# Initial Environmental and Social Examination Report

**PUBLIC**

Document version: Final
November 2024

# Bangladesh: Muktagacha Solar Power Project

# PART 3

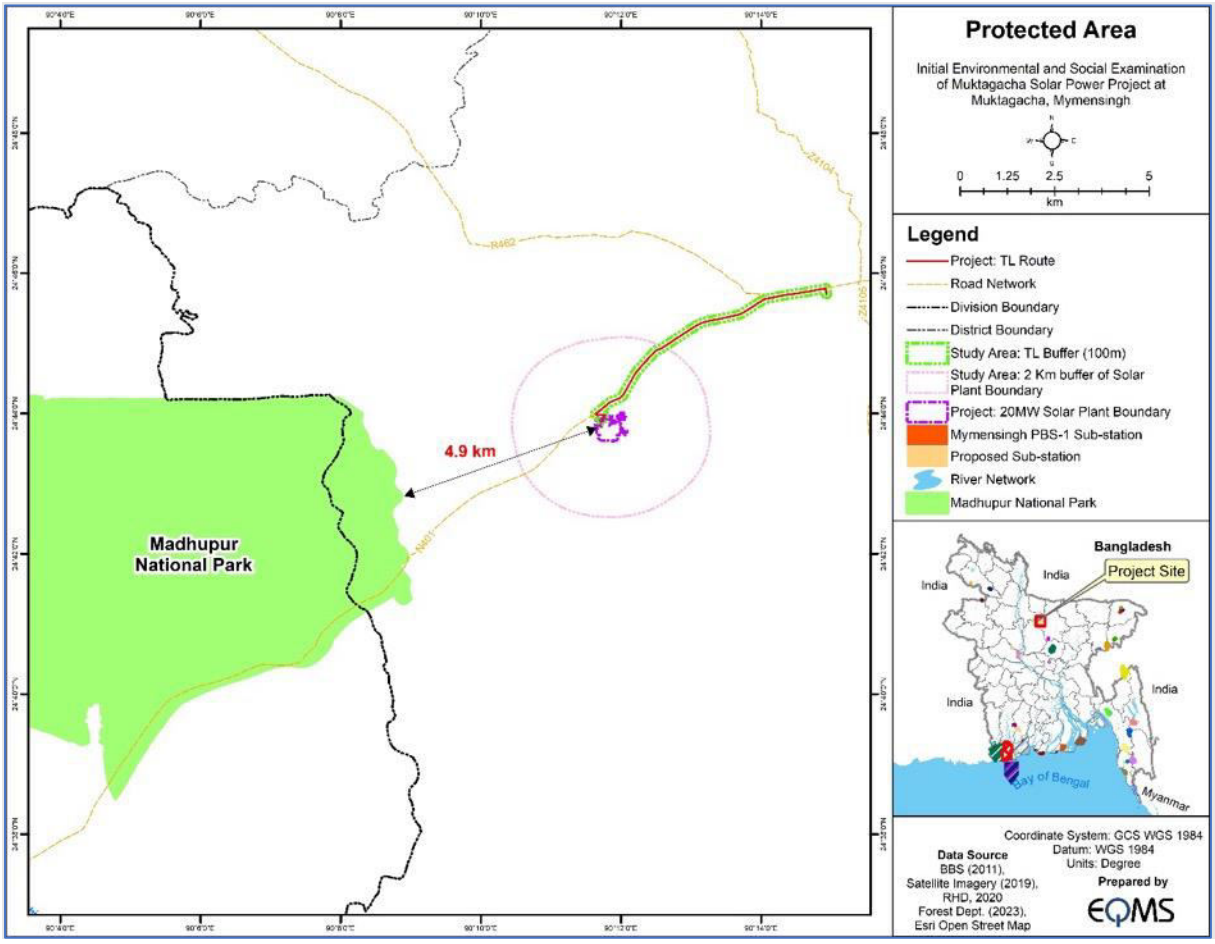
Prepared by EQMS Consulting Limited for the Asian Development Bank (ADB).

## 5.7.5 Ecological Sensitive Areas

### 5.7.5.1 Protected Areas (PAs)

Protected Areas (PAs) or conservation areas are locations that receive protection because of their recognized natural, ecological or cultural values. There are several kinds of protected areas, which vary by level of protection, depending on the enabling laws of each country or the regulations of the international organizations involved. The different categories of PAs in Bangladesh defined by the Wildlife (Conservation and Security) Act, 2012 are Wildlife Sanctuary, National Park, Safari Park, Eco Park, Botanical Garden, Wild Animal Breeding Center, Special Biodiversity Conservation Area, National Heritage, Memorial Tree, Sacred, Tree, and Kunjaban. There are fifty-three (53) PAs in total according to the Forest Department Website (May 14, 2023) in Bangladesh which are managed by Bangladesh Forest Department. However, the proposed Project AoI does not hold any protected areas as per Bangladesh regulations. The nearest Protected area from the project site is Madhupur national park which is only 4.9 km away from the project site. The location of the nearest PAs and their aerial distance from the project area have been shown in Figure 5-52.

**Figure 5-52: Map of nearest Protected Areas of the Project Area**



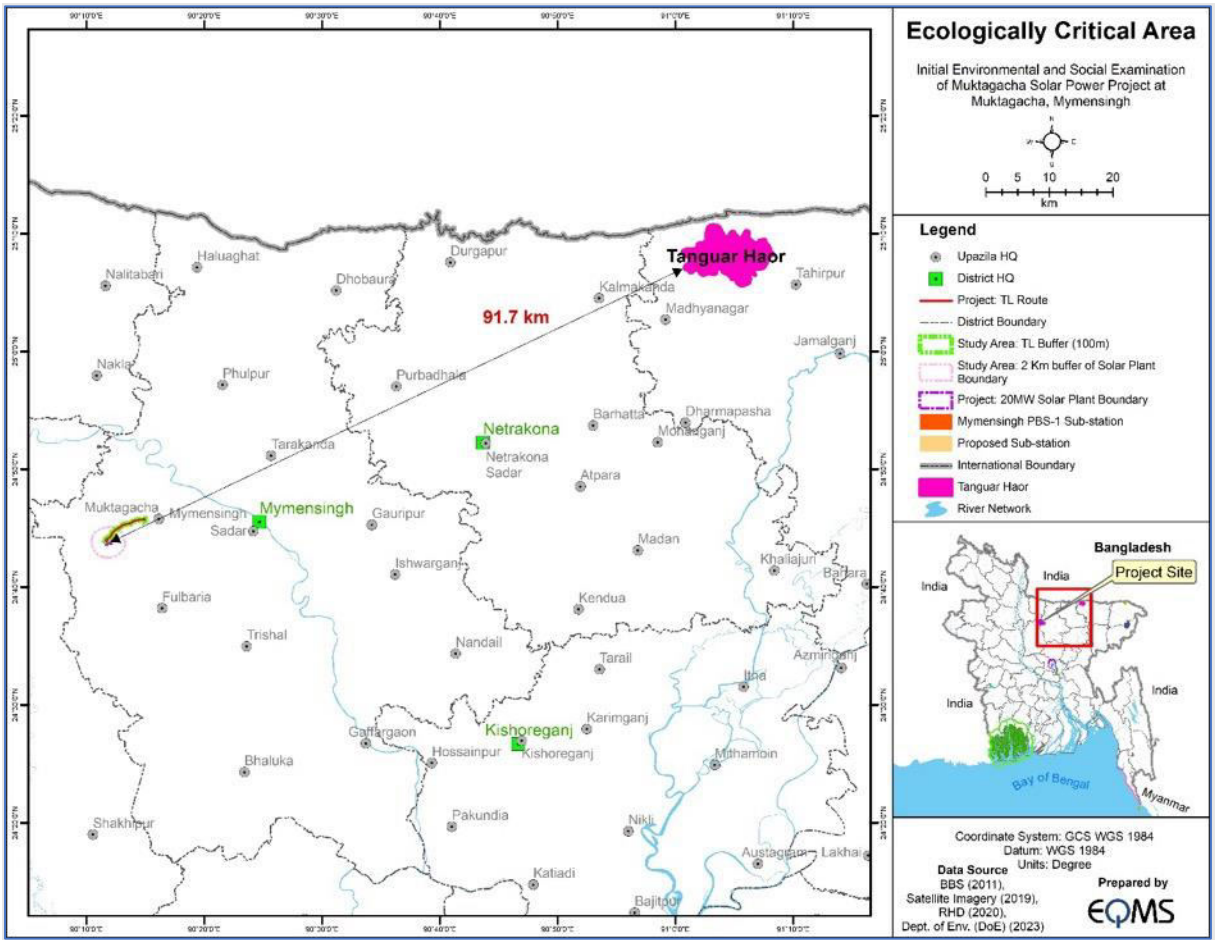

Source: GIS and RS Department, EQMS, May 2024

### 5.7.5.2 Ecologically Critical Areas (ECAs)

In 1995, after the enactment of the Ecologically Critical Area (ECA), the Bangladesh government was empowered to declare an area that is enriched with unique biodiversity and environmental significance and therefore requires protection or conservation from destructive activities. In this regard, after considering human habitat, ancient monuments, archaeological sites, forest sanctuaries, national

parks, game reserves, wild habitats, wetlands, mangroves, forest areas, biodiversity, and other relevant factors of the area, the GoB can declare an area as ECA. As per the legal mandate the MoEFCC has declared thirteen (13) areas as ECAs since its enactment[25]. The nearest ECA from the proposed project site is Tanguar haor which is 91.17 km away from the proposed project. The location of the nearest ECA and their aerial distance from the project area have been shown in Figure 5-53.

**Figure 5-53: Location Map of Nearest ECA from Project AOI**




Source: GIS and RS Department, EQMS, May 2024

### 5.7.5.3 Ramsar Sites

Ramsar site is a wetland site designated to be of international importance under the Ramsar Convention. The Convention on Wetlands, known as the Ramsar Convention, is an intergovernmental environmental treaty established in 1971 by UNESCO, which came into force in 1975. It provides support for national action and international cooperation regarding the conservation of wetlands, and wise sustainable use of their resources.

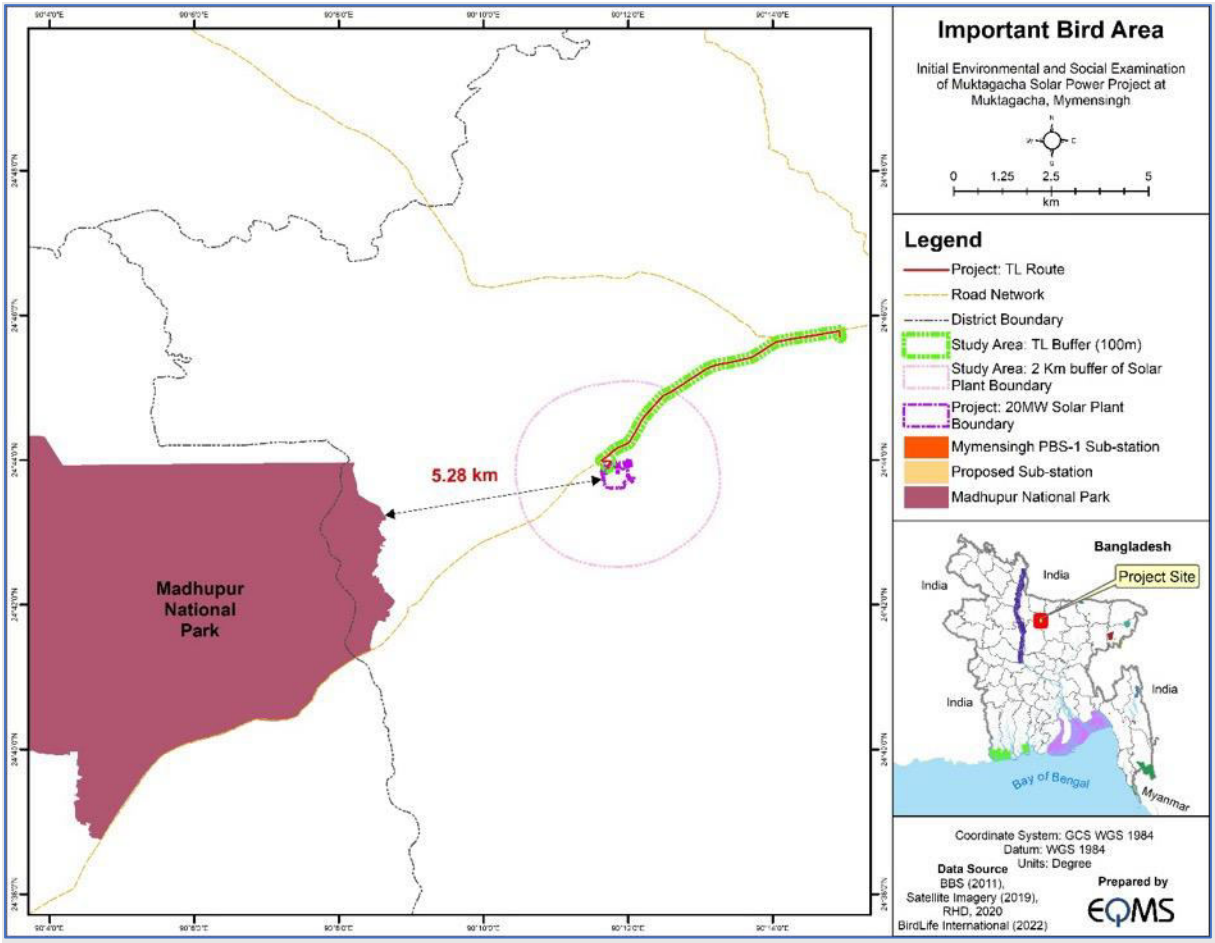
Bangladesh currently has two (2) sites designated as Wetlands of International Importance (Ramsar Sites) with a surface area of 611,200 hectares which are Sundarbans Reserved Forest and Tanguar Haor. However, there is no Ramsar site present within the study area. The nearest Ramsar Site from the proposed project site is Tanguar haor which is 92 km away from the proposed project

[25] Department of Environment, GoB (3rd April 2023)

### 5.7.5.4 Important Bird and Biodiversity Areas (IBAs)

According to BirdLife International (2021), there are twenty (20) Important Bird & Biodiversity Areas (IBAs) in Bangladesh[26]. Although there are no IBA within the project area, the nearest IBA the Madhupur National Park, located at an aerial distance of 5 km from the project area. Madhupur National Park (#BD001) was declared an IBA in 2004, with an area of 8436 ha. The location of the nearest IBA and its aerial distance from the project site have been shown in Figure 5-54.

**Figure 5-54. Important Bird and Biodiversity Area (IBA) near the project AOI**




## 5.8 Socio-economic Environment

Examining the existing socio-economic conditions of the residents in the project area will serve as a valuable benchmark for evaluating the potential socio-economic effects of proposed interventions. This analysis will facilitate a comparison of future changes and impacts resulting from the project interventions. Socio-economic characteristics encompass various aspects such as administrative structure, demographics, household size, education, occupation, housing, employment opportunities, and access to water and sanitation.

[26]BirdLife International (2023) Important Bird Areas factsheet: Jamuna-Brahmaputra River. Downloaded from http://www.birdlife.org on 05/04/2023.

### 5.8.1 Approach and Methodology

For the purposes of establishing the socio-economic baseline for the project and undertaking the social impact assessment of the project, a phased participatory approach was adopted. Through this approach, an attempt was made to integrate the local understanding and perspective into the impact assessment process and identification of the mitigation measures. The purpose of such an approach was to allow for:

- The triangulation of the information available from secondary sources through the information made available by the local community, both qualitative and quantitative.
- Formulation of the socio-economic baseline based on a combination of primary and secondary qualitative and quantitative data.

An understanding to be developed of the local community's perception of the project and its activities and the possible impacts from the same and the desirable mitigation measures.

#### 5.8.1.1 Socio-economic Survey Methodology

This section outlines the methodology developed for conducting a survey in the four unions named Mankon, Kashimpur, Basati and Ghoga of Muktagacha Upazila under Mymensingh district of Mymensingh division. The survey aimed to gather data on various socio-economic aspects within the community to better understand the socioeconomic profile of residents.

A simple random sampling technique was utilized to ensure a representative sample. With 33,693 households in the 2 km Area of Influence (AOI), a sample size of 271 (275 was selected as a round figure) was determined, achieving a 90% confidence level with a 5% margin of error. As discussed with the JPL, local people, landowners and the reconnaissance visit of the site it was identified that, most of the landowners are residing in the adjacent of the project area. Upon the consideration of the significance of landowners, 20% of total sample size (55) of landowners was surveyed to understand the socio-economic dynamics of landowners during the study period. The landowner survey was conducted through a purposive sampling method following a landowner list provided by MSEL.

On the other hand, the proposed project area is situated in two Unions named Kashimpur and Mankon. The nearest settlements are mostly in these areas. So, 60% of the rest of the survey will be conducted in these two unions and 40% will be conducted within the others. The socioeconomic survey was conducted for the respondents apart from landowners following the simple random sampling method.

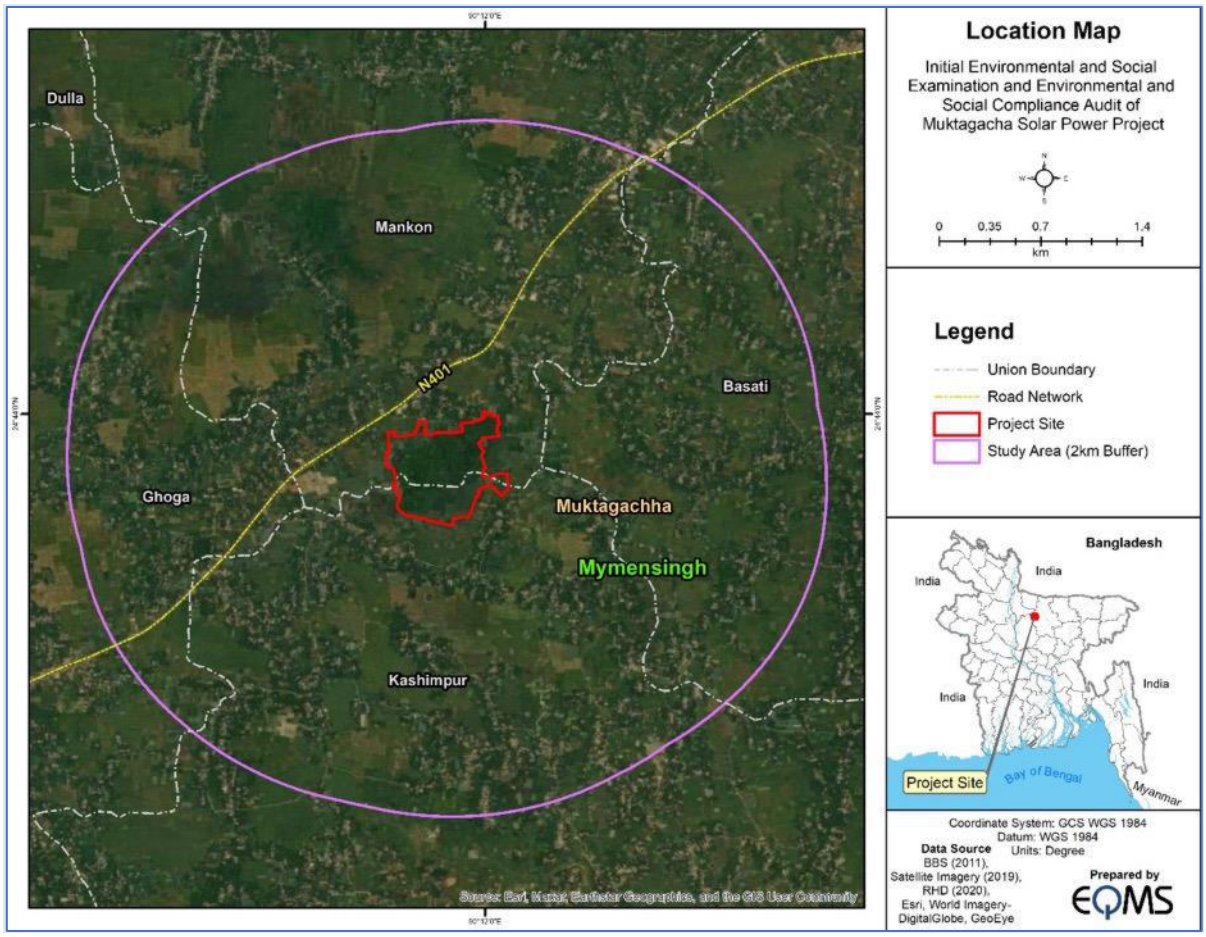
The proposed project will produce electricity and supply it to the local substation of Mymensingh Palli Bidyut Samity. They will supply it through transmission line. The length of transmission line is 8 km and there is existing 276 poles in both side of the Tangail – Mymensingh highway road. The poles mainly owned by the Bangladesh Rural Electrification Board and no privately owned land is going to be acquired for the installment of transmission line poles.

A standard questionnaire was developed for Socioeconomic and landowner survey (Appendix C-3: . The questionnaire covered various relevant topics, including demographics, income and expenditure, healthcare, education, public utilities and facilities and so on, with attention given to cultural sensitivity and language clarity. Surveyors were trained extensively in questionnaire administration, informed consent, confidentiality, and accurate data recording. Door-to-door surveys were conducted within the surveyed area based on predetermined sampling.

### 5.8.2 Study Area

A 2km area of influence has been selected to identify and assess the impact of the proposed project on the community. The project area falls under the union of Kashimpur and Mankon. The area of influence covers four unions named Basati, Ghoga, Kashimpur and Mankon under the District Muktagacha of Mymensingh. Below Figure 5-55 shows the study area.

**Figure 5-55: Study Area**




Source: EQMS, 2024

## 5.8.3 Socioeconomic Profile of Landowners

The socioeconomic survey focuses on landowners, selecting 55 landowners at random for the study. These 55 landowners were chosen from the list of landowners provided by MESL.

### 5.8.3.1 Demographic Profile

A total number of 216 population are living in 55 households that has been surveyed for socio economic study. Among these households, 53 were headed by males, and 2 were led by females. The average household size is 3.92 which is lower than the national average (4.0)[27]. Below **Table 5-28** shows the Demographic Information of the Project Area of Influence.

**Table 5-28: Demographic Information of the Landowners**

| HH | Male HH | Female HH | Male | | Female | | Total pop. | HH size |
|---|---|---|---|---|---|---|---|---|
| | | | Pop. | % | Pop. | % | | |
| 55 | 53 | 2 | 114 | 52.8 | 102 | 47.2 | 216 | 3.92 |

Source: EQMS Land-owner Survey, March 2024

Among the surveyed landowners, about 52.8% males and 47.2% females were identified. In the case of age distribution of the surveyed populations, the majority (26.4%) of the population are concentrated

[27] Population and Housing Census 2022 – Preliminary Report

below 14 years and about 18.1% are between 31 to 40 years of age. About 17.6% are between 21 to 30 years of age while the elderly population (more than 65+) is about 6%.

Moreover, 57.9% of the total population are found married while 36.6% of them are unmarried during survey of the study area. A total of 5.6% identified as widow/widower and divorced.

All over, health status among the households has been found quite well. Around 96.3% of the population are found physically normal, only 3.7% are found physically challenged. **Table 5-29** shows the Demographic Profile of the study area.

**Table 5-29: Profile- Age, Marital Status and Health Status of the Study Area**

| S/N | Demographic Information | | Land-owners | |
|---|---|---|---|---|
| | | | No | % |
| 1 | Population | Male | 114 | 52.8 |
| | | Female | 102 | 47.2 |
| | | Total | 216 | 100.0 |
| 2 | Age | Below 14 | 57 | 26.4 |
| | | 15 to 18 | 17 | 7.9 |
| | | 19 to 20 | 6 | 2.8 |
| | | 21 to 30 | 38 | 17.6 |
| | | 31 to 40 | 39 | 18.1 |
| | | 41 to 50 | 27 | 12.5 |
| | | 51 to 65 | 19 | 8.8 |
| | | Above 65 years | 13 | 6.0 |
| | | Total | 216 | 100.0 |
| 3 | Marital Status | Married | 125 | 57.9 |
| | | Unmarried | 79 | 36.6 |
| | | Widow/Widower | 11 | 5.1 |
| | | Divorced | 1 | 0.5 |
| | | Total | 216 | 100.0 |
| 4 | Health Status | No Disability or incurable diseases | 208 | 96.3 |
| | | Person with Disabilities | 8 | 3.7 |
| | | Total | 216 | 100.0 |

Source: EQMS land-owner Survey, April 2024

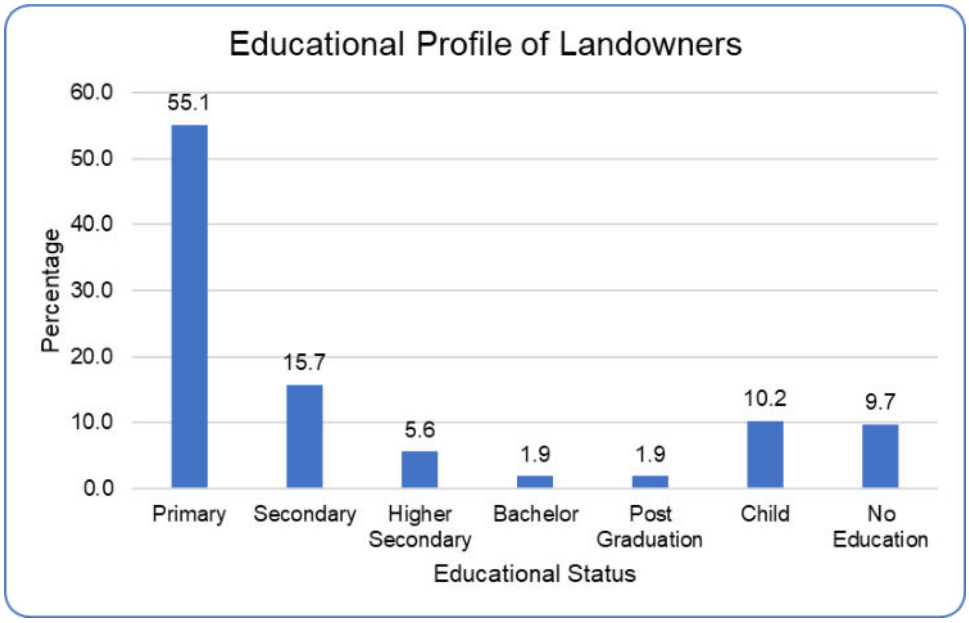
### 5.8.3.2 Religious Affiliation

Based on the outcomes of the landowner survey, it is found that the study area is Muslim dominated, with the entire surveyed households identified as followers of the Islamic faith.

### 5.8.3.3 Educational Status

According to landowner survey, the majority of the (55.1%) population of the surveyed households of landowners had access to primary level education. A considerable proportion of the population (15.7%) completed secondary school. While only 5.6% of the population had access to higher secondary education. According to survey results, the illiteracy rate is 9.7%. The total literacy rate of the surveyed landowners is 80.1% which is higher than the national literacy rate (74.7%) of Bangladesh. Children account for approximately 10.2% of the population. Below Figure 5-56 depicts the education profile of the surveyed people of area of influence of the proposed project.

**Figure 5-56: Education Profile of the Landowners**



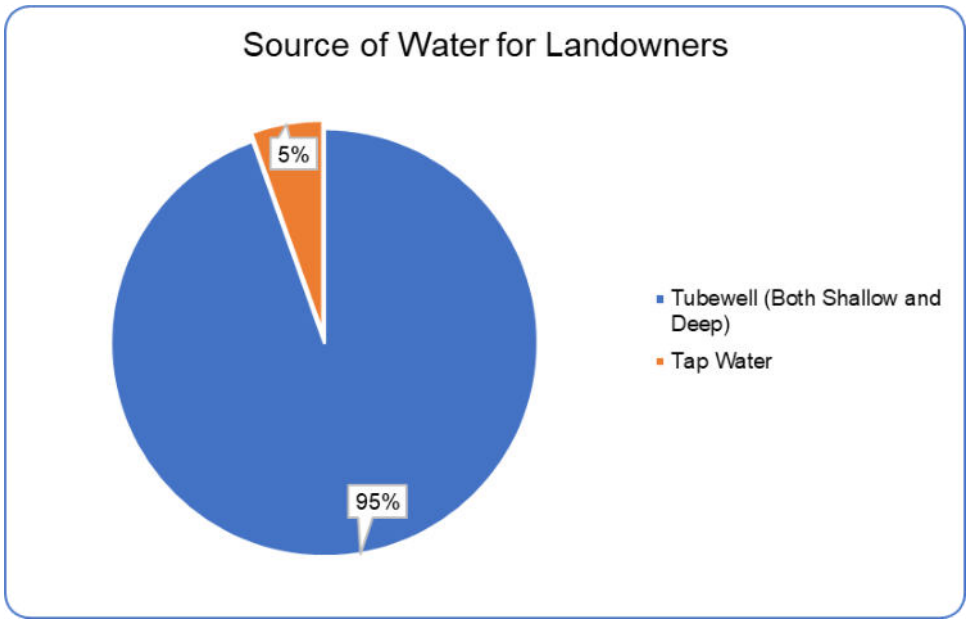

Source: EQMS Landowner Survey, April 2024

### 5.8.3.4 Public Utilities

#### 5.8.3.4.1 Access to Water

During the landowner survey, it was found that, 94.5% landowners source water from both Shallow and deep tubewell. Only 5.5% of the household collects tap water. Below **Figure 5-57** shows the status of study area's access to safe water.

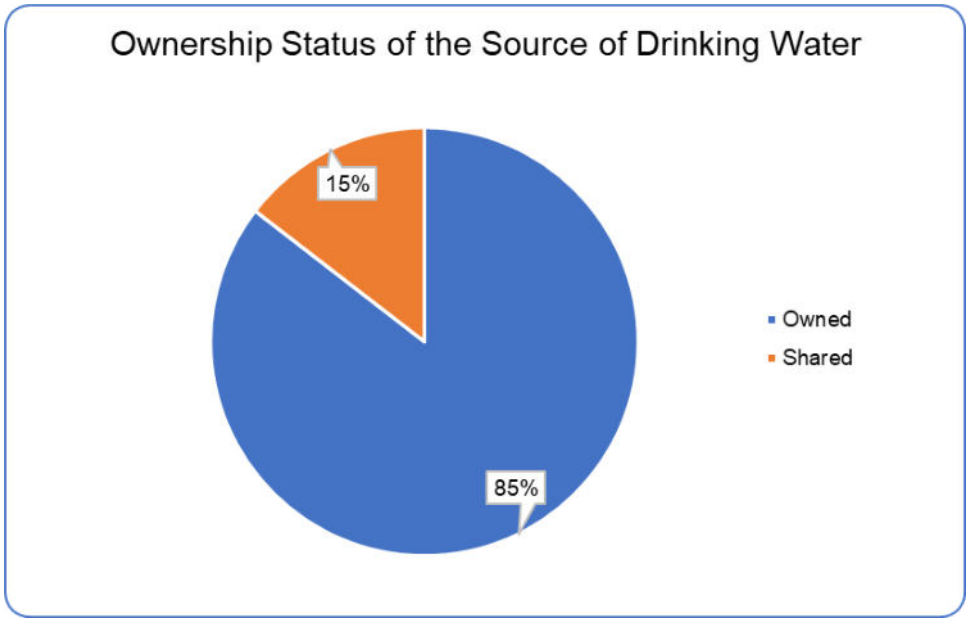
**Figure 5-57: Source of Water for Landowners**




Source: EQMS Landowner Survey, April 2024

Most of the Landowners (85%) collect water from their own drinking water source, whereas only 15% collect water from different shared water sources. Below **Figure 5-58** shows the Ownership Status of the Source of Drinking Water for the surveyed landowners.

**Figure 5-58: Ownership Status of the Source of Drinking Water**

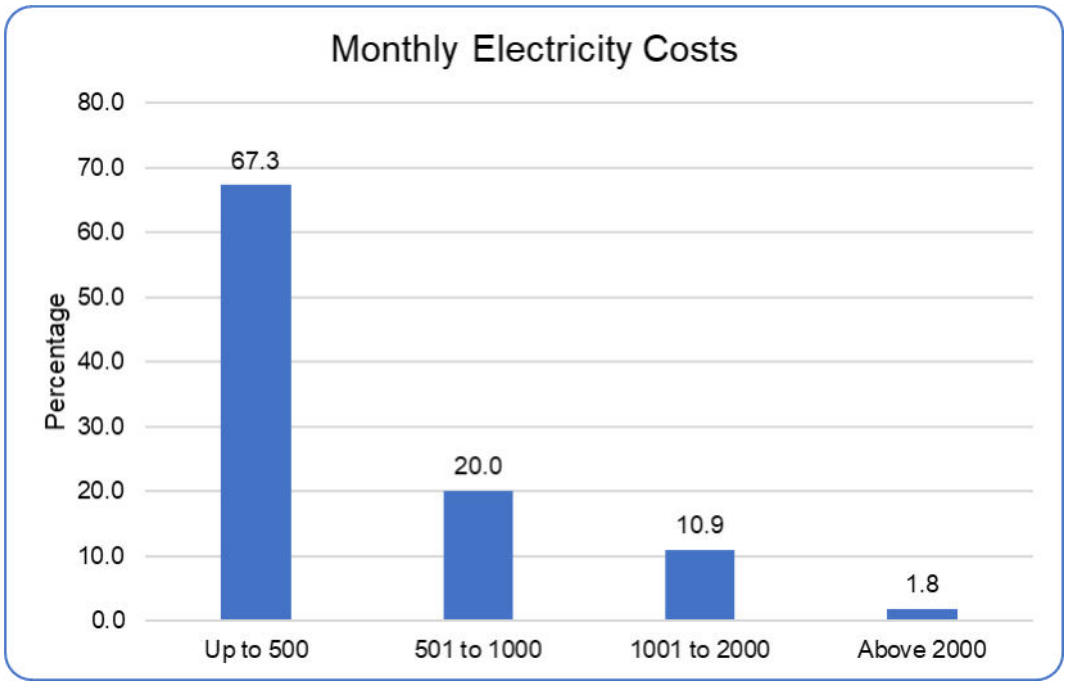



Source: EQMS Landowner Survey, April 2024

#### 5.8.3.4.2 Access to Electricity and Monthly Electricity Costs

The landowner survey results found that all of the surveyed households have access to electricity from the grid. Most of the surveyed households (67.3%) of the landowners spend up to BDT 500 per month and 20% has to spend within BDT 500 to 1000 per month. Only 1.8% of the households spend above BDT 2000 per month as their electricity cost. Below Figure 5-59 shows the overview of monthly electricity cost for the landowners.

**Figure 5-59: Monthly Electricity Cost for the Landowners**

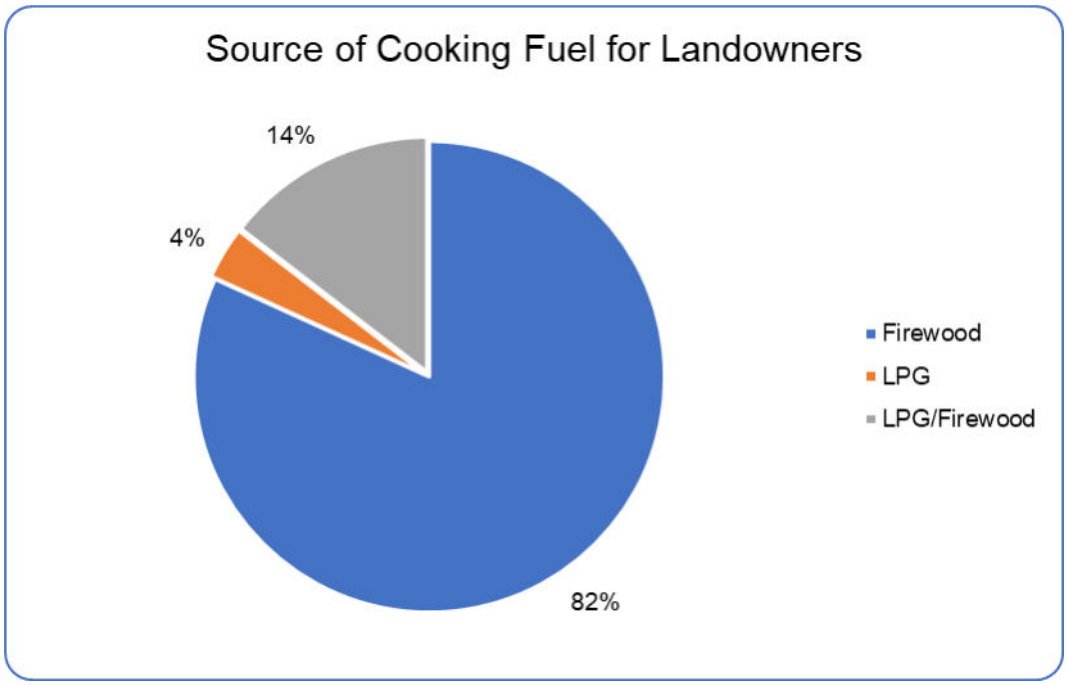



Source: EQMS Landowner Survey, April 2024

#### 5.8.3.4.3 Source of Cooking Fuel and Monthly Fuel Cost

The surveyed data outlines the diverse cooking fuel preferences within the surveyed landowners of the proposed project. Firewood, a traditional fuel, is still widely used by 81.8% of landowners. They usually purchase the firewood from their local market. Only 3.6% use LPG and 14.5% of households use both LPG gas and firewood for cooking purposes. Source of cooking fuel for landowners is presented hereunder **Figure 5-60**.

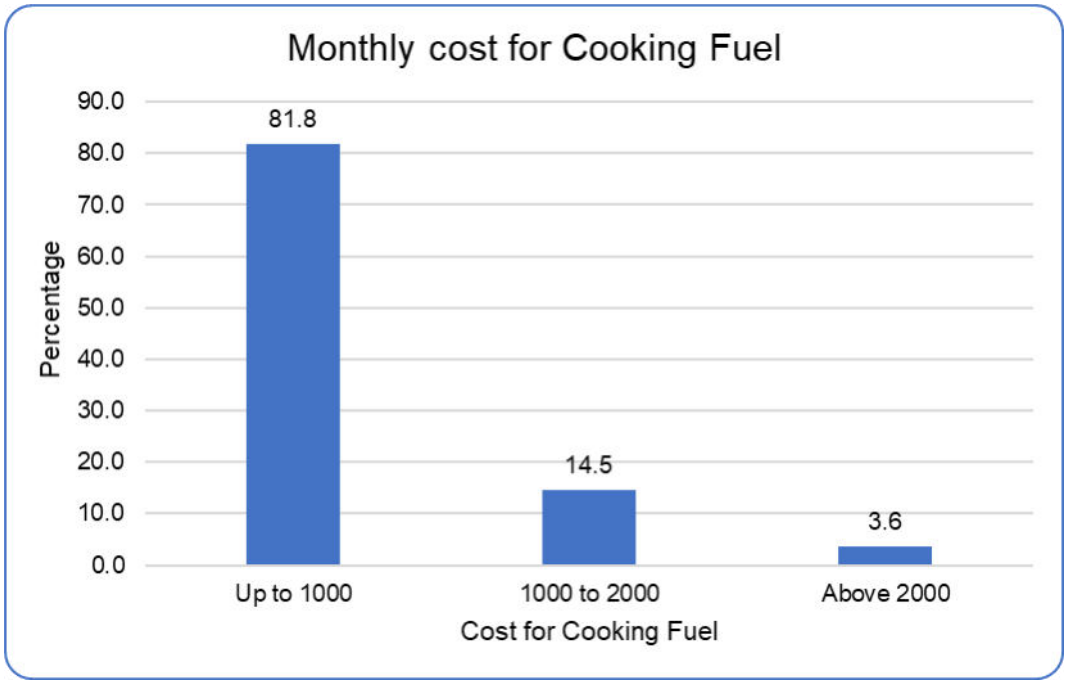
**Figure 5-60: Source of Cooking Fuel for Landowners**




Source: EQMS Landowner Survey, April 2024

Around 81.8% of landowners have to spend up to 1000 BDT per month for fuel cost. On the other hand, 14.5% of the households spend between BDT 1000 to 2000 per month and only 3.6% spend above BDT 2000 per month on their cooking fuel cost. Below Figure 5-61 shows the cooking fuel cost of the households of surveyed landowners.

**Figure 5-61: Monthly Cooking Fuel Cost for the Landowners**

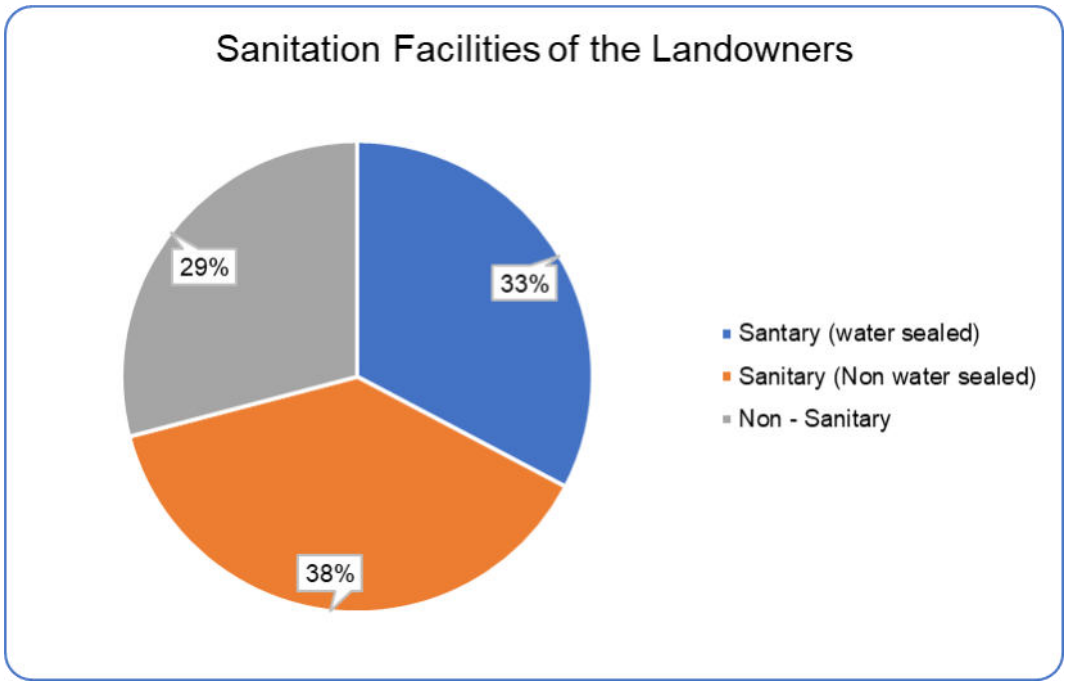



Source: EQMS Landowner Survey, April 2024

#### 5.8.3.4.4 Sanitation Facility

Primary survey results demonstrate that 38% of households of the landowners are using sanitary latrine (non-water sealed) and 33% are using water-sealed sanitary latrine. Around 29% of the surveyed landowner households use non sanitary latrine. Available sanitation facilities available for the landowners is presented in below **Figure 5-62**.

**Figure 5-62: Sanitation Facilities of the Landowners**




Source: EQMS Landowner Survey, April 2024

#### 5.8.3.5 Access to Social Institution for the Surveyed Landowners

Convenient and easy access to educational institutions, market and medical services help households to get basic needs and health services when it is necessary or urgent. Distance may create a barrier from easy access to these services which ultimately leads to poor livelihood status. On the contrary, easy access to social services leads to better livelihood and development.

##### 5.8.3.5.1 Access to Educational Institutions

**Table 5-30** shows the educational institution accessibility for the landowners. Study finds that 76.4% of total students has to travel up to 1 km for receiving elementary/basic education whereas 21.8% of the students has to travel around 1 to 3 km for receiving the same opportunity. On the other hand, 76.4% of the students has to travel up to 1 km to receive Higher secondary degrees. Conversely, 23.6% of the students have to travel 1 to 3 km. For receiving Bachelor/ post-graduation degree, 63.6% of the students need to travel around 1 to 3 km, whereas 34.5% of the students travel up to 1 km and only 1.8% travel more than 3 km.

On average, 62.4% of the total students have to move up to 1 km for receiving educational facilities whereas 36.4% have to move 1 to 3 km and only 1.2% have to move above 3 km for the purpose of education.

**Table 5-30: Access to Education**

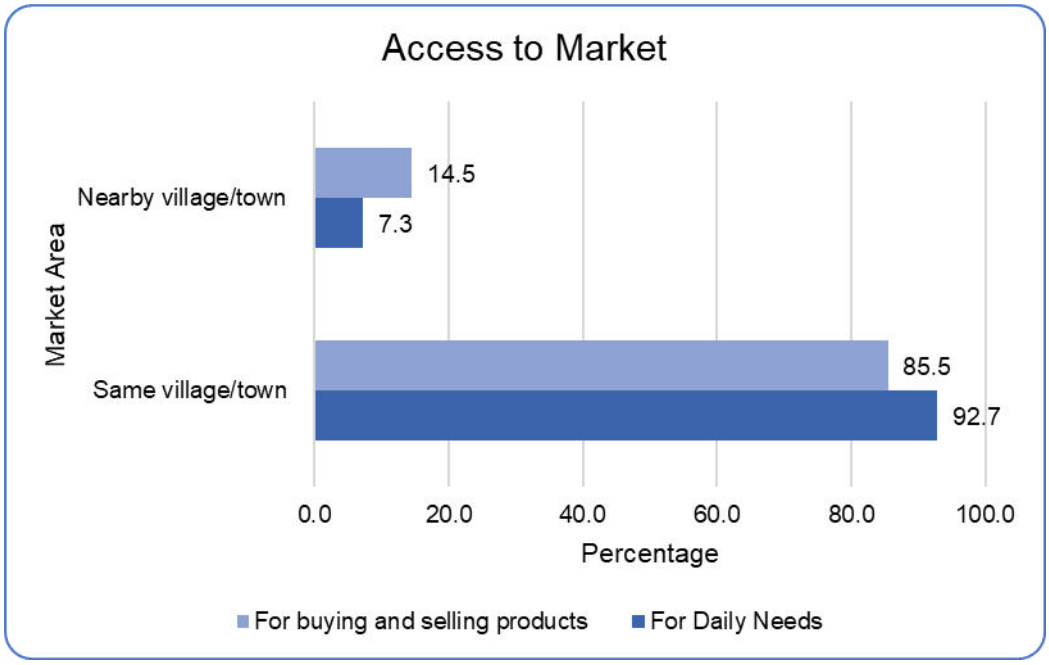
| Distance | Elementary/ Basic Education | Higher Secondary | Bachelor/ Post Graduation | Total |
|---|---|---|---|---|
| **Up to 1km** | 76.4 | 76.4 | 34.5 | 62.4 |
| **1 to 3 km** | 21.8 | 23.6 | 63.6 | 36.4 |
| **Above 3 km** | 1.8 | 0.0 | 1.8 | 1.2 |

Source: EQMS Landowner Survey, April 2024

##### 5.8.3.5.2 Access to Market

Survey results have found that 92.7% of the surveyed landowners go to the markets of their own town to buy daily need items whereas only 7.3% of the surveyed landowners go to the markets of nearby towns for the same purpose. On the other hand, 85.5% of the surveyed landowners usually go to the markets of their own town and only 14.5% go to other towns for buying and selling products. Below Figure 5-63 shows the accessible market facilities for the landowners.

**Figure 5-63: Access to Market Facilities for the Landowners**




Source: EQMS Landowner Survey, April 2024

Survey results have also found that 89.1% of the surveyed landowners have to move up to 1 km for buying daily needs whereas only 10.9% need to go more than 1 km for the same purpose. On the other hand, 76.4% of the total surveyed landowners have to move up to 1 km for buying and selling products. Conversely, 23.6% have to move more than 1 km for the same purpose. Below Table 5-31shows the distance to the market facilities for the surveyed landowners.

