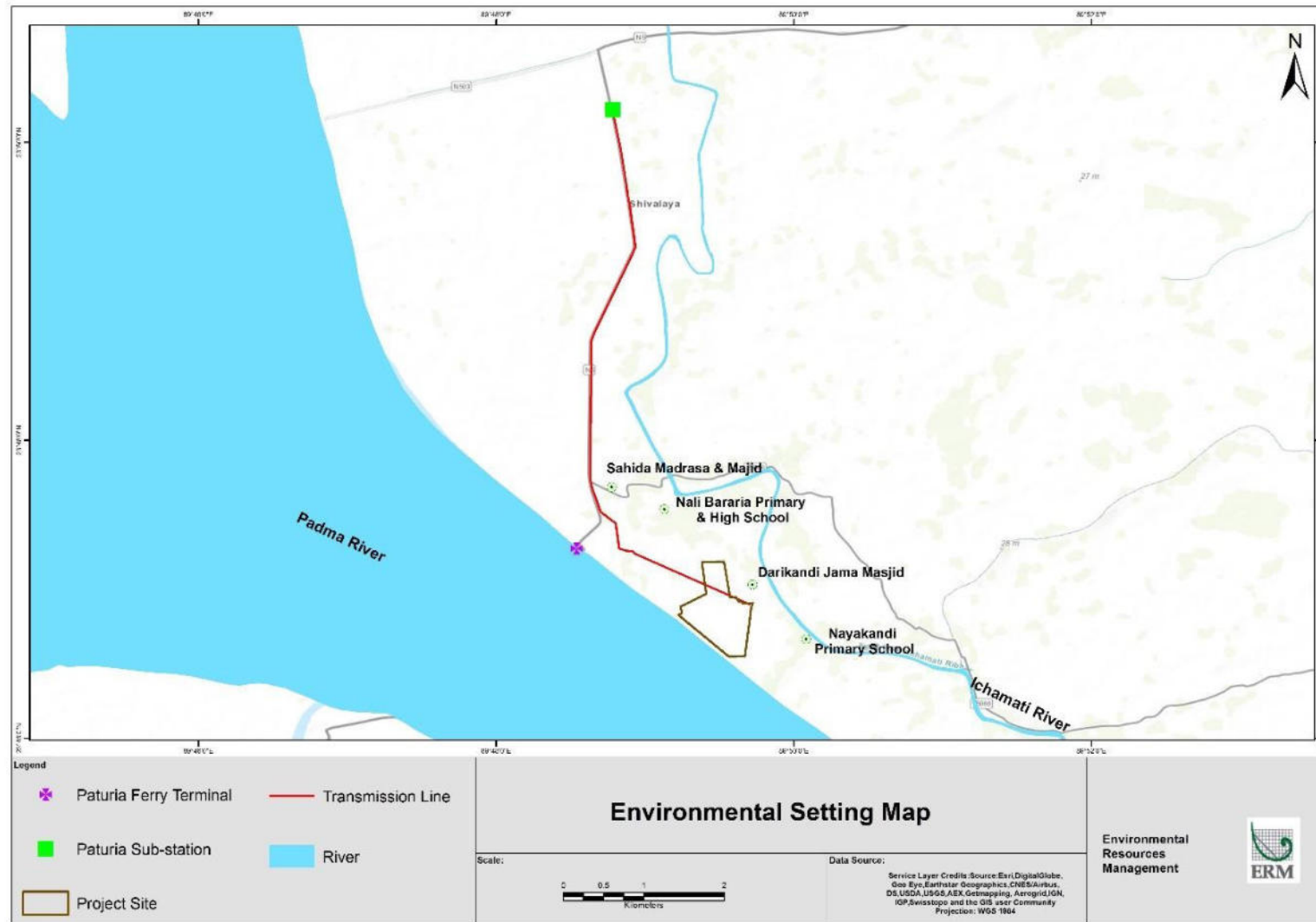
Table 2.1 Environmental Settings of the Project

S. No.	Environmental Features	Details																														
1.	Site surroundings	<ul style="list-style-type: none"> North – Tilochanpatti village (0.1 km from site boundary) South – Padma River 0.04 km from site boundary) East – Dariakandi village, Lakhipura village and Nayakandi village ((0.25 km, 0.35km, 0.25 km respectively from site boundary) West- Paturia village (0.3 km from site boundary) 																														
2.	Site Drainage	The drainage of the project site and its area is controlled through a small nala (streamlets) that is seasonal in nature. This nala is flowing towards east and joins Ichamati River. The Dhaleswari River is flowing from north to south, which is ultimately joins Padma River near Jhitka. During monsoon period water from Padma River backflow to Ichamati River and inundated that area. The consultation with the local villagers reveals that site is inundated about 4-5 months during monsoon period.																														
3.	Site Topography	The project site is locate in Ganges flood plan. Originally, the site was low laying land. Now the site is raised about 2 to 2.5 m. The Padma river is situated towards south and south west, approximately 50 m from site boundary. Villages are located towards, north, east and south. Ichamati River is located on the eastern side, approximately 450 m from site boundary.																														
4.	Site land use (pre-project)	<p>As per revenue record, the major part of the project site was Nal (low laying agricultural land) around 95%. The land area of the project site remains inundated for almost six months every year The other land use details are as follows:</p> <table> <tr> <th>Land category</th><th>Area (acre)</th><th>Percentage</th></tr> <tr> <td>Nal (low agricultural land)</td><td>134.95</td><td>95.21</td></tr> <tr> <td>Bari (homestead)</td><td>5.39</td><td>3.80</td></tr> <tr> <td>Bashjhar (bamboo thicket)</td><td>0.10</td><td>0.07</td></tr> <tr> <td>Bhiti (high land)</td><td>0.30</td><td>0.21</td></tr> <tr> <td>Matiyal (low non-agricultural land)</td><td>0.46</td><td>0.32</td></tr> <tr> <td>Palan (homestead garden area)</td><td>0.14</td><td>0.10</td></tr> <tr> <td>Bagan (orchard)</td><td>0.31</td><td>0.22</td></tr> <tr> <td>Doba (marshy land)</td><td>0.09</td><td>0.06</td></tr> <tr> <td>Total</td><td>141.74</td><td>100.00</td></tr> </table>	Land category	Area (acre)	Percentage	Nal (low agricultural land)	134.95	95.21	Bari (homestead)	5.39	3.80	Bashjhar (bamboo thicket)	0.10	0.07	Bhiti (high land)	0.30	0.21	Matiyal (low non-agricultural land)	0.46	0.32	Palan (homestead garden area)	0.14	0.10	Bagan (orchard)	0.31	0.22	Doba (marshy land)	0.09	0.06	Total	141.74	100.00
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Bagan (orchard)	0.31	0.22																														
Doba (marshy land)	0.09	0.06																														
Total	141.74	100.00																														
5.	Ecological Sensitivity	There is no designated ecological sensitive area like National Park, Wildlife Sanctuary in 10 km radius area of the solar power project site. There is no natural forest in the 5.0 km radius area of the solar power project site. Homestead plantation, block plantation and road side plantation was observed during site visit. Site is recently filled and free from any																														

S. No.	Environmental Features	Details
		vegetation. Padma River is located on southern side (approximately 0.05 km from site boundary) of the project site, commercial fishing is being carried out by the local villagers including Hilsa fish.
6.	Environmental Sensitivity	<ul style="list-style-type: none"> ■ Schools <ul style="list-style-type: none"> • Nali Bararia Primary School, High School and Kindergarten School- approximately 0.75 km towards North. Located adjacent to existing site access road; • Nayakandi Primary School – approximately 0.65 km towards East. ■ Masjid <ul style="list-style-type: none"> • Dariakandi Jama Masjid- approximately 0.25 km towards east • Sahida Khanam Hafigia Madrasa and Masjid- approximately 1.4 km towards North-West ■ Market <ul style="list-style-type: none"> • Nali Bazar – approximately 0.75 km towards North- situated both side of the site access road. • Paturia Ferry Terminal and Paturia Bazar- approximately 0.85 km towards North West ■ Health Facility <ul style="list-style-type: none"> • Sawastha Paribar Kalyan Kendra at Nali- approximately 1.5 km from site

The environmental setting map is presented in **Figure 2.4**.

Figure 2.4 Environmental Setting Map



2.3 Description of Project Facilities, Components and Activities

2.3.1 Project Features

Project will utilize Polycrystalline Silicon modules on fixed structures. The modules will be fixed type. The type of modules and mounting systems used is as presented in **Table 2.2**. Site layout plan is presented in **Figure 2.5**:

Table 2.2 PV Modules, Inverter and Mounting system

S. No.	Main Equipment	Solar Modules
1	PV Module Type	STP-330/24 Vfw
2	Mounting Type	Fixed
3	Number of modules	1,34,400
4	Number of modules per string	20
5	Rating	330 Wp
6	Total No. of Strings	6720
7	Total No. Brackets	3360
9	Total no. of Inverters	15

Source: Project Feasibility Report

2.3.2 Project Components

Key project components of this project are given in **Table 2.3**.

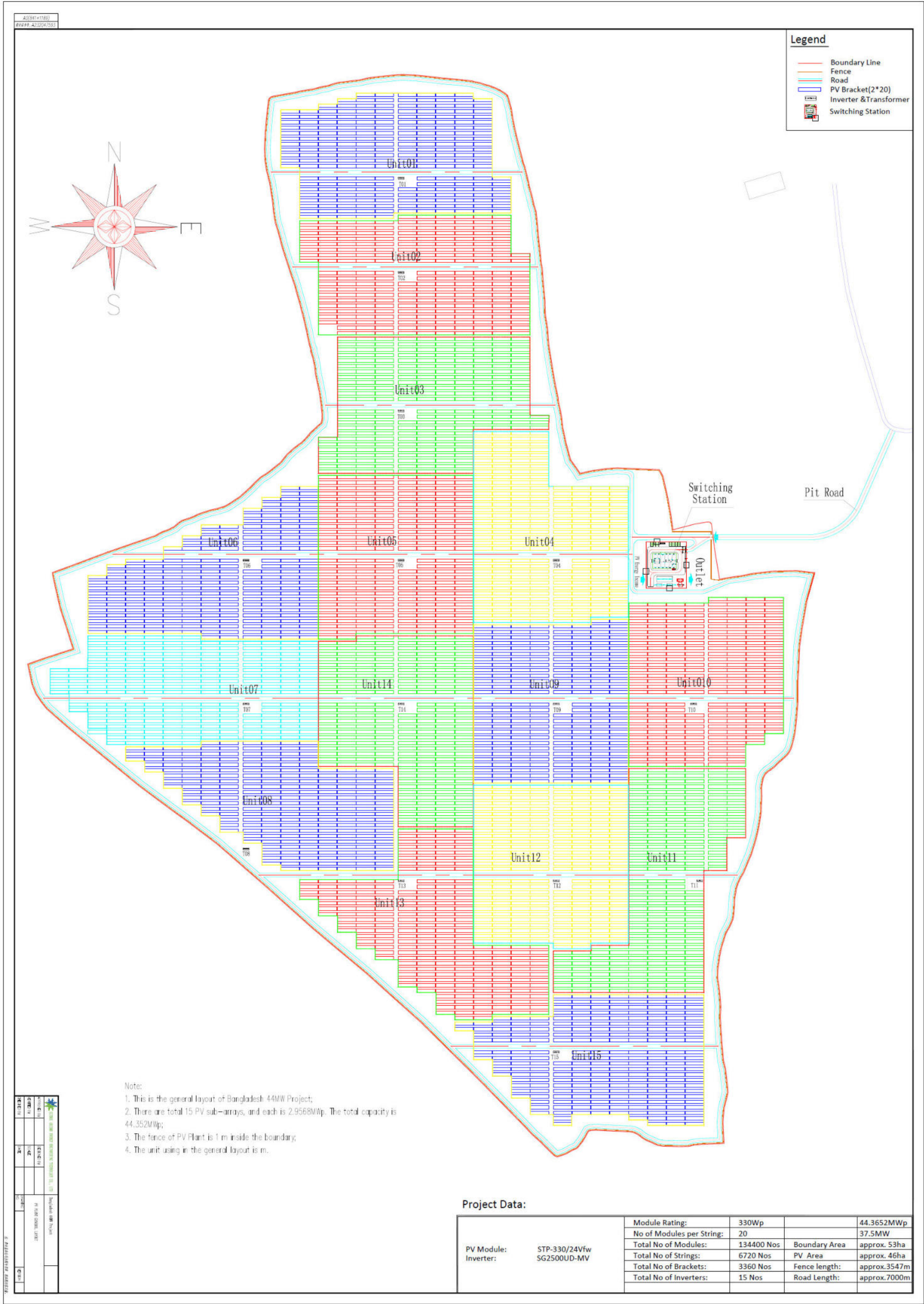
Table 2.3 Key Project Components

Component	Application	Details
Solar PV Modules	<ul style="list-style-type: none"> Polycrystalline Silicon Module is being used for capturing solar energy. 	<ul style="list-style-type: none"> Fixed type. Module tilt angle has been computed to be 14° (modules facing true south) Adhere to International Electro technical Commission (IEC) specifications for Crystalline Silicon modules.
Power Conditioning Unit (PCU) or Inverter	<ul style="list-style-type: none"> Convert the incoming DC received from PV modules into AC with suitable power quality. The inverter produces sinusoidal AC waveforms with low harmonic distortion. The inverter also has to act as a protective device of the system. It needs to trip if the voltage, current or frequency goes outside acceptable ranges. 	<ul style="list-style-type: none"> Used in grid-connected solar PV systems consist of an inverter and other electronics for Maximum Power Point Tracking (MPPT), Synchronization and remote monitoring. As the PV array output varies with the solar radiation the inverter has to effectively interface with the grid to remain synchronized.
DC Cables	<ul style="list-style-type: none"> PV Module is interconnected, with these cables, in series to form a string of 20 modules by MC4 connectors. 	<ul style="list-style-type: none"> Robust and resist high mechanical load and tension along with the UV rays of the sun. High temperature resistance and weather proofing characteristics provide long life.
LT Cables	<ul style="list-style-type: none"> The LT cables are used to connect inverter output to 	<ul style="list-style-type: none"> 1.1 kV, Single Core, XLPE insulated, PVC sheathed, armoured cable,