**Table 5-31: Distance to Market for landowners**

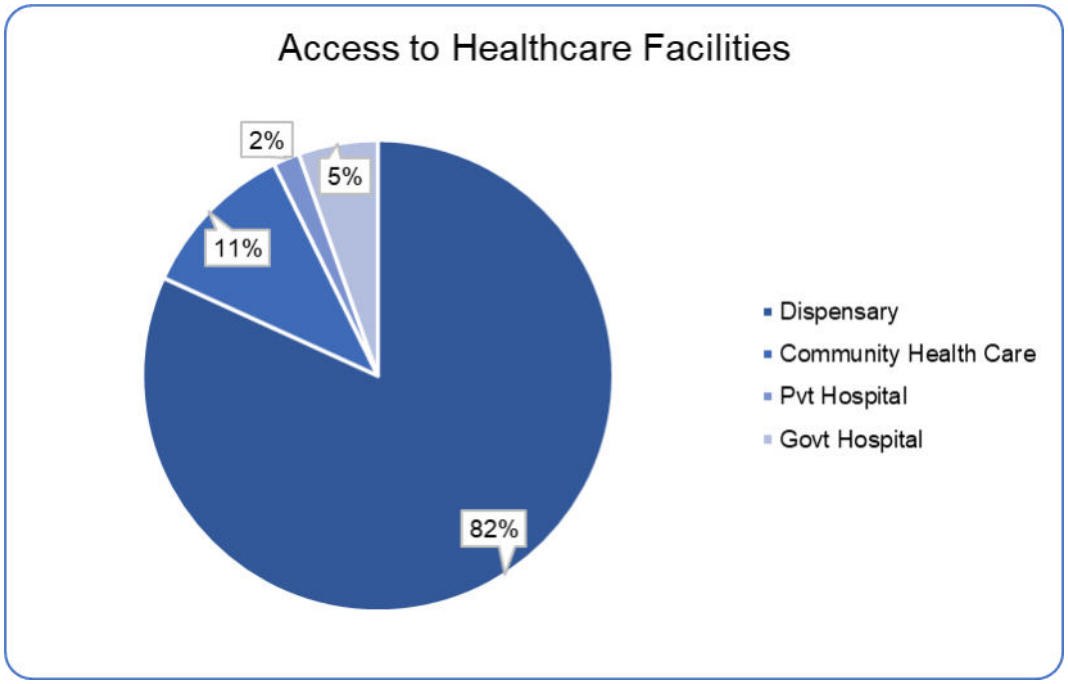
| Distance | For Daily Needs (%) | For Buying and Selling Products (%) |
|---|---|---|
| Up to 1km | 89.1 | 76.4 |
| More than 1 km | 10.9 | 23.6 |
| Total | 100.0 | 100.0 |

Source: EQMS landowner Survey, April 2024

#### 5.8.3.5.3 Access to Healthcare Facilities

Easy access to hospitals enhances the frequency of health services taking. Higher distance may hinder taking health services which ultimately increase the health risk. Survey results have found that 82% of the surveyed landowners go to their nearest dispensary for their general healthcare services, whereas the rest of the households go to community health care center (10.9%), Private hospital (1.8%) and government hospital (5.5%) for the same purpose. Below Figure 5-64 shows the access to healthcare facilities for the surveyed households of the Landowners.

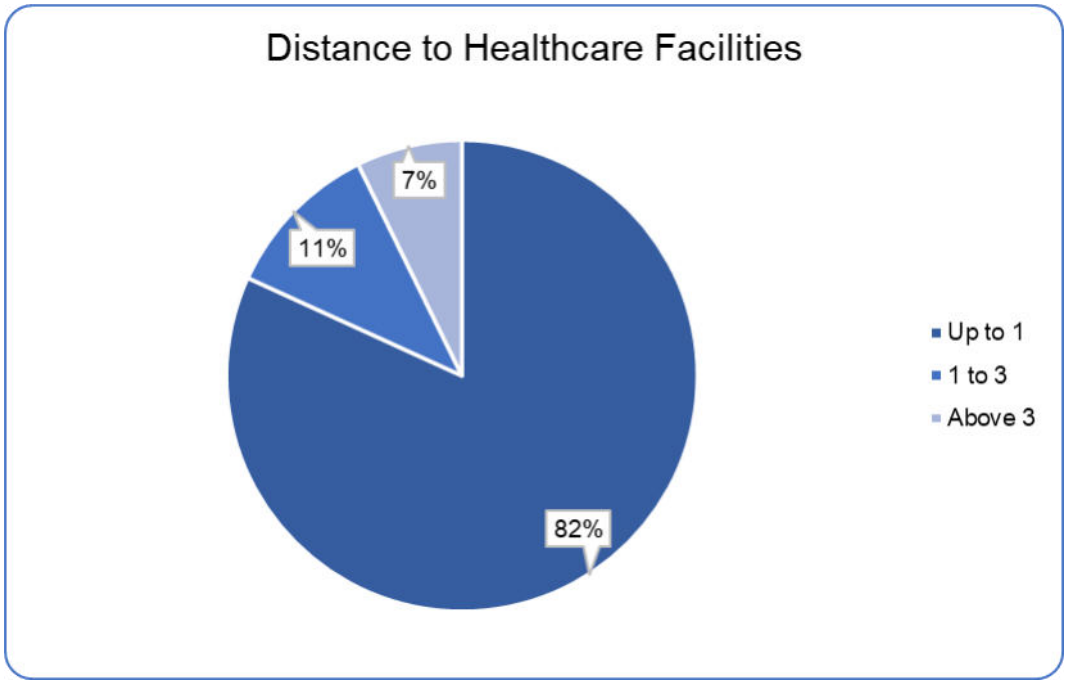
**Figure 5-64: Access to Healthcare Facilities for the Landowners**




Source: EQMS Landowner Survey, April 2024

Out of the surveyed households of landowners, around 82% of households are staying within 1 km distance from the health service point. On the other hand, only 11% live within 1 to 3 km distance and the rest 7% live 3 km far from the hospital services. Below shows the distance to the healthcare facilities from the surveyed households of surveyed landowners.

**Figure 5-65: Distance to Healthcare Services**



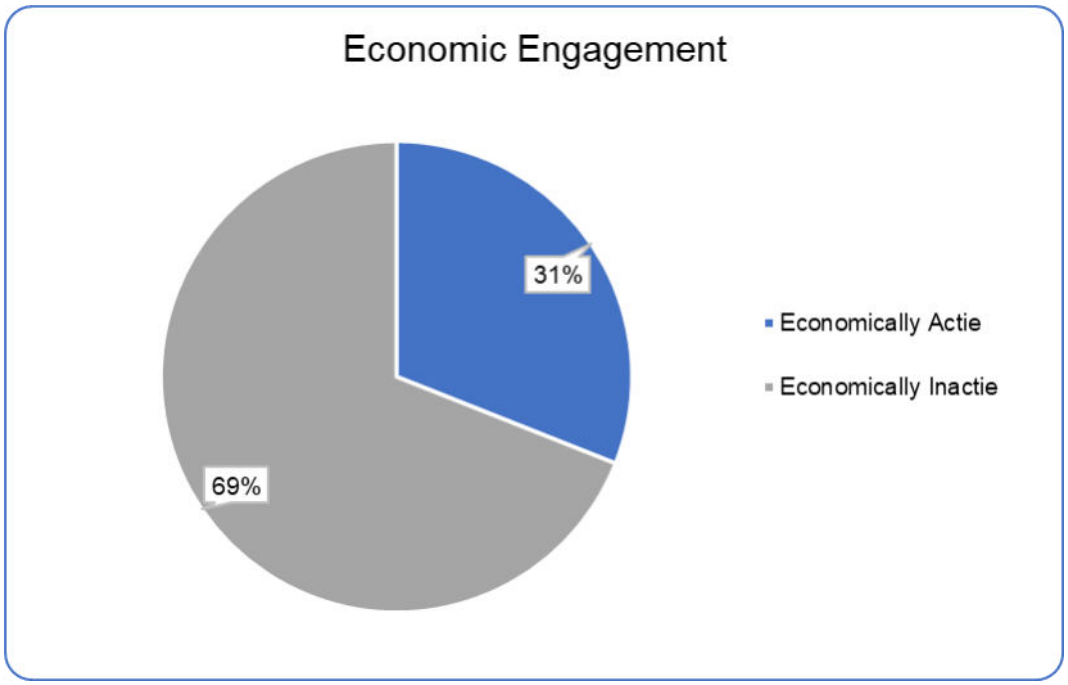

Source: EQMS Landowner Survey, April 2024

### 5.8.3.6 Economy and Employment

#### 5.8.3.6.1 Economic Engagement of the Surveyed Landowners

In the study area, only 31% of the total surveyed population is involved in economic activities through various occupations. On the contrary, 69% of those polled are economically inactive. Figure 5-66 depicted the economic engagement of project area of influence.

**Figure 5-66: Economic Engagement of Landowners**




Source: EQMS Landowner Survey, April 2024

#### 5.8.3.6.2 Occupation Profile of the Surveyed Households of the Landowners

According to the survey findings of the landowners, majority of the economically active male (53.7%) are engaged in farming activities, while the lowest number of people are teachers (1.5%). Conversely, only a few numbers of women (11.9%) are economically active who are involved in farming (4.5%), daily laboring (4.5%), service (1.5%) and teaching (1.5%) activities. The landowners used to engage in farming activities on the project land, on their other lands or on land owned by others.

The survey conducted with the landowners indicates that 69% of the population is economically inactive, attributed to various reasons. This includes 22.1% of males being students and 43% of females working as housewives. A detail of economically active and inactive populations according to their field of engagement is presented in **Table 5-32**.

**Table 5-32: Economically Active and Inactive Populations Occupation Profile**

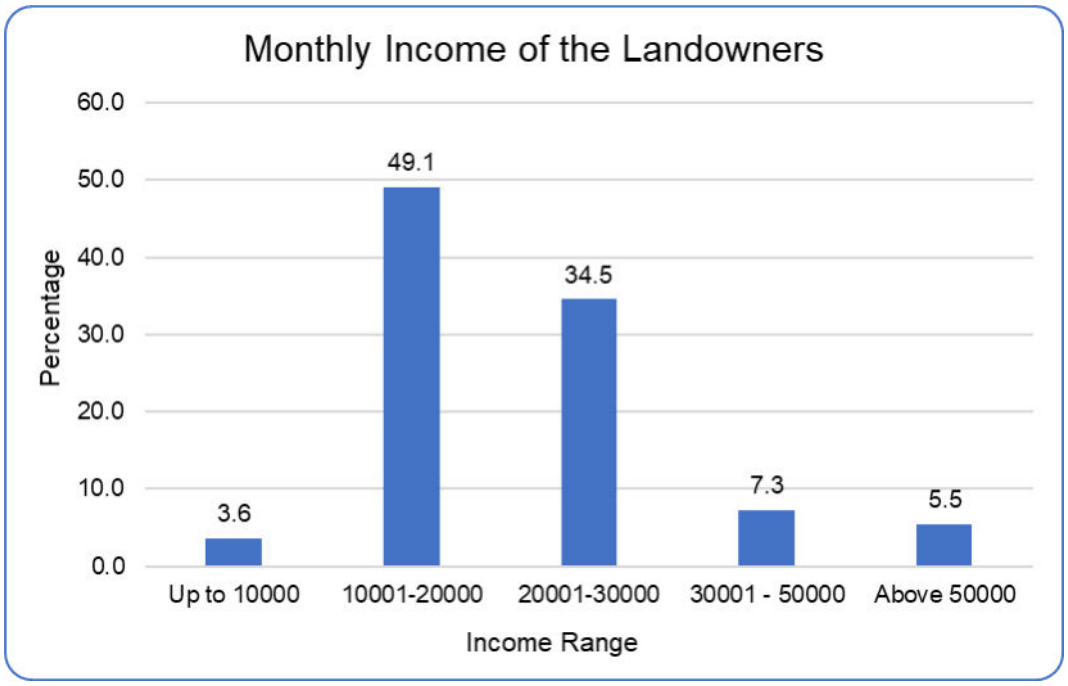
| Employment Status | Field of Engagement | Male | | Female | | Total | |
|---|---|---|---|---|---|---|---|
| | | Number | % | Number | % | Number | % |
| Economically Active | Farming | 36 | 53.7 | 3 | 4.5 | 39 | 58.2 |
| | Agricultural Labor | 2 | 3.0 | 0 | 0.0 | 2 | 3.0 |
| | Daily Labor | 0 | 0.0 | 3 | 4.5 | 3 | 4.5 |
| | Service | 6 | 9.0 | 1 | 1.5 | 7 | 10.4 |
| | Commercial business, Shops etc. | 14 | 20.9 | 0 | 0.0 | 14 | 20.9 |
| | Teacher | 1 | 1.5 | 1 | 1.5 | 2 | 3.0 |
| Sub-total | | 59 | 88.1 | 8 | 11.9 | 67 | 100.0 |
| Economically Inactive | Student | 33 | 22.1 | 20 | 13.4 | 53 | 35.6 |
| | Unemployed/ Job Seeker | 1 | 0.7 | 0 | 0.0 | 1 | 0.7 |
| | Unpaid Family work/Housewife | 0 | 0.0 | 64 | 43.0 | 64 | 43.0 |
| | Child and Elderly | 21 | 14.1 | 10 | 6.7 | 31 | 20.8 |
| Sub-total | | 55 | 36.9 | 94 | 63.1 | 149 | 100.0 |

Source: EQMS Landowner Survey, April 2024

#### 5.8.3.6.3 Monthly Income

According to the socioeconomic survey, it is found that most (49.1%) of the household's income range is from 10000 to 20000 BDT. The monthly income of the HHs of surveyed landowners is given in below Figure 5-67.

**Figure 5-67: Monthly Income of the Landowners**



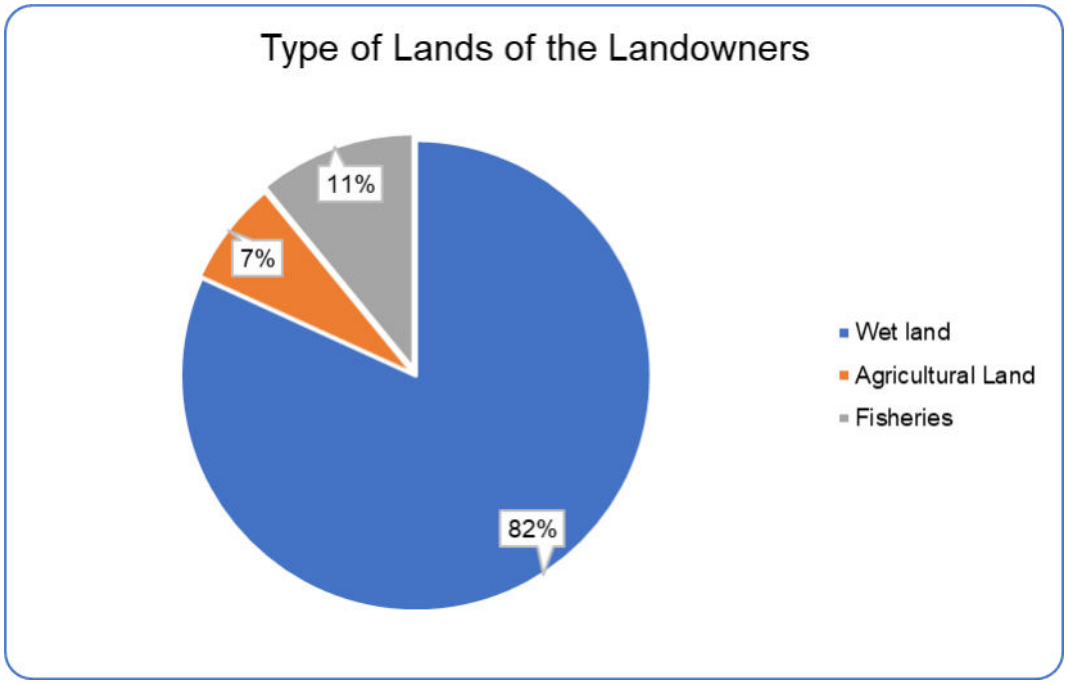

Source: EQMS Landowner Survey, April 2024

### 5.8.3.7 Information about the Landowners

#### 5.8.3.7.1 Type of Project Land

During the study period, 55 landowners were surveyed to understand the social dynamics of the landowners as well as their present condition. Out of the surveyed landowners, 82% had their land inundated in wet land. On the other hand, only 11% of the landowners used their land for fisheries purposes and 7% used their land for agriculture purposes. Below Figure 5-68 shows the type of land as per the landowners.

**Figure 5-68: Type of Project Land**




Source: EQMS Landowner Survey, April 2024

#### 5.8.3.7.1.1 Type of Agricultural Land

During the landowner survey, it was found that, the agricultural lands taken by the proposed project were single cropped lands. These lands were cultivated for 3 to 4 months of a year. Mainly the farmers produce Aman paddy[28] in these lands.

#### 5.8.3.7.1.2 Type of Fisheries Land

During the landowner survey, it was found that a few amounts of land was used for fish farming in the proposed project site. The landowners used to harvest fish on these farms for all over the year. Usually *rui, katla, tilapia, catfish* are the most common fish harvested in these farms.

### 5.8.3.7.2 Information about the Land dependents

During the landowner survey, no person was found who is fully dependent on these lands. All the landowners usually have engaged in other income generating activities. The land laborers, working in the agricultural lands, are appointed seasonally on daily basis contract. They also work on other lands, or any other income generating activities during the dull seasons. There were approximately 40 to 50 land laborers who usually worked on these lands. These agricultural laborers were usually hired for a single season on daily basis contract (BDT 800 to 900 per day). Moreover, the agricultural laborers are mostly hired from other villages. As a result, no land labors is fully dependent on cultivating in the project land. They are also involved in different income generating activities such as small business, daily laboring, driving and so on. As a result, the land procurement process did not have a significant financial impact on the land laborers. Those who took these lands for lease from the landowners before the project, are mostly moved to Dhaka or other cities for better livelihood options. There were no lessors who found themselves with reduced income due to the change in land use.

[28] Aman is one of the major cereal crops of Bangladesh. The paddy which is harvested in the month of November and December is said to be Aman paddy.

For the fish farms, each landowner appoints approximately 10 to 15 laborers for one time during the starting and ending period of cultivation. These labors are appointed for around one month and they usually work around two to three hours a day in these fish farms during their contract period. Since these laborers were hired for a short period, they took on this work temporarily and as a secondary income source. Each of them has a primary income from sources such as small businesses, daily labor, driving, or farming. This arrangement highlights that although the temporary work provided additional earnings, their primary financial stability comes from their main jobs, so there was no reduction in their overall income.

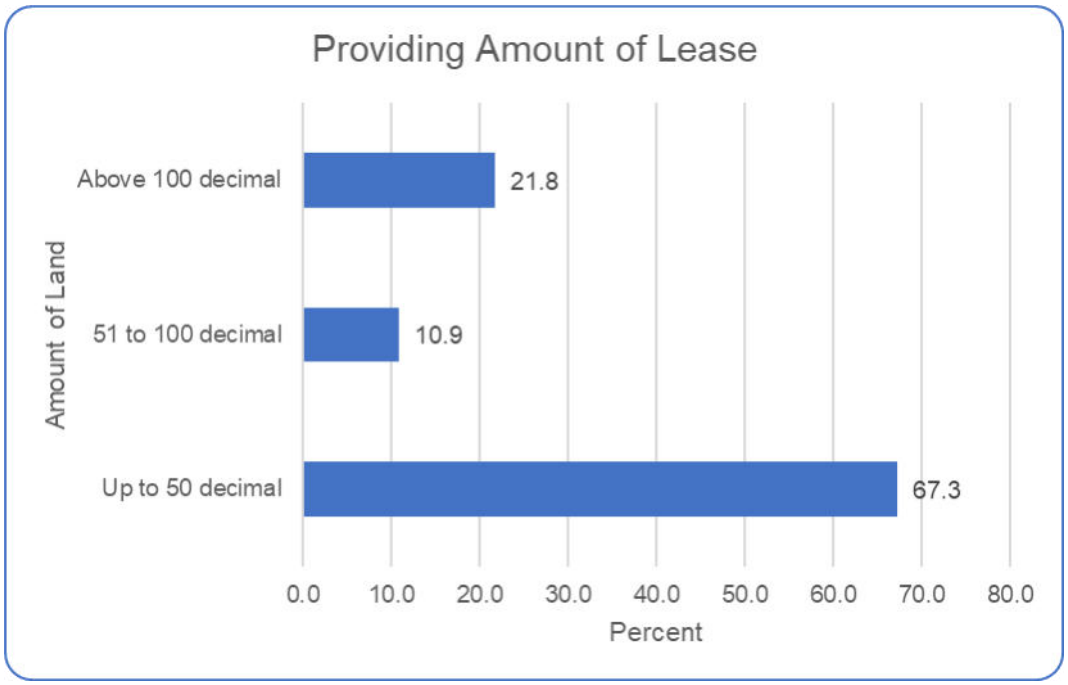
#### 5.8.3.7.3 Information about the Remaining Land of the Landowner

During the landowner survey, it was found that all the landowners have other land remaining after giving lease for the proposed project. All of the landowners have their homestead lands. Besides, they also have agricultural and fishing lands. 71% of the affected landowners have up to 0.20 acres (20 decimals) of land, whereas 29% of the affected landowners have above 0.20 acres (20 decimals) of land.

#### 5.8.3.7.4 Providing Amount of Land Lease to Project

Below **Figure 5-69** shows the amount of land providing to the project by the landowners through lease. Around 67.3% of the landowners provided up to 50 decimals of land to the proposed project whereas 21.8% provided above 100 decimals of land. Most of these lands were owned by the landowners (94.5%) through inherited, whereas only 5.5% of the landowners owned the land by purchased.

**Figure 5-69: Providing Amount of Lease to Project**




Source: EQMS Landowner Survey, April 2024

### 5.8.3.8 Overview of Payment

#### 5.8.3.8.1 Land Purchasing Process

According to MSEL, initially their primary objective was to lease all the land. They approached the landowners with leasing proposals in July 2022. However, some owners, due to family issues, preferred to sell their land instead and informed MSEL by July 2023. With no other option, MSEL agreed to purchase the land. The landowners proposed prices for their land, and MSEL determined the land value by verifying local rates and the mouza rate at the sub-register office.

MSEL then started to collect land documents from the respective landowners from September 2023. To verify the exact landowners, they also gathered documents from the government land office. These documents were shared with their legal adviser, who vetted them the documents by October 2023. After completing all the necessary paperwork, MSEL purchased the land through a registered agreement with the landowners, making the payments accordingly by May 2024. MSEL disbursed the land payment through both cash and bank transfer, according to the convenience of the landowners MSEL covered all costs associated with the land registration process.

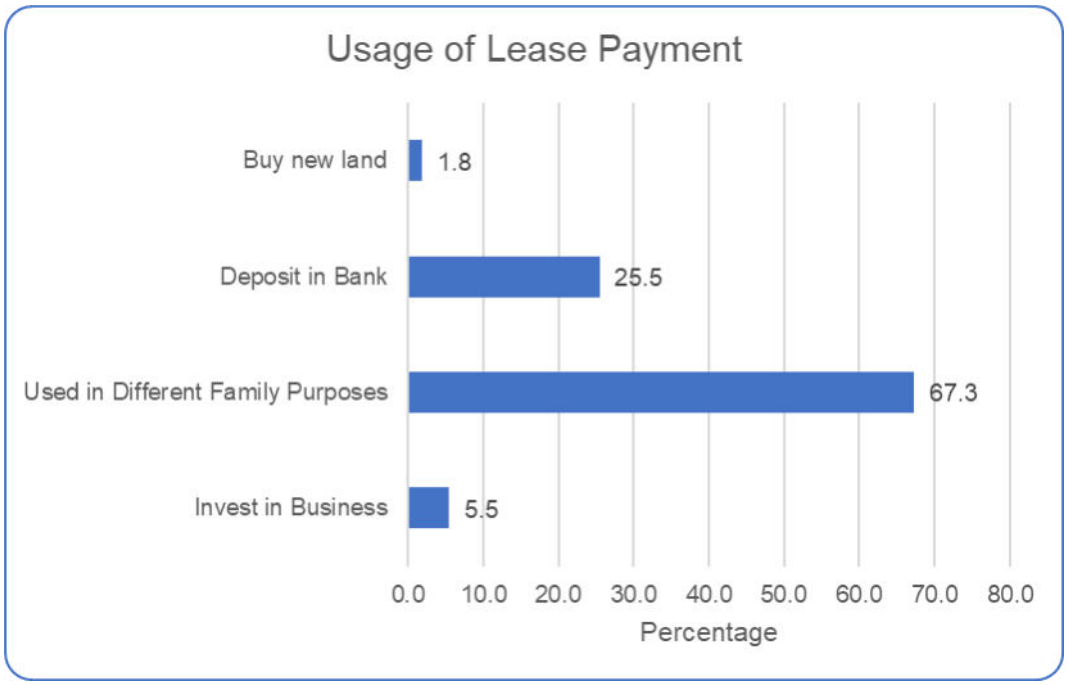
#### 5.8.3.8.2 Details about Payments Status

As per the landowner survey, all the landowners had received their land lease payments (BDT 2,765,725 for the year 2023 - 2024) through cash. They had received a partial amount of payment. As per their contact with the project authorities, they will get yearly payment for their land. The land lease amount is yearly BDT 462 per decimal, and they will get an additional 10% after each 5 years. Additionally, some of the landowners who redeveloped their land for fish farming received compensation from MSEL.

#### 5.8.3.8.3 Usage of Land Lease Payment

The landowners used the money received from leasing their land for different purposes such as using it for different family purposes (67.3%), deposit in bank (25.5%), invest in business (5.5%) and buying new land parcel (1.8%). **Figure 5-70** shows the details about the usage of the land selling price.

**Figure 5-70: Usage of Land Lease Payment**




Source: EQMS Landowner Survey, April 2024

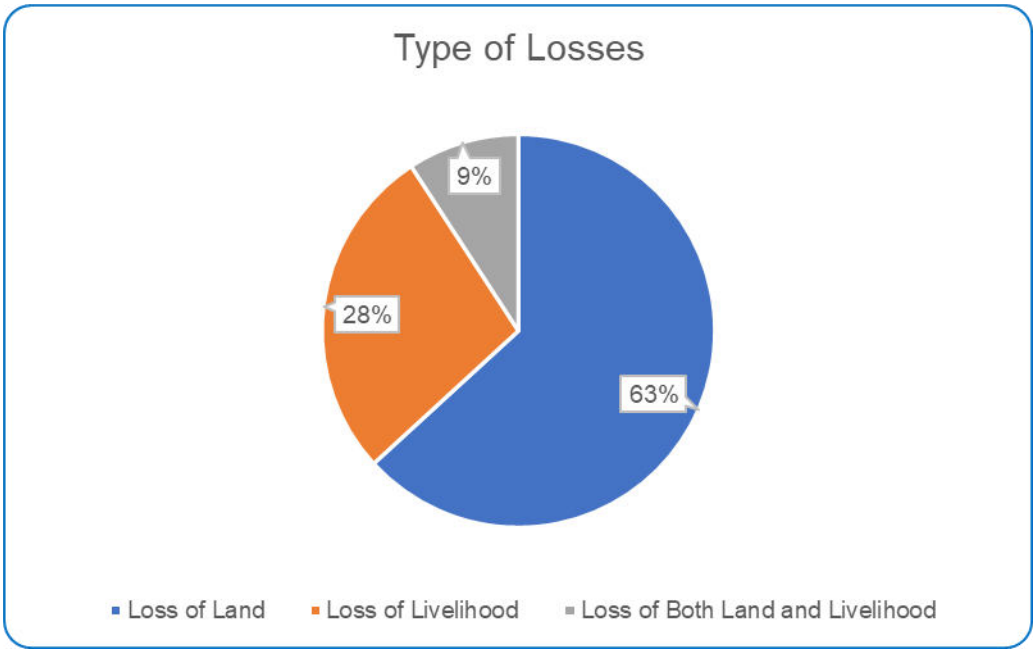
### 5.8.3.9 Details about the Losing of Livelihood

#### 5.8.3.9.1 Type of Loss

During the socioeconomic and landowner survey a total of 76 affected individuals were surveyed to understand their condition. Out of them, 63% had only lost their lands and 28% only lost their livelihood partially. There were only 9% of people who lost both lands and livelihood. The people who lost their livelihood partially from the proposed solar power project land, were engaged in income generating activities on those land such as agricultural work and fish farming. During the consultation, the affected

landowners expressed satisfaction with their lease payments, as they had experienced losses on this land several times before. Though the livelihood affected people did not get any payment, they were involved in other different types of income generating activities such as driving, small business, daily laboring, farming, agricultural laboring and so on. Below **Figure 5-71** shows the types of the losses in the proposed project area.

**Figure 5-71: Type of Losses**

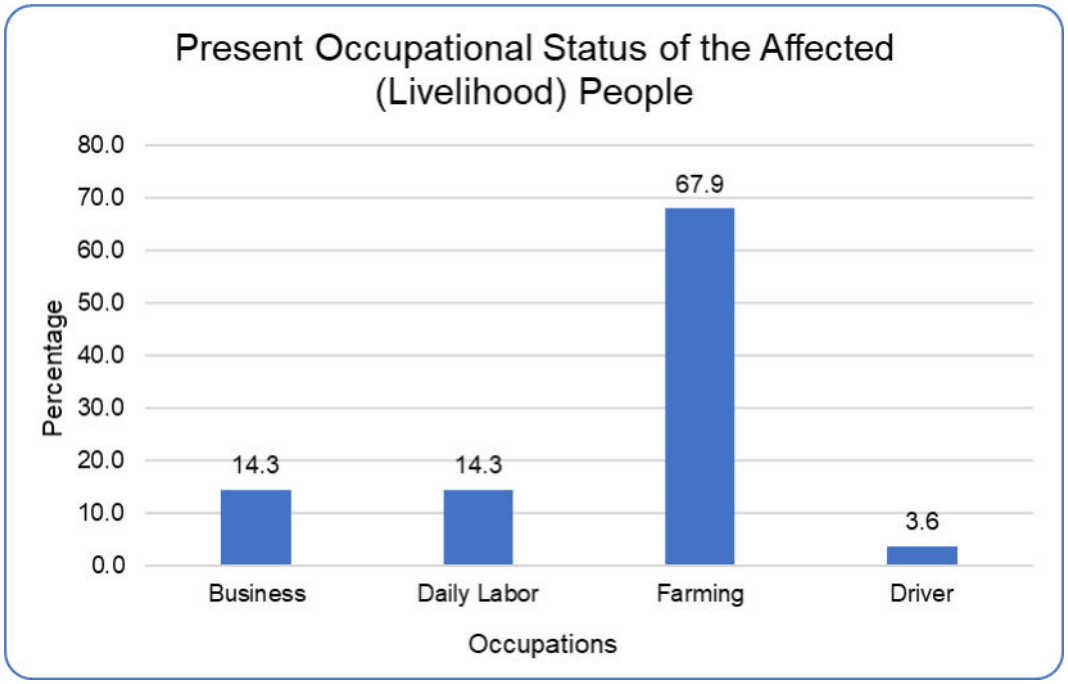



Source: EQMS Socio Economic and Landowner Survey, April 2024

#### 5.8.3.9.2 Present Occupational Status of the Affected (Livelihood) People

Out of the livelihood affected people, 67.9% are now involved in farming activities. They are now doing farming activities in other lands. The other affected people are now involved in different types of jobs such as business (14.3%), daily laboring (14.3%) and driving (3.6%). Below **Figure 5-72** refers to the present occupational status of the affected people of the study area.

**Figure 5-72: Present Occupational Status of the Affected (Livelihood) People**

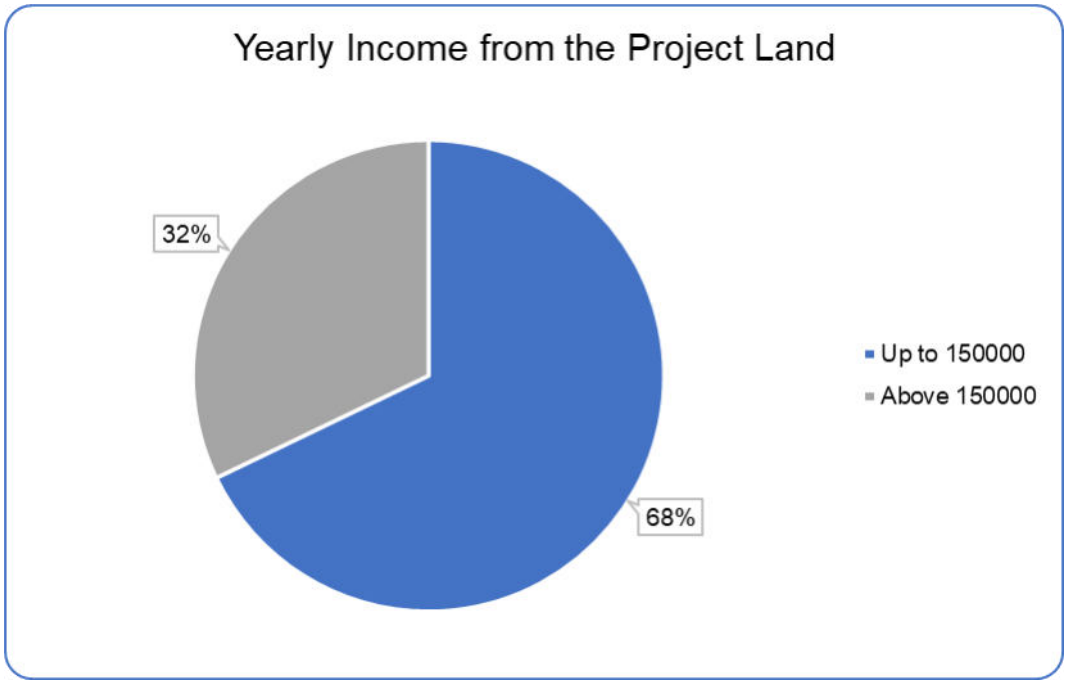



Source: EQMS Socio Economic and Landowner Survey, April 2024

#### 5.8.3.9.3 Affected (Livelihood) Persons' Yearly Income from the Land

The survey results find that 68% of the affected people, who had income from the proposed project land, used to earn up to BDT 1,50,000 per year, whereas the rest 32% earned above BDT 1,50,000 per year. **Figure 5-73** shows the yearly income of the affected persons from the project land.

**Figure 5-73: Yearly Income of the Affected (Livelihood) Persons from the Project land**

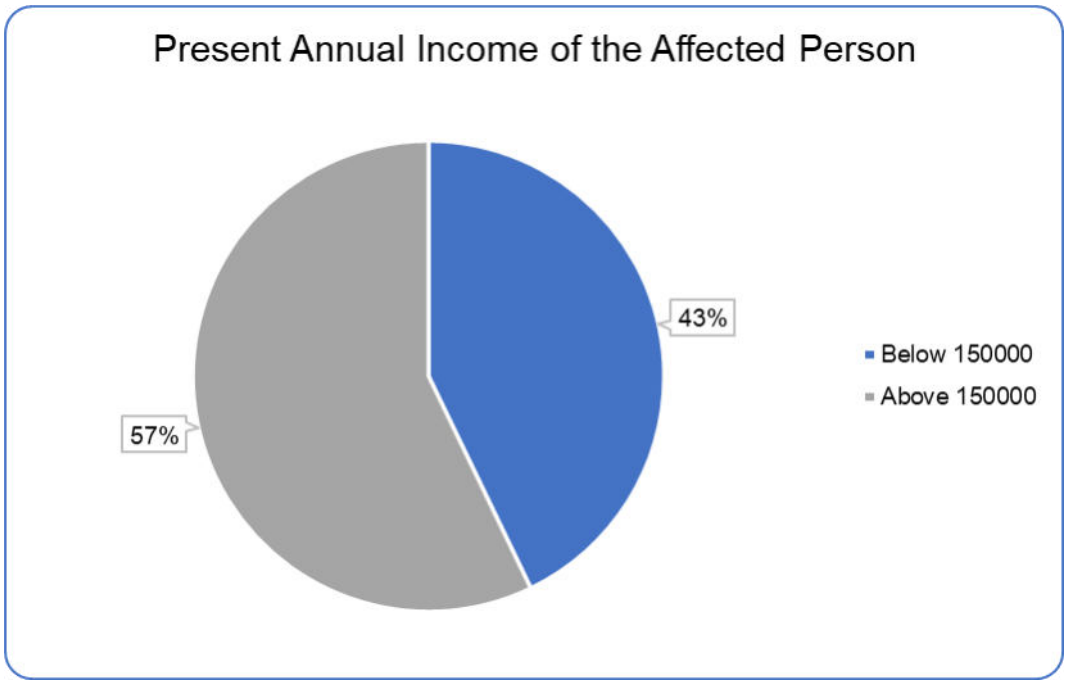



Source: EQMS Socio Economic and Landowner Survey, April 2024

#### 5.8.3.9.4 Affected (Livelihood) Persons' Present Yearly Income

The below indicates the increase **Figure 5-74** e of yearly income of the respondents after the proposed project take their land as lease. Only 43% of the surveyed affected persons are now earning below BDT 150,000 per year whereas the rest 57% have a yearly income of more than BDT 150,000.

**Figure 5-74: Present Annual Income of the Affected (Livelihood) Person**




Source: EQMS Socio Economic and Landowner Survey, April 2024

**Table 5-33: Present Annual Income of the Affected (Livelihood) Person**

| Income Range | Male | | Female | |
|---|---|---|---|---|
| | Number | % | Number | % |
| Below 100000 | 4 | 5.26 | 0 | 0.00 |
| 100000 to 150000 | 28 | 36.84 | 1 | 1.32 |
| 150001 to 200000 | 14 | 18.42 | 0 | 0.00 |
| 200000 to 250000 | 14 | 18.42 | 1 | 1.32 |
| Above 250000 | 14 | 18.42 | 0 | 0.00 |
| | **74** | 97.37 | 2 | 2.63 |

#### 5.8.3.9.5 Loss of Access Road

As per the socioeconomic and landowner survey, it was found that no access road was affected/ lost due to the proposed project. There is currently no access road within the project area. During consultations, local residents requested the construction of a paved road around the boundary of the solar power plant to connect Nimuria and Raghunathpur.

## 5.8.4 Socioeconomic Profile of Project Area of Influence

### 5.8.4.1 Demographic Profile

In the study area, a total number of 869 population are living in 220 households that has been surveyed for socio economic study. Among the surveyed HHs, 218 nos. are Male headed, and 2 nos. are Female headed HHs. In terms of individual population distribution, there are a total of 457 males, constituting

53% of the population, and 412 females, representing 47%. The average household size is 3.95 which is lower than the national average (4.0)[29]. Below Table 5-34 shows the Demographic Information of the Project Area of Influence.

**Table 5-34: Demographic Information of the Project Area of Influence**

| HH | Male HH | Female HH | Male | | Female | | Total pop. | HH size |
|---|---|---|---|---|---|---|---|---|
| | | | Pop. | % | Pop. | % | | |
| 220 | 218 | 2 | 457 | 53 | 412 | 47 | 869 | 3.95 |

Source: EQMS Socio Economic Survey, April 2024

Among the surveyed population, about 52.6% males and 47.4% females were identified. In the case of age distribution of the surveyed populations, the majority (26%) of the population are concentrated below 14 years and about 20.1% are between 21 to 30 years of age indicating the young adults. About 19.6% are between 31 to 40 years of age while the elderly population (more than 65+) is about 2.2%.

Moreover, 55.2% of the total population are found married while 43.7% of them are unmarried during survey of the study area. A total of 1% identified as widow/widower and divorced.

All over, health status among the households has been found quite well. Around 99.4% of the population are found physically normal, only 0.6% are found physically challenged. Table 5-35 shows the Demographic Profile of the study area.

**Table 5-35: Profile- Age, Marital Status and Health Status of the Project Area of Influence**

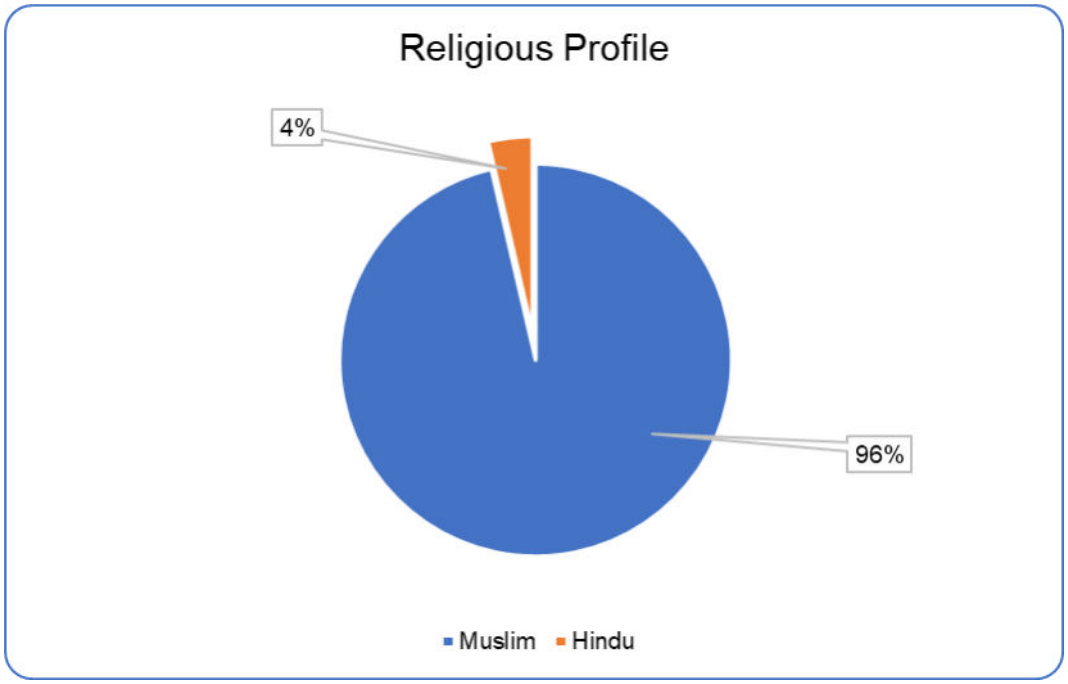
| S/N | Demographic Information | | Population | |
|---|---|---|---|---|
| | | | No | % |
| 1 | Population | Male | 457 | 52.6 |
| | | Female | 412 | 47.4 |
| | | Total | 869 | 100 |
| 2 | Age | Below 14 | 227 | 26.0 |
| | | 15 to 18 | 76 | 8.7 |
| | | 19 to 20 | 37 | 4.3 |
| | | 21 to 30 | 175 | 20.1 |
| | | 31 to 40 | 170 | 19.6 |
| | | 41 to 50 | 105 | 12.1 |
| | | 51 to 65 | 60 | 6.9 |
| | | Above 65 years | 19 | 2.2 |
| | | Total | 869 | 100 |
| 3 | Marital Status | Married | 480 | 55.2 |
| | | Unmarried | 380 | 43.7 |
| | | Widow/Widower | 8 | 0.9 |
| | | Divorced | 1 | 0.1 |
| | | Total | 869 | 100 |
| 4 | Health Status | No Disability or incurable diseases | 864 | 99.4 |
| | | Person with disabilities | 5 | 0.6 |
| | | Total | 869 | 100 |

[29] Population and Housing Census 2022 – Preliminary Report

### 5.8.4.2 Religious Affiliation

According to the findings of the socio-economic survey, the study area is Muslim dominated where about 96% of the people are Muslim while only 4% are Hindu by faith. The **Figure 5-75**shows the religious profile of the people of Project Area of Influence:

**Figure 5-75: Religious Profile of the Project Area of Influence**




Source: EQMS Socio Economic Survey, April 2024

### 5.8.4.3 Ethnic Composition

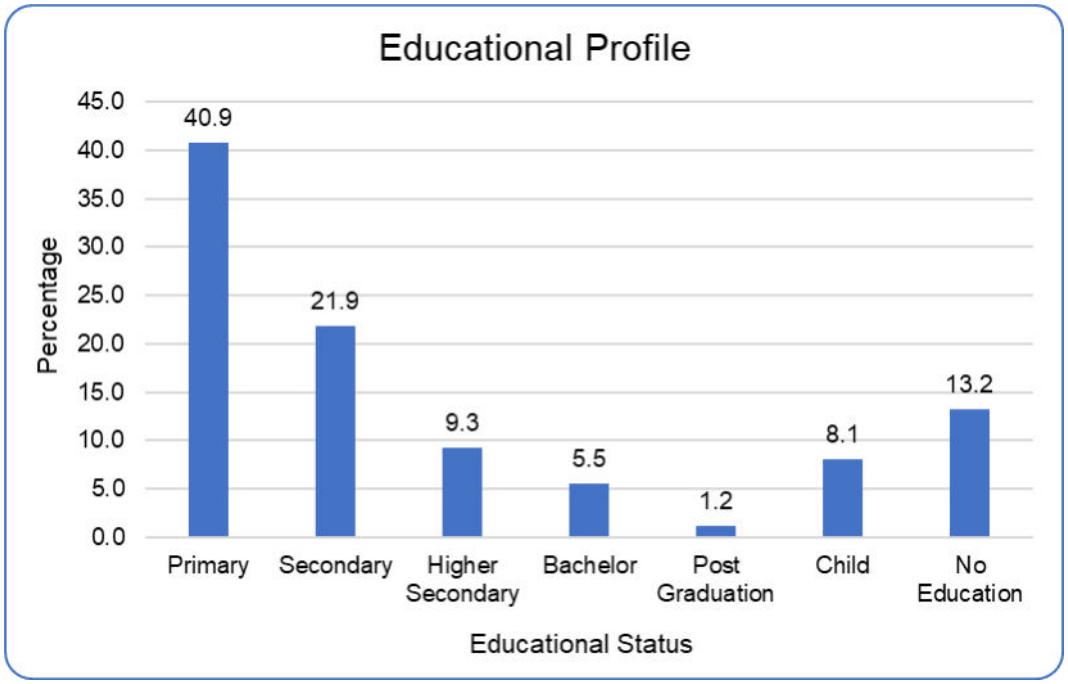
According to the socio-economic survey and consultation with local people conducted by the study team, no indigenous or ethnic minority populations were identified within 2 km from the project area.

### 5.8.4.4 Educational Status

According to socioeconomic primary data, the majority of the (40.9%) population in the study area completed primary level of education. A considerable proportion of the population (21.9%) completed secondary school. While only 9.3% of the population had access to higher secondary education. Only 5.5% and 1.2% of people have completed respectively B.A and M.A or equivalent degrees. According to survey results, the illiteracy rate is 13.2%. The total literacy rate of the area of influence is 78.7 which is higher than the national literacy rate (74.7%)[30] of Bangladesh. Children account for approximately 8.1% of the population. Below Figure 5-78 depicted the education profile of the surveyed people of area of influence of the proposed project.

[30] Population and Housing Census 2022 – Preliminary Report

**Figure 5-76: Education Profile of the Project Area of Influence**



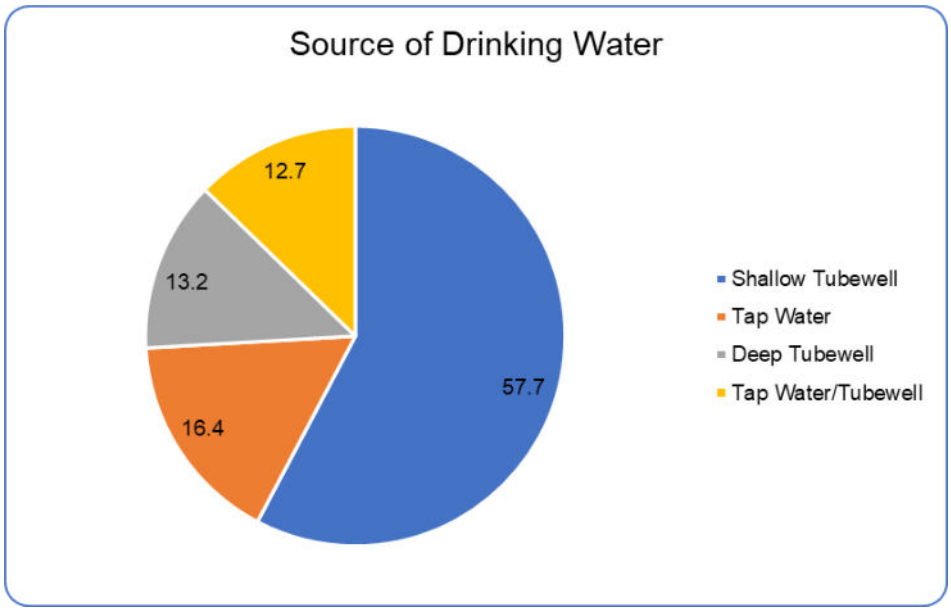

Source: EQMS Socio Economic Survey, April 2024

### 5.8.4.5 Public Utilities of Project AOI

#### 5.8.4.5.1 Access to Water

In the project AOI during survey, it was found that all households have access to water for drinking, cooking and other regular household usage. Here 57.7% people source water from shallow tubewell, 16.4% of the household collect tap water and 13.2% of the household use deep tubewell for water collection. 12.7% of households obtain water from a combination of sources, such as utilizing both deep and shallow tubewells. Below Figure 5-77 shows the status of access to safe water of the Project AOI.

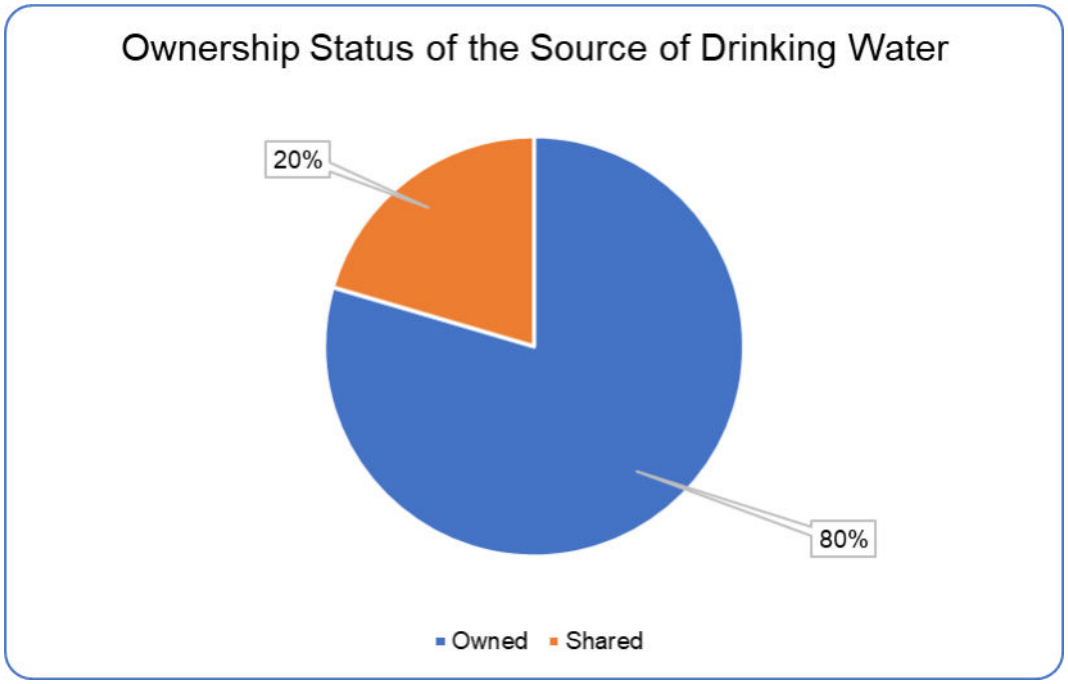
**Figure 5-77: Access to Water in the Project Area of Influence**




Source: EQMS Socio Economic Survey, April 2024

In the project area of Influence, most of the people (79.5%) collect water from their own drinking water source, whereas only 20.5% collect water from different shared water sources. Below Figure 5-78 shows the Ownership Status of the Source of Drinking Water at Project AoI.

**Figure 5-78: Ownership Status of the Source of Drinking Water at Project AoI**



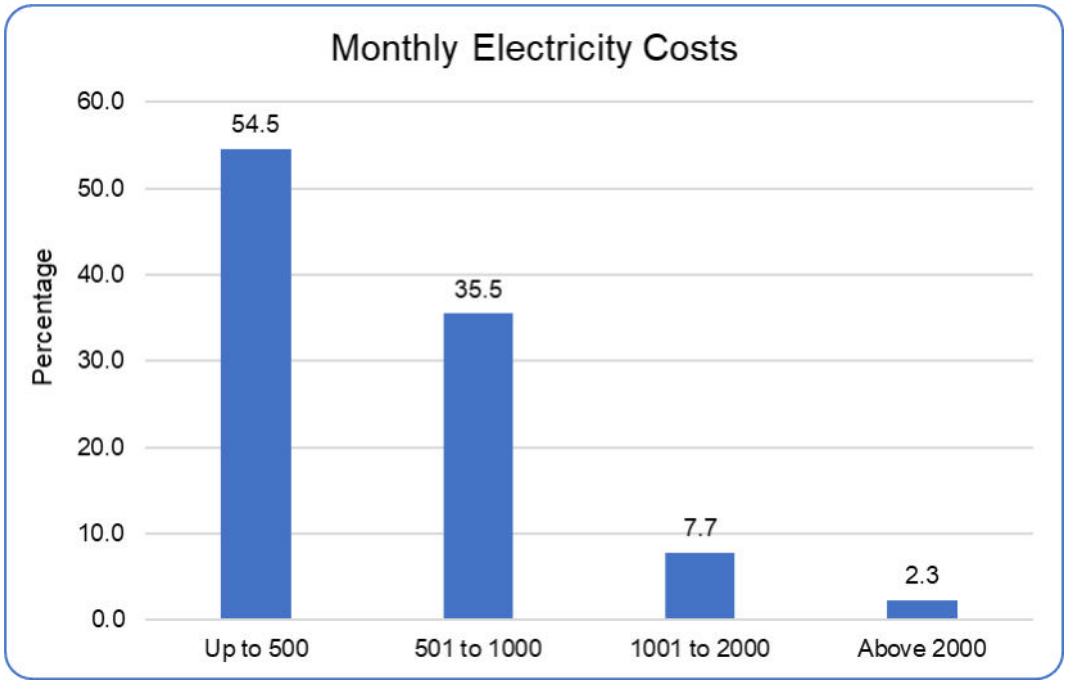

Source: EQMS Socio Economic Survey, April 2024

#### 5.8.4.5.2 Access to Electricity and Monthly Electricity Costs

Electricity is an important indicator for measuring the quality of life. In the study area, survey results found that all of the surveyed households have access to electricity from the grid.

Most of the surveyed households (54.5%) of the project area of influence, spend up to BDT 500 per month and 35.5% has to spend within BDT 500 to 1000 per month. Only 2.3% of households spend above BDT 2000 per month as their electricity cost. Below Figure 5-79 shows the overview of monthly electricity cost at project AoI.

**Figure 5-79: Monthly Electricity Cost at Project AoI**

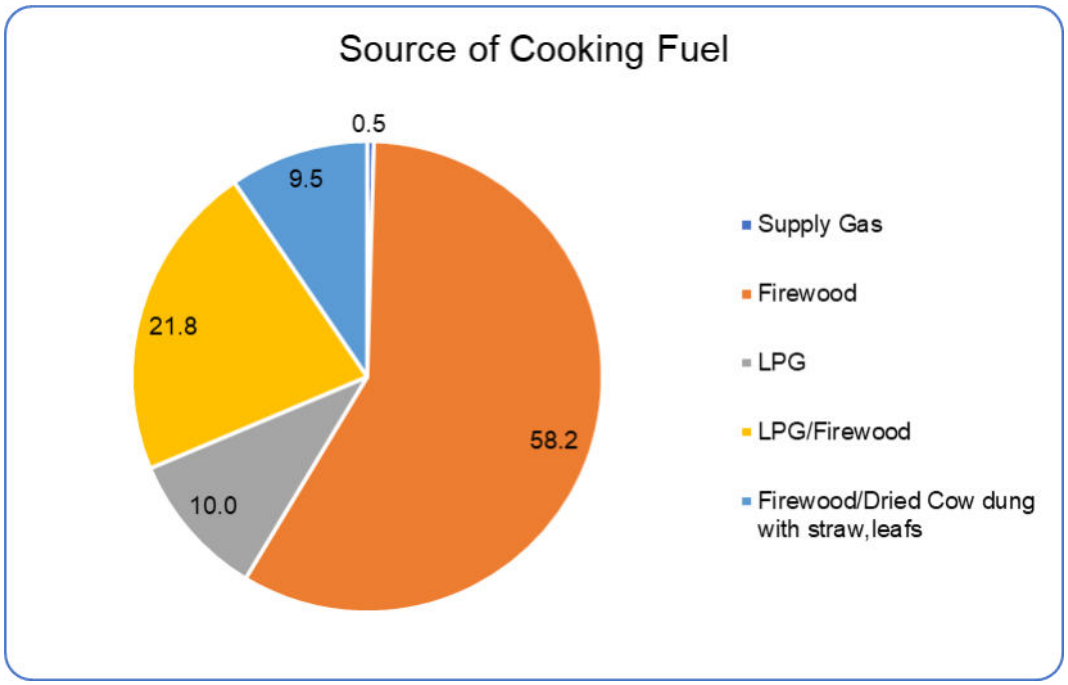



Source: EQMS Socio Economic Survey, April 2024

#### 5.8.4.5.3 Source of Cooking Fuel and Monthly Fuel Cost

The surveyed data outlines the diverse cooking fuel preferences within the surveyed people of project area of influence. Firewood, a traditional fuel, is still widely used by 58.2% of households. Only 10% use LPG and 0.5% use supplied natural gas. 21.8% of households use both LPG gas and firewood for cooking purposes. Energy access in the project AoI is presented hereunder Figure 5-80.

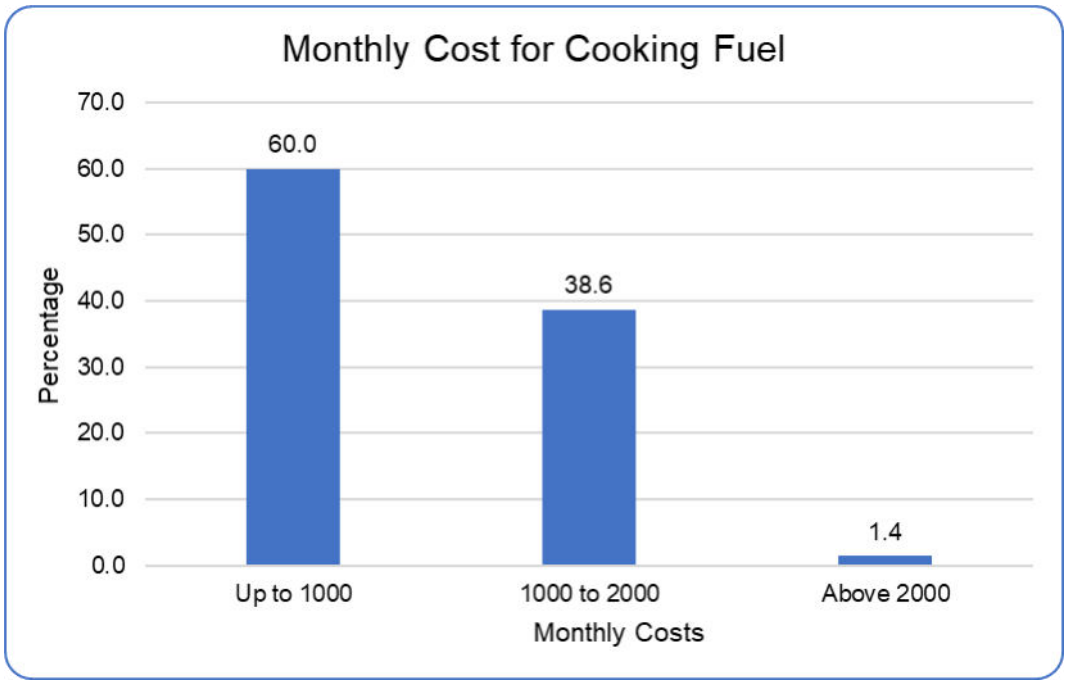
**Figure 5-80: Source of Cooking Fuel at Project AoI**




Source: EQMS Socio Economic Survey, April 2024

Around 60% of households have to spend up to 1000 BDT per month for fuel cost. On the other hand, 38.6% of the households spend between BDT 1000 to 2000 per month and only 1.4% spend above BDT 2000 per month for their cooking fuel cost. Below Figure 5-81 shows the cooking fuel cost of the households of project AoI.

**Figure 5-81: Monthly Cooking Fuel Cost at Project AoI**

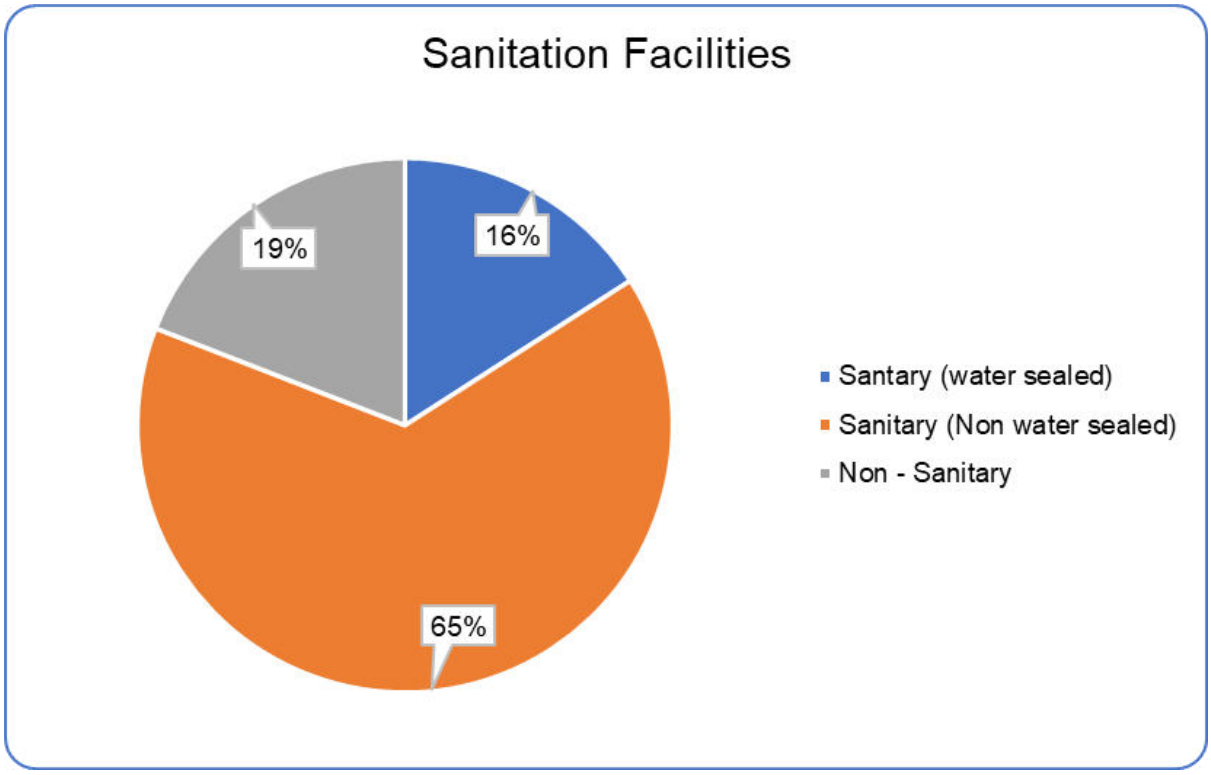



Source: EQMS Socio Economic Survey, April 2024

#### 5.8.4.5.4 Sanitation Facility

Primary survey results demonstrate that 65% households of the study area are using sanitary latrine (non-water sealed) and 15.9% are using water seal sanitary latrine. Additionally, 19.1% of the households included in the survey use non-sanitary toilet facilities. Available sanitation facilities available in the project area of influence is presented in below Figure 5-82.

**Figure 5-82: Sanitation Facilities in the Study Area**




Source: EQMS Socio Economic Survey, April 2024

### 5.8.4.6 Traffic and Transport

During the survey, it was found that only 3.6% of the total road network of the proposed project area are earthen road whereas 96.4% are pavement road. Various types of vehicles are available on these roads including CNG, Rickshaw, Van, Auto rickshaw, motorcycle etc.

### 5.8.4.7 Access to Social Institution for the Surveyed People of Project AoI

#### 5.8.4.7.1 Access to Educational Institutions

**Table 5-36** shows the educational institution accessibility in the proposed project area. Study finds that 86.4% of total students has to travel up to 1 km for receiving elementary/basic education whereas 13.6% of the students has to travel around 1 to 3 km for receiving the same opportunity. On the other hand, 88.2% of the students has to travel around 1 to 3 km to receive Higher secondary degrees. Conversely, 10.5% of the students have to travel up to 1 km and only 1.4% have to travel more than 3 km to receive the same degrees. For receiving Bachelor/ post-graduation degree, 87.7% of the students need to travel around 1 to 3 km, whereas 6.4% of the students travel up to 1 km and only 5.9% travel more than 3 km.

On average, 34.4% of the total students have to move up to 1 km for receiving educational facilities whereas 63.2% have to move 1 to 3 km and only 2.4% have to move above 3 km for the purpose of education.

**Table 5-36: Access to Education**

| Distance | Elementary/ Basic Education | Higher Secondary | Bachelor/ Post Graduation | Total |
|---|---|---|---|---|
| **Up to 1km** | 86.4 | 10.5 | 6.4 | 34.4 |
| **1 to 3 km** | 13.6 | 88.2 | 87.7 | 63.2 |

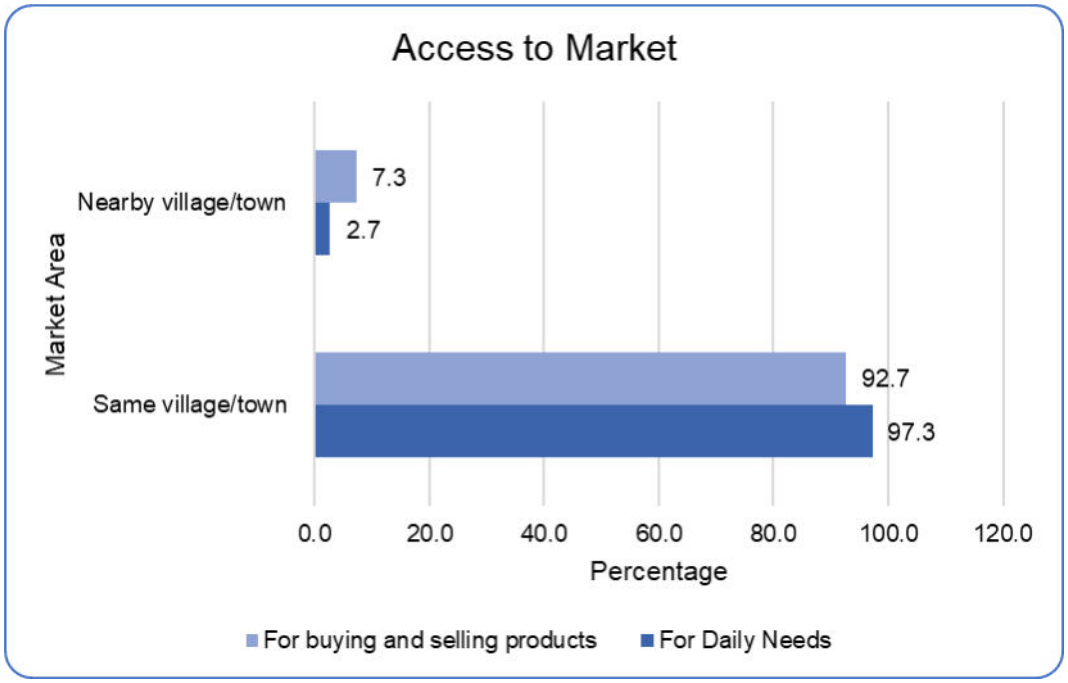
| Distance | Elementary/ Basic Education | Higher Secondary | Bachelor/ Post Graduation | Total |
|---|---|---|---|---|
| **Above 3 km** | 0.0 | 1.4 | 5.9 | 2.4 |

Source: EQMS Socio Economic Survey, April 2024

#### 5.8.4.7.2 Access to Market

Survey results have found that 97.3% of the surveyed people go to the markets of their own town to buy daily need items whereas only 2.7% of the surveyed people go to the markets of nearby towns for the same purpose. On the other hand, 92.7% of the surveyed people usually go to the markets of their own town and only 7.3% go to other towns for buying and selling products. The survey result indicates that, local people have available market facilities in their own village/ town. Below Figure 5-83 shows the accessible market facilities in the project area of influence.

**Figure 5-83: Access to Market Facilities**




Source: EQMS Socio Economic Survey, April 2024

Survey results have also found that 95.5% of the surveyed people have to move up to 1 km for buying daily needs whereas only 4.5% need to go more than 1 km for the same purpose. On the other hand, 93.6% of the total surveyed people have to move up to 1 km for buying and selling products. Conversely, only 6.4% have to move more than 1 km for the same purpose. Below Table 5-37 shows the distance to the market facilities for the surveyed people of the project AoI.

**Table 5-37: Distance to Market**

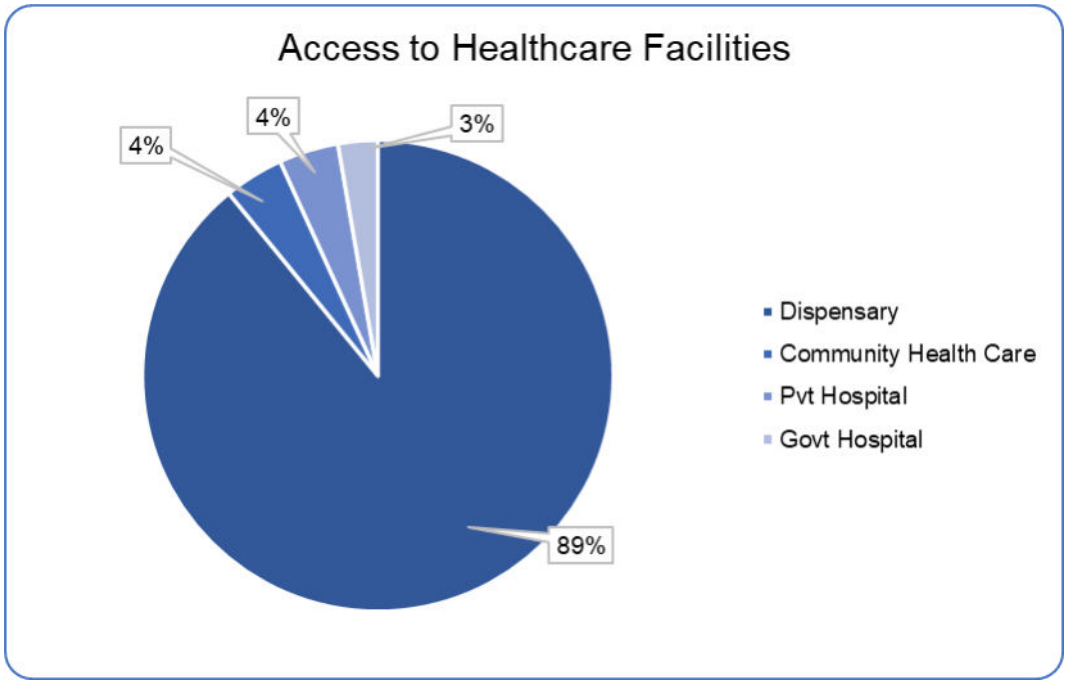
| Distance | For Daily Needs (%) | For Buying and Selling Products (%) |
|---|---|---|
| Up to 1km | 95.5 | 93.6 |
| More than 1 km | 4.5 | 6.4 |
| Total | 100.0 | 100.0 |

Source: EQMS Socio Economic Survey, April 2024

#### 5.8.4.7.3 Access to Healthcare Facilities

Survey results have found that 89.1% of the households go to their nearest dispensary for their general healthcare services, whereas the rest of the households go to community health care center (4.1%), Private hospital (4.1%) and government hospital (2.7%) for the same purpose. Figure 5-84 shows the access to healthcare facilities for the surveyed households of project AoI.

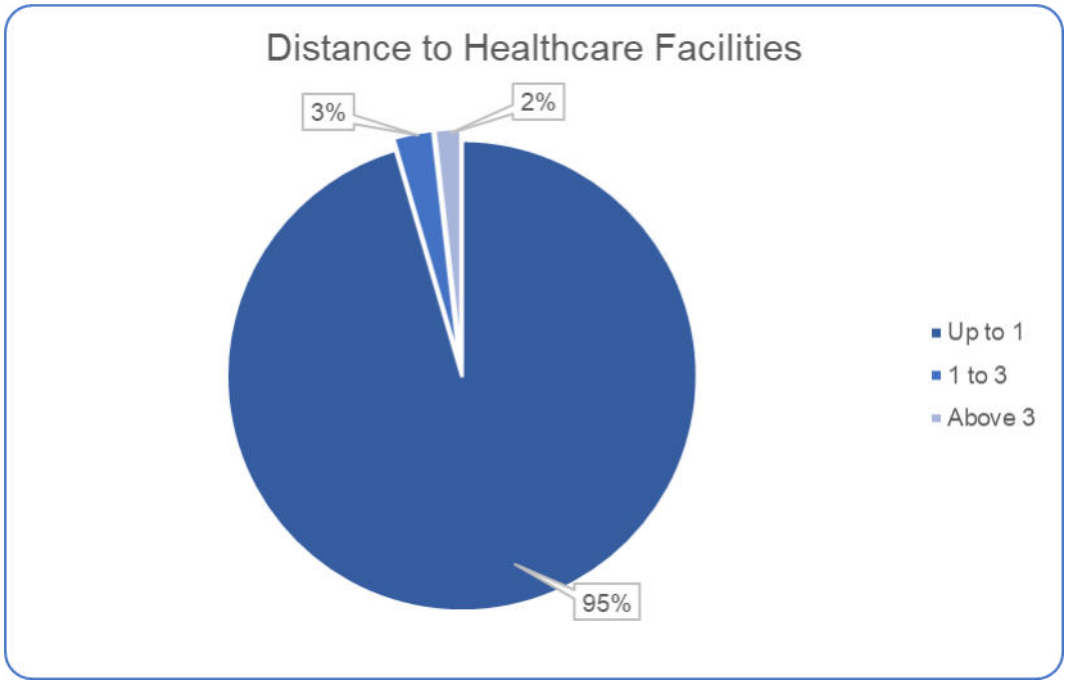
**Figure 5-84: Access to Healthcare Facilities in the project AoI**




Source: EQMS Socio Economic Survey, April 2024

Out of the surveyed households of the project AoI, around 95.5% of households are staying within 1 km distance from the health service point. On the other hand, only 2.7% live within 1 to 3 km distance from the hospital services. Below Figure 5-85shows the distance to the healthcare facilities from the surveyed households of project AoI.

**Figure 5-85: Distance to Healthcare Services**



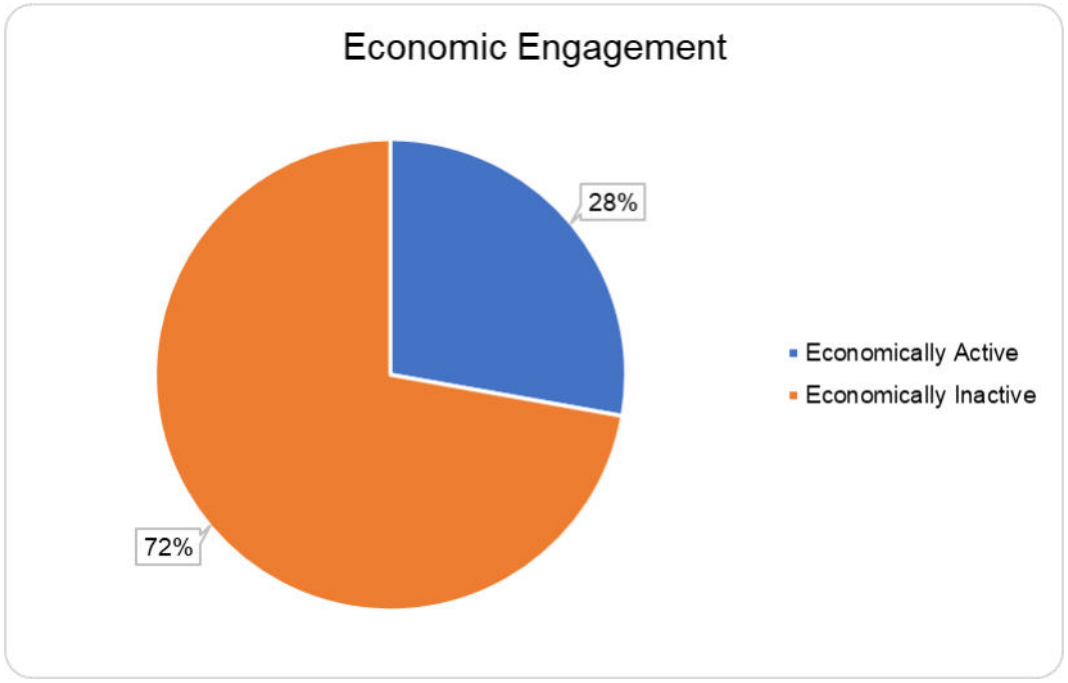

Source: EQMS Socio Economic Survey, April 2024

### 5.8.4.8 Economy and Employment

#### 5.8.4.8.1 Economic Engagement of the Surveyed Households of Project AoI

In the study area, only 27.8% of the total surveyed population is involved in economic activities through various occupations. On the contrary, 72.2% of those polled are economically inactive. Figure 5-86 depicted the economic engagement of project area of influence.

**Figure 5-86: Economic Engagement of Local People**




Source: EQMS Socio Economic Survey, April 2024

#### 5.8.4.8.2 Occupation Profile of the Surveyed Households of Project AoI

According to the socio-economic survey findings of the area of influence, majority of the economically active male (32.2%) are engaged in daily laboring activities, while the lowest number of people are carpenters (0.4%) and technicians (0.4%). Conversely, only a few numbers of women (3.3%) are economically active who are involved in daily labor (1.7%), service (1.2%) and tailor (0.4%) activities.

The survey conducted in the project area of influence indicates that 72% of the population is economically inactive, attributed to various reasons. This includes 47.7% of males being students and 4.9% of females working as housewives. A detail of economically active and inactive populations according to their field of engagement of project area of influence is presented in **Table 5-38**

**Table 5-38: Economically Active and Inactive Populations Occupation Profile**

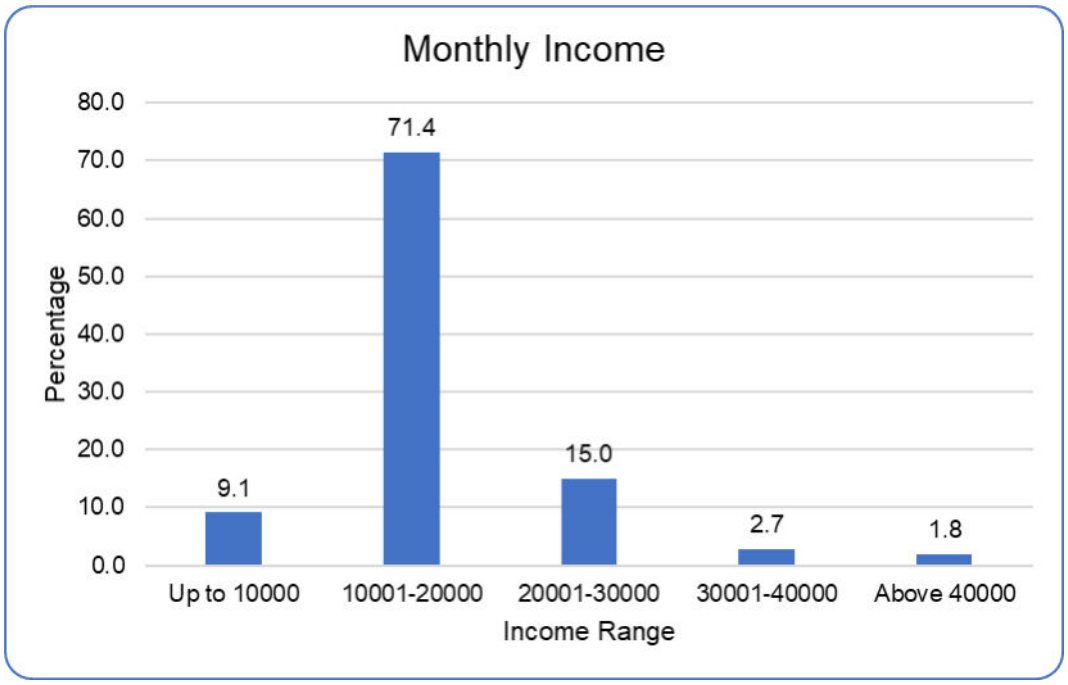
| Employment Status | Field of Engagement | Male (%) | Female (%) | Total (%) |
|---|---|---|---|---|
| Economically Active | Farming | 16.1 | 0.0 | 16.5 |
| | Agricultural Labor | 6.6 | 0.0 | 7.0 |
| | Fisherman | 3.3 | 0.0 | 3.7 |
| | Daily Labor | 23.1 | 1.7 | 24.8 |
| | Service | 16.5 | 1.2 | 16.5 |
| | Commercial business, Shops etc. | 18.6 | 0.0 | 18.6 |
| | Driving | 8.7 | 0.0 | 8.7 |
| | Tailor | 1.7 | Due to traffic movements happened on the access road to the proposed power plant site | 2.1 |
| | Carpentry | 0.4 | 0.0 | 0.4 |
| | Mechanics | 1.2 | 0.0 | 1.2 |
| | Technicians | 0.4 | 0.0 | 0.4 |
| **Sub-total** | | **96.7** | **3.3** | **100.0** |
| Economically Inactive | Student | 26.8 | 20.9 | 47.7 |
| | Unemployed/ Job Seeker | 0.2 | 0.2 | 0.3 |
| | Unpaid Family work/Housewife | 0.0 | 34.9 | 34.9 |
| | Child and Elderly | 8.6 | 8.5 | 17.1 |
| **Sub-total** | | **35.6** | **64.4** | **100.0** |

Source: EQMS Socio Economic Survey, April 2024

#### 5.8.4.8.3 Monthly Income

According to the socioeconomic survey, it is found that most (71.4%) of the household's income range is from 10000 to 20000 BDT. The monthly income of the adjacent HHs of project area of influence is given in below Figure 5-87

**Figure 5-87: Monthly Income of the Project Area of Influence**



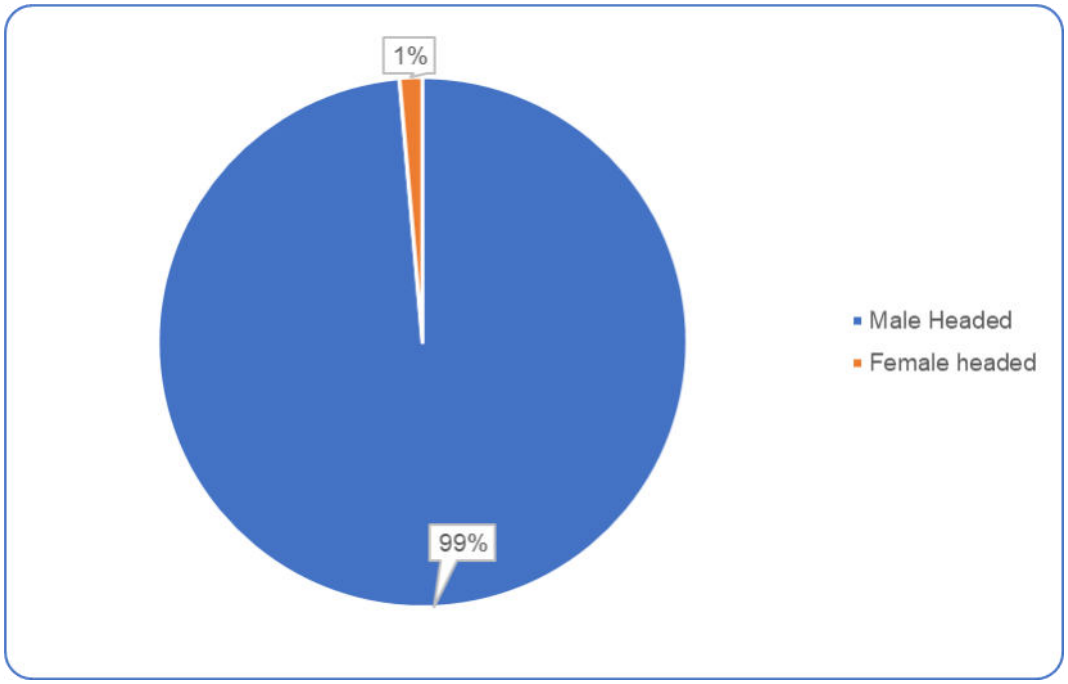

Source: EQMS Socio Economic Survey, April 2024

### 5.8.4.9 Gender Analysis

#### 5.8.4.9.1 Gender Analysis based on Household Head

Study finds the common patriarchic scenario in the local area. It has been found that only 1% households are headed by women.

**Figure 5-88: Gender Analysis based on Household Head**

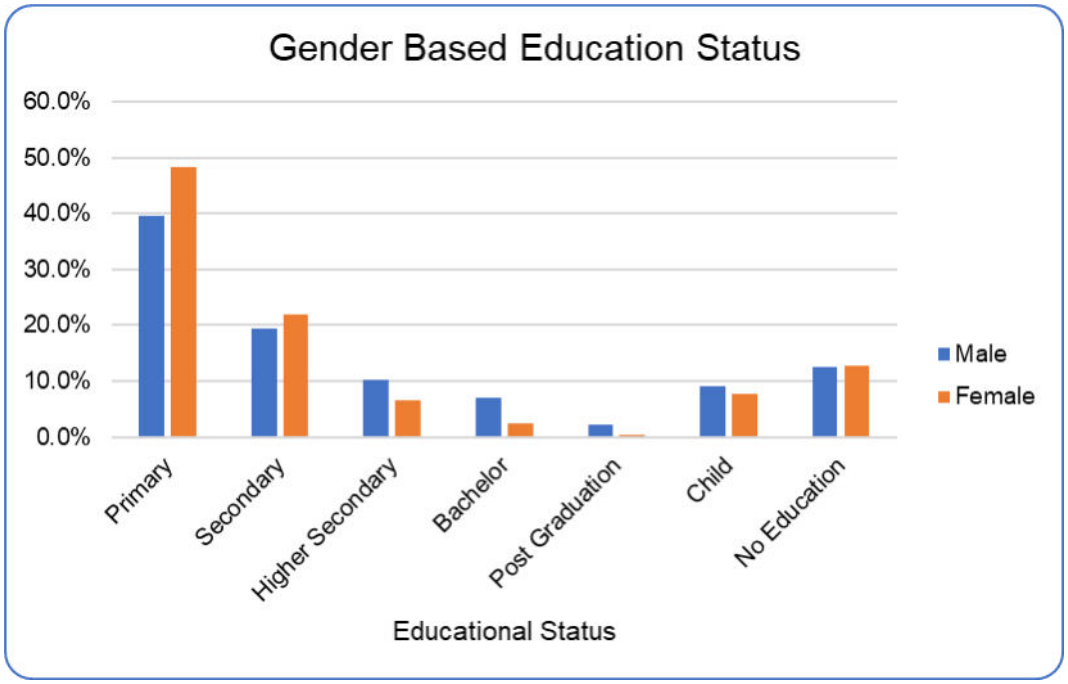



Source: EQMS Socio Economic and Landowner Survey, April 2024

#### 5.8.4.9.2 Gender Based Education and Occupation

According to the findings of the study, females are nearly as educated as their male counterparts at every level. A gender-based education status of the study area is given in Figure 5-89

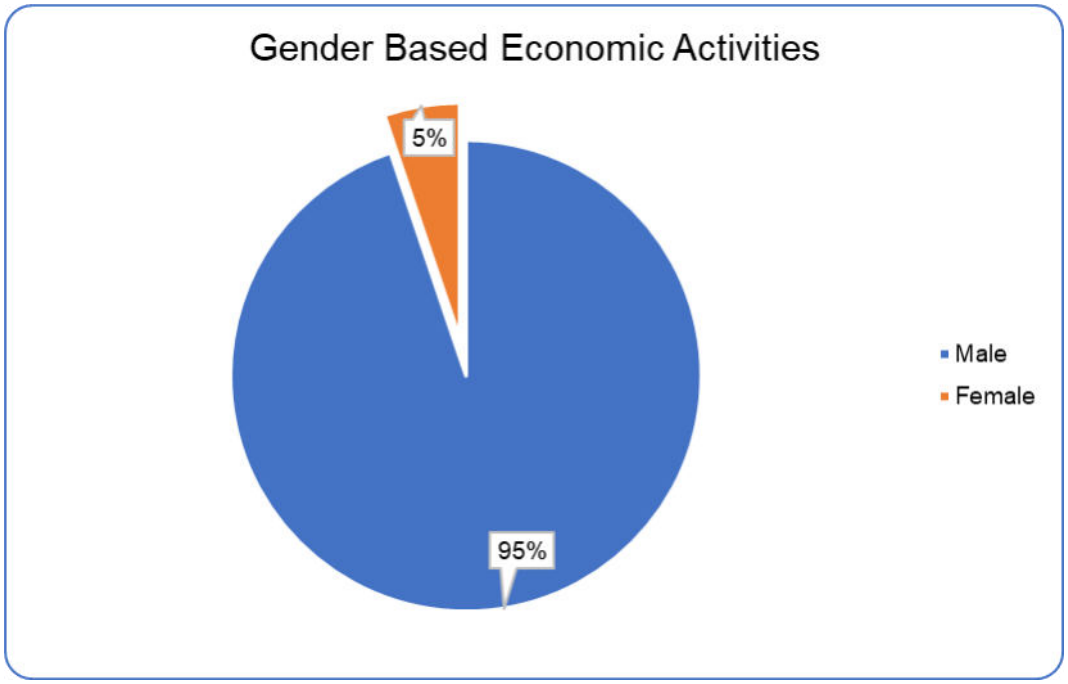
**Figure 5-89: Educational attainment based on Gender**




Source: EQMS Socio Economic and Landowner Survey, April 2024

Unlike the education attainment, female population are found lagging in economic activities. It is found that, only 5% female of total economically active population are engaged in different economic activities.

**Figure 5-90: Gender Based Economic Activity in the Study Area**




Source: EQMS Socio Economic and Landowner Survey, April 2024

#### 5.8.4.9.3 Other Relevant Issues (Decision making power, Ownership and Restrictions)

The below Table 5-39 highlights significant gender disparities within households, particularly in land ownership and financial control. Males dominate these aspects, while females have limited representation.

As per 99.3% of surveyed households, women of the area are allowed to travel outside the community. Moreover, they also can join and give their opinion in the decision-making process of the HHs. But, in the cases of land ownership and earning activities, women are largely lagging behind. These findings underscore the importance of promoting gender-inclusive practices for equitable household dynamics.

**Table 5-39: Gender Analysis based on Decision Making Power**

| Sl No | Components | Yes | No | |
|---|---|---|---|---|
| 1. | Women of the household / girl child are allowed to travel outside the community/ village alone | 99.3% | 0.7% | |
| 2. | Women of the household are involved in financial decisions of the household | 88.7 | 11.3 | |
| **Sl No** | **Components** | **Male** | **Female** | **Both** |
| 1. | The owner of Household land | 89.8% | 1.5% | 8.7% |
| 2. | Decision maker of HHs | 30.5% | 0.4% | 69.1% |
| 3. | Prime earning member of HHs | 96.0% | 0.7% | 3.6% |

Source: EQMS Socio Economic and Landowner Survey, April 2024

### 5.8.4.10 Current Issues in the Project Area

The provided data outlines the perceptions of individuals regarding various aspects of their social and environmental issues, with responses categorized into different levels of concern. Social issues are unexpected situations which hinder leading a normal life in a society. It may include gender-based violence (GBV)/ Sexual Exploitation, Abuse and Harassment (SEAH), Social Security, Unemployment, Gender Inequality etc. Environmental problems that are perceived by the respondents in the study area include air pollution, sound pollution, water pollution and water logging etc. Below Table 5-40 shows the current issues of the project area.

**Table 5-40: Current Issues in the Study Area**

| SL# | Details | | Frequency | Percent (%) |
|---|---|---|---|---|
| 1 | GBV/ SEAH | High | 0 | 0.0% |
| | | Moderate | 31 | 11.3% |
| | | Low | 61 | 22.2% |
| | | No Problem | 183 | 66.5% |
| **Total** | | | **275** | **100.0%** |
| 2 | Social Security | High | 0 | 0.0% |
| | | Moderate | 41 | 14.9% |
| | | Low | 64 | 23.3% |
| | | No Problem | 170 | 61.8% |
| **Total** | | | **275** | **100.0%** |
| 3 | Unemployment | High | 39 | 14.2% |
| | | Moderate | 52 | 18.9% |
| | | Low | 102 | 37.1% |
| | | No Problem | 82 | 29.8% |
| **Total** | | | **275** | **100.0%** |
| 4 | Gender Inequality | High | 2 | 0.7% |
| | | Moderate | 10 | 3.6% |
| | | Low | 109 | 39.6% |
| | | No Problem | 154 | 56.0% |
| **Total** | | | **275** | **100.0%** |
| 5 | Air Pollution | High | 3 | 1.1% |
| | | Moderate | 57 | 20.7% |
| | | Low | 177 | 64.4% |
| | | No Problem | 38 | 13.8% |
| **Total** | | | **275** | **100.0%** |
| 6 | Noise Pollution | High | 3 | 1.1% |
| | | Moderate | 56 | 20.4% |
| | | Low | 183 | 66.5% |
| | | No Problem | 33 | 12.0% |
| **Total** | | | **275** | **100.0%** |
| 7 | Water Pollution | High | 5 | 1.8% |
| | | Moderate | 88 | 32.0% |
| | | Low | 67 | 24.4% |

| SL# | Details | | Frequency | Percent (%) |
|---|---|---|---|---|
| | | No Problem | 115 | 41.8% |
| **Total** | | | **275** | **100.0%** |
| 8 | Water Logging | High | 0 | 0.0% |
| | | Moderate | 22 | 8.0% |
| | | Low | 227 | 82.5% |
| | | No Problem | 26 | 9.5% |
| **Total** | | | **275** | **100.0%** |

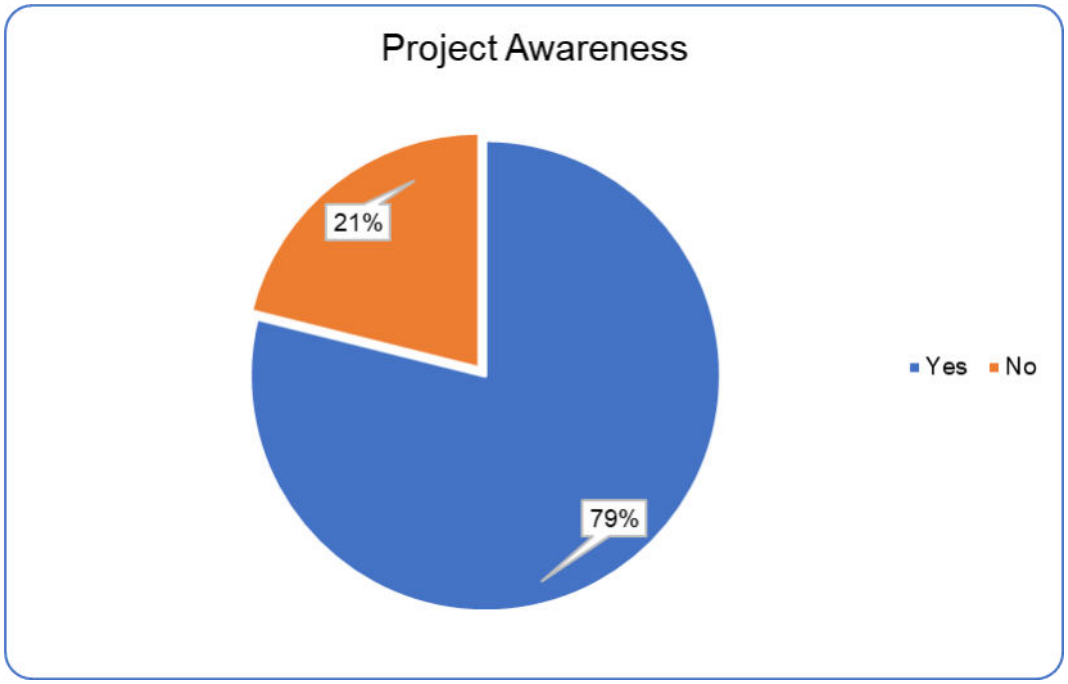
Source: EQMS Socio Economic and Landowner Survey, April 2024

### 5.8.4.11 Information About Proposed Project

#### 5.8.4.11.1 Project Awareness

Project awareness and perception may hinder or facilitate any project work's successful implementation. Moreover, community perception will lead to guide maintaining project activities in line with environmental & social standards. The survey result shows that 79% of total households are completely aware of this proposed project. They were informed about the proposed project by MSEL and local people. Conversely, 21% of total households are found indifferent and know nothing regarding this project. Below Figure 5-91 shows the project awareness of local people.