Component	Application	Details
	primary side of 2MVA transformers to step up inverter output voltage of 380V to 33kV.	confirming to IS 7098 Part 2 standard Aluminium conductor size 7R/PhX1CX300 sq.mm
Transformer	<ul style="list-style-type: none"> To step up inverter voltage level of 380 V to 33 kV and from 33 kV to 220 kV 	<ul style="list-style-type: none"> 50 transformers of 2 MVA capacity 2 transformers of 55 MVA capacity 2 transformers of 200 KVA capacity 24 transformers of 20 KVA capacity
HT Cables	<ul style="list-style-type: none"> HT cables carry power from the transformer output to the control room MV panel, and from MV panel to the switching yard. 	<ul style="list-style-type: none"> From Transformer to RMU: 33kV, Three Core Cable From RMU to MV Panel: 33kV, Three Core Cable From MV Panel to Stitching Yard
MV Panel	<ul style="list-style-type: none"> Interface between the transformers and grid providing the protection required for the system 	<ul style="list-style-type: none"> Consisting of: Circuit breaker and accessories Instrument transformer Isolators Control and Relay Panel Numerical Relays
Transmission Line	<ul style="list-style-type: none"> Evacuating power from the project site to the Paturia sub-station 	<ul style="list-style-type: none"> 7.2 km long 33 kV transmission line comprising of 55 poles will evacuate power from project site to Paturia Sub-station.

Source: SSPL

Figure 2.5 Layout of Solar Power Plant



Source: SSPL

2.4 Project Activities

The activities for the Project can be divided into four phases, namely: a) planning; b) construction; c) operations and maintenance; and d) decommissioning. Key project activities during these phases of the Project have been summarised below:

2.4.1 Planning Phase

The planning phase includes the following components:

- Identification of land area and site;
- Site surveys as topographic, geo-technical investigations, solar radiation and yield study, electrical grid studies, etc.;
- Obtaining all necessary approvals/clearances; and
- Design and finalization of contractors.

The project has identified the 35 MW solar project at Manikganj site. Land has been already procured. The site survey including topography survey geo-technical investigations, solar radiation and yield study has been already carried out. The status pre-project approval for the project is provided in **Table 2.4**.

Table 2.4 Legal Permits & Clearance

S. No.	Legal Requirement	Status
1.	NOC from DC-Revenue for Non-agricultural land	The project has taken NOC from Office of DC as non-agricultural land development of power project NOC Dated 03.04.2016)
2.	NOC from Union Parishad for construction of Solar Power Plant	The project has taken NOC from Arua Union Parishad for construction of Solar Power Plant
3.	NOC from Upazila Parishad for construction of Solar Power Plant	The project has taken NOC from Shibalaya Upazila Parishad for construction of Solar Power Plant
4.	Site Clearance and Environmental Clearance (EC) as per Environmental Conservation Rules, 1997 and subsequent amendments	Project is categorised as Orange 'B' Category and requires site clearance based on IEE report and EC based on IEE report and Management plan. The project accorded environmental clearance from the Department of Environment vide Permit No. 19-20144 on 28 th February 2019 and is valid for one year (refer to Appendix A).
5.	Land filling permission for DC office	The project has obtained permission from the Office of Deputy Commissioner for landfilling using Bulgate dredging sand (dated 30 April 2018).
6.	NOC for abstraction of ground water under The Bangladesh Pani Bidhimala 2018	The required water for construction works is being supplied from bore wells in the nearby villages. It was reported that during operational phase 2 bore wells will be installed within the site. The project has not verified whether the water supplier has the NOC for withdrawal of water from bore well. It was also reported that project will obtain NOC from concerned authority for installation of two bore wells during operational phase.
7.	Factory License under the Factories Act, 1965	This Act pertains to the occupational rights and safety of factory workers and the provision of a comfortable work environment and reasonable working conditions.

S. No.	Legal Requirement	Status
	Bangladesh Labour Law, 2006 and amendment 2013	As per this Act, the project need take factory license for operational phase
8.	LOI from Bangladesh Power Development Board for the development of Grid connected solar power plant	The GOB represented by the Power Division, Ministry of Power, Energy and Mineral Resources, accords its approval to Consortium of Spectra Engineers Limited and Shunfeng Investment Limited and grants its permission to design, finance, insure, construct, own, commission, operate and maintain a 35 MW Grid Connected Solar PV based power generating facility at Paturia, Shibaloia, Manikganj, Bangladesh.
9	Fire License from Fire Service and Civil Defence	The project has taken Fire License from Fire Service and Civil Defence for the building/ structure to be constructed at site (3720 sq. ft). NOC was issued on 17 January 2019 and renewal of license is required in every financial year.

2.4.2 Construction Activity

2.4.2.1 Approach Road

The Nali- Nayakandi Link Road (5.5 m width) is situated on the eastern side of the project site, which is connected with Dhaka-Paturia Highway (approximate road distance - 2.8 km). A 100 m site approach road has been constructed to connect the site with Nali- Nayakandi Link Road. It was observed that a 1ft dia Hume pipe has been provided as a cross drainage facility. The discussion with Site In-Charge reveals that a culvert will be constructed before monsoon.



Nali- Nayakandi Link Road



Site approach road

2.4.2.2 Site Development

The entire project site was on low land. The site has been filled up with white sand from river. The estimated volume of fill material required for the site is approximately 50.4 million cubic feet to raise the site level about 2 to 2.5 m from original level. The filling activity was started from September 2018 and it was reported during the site visit that 94% filling activity was completed.

The total periphery of the site is approximately, 3.846 km. Construction of retaining wall (box cutting, cut of wall casting, base casting and wall casting) along the periphery was started from January 2019 and currently approximately 50% of the work has been completed.



Site filled with Silver Sand



Construction of retaining wall (ongoing)



Construction of retaining wall (ongoing)



Construction machineries at site

2.4.2.3 EPC Works

SSPL will engage the Jiangsu Akcome Industrial Group Co., Ltd as the EPC contractor for this project. The scope of work of the EPC shall involve the following:

- Erection of Solar PV Panels
- Erection of Inverters and SCADA Facility
- Construction of underground and/or overhead electrical collection lines to connect PV modules to the pooling substation
- Erection of other associated facilities (control room, office, etc.)

Construction of related structures will involve civil and steel work for installation of pooling stations, transformers, substation, and electric cables and signal wires. After site development activity civil work will be initiated.

2.4.2.4 Construction Material & Waste Storage Area

The site has designated construction material storage facility and construction waste storage facility within the site. It was reported that during EPC works (installation of solar panel and associated facility) the project will provide a temporary laydown area (~4.2 acres).



Construction material (cement) storage



Construction junk material storage area



Construction material storage area



Recyclable waste storage (cement bag) area

2.4.2.5 Diesel Storage

A temporary diesel storage facility (10,000 litre capacity) has been provided within the project site. The storage facility is on paved surface. The facility does not have any secondary containment and cover on top. It was reported that this storage facility will be shifted to Laydown area and will have necessary paved surface and secondary containment arrangements.



Diesel storage area with safety precaution



DG Set at construction site

2.4.2.6 Workforce & Labour Camp

Site Development Activity

There is one contractor (Khadija Enterprise) presently working for construction of retaining wall. The average workforce working under this contractor is 60 and maximum up to 150. A Labour Camp has been

provided to accommodate 40 labourers within the project site. The Labour Camp has drinking water facility (water filter system), toilet facility and access to separate Kitchen.

There are 4 tube wells (15-20 ft depth) for sourcing of potable water for site office and labour camp. As per Bangladesh Pani Bidhimala 2018 that permission will not be required for sinking tube-wells, if it used for drinking and domestic use purpose. The water is being treated with filter and then used for drinking purpose. It was reported that for bathing and washing, labourers go to Padma River.



Site office and labour camp



Labour accommodation at Camp



Drinking water facility at Labour Camp



Single pit toilet facility

EPC Activity

It was informed that after the completion of site development work, Akcome will start the civil construction work. It was also reported that during this construction phase, maximum 200 workforce will be working in the site. A 100 people capacity Labour Camp will be developed within the project site. A Temporary Laydown area will be developed on the eastern side of the solar power plant, which is adjacent to site approach road.

The water required for construction activity is being sourced from bore wells in the nearby villages. The water is being supplied through water tanker. Potable water for labour camp is being sourced from bore wells, constructed within the project site. The drinking water is being treated through water filter. It was reported that drinking water has not been tested for its quality.

2.4.3 Operation and Maintenance

The list of activities to be carried out in the operation and maintenance phase would be:

- Monthly cleaning of PV modules;
- Control of vegetation viz. weeds, bushes etc. within the site and those immediately surrounding it;

- Routine inspection of all PV modules and associated structures viz. cables, transformers, inverters, mounting structures etc.;
- Operation and maintenance of ancillary facilities such as power substation;
- Inspection and maintenance of transmission lines; and
- Inspection and maintenance of internal site pathways/access roads.

SSPL will be having a dedicated operations and maintenance (O&M) team comprising of technical staff to conduct the aforesaid maintenance activities. This will also require additional resources in the form of water (for module cleaning), consumable spares and insurance.

2.4.4 Decommissioning

The average life span of the solar modules is 20 years. At the end of this life cycle, the solar modules will either be revamped or replaced and continue with its operation. If decommissioned, all components including foundations and internal roads of the project will be removed and the site will be restored to its pre-construction state. The concrete pedestals of the ground mounted structure foundations will be demolished and removed from the sub-surface. The associated infra-structures will be returned to the government for use.

2.5 Resources Requirement

2.5.1 Land

The total land requirement for the solar power project site 138.78 acres. For construction of site approach road (0.1 km), 1.0 acres of land and for residential unit 0.30 acres of land required. The entire project land is located in Boruria mouza in Shibalaya Upazila of Manikganj district and is sourced from private land owners. The summary of land required for the solar power project is presented in **Table 2.5**. The land procurement process followed for this project has been discussed in **Section 2.8**.

Table 2.5 Summary of land required for the project

S. No.	Project components	Land area Required (In acres)	Type of land	Village	Status of procurement
1	Solar power project site	138.78 acres	Private Land	Boruria mouza in Shibalaya Upazila of Manikganj district	Land procurement was completed in the month of February, 2018
2	Residential Unit	0.3 acre			
3	Approach Road	1.0 acre			
4	Transmission line	Power evacuation transmission line (7.2 km): 6.84 acre ROU (width 6.0 m)	3.5 km is the Government Land and remaining 3.7 km in private land.	Dhutrabari, Nobogram, Kashadoho, Aarpara, Rishadi, Bororia, Treggori villages of Arua and Shivalaya Union	

Source: SSPL

2.5.2 Water

2.5.2.1 Construction Phase

During construction stage, water requirement for construction activity is 5-6 KLD. The water is being sourced from private bore well from the nearby village. The water required for domestic use and drinking

water for construction workers and labour camp is being sourced from tube-wells, constructed within the project site.

2.5.2.2 Operational Phase

The water requirement for operational phase is primarily for washing of solar panel. Water requirement for cleaning of solar panels will be about 1.5 – 2.0 l/ sq. m. The surface area of each panel will be about 1.94 sq. m and total no. of solar panels at site as 134,400, total water requirement per cleaning cycle will be about 390 – 520 KL. Assuming bi-monthly solar panel cleaning during dry season, total monthly water requirement will be about 780 – 1040 KL and same will result into 30 – 40 KL per day of water consumption. Water will be also required for domestic use and drinking water for operational workforce at the project site and residential unit; the estimated volume is about 0.6 - 0.7 KLD for about 15-20 people at site. It was informed the two bore well will be constructed within the site and for that NOC from Union Parishad will be taken.