**Figure 5-91: Awareness about the Project**




Source: EQMS Socio Economic and Landowner Survey, April 2024

#### 5.8.4.11.2 Perceived Impact

The data indicates a prevailing positive sentiment, with all respondents perceiving a beneficial impact from the project. This optimistic outlook suggests a widespread belief in the project's potential to bring positive change or benefits to the community. The local people believe that the proposed project will significantly develop the entire area and boost its economic growth. Additionally, the land prices in the local area are expected to increase. Furthermore, employment and business opportunities will also rise in this region.

# CHAPTER 6

## Environmental and Social Impact Assessment and Evaluation

# 6 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT AND EVALUATION

Assessment of potential impacts are based on activities that will be involved in the implementation of the project, nature and extent of the proposed activities, and present environmental setting of the project area.

## 6.1 Impact Assessment Methodology

The impact assessment has involved the prediction, evaluation, and mitigation of impacts and report on impacts including residual impacts and cumulative impacts. The main IESE steps are summarized below and comprise of:

- Potential Impact Prediction: determination of what could potentially happen to resources/receptors as a consequence of the Project and its associated activities.
- Impact Evaluation: Evaluation of 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 Measures: Identification of appropriate and justified measures to mitigate negative impacts and enhance positive impacts.
- Residual Impact Evaluation: Evaluation of the significance and scale of the environmental impacts predicted to remain after the application of mitigation measures.

### 6.1.1 Potential Impact Prediction

Prediction of environmental impacts is the most important component in the impact assessment study as it provides quantitative information on likely environmental impacts from a project well in advance. The diverse range of potential impacts considered in the impact assessment process typically results in a wide range of prediction methods being used, including quantitative, semi-quantitative and qualitative techniques.

### 6.1.2 Impact Evaluation

Once the identification of potential impacts is completed, each potential impact is described in terms of its various relevant characteristics (e.g., nature, extent, duration, intensity/ severity, irreplaceable loss of resources, and probability).

#### 6.1.2.1 Nature of Impacts

The nature of impacts is an assessment of the type of effect the activity is likely to have on the surrounding affected environment. The description includes what is being affected and its magnitude. The nature of the impact will be classified as positive or negative and direct, indirect, and induced.

| Score | Nature | Description |
|---|---|---|
| 1 | Direct | Potential/possible Impacts will be generated directly from the project activities and its associated facilities, which are directly linked with the project. (e.g., discharge of untreated wastewater from construction camps into a nearby water body may lead to a decline in water quality). |
| 2 | Indirect | Potential/possible Impacts will be generated from secondary sources which are brought by the project activities. (e.g., impacts of air emissions such as $CO_2$ on climate change, $NO_X$ may lead to acid rains, VOC may lead to low-level atmospheric ozone when combined with $NO_X$ in the presence of sunlight). |

| | | |
|---|---|---|
| 3 | Induced | Potential/possible Impacts will be generated (which are not part of the Project) due to the effect/consequence/outcome of the Project (e.g., an influx of camp followers resulting from the importation of a large project workforce). |

#### 6.1.2.2 Extent and Location of Impacts

Extent and location indicate the spatial area that may be affected by the proposed project activities or its associated facilities (Table 6-1).

**Table 6-1: Geographical Extent of Impacts**

| Rating | Extent | Description |
|---|---|---|
| 1 | Project Site | Potential/possible impacts' area only at or within the project site/project boundary. |
| 2 | Local | Potential/possible impacts' area is not only limited to the site, but also its immediate surrounding areas/receptors. |
| 3 | Regional | Potential/possible impacts' area extends to the immediate surrounding areas along with adjacent areas. |
| 4 | National | Potential/possible impacts' area considered at a national level. |
| 5 | Trans-Boundary | • Impact is considered not only at the national level but also within the neighboring country.<br>• Impact considered a global level. |

#### 6.1.2.3 Duration of Impacts

Duration measures the lifetime/existence/continuation of the impact (Table 6-2).

**Table 6-2: Duration of Impacts**

| Rating | Duration | Description |
|---|---|---|
| 1 | Short Term | Potential/possible impact duration is a very limited time or length of construction/decommissioning period. |
| 2 | Medium Term | Potential/possible impact duration will continue after the construction period but stop/discontinue/cease within a tenure of 10 years. |
| 3 | Long Term | Potential/possible impact duration will continue for more than 10 years or the entire operational life of the project. |
| 4 | Permanent – Mitigated | Potential/possible impact will remain after the operational life of a project, but appropriate mitigation measures reduce the impact. |
| 5 | Permanent – No Mitigation | • Potential/possible impact will remain after the operational life of the project.<br>• No mitigation measures will reduce the impact after implementation. |

#### 6.1.2.4 Intensity/severity of Impacts

Intensity/severity is the degree to which the project affects or changes the environment; it includes a measure of the reversibility of impacts (Table 6-3).

**Table 6-3: Intensity of Impacts**

| Rating | Intensity | Description |
|---|---|---|
| 1 | Insignificant | Changes due to potential/possible impact are minor, not visible/noticeable, natural functioning of the environment not affected. |
| 2 | Low | • The natural<br>• functioning of the environment is minimally affected.<br>• Natural, cultural, and social functions and processes can be reversed to their original state if mitigation measure is taken. |
| 3 | Medium | • Environment remarkably distorted/disturbed/impacted, still functions, if in a modified way.<br>• Negative impacts cannot be fully reversed. |
| 4 | High | • Cultural and social functions and processes distorted/disturbed/impacted.<br>• Potentially ceasing to Environmental function temporarily.<br>• Negative impacts cannot be fully reversed. |
| 5 | Very High | • Natural, cultural, and social functions and processes permanently cease, and valued, important, sensitive, or vulnerable systems or communities are substantially affected.<br>• Negative impacts cannot be reversed. |

#### 6.1.2.5 Potential for Irreplaceable Loss of Resources

Potential for Irreplaceable Loss of Resources is the degree to which the project will cause a loss of irreplaceable resources (Table 6-4).

**Table 6-4: Potential for Irreplaceable Loss of Resources**

| Rating | Potential for Irreplaceable Loss of Resources | Description |
|---|---|---|
| 1 | Low | No irreplaceable/unique resources will be impacted. |
| 3 | Medium | Irreplaceable/unique resources can be replaced, with mitigation measures/efforts and will be replaced after a certain period of time. |
| 5 | High | Potential/possible Impact replaces a particular/vulnerable resource. |

#### 6.1.2.6 Probability

Probability is the likelihood or the chances that the impacts will occur (Table 6-5).

**Table 6-5: Probability of Impacts**

| Rating | Probability | Description |
|---|---|---|
| 1 | Unlikely | Under normal conditions, no potential/possible Impact expected. |
| 2 | Low | The probability of the impact to occur is low due to its design or historic experience. |

| Rating | Probability | Description |
|---|---|---|
| 3 | Medium | There is a distinct probability of the impact occurring. |
| 4 | High | It is most likely that the impact will occur. |
| 5 | Definite | The impact will occur regardless of any prevention measures. |

#### 6.1.2.7 Magnitude

The magnitude is calculated as extent + duration + intensity + potential impact on irreplaceable resources.

Magnitude essentially describes the intensity of the change that has the potential to occur in the resource/receptor as a result of the potential impact. The magnitude designations themselves are universally consistent, but the definitions for these designations vary depending on the resource/receptor.

In the case of a potential positive impact, no magnitude designation (aside from 'positive') is assigned. It is considered sufficient for the IESE to indicate that the project has the potential to result in a potential positive impact, without characterizing the exact degree of positive change that may occur.

#### 6.1.2.8 Significance

The significance will be rated by multiplying the consequence of the impact and the probability of occurrence (i.e., Magnitude × Probability = Significance).

**Table 6-6: Significance of Issues (Based on Environmental Parameters)**

| Rating | Significance | Description |
|---|---|---|
| | Positive Impact | Potential/possible impacts that have a beneficial impact on affected media |
| 4-14 | Very low | No action required. |
| 15-29 | Low | • Impacts are within the acceptable range.<br>• Potential/possible impacts such as localized or short-term effects on habitat, species, or environmental media. |
| 30-44 | Medium-Low | • Impacts are within the acceptable range but should be mitigated to lower significance levels wherever possible.<br>• Potential/possible impacts such as localized, long-term degradation of sensitive habitat or widespread, short-term impacts on habitat, species, or environmental media. |
| 45-59 | Medium-High | • Potential/possible impacts are significant and require attention;<br>• mitigation is required to reduce the negative impacts to acceptable levels;<br>• Potential/possible impacts such as localized but irreversible habitat loss or widespread, long-term effects on habitat, species, or environmental media. |
| 60-80 | High | • Impacts are of great importance, mitigation is crucial.<br>• Potential impacts such as significant, widespread, and persistent changes in habitat, species, or environmental media. |

| Rating | Significance | Description |
|---|---|---|
| | | • Potential impacts such as persistent reduction in ecosystem function on a landscape scale or significant disruption of a sensitive species. |
| 81-100 | Very High | • Impacts are unacceptable.<br>• Potential impacts such as loss of a significant portion of a valued species or loss of effective ecosystem function on a landscape scale. |

Potential social impacts are inherently variable because community response to a potential impact, perceptions of existing and changing conditions, and the degrees of vulnerability are all heavily dependent on local conditions and the human factor. The significance designations for potential social impacts take into consideration social science expertise and previous experience in Bangladesh regarding the relationships between individuals, communities, government agencies, NGOs, and special interest groups, and different industries.

**Table 6-7: Potential Social Impact Significance**

| | Significance | Definition |
|---|---|---|
| | Positive Impact | Potential/possible impacts that have a beneficial impact on affected stakeholders. |
| 4-14 | Very Low | Potential/possible impacts that are practically indistinguishable from the social baseline, with little to no potential impacts to or concerns from affected external stakeholders. |
| 15-19 | Low | Potential/possible impacts that are short-term nuisance or inconvenience; potentially affected external stakeholders concerned but likely able to adapt with relative ease. |
| 30-44 | Medium-Low | Potential/possible impacts such as localized or short-term effects; potentially affected stakeholders concerned but likely able to adapt with relative ease. |
| 45-59 | Medium-High | Potential/possible impacts such as local-to-regional (sub-national) or medium-term effects; potentially affected stakeholders concerned and raise the issue as a high priority but may be able to adapt with some targeted support or assistance. |
| 60-80 | High | Potential/possible impacts such as local-to-national or long-term effects; potentially affected stakeholders concerned and raised as a high priority; may not be able to adapt without targeted support or assistance to maintain a pre-impact livelihood. |
| 81-100 | Very High | Potential/possible impacts such as local-to-global or irreversible long-term effects; potentially affected stakeholders concerned raise the issue as a high priority and are likely, not able to adapt without targeted support or assistance. |

To determine potential public health impacts, the assessment team considers the public which has the potential to be exposed to various aspects and potential impacts of the project, whether it is a permanent resident with continuous exposure or periodic exposure to a fisherman transiting through the project area. The significance determinations for potential public health impacts take into consideration local and regional public health expertise and previous experience in

Bangladesh regarding the relationships between individuals, communities, health care providers, government agencies, NGOs, and different industries.

**Table 6-8: Potential Public Health Impact Significance**

| Significance | Definition |
|---|---|
| **Positive Impact** | Potential/possible impacts that have a beneficial impact on the affected stakeholder. |
| **Very low** | No impact to the public. |
| **Low** | Potential/possible illness or adverse effect with limited or no impacts on the ability to function and medical treatment is limited or not necessary. |
| **Medium-Low** | Potential/possible illness or adverse effects with mild to moderate functional impairment requiring medical treatment or management. |
| **Medium-high** | Potential/possible serious illness or severe adverse health effects requiring a high level of medical treatment or management. |
| **High** | Potential/possible serious illness or chronic exposure of a few resulting in life-shortening effects. |
| **Very High** | Potential/possible serious illness or chronic exposure of many resulting in life-shortening effects. |

### 6.1.3 Mitigation and Enhancement Measures

Once the significance of an impact has been characterized, the next step is to evaluate what mitigation and enhancement measures are defensible. These are commonly incorporated into the project as commitments. Mitigation is aimed at preventing, minimizing or managing significant negative impacts to as low as reasonably practicable and optimizing and maximizing any potential benefits of the project, where applicable.

The priority in mitigation is to first apply mitigation measures to the source of the impact (i.e., to avoid or reduce the magnitude of the impact from the associated project activities) and then to address the resultant effect to the resource/receptor via abatement or compensatory measures or offsets (i.e., to reduce the significance of the effect once all reasonably practicable mitigations have been applied to reduce the impact magnitude.

## 6.2 Impact Identification

The potential impacts have been identified through a systematic process whereby the activities (both planned and unplanned) associated with the project have been considered with respect to their potential to interact with environmental and social resources or receptors.

The interaction 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 i.e., the study area of the project. The interaction matrix for the project activities and likely impacted resources/receptors is presented in Table 6-9.

**Table 6-9: Impact Identification Matrix for the Proposed Project**

| Project Activities | Potential Impacts | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Physical Resources | | | | | | | | | | | | | | Biological Resources | | | | Socio-economic Resources | | | | | | | | | | Community Health | | | | |
| | Ambient Air Quality | Ambient Noise Level | Vibration | Surface water resource | Surface water quality | Groundwater resource | Groundwater quality | Soil Quality | Sediment quality | Landscape/Topography | Land use/L /Land Resource | Drainage pattern | GHG Emissions | Aesthetics & Visual | Vegetation Types | Wildlife | Fisheries Resources | Protected areas | Demographic (incl. Physical displacement) | Economy and livelihood | Traffic (Road) | Social and cultural structure | Economic displacement | Infrastructure and service | Cultural resources | Employment | Occupational Health and Safety | Public transportation | Community Health and Safety | Vector borne disease | Sextually transmitted disease | Healthcare/recreational facilities | Vulnerable groups |
| **Pre-construction Phase** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Preliminary survey and licensing process | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Land purchase/lease | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Site cleaning trees/vegetation removal | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Land leveling and grading | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Upgrading the existing access road | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Arranging construction water supply system | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Construction Phase** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Establishment of labor camp & accommodation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Civil construction | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Storage, Handling and disposal of waste | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Project Activities | Potential Impacts | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Physical Resources | | | | | | | | | | | | | | Biological Resources | | | | Socio-economic Resources | | | | | | | | Community Health | | | | | |
| | Ambient Air Quality | Ambient Noise Level | Vibration | Surface water resource | Surface water quality | Groundwater resource | Groundwater quality | Soil Quality | Sediment quality | Landscape/Topography | Land use/L /Land Resource | Drainage pattern | GHG Emissions | Aesthetics & Visual | Vegetation Types | Wildlife | Fisheries Resources | Protected areas | Demographic (incl. Physical displacement) | Economy and livelihood | Traffic (Road) | Social and cultural structure | Economic displacement | Infrastructure and service | Cultural resources | Employment | Occupational Health and Safety | Public transportation | Community Health and Safety | Vector borne disease | Sextually transmitted disease | Healthcare/recreational facilities | Vulnerable groups |
| Generation of wastewater | | | | | ■ | | ■ | ■ | | | | | | | | | | | | | | | | | | | | | ■ | ■ | | | |
| Transportation of personnel & material by road | ■ | ■ | | | | | | ■ | | | | | ■ | ■ | ■ | | ■ | | | | ■ | | | | ■ | | | | ■ | | | | |
| Supply of power, water, fuel, sanitation etc. | | | | | | ■ | ■ | ■ | | | | | | | | | | | | | ■ | | | | | ■ | | | ■ | | | | |
| Maintenance of vehicles and equipment | | ■ | | | | | ■ | ■ | | | | | | | | | | | | | | | | | | ■ | | | ■ | | | | |
| Mechanical and Electrical activities | ■ | ■ | | | | | | | | | | | | | | | | | | | | | | | | ■ | | | ■ | | | | |
| PV Mounting System Installation | ■ | ■ | | | | | ■ | ■ | | | ■ | | | ■ | | | | | | | | | | | | ■ | | | ■ | | | | |
| Stringing of transmission line | ■ | | | | | | | | | | | | | | | | | | | ■ | ■ | | | | | ■ | | | ■ | | | | |
| Demobilization of the construction equipment | ■ | ■ | | | | | ■ | ■ | | | | | | ■ | ■ | | | | | | | | | | | ■ | | | ■ | | | | |
| **Operation Phase** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power generation process | ■ | ■ | | | | | | | | | | | | ■ | ■ | | ■ | | | ■ | | | | | | ■ | ■ | | ■ | | | | |
| Water use/demand for Solar Panels cleaning | | | | | | ■ | ■ | | | | | | | | | | | | | | | | | | | | | | ■ | | | | |

| Project Activities | Potential Impacts | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Physical Resources | | | | | | | | | | | | | | Biological Resources | | | | Socio-economic Resources | | | | | | | | | | Community Health | | | | | |
| | Ambient Air Quality | Ambient Noise Level | Vibration | Surface water resource | Surface water quality | Groundwater resource | Groundwater quality | Soil Quality | Sediment quality | Landscape/Topography | Land use/L /Land Resource | Drainage pattern | GHG Emissions | Aesthetics & Visual | Vegetation Types | Wildlife | Fisheries Resources | Protected areas | Demographic (incl. Physical displacement) | Economy and livelihood | Traffic (Road) | Social and cultural structure | Economic displacement | Infrastructure and service | Cultural resources | Employment | Occupational Health and Safety | Public transportation | Community Health and Safety | Vector borne disease | Sextually transmitted disease | Healthcare/recreational facilities | Vulnerable groups |
| | | | | ■ | | | | ■ | | | | | | | | | | | | | | | | | | | | | | | | |
| Domestic, solid, and other non-hazardous waste handling, storage, and disposal | | | | ■ | ■ | | ■ | ■ | | | ■ | | ■ | ■ | | | ■ | | | | | | | | | ■ | | ■ | ■ | | | |
| Hazardous material and waste storage | | | | ■ | | | ■ | ■ | | | ■ | | | | | | ■ | | | | | | | | | ■ | | ■ | ■ | | | |
| Transportation during operation and maintenance | ■ | ■ | | | | | | ■ | | | | | | | | | | | | | | | | | | ■ | | ■ | | | | |
| Maintenance and replacement of Equipment | | | | | | | | ■ | | | | | ■ | | ■ | | | | | | | | | | | ■ | ■ | | | | | | |
| **Decommissioning Phase** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dismantling of infrastructure and replacement of dysfunctional equipment and installations | ■ | ■ | | | | | ■ | ■ | | | | | | ■ | | | | | | | | | | | | ■ | ■ | | | | | |
| Waste disposal | | | | | ■ | | ■ | ■ | | | ■ | | ■ | ■ | | | | | | | | | | | | | ■ | | ■ | ■ | | | |

## 6.3 Potential Environmental and Social Impacts and Risks

### 6.3.1 Impacts during Pre-construction Phase

#### 6.3.1.1 Impact on Air Quality

The site clearance of the power plant site, leveling the plant site, upgradation of access road, and installation of the water supply system in the project site etc. will generate dust. Moreover, dust can indeed be dispersed by wind and accumulate in nearby water bodies or plant leaves. The power plant site is surrounded by several water bodies like ponds, beel. Accumulated dust may have an impact on the natural water body or fisheries resources. Heavy equipment's such as chain dozer, roller machine, drilling rig will be used onsite for land leveling, soil compress and tubewell installation. Emissions such as Sulfur Dioxide (SO2), Nitrogen Oxides (NOx), Carbon Dioxide (CO2), Carbon Monoxide (CO) from this equipment and diesel generator sets used to generate power will marginally increase in the levels of SO2, NOx, and CO2 and cause an impact on ambient air quality. Moreover, the human receptor is within 10 m from the boundary of the power plant site and alongside of the access road.

According to the project's plan, land leveling and grading will be conducted for aligning module mounting structures, and auxiliary facilities. All of these activities are expected to be of short duration (see sec 3.5), mainly confined to the immediate vicinity of the site leading to an impact of low magnitude. This indicates that these effects are localized and temporary, which implies that any deterioration in air quality at project location is unlikely to be significant and is expected to be transient.

| Impact | Impact on Air Quality | | | | |
|---|---|---|---|---|---|
| Impact Nature | Direct | Indirect | Induced | | |
| Impact Scale | In and around the project site | | | | |
| Frequency | Limited to pre-construction Phase | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans Boundary |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High |
| Potential for Irreplaceable Loss of Resources | Low | | Medium | High | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider Medium-low | | | | |

**Mitigation Measures:**

The mitigation measures which can be adopted to reduce the impact on air quality during pre-construction phase may include the following:

- Preparation and implementation of Air Quality Management Plan follow Air Pollution (Control) Rules, 2022 to incorporate requirements such as

- Implement dust control measures such as water spraying, wind barriers, and vehicle speed limits
- Dusty materials[31] need to be covered with impermeable sheet cover.
- Dusty activities should be re-scheduled where possible if high-wind conditions are encountered.
- Vehicle/equipment exhausts observed emitting significant black smoke in their exhausts will be serviced/replaced.
- Vehicle/equipment air emissions will be controlled by good practice procedures (such as turning off equipment when not in use); and.

- Use low Sulphur diesel (S<O.5%) diesel powered equipment in collaboration with best management practices.
- No cleared vegetation to be burnt. Cleared vegetation will either be composed or reused for stabilization purposes.
- Avoid the use of diesel- or petrol-powered equipment by using electricity or battery-powered equipment where possible and if safety concerns can be overcome.
- All diesel-powered equipment will be regularly maintained, and idling time reduced to minimize emissions.
- Monitoring of ambient air condition.

After taking the proper mitigation measures the impact will be minimized to low from medium low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 6 (Low) |
| Probability x Magnitude=12 “Very Low” | | | |

### 6.3.1.2 Impact on Soil

In the pre-construction phase, tasks such as leveling the site, grading, cleaning the area, and upgrading of access roads and installation of tube well, will take place. The land levelling and grading activity will be for the undulations present at the power plant site and allocated area for MCR, Guest Room, Barrack, Warehouse and Inverter Stations and this will be conducted with appropriate cutting and filling to make the site suitable for aligning the structures.. These activities will affect the top layers of the soil. The removal of stabilized topsoil would result in slope destabilization and increased soil erosion. Also, vegetation removal and soil disturbance can lead to the decomposition and loss of organic matter.

Also, installation of tubewell requires to drill which in terms general drilling mud and affect the top layer of the soil. Drilling mud spills or leaks into soil, it can alter the soil’s composition and affect its health, potentially harming plant growth and soil organism.

Moreover, heavy equipment will be used for the grading, upgrading and tube well installation, which may compact the soil. Additional soil from external sources will be imported, filling the affected area, and ensuring thorough compaction to facilitate a smooth installation process and also to avoid the slope destabilization. Compacted soil has reduced pore space, which decreases water infiltration and root penetration, leading to poor plant growth and increased surface runoff.

It is noted that the water bodies are located in and around the project AOI, therefore impacts of soil erosion on water bodies will contribute to increase in dissolved and suspended solids. Surrounding water bodies are used as aquaculture (fish farming). Soil within the power plant is used for seasonal agricultural activities (sees sec 5.3.4.2) and supports a diverse habitat of flora

[31] As per Air Pollution Control Rules (2022), Dusty Materials: Means Cement, soil, aggregates, silt, stone, sand, dust and wooden chips.

and fauna. Therefore, the impact magnitude is considered Medium-low as soil erosion will affect local community's livelihood as well.

Areas affected by soil compaction and erosion will be the construction of new internal road, upgrading of access road, and installation of the tube well. These areas are localized within the power plant site and limited during the construction phase (11 months) and would last until the areas are fully rehabilitated during operations phase.

| | | | | | |
|---|---|---|---|---|---|
| Impact | Soil Pollution due to the site cleaning, leveling, upgrading the road, installation of tube well | | | | |
| Impact Nature | Direct | Indirect | Induced | | |
| Impact Scale | In and around the project site | | | | |
| Frequency | Limited to construction phase | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans Boundary |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High |
| Potential for Irreplaceable Loss of Resources | Low | | Medium | High | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider Medium-low | | | | |

**Mitigation Measures:**

Embedded Measures

As per Feasibility Report, MSEL/EPC Contractor will make the following activities:

- Grading adjustment to maintain slope stabilization.
- Introduce vegetation cover, mulching, or erosion control blankets, to prevent soil erosion.

Additional Measures:

The additional mitigation measures which can be adopted to reduce the impact on soil during pre-construction phase may include the following:

- Preparation and implementation of a Soil and Erosion Management Plan during pre-construction and construction to incorporate requirements such as use of dust suppression, soil stabilization and storm water and sediment management and control. The Soil and Erosion Management Plan should include some measures such as:
  - Any soil stockpiles should be located in sheltered areas where they are not exposed to wind and at a location approved by local authorities;
  - Stockpiles of soil (or other erodible materials) should be securely covered
  - Implement slope stabilization measures, such as retaining walls, soil reinforcement, or grading adjustments.
  - Activities to be scheduled to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff and vehicle tracking.
  - Demarcating routes for movement of heavy vehicles.

- Soil conservation measures will be implemented such as stockpiling topsoil or gravel for the remediation of disturbed areas.
- Stripping of topsoil shall not be conducted earlier than required in order to prevent the erosion of soil.

- A site-specific Emergency Response Plan will be prepared by the Contractor for soil clean-up and decontamination.
- Properly manage and dispose the drilling muds.
- Design processes to prevent/minimize quantities of wastes generated, and hazards associated with the waste generated.
- Minimize the production of waste materials by 3R (Reduce, Recycle and Reuse) approach.
- Training of laborers for waste disposal in designated areas and use of sanitation facilities.
- Fuel, lubricating oil and used oil storage areas will be contained in bunds of 110 percent capacity of the stored material.
- Spill containment and clean up kits will be available onsite and clean-up from any spill will be appropriately contained and disposed of
- Construction vehicles and equipment will be serviced regularly and off site.
- Construction vehicles will remain on designated and prepared compacted gravel roads.
- Address issues related to water drainage and runoff to prevent soil erosion and saturation.

After taking the proper mitigation measures the impact will be minimized to low from medium low.

| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 10 (Medium-Low) |
|---|---|---|---|
| Probability x Magnitude=20 “Low”, i.e. natural functions of environment is minimally affected and natural, cultural and social functions will be reveres to their original state with proper mitigation measures | | | |

#### 6.3.1.3 Impact on Surface Water

Several water bodies like ponds, beels are situated in and around the power plant site. Improper management of waste from site clearance, leveling, grading, and upgrading the existing road activities may cause deterioration of surface water quality by increasing turbidity. High turbidity can reduce the amount of sunlight reaching aquatic plants, impairing photosynthesis and affecting the growth of these plants.

Heavy equipment such as chain dozer, roller machine, drilling rig will be used onsite for land leveling, soil compress and tubewell installation that can increase dust onsite. As a result, this air-blown dust can accumulate in the nearest surface water body and increase the TSS. The installation of borewell is an additional challenge. Drilling mud, cuttings, and used casings can be generated as waste during installation of borewell. This drillings muds and waste may be washed out to the nearest surface water body to contribute suspended solids. The nearby power plant site surface water bodies are used by the local community for fish farming and domestic purposes. Moreover, some of the water bodies inside the project boundary remain unused due to the growth of water hyacinth. Increase of the TSS will enhance the condition.

The site clearance, leveling, grading, upgrading existing road does not require to use surface water. So no impact on surface water quantity.

Therefore, duration of the impact is considered as short term and overall impact significance is considered as medium low. Impact will be limited during the construction phase (11 months).

| Impact | *Surface Water Pollution due to the site cleaning, leveling, grading and tubewell installation* | | |
|---|---|---|---|
| Impact Nature | Direct | Indirect | Induced |

| | | | | | |
|---|---|---|---|---|---|
| Impact Scale | Ina and around the project site | | | | |
| Frequency | Limited to construction phase | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans Boundary |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High |
| Potential for Irreplaceable Loss of Resources | Low | | Medium | High | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider ***Medium-low*** | | | | |

**Mitigations Measures**

Embedded Measures

- Introduce vegetation cover, mulching, or erosion control blankets, to prevent soil erosion.

Additional Measures

- Develop and implement a water and wastewater/stormwater management plan which should cover measures and management of impacts to
  - nearby bodies of water and
  - surrounding communities.
- Designing drainage systems to manage and direct runoff effectively, minimizing the impact on local water bodies.
- Restoring vegetation in cleared areas to improve soil stability and reduce runoff after construction activities are completed.
- Monitoring and maintaining drainage and erosion control measures to ensure they are effective and making adjustments as needed.
- Timely disposal of the construction/chemical/hazardous waste to prevent leaching of any pollutant to the water bodies.

After taking the proper mitigation measures the impact will be minimized to very low from low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 8 (Medium-Low) |
| Probability x Magnitude=16 “Low”, i.e. natural functions of environment is minimally affected and natural, cultural and social functions will be reveres to their original state with proper mitigation measures | | | |

### 6.3.1.4 Impact on Ground Water

Ground water at the sites may be polluted due to drilling activities (drilling mud, chemicals used in drilling may spill or leak into the ground), and accidental spillage of chemicals from equipment. Moreover, leveling and grading can compact the soil, reducing its permeability and ability to absorb water. This leads to decreased groundwater recharge. Also, disturbing the land surface can lead to increased soil erosion, which can clog nearby water bodies with sediment, further reducing groundwater recharge.

The site clearance, leveling, grading, upgrading existing road does not require to use water. Minimum amount of water will be required for drinking purpose and which will be sourced from the community drinking water facilities. So, no impact on ground water quantity.

Therefore, duration of the impact is considered as short term and overall impact significance is considered as low.

| Impact | *Ground Water Pollution due to the site cleaning, leveling, grading and tubewell installation* | | | | | |
|---|---|---|---|---|---|---|
| Impact Nature | Direct | | Indirect | | Induced | |
| Impact Scale | In and around the project site | | | | | |
| Frequency | Limited to construction phase | | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans Boundary | |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation | |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High | |
| Potential for Irreplaceable Loss of Resources | Low | | Medium | | High | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite | |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider ***Low*** | | | | | |

**Mitigations Measures**

Embedded Measures

- Introduce vegetation cover, mulching, or erosion control blankets, to prevent soil erosion.

Additional Measures:

- Develop and implement Water and Wastewater Management Plan (sustainable ground water use management) should involve or indicate the following issue:
  - Establish monitoring systems to ensure compliance with sustainable extraction limits and water quality standard set by Government (WARPO/ Union) rules.
- Designing drainage systems to manage and direct runoff effectively, minimizing the impact on local water bodies.
- Restoring vegetation in cleared areas to improve soil stability and reduce runoff after construction activities are completed.
- Timely disposal of the construction/chemical/hazardous waste to prevent leaching of any pollutant to the water bodies.
- Training of laborers for waste disposal in designated areas and use of sanitation facilities.
- Fuel, lubricating oil and used oil storage areas will be contained in bunds of 110 percent capacity of the stored material.
- Spill containment and clean up kits will be available onsite and clean-up from any spill will be appropriately contained and disposed of.
- Construction vehicles and equipment will be serviced regularly and off site.

After taking the proper mitigation measures the impact will be minimized to very low from low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 6 (Low) |
| Probability x Magnitude=12 "Very Low" | | | |

#### 6.3.1.5 Impact due to Noise and Vibrations

During the pre-construction phase of the proposed project existing noise environment in the area is mainly influenced by activities like, movement of vehicles, operation of heavy vehicles/equipment and drilling. Site cleaning, leveling, grading, drilling will be inside the power plant site and upgrading the existing access road will be on the outside of the power plant boundary. Duration of the activities will be short term. The power plant site is far from any archeological site (see sec 3.2.2) but there is a close educational site, Madrasah, and some residences. Moreover, national highway with huge traffic volume is situated within the 200 m buffer area of the project site. Hence, it can be said that the project site would not be the only source of noise. However, some reptiles and mammals, within the project area can potentially be driven away from the site due to the sound levels.

Other sources of noise pollution are use of hydraulic horns, movement of public vehicles movement and use of generator in the site. Some common impacts of noise nuisances include annoyance, sleep disturbance and interference with communication.

Normal project construction activities will not generate significant levels of vibration. Pile driving will be producing ground-borne vibration levels that might be perceptible within approximately 200 meters of the pile-driving activity. Ground-borne vibration levels at distances of approximately 60 meters or more will not result in adverse effects. Pile driving very close to structures, can cause structural damage due to displacement of soil and resulting lateral movement.

Any impacts associated with these works would be temporary and will not represent a permanent impact on the community and the surrounding environment.

So, the significance can be assessed as medium Low.

| | | | | | | |
|---|---|---|---|---|---|---|
| Impact | Noise Pollution due to site cleaning, leveling, drilling, upgrading existing road | | | | | |
| Impact Nature | Direct | | Indirect | | Induced | |
| Impact Scale | In and around the project site | | | | | |
| Frequency | Limited to construction Phase | | | | | |
| Extent and location | Project Site | Local | Regional | National | Trans boundary | |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent – Mitigated | Permanent – no | |
| Impact Intensity/ severity | Insignificant | Low | Medium | High | Very High | |
| Potential for irreplaceable loss | Low | | Medium | | High | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite | |
| Impact Significance | Very low | Low | Medium-Low | Medium-high | High | Very High |
| | Significance of impact is considered as medium Low | | | | | |

**Mitigation Measures:**

– Development and implementation of Noise Management Plan which includes such as:

- Acoustic covers for all equipment and machinery that generate excessive noise.
- Noise Level need to be monitored once in monthly basis and If noise levels are found to be excessive activities should be stopped until adequate control measures are implemented.
- Ensure that all equipment and machinery and its mufflers are regularly serviced and immediately serviced or replaced, if damaged.
- Development of a regular maintenance schedule of all vehicles, machinery, and equipment for early detection of issues, and to avoid unnecessary elevated noise level.
- Regular maintenance of equipment including lubricating moving parts, tightening loose parts, and replacing worn-out components shall be conducted.
- The amount of equipment operating simultaneously shall be reduced as far as practicable.
- Only well-maintained equipment should be operated on-site.

– Compliance with the Occupational Safety and Health Administration (OSHA) requirements and the Bangladesh Codes to ensure that for activities associated with high noise levels, workers are equipped with proper PPE (e.g., Earmuffs).
– Construction work should be restricted from 7 pm to 7 am to avoid disturbance to the nearest residence (which is within 20 m form the power plant boundary) as per Noise Pollution (Control) Rules, 2006.

After taking the proper mitigation measures the impact will be minimized to very low from low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 6 (Low) |
| Probability x Magnitude=12 “Very Low” | | | |

#### 6.3.1.6 Impact on Landscape

Site engineering activities are likely to create a visual intrusion, and a disruption to aesthetics for this project include surface cleaning, land leveling and grading, and spoil. Also, to loss of vegetation, (where needed) and natural habitat will create considerable alteration of the existing visual landscape due. Given work nature and short-term duration, it is anticipated that they will have minimal impact and it is considered as **very low.** However, precautions measures should still be taken, such as fence the proposed area so that the surrounding agricultural land will not be disturbed.

| Impact | *Impact on Landscape* | | | | |
|---|---|---|---|---|---|
| Impact Nature | Direct | Indirect | Induced | | |
| Impact Scale | Project site | | | | |
| Frequency | Limited to pre-construction phase | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans Boundary |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High |
| Potential for Irreplaceable Loss of Resources | Low | | Medium | High | |

| Probability of Impact | Unlikely | Low | Medium | High | Definite |
|---|---|---|---|---|---|
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider ***Very Low*** | | | | | |

### 6.3.1.7 Impact due to Land Lease and Procurement

Potential sources of impacts due to land lease and procurement during pre-construction and construction phase activities include:

- Land leasing and purchasing from the local people
- Using the Agricultural and Fisheries lands
- Storage of construction materials including hazardous material
- Soil and water contamination during the construction phase

The land of MSEL is located at Nimuria Mouza under Muktagacha Upazila of Mymensingh Division. The total amount of the land is private land and owned by the local people. The proposed project started their land procurement and leasing process from 2022. The land requirement for the proposed project is approximately 76.4 acres comprising the main plant area and auxiliary facilities such as warehouse and guard barrack. As per the discussions with landowner and local community, most of the land parcels are wetlands and few land parcels are single-cropped agricultural land as well as fisheries land. The project's establishment would result in a change in land use of the proposed project site from agricultural or beels to industrial for a limited period. Approximately 181 landowners will lose their land permanently or temporarily. However, most of these lands have been underwater for the past 15 to 20 years, preventing the landowners from using them for income-generating purposes. The proposed project site is basically a wetland, whereas a minimum portion of land was used for agricultural and fish farming activities in the surrounding area. Approximately 40 to 50 workers (mostly migrant workers) were hired in these lands seasonally on daily basis contract. All of them have other income sources as they do not have permanent working opportunities in these lands. Moreover, the agricultural lands are single-cropped land, and the production rate is decreasing day by day. As a result, the agricultural laborers and the landowners are becoming reluctant to work in this area. On the other hand, those who worked in the fish farms were hired during the starting and ending period of fish farming on a daily basis contract. They usually work around two to three hours a day in these farms, and the rest of the time they are involved in other income generating activities

No physical displacement has been conducted so far for the development of the proposed project. The direct resultant impact (adverse) of land use change in the project area is the reduction in land area available for agriculture & fisheries and resultant livelihood impacts on landowners, agricultural labors. In terms of the nature of impact, the impact is likely to be direct, extent is in the project site, and duration is long term. The impact significance on land use is **Medium low.**

| Impact | *Impact due to Land Lease and Procurement* | | | | |
|---|---|---|---|---|---|
| Impact Nature | Direct | Indirect | | Induced | |
| Impact Scale | *Within the project site* | | | | |
| Frequency | *Limited to the total land lease period* | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans boundary |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation |

| | | | | | | |
|---|---|---|---|---|---|---|
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High | |
| Potential for Irreplaceability/ Vulnerability | Low | | Medium | | High | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite | |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider ***Medium-low*** | | | | | |

**Mitigation Measures**

- The SEP and GRM for the project will be applicable to the impacted landowners and land users.
- MSEL have to prepare and implement Livelihood restoration plan for the affected landowners and laborers.
- MSEL needs to develop Labor Management Plan and Local Procurement Plan and ensure the recruitment of Unskilled labor during the project construction phase from local community.

After taking the proper mitigation measures the impact will be minimized to low from medium low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 9 (Medium-Low) |
| Probability x Magnitude=18 "Low" | | | |

### 6.3.1.8 Impact on Occupational Health and Safety

During the pre-construction phase, health and safety of the workers is a major concern. The workers can face occupational health hazards such as minor or major injuries due to lack of general safety requirements and precautions applicable for the proposed site, malfunctioning equipment, careless use of equipment and vehicles, sharp objects, heavy weight objects, work in a high height and water body etc. Due to the movement of construction vehicles and operation of heavy equipment noise, air and dust pollution will occur. Longtime exposure with the high noise level is hazardous for the construction workers.

Ensuring labor compliance during construction is crucial for maintaining fair labor practices, worker safety, and overall project success. Key areas of focus include working conditions, and the well-being of workers. In case of absence of quality drinking water, sanitation, accommodation, transport facility etc. in the construction camps workers health and safety will be affected.

Uncontrolled vending of food and drinking water on the work site will also pose a risk with respect to the transmission of contagious diseases like typhoid, diarrhea, malaria, dengue, etc. The construction workers will be required to handle hazardous materials for the construction works etc. therefore increasing health risks of workers.

However, based on the matrix below the impact has been considered as **Medium-Low.**

| Impact | *Occupational Health and Safety* | | |
|---|---|---|---|
| Impact Nature | Direct | Indirect | Induced |
| Impact Scale | In project site | | |
| Frequency | Limited to construction phase | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Extent and Location | Project Site | Local | Regional | National | Trans Boundary | |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation | |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High | |
| Potential for Irreplaceable Loss of Resources | Low | | Medium | | High | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite | |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider ***Medium-low*** | | | | | |

***Mitigation Measures***

The following mitigation measures should be taken to minimize impact on occupational health and safety.

- The Contractor will prepare and implement a Health and Safety Plan prior to commencing work. This plan will include method statements for working methods, construction sequence and safety arrangements.
- Measures will be implemented to reduce the likelihood and consequence of the following hazards:
    - falling from height;
    - falling into water;
    - entanglement with machinery;
    - tripping over permanent obstacles or temporary obstructions;
    - slipping on greasy or icy walkways;
    - falling objects;
    - asphyxiation;
    - explosion;
    - contact with dangerous substances;
    - electric shock;
    - mistakes in operation;
    - variable weather conditions;
    - lifting excessive weights; and
    - Traffic operations.
- A Permit to Enter system will be established to ensure that only authorized persons gain entry to the site.
- Competent and adequately resources sub-contractors will be used where construction activities are to be sub-contracted.
- All persons working on site will be provided information about risks on Site and arrangements will be made for workers to discuss health and safety with the Contractor.
- All workers will be properly informed, consulted and trained on health and safety issues.

- Personal Protective Equipment (PPE) shall be worn at all times on the Site. This shall include appropriate safety shoes, safety eyewear, and hard hats. Non-slip or studded boots will be worn to minimize the risk of slips.
- Before starting work all the appropriate safety equipment and the first-aid kit will be assembled and checked as being in working order. Breathing apparatus will be tested at regular intervals in the manner specified by the makers.
- All lifting equipment and cranes will be tested and inspected regularly. All hoist ways will be guarded.
- Safety hoops or cages will be provided for ladders with a height in excess of two meters.
- Where sound levels cannot be reduced at the source, suitable hearing protection will be provided when noise levels indicate an Leq of more than 90 dB(A).
- The Contractor shall provide appropriate safety barriers with hazard warning signs attached around all exposed openings and excavations when the work is in progress.
- Labor management plan, contractor and supplier management plan, and workers' accommodation management plan needs to be developed and implemented.

After taking the proper mitigation measures the impact will be minimized to Low from medium Low.

| **Probability of Impact** | 2 | **Magnitude of the Impact** | 8 |
|---|---|---|---|
| Probability x Magnitude=16 Low" | | | |

#### 6.3.1.9 Impact on Community Health and Safety

During the preconstruction phase, there may be increased risks from equipment and construction activities if safety protocols aren't strictly enforced. Communities near the site may be at risk of accidental exposure to hazardous machinery and materials, necessitating clear barriers and safety signage to prevent unauthorized access. Land clearing, vegetation removal, and grading may generate dust and particulate matter. With the upgrading of access roads and transporting construction materials, there may be increased traffic, raising the risk of accidents for pedestrians and other road users. Traffic congestion can also lead to delays for emergency vehicles and inconvenient local residents.

Measures will be taken to reduce the impact on community health and safety during the pre-construction phase. Thus, activities in pre-construction activities pose low impact on community health and safety.

| **Impact** | *Community Health and Safety (Pre-Construction Phase)* | | | | |
|---|---|---|---|---|---|
| **Impact Nature** | Direct | Indirect | Induced | | |
| **Impact Scale** | *Project adjacent areas* | | | | |
| **Frequency** | *Not applicable* | | | | |
| **Extent and Location** | Project Site | Local | Regional | National | Trans boundary |
| **Impact Duration** | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation |
| **Impact Intensity/ Severity** | Insignificant | Low | Medium | High | Very High |
| **Potential for Irreplaceability/ Vulnerability** | Low | | Medium | High | |

| Probability of Impact | Unlikely | Low | Medium | High | Definite |
|---|---|---|---|---|---|
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider *Low* | | | | | |

**Mitigation Measures**

- Implement dust suppression measures, such as water spraying.
- Different types of dust suppression measures, such as water spraying, needs to be implemented on regular basis.
- Working hours need to be limited to reduce noise disturbance.
- Using low-emission and low-noise equipment is highly suggested to MSEL for their pre-construction and construction activities.
- Limit construction vehicle movement during peak hours.
- Enforce speed limits for construction vehicles.
- Use proper signage and fencing to restrict public access.

After taking the proper mitigation measures the impact will be minimized to low from medium low.

| Probability of Impact | 2 (Low) | Magnitude of the Impact | 6 (Medium-Low) |
|---|---|---|---|
| Probability x Magnitude=12 " Very Low" | | | |

### 6.3.1.10 Impacts on Vegetation Types

#### 6.3.1.10.1 Terrestrial Flora

The pre-construction activities for the Muktagacha Solar Power Project i.e., site preparation including temporary fencing, land leveling and grading, development of access roads, and transportation of construction equipment and machinery, will have impacts on the terrestrial flora present at the project site.

The clearing of land for site preparation, fencing, and access roads will result in the removal of terrestrial vegetation, including trees and bushes in homestead plantations, dikes of aquaculture ponds and agricultural lands. Pre-construction activities i.e., development of access road, transportation facilities and land leveling may generate dusts. Dust settling on remaining vegetation can hinder photosynthesis, potentially leading to stress or decreasing plant growth.

The use of heavy machinery for land leveling and grading will compact the soil, negatively affecting the root systems of terrestrial plants, reducing their growth and health. Increased human activity during the pre-construction phase may lead to trampling of vegetation and unintentional damage to plants. This can stress terrestrial flora reducing their vigor and resilience.

During the baseline study, a total of 61 terrestrial flora species were recorded under 33 families from the field survey. Among these plant species, 37 species under 20 families of trees and 24 species under 17 families of herbs and shrubs were recorded from the primary survey of the project area. There is no protected, threatened or endemic plant species recorded from the study area.

Considering the project activities and potential biological receptors within the project AoI, the impact on different vegetation types during the pre-construction phase has been considered as ***Medium-high***.

| Impact | *Impacts on Terrestrial Flora* | | |
|---|---|---|---|
| Impact Nature | Direct | Indirect | Induced |
| Impact Scale | Limited to project site | | |

| | | | | | |
|---|---|---|---|---|---|
| Frequency | Limited to Pre-construction Phase | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans Boundary |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High |
| Potential for Irreplaceable Loss of Resources | Low | | Medium | High | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider ***Medium-high*** | | | | |

**Mitigation Measures**

To minimize these impacts on terrestrial flora, the following mitigation measures should be implemented during the pre-construction phase:

- Restrict land clearing and leveling activities within the project site and to the areas absolutely necessary for the construction activities.
- Reduce the tree cutting and vegetation clearance to the extent possible.
- Cut trees just before construction work starts on that specific location.
- Prepare and implement a plan for post-construction restoration of affected trees.

After taking the proper mitigation measures the impact will be -

| | | | |
|---|---|---|---|
| **Probability of Impact** | 5 (Definite) | **Magnitude of the Impact** | 10 (Medium Low) |
| Probability x Magnitude=50 “Medium-high”, i.e. potential/possible impacts are significant and require attention, mitigation is required to reduce the negative impacts to acceptable levels, potential/possible impacts such as localized but irreversible habitat loss or widespread, long-term effects on habitat, species, or environmental media. | | | |

#### 6.3.1.10.2 Aquatic Flora

The pre-construction activities for the Muktagacha Solar Power Project i.e., site preparation, land leveling and grading and development of access roads will have impacts on the aquatic flora present at the project site and its surrounding areas.

Site preparation and land leveling will disturb beels and ponds. Along with this, removal of aquatic vegetation will directly lead to loss of aquatic plants. Pre-construction activities may generate significant dust emissions. Dust settling on vegetation can hinder photosynthesis, potentially leading to stress or damage to plant surfaces. Soil disturbance near water bodies can lead to increased sediment runoff into ponds and beels, smothering aquatic plants and altering the substrate they rely on. Land leveling and grading can alter the natural drainage patterns, affecting water levels in beels and ponds.

However, the project site largely consists of waterbodies which are beel area and aquaculture ponds. The beel area is filled with invasive alien common water hyacinth (*Pontederia crassipes*) species currently, with a very limited abundance of native aquatic vegetation. Water hyacinth

completely overtook the area around 15 years ago, and the cost of removing these aquatic plants became prohibitively high due to their invasive nature and exponential growth. Considering the high cleaning costs, utilizing this land for growing paddy became economically unfeasible, leading the locals to abandon the area. During the monsoon it multiplies rapidly and spreads quickly in newly inundated areas. Water hyacinth growing in large quantities can block sunlight, eventually rot and settle on the bed, leading to an increase in BOD and COD. These will impact other aquatic plants and fish species. Water hyacinth can decrease overall biodiversity by reducing both species richness and evenness.

Clearing invasive species like water hyacinth (*Eichhornia crassipes*) during site preparation will be beneficial in the long term but may temporarily disrupt the ecosystem and affect few other aquatic plants that have adapted to the presence of these invasives. However, removal of the invasive species might give a chance to native aquatic plants to establish in nearby waterbodies which can eventually help to restore the ecological balance of the surrounding area.

Considering the project activities and potential biological receptors within the project AoI, the impact on aquatic flora during the pre-construction phase has been considered as ***High***.

| Impact | *Impacts on Aquatic Flora* | | | | |
|---|---|---|---|---|---|
| Impact Nature | Direct | Indirect | | Induced | |
| Impact Scale | Limited to project site and adjacent areas | | | | |
| Frequency | Limited to Pre-construction Phase | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans Boundary |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High |
| Potential for Irreplaceable Loss of Resources | Low | | Medium | High | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider | | ***High*** | | |

**Mitigation Measures**

The following steps should be taken to minimize the impact:

- Prepare an Invasive Alien Species Management Plan and implement to control the spread of water hyacinth.
- Selectively collect native aquatic plants from the project site and rehabilitate remaining areas where aquatic habitats occur after construction phase as possible.

After taking the proper mitigation measures the impact will be -

| **Probability of Impact** | 5 (Definite) | **Magnitude of the Impact** | 13 (Medium high) |
|---|---|---|---|
| Probability x Magnitude=65 “High”. | | | |

### 6.3.1.11 Impacts on Wildlife

The pre-construction activities for the Muktagacha Solar Power Project i.e., site preparation including temporary fencing, land leveling and grading and development of access roads will have impacts on the terrestrial flora present at the project site.

Clearing of vegetation and surrounding agricultural land for pre-construction activities will lead to the loss of habitat for bird species such as the Yellow-wattled Lapwing and other species listed. The removal of trees and shrubs could destroy nesting sites, particularly for species that rely on specific vegetation structures for breeding.

Continuous noise from construction machinery and increased human activity can disturb bird species, leading to stress, displacement, and abandonment of nesting sites. The removal of vegetation for construction will reduce available habitat for mammals, including the Fishing Cat and other species. The temporary fencing can create barriers that restrict the movement of mammals, leading to fragmented populations and reduced genetic diversity. Continuous noise and increased human activity can disturb mammalian species, causing stress and leading to avoidance of the area. Artificial lighting can disrupt nocturnal mammals' natural behavior patterns, affecting their feeding and reproductive activities. Mammals may be injured or killed by construction machinery and vehicles, particularly smaller, less mobile species. Excavations and construction sites can trap mammals, leading to injury or death if they are unable to escape.

Considering the project activities and potential biological receptors within the project AoI, the impact on wildlife during the pre-construction phase has been considered as ***High***.

| Impact | *Impacts on Wildlife* | | | | |
|---|---|---|---|---|---|
| Impact Nature | Direct | Indirect | Induced | | |
| Impact Scale | Limited to project site and its adjacent areas | | | | |
| Frequency | Limited to Pre-construction Phase | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans Boundary |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High |
| Potential for Irreplaceable Loss of Resources | Low | | Medium | High | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider ***High*** | | | | |

**Mitigation Measures**

To mitigate the impacts on wildlife species during the construction phase, the following measures should be implemented:

- Implement noise reduction measures as suggested in Section 6.3.1.5.
- Limit construction activities to daylight hours to reduce disturbance to wildlife.
- Ensure all lights are downward-facing, shielded, with low-UV intensity bulbs, and on motion-sensitive switches.

- Conduct regular monitoring of wildlife populations during construction to identify and address emerging impacts.
- Workers should be aware of the importance of natural resources and should not do any harm or death to wildlife.
- Rescue, rehabilitation and relocation should be done for terrestrial fauna when necessary.

After taking the proper mitigation measures the impact will be minimized to high with acceptable mitigation measures.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 5 (Definite) | **Magnitude of the Impact** | 14 (Medium High) |
| Probability x Magnitude=70 “High”. | | | |

### 6.3.2 Impacts during Construction Phase

#### 6.3.2.1 Impact on Visual Amenity

The construction activities that are likely to create a visual intrusion and a disruption to aesthetics include: materials/waste storage, piling, civil construction, and transportation of materials etc.

The project site consists of areas that are mostly wet land, and then agricultural and aquacultural field, and some trees are there. Also, there are some close communities such residences that would be within the visual radius of the project. Therefore, visual intrusions are anticipated to be limited to employees and closed communities. Hence, the visual effects of the construction will be of very low significance within the project area during construction (if any).

| Impact | *Impact on Visual Intrusion and disruption to the aesthetic* | | | | | |
|---|---|---|---|---|---|---|
| Impact Nature | Direct | | Indirect | | Induced | |
| Impact Scale | In and around the project site | | | | | |
| Frequency | Limited to construction phase | | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans Boundary | |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation | |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High | |
| Potential for Irreplaceable Loss of Resources | Low | | Medium | High | | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite | |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider ***Very Low*** | | | | | |

#### 6.3.2.2 Impact on Ambient Air

The major sources of impacts on air quality during construction phase are as follows:

- **Dust generation:** resulting from movement of vehicles across roads especially during windy conditions, civil work construction, stockpiles of materials, waste, loose earth, handling and moving material, MMS installation, stringing of transmission line, and loading and unloading construction materials.

- **Exhaust emissions**: Exhaust emissions of $SO_2$, $NO_x$, CO, $CO_2$, and PM $_{10}$, $PM_{2.5}$ will be attributed predominantly to the operation of the construction plant and road vehicles such as movement of vehicles during construction works.

Exhaust emissions will be limited to the project area and are anticipated to be generated in small concentrations and dispersed rapidly within the area leading to an impact of low significance. This means that these effects are localized and temporary which implies that any deterioration in air quality at project location is unlikely to be significant and is expected to be transient.

Dust generated from many of above-mentioned activities will increase the particulate matter levels in ambient air. The extent of impacts from dust will depend on the exact location of these activities and on the weather conditions; stronger winds and dry conditions will enhance the transfer of dust, while damp or wet conditions will reduce this impact.

Dust can cause eye irritation, skin irritation, respiratory difficulties, and reduced visibility. Welding of different structures also produces gases. Improper management of construction camps may also create a bad odor. As the dust is expected to settle within 200 m and dust suppression techniques practiced, the main receptors would be workers on site and neighboring settlement. Dust and pollutants can settle on plant surfaces, reducing photosynthesis and plant growth. Moreover, airborne pollutants can deposit into water bodies, leading to acidification and contamination. Biodiversity loss and ecosystem imbalance can result from prolonged exposure to air pollutants.

The significance of impacts on air quality during the construction phase can be assessed as **Medium Low.**

| Impact | *Impact on Air Quality* | | | | |
|---|---|---|---|---|---|
| Impact Nature | Direct | | Indirect | | Induced |
| Impact Scale | In and around the project site | | | | |
| Frequency | Limited to construction phase | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans Boundary |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High |
| Potential for Irreplaceable Loss of Resources | Low | | Medium | | High |
| Probability of Impact | Unlikely | Low | Medium | High | Definite |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High / Very High |
| | Significance of impact consider ***Medium-low*** | | | | |

**Mitigation Measures**

The following steps should be taken to minimize the impact:

- The movement of construction vehicles will be minimized, and a 20 km/hr speed limit will be enforced around the construction site.
- Maintain proper stack height for generator set.
- All diesel-powered equipment will be regularly maintained, and idling time reduced to minimize emissions.

- Low Sulphur diesel (S<O.5%) will be used in diesel powered equipment in collaboration with best management practices.
- Vehicle/equipment air emissions will be controlled by good practice procedures (such as turning off equipment when not in use); and
- Vehicle/equipment exhausts observed emitting significant black smoke in their exhausts will be serviced/replaced.
- Dusty materials need to be covered with impermeable sheet cover as per stated in the Air Pollution (control) Rules, 2022.
- Dusty activities should be re-scheduled where possible if high-wind conditions are encountered.
- Water spray to the dry earth/material stockpiles, access roads and bare soils as and when required to minimize the potential for environmental nuisance due to dust.
- The Air quality monitoring should be carried out by the contractor following the National Air Quality Standard (Air Pollution (Control) Rules, 2022).
- Restricting heights from which materials are dropped as far as practicable, to minimize the fugitive dust arising from unloading/loading.
- Waste from construction will not be burned on site.

After taking the proper mitigation measures the impact will be minimized to low from medium low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 | **Magnitude of the Impact** | 6 |
| Probability x Magnitude=16 “Very Low” . | | | |

### 6.3.2.3 Impact on Soil

#### 6.3.2.3.1 Impact on soil due to compaction

Labour camp establishment, civil construction work, stringing of transmission line, storage, handling and waste disposal, material transportation, PV mounting system installation, maintenance of vehicle and equipment, and demobilization will impact on existing soil quality. The site must undergo extensive preparation, before the installation of solar panels. Pile drivers will be used to drive piles deep into the ground, ensuring a stable foundation. Vibrations from pile driving can disrupt the soil structure. This disturbance can lead to a breakdown of soil aggregates, increasing the risk of erosion and reducing the soil's ability to retain water and nutrients. Also, pile driving can displace large amounts of soil. Displacement alters the natural soil profile, potentially mixing soil layers and affecting soil properties such as texture and drainage. T. Moreover, soil will be compacted during the establishment of internal roads. Movement of heavy vehicles and heavy construction machinery will also cause soil compaction. Compaction reduces soil porosity, limiting water infiltration, root penetration, and gas exchange. This can lead to waterlogging and poor plant growth.

Soil compaction and possible damage to the soil structure will only be limited to the vicinity project site. However, the changes that will happen on the soil structure, and soil physical properties will require time to stabilize, they are significant enough to require monitoring and management. Based on the impact assessment matrix given below the impact was assessed as Medium heigh

| Impact | *Impact on Soil due to compaction* | | | | |
|---|---|---|---|---|---|
| Impact Nature | Direct | Indirect | Induced | | |
| Impact Scale | In and around the project site | | | | |
| Frequency | Limited to construction phase | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans Boundary |

| | | | | | | |
|---|---|---|---|---|---|---|
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation | |
| Impact Intensity/ Severity | Insignif icant | Low | Medium | High | Very High | |
| Potential for Irreplaceable Loss of Resources | Low | | Medium | High | | |
| Probability of Impact | Unlikel y | Low | Medium | High | Definite | |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider ***Medium-high*** | | | | | |

**Mitigation Measures:**

- Demarcating routes for movement of heavy vehicles.
- Stripping and placing soils when dry, and not when wet.
- Soil conservation measures will be implemented such as stockpiling topsoil or gravel for the remediation of disturbed areas.

After taking the proper mitigation measures the impact will be minimized to low from medium low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 | **Magnitude of the Impact** | 8 |
| Probability x Magnitude=16 “Low” .e. natural functions of environment is minimally affected and natural, cultural and social functions will be reveres to their original state with proper mitigation measures | | | |

#### 6.3.2.3.2 Impact on soil due to contamination

Construction wastes, such as metal cutting, debris, and packaging materials, may contaminate soil at the construction site. At the same time, a significant amount of solid waste will be produced from the domestic waste, garbage, sludge from a food waste, by-product material etc. Solid waste can affect on soil if it is not managed properly. Liquid wastes that will be generated from the construction labor camp facilities and improper disposal during the construction phase can pollute soil. Accidental spillage or inappropriate management of fuels, engine oil, and hazardous chemicals during the maintenance and replacement of vehicles and equipment can pollute surface soil. These contaminants can alter the soil's chemical composition, harming soil microorganisms and plants. Moreover, the soil texture of the project site is loamy soil which is more susceptible to wind erosion.

So, the impact on the soil due to the project activity has been considered as **Medium-Low.**

| | | | | | |
|---|---|---|---|---|---|
| Impact | *Impact on Soil due to contamination* | | | | |
| Impact Nature | Direct | Indirect | Induced | | |
| Impact Scale | In and around the project site | | | | |
| Frequency | Limited to construction phase | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans Boundary |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation |

| | | | | | | |
|---|---|---|---|---|---|---|
| Impact Intensity/ Severity | Insignif icant | Low | Medium | High | Very High | |
| Potential for Irreplaceable Loss of Resources | Low | | Medium | High | | |
| Probability of Impact | Unlikel y | Low | Medium | High | Definite | |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider ***Medium-low*** | | | | | |

**Mitigation Measures**

The following steps should be taken to minimize the impact.

- A site-specific Emergency Response Plan will be prepared by the Contractor for soil clean-up and decontamination.
- Design processes to prevent/minimize quantities of wastes generated and hazards associated with the waste generated.
- Minimize the production of waste materials by 3R (Reduce, Recycle and Reuse) approach.
- Training of laborers for waste disposal in designated areas and use of sanitation facilities.
- Fuel, lubricating oil and used oil storage areas will be contained in bunds of 110 percent capacity of the stored material.
- Spill containment and clean up kits will be available onsite and clean-up from any spill will be appropriately contained and disposed of
- Proper storage of the construction materials and wastes to minimize the potential damage or contamination of the materials.
- Construction vehicles and equipment will be serviced regularly and off site.
- Construction vehicles will remain on designated and prepared compacted gravel roads.
- Scheduling activities (as far as possible) to avoid extreme weather.

After taking the proper mitigation measures the impact will be minimized to low from medium low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 | **Magnitude of the Impact** | 8 |
| Probability x Magnitude=16 “Low” .e. natural functions of environment is minimally affected and natural, cultural and social functions will be reveres to their original state with proper mitigation measures | | | |

### 6.3.2.4 Impact due to Noise

During the construction phase of the proposed project existing noise environment in the area is mainly influenced by road network within and around the project area and activities like, transportation of construction materials and equipment’s, unloading of construction materials, wielding and cutting activities, installation of PV panels and operation of heavy vehicles/equipment for construction etc. The social, cultural and religious sites such as schools, madrashas, bazar, mosques, graveyard, temple etc. which are located within 2 Km of the site will also be affected by noise during construction period which are identified as sensitive receptor according to noise pollution rules, 2006.The project site is far from any archeological site (see sec 3.2.2) but there is a close educational site, Madrasah, and some residences. Moreover, national highway with huge traffic volume is situated within the 200 m buffer area of the project site. Hence, it can be said that the project site could not be a potential source of noise. However, some reptiles and mammals, within the project area can potentially be driven away from the site due to the sound levels

Number and types of vehicles/equipment for the construction activities also depends upon the construction methodology for various types of works. However, the vehicles/ equipment's will broadly consist of pile driver, crane, and transport vehicles. Most of these will use diesel engines that generate noise. Other sources of noise pollution are use of hydraulic horns, movement of public vehicles movement and use of generator in the construction site. Some common impacts of noise nuisances include annoyance, sleep disturbance and interference with communication.

So, the significance can be assessed as medium Low.

| | | | | | |
|---|---|---|---|---|---|
| Impact | Noise Pollution due to construction activities | | | | |
| Impact Nature | Direct | Indirect | Induced | | |
| Impact Scale | In and around the project site | | | | |
| Frequency | Limited to construction Phase | | | | |
| Extent and location | Project Site | Local | Regional | National | Trans boundary |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent – Mitigated | Permanent – no |
| Impact Intensity/ severity | Insignificant | Low | Medium | High | Very High |
| Potential for irreplaceable loss of | Low | Medium | High | | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite |
| Impact Significance | Very low | Low | Medium-Low | Medium-high | High | Very High |
| | Significance of impact is considered as medium Low | | | | |

**Mitigation Measures**

Noise level shall be minimized as follows:

- Normal working hours of the contractor will be between 06:00 and 21:00 hours. If work needs to be undertaken outside these hours, it should be limited to activities that do not exceed the noise criteria at nearby noise sensitive receptors.
- Only equipment that is well-maintained will be operated on-site.
- Regular maintenance of equipment such as lubricating moving parts, tightening loose parts and replacing worn out components should be conducted.
- Machinery and construction plant that are used intermittently (e.g. trucks) shall be turned off or throttled down during non-work periods.
- Low noise equipment shall be used as far as practicable.
- The number of equipment operating simultaneously shall be reduced as far as practicable.
- Equipment known to emit noise strongly in one direction should be orientated so that the noise is directed away from nearby NSRs as far as practicable.
- The contractor should consider the noise emission characteristics of equipment when selecting equipment for the project and select the least noisy machine available to perform the specific work (this is a requirement of OSHA 2007).
- The contractor should undertake noise monitoring in accordance with National and International noise standards.

- Mobile noise sources such as cranes, pile driver shall be routed in such a way that there is minimum disturbance to receptors.
- Developer shall instruct their EPC contractor to arrange for inherently quiet construction equipment and machines to maintain the noise level to minimum.
- Restrict the night time vehicle movement through the access road.
- Adopt the vehicle speed (20 km/hr) limit in the access road.
- Rubber padding/noise isolators will be used for construction equipment.
- Temporary noise barriers shall be provided surrounding the high noise generating construction equipment.
- The personnel involved in high noise generating activities shall be provided with personal protective devices to minimize their exposure to high noise levels.

After taking the proper mitigation measures the impact will be minimized to low from medium low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 | **Magnitude of the Impact** | 6 |
| Probability x Magnitude=12 “very Low” . | | | |

#### 6.3.2.5 Impact on Ground Water

The ground water in Bangladesh is polluted largely due to seepage from non-sanitary latrines and runoff agro-chemicals from agricultural field. Project activities have two type impact on groundwater. They are discussed below:

##### 6.3.2.5.1 Impact on groundwater due to contamination

Existing groundwater quality analysis around the project site does not reveal any existing contamination or pollution (see sec 4.5.3.2). Also, it has been informed during consultation with the DPHE personal that iron content in this area ground water is very low. However, ground water at the sites may be polluted due to pillar installation activities, accidental spillage of chemicals and hazardous liquid from working sites and seepage of untreated waste from construction camp. Oils, fuels, and chemicals from the project materials or machinery may leach into the soil, which can leach into the groundwater. The installation of pile can alter the natural flow of groundwater, potentially mobilizing contaminants that were previously immobile. Hazardous liquid from working sites and seepage of untreated waste from construction camp can lead to physical and chemical pollution of the soil and groundwater if materials are not properly contained and disposed of.

The significance of impacts on the groundwater pollution can be assessed as Low.

| **Impact** | *Impact on ground water due to contamination* | | | | |
|---|---|---|---|---|---|
| **Impact Nature** | Direct | Indirect | | Induced | |
| **Impact Scale** | In and around the project site | | | | |
| **Frequency** | Limited to construction Phase | | | | |
| **Extent and location** | Project Site | Local | Regional | National | Trans |
| **Impact Duration** | Short Term | Medium Term | Long-term | Permanent – Mitigated | Permanent – no |
| **Impact Intensity/ severity** | Insignificant | Low | Medium | High | Very High |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Potential for irreplaceable loss of resources** | Low | | Medium | | High | |
| **Probability of Impact** | Unlikely | Low | Medium | High | Definite | |
| **Impact Significance** | Very low | Low | Medium-Low | Medium-high | High | Very High |
| | Significance of impact is considered as Low | | | | | |

***Mitigation Measure:***

The following measures can be taken to minimize impact on ground water during construction phase

- Ensure proper spill control and management at site;
- Designing drainage systems to manage and direct runoff effectively, minimizing the impact on local water bodies.
- Restoring vegetation in cleared areas to improve soil stability and reduce runoff after construction activities are completed. Ensure storage of hazardous material and waste in proper manner and disposed the waste in Hazardous waste Landfill site;
- Monitor groundwater from time to time to detect any contamination.
- Install barriers or liners to prevent the movement of contaminants into the soil and groundwater.

After taking the proper mitigation measures the impact will be minimized to very low from low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 | **Magnitude of the Impact** | 6 |
| Probability x Magnitude=12 “Very Low” | | | |

#### 6.3.2.5.2 Impact on groundwater resources

Water will also be required for the construction, domestic and drinking purposes for the construction workers. Sources of these activities will be the ground water from own borehole. Quantity of the ground water may change due to abstraction of water for construction activity purpose. During construction phase 5000 litr/day water will be required. At present available depth for tubewell is of 200-250 ft (Source: Upazila DPHE). Also its has been noted form the consultation of the DPHE persons that water is always available on that area.

Based on above discussion, impact significance on ground water resources is considered as very low.

| | | | | | |
|---|---|---|---|---|---|
| Impact | *Impact on ground water resources* | | | | |
| Impact Nature | Direct | Indirect | Induced | | |
| Impact Scale | In and around the project site | | | | |
| Frequency | Limited to construction Phase | | | | |
| Extent and location | Project Site | Local | Regional | National | Trans |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent – Mitigated | Permanent – no |

| | | | | | | |
|---|---|---|---|---|---|---|
| Impact Intensity/ severity | Insignificant | Low | Medium | High | Very High | |
| Potential for irreplaceable loss of resources | Low | | Medium | | High | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite | |
| Impact Significance | Very low | Low | Medium-Low | Medium-high | High | Very High |
| | Significance of impact is considered as very Low | | | | | |

### 6.3.2.6 Impact on Surface Water

The nearest surface water body which has flow is almost 1.2 km away from the site. Other than that, inside the power plant boundary and around the site there are some ponds, beels used mainly for agricultural and fish farming activities. Moreover, along the transmission line route there are some ponds situated. These surface water bodies will be polluted due to pillar installation work, stringing of transmission line, construction camp and construction site, and accidental spillage of hazardous liquids into the river.

Dust can be blown from the transportation of construction materials and equipment by road. As a result, this air blown dust can accumulate in the nearest surface water body and increase the TSS. Due to throwing of construction and general wastes, fishes and aquatic wildlife in the nearest water bodies will be affected.

The significance of impacts on the surface water pollution can be assessed as medium Low.

| **Impact** | *Impact on surface water* | | | | |
|---|---|---|---|---|---|
| Impact Nature | Direct | Indirect | Induced | | |
| Impact Scale | in and around the project site | | | | |
| Frequency | Limited to construction Phase | | | | |
| Extent and location | Project Site | Local | Regional | National | Trans boundary |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent – Mitigated | Permanent – no mitigation |
| Impact Intensity/ severity | Insignificant | Low | Medium | High | Very High |
| Potential for irreplaceable loss of resources | Low | Medium | High | | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite |
| Impact Significance | Very low | Low | Medium-Low | Medium-high | High | Very High |
| | Significance of impact is considered as medium Low | | | | | |

***Mitigation Measure:***

– Restrict the civil construction activities during monsoon season;

- Prevent and mitigate spill of paint/fuel within the construction site;
- Oil leakage or spillage will be contained and cleaned up immediately. Waste oil will be collected and stored for recycling or disposal;
- Minimize the generation of oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes). These substances must not enter waterways, or underground water tables;
- Adequate sanitary facilities, i.e. toilets and showers, will be provided for the construction workforce;
- Stockpiles will be protected by plastic sheets and suitably secured against the wind, at the end of each working day if rain is forecasted;
- Create an appropriate drainage channel for storm water and surface water runoff
- Restoring vegetation in cleared areas to improve soil stability and reduce runoff after construction activities are completed.
- Monitoring and maintaining drainage and erosion control measures to ensure they are effective and making adjustments as needed.
- Timely disposal of the construction/chemical/hazardous waste to prevent leaching of any pollutant to the water bodies;

After taking the proper mitigation measures the impact will be minimized to Low from medium Low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 | **Magnitude of the Impact** | 8 |
| Probability x Magnitude=16 “Low” | | | |

#### 6.3.2.7 Impact on Occupational Health and Safety

During the construction phase, health and safety of the workers is a major concern. The workers can face occupational health hazards such as minor or major injuries due to lack of general safety requirements and precautions applicable for the proposed site, malfunctioning equipment, careless use of equipment and vehicles, sharp objects, heavy weight objects, work in a high height and water body etc. Due to the movement of construction vehicles and operation of heavy equipment noise, air and dust pollution will occur. Longtime exposure with the high noise level is hazardous for the construction workers.

Ensuring labor compliance during construction is crucial for maintaining fair labor practices, worker safety, and overall project success. Key areas of focus include working conditions, and the well-being of workers. In case of absence of quality drinking water, sanitation, accommodation, transport facility etc. in the construction camps workers health and safety will be affected.

Uncontrolled vending of food and drinking water on the work site will also pose a risk with respect to the transmission of contagious diseases like typhoid, diarrhea, malaria, dengue, etc. The construction workers will be required to handle hazardous materials for the construction works etc. therefore increasing health risks of workers.

However, based on the matrix below the impact has been considered as **Medium-Low.**

| **Impact** | *Occupational Health and Safety* | | |
|---|---|---|---|
| **Impact Nature** | Direct | Indirect | Induced |
| **Impact Scale** | In project site | | |
| **Frequency** | Limited to construction phase | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Extent and Location** | Project Site | Local | Regional | National | Trans Boundary | |
| **Impact Duration** | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation | |
| **Impact Intensity/ Severity** | Insignificant | Low | Medium | High | Very High | |
| **Potential for Irreplaceable Loss of Resources** | Low | | Medium | | High | |
| **Probability of Impact** | Unlikely | Low | Medium | High | Definite | |
| **Impact Significance** | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider ***Medium-low*** | | | | | |

***Mitigation Measures***

The following mitigation measures should be taken to minimize impact on occupational health and safety.

- The Contractor will prepare and implement a Health and Safety Plan prior to commencing work. This plan will include method statements for working methods, construction sequence and safety arrangements;
- Measures will be implemented to reduce the likelihood and consequence of the following hazards:
    - falling from height;
    - falling into water;
    - entanglement with machinery;
    - tripping over permanent obstacles or temporary obstructions;
    - slipping on greasy or icy walkways;
    - falling objects;
    - asphyxiation;
    - explosion;
    - contact with dangerous substances;
    - electric shock;
    - mistakes in operation;
    - variable weather conditions;
    - lifting excessive weights; and
    - Traffic operations.
- A Permit to Enter system will be established to ensure that only authorized persons gain entry to the site;
- Competent and adequately resources sub-contractors will be used where construction activities are to be sub-contracted;

- All persons working on site will be provided information about risks on Site and arrangements will be made for workers to discuss health and safety with the Contractor.
- All workers will be properly informed, consulted and trained on health and safety issues;
- Personal Protective Equipment (PPE) shall be worn at all times on the Site. This shall include appropriate safety shoes, safety eyewear, and hard hats. Non-slip or studded boots will be worn to minimize the risk of slips;
- Before starting work all the appropriate safety equipment and the first-aid kit will be assembled and checked as being in working order. Breathing apparatus will be tested at regular intervals in the manner specified by the makers;
- All lifting equipment and cranes will be tested and inspected regularly. All hoist ways will be guarded;
- Safety hoops or cages will be provided for ladders with a height in excess of two meters.
- Where sound levels cannot be reduced at the source, suitable hearing protection will be provided when noise levels indicate an Leq of more than 90 dB(A).
- The Contractor shall provide appropriate safety barriers with hazard warning signs attached around all exposed openings and excavations when the work is in progress.
- Labor management plan, contractor and supplier management plan, and workers' accommodation management plan needs to be developed and implemented.

After taking the proper mitigation measures the impact will be minimized to Low from medium Low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 | **Magnitude of the Impact** | 8 |
| Probability x Magnitude=16 Low" | | | |

### 6.3.2.8 Enhancement of Local Economy

During the construction period the local economy will be enhanced by creating opportunities for business enhancement and employment opportunities for the local workforce. Local traders will likely benefit from the implementation of the proposed project. Economic impacts including potential for impacts on direct and indirect employment and additional job opportunities generation, funds for local development will likely occur.

Thus, the impact significance should be considered as low and positive.

| Impact | *Enhancement of Local Economy* | | | | |
|---|---|---|---|---|---|
| Impact Nature | Direct | Indirect | Induced | | |
| Impact Scale | *Around the project area* | | | | |
| Frequency | *Limited to construction phase* | | | | |
| Extent of Affected Stakeholders | Insignificant | Low | Medium | Moderate | High |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High |

| | | | | | | |
|---|---|---|---|---|---|---|
| Potential for Irreplaceability/ Vulnerability | Low | | | Medium | | High |
| Probability of Impact | Unlikely | Low | | Medium | High | Definite |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider *Low (Positive)* | | | | | |

Moreover, to maximize the positive impact,

- labor management plan (hiring of local workers) and local procurement plan needs to be developed and implemented.
- Contractor and supplier management plan should also include provisions on local hiring.
- Moreover, SEP should be implemented to communicate with local communities.

#### 6.3.2.9 Impact on Traffic and Transportation

The main source of road traffic will be vehicles carrying equipment and construction material to the project site.

This project will lead to an increase in traffic volume and vehicle movement on the existing access road and the highway connecting road (see sec 3.2.1). Currently, the access road handles a certain volume of traffic with specific types of vehicles, and the main road has its own capacity. Therefore, the project must emphasize the proper traffic maintenance

During the construction phase, construction materials, equipment, and machinery will be delivered to the site, resulting in increased local traffic. Moreover, stringing of transmission will also increase the traffic as equipment and vehicle will need to be deployed to that certain area for stringing create certain time impact on traffic. The movement of laborers to the site may also contribute to traffic congestion. Though there will be a labor camp beside the site, the local laborers may have to use local transports to come to the site. The movement of laborers to the site may also contribute to traffic congestion as they will use local transport, reducing availability for residents. This rise in traffic on local roads will not only lead to congestion but also increase the likelihood of accidents involving people and domestic animals.

However, the extra traffic load during the construction stage is not too high to impose a high-level impact on the road. Therefore, the impact significance is assessed as **low.**

| | | | | | |
|---|---|---|---|---|---|
| Impact | *Impact on Traffic and Transportation* | | | | |
| Impact Nature | Direct | Indirect | Induced | | |
| Impact Scale | *Within the project area* | | | | |
| Frequency | *Limited to construction phase* | | | | |
| Extent of Affected Stakeholders | Insignificant | Low | Medium | Moderate | High |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High |
| Potential for Irreplaceability/ Vulnerability | Low | | Medium | High | |

| Probability of Impact | Unlikely | Low | Medium | High | Definite |
|---|---|---|---|---|---|
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider *Low* | | | | | |

**Mitigation Measures**

The following steps should be taken to minimize the impact due to increasing road traffic.

- Develop and implement traffic management plan which includes:
  - All vehicles would undergo routine repair and maintenance to keep the vehicle in good operating condition.
  - Drivers and operators would be checked for fitness and any driver/operator impaired due to any reason, including but not confined to the influence of drugs and/or alcohol would not be allowed to drive.
  - A speed limit of 20 km/hr. within the project site area would be followed and the use of mobile phones while driving would be prohibited.
  - Implementation of a safety program (signage, speed restrictions, lights on trucks, truckload restrictions, etc.) within the construction area
  - All drivers shall follow the speed limit, the direction of the signalman, sensitive locations like educational and religious institutions, horn usage restrictions, etc.
  - Appoint traffic personnel at the project entrance.
  - Plan stringing activities during off-peak hours or at night, provide clear signage, and communicate changes to the public in advance.
  - Implement temporary traffic control measures, such as traffic cones and barriers, to safely guide vehicles and optimize traffic flow during the stringing activities.
  - Develop a traffic management plan including the above mitigation measures and maintain it properly.
- The SEP and GRM for the project will be applicable to manage the impacts on traffic as well.

After taking the proper mitigation measures the impact will be minimized to Very Low from Low.

| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 7 (Low) |
|---|---|---|---|
| Probability x Magnitude=14 “Very Low” | | | |

### 6.3.2.10 Local Conflict of Interest

The potential source of impact in terms of labor influx could arise from the increasing of migrant worker and their followers.

Based on the manpower requirement data for the proposed project approximately 100 to 150 number of employments are expected in the construction phase. Both migrants and locals have the potential to be engaged in construction phase activities. Thus, the construction workers from another region of Bangladesh may have conflicts with the local community. For these purposes, they need to hire approximately 30% of local unskilled laborers.

The influx of workers to the community may have an impact on public health, especially an increase in the prevalence of vector borne disease. The influx of migrant laborers during construction can cause a mixing of the migrant workforce with the local people. This mixing of the groups may cause some adverse impacts on public health in the neighboring villages with the potential for the spread of infectious diseases like Acquired Immune Deficiency Syndrome (AIDS)

The extent of affected stakeholder is low. The impact duration of local conflict of interest is medium term and its impact intensity is assessed as medium as well. The probability of this impact is low.

As a result, the impact significance is assessed as **low.**

| | | | | | | |
|---|---|---|---|---|---|---|
| Impact | *Labour Influx and Local Conflict of Interest* | | | | | |
| Impact Nature | Direct | | Indirect | | Induced | |
| Impact Scale | *Within the project area and Local Communities* | | | | | |
| Frequency | *During Construction phase* | | | | | |
| Extent of Affected Stakeholders | Insignificant | Low | Medium | Moderate | High | |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation | |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High | |
| Potential for Irreplaceability/ Vulnerability | Low | | Medium | | High | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite | |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider *Low* | | | | | |

**Mitigation Measures**

The following steps should be taken to minimize anything related to local conflict of interest.

- Job opportunities should be provided in a fair way.
- Clear information about the needs of labor (number and qualification) should be provided with local people ensure no labor will engage any function and any local argument.
- The job skills and the priorities for the affected people shall be taken into account and the workers can be chosen.
- Give priority of local people while recruiting employees for the project.
- Labor and security personnel should be well trained to deal with the community.
- Grievance mechanism and SEP will be applicable for the community.
- The Labor Management Plan (including labor influx management) should be developed and implemented properly.
- A comprehensive workers' accommodation plan should be developed and implemented to ensure proper maintenance of the labor camp.
- A free health checkup and awareness campaign for the community people regarding infectious diseases will be provided by MSEL.

After taking the proper mitigation measures the impact will be minimized to Very Low from Low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 | **Magnitude of the Impact** | 7 |
| Probability x Magnitude=14 “Very Low” | | | |

### 6.3.2.11 Impact Related to Gender Based Violence (GBV)/ Sexual Exploitation, Abuse and Harassment (SEAH)

There is no gender-specific issues observed and expected in the project area. The fact is that the participation of women in society is limited from a social and religious perspective, which has been observed during the field visit and consultation meeting. GBV and SEAH based issues may be raised during construction phase of the project where women worker would work along with male worker. These issues may also arise between women member of local community and migrant workers who would be working during construction phase.

The significance of the impact may be **low.**

| Impact | *Impact on Gender Based Violence* | | | | | |
|---|---|---|---|---|---|---|
| Impact Nature | Direct | | Indirect | | Induced | |
| Impact Scale | *Around Project Site* | | | | | |
| Frequency | *During the all phases of the project* | | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans boundary | |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation | |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High | |
| Potential for Irreplaceability/ Vulnerability | Low | | Medium | | High | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite | |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider *Low* | | | | | |

**Mitigation Measures**

The following steps should be taken to minimize anything related to gender.

- Announce employment opportunities and recruitment notices widely, targeted at women as well as men.
- Technical training can be provided to the local workforce, especially women for inclusion.
- Any grievance related to the GBV will be treated with high priority.
- Conduct regular training sessions for workers and community members to raise awareness about GBVH, its consequences, and the importance of respectful behavior.
- Regularly monitor and evaluate the effectiveness of GBVH prevention measures and make necessary adjustments.
- The Labor Management Plan (including labor influx management) should be developed and implemented properly.
- Grievance mechanism and SEP will be applicable for the female.

After taking the proper mitigation measures the impact will be minimized to Very Low from Low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 7 (Low) |
| Probability x Magnitude=14 "Very Low" | | | |

### 6.3.2.12 Impact on Community Health Safety and Security

Possible sources of impacts on community health and safety during the construction phase are:

- Changes in environmental quality due to construction activities.
- Increased prevalence of disease arising from the influx of construction workers; and
- Heavy traffic movement.

Changes in the environmental quality of air, surface water, groundwater, and soil quality may occur as a result of construction activities. High noise levels are also expected from the operation of heavy machinery. The discharge of domestic waste effluent from sanitary facilities for construction workers may have the potential to cause contamination of surface water and groundwater in this area.

Excessive traffic movement causes the increase of fugitive dust. Moreover, the noise and vibration related to increased traffic movement causes community disturbance.

Measures such as proper collection, storage, and disposal of wastes, and construction of septic tanks to prevent contamination of water resources from sanitary effluents generated from labor camps will be implemented. Thus, activities in construction activities pose low impact on community health and safety.

| | | | | | | |
|---|---|---|---|---|---|---|
| Impact | *Community Health and Safety* | | | | | |
| Impact Nature | Direct | | Indirect | | Induced | |
| Impact Scale | Adjacent Communities and project workers | | | | | |
| Frequency | Limited to construction Phase | | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans Boundary | |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation | |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High | |
| Potential for Irreplaceable Loss of Resources | Low | | Medium | High | | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite | |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider ***Low*** | | | | | |

**Mitigation Measures**

The following mitigation measures will be put in place to reduce impacts on community receptors:

- Barriers will be provided to prevent the ingress of persons into the construction site and also to protect the public from exposure to hazards associated with construction activities.

- Sprinkling of water in dust prone activities like transportation on unmetalled road, digging works, material handling etc. would be taken up.
- Emphasizing safety aspects among drivers, particularly with regard to the speed limit of 20 km/hr that will be enforced.
- Ensuring that only licensed drivers are employed by the Project.
- Avoiding peak hours for heavy vehicle movement where possible.
- Collaboration with local communities and responsible authorities to improve signage (e.g., pedestrian crossings, speed limits, etc.), visibility, and awareness of traffic and pedestrian safety.
- Screening, surveillance, and treatment of workers, through the provision of medical facilities and, where required, immunization programs.
- A free health checkup and awareness campaign for the community people regarding infectious diseases will be provided by MSEL.
- A community Health and Safety Management Plan needs to be developed including all the above measures.
- A security management system will be in place to prevent unauthorized entries into the construction site.

After taking the proper mitigation measures the impact will be minimized to Very Low from Low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 6 (Low) |
| Probability x Magnitude=12 “Very Low” | | | |

#### 6.3.2.13 Impact on Vegetation Types

The construction activities and transportation of equipment, materials and machinery for the Muktagacha Solar Power Project will have several direct and indirect impacts on the vegetation types in the project site and surrounding areas.

The surrounding vegetations both terrestrial and aquatic of the project site are likely to be exposed to impacts due to dust emissions. However, dispersion and deposition of dust particles, as well as impacts on floral species, decrease over the distance considering wind speed, topography and presence of physical barriers. Deposition of dust particles on the plant leaves, twigs and stems may hamper photosynthesis, respiration and other physiological processes of plants. This might decrease plant growth, cause diseases and affect the health of the vegetation adjacent to the project construction sites and approach roads. Heavy machinery used in civil construction and transportation of materials will compact soil, reducing its permeability and negatively affecting root growth for terrestrial plants. Workers might be unaware to destroy plants or plant parts in the surrounding area. However, spread of invasive species might occur after the removal of them in the pre-construction phase.

Considering the project activities and potential biological receptors within the project AoI, the impact on different vegetation types during the construction phase has been considered insignificant and assessed as ***Low***.

| Impact | *Impacts on Vegetation types* | | |
|---|---|---|---|
| Impact Nature | Direct | Indirect | Induced |
| Impact Scale | Limited to project site and its adjacent areas | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | Limited to Construction Phase | | | | | | | | | | |
| Extent and Location | Project Site | | Local | | Regional | | National | | Trans Boundary | | |
| Impact Duration | Short Term | | Medium Term | | Long-term | | Permanent-mitigated | | Permanent-no mitigation | | |
| Impact Intensity/ Severity | Insignificant | | Low | | Medium | | High | | Very High | | |
| Potential for Irreplaceable Loss of Resources | Low | | | | Medium | | | | High | | |
| Probability of Impact | Unlikely | | Low | | Medium | | High | | Definite | | |
| Impact Significance | Very Low | | Low | | Medium-low | | Medium-high | | High | Very High | |
| | Significance of impact consider ***Low*** | | | | | | | | | | |

**Mitigation Measures**

To mitigate the impacts on vegetation types during the construction phase, the following measures should be implemented:

- Mitigation measures for dust generation and dispersion as suggested in section 6.3.2.2 should be followed.
- Regular water spaying should be done in the construction areas and approach roads.
- Workers should be aware of the importance of natural resources and should not unnecessarily clear any area or break branches, twigs, flowers, etc. of adjacent vegetation.
- Implement Invasive Alien Species Management Plan to control the spread of water hyacinth.

After taking the proper mitigation measures the impact will be minimized to Very Low from Low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 7 (Low) |
| Probability x Magnitude=14 “Very Low” | | | |

### 6.3.2.14 Impacts on Wildlife

The construction phase of the Muktagacha Solar Power Project involves numerous activities that can significantly impact the wildlife species in the project site and its Area of Influence (AoI). These activities include establishing labor camps, civil construction, waste handling, transportation, and the installation of infrastructure.

Continuous noise from construction machinery and increased human activity can disturb bird species, leading to stress, displacement, and abandonment of nesting sites. The establishment of labor camps and increased human presence can lead to disturbances, reducing the quality of the habitat for avifauna. Dust and pollutants from construction activities can degrade air and water quality, negatively impacting bird health and reducing the availability of clean water for drinking and bathing. The installation of PV mounting structures and transmission lines increases the risk of bird collisions, which can be fatal for flying birds, particularly during low visibility conditions. The transmission line might have impact on the birds resulting to mortality of them due to electrocution.

Heavy machinery and excavation activities can destroy burrows and hiding spots for amphibians and reptiles, such as the Bengal Monitor and Yellow Monitor. Alteration of wetland areas and ponds can impact amphibian breeding sites and reduce habitat availability.

Leakage of fuels, lubricants, and other chemicals from construction equipment can contaminate soil and water, adversely affecting herpetofauna which are sensitive to pollution. Inappropriate handling and disposal of construction waste can lead to habitat degradation, affecting species that depend on clean and undisturbed environments. Increased vehicular movement during construction can lead to higher mortality rates for amphibians and reptiles crossing roads, especially during breeding migrations.

The construction of infrastructure might create barriers that restrict the movement of mammals, leading to fragmented populations. Continuous noise and increased human activity can disturb mammalian species, causing stress and leading to avoidance of the area. Artificial lighting from construction activities can disrupt nocturnal mammals' natural behavior patterns, affecting their feeding and reproductive activities. Mammals may be injured or killed by construction machinery and vehicles, particularly smaller, less mobile species. Excavations and construction sites can trap mammals, leading to injury or death if they are unable to escape.

During the baseline study, a total of 33 species of birds including threatened bird species, Steppe Eagle (*Aquila nipalensis)* and Indian Spotted Eagle *(Clanga hastata*), five (05) species of amphibians and nine (09) species of reptiles including threatened species, Tricarinate Hill Turtle (*Melanochelys tricarinata*), Indian Flap-shelled Turtle (*Lissemys punctata*) and Yellow Monitor (*Varanus flavescens*), nine (09) terrestrial Mammal including threatened species, Fishing Cat (*Prionailurus viverrinus)* and Capped Langur (*Trachypithecus pileatus*) were recorded from the project area. However, no threatened species was sighted in the project site. FGDs with local people confirmed the presence of the Yellow Monitor in the project area.

Considering these issues, the impact of the construction phase of the solar project on wildlife species is evaluated to be ***Medium-low***.

| Impact | *Impact on Wildlife* | | | | |
|---|---|---|---|---|---|
| Impact Nature | Direct | Indirect | Induced | | |
| Impact Scale | Limited to project site and its adjacent areas | | | | |
| Frequency | Limited to Construction Phase | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans Boundary |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High |
| Potential for Irreplaceable Loss of Resources | Low | | Medium | | High |
| Probability of Impact | Unlikely | Low | Medium | | Definite |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider ***Medium-low*** | | | | |

**Mitigation Measures**

To mitigate the impacts on wildlife species during the construction phase, the following measures should be implemented:

- Implement noise reduction measures as suggested in Section 6.3.2.4.

- Limit construction activities to daylight hours to reduce disturbance to wildlife and ensure the use of lights at night should not disrupt the movement of nocturnal wildlife.
- Ensure all lights are downward-facing, shielded, with low-UV intensity bulbs, and on motion-sensitive switches.
- Add insulating covers to all Project conductors (~8km) near poles and crossarms (including on the temporary construction power supply) to prevent birds from being electrocuted by touching both live and earthed infrastructure
- Conduct regular monitoring of wildlife populations during construction to identify and address emerging impacts.
- Workers should be aware of the importance of natural resources and should not do any harm or death to wildlife.
- Rescue, rehabilitation and relocation should be done for terrestrial fauna when necessary.

After taking the proper mitigation measures the impact will be minimized to medium Low from Low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 12 (Medium high) |
| Probability x Magnitude=24 “Low” | | | |

#### 6.3.2.15 Impacts on Fisheries Resources

The construction phase activities for the Muktagacha Solar Power Project, including establishment of labor camps, civil construction, waste handling and disposal, transportation of materials, and installation of infrastructure, will have several potential impacts on the fisheries resources in the project site and surrounding areas.

Civil construction activities, including PV mounting and foundation excavation, will physically disturb the beels and ponds. This can lead to the destruction of critical fish habitats, including breeding and feeding grounds for both captured and cultured fish species. Removal of aquatic and riparian vegetation to make way for infrastructure will result in habitat loss for species like Punti (*Puntius chola*), Baila (*Awaous guamensis*), and Taki (*Channa punctatus*), which rely on these plants for shelter and spawning.

Construction activities will increase soil erosion and sediment runoff into adjacent water bodies, raising turbidity levels and negatively affecting fish health and habitats. Increased sedimentation can smother fish eggs and reduce the availability of light for photosynthetic aquatic plants.

Handling and disposal of construction waste, generation of wastewater, and maintenance of vehicles and equipment can introduce pollutants such as oils, grease, and chemicals into the water. These pollutants can degrade water quality and be toxic to fish, affecting species like Mola (*Amblypharyngodon mola*) and Koi (*Anabas testudineus*). Excavation and installation of infrastructure can disrupt natural water flow patterns in beels and ponds. Altered hydrology can affect fish spawning cycles and access to feeding areas, particularly during the monsoon season when species like Shol (*Channa striatas*) and Baim (*Mastacembalus* spp.) are more active.

The noise and vibration from heavy machinery and construction activities can disturb fish behavior and physiology. Continuous exposure to high noise levels can cause stress and displace fish from their habitats. Habitat destruction and water quality degradation can reduce reproductive success and larval survival rates, leading to long-term declines in fish populations. This is particularly critical for native species like Gutum (*Lepidocephalichthys guntea*). Fish may move away from disturbed areas, leading to decreased local fish density and potentially impacting the local fishery economy.

The decline in fish population and diversity can reduce the catch for local fishermen, impacting their livelihoods. The availability of commercially important fish species in the market may decrease, affecting local food security and income. Reduced fish availability in the project area

may push local fishermen to overexploit other nearby water bodies, leading to broader ecological impacts.

Considering these issues, the impact of the construction phase of the Project on fisheries resources is evaluated to be ***Low***.

| Impact | *Impacts on Fisheries Resources* | | | | | |
|---|---|---|---|---|---|---|
| Impact Nature | Direct | | Indirect | | Induced | |
| Impact Scale | Limited to project site and its adjacent areas | | | | | |
| Frequency | Limited to construction phase | | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans Boundary | |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation | |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High | |
| Potential for Irreplaceable Loss of Resources | Low | | Medium | | High | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite | |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider ***Low*** | | | | | |

**Mitigation Measures**

To minimize these impacts on fisheries resources, the following mitigation measures should be implemented during the construction phase:

- Limit construction activities to designated areas and avoid critical fish habitats as much as possible.
- Use protective measures, such as silt fences and sediment traps, to minimize sediment runoff into water bodies.
- Implement best practices for waste management to prevent pollutants from entering the water. This includes proper storage, handling, and disposal of hazardous materials.
- Treat construction wastewater before discharge to ensure it meets environmental quality standards.
- Design construction activities to maintain natural water flow patterns in beels and ponds.
- Implement hydrological monitoring to ensure water flow is not significantly altered.
- Use noise-reducing construction techniques and equipment where possible.
- Schedule high-noise activities during periods of low fish activity to minimize disturbance.
- Restore disturbed habitats after construction is completed. This can include replanting native vegetation and rehabilitating ponds and beels.
- Develop and implement a fish habitat enhancement plan to support the recovery of fish populations.
- Establish a monitoring program to track the impacts of construction activities on fish populations and water quality.