2.5.3 Power

2.5.3.1 Construction Phase

For construction activity, the project site has installed 3 DG sets (2 x 16 KVA, 8 KVA).

2.5.3.2 Operational Phase

During operational Phase, back up DG sets will be installed for emergency operation of the project.

2.5.4 Manpower

The manpower requirement for different phases of the project is as follows:

- Land Development- activity already completed
- Civil construction (3-4 months duration) - 112
- Electrical work (1-2 months duration) – 62
- Operational phase 20 years

2.6 Pollution Source, Characterisation, and Control Measures

2.6.1 Air emission

2.6.1.1 Construction Phase

The site development activity (land filling and compaction activity), near to completion phase. Construction of retaining wall along the periphery was started from January 2019 and currently approximately 50% of the work has been completed. Other construction activities will be carried out in next 5-6 months are construction of internal roads, foundation work for solar panel, construction of site office, construction of associated facilities. The likely emissions from the remaining construction activities would include the following:

- Generation of windblown dust from project site (filled up with silver sand)
- Fugitive emissions from material handling, transportation, piling, use of construction machinery, etc.;
- Fugitive dust emissions from unpaved internal roads;
- Vehicular emissions from increased traffic volume from vehicles used for transport of transportation of PV modules and accessories; and
- Exhaust emissions from operation of diesel generators.

Fugitive dust emission arising from various activities such as piling, transportation of material (loading and unloading), vehicular movement (on unpaved roads) should be minimized through sprinkling of water and maintaining vehicular speed to 10-15 km/hr. Vehicular emission should be controlled through proper maintenance of vehicles and vehicles operated at project site.

2.6.1.2 Operation Phase

Under normal operations, there will be no gaseous emissions from the operating areas. There will be gaseous and fugitive dust emissions owing to plying of maintenance vehicles. It will be ensured that well maintained vehicles will be used for maintenance purposes.

2.6.2 Noise emission

2.6.2.1 Construction Phase

Noise emission generated from piling, movement of vehicle and other construction machinery and operation of DG set. Noise from DG sets will be minimised through provision of acoustic enclosures. In addition, other noise generating activities will be restricted to daytime only.

2.6.3 Waste Water

2.6.3.1 Construction Phase

The liquid effluents generated during the construction phase will include domestic sewage from temporary site office and labour camp. The sewage generated from the site office and labour camp is being disposed through single pit toilet facility. Grey water generated from site is being disposed in the pit. It was reported that, after the filled up single pit latrine, it will be capped with sand and soil on top and another latrine will be constructed.



Single Pit Latrine



Tube well and Grey water storage pit



Solid waste collection at labour camp

Municipal waste dumping pit within the project site

2.6.3.2 .Operation Phase

The operational phase will have negligible wastewater generation at site office. Septic tank and soak pits will be provided at the site office for disposal of sewage.

2.6.4 Solid & Hazardous waste

2.6.4.1 Construction Phase

The key solid waste that is expected to be generated during construction phase is the following:

- Domestic soil waste from temporary site office; hazardous waste like waste oil, lubricants, oil contaminated rags; electronic waste like broken PV module etc.;
- The hazardous wastes will be stored onsite at separate designated covered area provided with impervious flooring and secondary containment. The storage containers/ bins/ drum will be clearly marked and identified for their hazards. The hazardous waste materials will be disposed through authorised vendor;
- The broken solar panels if any, will be sent back to the vendor as part of buyback arrangement;
- Bio-degradable domestic solid waste will be disposed at compost pit within the project site. The recyclable waste will be disposed through local vendors.
- The transformer oil drums will be disposed through an authorized hazardous waste recycles; and

2.6.4.2 Operation Phase

During operation phase, waste generated from the project will include domestic waste at site office, scrap materials like scrap tools, damaged PPEs etc.; hazardous waste like waste oil, lubricants, used transformer oil; damaged batteries; electronic waste like damaged PV modules etc. Following measure will be adopted for disposal of solid waste;

- The hazardous wastes will be stored temporarily onsite at separate designated covered area provided with impervious flooring and secondary containment and will be disposed in accordance with best practices;
- The broken solar panels if any, will be sent back to the vendor as part of buyback arrangement; and
- Bio-degradable domestic solid waste will be disposed at compost pit within the project site. The recyclable waste will be disposed through local vendors.

2.7 Safety Provisions

2.7.1 Fire Safety and Security

2.7.1.1 Construction

Appropriate firefighting system has been provided at construction site. The fire extinguishers are placed at strategic locations such as site office, storage yard etc. Besides this, emergency contact numbers are also displayed project site.

2.7.1.2 Operations

Suitable fire protection and fighting systems viz. portable fire extinguishers, fire buckets and automatic fire detection system to be made available at the entire PV array area, inverter stations, main control room and switchyard.

2.8 Land Requirement and Procurement Process

The project requires 140.740 acres (56.68 ha.) of land for the plant site (Refer Section 2.5.1). In addition 6 meter width right of use (ROU) will be required for 7.2 km transmission line. The land procurement process for the proposed has been discussed in the following section.

2.8.1 Project related land procurement and specific issues

Negotiation with Land Owners: Spectra Engineer Ltd. started negotiation with landowners since 2015 for procuring required land for the project. The company conducted a series of discussion, consultation and negotiations with the landowners. The project conducted several consultations with the land owners, key persons from the community and also community at large. The Acquisition and Requisition of Immovable Property Act (ARIPA)-2017 was not applicable for the project as land has been purchased and not acquired.

Determination of Land Price: Spectra procured the required land parcels through negotiation with the land owners as per the market rates of the land and ensured fair and just price of purchased land was received by the land owners. As on date the existing mouza rate is BDT 16400 per decimal (i.e. BDT 1,640,347 per acre) for low land in Baruria mouza. The company purchased and procured land at the rate of minimum BDT 35,000 per decimal (i.e. BDT 3,500,741 per acre) and maximum 45,000 (i.e. BDT 4,500,953 per acre) per decimal both are equivalent to the value according to the provision stipulated in the ARIPA-2017. **(Refer Appendix B).** Consultation with the land sellers indicated that most of the land parcels purchased by the Spectra Engineer Ltd. were low lying and had lower per decimal rates, than the rates provided by the Company to them.

Consultation with Land Sellers: Consultations and focused group discussions (FGDs) indicated that with the spread of word regarding procurement of less productive land at very high and lucrative price attracted the landowners and they satisfactorily sold their land to the company.

Land for Land Policy: The Company also followed land for land policy for the procurement process. 29% (47 out of 161) of the affected land owners got land for land in the adjoining villages. 9% of which (15 out of 161) got compensation in terms of land.

However, it is to be noted that some of the affected land owners reported that most of the plots selected for the solar park were low lying sandy nature which had lower per decimal rates. The company purchased equal quantity of double cropped land at their convenience and exchanged the land with them.

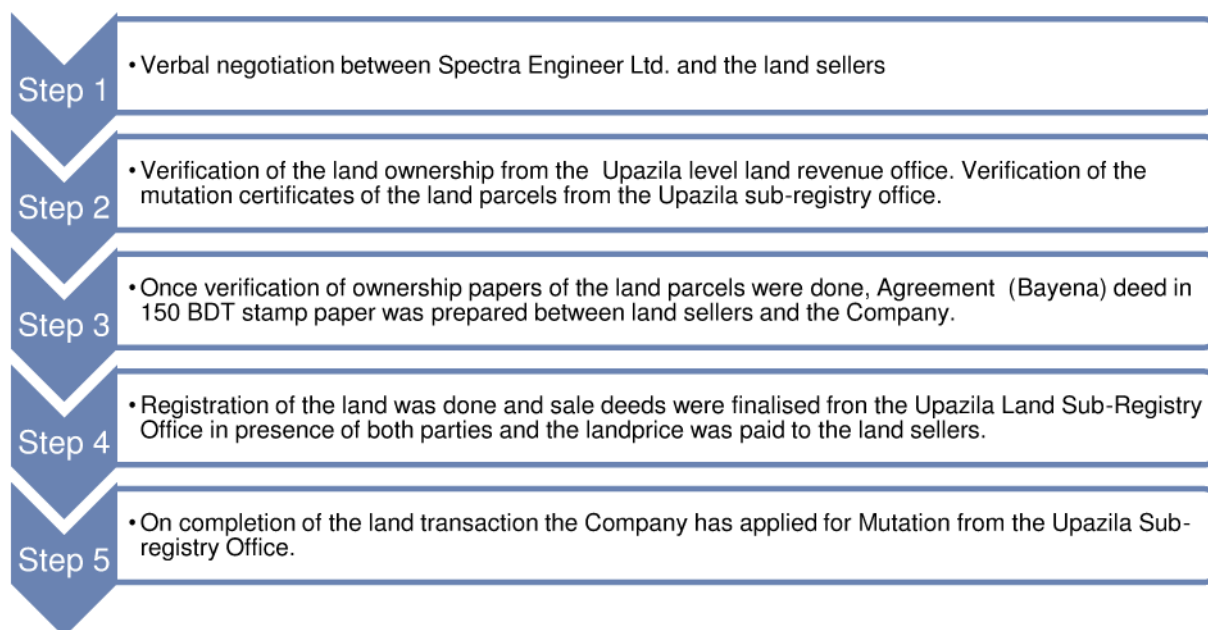
Preventing Land Owners from becoming Landless: Out of 161 land owners, 2 land owners were on the virtue of becoming landless due to selling of land to Spectra Engineer Ltd. (both the land owners were reported to have small land holdings and did not have any additional land outside the project area). However, the company has purchased equal quantity of cultivable land for these 2 land sellers at the nearby village in exchange of their land, thus preventing them from becoming land less.

Utilization of the Land Price Received: 20% of land owners confirmed that they have purchased land with the compensation amount in the adjacent locations from the village. The rest mentioned that they have started new business, purchased homestead in urban areas, deposited in local commercial banks and post offices, sending capable person to abroad for employment, purchased motorized passenger vehicle etc.

Preference in Employment: The Company has a policy to provide employment preference to the affected landowners. Based on the consultation with Spectra and affected land owners, it is revealed that some people i.e. approximately 5% from affected landowners got job at the Project site. Mostly these people engaged into non-technical job like security, cleaning or office clerk. Furthermore, it was reported

that eligible, capable and qualified person or landowners will get preference in employment in the project in both construction and operational phase.

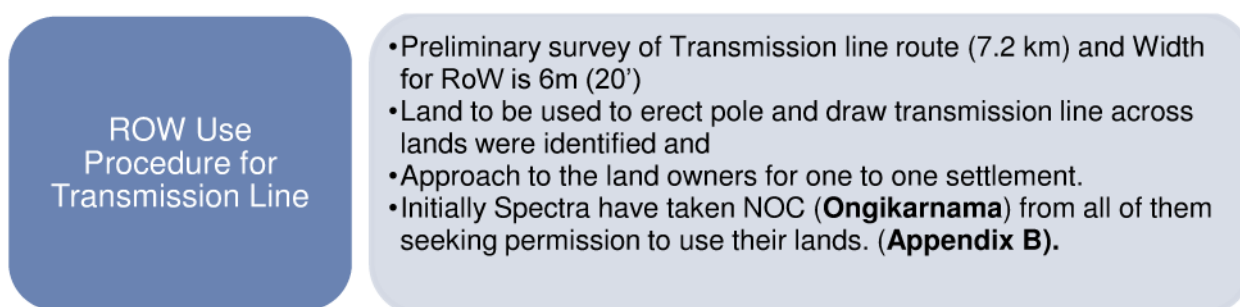
Figure 2.6 Land Procurement Process



2.8.2 Land for Right of Way for Transmission Line

In addition to the solar park, the transmission line is also passing through private land (and partially along government road RoW). Transmission line RoW compensations are given to affected land owners for crop damages and devaluation of land due to restriction on land use. Compensation of BDT 25,000 paid to all the 48 land owners whose land parcel comes under the 6 meter (20 ft) RoW of the 7.2 km transmission line. Excluding this compensation paid for non-agricultural land BDT 40,000 per pole for erecting and for agricultural land BDT 25,000 per pole for erecting. Compensation paid one time to the affected land owners.

Figure 2.7 Procedure to use the Transmission Line ROW



On the basis of the information available presently, some of the observations especially with respect to the project related land procurement are mentioned below.

Forest land

The project is being developed on private land. As reported by the personnel from SSPL no forest land has been used for the project.

Indigenous people land

As reported by the SSPL personnel no indigenous people land has been purchased for the project and all 161 land owners from whom land has been purchased not belong to Indigenous community.

Landlessness

As reported by SSPL, 140.740 acres of land was procured from 161 land owners and none of the land owner can be categorised as marginal and small farmers and even after the sale they would have enough land left with them.

As indicated above the mentioned land owners will also not become landless due to the sale of land. 2 land owners were on the virtue of becoming landless due to selling of land to Spectra Engineer Ltd. (both the land owners were reported to have small land holdings and did not have any additional land outside the project area). However, the company has purchased equal quantity of cultivable land for these 2 land sellers at the nearby village in exchange of their land, thus preventing them from becoming land less. Consultation with land owners also revealed that most of the land owners also purchased better quality of land using the compensation money. It has also been reported by the SSPL personnel that as per specific requirement of very few land owners they also have arranged same amount of land to the land owners in exchange of the land, which was purchased for the project.