After taking the proper mitigation measures the impact will be minimized to Very Low from Low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 7 (Low) |
| Probability x Magnitude=14 "Very Low" | | | |

## 6.3.3 Impacts during Operation Phase

### 6.3.3.1 Impact on Visual Amenity

***Impact Significance***

A total 46452 modules will be setup in the proposed project area so the presence of a large area of PV panels is expected to constitute a risk for glare since it is situated near a residence. Besides the transmission line, lighting in the project area and building structure also sources of visual impact.

Thus, the significance of impact is assessed as low.

| **Impact** | *Impacts on Visual Amenity* | | | | | |
|---|---|---|---|---|---|---|
| **Impact Nature** | Direct | | Indirect | | Induced | |
| **Impact Scale** | In and around the project site | | | | | |
| **Frequency** | Limited to project duration phase | | | | | |
| **Extent and Location** | Project Site | Local | Regional | National | Trans Boundary | |
| **Impact Duration** | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation | |
| **Impact Intensity/ Severity** | Insignificant | Low | Medium | High | Very High | |
| **Potential for Irreplaceable Loss of Resources** | Low | | Medium | | High | |
| **Probability of Impact** | Unlikely | Low | Medium | High | Definite | |
| **Impact Significance** | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider ***Low*** | | | | | |

***Mitigation Measures***

The following mitigation measures will be implemented during operation phase:

- The panels will be arranged in a systematic manner which will give an aesthetic sense to it.
- The proposed project would include a boundary wall around the perimeter of the project to further obscure the peripheral view of the project and any indirect reflection. Impacts from glare would be minor.
- The substations, gatehouses and maintenance and storage buildings will be grouped as far as possible to avoid the scatter of buildings in the open landscape.
- The color of the solar array structures, such as the supports and the rear of the panels, will be carefully selected, and to be in the dark grey or green range, to minimize visibility and avoid reflectivity.
- All lighting will be kept to a minimum within the requirement
- Where such lighting is deemed necessary, low-level lighting, which is shielded to reduce light spillage and pollution, will be used.

- No naked light sources will be directly visible from a distance. Only reflected light will be visible from outside the Site.
- External lighting will use down-lighters shielded in such a way as to minimize light spillage and pollution beyond the extent of the area that needs to be lit.

After taking the proper mitigation measures the impact will be minimized to very low from low.

| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 7 (Low) |
|---|---|---|---|
| Probability x Magnitude=14 "Very Low" | | | |

### 6.3.3.2 Impact on Air Quality

Few sources in the project site that will emit pollutants into air. They are:

- Emission from vehicles
- Emission from diesel generator (use when solar light energy decreases)

No emissions are expected to be released during the operation phase, due to the fact that solar PV plants do not release greenhouse gases or pollutants during their operation as solar do not involve combustion processes. Dust will be generated during the movement of the vehicle during maintenance of power plant and transmission line which is very limited scale. Limited exhaust will be emitted from the vehicle during the operation phase.

Transmission and distribution lead to some losses in electricity as it moves from the point of generation to the end-user. These losses are collectively referred to as "line loss." In general, the longer the distance the electricity must travel from generation to consumer, the larger the line loss. Energy losses during transmission cause indirect carbon emissions and air pollution in power generation plants which vary with the type of primary energy source.

Therefore, the impact of dust and emissions generated during the operation phase is considered as very low.

| Impact | *Impact on air quality* | | | | | |
|---|---|---|---|---|---|---|
| Impact Nature | Direct | | Indirect | | Induced | |
| Impact Scale | In and around project site | | | | | |
| Frequency | Limited to operation Phase | | | | | |
| Extent and location | Project Site | Local | Regional | National | Trans boundary | |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent – Mitigated | Permanent – no | |
| Impact Intensity/ severity | Insignificant | Low | Medium | High | Very High | |
| Potential for irreplaceable loss of | Low | | Medium | | High | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite | |
| Impact Significance | Very low | Low | Medium-Low | Medium-high | High | Very High |
| | Significance of impact consider Low | | | | | |

***Mitigation Measures***

The following mitigation measures should be taken to control air quality around the project site

- Vehicles traveling on gravel roads should not exceed a speed of 20 km/hr

- Regular water spray is required on unpaved road as the dust not move during heavy wind
- Use clean fuel in vehicle as the exhaust emission will be low

After taking the proper mitigation measures the impact will be minimized to very low from low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 6 (Low) |
| Probability x Magnitude=14 "Very Low" | | | |

#### 6.3.3.3 Impact on Soil Quality

The following activities will lead to an impact on soil quality:

- Soil impacts during operation phase are limited to accidental spillage of lubricant, fuel and other chemicals that may potentially cause soil degradation.
- Another most significant source of soil pollution is the damage of battery and PV panels in case of major accidents. These contain chemicals and may be harmful for soil quality.
- Routine maintenance activities /any unscheduled maintenance at PV module or transmission line;
- Material handling and storage
- Maintenance activity generating hazardous and non-hazardous wastes
- Wastewater from PV module cleaning
- The defunct / damaged photovoltaic cells will also be generated;
- Domestic liquid and solid waste

During operation phase, the waste generated from the project will include domestic solid waste at SCADA building, substation, and hazardous waste like waste oil and lubricants and oil containing jute and rags will be generated during maintenance activities. Operation of solar photovoltaic panels for power generation will not have a direct impact on soil. But long run it may have effect on soil fertility. Solar panels can create shaded areas that reduce the amount of sunlight reaching the ground. This can affect the growth of vegetation beneath the panels, potentially altering the local ecosystem and soil quality over time. The quantity of hazardous waste generated will be much lesser quantity during the operations phase. The PV module will be set on a fixed tilled angle and no tracking system will be used so no gear oil/hydraulic oil shall be required for the purpose. As the waste will be generated fewer amounts so the impact has been assessed as Low.

| | | | | | | |
|---|---|---|---|---|---|---|
| Impact | *Impact on soil due to improper waste disposal (hazardous and non-hazardous)* | | | | | |
| Impact Nature | Direct | | Indirect | | Induced | |
| Impact Scale | Within the project site | | | | | |
| Frequency | Operation phase | | | | | |
| Extent and location | Project Site | Local | Regional | National | Trans boundary | |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent – Mitigated | Permanent – no mitigation | |
| Impact Intensity/ severity | Insignificant | Low | Medium | High | Very High | |
| Potential for | Low | | Medium | | High | |

| Probability of Impact | Unlikely | Low | Medium | High | Definite |
|---|---|---|---|---|---|
| Impact Significance | Very low | Low | Medium-Low | Medium-high | High | Very High |
| | Significance of impact is considered as Low | | | | | |

***Mitigation Measures***

The following mitigation measures will be undertaken:

- The hazardous wastes will be stored onsite at separate designated covered area provided with impervious flooring and send for disposal to nearest designated dumping site.
- The proponent should make a MoU with the local municipality to collect the daily domestic for disposing of in the designated dumping site.
- Ensure oil/ lubricants are stored on impervious floor in the storage area having secondary containment.
- Use of spill control kits to contain and clean small spills and leaks during O&M activities.
- The guidelines and procedures shall be prepared and followed for immediate clean-up actions following any spillages.
- Establishing proper monitoring of the soil parameter to at regular interval to identify any deviation in the soil properties.
- When laying high voltage cables, utilize best available technology to keep warming at a low level.

After taking the proper mitigation measures the impact will be minimized to very low from low.

| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 7 (Low) |
|---|---|---|---|
| Probability x Magnitude=14 “Very Low” | | | |

### 6.3.3.4 Impact on Noise Level

The project is not considered to exhibit any significant noisy operations from the solar power plant although the power plant facility’s inverters and transformers may produce noise, but this is not considered a serious issue, since they will not generate any significant noise. During maintenance work at transmission line, vehicles will be needed. Noise may generate from their horn or movement, however, this is insignificant. In addition, there are some close by sensitive receptors such as a school and some residential dwellings within the project site. In addition, noise generated from inverters is only heard when distance is close (i.e. within 1 - 2 m, however, as distance increases, noise will be greatly reduced, not to mention that they do not generate noise during night time. The most significant noise source of this solar power plant is from the backup diesel generator. The diesel generator will create discomfort sound level around the project area which may affect to the surrounding inhabitants. Photovoltaic (PV) systems make no noise and cause no pollution in operation. Solar energy is clean, silent, and freely available.

| Impact | *Impact on Noise Level during operation phase* | | |
|---|---|---|---|
| Impact Nature | Direct | Indirect | Induced |
| Impact Scale | In and around project site | | |
| Frequency | Limited to operation phase | | |

| | | | | | |
|---|---|---|---|---|---|
| Extent and location | Project Site | Local | Regional | National | Trans boundary |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent – Mitigated | Permanent – no |
| Impact Intensity/ severity | Insignificant | Low | Medium | High | Very High |
| Potential for irreplaceable loss of | Low | | Medium | | High |
| Probability of Impact | Unlikely | Low | Medium | High | Definite |
| Impact Significance | Very low | Low | Medium-Low | Medium-high | High | Very High |
| | Significance of impact consider very Low | | | | | |

***Mitigation Measures***

These noise impacts are not considered to significantly harm animals nor cause impacts on a population level. However, the noise from diesel generator needs to take action for mitigation. The project proponent should establish the generator inside an insulated room to keep the environment free from sound pollution. Noise barrier should also be given around the generator room as a mitigation measure from noise pollution. The increased noise levels are considered occupational noises that require occupational health and safety measures. The worker inside the project area should use earmuffs during the operation of diesel generator.

### 6.3.3.5 Impact on Water Resources

The potential sources of impact on surface and ground water resources during the operational phase are:

- Water use for PV module cleaning;
- Water Consumption for domestic use;
- Spillage of Chemicals
- Possibility of groundwater level reduction due to compacted soil and covered by PV module;
- Surface water pollution due to the surface runoff from nearest water body
- The abstraction of ground water for plant operation and drinking purposes for the employees of the power plant.

#### *A. Impact due to Groundwater Abstraction*

The power plant will utilize deep tube well water for plant operation. At least 16000 liters of waters will be required for operation and maintenance purposes daily. The project site is surrounded by school, madrsha and residence. They are also dependent on the ground water for daily activities purpose like drinking, washing and bathing. So, usage of this large amount of ground water may have impact on surrounding users and ultimately on grown water table. The overall significance is therefore assessed as Medium low.

| | | | | | |
|---|---|---|---|---|---|
| Impact | *Impacts on ground water abstraction* | | | | |
| Impact Nature | Direct | Indirect | Induced | | |
| Impact Scale | In and around the project site | | | | |
| Frequency | Limited to operation phase | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans Boundary |

| | | | | | | |
|---|---|---|---|---|---|---|
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation | |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High | |
| Potential for Irreplaceable Loss of Resources | Low | | Medium | High | | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite | |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider ***Medium-low*** | | | | | |

### *B. Impact on surface water*

The surface water bodies may get polluted due to uncontrolled release of contaminated stormwater/runoff from plant area. The pollutants associated with the plant activities include, hydrocarbons form vehicles oil, fuel, from plant chemicals such as batteries etc. Also, PV module water can wash out to the nearest water body. Surface water may get polluted due to contaminated runoff chemical materials. The significance of impact is calculated as very low.

| | | | | | |
|---|---|---|---|---|---|
| Impact | *Impact on surface quality due to contamination* | | | | |
| Impact Nature | Direct | Indirect | Induced | | |
| Impact Scale | In and around the project site | | | | |
| Frequency | Limited to operational phase | | | | |
| Extent and location | Project Site | Local | Regional | National | Trans boundary |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent – Mitigated | Permanent – no mitigation |
| Impact Intensity/ severity | Insignificant | Low | Medium | High | Very High |
| Potential for irreplaceable loss of resources | Low | | Medium | High | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite |
| Impact Significance | Very low | Low | Medium-Low | Medium-high | High | Very High |
| | Significance of impact is considered as very Low | | | | | |

***Mitigation Measures***

The following mitigation measures are proposed to attenuate water quality related impacts:

- Prior to operation, an emergency response plan for spills of hazardous materials and oil will be prepared.
- The surface water quality monitoring will also be carried out at defined intervals and for environmental quality monitoring parameters suggested in the Environmental Monitoring Plan. If these parameters are above the prescribed limits, suitable control measures will be taken;

- Groundwater quality monitoring and level will be carried out as per schedule suggested in the Environmental Monitoring Plan.
- Conduct groundwater assessment on availability.
- Maintain records of daily water usage.
- Conduct regular inspections to identify and promptly address water leaks, preventing unnecessary wastage.
- Maximize recycling and reuse of water wherever feasible.
- Sanitary effluent should be deposit in septic tank;
- Create an appropriate drainage channel for storm water and surface water runoff.

After taking the proper mitigation measures the impact on groundwater resources will be minimized to low from very low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 8 (Low) |
| Probability x Magnitude=16 “Low” | | | |

#### 6.3.3.6 Impact on Occupational Health and Safety

There are many hazards associated with a solar PV power plant if sufficient precautions are not taken during the operation stages. The impact origins are in the following sectors….

- Accidents during replacement of components/parts
- Entering of lead (Pb) into human body from lead-acid battery
- Acid hazard during battery handling
- Leaching of materials from broken or fire damaged PV modules
- Emergency Fire Hazard
- Electrocution of workers
- Electromagnetic radiation from PV modules and Transmission Line
- Working at heights during maintenance of Transmission Line
- Exposure to extreme weather condition as outdoor work exposes to heat stress, wind, rain, and lightning.

***Accidents during maintenance work***

The potential occupational safety and health risks include injuries to workers from routine monitoring and maintenance activities (vehicle accidents, replacement of components/parts, etc.) and emergencies such as equipment malfunction, fires, etc.

***Entering of lead into human body from lead-acid battery:***

Lead can enter body in two ways: by breathing or by swallowing it. Lead Sulfide dust enters the body through breathing. Very fine lead particles may penetrate into the lungs result in absorption in the bloodstream. In addition, there is an impending threat for the workers due to the inhalation of lead fumes. Long exposure to lead pollution results in the adverse impact in nervous system and causes headaches, dizziness, irritability, memory problems, and disturbance in sleep. It can affect the digestive system and cause nausea, vomiting, constipation, appetite loss, and abdominal pain. Lead also affects formation of blood and can result in anemia. Too much lead can also cause

miscarriages and stillbirths when pregnant women are exposed to lead. In men, the sperm can be affected, and this may result in infertility.

***Acid hazard during battery handling:***

The potential risk of workers being damaged by acid who are handling lead-acid battery is apparent. Proponent will not store any acid in the project site as the batteries will need only to be refilled with water sometimes. However, acid spilling during watering process or acid splash on to the workers body is not deniable.

***Leaching of materials from broken or fire damaged PV modules***

The potential for chemical releases appears to be small since the chemicals are present in the sealed PV modules when completed installations of photovoltaic systems for power generation. Releases are likely to occur only due to fires or other unusual accidents. Cadmium could be a potential concern in this setting with thin-film technologies, as would arsenic and zinc to a lesser extent. Other chemicals that have inhalation toxicity factors are present only during the manufacturing process. Solar PV modules may contain heavy metals like lead, mercury, cadmium, chromium, polybrominated biphenyls (PBBs), or brominated diphenyl ethers (PBDEs) etc. Leaching of metals from the installed modules is not likely to be a concern, as documented in a study by Steinberger (1998). Leaching from small cells used in electronic devices is also unlikely to be a concern, given the small amounts of chemicals present and the sealed nature of the devices.

***Emergency Fire Hazard:***

Since this is a solar PV and wind hybrid power plant, the plant has always some risks of fire hazards. Electrical equipment is the main source of a potential fire hazard. In the event of fire catching a solar module, it is theoretically possible for hazardous fumes to be released and inhalation of these fumes could pose a risk to human health. However, researchers do not generally believe these risks to be substantial given the short duration of fires and the relatively high melting point of the materials present in the solar modules. Moreover, the risk of fire at ground-mounted solar installations is remote because of the precautions are taken during site preparation including the removal of fuels and the lack of burnable materials mostly glass and aluminum contained in a solar panel.

***Electrocution of Workers***

Risk of electrocution of workers during performing duties in a power plant and transmission line is always present. Faulty electrical equipment, electric short circuits, exposed electrical wires may be the chief sources of electrocution. Damaged PV modules with exposed high voltage conductor also present high risk of electrocution. Direct contact with live wires can cause severe injury or death. Proper insulation, grounding, and protective equipment are essential.

***Electromagnetic radiation from PV modules and Transmission Line:***

The strength of electromagnetic fields produced by photovoltaic systems do not approach levels considered harmful to human health established by the International Commission on Non-Ionizing Radiation Protection. Moreover, the small electromagnetic fields produced by photovoltaic systems rapidly diminish with distance and would be indistinguishable from normal background levels within several yards.

Transmission line: Electric filed Generated by the voltage in the power lines, these fields are always present even when no current is flowing. They decrease rapidly with distance from the source and can be shielded by buildings and other structures.

***Working at heights during maintenance of Transmission Line***

Maintenance and inspection of transmission towers require climbing, increasing the risk of falls. Inadequate fall protection systems or failure to use proper safety gear can lead to serious injuries.

***Exposure to extreme weather condition***

Outdoor work exposes workers to temperature extremes causing heart stress, wind, rain, and lightning. Severe weather can increase the risk of accidents and adversely affect workers' health.

As the abovementioned impact may happen during the operation phase but the probability of the impact occurrence is Medium. The impact may cause serious damage if the proper mitigation measures do not take properly.

So the impact on health and safety during operation phase has been assessed as medium Low.

| Impact | *Impact on health and safety during operation phase* | | | | | |
|---|---|---|---|---|---|---|
| Impact Nature | Direct | | Indirect | | Induced | |
| Impact Scale | Power plant operations and maintenance workers | | | | | |
| Frequency | Operation phase | | | | | |
| Extent and location | Project Site | Local | Regional | National | Trans boundary | |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent – Mitigated | Permanent – no mitigation | |
| Impact Intensity/ severity | Insignificant | Low | Medium | High | Very High | |
| Potential for irreplaceable loss of resources | Low | | Medium | | High | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite | |
| Impact Significance | Very low | Low | Medium-Low | Medium-high | High | Very High |
| | Significance of impact is considered as medium Low | | | | | |

***Mitigation Measures***

The following mitigation measures will be taken to minimize the health impact during operation phase:

- Workers handling electricity and related components will be provided with shock resistant gloves, shoes and other protective gears.
- Adequate training regarding health and safety will be provided to the workers.
- A health, safety, and environment (HSE) management system will be developed, rolled out and implemented. This system which will be reviewed annually or after a major accident or incident. This will include method statements for working methods, work sequence and safety arrangements.
- Measures will be implemented to reduce the likelihood and consequence of the following hazards:
    - falling from height;

- entanglement with machinery;
- tripping over permanent obstacles or temporary obstructions;
- falling objects;
- electric shock;
- mistakes in operation;
- variable weather conditions;
- lifting excessive weights; and
- Traffic operations.

- A Permit to Enter system will be developed.
- The switchyard building will be provided with fire extinguishers and sand buckets at all strategic locations to deal with any incident of fire.
- Safety incidents will be recorded and monitored with an aim that numbers are never significant, and gradually reduce.
- Workers at site handling broken solar panels shall be provided with adequate PPEs (safety gear, goggles, and gloves).
- The workers at the site are also on regular basis shall be appraised about the potential health risks associated with the handling of solar panels.
- Ensure use of safety belt and need for safety net as required.
- All work at height to be undertaken during daytime with sufficient sunlight except emergency (with proper illumination arrangement);
- Fixtures shall be installed on tower components to facilitate the use of fall protection systems.
- Only workers trained in climbing techniques and use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment shall be engaged for work at height.
- Adequate training regarding health and safety will be provided to the workers.
- Access to areas containing exposed electrical equipment (such as transformers) shall be fenced and locked. Warning signs shall be posted at hazardous locations.
- Firefighting equipment such as fire extinguishers and sand buckets shall be provided at appropriate locations.
- Employees involved in electrical works shall be trained in and familiar with the safety-related work practices, safety procedures, and other safety requirements that pertain to their respective job assignments.
- First aid box/ arrangement to be ensured.
- Labor management plan, contractor and supplier management plan, and workers' accommodation management plan needs to be developed and implemented.

After taking the proper mitigation measures the impact will be minimized to low from medium low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 8 (Medium Low) |
| Probability x Magnitude=16 "Low" | | | |

### 6.3.3.7 Gender Based Violence (GBV)/ Sexual Exploitation, Abuse and Harassment (SEAH)

No gender-specific issues are observed and expected in the project area. The fact is that the participation of women in society is limited from a social and religious perspective, which has been observed during the field visit and consultation meeting. However, during the operation phase, female labor from technical and non-technical aspects will be engaged within the project location. Thus, the overall impact significance of Gender during the operation phase of the plant will be **Low.**

| Impact | *Impact on Gender Based Violence* | | | | | |
|---|---|---|---|---|---|---|
| Impact Nature | Direct | | Indirect | | Induced | |
| Impact Scale | *Around Project Site* | | | | | |
| Frequency | *During the all phases of the project* | | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans boundary | |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation | |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High | |
| Potential for Irreplaceability/ Vulnerability | Low | | Medium | High | | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite | |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider *Low* | | | | | |

**Mitigation Measures**

The following steps should be taken to minimize anything related to gender.

- Project will ensure no gender-based violence will occur due to the project.
- Women will be heard if any issue raised by them and will be mitigated with high priority.
- Announce employment opportunities and recruitment notices widely, targeted at women as well as men.
- Technical training can be provided to the local workforce, especially women for inclusion in the operation and maintenance phase.
- Conduct regular training sessions for workers and community members to raise awareness about GBVH, its consequences, and the importance of respectful behavior.
- Regularly monitor and evaluate the effectiveness of GBVH prevention measures and make necessary adjustments.
- The Labor Management Plan (including labor influx management) should be developed and implemented properly.
- Grievance mechanism and SEP will be applicable for the female

After taking the proper mitigation measures the impact will be minimized to Very Low from Low.

| **Probability of Impact** | 2 | **Magnitude of the Impact** | 7 |
|---|---|---|---|
| Probability x Magnitude=14 “Very Low” | | | |

### 6.3.3.8 Labor Influx

The operation stage will involve the labor of unskilled, semi-skilled, skilled, and highly skilled type. However, it is envisioned that outsourced personnel will comprise mostly of skilled laborers and workers. During the project operation period around 40 to 50 technical and non-technical people will be engaged. If local workers can be tapped for unskilled work, then there will be less influx of labor. Therefore, the anticipated impact is calculated as very low in this case. Thus, the overall impact significance of labor influx during the construction phase of the plant will be **Low.**

| Impact | *Labor Influx* | | | | | |
|---|---|---|---|---|---|---|
| Impact Nature | Direct | | Indirect | | Induced | |
| Impact Scale | *In and around the project area* | | | | | |
| Frequency | *Limited to operation phase* | | | | | |
| Extent of Affected Stakeholders | Insignificant | Low | Medium | Moderate | High | |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation | |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High | |
| Potential for Irreplaceability/ Vulnerability | Low | | Medium | | High | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite | |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider *Low* | | | | | |

**Mitigation Measure**

The following mitigation measures should be taken to minimize the impact created due to labor influx.

- Prevention of excessive movement within the locality for workers.
- Proper safety protocol should be taken under the labor management plan by MSEL.
- Alert the migrant workers regarding GBV, local harmony and other socio-cultural aspects to avoid any kind of collision between labor and local people.
- Promoting collaboration with local authorities to enhance access of workers for their basic necessary that can be collected from the locality.
- Promoting use of local goods and other material to make a balance between workers and local people.
- The Labor Management Plan (including labor influx management) should be developed and implemented properly.
- A comprehensive workers' accommodation plan should be developed and implemented to ensure proper maintenance of the labor camp.

After taking the proper mitigation measures the impact will be minimized to Very Low from Low.

| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 6 (Low) |
|---|---|---|---|
| Probability x Magnitude=12 “Very Low” | | | |

### 6.3.3.9 Enhancement of Local Economy

During operations, limited outsiders are expected to come to the project site. But it will enhance our economy through supplying unskilled labor for maintenance, establishing canteens or shops for limited number of workers and enhancing other potential livelihood activities.

Thus, a simple backward community may be transformed into a semi-urban complex within a short time frame. Such impacts are inevitable, that could also be felt in case of the proposed project; however, these would be attempted to be controlled and minimized by ensuring suitable human management, stable working conditions, security, and the provision of adequate compensation. Thus, this impact should be considered as Low and Positive for the operation phase of the proposed project.

| Impact | *Enhancement of Local Economy* | | | | |
|---|---|---|---|---|---|
| Impact Nature | Direct | Indirect | Induced | | |
| Impact Scale | *Around the project area* | | | | |
| Frequency | *Limited to construction phase* | | | | |
| Extent of Affected Stakeholders | Insignificant | Low | Medium | Moderate | High |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High |
| Potential for Irreplaceability/ Vulnerability | Low | | Medium | High | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider *Low (Positive)* | | | | |

### 6.3.3.10 Impacts on Wildlife

The operation phase of the Muktagacha Solar Power Project involves various activities that can affect the wildlife species in the project site and its Area of Influence (AoI). These activities include power generation, water use for cleaning solar panels, waste handling, transportation, and maintenance. The impacts on avifauna, herpetofauna, and mammals are discussed below:

Excessive water use can lead to reduced water availability in wetland areas, affecting amphibian breeding sites and habitat quality. Runoff from cleaning activities can introduce pollutants into wetlands, degrading habitats for amphibians and reptiles. Continuous noise and human presence during operation and maintenance can disturb herpetofauna, causing stress and displacement. Spills of cleaning agents and hazardous materials can contaminate soil and water, adversely affecting amphibians and reptiles sensitive to pollutants. Improper disposal of waste can lead to habitat degradation, impacting species that rely on clean and undisturbed environments.

The presence of solar panels and infrastructure can alter the landscape, reducing available habitat for mammals such as the Fishing Cat (Endangered nationally and Vulnerable globally). Infrastructure can create barriers that restrict mammalian movement, leading to habitat fragmentation and reduced genetic diversity. Regular maintenance can disturb mammals, causing

stress and displacement, particularly for nocturnal species. Higher levels of human activity and vehicle movement can lead to avoidance behavior in mammals. The use of water for cleaning and potential chemical runoff can degrade water sources relied upon by mammals for drinking and foraging. Improper management of waste can lead to habitat degradation, impacting mammalian health and habitat quality. Higher levels of traffic during operation can increase the risk of road mortality for mammals, particularly those that move between fragmented habitats.

No potential visual disturbance to birds is expected given the fact, and as a result, there is no migratory birds fly way over the project area.

Considering the project activities and potential biological receptors within the project AoI, the impact on wildlife species during the operation phase might be less significant and assessed as ***Low***.

| Impact | *Impacts on Wildlife* | | | | | |
|---|---|---|---|---|---|---|
| Impact Nature | Direct | | Indirect | | Induced | |
| Impact Scale | Limited to project site and its adjacent areas | | | | | |
| Frequency | Limited to Operation Phase | | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans Boundary | |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation | |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High | |
| Potential for Irreplaceable Loss of Resources | Low | | Medium | High | | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite | |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider ***Low*** | | | | | |

**Mitigation Measures**

To mitigate the impacts on wildlife species during the operation phase, the following measures should be implemented:

- Use biodegradable and non-toxic cleaning agents to prevent water and soil contamination.
- Implement stringent waste management practices to ensure proper disposal and recycling of waste materials.
- Install proper drainage systems to manage runoff if water is used for cleaning of solar panels and prevent contamination of wetlands and water bodies.
- Ensure all lights are downward-facing, shielded, with low-UV intensity bulbs, and on motion-sensitive switches.
- Conduct regular monitoring of wildlife populations and habitats to identify and address emerging impacts.
- Adjust operational practices based on monitoring results to continuously improve mitigation efforts.
- Educate operational staff and local communities about the importance of wildlife conservation and the need to minimize disturbances.
- Rescue, rehabilitation and relocation should be done for terrestrial fauna when necessary.

After taking the proper mitigation measures the impact will be low with necessary acceptable mitigation measures.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 10 (Medium Low) |
| Probability x Magnitude=20 "Low" | | | |

### 6.3.3.11 Impacts on Fisheries Resources

The operation phase activities of the Muktagacha Solar Power Project can have various impacts on fish resources found within the project site and its Area of Influence (AoI). These impacts arise from activities such as power generation, water usage, waste handling, and transportation.

The demand for water to clean solar panels can affect the water levels in beels and ponds within the project site, potentially disrupting the habitat of fish species. Lower water levels may reduce available habitat and impact spawning and breeding grounds. Runoff from the project site, including from cleaning activities and waste disposal areas, can carry sediment and pollutants into nearby water bodies, impacting water quality and aquatic habitats. Sedimentation can smother fish eggs and larvae, affecting their survival rates.

Improper handling and disposal of hazardous materials can lead to chemical contamination of water bodies, affecting fish health and biodiversity. Chemical pollutants can bioaccumulate in fish tissues, posing risks to both aquatic ecosystems and human consumers. Runoff from waste storage areas can introduce excess nutrients into water bodies, leading to eutrophication. Elevated nutrient levels can promote algal blooms, which can deplete oxygen levels in water, suffocating fish and other aquatic organisms.

Construction activities and infrastructure installation can lead to the loss of fish habitat, particularly in beel areas modified into ponds for fish farming purposes. Displacement from habitat loss can reduce fish populations and biodiversity. Fish may be accidentally killed during construction and maintenance activities, such as dredging, excavation, and transportation. Direct physical harm from machinery or vehicle collisions can result in fish mortality. Fragmentation of habitat can disrupt seasonal movements and breeding migrations.

Project-related activities, such as transportation and trade, can inadvertently introduce invasive fish species into local water bodies. Invasive species may outcompete native fish for resources, leading to declines in native fish populations and altering ecosystem dynamics.

| Impact | *Impacts on Fisheries Resources* | | | | |
|---|---|---|---|---|---|
| Impact Nature | Direct | Indirect | Induced | | |
| Impact Scale | Limited to project site | | | | |
| Frequency | Limited to Operation Phase | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans Boundary |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High |
| Potential for Irreplaceable Loss of Resources | Low | | Medium | High | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite |

| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
|---|---|---|---|---|---|---|
| | Significance of impact consider ***Low*** | | | | | |

**Mitigation Measures**

To mitigate the impacts on fish resources during the operation phase, the following measures should be implemented:

- Implement water-saving technologies for panel cleaning to reduce water demand.
- Implement best management practices for waste disposal to prevent chemical contamination of water bodies.
- Implement habitat restoration projects to compensate for any habitat loss due to project activities.
- Install fish-friendly infrastructure, such as fish passages and screens, to facilitate fish migration and prevent habitat fragmentation.
- Conduct regular monitoring of fish populations to assess the effectiveness of mitigation measures and identify any emerging threats.
- Develop and implement invasive species management plans to prevent the introduction and spread of invasive fish species.
- Conduct awareness campaigns and training for project staff and local communities on the risks associated with invasive species and the importance of preventing their spread.

After taking the proper mitigation measures the impact will be minimized to low with necessary acceptable mitigation measures.

| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 9 (Medium low) |
|---|---|---|---|
| Probability x Magnitude=18 “Low” | | | |

#### 6.3.3.12 Environmental and Social Impact due to power transmission line

Transmission line construction is mandatory by the proponent to evacuate power through 33/11 KV Muktagacha substation. Overhead transmission line follows the existing transmission line route. Only two poles needed to be installed at the at the approach road which will be under BREB. Other than that, the remaining line will string to the existing line route. Given their nature and short-term duration, it is anticipated that they will have minimal impact on air quality, soil, and surface water and it is considered **very low,** and no social impact envisaged.

### 6.3.4 Impacts during Decommissioning Phase

#### 6.3.4.1 Impact on Ambient Air Quality

In the decommissioning phase, tasks such as dismantling of infrastructure, removing of the transmission cable will take place. The only emission source is the exhaust gas emissions from the vehicles operating under the scope of the activities. Dust may generate from the traffic for transfer of the temporary stockpiling of the debris materials, surface clearing to reinstate to its original condition, and from building demolition activities, and removal of the transmission line. All of these activities are expected to be of short duration, mainly confined to the immediate vicinity of the project site. Given their nature and short-term duration, it is anticipated that they will have minimal impact on air quality, and it is considered low.

| Impact | *Impact on Ambient Air Quality* | | |
|---|---|---|---|
| Impact Nature | Direct | Indirect | Induced |
| Impact Scale | Project site and approach road | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Frequency | Limited to decommissioning phase | | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans Boundary | |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation | |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High | |
| Potential for Irreplaceable Loss of Resources | Low | | Medium | High | | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite | |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider ***Low*** | | | | | |

**Mitigation Measures**

- Implement dust control measures such as water spraying, wind barriers, and vehicle speed limits
- Careful handling of dismantling waste and disposal of wastes in a designated place.
- Fit vehicles with appropriate exhaust systems and emission control devices.
- Use low Sulphur diesel (S<O.5%) diesel powered equipment in collaboration with best management practices.
- Avoid the use of diesel- or petrol-powered equipment by using electricity or battery-powered equipment where possible and if safety concerns can be overcome.
- Monitoring of ambient air condition.

After taking the proper mitigation measures the impact will be minimized to low from medium low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 5 (Very Low) |
| Probability x Magnitude=10 “Very Low” | | | |

### 6.3.4.2 Impact on Soil

During the removal of the piles, transmission line and dismantling of the other parts of the project component the soil will be impacted. The physical process of pile removal and component dismantling can alter the soil structure, affecting its fertility and stability. The topsoil, which contains most of the organic matter and nutrients, can be lost or diluted during the dismantling activities. The removal of structures can disturb the soil surface, making it more susceptible to erosion by wind or water. Any vegetation that has grown around the project components may be removed or damaged during dismantling, leading to soil destabilization.

Heavy machinery used during dismantling can compress the soil, reducing its porosity and ability to absorb water. Due to accidental spillage of oil and chemicals from the dismantling equipment and vehicles at the dismantling site, surface soil will be contaminated. Temporary stockpiling of hazardous materials and waste may pollute the soil. Dismantling activities can create dust, which can settle on the soil and affect its quality and health.

All of these activities are expected to be of short duration that reduces likelihood of long-term degradation of soil quality, mainly confined to the immediate vicinity of the project. Since activities are confined to the project site, the area of soil potentially impacted is limited. Impact intensity is

considered medium as the noticeable changes happened on soil surface., which can be stabilized over time.

The impact of soil pollution due to the dismantling of is assessed to be low.

| | | | | | |
|---|---|---|---|---|---|
| **Impact** | *Soil Pollution due to dismantling activities* | | | | |
| **Impact Nature** | Direct | Indirect | Induced | | |
| **Impact Scale** | Project site | | | | |
| **Frequency** | Limited to decommissioning phase | | | | |
| **Extent and Location** | Project Site | Local | Regional | National | Trans Boundary |
| **Impact Duration** | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation |
| **Impact Intensity/ Severity** | Insignificant | Low | Medium | High | Very High |
| **Potential for Irreplaceable Loss of Resources** | Low | | Medium | High | |
| **Probability of Impact** | Unlikely | Low | Medium | High | Definite |
| **Impact Significance** | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider medium ***Low*** | | | | |

**Mitigation Measures**

- During the dismantling, existing piles and pillar will be fully removed and stored at the designated area of the construction camp by the contractor at any cost, cutting of piles/pillar will not be allowed
- Implement practices such as restricting heavy machinery use, creating designated paths, and post-activity soil aeration.
- Implement robust erosion control measures such as silt fences, mulching, cover crops, and prompt revegetation.
- Store the oil and petroleum product in a separate location cover by a concrete structure;
- Handling of hazardous liquid should be done carefully by the designated experienced person.
- The soil quality test should be carried out by the contractor as per the available standards.

After taking the proper mitigation measures the impact will be minimized to very low from low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 9 (Medium-Low) |
| Probability x Magnitude=18 " Low" | | | |

### 6.3.4.3 Impact on Surface Water

During the dismantling of existing facilities surface water will be polluted by concrete dust, pieces of broken concrete, accidental spillage of hazardous liquids into the nearest water body. Another possible source of water pollution is the improper management of the waste. Dust will be blown from the transportation of construction waste by road. As a result, this air blown dust will accumulate in the nearest surface water body and increase the TSS.

Moreover, surface water is not required for any dismantling activities, thus no impact on quantity of the surface water. The significance of impacts on the surface water pollution can be assessed as medium low.

| | | | | | |
|---|---|---|---|---|---|
| **Impact** | *Surface Water Pollution due dismantling activities* | | | | |
| **Impact Nature** | Direct | Indirect | Induced | | |
| **Impact Scale** | In and around the project site | | | | |
| **Frequency** | Limited to decommissioning phase | | | | |
| **Extent and Location** | Project Site | Local | Regional | National | Trans Boundary |
| **Impact Duration** | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation |
| **Impact Intensity/ Severity** | Insignificant | Low | Medium | High | Very High |
| **Potential for Irreplaceable Loss of Resources** | Low | | Medium | High | |
| **Probability of Impact** | Unlikely | Low | Medium | High | Definite |
| **Impact Significance** | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider | Medium Low | | | | |

**Mitigation Measures**

- Proper safety fence will be provided by the contractor to control the dismantled piece of concrete into the waterbody.
- Any wastes should not be throwing into the surface water body other than dump in to the designated waste dumping area;
- Handling of dismantled wastes should be done carefully by the designated experienced person.
- Dismantling work should be preferred during the dry season and day time only;
- Monitor the surface water by testing in designated laboratory should be done by the Contractor following the National Water Quality Standard (ECR, 2023).

After taking the proper mitigation measures the impact will be minimized to very low from low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 9 (Medium Low) |
| Probability x Magnitude=18 “Low” | | | |

### 6.3.4.4 Impact on Ground Water

Dismantling can release contaminants like heavy metals, oils, fuels, and chemicals from the project materials or machinery into the soil, which can leach into the groundwater. The removal of structures or piles can alter the natural flow of groundwater, potentially mobilizing contaminants that were previously immobile. Handling of demolition debris can lead to physical and chemical pollution of the soil and groundwater if materials are not properly contained and disposed of. Moreover, during dismantling work no ground water will be required on process, only required for drinking purposes, thus no impact on groundwater quantity. The significance of impacts on the surface water pollution can be assessed as low.

| | | | |
|---|---|---|---|
| **Impact** | *Ground Water Pollution due dismantling activities* | | |
| Impact Nature | Direct | Indirect | Induced |
| Impact Scale | In and around the project site | | |

| | | | | | |
|---|---|---|---|---|---|
| Frequency | Limited to decommissioning phase | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans Boundary |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High |
| Potential for Irreplaceable Loss of Resources | Low | | Medium | | High |
| Probability of Impact | Unlikely | Low | Medium | High | Definite |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High / Very High |
| | Significance of impact consider ***Low*** | | | | |

**Mitigation Measures**

- Ensure all hazardous materials are properly contained and disposed of to prevent contamination.
- Develop and implement spill prevention and response plans, including training for workers.
- Conduct regular monitoring of groundwater quality before, during, and after dismantling activities to detect any contamination early.
- Install barriers or liners to prevent the movement of contaminants into the soil and groundwater.

After taking the proper mitigation measures the impact will be minimized to very low from low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 5 |
| Probability x Magnitude=10 “Very Low” | | | |

### 6.3.4.5 Impact due to Noise

Noise will be generated during the dismantling by hammering, movement of transportation vehicles for carrying concrete wastes and movement of workers. Other sources of noise pollution are the use of hydraulic horns, and use of the generator in the dismantling site. Some common impacts of noise nuisances include annoyance, sleep disturbance and interference with communication. Noise will impact on the occupational health and safety of the workers, community health and safety of the local road users and aquatic animals. The impact of noise pollution due to the dismantling is assessed to be Medium-low.

| | | | | | |
|---|---|---|---|---|---|
| Impact | Impact due to noise | | | | |
| Impact Nature | Direct | Indirect | Induced | | |
| Impact Scale | Ina and around the project site | | | | |
| Frequency | Limited to construction phase | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans Boundary |

| | | | | | | |
|---|---|---|---|---|---|---|
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent -no mitigation | |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High | |
| Potential for Irreplaceable Loss of Resources | Low | | Medium | High | | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite | |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider Medium-low | | | | | |

**Mitigation Measures**

- Notify the adjacent community before starting the dismantling/demolishing work.
- Create noise barrier and consider the minimum noise levels at sensitive receptor sites (e.g., school, mosque, and madrasa etc.);
- Protection devices (ear plugs or earmuffs) shall be provided to the workers operating in the vicinity of high noise generating location and sources during dismantling.
- Dismantling works should be conducted during daytime only.
- Instruction to the drivers to avoid unnecessary horn.
- Noise level monitoring should be carried out by the contractor following the National Noise Quality Standard (Noise Pollution (control) rules 2006).

After taking the proper mitigation measures the impact will be minimized to low from medium low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 6 (Low) |
| Probability x Magnitude=16 “Very Low” | | | |

#### 6.3.4.6 Waste Generation

***Impact***

Waste generated during decommissioning include non-hazardous and inert wastes such as scrap metals, paper, wires, wood, plastic, given that the contractor will adhere his waste management procedures. Similar to the construction phase, potential generation of hazardous waste includes absorbent material, batteries, tires, metal drums, empty chemical containers, waste oil from machinery lubricants, etc. Solar Panels as utilized for the project even after 20 years will have the 70 – 80% power generation capacity. Due to technology improvement, after 20 years recycling or re-utilisation of these panels are very much likely.

***PV modules and others:***

PV modules wastes are the other waste besides the lead-acid battery and few other solid wastes generated during the decomissioning stage. These include end-of-life solar PV modules, electrical wastes, metallic wastes and stationary wastes of office works etc. Ground-mounted PV solar arrays are typically made up of panels of silicon solar cells covered by a thin layer of protective glass attached to an inert solid underlying substance (or “substrate”). While the vast majority of PV panels currently in use are made of silicon, certain types of solar cells may contain cadmium

telluride (CdTe), copper indium (di)selenide (CIS), and gallium arsenide (GaAs). All solar panel materials, including the chemicals noted, are contained in a solid matrix, insoluble and non-volatile at ambient conditions, and enclosed. Therefore, releases to the ground from leaching to the air from volatilization during use, or from panel breakage, are not a concern[32]

***End-of-Life Solar Panels:***

The solar PV panels that will be used in the project will have a life span of years. Disposal of wasted solar PV modules is very important because if not properly decommissioned, the greatest health risk from end-of-life crystalline solar modules arises from lead containing solders. Under the right conditions it is possible for the lead to leach into landfill soils and eventually into water bodies. While the solar cell is the heart of a photovoltaic system, on a mass basis it accounts for only a small fraction of the total materials required to produce a solar panel. The outer glass cover constitutes the largest share of the total mass of a finished crystalline photovoltaic module (approximately 65%), followed by the aluminum frame (~20%), the ethylene vinyl acetate encapsulant (~7.5%), the polyvinyl fluoride substrate (~2.5%), and the junction box (1%). The solar cells themselves only represent about four percent (4%) of the mass of a finished module.

***Mitigation***

The following identifies the mitigation measures to be applied by all involved entities:

- Ensure that hazardous materials are stored in proper areas and in a location where they cannot reach the land in case of accidental spillage. This includes storage facilities that are of hard impermeable surface, flame-proof, accessible to authorized personnel only, locked when not in use, and prevents incompatible materials from coming in contact with one another.
- Maintain a register of all hazardous materials used and accompanying Material Safety Data Sheet (MSDS) must present at all times. Spilled material should be tracked and accounted for;
- If spillage on soil occurs, spill must be immediately contained, cleaned-up, and contaminated soil disposed as hazardous waste;
- Proper decommissioning and recycling of solar panels both ensures that potentially harmful materials are not released into the environment and reduces the need for virgin raw materials. In recognition of these facts, the photovoltaic industry is acting voluntarily to implement product take-back and recycling programs at the manufacturing level.
- The proponent/developer shall inform the workers and local community about the duration of work;
- Dismantling activities will take care of experienced professionals under the guidance of plant EMS Head.
- All the dismantled infrastructures and debris shall be segregated and stored separately with cover facility to negotiate with contamination effects of such wastes;
- The metal structure will be sold out to the approved recyclers, whereas, debris will be disposed-off as per their characteristics.
- The workers shall be clearly informed about the expected schedule and completion of each activity;
- All waste generated from decommissioning phase shall be collected and disposed of at

[32] Source: Clean Energy Result: Annual Report, June 2015 Massachusetts Department of Energy Resources).

the nearest identified disposal site;

- All necessary Personal Protection Equipment (PPE) shall be used by the workers during demolition work;
- Water sprinkling would be the regular practice to reduce the dust generation from the plant decommissioning activities.
- Disposal panels will be handover to government authorized recycling plant ;
- It is to be ensured that dismantling is carried out during the non-monsoon season and all the drainage channels will keep intact by creating bunds around them.

#### 6.3.4.7 Impacts on Occupational Health and Safety

***Impact***

The decommissioning activities will include equipment dismantling and demolishing facilities including removal of transmission line at project site. As project components will be recycled after decommissioning, the prospect risks from decommissioning phase will be limited to dismantling and demolishing activities including moving all recyclable components to their final destination. During the dismantling of existing facilities activities, noise, air and dust pollution will occur. Longtime exposure with the high noise level is hazardous for the construction workers. In case of the absence of personal protective equipment (PPE), quality drinking water, sanitation, first aid facilities in the dismantling site workers' health and safety will be affected. The impact on occupational health and safety due to the decommissioning activities assessed to be low.

| | | | | | |
|---|---|---|---|---|---|
| Impact | Impact on Occupational health and safety during dismantling of | | | | |
| Impact Nature | Direct | Indirect | Induced | | |
| Impact Scale | Within the project location | | | | |
| Frequency | Limited to construction Phase | | | | |
| Extent and location | Project Site | Local | Regional | National | Trans boundary |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent – Mitigated | Permanent – no mitigation |
| Impact Intensity/ severity | Insignificant | Low | Medium | High | Very High |
| Potential for irreplaceable loss of resources | Low | | Medium | High | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite |
| Significance | Very low | Low | Medium-Low | Medium-high | High | Very High |
| | Significance of impact is considered as medium low | | | | |

***Mitigation***

The impact will be very low if the following mitigation measures are taken

- The Contractor will prepare and implement a Health and Safety Plan prior to commencing work. This plan will include method statements for working methods, decommissioning sequence and safety arrangements.
- Measures will be implemented to reduce the likelihood and consequence of the following hazards:
    - falling from height;
    - entanglement with machinery;
    - tripping over permanent obstacles or temporary obstructions;
    - falling objects;
    - electric shock;
    - mistakes in operation;
    - variable weather conditions;
    - lifting excessive weights; and
    - Traffic operations.
- A Permit to Enter system will be established to ensure that only authorized persons gain entry to the site.
- Competent and adequately resources sub-contractors will be used where dismantling activities are to be sub-contracted.
- All persons working on site will be provided information about risks on Site and arrangements will be made for workers to discuss health and safety with the Contractor.
- All workers will be properly informed, consulted and trained on health and safety issues.
- Personal Protective Equipment (PPE) shall be worn at all times on the Site. This shall include appropriate safety shoes, safety eyewear, and hard hats. Non-slip or studded boots will be worn to minimize the risk of slips.
- Before starting work all the appropriate safety equipment and the first-aid kit will be assembled and checked as being in working order.
- All lifting equipment and cranes will be tested and inspected regularly. All hoist ways will be guarded.
- Safety hoops or cages will be provided for ladders with a height in excess of two meters.

After taking the proper mitigation measures the impact will be minimized to very low from low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 8 (Medium Low) |
| Probability x Magnitude=16 “Low” | | | |

#### 6.3.4.8 Employment Opportunities

***Impact***

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

Although this impact is very unlikely given that fact that an upgrade is expected for the facility during its post–design life, however, the consequence is considered critical to permanent personnel if the facility underwent decommissioning, yielding a low impact significance.

***Recommendation***

Preference should be given to employing the local communities in various positions.

### 6.3.4.9 Community Health and Safety

Possible sources of impacts on community health and safety during the decommissioning phase are:

- Heavy traffic movement.