Encroachment

No encroachments were observed in the purchased land parcels during the site visit. The land was reported to belong to individual farmers with the necessary title deeds.

Common Property Resources (CPR)¹

The project is located on private land. Hence no common property resources will be used for the project activity.

NOC from Union Parishad & Upazila

NOC (No Objection Certificate) was taken from Arua Union Parishad and Upazila Parishad Shivalaya prior to initiation of construction activities.

Cultural Heritage

There are no designated archaeological sites near to the project site. This is typical of rural settlements and each village in the study area has some cultural sites or sites of religious significance, like temples, mosques, graveyards etc. Sometimes their significance is related to specific seasons/or time of the year.

Land use change

This solar power project of SSPL is being set up on 140.740 acres of private land procured on a willing seller-willing buyer basis from individual farmers.

The site is located at a low lying area of river Padma. The land area of the project site remains inundated for almost six months every year. The surface of the land is hugely sandy and suitable for seasonal bean crops. Under such circumstances, the setting up of the solar power project will result in permanent land use change of the concerned land parcels from agriculture/ fallow to non-agricultural category. Spectra Engineers Limited applied to Deputy Collector, Manikganj for clearance of 141.740 acre non- agricultural land as it needs with the regulation to comply that no solar project will be installed on agricultural land. Deputy Commissioner, Manikganj issued a clearance letter of 141.740 acre land as non-agricultural land on 03.04.2016. (**Appendix C**).

¹. Common Property Resources (environmental) are natural resources owned and managed collectively by a community or society rather than individuals

Mutation

The land is being purchased in the name of SPV (SSPL). It was also reported that the mutation process of land will be undertaken prior to start of any project-related construction activities on site.

2.9 Project Schedule

The project is currently in site development phase and as per project schedule EPC works will start from May 2019. As per general construction schedule prepared by the EPC contractor, construction phase will be completed by January 2020 and Commercial Operation Date (COD) will be achieved by February 2019. General project construction schedule plan is presented in **Figure 2.8**.

2.10 Analysis of Alternatives

The project has considered alternatives in terms of design and technology options. An analysis of these alternatives has been undertaken for the proposed Project including consideration of a no-Project scenario.

2.10.1 No Project Scenario

The generation and supply of electricity has a significant impact on the national economy of any country. Presently, 80% of the total population has access to electricity and per capita generation is 348 kWh, which is significantly lower when compared to other developing countries (Power Division 2019). The present installed generation capacity as on April 2019 is 18,242 MW, which includes 1160 MW of imported electricity. In addition to this, there is captive power generation of about 2,200 MW.

In the public sector a number of the generation units have become very old and have been operating at much reduced capacities. As a result, their reliability and productivity has been poor. For the last few years actual electricity demand in the country has not been met due to a shortage of available generation capacity. In addition, due to a shortage of gas supply, some power plants are unable to reach their full generation capability.

The current supply-demand in Bangladesh also has a knock on effect on all other key sectors including agriculture, industry, commercial and domestic sectors. There is therefore no alternative to adding more power generating units to the existing power system of Bangladesh, to help improve and meet the energy demand for both domestic and industrial requirements. Furthermore, most of the power production in Bangladesh is concentrated towards the central, eastern and coastal areas, whereas in the western and north-west region power projects development was limited due to non-availability of indigenous gas and higher cost of transportation of fuel oil to these areas.

The 'No Project Scenario' is also likely to have a negative effect on opportunities for employment, both directly from the proposed power project and its dependant sectors such as agriculture, industries and manufacturing that require stable power supply in order to operate and be competitive.

2.10.2 With project scenario

Site Selection

SSPL has conducted the siting study for setting up of the solar plant. As per GoB requirement, any solar plant project should be constructed on non-agricultural land. The Project has procured approximately 138 acres land, which is categorised as non-agricultural land. The discussion with land sellers also reveals that major part of the site was low laying land and inundated during monsoon and post-monsoon season, approximately 5-6 month. The local people also confirmed that land was not suitable for agriculture purpose. There was no residential unit within the project site; therefore, R&R is not applicable for this project.

Technical

- Access to road and transportation networks;
- Existing power evacuation infrastructure;

Social and environmental

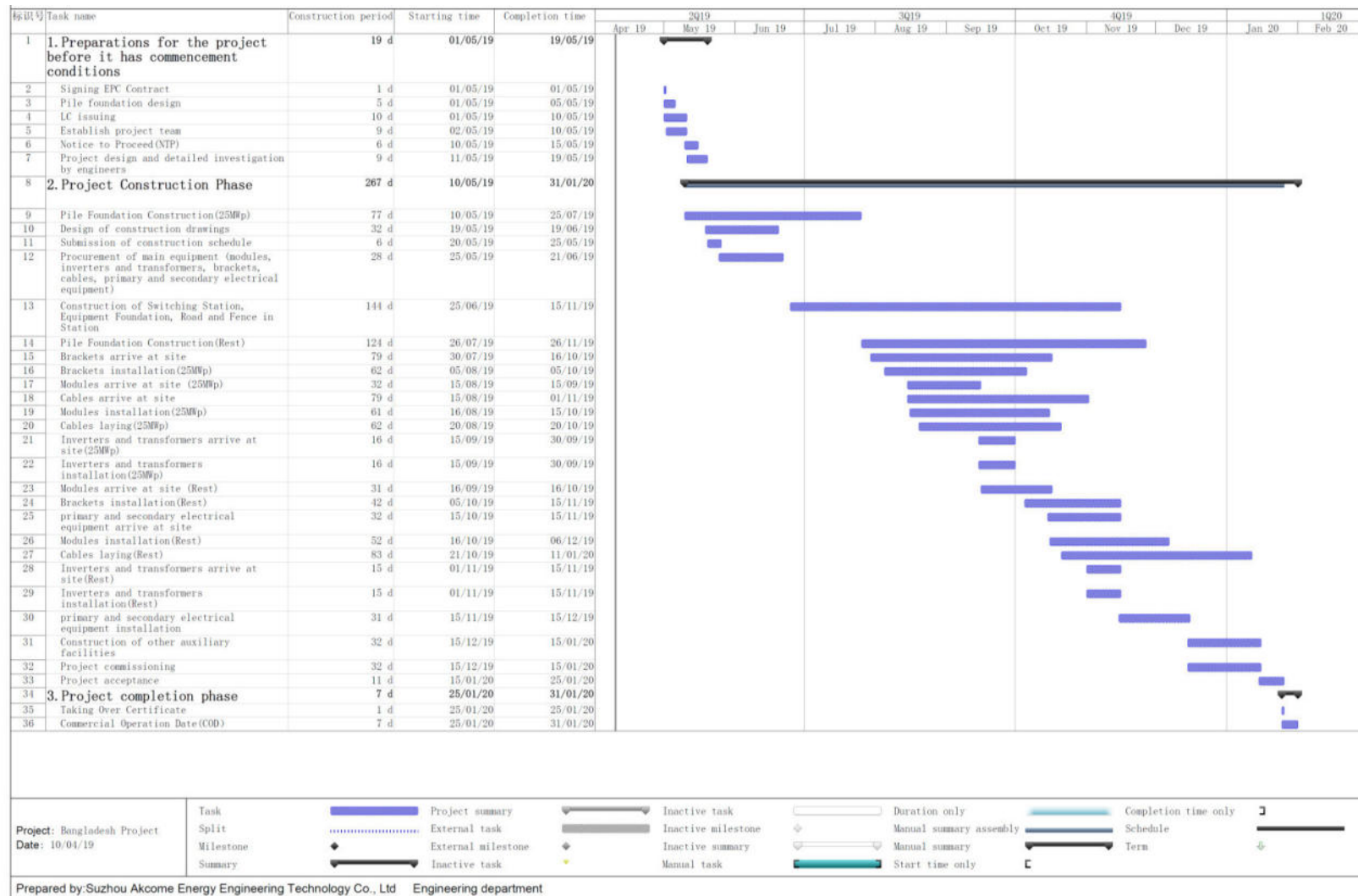
- No major sensitive environmental receptors (such as hospitals, schools, etc.) in close proximity;
- No physical cultural resources on site and in close proximity;
- No resettlement requirements

2.10.3 Conclusion

The 'No Project Scenario' is likely to have a negative effect on opportunities for employment, both directly from the proposed power project and its dependant sectors such as agriculture, industries and manufacturing that require stable power supply in order to operate effectively and be competitive. This will further affect the proposed industrial development in the Manikganj Region.

The site location is well suited for setting up of power plant with availability of adequate availability of land, water, access to road. Based on alternative analysis and selection of best-suited option.

Figure 2.8 General Project Construction Schedule



3. ADMINISTRATIVE FRAMEWORK

3.1 Introduction

This chapter has identified the various environmental and social policies and guidelines of the Government of Bangladesh (GoB) and the Potential Lenders' of the Project – ADB Safeguard Policy Statement, 2009 and the IFC's Performance Standards – to which any project funded by them must operate.

This section focuses on the legal and administrative framework under the purview of which the Project will fall and the scoping study will be governed; they are namely:

- Bangladesh national and local, legal and institutional framework
- ADB Safeguard Policy Statement, 2009
- IFC Performance Standards (2012) and EHS Guidelines

3.2 Environment-related policies in Bangladesh

The GOB has developed a policy framework that requires environmental issues to be incorporated into economic development planning. The Key tenets of the various applicable policies are detailed in the following subsections.

3.2.1 National Environmental Policy, 1992

The Bangladesh National Environmental Policy, approved in May 1992, sets out the basic framework for environmental action together with a set of broad sectoral action guidelines. Key elements of the Policy are:

- Maintaining ecological balance and ensuring sustainable development of the country through protection, conservation and improvement of the environment;
- Protecting the country from natural disasters;
- Identifying and regulating all activities that pollute and destroy the environment;
- Ensuring environment-friendly development in all sectors;
- Ensuring sustainable and environmentally sound management of the natural resources; and
- Promoting active association, as far as possible, with all international initiatives related to environment.

The Environmental Policy of 1992 requires specific actions with respect to the industrial sector which are as follows:

- To phase-in corrective measures in polluting industries;
- To conduct Environmental Impact Assessments ("EIAs") for all new public and private industrial developments;
- To ban, or find environmentally sound alternatives for, the production of goods that cause environmental pollution; and
- To minimize waste and ensure sustainable use of resources by industry.

The policy also states that EIA's should be conducted before projects are undertaken and the DOE is directed to review and approve all Environmental Impact Assessments.

3.2.2 National Environment Management Action Plan, 1995

The National Environmental Management Action Plan (NEMAP) is a wide-ranging and multi-faceted plan, which builds on and extends the statements, set out in the National Environmental Policy. NEMAP

was developed to address issues and management requirements related to the environment during the period 1995 to 2005; it also sets out the framework within which the recommendations of the National Conservation Strategy are to be implemented. NEMAP was developed to achieve the following broad objectives:

- Identification of key environmental issues affecting Bangladesh;
- Identification of actions necessary to halt or reduce the rate of environmental degradation;
- Improvement of the natural environment;
- Conservation of habitats and bio-diversity;
- Promotion of sustainable development; and
- Improvement of the quality of life of the people.

To attain the above mentioned objectives, the plan groups all the relevant necessary actions under four headings, namely: institutional, sectoral, location-specific and long-term issues.

The institutional aspects reflect the need of inter-sectoral cooperation to tackle environmental problems which need new and appropriate institutional mechanisms at national and local levels. The sectoral action reflects the way the Ministries and agencies are organized and makes it easier to identify the agency to carry out the recommended actions. The location-specific action focuses particularly on acute environmental problems at local levels that need to be addressed on a priority basis. The long-term actions include environmental degradation to such degree that might become even more serious and threatening, if cognizance is not taken immediately.

3.2.3 National Conservation Strategy, 1992

The National Conservation Strategy, 1992, provides recommendations for sustainable development of the industrial sector. The key aspects of the strategy are as follows:

- All industries shall be subject to an EIA and the adoption of pollution prevention/control technologies shall be enforced;
- Hazardous or toxic materials/wastes shall not be imported as raw materials for industry;
- Import of appropriate and environmentally-sound technology shall be ensured; and
- Dependence on imported technology and machinery should gradually be reduced in favour of sustainable local skills and resources.

3.2.4 Other policies relevant to environment

Additional Bangladesh policies, their key features and applicability to the subject Project are detailed in **Table 3.1**.

Table 3.1 Policies relevant to Environment

Policy	Key Features	Applicability
The National Forest Policy, 1994	<ul style="list-style-type: none"> ■ Afforestation of 20% land ■ Bio-diversity of the existing degraded forests ■ Strengthening of the agricultural sector ■ Control of Global warming, desertification ■ Control of trade in wild birds and animals ■ Prevention of illegal occupation of the forested land, tree felling and hunting of wild animals 	<ul style="list-style-type: none"> ■ Not applicable, as no diversion of forest land is involved in the Project.
National Land Transport Policy, 2004	<ul style="list-style-type: none"> ■ All new roads and major improvements will be subjected to an EIA ■ Funding will be provided for mitigation measures 	<ul style="list-style-type: none"> ■ Not applicable as the existing approach road to the project site will be used and only 100 m link road has been

Policy	Key Features	Applicability
	<ul style="list-style-type: none"> The Government will publish environmental standards for new roads and new design standards addressing environmental issues 	constructed from existing site approach road to project site.
The National Water Policy, 1999	<ul style="list-style-type: none"> Protection, restoration and enhancement of water resources Protection of water quality, including strengthening regulations concerning agrochemicals and industrial effluent Sanitation and potable water Fish and fisheries Participation of local communities in all water sector development 	<ul style="list-style-type: none"> Applicable for the preservation of water quality in the project area.
National Landuse Policy, 2001	<ul style="list-style-type: none"> Deals with several land uses including: agriculture (crop production, fishery and livestock), housing, forestry, industrialization, railways and roads, tea and rubber Identifies land use constraints in all these sectors 	<ul style="list-style-type: none"> Applicable, as the solar power project shall be constructed on non-agricultural land
Draft Wetland Policy, 1998	<ul style="list-style-type: none"> Establishment of principles for the sustainable use of wetland resources Maintenance of the existing level of biological diversity Maintenance of the functions and values of wetlands Promotion and recognition of the value of wetland functions in resource management and economic development 	<ul style="list-style-type: none"> Not directly applicable, however may be applicable once the draft policy is finalised.
National Fisheries Policy, 1998	<ul style="list-style-type: none"> Not applicable 	
The Energy Policy, 1996	<ul style="list-style-type: none"> Provides for utilization of energy for sustainable economic growth, supply to different zones of the country, development of the indigenous energy source and environmentally sound sustainable energy development programmes Highlights the importance of EIA's for any new energy development project 	<ul style="list-style-type: none"> Applicable as the Project is a Power generation project
The Power Policy, 1995	<ul style="list-style-type: none"> Is an integral part of the Energy Policy and deals with policy statement on demand forecast, long term planning and project implementation, investment terms, fuels and technologies, load management, institutional issues, private sector participation, technology transfer and research programme, environmental policy and legal issues 	<ul style="list-style-type: none"> Applicable as the Project is a Power generation project
Industrial Policy, 1999	<ul style="list-style-type: none"> Deals with industrial development, direct foreign investments, investment by public and private sector, introduction of new appropriate technology, women's participation, infrastructure development and environmentally sound industrial development 	<ul style="list-style-type: none"> Applicable as the Project is industrial development and likely to attract investment from lenders.

3.3 Environment and social related legislations in Bangladesh

The main Acts and Regulations guiding environmental protection and conservation in Bangladesh are outlined in the following subsections and **Table 3.2**.

3.3.1 The Environment Conservation Act, 1995 (subsequent amendments in 2000 and 2002)

The provisions of the Act authorize the Director General of Department of Environment (“DOE”) to undertake any activity that is deemed fit and necessary to conserve and enhance the quality of environment and to control, prevent and mitigate pollution. The main highlights of the act are:

- Declaration of Ecologically Critical Areas;
- Obtaining Environmental Clearance Certificate;
- Regulation with respect to vehicles emitting smoke harmful for the environment;
- Regulation of development activities from environmental perspective;
- Promulgation of standards for quality of air, water, noise, and soils for different areas and for different purposes;
- Promulgation of acceptable limits for discharging and emitting waste; and
- Formulation of environmental guidelines relating to control and mitigation of environmental pollution, conservation and improvement of environment

3.3.2 Environment Conservation Rules (ECR), 1997 (subsequent amendments in 2002 and 2003)

The Environment Conservation Rules, 1997 are the first set of rules promulgated under the Environment Conservation Act, 1995. These Rules provide for, inter alia, the following:

- The National Environmental Quality Standards (“EQS”) for ambient air, surface water, groundwater, drinking water, industrial effluents, emissions, noise and vehicular exhaust;
- Categorization of industries, development projects and other activities on the basis of actual (for existing industries/development projects/activities) and anticipated (for proposed industries/development projects/activities) pollution load;
- Procedure for obtaining environmental clearance;
- Requirements for undertaking IEE and EIA’s as well as formulating EMP’s according to categories of industries/development projects/activities; and
- Procedure for damage-claim by persons affected or likely to be affected due to polluting activities or activities causing hindrance to normal civic life.

Depending upon the location, size and severity of pollution loads, projects/activities have been classified in ECR, 1997 into four categories: Green, Orange A, Orange B and Red respectively as nil, minor, medium and severe impacts on important environmental components (“IECs”).

3.3.3 The Acquisition and Requisition of Immovable Property Act, 2017

The basic principles behind compensation of property in Bangladesh are founded in Articles 42 and 47 of the Constitution (1972). The current legislation for governing land acquisition in Bangladesh is the “Acquisition and Requisition of Immovable Property Ordinance (ARIPO), 1982 and amended in 1983, 1993 and 1994. Key features of the ordinance are as follows:

- This Ordinance provides the Deputy Commissioner (DC) with the power to initiate the acquisition or requisition of any property in any locality within his district that is likely to be needed for a public purpose or in the public interest.
- It describes the entire procedure of notice and intimations prior to acquisition of any property and process and timeframes for raising objections.

- Section 8 deals with matters to be considered in determining compensation which is based on the market value of the property at the date of publication of the notice under section-3.
- It defines the role and authority of Divisional Commissioner in decision making, compensation issues and in case of dispute. Among the matters to be considered in determining compensation are the following:
 - The damage that may be sustained by the person interested, by reason of the taking of standing crops or trees which may be on the property at the time of taking possession thereof by the Deputy Commissioner,
 - The damage that may be sustained by reason of the acquisition injuriously affecting his other properties, movable or immovable, in any other matter, or his earnings; and
 - If in consequence of the acquisition of the property, the person interested is likely to be compelled to change his residence or place of business, the reasonable expenses, if any, incidental to such change; In terms of compensation, the Ordinance explicitly states that the DC, when determining compensation, shall neither consider any disinclination of the person to part with the property, nor any increase in the value of the property to be acquired likely to accrue from the use of it after it has been acquired.
- The Ordinance also covers the case of temporary acquisition of property for a public purpose or in the public interest.

The 7(1)(b) makes provision for apportionment of the compensation among all the persons interested in the property. Further, Section 10A makes specific provision for payment of compensation to bargadar (share cultivators).

Section-18 deals with requisition of property which is required for temporarily for a public purpose. Section 20 deals with the award of the compensation for requisition of the property under section 18. The amount of compensation payable for the requisition of any property consist of a recurring payment in respect of the period of requisition (equal to rent of lease that would be revised in every two years) and other associated damages such as expenses on account of vacating, expenses on account of re-occupying the property, and damages other than wear and tear, caused to the property during the period of requisition. Section 23 makes provision for protection of the property to prevent deterioration and to ensure proper maintenance of the requisitioned property.

Note: SSPL has procured 140.08 acres of land from 161 private land owners. The land is being purchased from private land owners through Willing Seller – Willing Buyer (WSWB) negotiations and hence, no acquisition of land is required under the above regulation for the present project.

3.4 Administrative and regulatory guidelines and instructions

In addition to the provisions in the law, the land acquisition process is regulated by certain administrative instructions and procedural requirements. The most important of these are summarised here.

- In 1976, the Government constituted a Land Allocation Committees (DLACs) at the district, divisional and central levels to control what was regarded as too lavish taking of land for public purposes. The committees were charged with ensuring 'the most rigid measures of economy in the use of land for purposes other than agriculture.'
- The DLACs are chaired by the District Commissioner and have seven other members. These members include Executive Engineers of the Roads and Highways (R&H) Department, the Public Works Department, and the Civil Surgeon. They are entrusted with land allocation within the district not exceeding two acres.
- The Divisional LACs are chaired by the Divisional Commissioner and have technical representation at the Superintending Engineer and Deputy Director level. These committees consider land acquisition cases involving between two and five acres of land. All cases of more than five acres go to the Central Land Allocation Committee (CLAC). This committee is chaired by the Minister of Land

Administration and has technical representation at the Secretary level. In 1989, the Government ordered that in all cases involving the acquisition of land exceeding 10 bighas, the President would have to give consent.

3.4.1 Other Relevant National Legal Instruments for the Project

Table 3.2 presents an outline of other National legal instruments that will have relevance to the proposed Project with respect to the social and environmental considerations.

Table 3.2 National Legal Instruments relevant to the Project

Act/ Rule/ Law/ Ordinance	Enforcement Agency – Ministry/ Authority	Key Features	Applicability to Proposed Project
The Environment Conservation Act, 1995 and subsequent amendments in 2000 and 2002	Department of Environment Ministry of Environment and Forests,	<ul style="list-style-type: none"> Define Applicability of environmental clearance Regulation of development activities from environmental perspective Framing applicable limits for emissions and effluents Framing of standards for air, water and noise quality Formulation of guidelines relating to control and mitigation of environmental pollution, conservation and improvement of environment Declaration of Ecologically critical areas 	<ul style="list-style-type: none"> Applicable
Environmental Conservation Rules, 1997 and subsequent amendments in 2002 and 2003	Department of Environment Ministry of Environment and Forests	<ul style="list-style-type: none"> Declaration of Ecologically critical areas Requirement of environmental clearance certificate for various categories of projects Requirement of IEE/EIA as per category Renewal of the environmental clearance certificate within 30 days after the expiry Provides standards for quality of air, water and sound and acceptable limits for emissions/discharges from vehicles and other sources 	<ul style="list-style-type: none"> Applicable Projects falls under Orange B Category and require environmental clearance
Environment Court Act, 2000 and subsequent amendments in 2002	Ministry of Environment and Forests and Judiciary	<ul style="list-style-type: none"> GOB has given highest priority to environment pollution Passed 'Environment Court Act, 2000 for completing environment related legal proceedings effectively 	<ul style="list-style-type: none"> Applicable for completing environmental legal requirements effectively
The Vehicle Act, 1927; The Motor Vehicles Ordinance, 1983; and The Bengal Motor Vehicle Rules, 1940	Bangladesh Road Transport Authority	<ul style="list-style-type: none"> Exhaust emissions Vehicular air and noise pollution Road/traffic safety Vehicle Licensing and Registration Fitness of Motor Vehicles Parking by-laws. 	<ul style="list-style-type: none"> Applicable for proposed Project in relation to road transport
The Removal of Wrecks and Obstructions in inland Navigable Water Ways Rules 1973	Bangladesh Water Transport Authority	<ul style="list-style-type: none"> Removal of wrecks and obstructions in inland navigable waterways 	<ul style="list-style-type: none"> Not applicable
Water Supply and Sanitation Act, 1996	Ministry of Local Government, Rural	<ul style="list-style-type: none"> Management and Control of water supply and sanitation in urban areas. 	<ul style="list-style-type: none"> Not directly applicable, however, indirectly applicable when considering water usage

Act/ Rule/ Law/ Ordinance	Enforcement Agency – Ministry/ Authority	Key Features	Applicability to Proposed Project
	Development and Cooperatives		management and sanitation facilities for the project
NOC for abstraction of ground water under The Bangladesh Pani Bidhimala 2018	Upazila Parishad	<ul style="list-style-type: none"> ■ Management of ground water resources ■ Installation of bore-wells at any place after license from Upazila Parishad 	<ul style="list-style-type: none"> ■ Applicable as the Proposed Project will use groundwater for which licenses will need to be obtained prior to installation of any bore-wells.
The Forest Act, 1927 and subsequent amendments in 1982 and 1989	Ministry of Environment and Forests	<ul style="list-style-type: none"> ■ Categorization of forests as reserve, protected and village forests ■ Permission is required for use of forest land for any non-forest purposes 	<ul style="list-style-type: none"> ■ Not applicable as proposed Project is not on forest land
The Private Forests Ordinance Act, 1959	Regional Forest Officer, Forest Department	<ul style="list-style-type: none"> ■ Conservation of private forests and for the afforestation on wastelands 	<ul style="list-style-type: none"> ■ Not applicable
Bangladesh Wild Life (Preservation) Act, 1974	Ministry of Environment and Forest; Bangladesh Wild Life Advisory Board	<ul style="list-style-type: none"> ■ Preservation of Wildlife Sanctuaries, Parks, and Reserves 	<ul style="list-style-type: none"> ■ Not applicable as the Project study area does not have any wildlife areas
National Biodiversity Strategy and Action Plan (2004)	Ministry of Environment and Forest Bangladesh Wild Life Advisory Board	<ul style="list-style-type: none"> ■ Conserve, and restore the biodiversity of the country for well-being of the present and future generations ■ Maintain and improve environmental stability for ecosystems ■ Ensure preservation of the unique biological heritage of the nation for the benefit of the present and future generations ■ Guarantee the safe passage and conservation of globally endangered migratory species, especially birds and mammals in the country ■ Stop introduction of invasive alien species, genetically modified organisms and living modified organisms 	<ul style="list-style-type: none"> ■ Applicable for conservation of bio-diversity in the study area
National Water Bodies Protection Act, 2000	Town development authority/Municipalities	<ul style="list-style-type: none"> ■ The characterization of water bodies as rivers, canals, tanks or flood plains identified in the master plans formulated under the laws establishing municipalities in division and district towns shall not be changed without approval of concerned ministry 	<ul style="list-style-type: none"> ■ Applicable due to the proximity to and use of surface water bodies