The project will increase the volume of traffic and vehicular movement on the existing road which is the only way to access the site of Nimuria of Muktagacha Upazila. The emphasize on traffic maintenance should be ensured by the project. Vehicular movement will increase during the decommissioning phase for carrying plant materials and other relevant associated things. Exhaust emission from vehicles, likely to cause a rise in air pollutants. Moreover, the noise and vibration related to increased traffic movement causes community disturbance. Therefore, the impact significance is assessed as low.

| **Impact** | *Community Health and Safety* | | | | | |
|---|---|---|---|---|---|---|
| **Impact Nature** | Direct | | Indirect | | Induced | |
| **Impact Scale** | Adjacent Communities and project workers | | | | | |
| **Frequency** | Limited to decommissioning Phase | | | | | |
| **Extent and Location** | Project Site | Local | Regional | National | Trans Boundary | |
| **Impact Duration** | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation | |
| **Impact Intensity/ Severity** | Insignificant | Low | Medium | High | Very High | |
| **Potential for Irreplaceable Loss of Resources** | Low | | Medium | | High | |
| **Probability of Impact** | Unlikely | Low | Medium | High | Definite | |
| **Impact Significance** | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider ***Low*** | | | | | |

**Mitigation Measures**

The following mitigation measures will be put in place to reduce impacts on community receptors:

- Emphasizing safety aspects among drivers, particularly with regard to the speed limit of 20 km/hr that will be enforced.
- Ensuring that only licensed drivers are employed by the Project.
- Avoiding peak hours for heavy vehicle movement where possible.
- Collaboration with local communities and responsible authorities to improve signage (e.g., pedestrian crossings, speed limits, etc.), visibility, and awareness of traffic and pedestrian safety.
- After taking the proper mitigation measures the impact will be minimized to very low from low.

| **Probability of Impact** | 2 | **Magnitude of the Impact** | 6 |
|---|---|---|---|
| Probability x Magnitude=12 “Very Low” | | | |

### 6.3.4.10 Impacts on Ecosystems and Biodiversity

The decommissioning phase of the solar plant involves dismantling infrastructure, replacing dysfunctional equipment, and waste disposal activities. These activities can have significant impacts on biodiversity and ecosystems within the project site and its surrounding areas.

The dismantling of solar panels, support structures, and transmission lines can disturb habitats within the project site. Machinery used for dismantling may cause soil compaction and habitat destruction, affecting vegetation and soil organisms. Improper disposal of decommissioned equipment and materials can lead to habitat contamination and degradation. Toxic substances from waste can leach into the soil and water, harming plant and animal life.

The handling and disposal of hazardous materials used in solar panels and electronic equipment can result in soil and water pollution. Chemicals such as cadmium and lead, commonly found in photovoltaic cells, can leach into the environment, posing risks to soil microorganisms, plants, and aquatic organisms. Runoff from waste disposal sites can carry pollutants into nearby water bodies, impacting water quality and aquatic ecosystems. Sedimentation and chemical contamination can harm aquatic organisms and disrupt food chains.

Dismantling infrastructure and clearing sites can fragment habitats and disrupt wildlife corridors. Displaced wildlife may struggle to find suitable alternative habitats, leading to population declines and increased vulnerability to predation and other threats. Birds and other wildlife species may abandon nesting and breeding sites due to disturbance from decommissioning activities. Loss of nesting sites can reduce reproductive success and population resilience.

Decommissioned areas may become susceptible to colonization by invasive plant species. Disturbed soil and vegetation provide opportunities for invasive species to establish and outcompete native flora, altering ecosystem dynamics and reducing biodiversity.

Considering the project activities and potential biological receptors within the project AoI, the impact on ecosystems and biodiversity during the decommissioning phase has been considered insignificant and assessed as ***Low***.

| Impact | *Impacts on Ecosystems and Biodiversity* | | | | |
|---|---|---|---|---|---|
| Impact Nature | Direct | Indirect | Induced | | |
| Impact Scale | Limited to project site and its adjacent areas | | | | |
| Frequency | Limited to Construction Phase | | | | |
| Extent and Location | Project Site | Local | Regional | National | Trans Boundary |
| Impact Duration | Short Term | Medium Term | Long-term | Permanent-mitigated | Permanent-no mitigation |
| Impact Intensity/ Severity | Insignificant | Low | Medium | High | Very High |
| Potential for Irreplaceable Loss of Resources | Low | | Medium | High | |
| Probability of Impact | Unlikely | Low | Medium | High | Definite |
| Impact Significance | Very Low | Low | Medium-low | Medium-high | High | Very High |
| | Significance of impact consider ***medium Low*** | | | | |

**Mitigation Measures**

To mitigate the impacts on biodiversity and ecosystems during the decommissioning phase, the following measures should be implemented:

- Implement habitat restoration programs to mitigate habitat disturbance and loss caused by decommissioning activities.
- Replant native vegetation and establish wildlife corridors to reconnect fragmented habitats and support biodiversity recovery.
- Develop and implement waste management plans to ensure proper handling, recycling, and disposal of decommissioned equipment and materials.
- Conduct soil and water quality monitoring to detect and mitigate pollution risks associated with hazardous waste disposal.
- Conduct pre-decommissioning surveys to identify critical wildlife habitats and nesting sites and implement protective measures to minimize disturbance.
- Monitor wildlife populations during and after decommissioning to assess the effectiveness of mitigation measures and identify any emerging threats.
- Implement invasive species monitoring and control programs to prevent the establishment and spread of invasive plants in decommissioned areas.
- Conduct regular vegetation surveys to detect and manage invasive species colonization, employing techniques such as manual removal and herbicide application where necessary.

After taking the proper mitigation measures the impact will be minimized to very low from low.

| | | | |
|---|---|---|---|
| **Probability of Impact** | 2 (Low) | **Magnitude of the Impact** | 6 (Low) |
| Probability x Magnitude=12 “Very Low” | | | |

# CHAPTER 7

## Environmental and Social Management Plan

# 7 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

## 7.1 Introduction

This section presents the Environmental and Social Management Plan (ESMP) for the project. The purpose of this ESMP is to specify the standards and controls required to manage and monitor environmental and social impacts during construction and operation phase. To achieve this, the ESMP identifies potential adverse impacts from the planned activities and outlines mitigation measures required to reduce the likely negative effects on the physical, natural and social environment.

The purpose of ESMP is as follows:

- Provide an institutional mechanism with well-defined roles and responsibilities for ensuring that measures identified in IESE designated to mitigate potentially adverse impacts are implemented.
- List of all suggested mitigation measures and control technologies, safeguards identified through the IESE process.
- Provide project monitoring program for effective implementation of the mitigation measures and ascertain efficacy of the environmental management and risk control systems in place.
- Assist in ensuring compliance with all relevant legislation at local, state and national level for the projects.

## 7.2 Environmental and Social Management Plan

In order to minimize adverse impacts during different phases of project lifecycles, mitigation measures and responsibilities for its implementation during pre-construction, construction, operation, and decommissioning phase are given below.

### 7.2.1 During Pre-construction Phase

**Table 7-1: Mitigation Measures during Pre-construction Phase**

| Issues/Activities | Potential Impacts[33] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| Air Quality | • Exhaust Emissions due to operation of construction machinery<br>• Dust generation from leveling, grading, and movement of vehicles across dirt/unpaved roads, especially during windy conditions<br>• Dust generated from stockpiles of waste, transporting wastes on vehicles. | • Air and Noise Management Plan | • Implement dust control measures such as water spraying, wind barriers, and vehicle speed limits<br>• Dusty materials34 need to be covered with impermeable sheet cover.<br>• Dusty activities should be re-scheduled where possible if high-wind conditions are encountered.<br>• Vehicle/equipment exhausts observed emitting significant black smoke in their exhausts will be serviced/replaced.<br>• Vehicle/equipment air emissions will be controlled by good practice procedures (such as turning off equipment when not in use);<br>• Use low Sulphur diesel (S<O.5%) diesel powered equipment in collaboration with best management practices.<br>• No cleared vegetation to be burnt. Cleared vegetation will either be composed or reused for stabilization purposes. | Appointed contractor | Project management team and designated HSE team of MSEL |

[33] In terms of Environmental, Social and Ecological parameters

[34] As per Air Pollution Control Rules (2022), Dusty Materials: Means Cement, soil, aggregates, silt, stone, sand, dust and wooden chips.

| Issues/Activities | Potential Impacts[33] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | • Avoid the use of diesel- or petrol-powered equipment by using electricity or battery-powered equipment where possible and if safety concerns can be overcome.<br>• All diesel-powered equipment will be regularly maintained, and idling time reduced to minimize emissions.<br>• Monitoring of ambient air condition | | |
| Soil Quality | • Soil compaction and erosion<br>• Soil Contamination | • Emergency Preparedness and Response Management Plan (Soil and Erosion Management Plan)<br>• Emergency Preparedness and Response Plan (Contingency Plan on Spill Management)<br>• Waste Management Plan | **Emergency Preparedness and Response Management Plan (Soil and Erosion Management Plan)**<br>• Any soil stockpiles should be located in sheltered areas where they are not exposed to wind and at a location approved by local authorities.<br>• Stockpiles of soil (or other erodible materials) should be securely covered.<br>• Implement slope stabilization measures, such as retaining walls, soil reinforcement, or grading adjustments.<br>• Activities to be scheduled to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff and vehicle tracking.<br>• Demarcating routes for movement of heavy vehicles. | Appointed contractor | Project management team and designated HSE team of MSEL |

| Issues/Activities | Potential Impacts[33] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | • Soil conservation measures will be implemented such as stockpiling topsoil or gravel for the remediation of disturbed areas.<br>• Stripping of topsoil shall not be conducted earlier than required in order to prevent the erosion of soil.<br>• Construction vehicles and equipment will be serviced regularly and off site.<br>• Construction vehicles will remain on designated and prepared compacted gravel roads.<br>• Address issues related to water drainage and runoff to prevent soil erosion and saturation.<br>• A site-specific Emergency Response Plan will be prepared by the Contractor for soil clean-up and decontamination.<br>• Properly manage and dispose the drilling muds.<br>• Design processes to prevent/minimize quantities of wastes generated, and hazards associated with the waste generated.<br>**Emergency Preparedness and Response Plan**<br>• Fuel, lubricating oil and used oil storage areas will be contained in | | |

| Issues/Activities | Potential Impacts[33] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | bunds of 110 percent capacity of the stored material.<br>• Spill containment and clean up kits will be available onsite and clean-up from any spill will be appropriately contained and disposed of<br>**Waste Management Plan**<br>• Minimize the production of waste materials by 3R (Reduce, Recycle and Reuse) approach.<br>• Training of laborers for waste disposal in designated areas and use of sanitation facilities. | | |
| Surface Water | • Accidental spillage of hazardous liquids into the surface water body<br>• Drilling mud and waste from site clearance, leveling, grading, and upgrading the existing road activities washed out the surface water and increase turbidity<br>• Accumulation of air blown dust to nearest surface water body and increase the TSS<br>• | • Water and Wastewater Management Plan<br>• Waste Management Plan (Spoli Management Plan) | **Water and Wastewater Management Plan**<br>• Designing drainage systems to manage and direct runoff effectively, minimizing the impact on local water bodies.<br>• Restoring vegetation in cleared areas to improve soil stability and reduce runoff after construction activities are completed.<br>• Monitoring and maintaining drainage and erosion control measures to ensure they are effective and making adjustments as needed.<br>• Timely disposal of the construction/chemical/hazardous waste to prevent leaching of any pollutant to the water bodies. | Appointed contractor | Project management team and designated HSE team of MSEL |

| Issues/Activities | Potential Impacts[33] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | **Waste Management Plan (Spoil Management Plan)**<br>• Use appropriate machinery and equipment to handle and transport spoil safely.<br>• Keep record of spoil that generated onsite.<br>• Secure loads and use cover to prevent spoil from spilling or blowing away during transportation.<br>• Implement measures to prevent soil erosion, such as silt fences or erosion control blankets.<br>• Ensure spoil is disposed of at authorized and environmentally compliant sites.<br>• Apply water or dust suppressants to reduce dust generation during handling and transport. | | |
| Ground Water | • Drilling mud, chemicals used in drilling may spill or leak into the ground<br>• Accidental spillage of chemicals from equipment<br>• Soil compact and decrease in groundwater recharge | • Water and Wastewater Management Plan (Sustainable groundwater management) | • Establish monitoring systems to ensure compliance with sustainable extraction limits and water quality standard set by Government (WARPO/ Union) rules.<br>• Designing drainage systems to manage and direct runoff effectively, minimizing the impact on local water bodies. | Appointed contractor | Project management team and designated HSE team of MSEL |

| Issues/Activities | Potential Impacts[33] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | • Restoring vegetation in cleared areas to improve soil stability and reduce runoff after construction activities are completed.<br>• Timely disposal of the construction/chemical/hazardous waste to prevent leaching of any pollutant to the water bodies.<br>• Training of laborers for waste disposal in designated areas and use of sanitation facilities.<br>• Fuel, lubricating oil and used oil storage areas will be contained in bunds of 110 percent capacity of the stored material.<br>• Spill containment and clean up kits will be available onsite and clean-up from any spill will be appropriately contained and disposed of<br>• Construction vehicles and equipment will be serviced regularly and off site. | | |
| Noise | • Noise generation due to construction activities<br>• Transportation of construction materials, plant materials, machinery and personnel<br>• Operation DG sets and drilling | • Air and Noise Management Plan | • Acoustic covers for all equipment and machinery that generate excessive noise.<br>• Noise Level need to be monitored once in monthly basis and If noise levels are found to be excessive activities should be stopped until adequate control measures are implemented. | Appointed contractor | Project management team and designated HSE team of MSEL |

| Issues/Activities | Potential Impacts[33] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | • Ensure that all equipment and machinery and its mufflers are regularly serviced and immediately serviced or replaced, if damaged.<br>• Development of a regular maintenance schedule of all vehicles, machinery, and equipment for early detection of issues, and to avoid unnecessary elevated noise level.<br>• Regular maintenance of equipment including lubricating moving parts, tightening loose parts, and replacing worn-out components shall be conducted.<br>• The amount of equipment operating simultaneously shall be reduced as far as practicable.<br>• Only well-maintained equipment should be operated on-site.<br>• Compliance with the Occupational Safety and Health Administration (OSHA) requirements and the Bangladesh Codes to ensure that for activities associated with high noise levels, workers are equipped with proper PPE (e.g., Earmuffs).<br>• Construction work should be restricted from 7 pm to 7 am to avoid disturbance to the nearest residence (which is within 20 m form the power | | |

| Issues/Activities | Potential Impacts[33] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | plant boundary) as per Noise Pollution (Control) Rules, 2006.<br>• Vibration monitoring should be carried out by the contractor. | | |
| Landscape | • Visual intrusion, and disruption to aesthetics view due to site activities include surface cleaning, land leveling and grading, and spoil.<br>• Loss of vegetation | | • The contractor shall always ensure general cleanliness and good housekeeping practice at the project site.<br>• Surrounding the construction yard by temporary fencing.<br>• Removal of soil/mud from trucks and other appliances prior to leaving the project area.<br>• Transport of materials in tarpaulin covered trucks.<br>• Training to worker not to dispose of spoil to the nearest surface water body. | Appointed contractor | Project management team and designated HSE team of MSEL |
| Land Lease and Procurement | • Change of land use pattern | | • The SEP and GRM for the project will be applicable to the impacted landowners and land users.<br>• Grant preference to the PAPs for direct/indirect project employment opportunities.<br>• Unskilled labor during the project construction phase would be sourced from the local community; and<br>• Training would be provided to the local people for their skill enhancement. | Appointed contractor | Project management team and designated HSE team of MSEL<br>A social safeguard officer will be responsible particularly for IR and |

| Issues/Activities | Potential Impacts[33] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | | | community concerns |
| Terrestrial Flora | • Hampering plant growth and causing diseases<br>• Reduce vegetation cover and productivity | • Biodiversity Management Plan | • Restrict land clearing and leveling activities within the project site and to the areas absolutely necessary for the construction activities.<br>• Reduce the tree cutting and vegetation clearance to the extent possible.<br>• Cut trees just before construction work starts on that specific location.<br>• Prepare and implement a plan for post-construction restoration of affected trees. | Appointed contractor | Project management team and designated HSE team of Muktagacha Solar |
| Aquatic Flora | • Loss of aquatic vegetation<br>• Spread of invasive water hyacinth | • Biodiversity Management Plan | • Prepare an Invasive Alien Species Management Plan and implement to control the spread of water hyacinth.<br>• Selectively collect native aquatic plants from the project site and rehabilitate remaining areas where aquatic habitats occur after construction phase as possible. | Appointed contractor | Project management team and designated HSE team of Muktagacha Solar |
| Wildlife | • Destruction and degradation of habitats<br>• Physical injury/ mortality | • Biodiversity Management Plan | • Implement noise reduction measures as suggested in Section 6.3.1.5.<br>• Limit construction activities to daylight hours to reduce disturbance to wildlife.<br>• Ensure all lights are downward-facing, shielded, with low-UV intensity bulbs, and on motion-sensitive switches. | Appointed contractor | Project management team and designated HSE team of Muktagacha Solar |

| Issues/Activities | Potential Impacts[33] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | • Conduct regular monitoring of wildlife populations during construction to identify and address emerging impacts.<br>• Workers should be aware of the importance of natural resources and should not do any harm or death to wildlife.<br>• Rescue, rehabilitation and relocation should be done for terrestrial fauna when necessary. | | |
| Occupational Health and Safety | • Risks of accidents and | • Occupational Health and Safety Management Plan | • The Contractor will prepare and implement a Health and Safety Plan prior to commencing work. This plan will include method statements for working methods, construction sequence and safety arrangements.<br>• Proper Measures will be implemented to reduce the likelihood and consequence of the following hazards:<br>○ *falling from height;*<br>○ *falling into water;*<br>○ *entanglement with machinery;*<br>○ *tripping over permanent obstacles or temporary obstructions;*<br>○ *slipping on greasy or icy walkways;* | Appointed contractor | Plant Manager, and EHS & Admin Officer |

| Issues/Activities | Potential Impacts[33] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | ○ *falling objects;*<br>○ *asphyxiation;*<br>○ *explosion;*<br>○ *contact with dangerous substances;*<br>○ *electric shock;*<br>○ *mistakes in operation;*<br>○ *variable weather conditions;*<br>○ *lifting excessive weights; and*<br>○ *Traffic operations.*<br>• A Permit to Enter system will be established to ensure that only authorized persons gain entry to the site.<br>• Competent and adequately resources sub-contractors will be used where construction activities are to be sub-contracted.<br>• All persons working on site will be provided information about risks on Site and arrangements will be made for workers to discuss health and safety with the Contractor.<br>• All workers will be properly informed, consulted and trained on health and safety issues.<br>• Personal Protective Equipment (PPE) shall be worn at all times on the Site. This shall include appropriate safety | | |

| Issues/Activities | Potential Impacts[33] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | shoes, safety eyewear, and hard hats. Non-slip or studded boots will be worn to minimize the risk of slips.<br>• Before starting work all the appropriate safety equipment and the first-aid kit will be assembled and checked as being in working order. Breathing apparatus will be tested at regular intervals in the manner specified by the makers.<br>• Safety hoops or cages will be provided for ladders with a height in excess of two meters.<br>• Where sound levels cannot be reduced at the source, suitable hearing protection will be provided when noise levels indicate an Leq of more than 90 dB(A).<br>• The Contractor shall provide appropriate safety barriers with hazard warning signs attached around all exposed openings and excavations when the work is in progress. | | |
| Community Health and Safety Management Plan | • Health Impacts due to Changes in environmental conditions | • Community Health and Safety Management Plan | • Implement dust suppression measures, such as water spraying.<br>• Different types of dust suppression measures, such as water spraying, needs to be implemented on regular basis. | Appointed contractor | Project management team and designated HSE team of |

| Issues/Activities | Potential Impacts[33] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | • Working hours need to be limited to reduce noise disturbance.<br>• Using low-emission and low-noise equipment is highly suggested to MSEL for their pre-construction and construction activities.<br>• Limit construction vehicle movement during peak hours.<br>• Enforce speed limits for construction vehicles.<br>• Use proper signage and fencing to restrict public access | | Muktagacha Solar |

### 7.2.2 During Construction Phase

**Table 7-2: Mitigation Measure during Construction Phase**

| Issues/Activities | Potential Impacts[35] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| Visual Amenity | • Visual impacts from construction activities such as materials/waste storage, piling, civil construction, and | | • The contractor shall always ensure general cleanliness and good housekeeping practice at the project site | Appointed contractor | Plant Manager, and EHS & Admin Officer |

[35] In terms of Environmental, Social and Ecological parameters

| Issues/Activities | Potential Impacts[35] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | transportation of materials etc. | | | | |
| Air Quality | • Exhaust Emissions due to operation of construction machinery | • Air and Noise Management Plan<br>• Road Safety and Traffic Management Plan | **Road Safety and Traffic Management Plan**<br>• The movement of construction vehicles will be minimized, and a 20 km/hr speed limit will be enforced around the construction site.<br>• Vehicles travelling on gravel roads will not exceed a speed of 15 km/hr.<br>• Provide clear and consistent signage to guide drivers, pedestrians, and cyclists.<br>• Implement communication strategies to inform the public about traffic conditions, changes, and upcoming events.<br>• Establish methods for monitoring traffic conditions and the effectiveness of the management plan etc.<br>**Air and Nosie Management Plan**<br>• All diesel-powered equipment will be regularly maintained, and idling time reduced to minimize emissions.<br>• Low Sulphur diesel (S<O.5%) will be used in diesel powered equipment in collaboration with best management practices.<br>• Vehicle/equipment air emissions will be controlled by good practice procedures (such as turning off equipment when not in use); and | Appointed contractor | Plant Manager, and EHS & Admin Officer |
| | • Dust generation from leveling, grading, and movement of vehicles across dirt/unpaved roads, especially during windy conditions<br>• Installation of PV module construction of building, loading and unloading equipment, stringing of the transmission line<br>• Dust generated from stockpiles of waste, transporting wastes on vehicles. | | | Appointed contractor | Plant Manager, and EHS & Admin Officer |

| Issues/Activities | Potential Impacts[35] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | • Solid waste burning in the project site is strictly prohibited.<br>• Implementation of a regular watering and sprinkling dust suppression regime, during the dry season.<br>• Stockpiles of dusty materials will be enclosed or covered by suitable shade cloth or netting to prevent the escape of dust during loading and transfer from Site as stated in the Air Pollution (Control) Rules, 2022.<br>• No stockpiles will be maintained outside, and maximum Possible distance between the stockpiles and receptors will be maintained.<br>• Covering and/or watering of all stockpiles of dusty materials such as excavated spoils to avoid fugitive dust emissions.<br>• During construction, the approach road will be kept clean, free from mud and slurry.<br>• Material transport will be totally enclosed with impervious sheeting and wheel washing will be carried out at site.<br>• Idling of vehicles and equipment will be prevented.<br>• The Air quality monitoring should be carried out by the contractor following the National Air Quality Standard (Air Pollution (Control) Rules, 2022).<br>• Restricting heights from which materials are dropped as far as practicable, to | | |

| Issues/Activities | Potential Impacts[35] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | minimize the fugitive dust arising from unloading/loading.<br>• Waste from construction will not be burned on site. | | |
| Soil Quality | • Soil compaction and erosion<br>• Soil Contamination | • Emergency Preparedness and Response Management Plan (Soil and Erosion Management Plan)<br>• Emergency Preparedness and Response Management Plan (Contingency Plan on Spill Management)<br>• Waste Management Plan | **Emergency Preparedness and Response Management Plan (Soil and Erosion Management Plan)**<br>• Demarcating routes for movement of heavy vehicles.<br>• Stripping and placing soils when dry, and not when wet.<br>• Proper storage of the construction materials and wastes to minimize the potential damage or contamination of the materials.<br>• Construction vehicles and equipment will be serviced regularly and off site.<br>• Construction vehicles will remain on designated and prepared compacted gravel roads.<br>• Scheduling activities (as far as possible) to avoid extreme weather.<br>• Soil conservation measures will be implemented such as stockpiling topsoil or gravel for the remediation of disturbed areas.<br>**Waste Management Plan**<br>• Design processes to prevent/minimize quantities of wastes generated, and hazards associated with the waste generated. | Appointed contractor | Plant Manager, and EHS & Admin Officer |

| Issues/Activities | Potential Impacts[35] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | • Minimize the production of waste materials by 3R (Reduce, Recycle and Reuse) approach.<br>• Training laborers for waste disposal in designated areas and use of sanitation facilities.<br><br>**Emergency Preparedness and Response Management Plan (Contingency Plan on Spill Management)**<br>• Fuel, lubricating oil and used oil storage areas will be contained in bunds of 110 percent capacity of the stored material.<br>• Spill containment and clean up kits will be available onsite and clean-up from any spill will be appropriately contained and disposed of.<br>A site-specific Emergency Response Plan will be prepared by the Contractor for soil clean-up and decontamination. | | |
| Noise | • Noise generation due to construction activities<br>• Transportation of construction materials, plant materials, machinery and personnel<br>• Operation DG sets; | • Air and Noise Management Plan | • The contractor shall follow guidelines for use of construction machinery as stated in sec11 of Noise Pollution Control Rules 2006. As such:<br>○ No brick or stone breakers machine can be used for Construction purpose in residential areas or within 500 m of such area, (As per Noise Pollution Control Rules,2006 sec(11));<br>○ All construction machineries along with mixture machine cannot be | Appointed contractor | Plant Manager, and EHS & Admin Officer |

| Issues/Activities | Potential Impacts[35] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | used during 7 pm t0 7 am at residential area.<br>• Only well-maintained equipment will be operated on-site.<br>• Regular maintenance of equipment such as lubricating moving parts, tightening loose parts and replacing worn out components should be conducted.<br>• Machinery and construction plant that may be in intermittent use (e.g. trucks) shall be shut-down or throttled down during non-work periods;<br>• Low noise equipment shall be used as far as practicable.<br>• The number of equipment operating simultaneously shall be reduced as far as practicable.<br>• Equipment known to emit noise strongly in one direction should be orientated so that the noise is directed away from nearby NSRs as far as practicable.<br>• The contractor should consider the noise emission characteristics of equipment when selecting equipment for the project and select the least noisy machine available to perform the specific work (this is a requirement of OSHA 2007);<br>• The contractor should undertake additional post development noise monitoring in accordance with National and International noise standards. | | |

| Issues/Activities | Potential Impacts[35] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | • Mobile noise sources such as cranes, pile driver shall be routed in such a way that there is minimum disturbance to receptors.<br>• Developer shall instruct their Safety Officers to arrange for inherently quiet construction equipment and machines to maintain the noise level to minimum.<br>• Only limited construction activities shall be carried out during night-time.<br>• Restrict the nighttime vehicle movement through the access road;<br>• Adopt the vehicle speed (20 km/hr) limit in the access road.<br>• Rubber padding/noise isolators will be used for construction equipment.<br>• Temporary noise barriers shall be provided surrounding the high noise generating construction equipment.<br>• The personnel involved in high noise generating activities shall be provided with personal protective devices to minimize their exposure to high noise levels.<br>• Construction vehicles and machinery will be well maintained and not kept idling when not in use; | | |
| Water Resources (Ground Water) | • Ground water pollution due to<br>○ *improper disposal of sewage and* | • Water and Wastewater Management Plan | • Ensure proper spill control and management at site.<br>• Designing drainage systems to manage and direct runoff effectively, minimizing the impact on local water bodies. | | |

| Issues/Activities | Potential Impacts[35] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | ○ *construction debris*<br>○ *Unplanned event such as leaks and spills of oil, lubricants, fuel from heavy equipment* | | • Restoring vegetation in cleared areas to improve soil stability and reduce runoff after construction activities are completed. Ensure storage of hazardous material and waste in proper manner and disposed the waste in Hazardous waste Landfill site.<br>• Monitor groundwater from time to time to detect any contamination. –<br>• Install barriers or liners to prevent the movement of contaminants into the soil and groundwater. | | |
| Water Resources (Surface water) | • Construction work like pillar installation work, construction camp and construction site, and accidental spillage of hazardous liquids into the river<br>• Accumulation of air blown dust to nearest surface water body and increase the TSS | • Water and Wastewater Management Plan<br>•<br>• Emergency Preparedness and Response Management Plan (Contingency Plan for Spill Management) | • Restrict the civil construction activities during monsoon season.<br>• Prevent and mitigate spill of paint/fuel within the construction site.<br>• Oil leakage or spillage will be contained and cleaned up immediately. Waste oil will be collected and stored for recycling or disposal.<br>• Minimize the generation of oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes). These substances must not enter waterways, or underground water tables.<br>• Adequate sanitary facilities, i.e., toilets and showers, will be provided for the construction workforce; | Appointed contractor | Plant Manager, and EHS & Admin Officer |

| Issues/Activities | Potential Impacts[35] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | • Stockpiles will be protected by plastic sheets and suitably secured against the wind, at the end of each working day if rain is forecasted.<br>• Create an appropriate drainage channel for storm water and surface water runoff.<br>• Restoring vegetation in cleared areas to improve soil stability and reduce runoff after construction activities are completed.<br>Monitoring and maintaining drainage and erosion control measures to ensure they are effective and making adjustments as needed.<br>• Timely disposal of the construction/chemical/hazardous waste to prevent leaching of any pollutant to the water bodies; | | |
| Traffic | • An increase in traffic volume on the only local road may cause traffic congestion and accidents. | • Road Safety and Traffic Management Plan<br>• Stakeholder Engagement Plan<br>• External Grievance | • All vehicles would undergo routine repair and maintenance to keep the vehicle in good operating condition.<br>• Sprinkling of water in dust prone activities like transportation on unmetalled road, digging works, material handling etc. would be taken up.<br>• Drivers and operators would be checked for fitness and any driver/operator impaired due to any reason, including but not | • Appointed contractor | Plant Manager, and EHS & Admin Officer |

| Issues/Activities | Potential Impacts[35] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | Redressal Mechanism | confined to the influence of drugs and/or alcohol would not be allowed to drive.<br>• A speed limit of 20 km/hr. within the project site area would be followed and the use of mobile phones while driving would be prohibited.<br>• Implementation of a safety program (signage, speed restrictions, lights on trucks, truckload restrictions, etc.) within the construction area<br>• All drivers shall follow the speed limit, the direction of the signalman, sensitive locations, horn usage restrictions, etc.<br>• Appoint traffic personnel at the project entrance. | | |
| labor Influx and Local conflict of interest | • Construction workers and staff may have conflicts with the community.<br>• Construction of the project will require nearly 150 skilled, semi-skilled and unskilled labor which will create an influx within the community adjacent to this project. | • Labour Management Plan<br>• Contractor and Supplier Management Plan<br>• Worker Accommodation Management Plan<br>• Stakeholder Engagement Plan | • Job opportunities should be provided in a fair way.<br>• Clear information about the needs of labor (number and qualification) should be provided with local people ensure no labor will engage any function and any local argument.<br>• The job skills and the priorities for the affected people shall be taken into account and the workers can be chosen.<br>• Give priority of local people while recruiting employees for the project.<br>• Labor and security personnel should be well trained to deal with the community. | Appointed contractor<br>• Appointed contractor | Plant Manager, and EHS & Admin Officer<br>Plant Manager, and EHS & Admin Officer |

| Issues/Activities | Potential Impacts[35] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | • Internal Grievance Redressal Mechanism<br>• External Grievance Redressal Mechanism | • A free health checkup and awareness campaign for the community people regarding infectious diseases will be provided by MSEL.<br>• A comprehensive workers' accommodation plan should be developed and implemented to ensure proper maintenance of the labor camp.<br>• The labor camp and accommodation facility for regular employees should be constructed to meet the requirements of the applicable reference framework, in terms of space per worker, water and sanitation facilities, first aid, lighting and ventilation etc. and regular monitoring should be undertaken to ensure compliance through the project lifecycle.<br>• The labor camp should be located at a certain safe distance from the local community settlements, to minimize impacts on the local community due to the daily activities of the laborers.<br>• MSEL should ensure a monthly monitoring and regular auditing mechanism for monitoring the sub-contractors and suppliers with respect to compliance to the applicable reference framework, in terms of resources, migrant workers, child labor and forced labor, health and safety, payment of wages etc. | | |

| Issues/Activities | Potential Impacts[35] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | • Strengthen security personnel around labor camps in order to maintain adequate law and order and avoid any possible tensions between the migrant workforce and host community.<br>• Each worker and employee shall be provided a health and safety training as part of the induction process.<br>• Establish an internal grievance redressal mechanism in place, to allow for the employees and workers to report any concern or grievance related to work activities.<br>• Alert the migrant workers regarding GBV, local harmony and other socio-cultural aspects to avoid any kind of collision between labor and local people.<br>• Promoting collaboration with local authorities to enhance access of workers for their basic necessary that can be collected from the locality.<br>• Promoting use of local goods and other material to make a balance between workers and local people; | | |
| GBV/ SEAH | • Community women adjacent to the proposed project site, promote their participation in project planning | • Stakeholder Engagement Plan<br>• Internal Grievance | • Announce employment opportunities and recruitment notices widely, targeted at women as well as men.<br>• Technical training can be provided to the local workforce, especially women for | Appointed contractor | Plant Manager, and EHS & Admin Officer |

| Issues/Activities | Potential Impacts[35] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | and activities (if applicable) and ensure safer and healthier living conditions for them. | Redressal Mechanism<br>• External Grievance Redressal Mechanism | inclusion in the operation and maintenance phase.<br>• Any grievance related to the GBV will be treated with high priority.<br>• Conduct regular training sessions for workers and community members to raise awareness about GBVH, its consequences, and the importance of respectful behavior.<br>• Regularly monitor and evaluate the effectiveness of GBVH prevention measures and make necessary adjustments. | | |
| Occupational Health and Safety | • Risks of accidents and fatalities to workers | • Occupational Health and Safety Management Plan | • The Contractor will prepare and implement a Health and Safety Plan prior to commencing work. This plan will include method statements for working methods, construction sequence and safety arrangements.<br>• Proper Measures will be implemented to reduce the likelihood and consequence of the following hazards:<br>○ *falling from height;*<br>○ *falling into water;*<br>○ *entanglement with machinery;*<br>○ *tripping over permanent obstacles or temporary obstructions;*<br>○ *slipping on greasy or icy walkways;* | Appointed contractor | Plant Manager, and EHS & Admin Officer |

| Issues/Activities | Potential Impacts[35] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | ○ *falling objects;*<br>○ *asphyxiation;*<br>○ *explosion;*<br>○ *contact with dangerous substances;*<br>○ *electric shock;*<br>○ *mistakes in operation;*<br>○ *variable weather conditions;*<br>○ *lifting excessive weights; and*<br>○ *Traffic operations.*<br>• A Permit to Enter system will be established to ensure that only authorized persons gain entry to the site.<br>• Competent and adequately resources sub-contractors will be used where construction activities are to be sub-contracted.<br>• All persons working on site will be provided information about risks on Site and arrangements will be made for workers to discuss health and safety with the Contractor.<br>• All workers will be properly informed, consulted and trained on health and safety issues.<br>• Personal Protective Equipment (PPE) shall be worn at all times on the Site. This shall include appropriate safety shoes, safety eyewear, and hard hats. Non-slip or | | |

| Issues/Activities | Potential Impacts[35] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | studded boots will be worn to minimize the risk of slips.<br>• Before starting work all the appropriate safety equipment and the first-aid kit will be assembled and checked as being in working order. Breathing apparatus will be tested at regular intervals in the manner specified by the makers.<br>• All lifting equipment and cranes will be tested and inspected regularly. All hoist ways will be guarded.<br>• Safety hoops or cages will be provided for ladders with a height in excess of two meters.<br>• Where sound levels cannot be reduced at the source, suitable hearing protection will be provided when noise levels indicate an Leq of more than 90 dB(A).<br>• The Contractor shall provide appropriate safety barriers with hazard warning signs attached around all exposed openings and excavations when the work is in progress. | | |
| Community Health and Safety | • Health Impacts due to Changes in environmental conditions | • Stakeholder Engagement Plan<br>• External Grievance Redressal Mechanism | • Barriers will be provided to prevent the ingress of persons into the construction site and also to protect the public from exposure to hazards associated with construction activities.<br>• Sprinkling of water in dust prone activities like transportation on unmetalled road, | Appointed contractor | Plant Manager, and EHS & Admin Officer |

| Issues/Activities | Potential Impacts[35] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | • Increased prevalence of disease | • Community Health and Safety Management Plan | digging works, material handling etc. would be taken up.<br>• Emphasizing safety aspects among drivers, particularly with regard to the speed limit of 20 km/hr that will be enforced.<br>• Ensuring that only licensed drivers are employed by the Project.<br>• Avoiding peak hours for heavy vehicle movement where possible.<br>• Collaboration with local communities and responsible authorities to improve signage (e.g., pedestrian crossings, speed limits, etc.), visibility, and awareness of traffic and pedestrian safety.<br>• Screening, surveillance, and treatment of workers, through the provision of medical facilities and, where required, immunization programs.<br>• A free health checkup and awareness campaign for the community people regarding infectious diseases will be provided by MSEL. | | |
| Vegetation Types | • Hampering plant growth and causing diseases<br>• Reduce vegetation cover and productivity | • Biodiversity Management Plan | • Mitigation measures for dust generation and dispersion as suggested in section 6.3.2.2 should be followed.<br>• Regular water spaying should be done in the construction areas and approach roads. | Appointed contractor | Project management team and designated HSE team of Muktagacha Solar |

| Issues/Activities | Potential Impacts[35] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | • Affecting root growth for terrestrial plants<br>• Degrading habitat quality | | • Workers should be aware of the importance of natural resources and should not unnecessarily clear any area or break branches, twigs, flowers, etc. of adjacent vegetation.<br>• Implement Invasive Alien Species Management Plan to control the spread of water hyacinth. | | |
| Wildlife | • Impact on the health and behavior of wildlife through dust, noise, and vibration.<br>• Impacts on movement, reproduction, and migration patterns of wildlife species.<br>• Potential introduction of invasive species. | • Biodiversity Management Plan | • Implement noise reduction measures as suggested in Section 6.3.2.4.<br>• Limit construction activities to daylight hours to reduce disturbance to wildlife and ensure the use of lights at night should not disrupt the movement of nocturnal wildlife.<br>• Use reflective or colored line markers that are visible both day and night to help birds avoid the lines.<br>• Add bird guards or insulating covers to poles and crossarms to prevent birds from perching on dangerous parts of the transmission structures.<br>• Conduct regular monitoring of wildlife populations during construction to identify and address emerging impacts.<br>• Workers should be aware of the importance of natural resources and should not do any harm or death to wildlife.<br>• Rescue, rehabilitation and relocation should be done for terrestrial fauna when necessary. | Appointed contractor | Project management team and designated HSE team of Muktagacha Solar |

| Issues/Activities | Potential Impacts[35] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| Fisheries Resources | • Impacts on crucial habitats for various fish species<br>• Degrading water quality<br>• Impacts on spawning and feeding ground of fish<br>• Fish Morbidity and mortality | • Biodiversity Management Plan | • Limit construction activities to designated areas and avoid critical fish habitats as much as possible.<br>• Use protective measures, such as silt fences and sediment traps, to minimize sediment runoff into water bodies.<br>• Implement best practices for waste management to prevent pollutants from entering the water. This includes proper storage, handling, and disposal of hazardous materials.<br>• Treat construction wastewater before discharge to ensure it meets environmental quality standards.<br>• Design construction activities to maintain natural water flow patterns in beels and ponds.<br>• Implement hydrological monitoring to ensure water flow is not significantly altered.<br>• Use noise-reducing construction techniques and equipment where possible.<br>• Schedule high-noise activities during periods of low fish activity to minimize disturbance.<br>• Restore disturbed habitats after construction is completed. This can include replanting native vegetation and rehabilitating ponds and beels. | Appointed contractor | Project management team and designated HSE team of Muktagacha Solar |

| Issues/Activities | Potential Impacts[35] | Proposed Management Plan | Proposed Mitigation Measures to Enhancement the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | • Develop and implement a fish habitat enhancement plan to support the recovery of fish populations.<br>• Establish a monitoring program to track the impacts of construction activities on fish populations and water quality. | | |

### 7.2.3 During Operation Phase

**Table 7-3: Mitigation Measure during Operation Phase**

| Issues/Activities | Potential Impacts[36] | Proposed Management Plan | Proposed Mitigation Measures to Enhance the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| Visual Amenity | • Disturbance in view | | • The panels will be arranged in a systematic manner which will give an aesthetic sense to it.<br>• The proposed project would include a boundary wall around the perimeter of the project to further obscure the peripheral view of the project and any indirect reflection. Impacts from glare would be minor.<br>• The substations, gatehouses and maintenance and storage buildings will be grouped as far as possible to avoid | Plant EHS Team and operations | Designated Team comprising of representation from EHS & Admin Officer and Operations of MSEL |

[36] In terms of Environmental, social and ecological parameters

| Issues/Activities | Potential Impacts[36] | Proposed Management Plan | Proposed Mitigation Measures to Enhance the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | the scatter of buildings in the open landscape.<br>• The color of the solar array structures, such as the supports and the rear of the panels, will be carefully selected, and to be in the dark grey or green range, to minimize visibility and avoid reflectivity.<br>• All lighting will be kept to a minimum within the requirement<br>• Where such lighting is deemed necessary, low-level lighting, which is shielded to reduce light spillage and pollution, will be used.<br>• No naked light sources will be directly visible from a distance. Only reflected light will be visible from outside the Site.<br>• External lighting will use down-lighters shielded in such a way as to minimize light spillage and pollution beyond the extent of the area that needs to be lit. | | |
| Air Quality | • Dust generation and exhaust emission | • Air and Noise Management Plan | • Vehicles traveling on gravel roads should not exceed a speed of 30 km/hr.<br>• Regular water spray is required on unpaved road as the dust not move during heavy wind.<br>• Use clean fuel in vehicle as the exhaust emission will be low | Plant EHS Team and operations | Designated Team comprising of representation from EHS & Admin Officer and |

| Issues/Activities | Potential Impacts[36] | Proposed Management Plan | Proposed Mitigation Measures to Enhance the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | | | Operations of MSEL |
| Noise Level | • Increase in ambient noise level | • Air and Noise Management Plan | • Periodic monitoring of noise near to the sources of generation to ensure compliance with design specification.<br>• Maintain the speed limit when car run through the settlement area.<br>• Aware of the unusual horn use; | Plant EHS Team and operations | Designated Team comprising of representation from EHS & Admin Officer and Operations of MSEL |
| Soil Quality | • Potential spillage of stored oil and chemicals<br>• Soil Warming | • Emergency Preparedness and Response Management Plan | • The hazardous wastes will be stored onsite at separate designated covered area provided with impervious flooring and send for disposal to nearest designated dumping site.<br>• The water for cleaning purpose of the solar PV modules remove dust from it is likely to get evaporate or absorbed by the vegetation and soil underneath the solar panel.<br>• The proponent should make a MoU with the local municipality to collect the daily | Plant EHS Team and operations | Designated Team comprising of representation from EHS & Admin Officer and Operations of MSEL |

| Issues/Activities | Potential Impacts[36] | Proposed Management Plan | Proposed Mitigation Measures to Enhance the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | domestic for disposing of in the designated dumping site.<br>• Ensure oil/ lubricants are stored on impervious floor in the storage area having secondary containment.<br>• Use of spill control kits to contain and clean small spills and leaks during O&M activities; and<br>• The guidelines and procedures shall be prepared and followed for immediate clean-up actions following any spillages.<br>• Establishing proper monitoring of the soil parameter to at regular interval to identify any deviation in the soil properties.<br>• When laying high voltage cables, utilize best available technology to keep warming at a low level. | | |
| Water Resources | • Uncontrolled release of contaminated runoff from PV operation facilities<br>• Depletion in ground | • Water and Wastewater Management Plan Management Plan | • Ensure that rainwater collected from the project site will be utilized to recharge the ground water through onsite rainwater harvesting tank/pits. | Plant EHS Team and operations | Designated Team comprising of representation |

| Issues/Activities | Potential Impacts[36] | Proposed Management Plan | Proposed Mitigation Measures to Enhance the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | • Emergency Preparedness and Response Management Plan (Contingency Plan to Spill Management) | • Prior to operation, an emergency response plan for spills of hazardous materials and oil will be prepared.<br>• The surface water quality monitoring will also be carried out at defined intervals and for environmental quality monitoring parameters suggested in the Environmental Monitoring Plan. If these parameters are above the prescribed limits, suitable control measures will be taken.<br>• Groundwater quality monitoring will be carried out as per schedule suggested in the Environmental Monitoring Plan.<br>• Sanitary effluent should deposit in septic tank.<br>• Create an appropriate drainage channel for storm water and surface water runoff. | | from EHS & Admin Officer and Operations of MSEL |
| Occupational Health and Safety | • Health risk of the worker due to<br>○ *Leaching of materials from broken or fire damaged PV modules*<br>○ *Vehicle accidents, replacement of components/parts* | • Occupational Health and Safety Plan<br>• Labour Management Plan<br>• Supplier Management Plan | • Workers handling electricity and related components will be provided with shock resistant gloves, shoes and other protective gears.<br>• Adequate training regarding health and safety will be provided to the workers.<br>• A health, safety, and environment (HSE) management system will be developed, rolled out and implemented. | Plant EHS Team and operations | Designated Team comprising of representation from EHS & Admin Officer and |

| Issues/Activities | Potential Impacts[36] | Proposed Management Plan | Proposed Mitigation Measures to Enhance the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | ○ *Emergency Fire Hazard*<br>○ *Electrocution of workers*<br>○ *Electromagnetic radiation from PV modules* | | This system which will be reviewed annually or after a major accident or incident.<br>• The switchyard building will be provided with fire extinguishers and sand buckets at all strategic locations to deal with any incident of fire.<br>• Safety incidents will be recorded and monitored with an aim that numbers are never significant, and gradually reduce.<br>• Workers at site handling broken solar panels shall be provided with adequate PPEs (safety gear, goggles, and gloves).<br>• The workers at the site are also on regular basis shall be appraised about the potential health risks associated with the handling of solar panels.<br>• All work at height to be undertaken during daytime with sufficient sunlight except emergency (with proper illumination arrangement);<br>• Only workers trained in climbing techniques and use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment shall be engaged for work at height. | | Operations of MSEL |

| Issues/Activities | Potential Impacts[36] | Proposed Management Plan | Proposed Mitigation Measures to Enhance the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | • Workers handling electricity and related components will be provided with shock resistant gloves, shoes and other protective gears. Adequate training regarding health and safety will be provided to the workers.<br>• Access to areas containing exposed electrical equipment (such as transformers) shall be fenced and locked. Warning signs shall be posted at hazardous locations.<br>• Firefighting equipment's such as fire extinguishers and sand buckets shall be provided at appropriate locations.<br>• Workers involved in electric operations shall be provided with Protective Equipment rubber gloves etc.<br>• Employees involved in electrical works shall be trained in and familiar with the safety-related work practices, safety procedures, and other safety requirements that pertain to their respective job assignments.<br>• First aid box/ arrangement to be ensured | | |
| Labor Influx | • Operation of this project will require nearly 65 people from | • Labour Management Plan | • Prevention of massive movement within the locality for workers. | Plant EHS Team and operations | Designated Team comprising of |

| Issues/Activities | Potential Impacts[36] | Proposed Management Plan | Proposed Mitigation Measures to Enhance the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | various department and will create an influx within the locality | (including labor influx)<br>• | • Proper safety protocol should be taken under the labor management plan by MSEL.<br>• Alert the migrant workers regarding GBV, local harmony and other socio-cultural aspects to avoid any kind of collision between labor and local people.<br>• Promoting collaboration with local authorities to enhance access of workers for their basic necessary that can be collected from the locality.<br>• Promoting use of local goods and other material to make a balance between workers and local people | | representation from EHS & Admin Officer and Operations of MSEL |
| Wildlife | • Lake effect on aquatic bird<br>• Reduce habitat quality.<br>• Potential introduction of invasive species.<br>• Fauna morbidity and mortality | • Biodiversity Management Plan | • Consider dry cleaning of solar panels as good maintenance practice.<br>• Use biodegradable and non-toxic cleaning agents to prevent water and soil contamination.<br>• Implement stringent waste management practices to ensure proper disposal and recycling of waste materials.<br>• Install proper drainage systems to manage runoff if water is used for cleaning of solar panels and prevent contamination of wetlands and water bodies. | Plant EHS Team and operations | Designated Team comprising of representation from EHS & Admin Officer and Operations of MSEL |

| Issues/Activities | Potential Impacts[36] | Proposed Management Plan | Proposed Mitigation Measures to Enhance the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | • Conduct regular monitoring of wildlife populations and habitats to identify and address emerging impacts.<br>• Adjust operational practices based on monitoring results to continuously improve mitigation efforts.<br>• Educate operational staff and local communities about the importance of wildlife conservation and the need to minimize disturbances.<br>• Rescue, rehabilitation and relocation should be done for terrestrial fauna when necessary. | | |
| Fisheries Resources | • Habitat quality<br>• Impacts on spawning and feeding ground of fish<br>• Fish Morbidity and mortality<br>• Spreading of invasive species | • Biodiversity Management Plan | • Implement water-saving technologies for panel cleaning to reduce water demand.<br>• Implement best management practices for waste disposal to prevent chemical contamination of water bodies.<br>• Implement habitat restoration projects to compensate for any habitat loss due to project activities.<br>• Install fish-friendly infrastructure, such as fish passages and screens, to facilitate fish migration and prevent habitat fragmentation.<br>• Conduct regular monitoring of fish populations to assess the effectiveness of mitigation measures and identify any emerging threats. | Plant EHS Team and operations | Designated Team comprising of representation from EHS & Admin Officer and Operations of MSEL |

| Issues/Activities | Potential Impacts[36] | Proposed Management Plan | Proposed Mitigation Measures to Enhance the Plan | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | • Develop and implement invasive species management plans to prevent the introduction and spread of invasive fish species.<br>• Conduct awareness campaigns and training for project staff and local communities on the risks associated with invasive species and the importance of preventing their spread. | | |