Act/ Rule/ Law/ Ordinance	Enforcement Agency – Ministry/ Authority	Key Features	Applicability to Proposed Project
The Protection and Conservation of Fish Act 1950 and subsequent amendments in 1982	Ministry of Fisheries and Livestock	■ Protection and conservation of fish in Government owned water bodies	■ Not applicable
The Embankment and Drainage Act 1952	Ministry of Water Resources	■ An Act to consolidate the laws relating to embankment and drainage and to make better provision for the construction, maintenance, management, removal and control of embankments and water courses for the better drainage of lands and for their protection from floods, erosion and other damage by water	■ Not applicable
Antiquities Act, 1968	Ministry of Cultural Affairs	■ This legislation governs preservation of the national cultural heritage, protects and controls ancient monuments, regulates antiquities as well as the maintenance, conservation and restoration of protected sites and monuments, controls planning, exploration and excavation of archaeological sites	■ Not applicable as the study area reportedly does not have any likely cultural heritage or ancient monuments of national or international significance. However in case, any such evidence of archaeological findings arise, the Project will need to act in consonance to the Act
The Acquisition and Requisition of Immovable Property Ordinance 1982 and subsequent amendments in 1994, 1995 and 2004	Ministry of Land	■ Current GOB Act and Guidelines, relating to acquisition and requisition of land	■ Not applicable
Administrative and Regulatory Guidelines and Instructions for Land Acquisition	Ministry of Land	■ Regulation of land acquisition process by certain administrative instructions and procedural requirements	■ Not applicable
The Building Construction Act 1952 and subsequent amendments	Ministry of Housing and Public Works	■ This act provide for prevention of haphazard construction of building and excavation of tanks which are likely to interfere with the planning of certain areas in Bangladesh	■ Applicable
The Factories Act, 1965 Bangladesh Labour Law, 2006 and amendment 2013	Ministry of Labour	■ This Act pertains to the occupational rights and safety of factory workers and the provision of a comfortable work environment and reasonable working conditions	■ Applicable

Act/ Rule/ Law/ Ordinance	Enforcement Agency – Ministry/ Authority	Key Features	Applicability to Proposed Project
Ozone Depleting Substances (Control) Rules, 2004	Ministry of Environment and Forests	<ul style="list-style-type: none"> ■ Ban on the use of Ozone depleting substances ■ Phasing out of Ozone depleting substances 	■ Applicable
Noise Pollution (Control) Rules 2006	Ministry of Environment and Forests	<ul style="list-style-type: none"> ■ Prevention of Noise pollution ■ Standards for noise levels 	■ Applicable

3.5 Administrative Setup Related to Environment in Bangladesh

The Ministry of Environment & Forest (“MoEF”) is the nodal agency in the administrative structure of the GOB, for overseeing all environmental matters relating to national environmental policy and regulatory issues in the country. The MoEF oversees the activities of the following technical/implementing agencies:

- Department of Environment (“DOE”);
- Forest Department (“FD”);
- Bangladesh Forest Industries Development Corporation (“BFIDC”);
- Bangladesh Forest Research Institute (“BFRI”); and
- Bangladesh National Herbarium (“BNH”).

Other Related Organizations

There are several other organisations under the administrative framework which would govern social and environmental functions related to the proposed Project, namely:

- Forest Department;
- Ministry of Land: Land reform and land acquisition directorate;
- Ministry of water resources: Bangladesh Water Development Board; and
- Local Government Engineering Department (LGED).

3.5.2 Department of Environment (“DOE”)

The DOE has been placed under the MoEF as its technical wing and is statutorily responsible for the implementation of the Environment Conservation Act, 1995. The Department was created in 1989, to ensure sustainable development and to conserve and manage the environment of Bangladesh. The principal activities of the DOE are:

- Defining EIA procedures and issuing environmental clearance permits - the latter being the legal requirement before the proposed Project can be implemented;
- Providing advice or taking direct action to prevent degradation of the environment;
- Pollution control, including the monitoring of effluent sources and ensuring mitigation of environmental pollution;
- Setting the Quality Standards for environmental parameters;
- Declaring Ecologically Critical Areas (“ECAs”), where the ecosystem has been degraded to a critical state; and
- Review and evaluation of Initial Environmental Examinations (“IEEs”) and EIAs prepared for projects in Bangladesh.

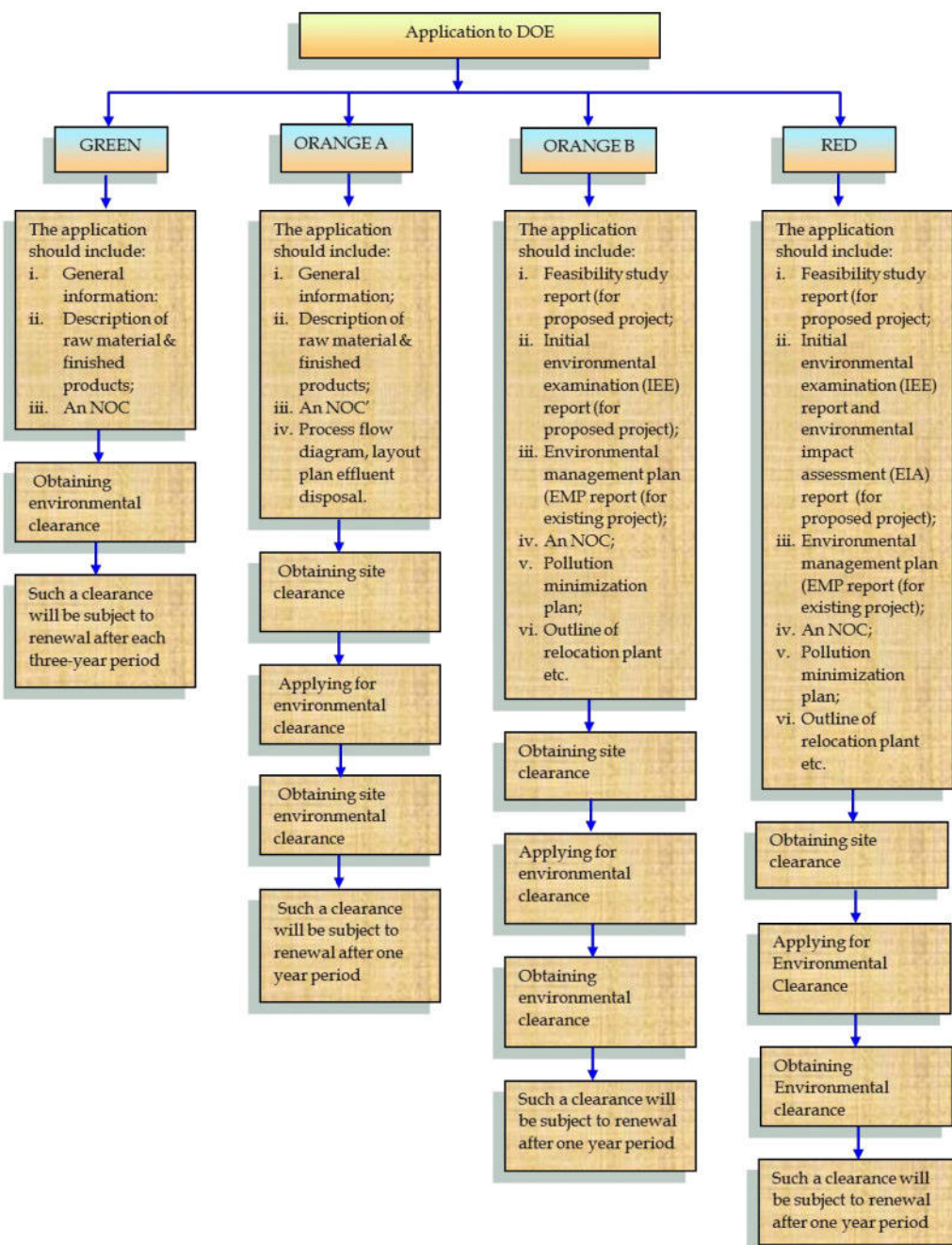
3.5.2.1 Environmental Clearance Process

As mentioned in the Section 3.3.2, ECR has classified projects to be assessed by the DOE in four categories based on the severity of impacts on IECs:

- Green: Nil;
- Orange A: minor;
- Orange B: medium; and
- Red: severe.

The applicability of environmental clearance and the process in Bangladesh is described in **Figure 3.1**. The EIA process consists of three stages, screening, IEE, and detailed EIA:

Figure 3.1 DOE Environmental Clearance Applicability and Procedure



3.6 Project Relevant International Treaties and Conventions

Bangladesh is party to a number (30)¹ of international environmental convention, treaties and agreements. The Project relevant international treaties and conventions relevant to the project signed, ratified and in the process of ratification by Bangladesh are detailed in **Table 3.3**.

(1) ¹ Department of Environment, Bangladesh

Table 3.3 Project Relevant International Treaties and Conventions

Environment Related International Convention and Treaties	Status
International Plant Protection Convention (Rome, 1951.)	01.09.78 (ratified)
International Convention for the Prevention of Pollution of the Sea by Oil (London, 1954 (as amended on 11 April 1962 and 21 October 1969.)	28.12.81 (entry into force)
Plant Protection Agreement for the South East Asia and Pacific Region (as amended) (Rome, 1956.)	04.12.74 (accessed) (entry into force)
International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (Brussels, 1969.)	04.02.82 (entry into force)
Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar, 1971) ("Ramsar Convention").	20.04.92 (ratified)
Convention Concerning the Protection of the World Cultural and natural Heritage (Paris, 1972.)	03.08.83 (accepted) 03.11.83 (ratified)
Convention on International Trade in Endangered Species of Wild Fauna and flora (Washington, 1973.) ("CITES Convention")	18.02.82 (ratified)
United Nations Convention on the Law of the Sea (Montego Bay, 1982.)	10.12.82 (ratified)
Vienna Convention for the Protection of the Ozone Layer (Vienna, 1985.)	02.08.90 (accessed) 31.10.90 (entry into force)
Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal 1987.)	02.08.90 31.10.90 (accessed) (entry into force)
London Amendment to the Montreal Protocol on substances that Deplete the Ozone Layer (London, 1990)	18.03.94 (accessed) 16.06.94 (entry into force)
Copenhagen Amendment to the Montreal protocol on Substances that Deplete the Ozone Layer, Copenhagen, 1992	27.11.2000 (accepted) 26.2.2001 (entry into force)
Montreal Amendment of the Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal, 1997	27.7.2001 (Accepted) 26.10.2001 (Entry into force)
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Basel, 1989.)	01.04.93 (accessed)
International Convention on Oil Pollution Preparedness, Response and Cooperation (London, 1990.)	30.01.90 (signed) In the process of ratification
United Nations Framework Convention on Climate Change, (New York, 1992.)	09.06.92 (signed) 15.04.94 (ratified)
Convention on Biological Diversity, (Rio De Janeiro, 1992.)	05.06.92 (signed) 03.05.94 (ratified)
International Convention to Combat Desertification, (Paris 1994.)	14.10.94 (signed) 26.01.1996 (ratification) 26.12.1996 (entry into force)
Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques, (Geneva, 1976.)	03.10.79 (accessed) (entry into force)
Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982 (New York, 1994.)	28.07.96 (signed)
Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction (Paris, 1993.)	14.01.93 (signed)
Convention on persistent Organic Pollutants, Stockholm	23.5.2001 (signed)

Environment Related International Convention and Treaties	Status
	12.03.2007 (ratified)
Kyoto protocol to the United Nations Framework Convention on Climate Change	21.8.2001 (accessed)

3.7 International Safeguard Requirements

As understood from SSPL, financing sources and financial support for the Project is being explored from the multi-lateral financial, such as the ADB, DEG and the EPFIs. This support from the multi-lateral financial institutions/ export credit agencies is linked with the adherence of international best practices and environmental and social safeguard requirements of the lenders. The following subsections outline the key environmental and social requirements of the ADB and the IFC, applicable to the Project

3.7.1 ADB's Safeguard Policy Statement, 2009

In July 2009, ADB's Board of Directors approved the new Safeguard Policy Statement (SPS) governing the environmental and social safeguards of ADB's operations. The SPS builds upon ADB's previous safeguard policies on the Environment, Involuntary Resettlement, and Indigenous Peoples, and brings them into one consolidated policy framework with enhanced consistency and coherence, and more comprehensively addresses environmental and social impacts and risks. The SPS also provides a platform for participation by affected people and other stakeholders in the project design and implementation.

The SPS applies to all ADB-financed and/or ADB-administered projects and their components, regardless of the source of financing, including investment projects funded by a loan; and/or a grant; and/or other means, such as equity and/or guarantees. ADB works with borrowers and clients to put into practice the requirements of SPS.

The SPS supersedes ADB's Involuntary Resettlement Policy (1995), Policy on Indigenous Peoples (1998), and Environment Policy (2002). In accordance with the SPS, these previous policies apply to all projects and tranches of multi-tranche financing facility projects that were reviewed by ADB's management before 20 January 2010.

The objectives of ADB's safeguards are to:

- avoid adverse impacts of projects on the environment and affected people, where possible;
- minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; and
- assist borrowers and clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

ADB's SPS sets out the policy objectives, scope and triggers, and principles for three key safeguard areas:

- Environmental safeguards;
- Involuntary Resettlement safeguards; and
- Indigenous Peoples safeguards.

To help borrowers and clients and their projects achieve the desired outcomes, ADB adopts a set of specific safeguard requirements that borrowers and clients are required to meet in addressing environmental and social impacts and risks. These safeguard requirements are as follows:

- Safeguard Requirements 1: Environment (Appendix 1 of SPS);
- Safeguard Requirements 2: Involuntary Resettlement (Appendix 2 of SPS);
- Safeguard Requirements 3: Indigenous Peoples (Appendix 3 of SPS); and

- **Safeguard Requirements 4: Special Requirements for Different Finance Modalities (Appendix 4 of SPS).**

In addition, ADB does not finance activities on the prohibited investment activities list (Appendix 5 of SPS). Furthermore, ADB does not finance projects that do not comply with its safeguard policy statement, nor does it finance projects that do not comply with the host country's social and environmental laws and regulations, including those laws implementing host country obligations under international law.

3.7.1.1 Consultation and Disclosure requirements of ADB

ADB's Safeguard Policy and Public Communications Policy (2011) sets out disclosure requirements for various ADB activities, including safeguard requirement. Safeguard Requirements 2: Involuntary Resettlement (Appendix 2 of SPS); and Safeguard Requirements 3: Indigenous Peoples (Appendix 3 of SPS) sets out the need for meaningful consultation and information disclosure during project preparation and operation to the affected population and other stakeholders. Key requirements include:

- **Information Disclosure:** The borrower/client will submit the following documents to ADB for disclosure on ADB's website as per the applicability with respect to the Project:
 - Draft EIA including draft EMP;
 - Final EIA/IEE;
 - Updated EIA/IEE and corrective action plan;
 - Environmental Monitoring Reports.
 - Resettlement Plan ("RP")
 - Indigenous Peoples Plan ("IPP")
- **Information disclosure to affected people or stakeholders:** The borrower/client will provide relevant environmental information in a timely manner, in an accessible place and in a form and language(s) understandable to affected people and other stakeholders. For illiterate people, other suitable communication methods will be used.
- **Consultation and Participation:** The borrower/client will carry out meaningful consultation with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation.

Timing and Frequency for consultation and participation: Meaningful consultation begins early in the project preparation stage and is carried out on an on-going basis throughout the project cycle,

3.7.1.2 ADB project categorisation

The SPS, 2009 further outlines a classification system for the categorization of projects. The classification tentatively occurs at the project identification stage, during the initial screening of anticipated impacts. However, classification is an on-going process, and the classification can be changed at any time with the concurrence of the Chief Compliance Officer (CCO), as more detailed information becomes available and a project proceeds.

Environment

A project's environment category is determined by the category of its most environmentally sensitive component, including direct, indirect, induced, and cumulative impacts. Each proposed project is scrutinized as to its type, location, scale, sensitivity and the magnitude of its potential environmental impacts. The level of detail and comprehensiveness of the EIA or IEE are commensurate with the significance of the potential impacts and risks.

A proposed project is assigned to one of the following categories depending on the significance of the potential environmental impacts and risks:

- Category A: A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An EIA, including an environmental management plan (“EMP”), is required;
- Category B: A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category ‘A’ projects. An IEE, including an EMP, is required;
- Category C: A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. An EIA or IEE is not required, although environmental implications need to be reviewed; and
- Category FI: A proposed project is classified as category FI if it involves the investment of ADB funds to, or through, a financial intermediary (paragraphs 53–58).

Involuntary Resettlement

A project’s involuntary resettlement category is determined by the category of its most sensitive component in terms of involuntary resettlement impacts. The involuntary resettlement impacts of an ADB-supported project are considered significant if 200 or more persons will experience major impacts, which are defined as (i) being physically displaced from housing, or (ii) losing 10% or more of their productive assets (income generating). The level of detail and comprehensiveness of the resettlement plan are commensurate with the significance of the potential impacts and risks. A project is assigned to one of the following categories depending on the significance of the probable involuntary resettlement impacts:

- Category A: A proposed project is classified as category A if it is likely to have significant involuntary resettlement impacts. A resettlement plan, including assessment of social impacts, is required;
- Category B: A proposed project is classified as category B if it includes involuntary resettlement impacts that are not deemed significant. A resettlement plan, including assessment of social impacts, is required;
- Category C: A proposed project is classified as category C if it has no involuntary resettlement impacts. No further action is required; and
- Category FI: A proposed project is classified as category FI if it involves the investment of ADB funds to, or through, a financial intermediary (paragraphs 53–58).

Indigenous Peoples

ADB also screen all projects to determine whether or not they have potential impacts on Indigenous Peoples¹. For projects with impacts on Indigenous Peoples, an Indigenous Peoples Plan needs to be

¹ As per the working definition of indigenous peoples by ADB, two significant characteristics of indigenous peoples would be:

- descent from population groups present in a given area, most often before modern states or territories were created and before modern borders were defined; and
- maintenance of cultural and social identities; and social, economic, cultural, and political institutions separate from mainstream or dominant societies and cultures. In some cases, over recent centuries, tribal groups or cultural minorities have migrated into areas to which they are not indigenous, but have established a presence and continue to maintain a definite and separate social and cultural identity and related social institutions. In such cases, the second identifying characteristic would carry greater weight.

Additional characteristics often ascribed to indigenous peoples include

- self-identification and identification by others as being part of a distinct indigenous cultural group, and the display of a desire to preserve that cultural identity;
- a linguistic identity different from that of the dominant society;
- social, cultural, economic, and political traditions and institutions distinct from the dominant culture;
- economic systems oriented more toward traditional systems of production than mainstream systems; and

prepared. The degree of impacts is determined by evaluating (i) the magnitude of the impact on Indigenous Peoples' customary rights of use and access to land and natural resources; socio-economic status; cultural and communal integrity; health, education, livelihood systems, and social security status; or indigenous knowledge; and (ii) the vulnerability of the affected Indigenous Peoples.

Indigenous people's or ethnic minorities' issues are likely to be significant when it is established that groups in the project area have one or more of the following attributes: (i) self-identification or identification by others as a distinct cultural group; (ii) a display of a desire to preserve such cultural identity; (iii) a linguistic identity distinct from that of the dominant society; (iv) distinct social, economic, and political traditions and institutions; (v) an economic system oriented more toward a traditional system of production; and (vi) a unique tie with and attachment to traditional habitat and ancestral territory and its natural resources; such groups are found to exhibit historical, socioeconomic, political, or demographic vulnerability; project intervention will be (positively or negatively) affecting one of these areas: customary rights to (ancestral) land and natural resources; their socioeconomic status; their health, education, livelihood, and social security status; indigenous people's knowledge; the project involves new construction, rehabilitation or expansion of large-scale infrastructure; or such interventions as water supply, sanitation, education, health, nutrition, or social protection target indigenous people; the project is located within or nearby the habitat of indigenous people; and/or project impacts are potentially long term, or irreversible or permanent, affecting a substantial portion of the indigenous community or the community as a whole.

A project is assigned to one of the following categories depending on the significance of the probable impact on the indigenous peoples:

Table 3.4 ADB Project Categorization

Category	Impact	Actions Required
Category-A	Expected to have significant impact	Both IPP and SIA are required
Category-B	Expected to have limited impact	Both IPP and SIA are Required. A specific action favourable to indigenous peoples/ethnic minority is required and addressed through a specific provision in RRP and in related plans such as a resettlement action plan, a gender action plan, or a general community participatory plan.
Category-C	Not expected to have any impact on ethnic minority	No specific action required.

Based on the information made available, the project is categorised as follows:

- Category A for Environmental Assessment – thus requiring an ESIA and Management Plan;
- Category C for Involuntary Resettlement: As the project will have no involuntary resettlement impacts. At the time of site visit, no housing structure could be located of the project site;
- Category C for Indigenous Peoples: The project is not expected to have any impact on designated indigenous peoples.

3.7.2 IFC Performance Standard

The Performance Standards ("PS") (January 2012) established by IFC stipulates that the Project shall meet certain requirements throughout the life cycle of an investment by IFC or other relevant financial

- Unique ties and attachments to traditional habitats and ancestral territories and natural resources in these habitats and territories.

(Source: Policy on Indigenous Peoples, ADB)

institution such as other DFIs (e.g. DEG, FMO) or commercial banks, which have adopted the Equator Principles.

A brief description of the Performance standards is provided in **Table 3.5**.

Table 3.5 IFC Performance Standards

Performance Standards	Specific Areas
Performance Standard 1:	Assessment and Management of Environmental and Social Risks and Impacts
Performance Standard 2	Labour and Working Conditions
Performance Standard 3	Resource Efficiency and Pollution Prevention
Performance Standard 4	Community Health, Safety and Security
Performance Standard 5	Land Acquisition and Involuntary Resettlement
Performance Standard 6	Biodiversity Conservation and Sustainable Management of Living Natural Resources
Performance Standard 7	Indigenous Peoples
Performance Standard 8	Cultural Heritage

3.7.2.1 IFC Project Categorization

As part of its review of a project's expected social and environmental impacts, IFC uses a system of social and environmental categorisation. This categorisation is used to reflect the size of impacts understood as a result of the client's social and environmental assessment and to specify IFC's institutional requirements. Similar to ADB, the IFC categories are:

- Category A Projects: Projects with potential significant adverse social or environmental impacts that are diverse, irreversible or unprecedented;
- Category B Projects: Projects with potential limited adverse social or environmental impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures;
- Category C Projects: Projects with minimal or no adverse social or environmental impacts, including certain financial intermediary (FI) projects with minimal or no adverse risks;
- Category FI Projects: All FI projects excluding those that are Category C projects.

IFC therefore categorises project primarily according to the significance and nature of impacts. IFC defines the project's area of influence as the primary project site(s) and related facilities that the client (including its contractors) develops or controls; associated facilities that are not funded as part of the project (funding may be provided separately by a client or a third party including the government), and whose viability and existence depend exclusively on the project and whose goods or services are essential for the successful operation of a project; areas potentially impacted by cumulative impacts from further planned development of a project; and areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location. The area of influence does not include potential impacts that would occur without a project or independently of a project.

3.8 Applicable EHS Standards

The Project shall have to comply with Bangladesh environmental, health and safety laws and World Bank Group Guidelines with special attention to comply with the Bangladesh (GOB Environmental Conservation Rule 1997) and World Bank Group requirements regarding air emissions (December 2008).

Therefore, the EHS standards as stipulated in ECR 1997 and amendments thereof as well as in the IFC EHS guidelines (General and Thermal Power Plant specific) for air quality, surface and ground water quality, ambient noise levels, emissions and effluent discharge will be applicable.

The ADB SPS policy Statement 2009 (SPS) also states, "During the design, construction, and operation of the project the borrower/client will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines. These standards contain performance levels and measures that are normally acceptable and applicable to projects." For this purpose IFC EHS guidelines are recommended.

3.8.1 Applicable Environmental Standards

The relevant environmental standards (national as well as international) for the project as applicable to the proposed Project are presented in the following tables:

Table 3.6 Ambient Air Quality Standards

Parameter	Bangladesh**		WHO***	
	24 hourly (µg/m ³)	Annual (µg/m ³)	24 hourly (µg/m ³)	Annual (µg/m ³)
SPM	200	-	-	-
PM ₁₀	150	50	50	20
PM _{2.5}	65	15	25	10
SO ₂	365	80	20	-
NO _x	-	100	-	40
CO*	10,000	-	10,000	-

Note:


- * CO standard is 8-hourly only.
- ** The Bangladesh National Ambient Air Quality Standards have been taken from the Environmental Conservation Rules, 1997 which was amended on 19th July 2005 vide S.R.O. No. 220-Law/2005.
- *** WHO Ambient Air Quality Guideline Values (2005 and 2000), which are also being referred in the World Bank and IFC's General EHS Guidelines (2007)
-  Represents the standard values applicable to the Project.

Table 3.7 Noise Level Standards/ Guidelines

Category of Area/ Receptor	Bangladesh*		WHO***	
	Day (dB(A))	Night (dB(A))	Day (dB(A))	Night (dB(A))
Silent Zone	45	35	55	45
Residential Area	55	45	55	45
Mixed Area	60	50	-	-
Commercial Area	70	60	70	70
Industrial Area	75	70	70	70

Note:


- * The Bangladesh National Ambient Noise Standards have been taken from Schedule 4 (Standards for Sound) of the Environmental Conservation Rules, 1997.
- ** Guidelines values are for noise levels measured out of doors. Source: Guidelines for Community Noise, World Health Organization (WHO), 1999.
- *** As per IFC EHS noise level guidelines, Noise impacts should not exceed the levels presented in the above table or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.
- **** In Bangladesh standard day time is defined from 6.00 to 21.00 hrs and night time is from 21.00 to 6:00 hrs, whereas in WHO guidelines, day time is defined from 7.00 to 22.00 hrs and night time is from 22.00 to 7:00 hrs.
-  Represents the standard values applicable to the Project.

Table 3.8 Standards for sewage discharge

Parameter	Unit	Standard Limit (Bangladesh)*
BOD	mg/l	40
Nitrate	mg/l	250
Phosphate	mg/l	35
Suspended Solid	mg/l	100
Temperature	°C	30

Parameter	Unit	Standard Limit (Bangladesh)*
Coliform	No./100 ml	1000

Notes :

- (1) This limit shall be applicable to discharges into surface and inland waters bodies.
- (2) Sewage shall be chlorinated before final discharge.

* Schedule 9 (Standards for Sewage Discharge) of the Environmental Conservation Rules, 1997

It is evident from the above tables that except noise level standards, the WB/IFC guidelines are more stringent than the local standards. The Project needs to comply with the Bangladesh environmental, health and safety laws and World Bank Group Guidelines. Hence, it is mandatory for the Project to meet the stringent standards, as per applicability.

4. ENVIRONMENTAL AND SOCIAL SCREENING AND SCOPING

4.1 Screening

4.1.1 Project categorisation as per DoE, Ministry of Environment and Forest, Bangladesh

Depending upon location, size and severity of pollution loads, projects/ activities have been classified in the ECR, 1997 into four categories: Green, Orange A, Orange B and Red, respectively, to nil, minor, medium and severe impacts on important environmental components (IECs).

As per the Schedule-1 of the ECR 1997, corresponding category related to power plants, fall under **Orange B** for the following components:

- Item 70 : solar power project (generation capacity more than 1 MW)

4.1.2 Project categorisation as per ADB Safeguard Policy Statement

Categorization for the proposed Project was undertaken by using ADB's Rapid Environmental Assessment (REA), Involuntary Resettlement (IR) and Indigenous People (IP) Assessment checklists during the screening and scoping exercise. The findings of the assessment are presented in **Table 4.1**.

Table 4.1 Project Categorisation as per ADB Safeguards

S. No.	Criteria	Relevance	Remarks	Category
1	Environmental Categorization			
(a)	Irreversible	Environmental issues and impacts of the Project are anticipated during the construction and operation of the solar power project.	<p>Irreversible impacts due to the Project include:</p> <ul style="list-style-type: none"> • Increase noise and vibration during the construction phase only, as the settlements are present just 0.1 km away from the project boundary. • Change in air quality due to fugitive emission during site development and construction activity and gaseous emission due to operation of diesel operated machineries and transport vehicles and DG sets. • Land filling –about 2.0 to 2.5 m, may have impact on local drainage and water logging of surrounding agricultural land. • Occupational health and safety; • Community health and safety; • Associated development in the area. 	Based on, irreversible, diverse and unprecedented impacts, it should be categorized as <u>'B'</u>.
(b)	Cumulative	Type of projects	Cumulative impacts on physical, biological and socio-economic environmental conditions are anticipated due to developmental activities including upgradation of the Manikganj-Paturia Highway.	

S. No.	Criteria	Relevance	Remarks	Category
(c)	Diverse	Nature of activities	The project site and surrounding area is mainly having agricultural land and homestead plantation with settlements. The nature of activities are diverse for the area, as there is no other major industrial unit/ power plant.	
(d)	Unprecedented	Change in land use	About 138.78 acres of land will be converted from low lying agricultural land to industrial use.	
2	Involuntary Resettlement Categorization			
(a)	Mode of Acquisition	Through WSWB negotiations	138.78 acres of land for the Project is required for the project in addition to the 1.0 acres of land for site link road and 0.3 acres of land for residential unit. The required land has been procured through WSWB negotiations from the private land owners.	<p>The land has been procured by the Project proponent through WSWB negotiations from local farmers. No land acquisition was undertaken for the proposed project.</p> <p>No evidence of any form of land related dependence (homestead area or livelihood) was observed at the site location.</p> <p>Hence on Involuntary Resettlement, the Project shall be categorised as ‘C’.</p>
(b)	Irreversible	Project affected households	Land procurement has been completed and compensation to land sellers are already paid by the project proponent.	
3	Indigenous People Categorization			
(a)	Presence	Existence of indigenous people	The total ethnic households of Manikganj District as enumerated in Population and Housing Census 2011 are 116, which cover only 0.04% of the total household of the District. In Shivalaya Upazila, there are total 32 ethnic households with total population of 126, as per P&HC 2011, whereas in Arua Union, there are 20 ethnic households with total population of 74 and	In case of no foreseen adverse impact, project shall be categorized as ‘C’.

S. No.	Criteria	Relevance	Remarks	Category
			majority of the population belongs to Monda ethnic group. Based on consultations with the land sellers, it can be confirmed that no land was purchased from ethnic/ indigenous communities. Client representative also confirmed that the project would not lead to any adverse impacts on ethnic/ indigenous peoples.	
(b)	Impact	Impact on indigenous/ ethnic/ scheduled tribes	No adverse impact on the ethnic minority is foreseen	

4.1.3 Project Categorisation as per IFC Performance Standards

With reference to the IFC's environmental and social screening criteria, it is anticipated that the proposed Project will fall under Category **B** for the following reasons:

- **Potentially limited risks/impacts and reversible:** Environmental and social impacts of the project are anticipated during the construction phase and will encompass changes in land-use, local drainage and water logging, increased noise levels, changes in air quality, use and changes in water quality, impacts on terrestrial ecology, occupational health & safety, etc. Further, there is no physical displacement involved in this project. Thus, most of these impacts are limited to the project sites and their immediate vicinity and can be minimized through application of mitigation measures as proposed in the ESMP.
- **Unprecedented:** Development of solar power projects is occurring in different parts of Bangladesh. A solar power project can therefore not be considered an unprecedented activity.
- **Limited adverse impacts on the baseline:** Solar based energy development is a non-polluting source of energy and thus is not likely to lead to any adverse impacts on the baseline environment during the operation phase. In terms of social impacts the land required is composed of private agricultural land. The proposed project site do not involve any anticipated settlements and physical displacement.

4.2 Scoping

4.2.1 Identification of potential environmental and social impacts

Potential environmental and social impacts have been identified through a systematic process whereby the activities (both planned and unplanned) associated with the construction and operation of the Project have been considered with respect to their potential to interaction with sensitive environmental and social resources or receptors. Scoping of potential impacts has been undertaken in two stages:

- Stage 1: Identification of potential interactions between project activities and environmental receptors; and
- Stage 2: Prioritization of these interactions in terms of their potential to cause significant impacts taking into consideration the current knowledge of project activities, and the existing condition/ sensitivities of environmental and social baseline.

The approach taken and outcomes for each stage are discussed in the subsequent section.

4.2.2 Scoping matrix

The Scoping Matrix enables a methodical identification of the potential interactions each Project activity may have on the range of resources/receptors within the Area of Influence for the Project.

The matrix consists of a list of resources/receptors that could be affected by the Project activities, set against a list of Project activities. Entries in the matrix cells are coloured to indicate whether:

- An interaction is not reasonably expected (white);
- An interaction is reasonably possible but none of the resulting impacts are likely to lead to significant effects (grey); or
- The interaction is reasonably possible and at least one of the resulting impacts is likely to lead to an effect that is significant (black).

All potential interactions, regardless of probability of occurrence, are considered at this stage

Table 4.2 Scoping Matrix of Potential Interactions

Project Activity/ Hazards

	Environmental Resources													Social Resources									
	Land Forms/ Profile	Soil/ Sediment Quality	Land Use	Air Quality	Climate Change	Drainage Pattern	Surface Water Quantity/Quality	Ground Water Resource &Quality	Noise Levels & vibration	Road & Traffic	Occupational Health & Safety	Terrestrial Ecology	Aquatic Flora / Fauna (Biodiversity)	Demographics (i.e. Displacement)	Economy & Livelihoods	Social & Cultural Structures	Land Use (including Economic Displacement)	Infrastructure & Services	Cultural Resources	Community Health & Safety	Vulnerable Groups	Social/ Community Cohesion	
Pre-construction phase																							
Land acquisition/ purchase / lease																							
Construction Phase																							
Construction of Site Link Road (completed)																							
Site development -filling, levelling & compaction (completed)																							
Transportation of construction materials																							
Transportation of solar modules and ancillary facilities																							
Foundation excavation, piling and construction for solar mounts, site office, Transformer																							
Electrical cable laying and installation of PV module																							
Transmission tower installation and stringing of wire																							
Storage, handling and disposal of waste																							
Storage and handling of chemicals (unplanned release)																							
Generation of sewage																							

Project Activity/ Hazards

	Environmental Resources													Social Resources									
	Land Forms/ Profile	Soil/ Sediment Quality	Land Use	Air Quality	Climate Change	Drainage Pattern	Surface Water Quantity/Quality	Ground Water Resource &Quality	Noise Levels & vibration	Road & Traffic	Occupational Health & Safety	Terrestrial Ecology	Aquatic Flora / Fauna (Biodiversity)	Demographics (i.e. Displacement)	Economy & Livelihoods	Social & Cultural Structures	Land Use (including Economic Displacement)	Infrastructure & Services	Cultural Resources	Community Health & Safety	Vulnerable Groups	Social/ Community Cohesion	
Influx of construction workers																							
Sourcing of water																							
Operation & Maintenance Phase																							
Washing of solar modules																							
Grass cutting																							
Regular Inspection and Maintenance of equipment																							
Decommissioning																							
Removal of PV Module																							
Removal of ground mounted structures, ancillary facilities																							

- ☐ = Represents "no" interactions is reasonably expected
☐ = Represents interactions reasonably possible but none of the outcome will lead to significant impacts
☐ = Represents interactions reasonably possible with one of the outcomes leading to potential significant impact

4.3 Environmental and social impacts

The interactions with resources/ receptor has been discussed in the following section.

- **Change in land use:** Only private mono-cropped low laying agricultural land will be utilized for the project and therefore there will be a change in land use from agriculture to non-agricultural purpose.
- **Alteration of Topography and drainage:** The site is located at a low lying area. Land owners in the neighbouring agricultural land parcels reported water logging and poor drainage. Site was part of natural drainage of the area which is historically water logged for 4 – 6 months in a year. Development at the Site (backfilling) is likely to increase water inundation in the neighbouring agricultural land parcels.
- **Impact on Soil / Land Environment:** The project site was already developed. It was reported that there was no mature trees. Therefore, vegetation clearance was not required. The top soil has not been stripped prior to site development. Soil erosion and deposition of fill material in the adjacent agricultural land, improper waste disposal can contaminate soil.
- **Impact on Air Quality:** Operation of DG sets, vehicular movement and construction activities (filling of site, handling of construction material) can cause fugitive and point source emission. This may have adverse impact on local ambient air quality.
- **Increased Ambient Noise Levels:** Operation of construction equipment, machinery, piling, DG sets, vehicular movement and maintenance activities would increase the ambient noise levels. Local communities may be disturbed due to higher than anticipated noise.
- **Impact on Water Environment:** Construction of the project will require water from local sources to carry out its activities. Further, PV module cleaning will require large quantity of water. Therefore, there can be impact on ground water resource. Surface and ground water quality can also be impacted due to improper waste disposal or leaks/spills and runoff.
- **Impact on terrestrial habitat:** Fugitive emission and noise related disturbance due to operation of machineries may have impact on terrestrial habitat of the nearby habitat.
- **Impact on Aquatic Habitat:** The surface runoff from project site during construction and operation phase of the project may increase the suspended solid in the receiving surface water body- this may have impact on primary productivity of the aquatic eco-system.
- **Occupational Health and Safety:** Occupational health and safety hazards can include construction machinery, handling of electrical instruments, noise pollution and dust pollution. In the case of spills/leaks there is a potential for fire hazards and some hazardous substances.
- **Local Economy and Employment:** Solar Power Plant will generate employment opportunity for local people mostly during construction phase as well as for module cleaning, grass cutting and security related works during operation phase.
- **Land Based Livelihoods:** Land based livelihood may be hampered due to land purchase for the project.
- **Community Health and Safety:** The community health and safety may arise due to changes in environmental quality, increased prevalence of disease and increase in traffic movement for transport of solar panel, machine and equipment.