### 7.2.4 During Decommissioning Phase

**Figure 7-1 Mitigation measures during decommissioning phase**

| Issues/Activities | Potential Impacts[37] | Proposed Management Plan | Proposed Mitigation/Enhancement Measures | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| Air Quality | • Exhaust Emissions due to operation of construction machinery<br>• Dust generated from stockpiles of | • Air and Noise Management Plan | • Implement dust control measures such as water spraying, wind barriers, and vehicle speed limits.<br>• Careful handling of dismantling waste and disposal of wastes in a designated place.<br>• Fit vehicles with appropriate exhaust systems and emission control devices. | Plant EHS Team and operations | Designated Team comprising of representation from EHS & Admin Officer and |

[37] In terms of environmental, social and ecological parameters

| Issues/Activities | Potential Impacts[37] | Proposed Management Plan | Proposed Mitigation/Enhancement Measures | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | waste, transporting wastes on vehicle | | • Use low Sulphur diesel (S<O.5%) diesel powered equipment in collaboration with best management practices.<br>• Avoid the use of diesel- or petrol-powered equipment by using electricity or battery-powered equipment where possible and if safety concerns can be overcome.<br>• Monitoring of ambient air condition. | | Operations of MSEL |
| Soil | • Soil compaction and erosion<br>• Soil Contamination | • Emergency Response and Preparedness Plan (Soil and Erosion Management Plan) | • During the dismantling, existing piles and pillar will be fully removed and stored at the designated area of the construction camp by the contractor at any cost, cutting of piles/pillar will not be allowed.<br>• Implement practices such as restricting heavy machinery use, creating designated paths, and post-activity soil aeration.<br>• Implement robust erosion control measures such as silt fences, mulching, cover crops, and prompt revegetation.<br>• Store the oil and petroleum product in a separate location cover by a concrete structure.<br>• Handling of hazardous liquid should be done carefully by the designated experienced person.<br>• The soil quality test should be carried out by the contractor as per the available standards.<br>• | Plant EHS Team and operations | Designated Team comprising of representation from EHS & Admin Officer and Operations of MSEL |

| Issues/Activities | Potential Impacts[37] | Proposed Management Plan | Proposed Mitigation/Enhancement Measures | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| Surface Water | • , accidental spillage of hazardous liquids into the nearest water body<br>• Accumulation of the dust in the water body | • Waste Management Plan | • Proper safety fence will be provided by the contractor to control the dismantled piece of concrete into the waterbody.<br>• Any wastes should not be throwing into the surface water body other than dump into the designated waste dumping area;<br>• Handling of dismantled wastes should be done carefully by the designated experienced person.<br>• Dismantling work should be preferred during the dry season and daytime only.<br>• Monitor the surface water by testing in designated laboratory should be done by the Contractor following the National Water Quality Standard (ECR, 2023). | Plant EHS Team and operations | Designated Team comprising of representation from EHS & Admin Officer and Operations of MSEL |
| Ground Water | • Groundwater pollution due to contamination | • Emergency Preparedness and Response Plan (Contingency Plan for Spill Management) | • Ensure all hazardous materials are properly contained and disposed of to prevent contamination.<br>• Develop and implement spill prevention and response plans, including training for workers.<br>• Conduct regular monitoring of groundwater quality before, during, and after dismantling activities to detect any contamination early.<br>• Install barriers or liners to prevent the movement of contaminants into the soil and groundwater. | Plant EHS Team and operations | Designated Team comprising of representation from EHS & Admin Officer and Operations of MSEL |

| Issues/Activities | Potential Impacts[37] | Proposed Management Plan | Proposed Mitigation/Enhancement Measures | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| Noise | • Noise generation due to decommissioning activities<br>• Vehicular movement<br>• Operation DG sets | • Air and Noise Management Plan | • Notify the adjacent community before starting the dismantling/demolishing work.<br>• Create noise barrier and consider the minimum noise levels at sensitive receptor sites (e.g., school, mosque, and madrasa etc.);<br>• Protection devices (ear plugs or earmuffs) shall be provided to the workers operating in the vicinity of high noise generating location and sources during dismantling.<br>• Dismantling works should be conducted during daytime only.<br>• Instruction to the drivers to avoid unnecessary horn.<br>• Noise level monitoring should be carried out by the contractor following the National Noise Quality Standard (Noise Pollution (control) rules 2006) | Plant EHS Team and operations | Designated Team comprising of representation from EHS & Admin Officer and Operations of MSEL |
| Environmental, Health and Safety | • Impact on human health | • Environmental Health and Safety Management Plan | • The proponent/developer shall inform the workers and local community about the duration of work.<br>• Dismantling activities will take care of experienced professionals under the guidance of plant EMS Head.<br>• All the dismantled infrastructures and debris shall be segregated and stored separately with cover facility to negotiate with contamination effects of such wastes. | Plant EHS Team and operations | Designated Team comprising of representation from EHS & Admin Officer and Operations of MSEL |

| Issues/Activities | Potential Impacts[37] | Proposed Management Plan | Proposed Mitigation/Enhancement Measures | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | • The metal structure will be sold out to the approved recyclers, whereas debris will be disposed-off as per their characteristics.<br>• The workers shall be clearly informed about the expected schedule and completion of each activity.<br>• All waste generated from the decommissioning phase shall be collected and disposed of at the nearest identified disposal site.<br>• All necessary Personal Protection Equipment (PPE) shall be used by the workers during demolition work.<br>• Solar Panels as utilized for the project even after 20 years will have the 70 – 80% power generation capacity. Due to technological improvement, after 20 years recycling or reutilization of these panels are very much likely.<br>• During decommissioning phase proponent should follow mitigation measures for air, noise, solid & liquid waste and Occupational health and safety respectively.<br>• Water sprinkling would be the regular practice to reduce the dust generation from the plant decommissioning activities.<br>• Disposal panels will be disposed of off to authorized vendor through buyback agreements. | | |

| Issues/Activities | Potential Impacts[37] | Proposed Management Plan | Proposed Mitigation/Enhancement Measures | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | | | • It is to be ensured that dismantling is carried out during the non-monsoon season.<br>• Committed to ensuring that all health and safety measures are in place to prevent accidents and reduce the consequences of non-conformance events.<br>• After decommissioning project authority will make sure that land fertile in few years. | | |
| Community Health and Safety | • Health impact<br>• community disturbance | • Community Health and Safety Management Plan | • Emphasizing safety aspects among drivers, particularly with regard to the speed limit of<br>• 20 km/hr that will be enforced.<br>• Ensuring that only licensed drivers are employed by the Project.<br>• Avoiding peak hours for heavy vehicle movement where possible.<br>• Collaboration with local communities and responsible authorities to improve signage (e.g.,<br>• pedestrian crossings, speed limits, etc.), visibility, and awareness of traffic and pedestrian safety.<br>• After taking the proper mitigation measures the impact will be minimized to very low from<br>• low. | Plant EHS Team and operations | Designated Team comprising of representation from EHS & Admin Officer and Operations of MSEL |
| Ecosystems and Biodiversity | • Reduce habitat quality for plants and animals | • Biodiversity Management Plan | • Implement habitat restoration programs to mitigate habitat disturbance and loss caused by decommissioning activities. | Plant EHS Team and operations | Designated Team comprising of representation |

| Issues/Activities | Potential Impacts[37] | Proposed Management Plan | Proposed Mitigation/Enhancement Measures | Responsibility | |
|---|---|---|---|---|---|
| | | | | Implementation | Supervision |
| | • Hampering plant growth and causing diseases<br>• Reduce plants productivity<br>• Spreading of invasive species<br>• Faunal morbidity and mortality | | • Replant native vegetation and establish wildlife corridors to reconnect fragmented habitats and support biodiversity recovery.<br>• Develop and implement waste management plans to ensure proper handling, recycling, and disposal of decommissioned equipment and materials.<br>• Conduct soil and water quality monitoring to detect and mitigate pollution risks associated with hazardous waste disposal.<br>• Conduct pre-decommissioning surveys to identify critical wildlife habitats and nesting sites and implement protective measures to minimize disturbance.<br>• Monitor wildlife populations during and after decommissioning to assess the effectiveness of mitigation measures and identify any emerging threats.<br>• Implement invasive species monitoring and control programs to prevent the establishment and spread of invasive plants in decommissioned areas. | | from EHS & Admin Officer and<br>Operations of MSEL |

## 7.3 Monitoring Plan

The monitoring plan is one of the important tools for implementing the mitigation plan for the proposed project. The Monitoring plan guides environmental issues/parameters, location, frequency, and means of monitoring.

The aim of Environmental monitoring during the construction, and operation phases of the project is to compare the monitored data against the baseline condition collected during the study period to assess the effectiveness of the mitigation measures and the protection of environmental components (e.g., air, water, soil, noise, etc.) based on the national environmental standards (e.g., ECR, 2023). Since the project is likely to impact various components of the environment, a comprehensive monitoring plan covering soil quality, air quality, water quality, noise, should be developed. Also monitoring of social and ecological parameters also included here.

### 7.3.1 Objectives

The objective of environmental monitoring during the project different phases is to compare the monitored data against the baseline condition collected during the study period to assess the effectiveness of the mitigation measures and the protection of the ambient environment based on national and international standards. Monitoring of the social parameters to ensure that project is align mitigation measures proposed in the IESE. The main objectives of the phase monitoring plans will be to:

- Monitor the actual impact of the works on physical and biological receptors within the project area to indicate the adequacy of the IESE.
- Recommend mitigation measures for any unexpected impact or where the impact level exceeds anticipated in the IESE.
- Ensure compliance with legal and community obligations, including safety on the project site.
- Ensure the safe disposal of excess construction materials and other wastes.
- Appraise the adequacy of the IESE concerning the project's predicted long-term impacts on the physical, biological, and socio-economic environment.
- Evaluate the effectiveness of the mitigation measures proposed in the ESMP and recommend improvements if and when necessary.

**Table 7-4: Monitoring Plan**

| Affected components | Environmental Issues | Parameters/Units | Monitoring Location | Means of Monitoring/Measurement | Applicable Standards | Frequency | Responsibility | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Implementation | Supervision |
| Pre-Construction Phase | | | | | | | | |
| Land | Amount of land | Documentation | Site | Leased documents | Laws of Bangladesh | Once before starting the construction | MSEL | MSEL |
| Ambient Air Quality | Dust generation | Dust | Project activity areas | Visual inspection of all active work areas | Monitoring | Daily | Appointed Contractor | MSEL |
| | Ambient Air Pollutant | $PM_{2.5}$, $PM_{10}$, CO, $SO_2$, NOx, SPM | 4 Location, Project site as per baseline monitoring points and adjacent location | 24-hour | Air Pollution (Control) Rules, 2022 and WHO global air quality guidelines, 2021 | Bi-monthly | Appointed Contractor | MSEL/DOE |
| Noise | Increase in ambient noise levels | Noise levels in Leq, Leq day, Leq night | The project site, adjacent sensitive receptors (5 locations) as per baseline monitoring points | 24-hour | Noise Pollution Control Rules (2006), Bangladesh and IFC EHS guidelines[38] | Bi-monthly | Appointed Contractor | MSEL/DOE |
| Water Quality | Surface water | Temperature, Ph, DO, TDS, BOD, COD, Nitrate, chromium, FC, TC | 2 samples as per baseline monitoring points | Sampling | Surface water quality standard as per Schedule | Bi-monthly | Appointed Contractor | MSEL /DOE |

[38] Guidelines values are for noise levels measured out of doors. Source: Guidelines for Community Noise, World Health Organization (WHO), 1999

| Affected components | Environmental Issues | Parameters/Units | Monitoring Location | Means of Monitoring/Measurement | Applicable Standards | Frequency | Responsibility | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Implementation | Supervision |
| | | | | | 2 of ECR 2023 | | | |
| | Groundwater quality | FC, TC, $NO_3^-$, As, Al, $NH_3$, Ca, Cl-, Cr, Cu, Cyanide CN, $F^-$, Fe, Pb, Mg, Mn, Ni, $NO_2^-$, Oil and Grease, pH, K, | 2 Locations, Project area and Adjacent village. | Sampling | Drinking water quality standards as per Schedule 2 of ECR 2023 and WHO guideline | Bi-monthly | Appointed Contractor | MSEL /DOE |
| Soil Quality | Contamination of Soil | pH, texture, EC, TDS, Salinity, NH4+, total P, heavy metals, Organic Matter as per baseline parameters | 2 sample (Adjacent agricultural land) | Sampling | Standard analytical methods | Bi-monthly | Appointed Contractor | MSEL /DOE |
| Waste | Liquid waste, Solid Waste | • Check storage, transportation, disposal, and handling of hazardous waste.<br>Wastes and garbage from construction sites are to be disposed of safely | Project Site | Visual inspection of all active work areas | Monitoring ADB SPS | Daily | Appointed Contractor | MSEL /DOE |
| Occupational Health and Safe | Workers Health & Safety | Near-misses, incidents, occupational diseases, dangerous occurrences | Project activity areas and construction camp area | Site visit and visual inspection and documentation | Laws of Bangladesh ADB SPS | Daily | Appointed Contractor | MSEL /DOE |

| Affected components | Environmental Issues | Parameters/Units | Monitoring Location | Means of Monitoring/Measurement | Applicable Standards | Frequency | Responsibility | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Implementation | Supervision |
| Ecology | Terrestrial Flora | Number of tree felled, area of vegetation clearance | Plant site and adjacent area | Visual inspection and photographic documentation, maintain checklist | Laws of Bangladesh | Monthly | MSEL | MSEL |
| | Wildlife (mammals, reptiles, amphibians, birds) | Number of injured/rescued and rehabilitated wildlife | Plant site and adjacent area | Visual inspection and photographic documentation, maintain checklist | Laws of Bangladesh | Monthly | MSEL | MSEL |
| | | Occurrence of threatened mammals, reptiles, birds and their abundance | Plant site and adjacent area | Visual inspection and photographic documentation, maintain checklist | Laws of Bangladesh | Quarterly | MSEL/ 3rd party | MSEL |
| Construction Phase | | | | | | | | |
| Ambient Air Quality | Dust generation | Dust | Project activity areas | Visual inspection of all active work areas | Monitoring | Daily | Appointed Contractor | MSEL |
| | Ambient Air Pollutant | $PM_{2.5}$, $PM_{10}$, CO, $SO_2$, NOx, SPM | 4 Location, Project site as per baseline monitoring points and adjacent location | 24-hour | Air Pollution (Control) Rules, 2022 and WHO global air quality guidelines, 2021 | Quarterly | Appointed Contractor | MSEL/DOE |
| Noise | Increase in ambient noise levels | Noise levels in Leq, Leq day, Leq night | The project site, adjacent sensitive receptors (5 locations) as per baseline | 24-hour | Noise Pollution Control Rules (2006), Bangladesh | Quarterly | Appointed Contractor | MSEL/DOE |

| Affected components | Environmental Issues | Parameters/Units | Monitoring Location | Means of Monitoring/Measurement | Applicable Standards | Frequency | Responsibility | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Implementation | Supervision |
| | | | monitoring points | | and IFC EHS guidelines[39] | | | |
| Water Quality | Surface water | Temperature, Ph, DO, TDS, BOD, COD, Nitrate, chromium, FC, TC | 2 samples as per baseline monitoring points | Sampling | Surface water quality standard as per Schedule 2 of ECR 2023 | Quarterly | Appointed Contractor | MSEL /DOE |
| | Groundwater quality | FC, TC, $NO_3^-$, As, Al, $NH_3$, Ca, Cl-, Cr, Cu, Cyanide CN, $F^-$, Fe, Pb, Mg, Mn, Ni, $NO_2^-$, Oil and Grease, pH, K, | 2 Locations, Project area and Adjacent village. | Sampling | Drinking water quality standards as per Schedule 2 of ECR 2023 and WHO guideline | Quarterly | Appointed Contractor | MSEL /DOE |
| Soil Quality | Contamination of Soil | pH, texture, EC, TDS, Salinity, NH4+, total P, heavy metals, Organic Matter as per baseline parameters | 2 sample (Adjacent agricultural land) | Sampling | Standard analytical methods | Quarterly | Appointed Contractor | MSEL /DOE |
| Waste | Liquid waste, Solid Waste | • Check storage, transportation, disposal, and handling of hazardous waste.<br>• Wastes and garbage from construction | Project Site | Visual inspection of all active work areas | Monitoring ADB SPS | Daily | Appointed Contractor | MSEL /DOE |

[39] Guidelines values are for noise levels measured out of doors. Source: Guidelines for Community Noise, World Health Organization (WHO), 1999

| Affected components | Environmental Issues | Parameters/Units | Monitoring Location | Means of Monitoring/Measurement | Applicable Standards | Frequency | Responsibility | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Implementation | Supervision |
| | | sites are to be disposed of safely | | | | | | |
| Occupational Health and Safe | Workers Health & Safety | • Near-misses, incidents, occupational diseases, dangerous occurrences | Project activity areas and construction camp area | Site visit and visual inspection and documentation | Laws of Bangladesh<br>ADB SPS | Daily | Appointed Contractor | MSEL /DOE |
| Land Lease Payment | - | • Payment Related Document | Project Site | Site visit and visual inspection and documentation | ADB SPS | Semi-Annual | Appointed Contractor | MSEL /DOE |
| SEP Activities | - | • Consultation Documents | Project Site | Site visit and visual inspection and documentation | ADB SPS | Semi-Annual | Appointed Contractor | MSEL /DOE |
| Grievance Resolution | - | • Grievance Regioster | Project Site | Site visit and visual inspection and documentation | ADB SPS | Semi-Annual | Appointed Contractor | MSEL /DOE |
| Community health and Safety | Community disturbance and potential safety hazard due to road traffic | • Accidents, incidents, and complaints due to project vehicle movement | Project access road and Transmissio n line route | Incidents, accidents, and community complaint | As per national and IFC/ WB standard guideline, ADB SPS | Based on occurrence | Appointed Contractor | MSEL /DOE |
| | Public concerns | • Complaints from community | Neighboring communities around the project activity areas | As per GRM | As per national and IFC/ WB standard guideline, ADB SPS | Continuous | Appointed Contractor | MSEL /DOE |

| Affected components | Environmental Issues | Parameters/Units | Monitoring Location | Means of Monitoring/Measurement | Applicable Standards | Frequency | Responsibility | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Implementation | Supervision |
| Environmental and Social Issue | Training Need | People of Contractor who involved in environmental and social issues.<br>• *1 – day training of management staff*<br>• *1- day training of workforce level* | Project Site | Training Documents, Modules, Phot evidence | As per national and IFC/ WB standard guideline, ADB SPS | Twice a year | Appointed Contractor | MSEL /DOE |
| | Monitoring of the ESMP | Mitigation Measures/Management Plan | Project | Implementation of the Mitigation Measures, Development of the Management Plan, Document, Photo evidence, Site visit | As per national and IFC/ WB standard guideline, ADB SPS | Twice a year | Appointed Contractor | MSEL /DOE |
| Ecology | Wildlife (mammals, reptiles, amphibians, birds) | • Number of species and their abundance<br>• Disturbance to and mortality of wildlife<br>• Occurrence of threatened mammals, reptiles, birds and their abundance | Plant site and adjacent area | Visual inspection and photographic documentation | Laws of Bangladesh | Quarterly | Appointed contractor/ 3rd party | MSEL |
| | Fisheries Resources | • Fish Mortality<br>• Fish production | Plant site adjacent | Visual inspection, Consultation | Laws of Bangladesh | Half yearly | Appointed contractor | MSEL |

| Affected components | Environmental Issues | Parameters/Units | Monitoring Location | Means of Monitoring/Measurement | Applicable Standards | Frequency | Responsibility | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Implementation | Supervision |
| | | | aquaculture ponds | | | | | |
| Lightening and Flood hazard | Inflict damage to the project, people and its various component | Weather forecast | Project Site | Lightening arrestor installation<br>Site and visual inspection | Monitoring | Based on occurrence | Appointed contractor | MSEL |
| Operation Phase | | | | | | | | |
| Ambient Air Quality | Ambient Air Pollutant | • $PM_{2.5}$, $PM_{10}$, CO, $SO_2$, NOx, SPM | 4 Location, Project site as per baseline monitoring points and adjacent location | 24-hour | Air Pollution (Control) Rules, 2022 and WHO global air quality guidelines, 2021 | Semi-annual | O&M unit/3rd party | MSE |
| Noise | Noise generation from plant Equipment | • Sound pressure level | 1 m from the noise generation equipment's (for all noise sources greater than 70 dB (A) noise level) | Instant | Noise Pollution Control Rules (2006), Bangladesh and IFC EHS guidelines[40] | Semi-annual | O&M unit/3rd party | MSEL/DOE |
| | Increase in ambient noise levels | • Noise levels in Leq, Leq day, Leq night and hourly Leq | At project boundary and at nearest noise sensitive | 24-hour | Noise Pollution Control Rules (2006), Bangladesh | Semi-annual | O&M unit/3rd party | MSEL/DOE |

[40] Guidelines values are for noise levels measured out of doors. Source: Guidelines for Community Noise, World Health Organization (WHO), 1999

| Affected components | Environmental Issues | Parameters/Units | Monitoring Location | Means of Monitoring/Measurement | Applicable Standards | Frequency | Responsibility | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Implementation | Supervision |
| | | | receptors in all direction from the plant (5 location) as per baseline | | and IFC EHS guidelines[41] | | | |
| Water Quality | Surface water | Temperature, Ph, DO, TDS, BOD, COD, Nitrate, chromium, FC, TC | 2 samples as per baseline monitoring points | Sampling | Surface water quality standard as per Schedule 2 of ECR 2023 | Quarterly | O&M unit/3rd party | MSEL |
| | Groundwater quality | Drinking Water Quality FC, TC, $NO_3^-$,As, Al, $NH_3$, Ca, Cl-, Cr, Cu, Cyanide CN, $F^-$, Fe, Pb, Mg, Mn, Ni, $NO_2^-$, Oil and Grease, pH, K, | 2 Locations, Project area and Adjacent village. | Sampling | Drinking water quality standards as per Schedule 2 of ECR 2023 and WHO guideline | Quarterly | O&M unit/3rd party | MSEL |
| | | Ground water depletion rate | One location in and around the project site | Monitoring techniques | Monitoring | Half yearly (dry and wet season) | O&M unit/3rd party | MSEL |
| Soil Quality | Contamination of Soil | pH, texture, EC, TDS, Salinity, NH4+, total P, heavy metals, Organic Matter as | 2 sample (Adjacent agricultural land) | Sampling | Standard analytical methods | Quarterly | O&M unit/3rd party | MSEL |

[41] Guidelines values are for noise levels measured out of doors. Source: Guidelines for Community Noise, World Health Organization (WHO), 1999

| Affected components | Environmental Issues | Parameters/Units | Monitoring Location | Means of Monitoring/Measurement | Applicable Standards | Frequency | Responsibility | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Implementation | Supervision |
| | | per baseline parameters | | | | | | |
| Waste | Liquid waste, Solid Waste | • Check storage, transportation, disposal, and handling of hazardous waste.<br>• Wastes and garbage from sites are to be disposed of safely | Project Site | Visual inspection of all active work areas | Monitoring<br>ABD SPS | Daily | O&M unit/3rd party | MSEL |
| Ecology | Wildlife (mammals, reptiles, amphibians, birds) | • Number of species and their abundance<br>• Disturbance to and mortality of wildlife<br>• Occurrence of threatened mammals, reptiles, birds and their abundance | Plant site and adjacent area | Visual inspection and photographic documentation | Laws of Bangladesh | Half yearly | O&M unit/3rd party | MSEL |
| Occupational Health and Safe | Workers Health & Safety | • Near-misses, incidents, occupational diseases, dangerous occurrences | Project activity areas | Site visit and visual inspection and documentation | Laws of Bangladesh<br>ADB SPS | Daily | O&M unit/3rd party | MSEL |
| Land Lease Payment | - | • Payment Related Document | Project Site | Site visit and visual inspection and documentation | ADB SPS | Semi-Annual | Appointed Contractor | MSEL /DOE |

| Affected components | Environmental Issues | Parameters/Units | Monitoring Location | Means of Monitoring/Measurement | Applicable Standards | Frequency | Responsibility | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Implementation | Supervision |
| SEP Activities | - | • Consultation Documents | Project Site | Site visit and visual inspection and documentation | ADB SPS | Semi-Annual | Appointed Contractor | MSEL /DOE |
| Grievance Resolution | - | • Grievance Register | Project Site | Site visit and visual inspection and documentation | ADB SPS | Semi-Annual | Appointed Contractor | MSEL /DOE |
| LRP Implementation | - | • LRP Progress Report | Project Site | Site visit and visual inspection and documentation | ADB SPS | Semi-Annual | Appointed Contractor | MSEL /DOE |
| Community health and Safety | Community disturbance and potential safety hazard due to road traffic | • Accidents, incidents, and complaints due to project vehicle movement | Project access road and Transmission line route | Incidents, accidents, and community complaint | As per national and IFC/ WB standard guideline, ADB SPS | Based on occurrence | O&M unit/3rd party | MSEL |
| | Public concerns | • Complaints from community | Neighboring communities around the project activity areas | As per GRM | As per national and IFC/ WB standard guideline, ADB SPS | Continuous | O&M unit/3rd party | MSEL |
| | Monitoring of the ESMP | • Mitigation Measures/Management Plan | Project | Implementation of the Mitigation Measures, Development of the Management Plan, Document, Photo evidence, Site visit | As per national and IFC/ WB standard guideline, ADB SPS | Twice a year (first two operation year) Yearly (after two operation year-continue to 10 years or loan | Appointed Contractor | MSEL /DOE |

| Affected components | Environmental Issues | Parameters/Units | Monitoring Location | Means of Monitoring/Measurement | Applicable Standards | Frequency | Responsibility | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Implementation | Supervision |
| | | | | | | guaranty period.) | | |
| CSR Activities | Community Development | • Activities/ programs and no of beneficiaries | Vulnerable group around the project activities area | No of beneficiaries and outcome of the activities | ---- | Twice a year | O&M unit/3rd party | MSEL |
| Decommissioning Phase | | | | | | | | |
| EHS | All EHS related issues | Checklist on<br>• General Cleanliness of site considering Soil, water, air related mitigations mean | Site | Visual inspection and maintain checklist | Laws of Bangladesh and ADB SPS | Daily | MSEL | MSEL |
| Community health and Safety | Community disturbance and potential safety hazard due to road traffic | • Accidents, incidents, and complaints due to project vehicle movement | Project access road and Transmission line route | Incidents, accidents, and community complaint | As per national and IFC/ WB standard guideline, ADB SPS | Based on occurrence | MSEL | MSEL |
| | Public concerns | • Complaints from community | Neighboring communities around the project activity areas | As per GRM | As per national and IFC/ WB standard guideline, ADB SPS | Continuous | O&M unit/3rd party | MSEL |

### 7.3.2 Budget for Environmental and Social Management

The estimated budget for implementation of the mitigation and monitoring measures proposed in the EMP is presented in **Table 7-5**.

The overall costs of the EMP will comprise:

- Environmental monitoring through sample collection and analysis.
- Any remedial measures necessary to reduce or avoid environmental damage.
- Designing and implementing all mitigating and enhancement measures.

EHS will be checked on visual inspection, monitoring and through checklist. Construction stages the budget is BDT. 1510,000 in 7 months because the activities under preconstruction will take 4 months. In addition, the operation stage budget is BDT. 21,42,000/year. This budget does not include the decommissioning stage since the minimum operation period is 20 years and the rate will vary largely from the present cost.

**Table 7-5: Environmental Budget**

| Component | Item | Location | Unit | Quantity | Rate (in BDT) | Amount (BDT) |
|---|---|---|---|---|---|---|
| **A. PRE-CONSTRUCTION PHASE** | | | | | | |
| Land lease and buying | -. | Project site | Lump-sum | - | - | --- |
| Environmental Expert | - | | Man month | 3 | 60,000 | 180,000 |
| Air Quality | Measuring air quality | 4 | No. | 8 | 25,000 | 200,000 |
| Noise | Measuring ambient noise level | 5 | No. | 10 | 3000 | 30,000 |
| Water Quality | Surface water quality measurement | 2 | No | 4 | 10,000 | 40,000 |
| | Groundwater quality measurement | 2 | No | 4 | 10,000 | 40,000 |
| Soil Qaulity | Soil Quality measurement | 1 | No | 2 | 10,000 | 20000 |
| | | | | | **SUB TOTAL (B)** | 510,000 |
| **B. CONSTRUCTION STAGE – 11 Months** | | | | | | |
| Personnel | Environmental Expert | - | Man month | 6 | 60,000 | 360,000 |
| Air Quality | Measuring air quality | 4 | No. | 8 | 25,000 | 200,000 |
| Noise | Measuring ambient noise level | 5 | No. | 10 | 3,000 | 30,000 |
| Water Quality | Surface water quality measurement | 2 | No. | 4 | 10,000 | 40,000 |

| Component | Item | Location | Unit | Quantity | Rate (in BDT) | Amount (BDT) |
|---|---|---|---|---|---|---|
| | Groundwater quality measurement | 2 | No. | 4 | 10,000 | 40,000 |
| Soil Quality | Soil Quality measurement | 2 | No. | 4 | 10,00 | 40,000 |
| Ecology | | Project site and surroundings | no | 3 | 60,000 | 1,80,000 |
| Waste disposal and management | Disposal and management of construction waste | Project Site | Lump-sum | - | 50,000 | 50,000 |
| Monitoring of th ESMP implementation | Mitigation Measures | Project Site | Lump-sum | 2 | 5,00,000 | 10,00,000 |
| Land Lease Payment | | Project Site | No | 3 | 50000 | 150,000 |
| SEP Activities | | Project Site | No | 3 | 50000 | 150,000 |
| Grievance Resolution | | Project Site | No | 3 | 50000 | 150,000 |
| Training | Environmental training and awareness | | Lump-sum | 1 | - | 100,000 |
| Contingency | - | - | Lump-sum | | | 100,000 |
| | | **SUB TOTAL (B)** | | | | 2590,000 |
| **C. OPERATION STAGE – (PER YEAR)** | | | | | | |
| Personnel | Environmental Expert | - | Man Month | 12 | 60,000 | 720,000 |
| Air Quality | Monitoring air quality | 4 | No. | 8 | 25,000 | 200,000 |
| Noise | Monitoring ambient noise level | 6 | No. | 12 | 3,000 | 36,000 |
| Water | Monitoring surface water quality | 2 | No. | 8 | 10,000 | 80,000 |
| | Monitoring ground water quality | 2 | No. | 8 | 10,000 | 80,000 |
| | Ground water level measurement | 1 | No. | 2 | 25,000 | 50,000 |
| Soil Quality | Monitoring of Soil parameters | 2 | No | 8 | 10000 | 80000 |

| Component | Item | Location | Unit | Quantity | Rate (in BDT) | Amount (BDT) |
|---|---|---|---|---|---|---|
| Monitoring of th ESMP implementation | Mitigation Measures | Project SIte | Lump-sum | 2 | 5,00,000 | 10,00,000 |
| Land Lease Payment | | Project Site | No | 2 | 50000 | 100000 |
| SEP Activities | | Project Site | No | 2 | 50000 | 100,000 |
| Grievance Resolution | | Project Site | No | 2 | 50000 | 100,000 |
| LRP Implementation | | Project Site | No | 2 | 50000 | 100,000 |
| Training | Environmental training and awareness | | Lump-sum | 1 | | 100,000 |
| Ecology | | | No | 1 | 60,000 | 60,000 |
| Contingency | - | - | Lump-sum | | | 100,000 |
| | | **SUB TOTAL (C)** | | | | **19,06,000** |

## 7.4 Institutional Arrangements

The effective implementation and operation of the ESMP depends on the regular monitoring of environmental and social components in the proposed project area. During the pre-construction and preconstruction, construction stage and decommissioning stage, the Environment, Health, and Safety officer of the contractor will be responsible for the implementation of the ESMP and the project developer's staff, specifically the EHS officer, will supervise the implementation of these mitigation measures by the contractors at the site. During operation EHS officer from O&M team will observe.

The Project proponent, MSEL will ensure the implementation and monitoring of ESMP have been outlined in previous section. The flow diagram depicting the institutional arrangement for implementation of the ESMP is presented in Figure 7-1

**Table 7-6: Roles and Responsibilities of Project Developer and EPC Contractor**

| Project Developer (MSEL) | EPC Contractor |
|---|---|
| Obtaining statutory clearances required during pre-construction stage of the Project | Obtaining permits required during the preconstruction, construction and decommissioning stage |
| Overall project co-ordination and management through EPC and supported by the third-party environmental consultant/s | Engage third Party Environmental Consultant for Environmental monitoring as per the ESMP |
| Interaction and reporting to the respective department of GOB | Interaction with Project proponent and appointed supervision consultant, if any |
| Liaison and reporting to lenders | Filling of reporting formats as per the reporting schedule and submission to Project Developer |
| Monitoring of implementation of ESMP | Environmental monitoring through Third Party Environmental Laboratory |

| Project Developer (MSEL) | EPC Contractor |
|---|---|
| Carryout verification/ supervision exercises during the construction phase of the Project for implementation of ESMP | Preparation of various plans for effective implementation of ESMP as detailed out in the "Specification Manual" by the Project Developer |
| Keeping records of all permits obtained by EPC Contractor | Provide adequate drinking water, sanitation facility |
| Engage third Party Environmental Consultant for Environmental monitoring as per the ESMP during operation | |
| Overall supervision of ESMP implementation | |
| Approval of plans prepared by EPC Contractor | |
| Addressing grievances of local community and information dissemination | |
| Environmental monitoring through laboratory | |

While the contractor or a particular party is responsible for physical implementation of the mitigating measures, the whole implementation process requires supervision, checking, documentation and verification so that problems are identified and properly addressed before they get out of hand.

In order to ensure proper execution of the ESMP, implementation reviews will be conducted by the project management such as the weekly construction meetings, construction log book, monthly and other construction reports etc.

Records of these minutes of the weekly meeting, monthly reports and special reports on implementation of the mitigating measures will also be maintained and available for review by the Project management team of the MSEL. It is suggested to identify documents and records that require templates and accordingly suitable templates shall be developed, which shall include but not limited to policies, procedures and work instructions, meeting minutes, monitoring results, training attendance records, emergency contract lists, action plans etc. Further, all these templates shall be communicated to all potential users. All these records will be archived at the Project office and will be maintained by the EHS officer of the EPC contractor. All documents and records shall be archived with a unique identifier so that they can be distinguished from any other material and can be easily retrieved. MSEL will document the process for creating, allocating and approving unique identifiers and will communicate this to relevant staff.

The contractor shall identify EHS Officer for implementation ESMP for the project for which the contract has been awarded. The Contractor shall ensure that the ESMP (for the project) is implemented, the performance of which will be evaluated by MSEL time to time. The Contractor shall also be responsible for provisioning adequate arrangements and resources for implementing the corrective action developed as part of the internal and external audit reports developed time to time. Implementation shall be time and responsibility bound in the contractor project organogram. Organogram of MSEL and construction phase EPC contractor is shown below.

**Figure 7-2: Project Implementation Unit**

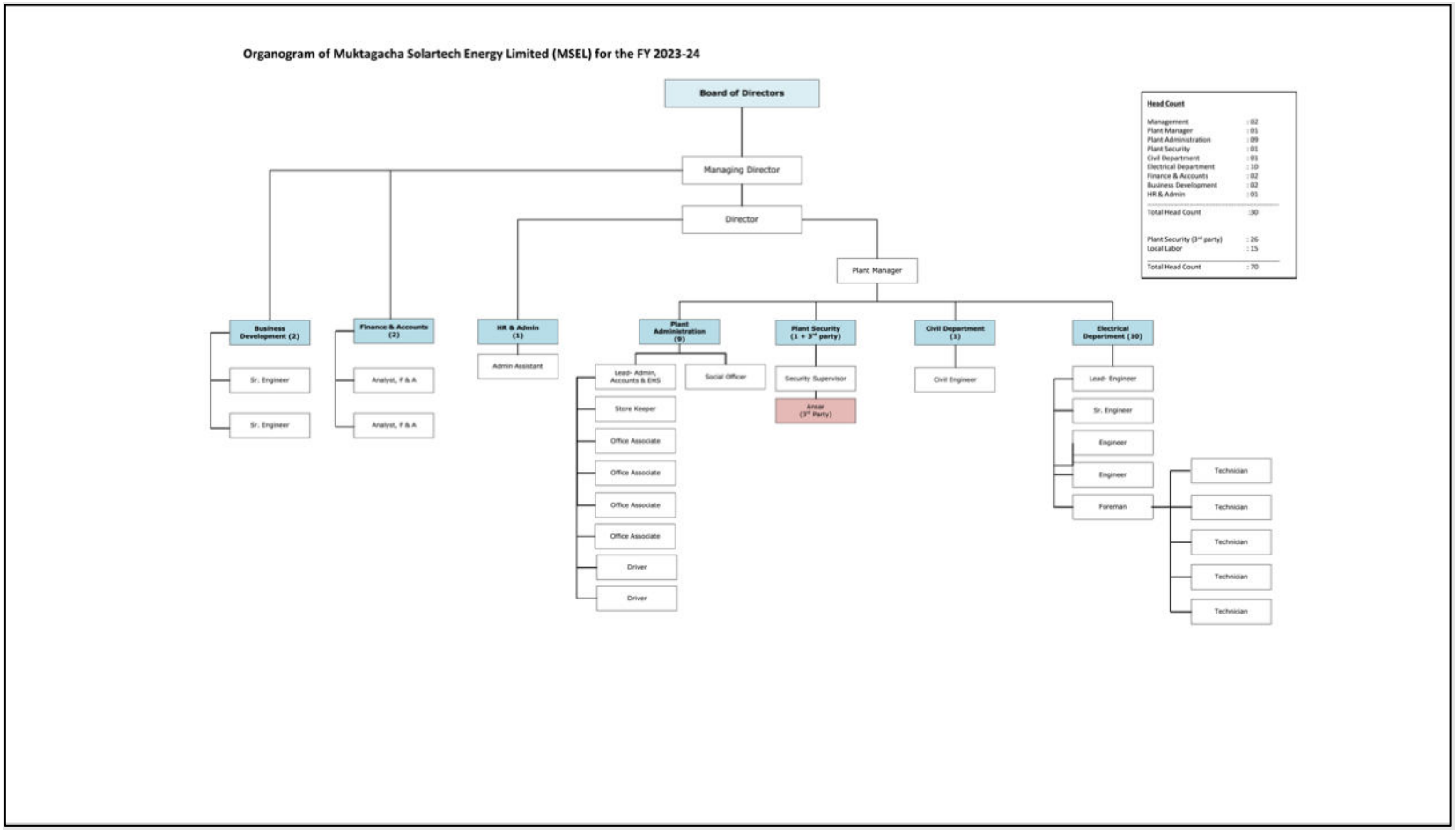
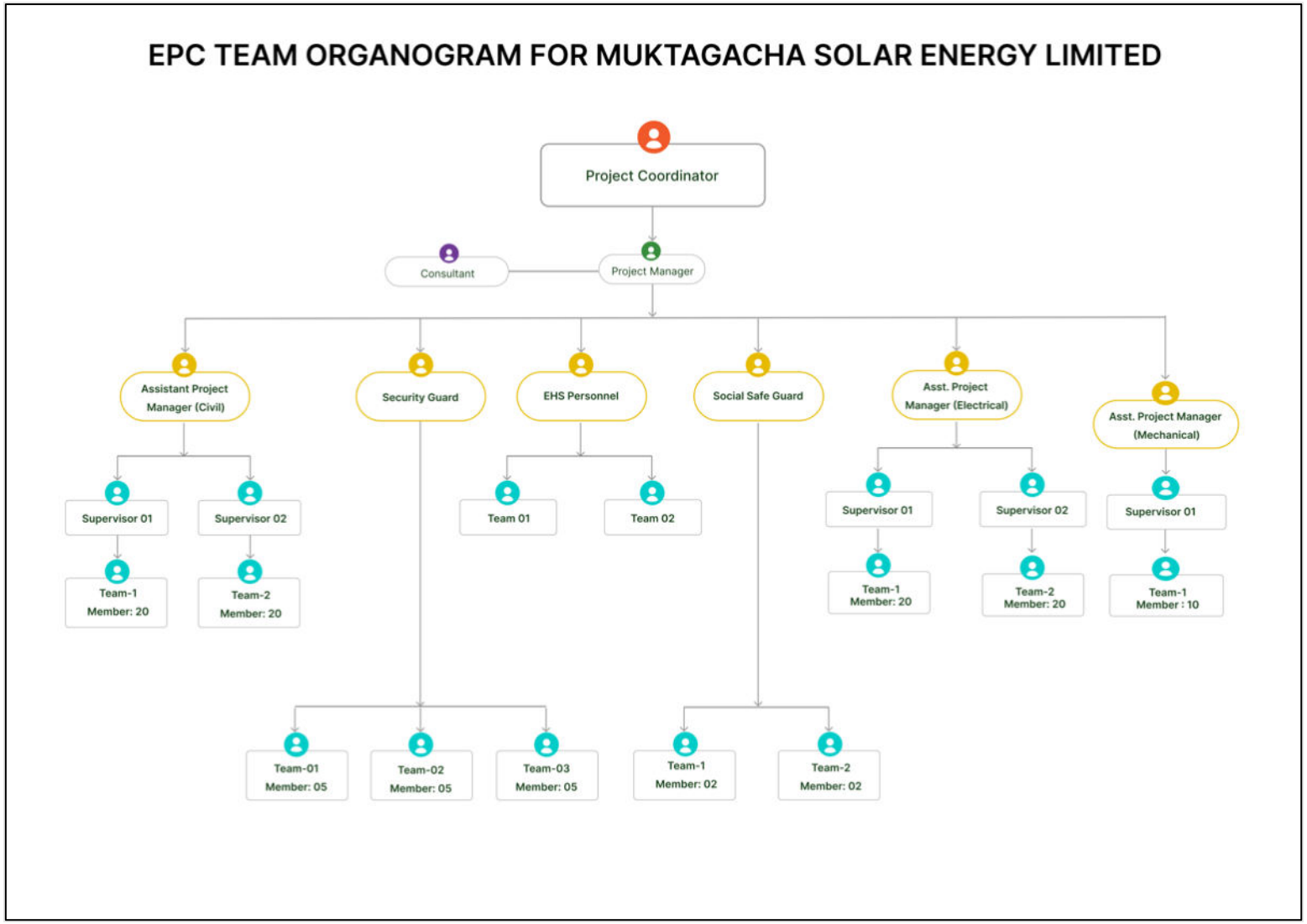


**Figure 7-3: EPC Team Organogram**



# CHAPTER 8

## Emergency Response Plan

# 8 EMERGENCY RESPONSE PLAN

## 8.1 Introduction

Industrial incidents lead to significant individual and economic harm. In the present context, all industries, including solar plants, are focused on handling these unforeseen dangers. This is crucial, as actual or even perceived mishaps can rapidly put a company's financial stability at risk. Numerous facilities engage in diverse production procedures that carry the risk of accidents, which could have disastrous effects on the facility itself, its employees, the surroundings, or the general public.

An Emergency Response Plan (ERP) is a written document which is required for an organization according to occupational health safety standards and must be displayed at every job site with a certain number of employees (usually five to ten). It is a detailed step-by-step procedure to follow in emergencies situation such as fire or a major accident. An emergency response plan also includes information such as whom to notify, who should do what, and location of emergency stock. The Emergency Response Plan includes any measures that should be in place at all facilities to combat an accident resulting from fire, explosion or due to any natural calamities (e.g. Earthquake, cyclones, fire).

The primary objective of an emergency response plan is to recognize potential accident triggers, dangers, and other calamities, and to outline a range of efficient steps and operational strategies that the relevant governing body can execute if such situations arise. This plan assigns specific duties to factory staff members and equips them with predefined processes and instructions, enabling them to react swiftly. These emergency interventions should prioritize the safety of individuals, assets, and the surroundings. By utilizing a well-designed emergency response plan, the impact of a disruptive incident can be lessened, resulting in reduced recovery durations and expenses.

## 8.2 Definition of Emergency

A major emergency can be defined as an accident/incident that has potential to cause serious injuries or loss of life. It may cause extensive damage to property, serious disruption both in production and working of factory and may adversely affect the environment. The following factors may cause major emergency:

- Plant failure;
- Human error;
- Vehicle crash;
- Sabotage;
- Earthquake;
- Lightning; and
- Fire.

## 8.3 Objectives of Emergency Planning

When an emergency occurs, the main concern is to preserve life and safeguard property and the environment. Therefore, an Emergency Contingency Plan, catering for both minor and major emergencies need to be designed with the following objectives:

- Rescuing people;
- Treating the injured;
- Safeguarding others;
- Minimizing damage to property and environment;
- Controlling the incident, removing the hazard, preventing escalation;

- Maintaining the welfare of personnel involved in controlling the occurrence;
- Identifying casualties;
- Informing and assisting relatives;
- Informing the news media;
- Informing/collaborating with the authorities and emergency services;
- Preserving records.

## 8.4 Emergency Management Plan

### 8.4.1 Elements of an Emergency Plan

The main elements of an emergency plan are as like as follows:

- Leadership and Administration;
- Role and Responsibilities of Key Personnel;
- Emergency action;
- Emergency Light and Power;
- Source of energy control;
- Protective and rescue equipment;
- Communication.
- Medical care/First Aid;
- Public relation;
- Protection of vital records;
- Training; and
- Periodical revision of plan.

## 8.5 Potential causes of Emergency in the Plant

- The potential causes of an industrial accident are as like as follows:
- Fire: flammable material;
- Snapping of cables, ropes, chains, slings;
- Handling heavy objects;
- Electricity (electrocution);
- Falls from height inside industrial units or on the ground;
- Slipping on wet surfaces;
- Sharp objects;
- Oxygen deficiency in confined spaces;
- Lack of PPE, housekeeping practices and safety signs;
- Hackles, hooks, chains;
- Cranes, winches, hoisting and hauling equipment's.

## 8.6 Emergency Action Plan at project site

The action plan should consist of the following:

- Emergency Control Centre/Room; and

- Key Personnel.

It is very important to establish an emergency control center at the plant site for managing any kind of emergency situation. This center will be the main center from where the operations to handle the emergency will be directed and coordinated. After establishing the control center/room, the following facilities to be made available in the emergency control center/room:

- Internal and external communication system;
- Computer and other essential records;
- Daily attendance of workers employed in the plant/factory;
- Records of the storage of hazardous material and manufacturing;
- Pollution records;
- Walky-talky.
- Plan of the plant showing:
    - Storage area of hazardous materials;
    - Storage of safety equipment's;
    - Firefighting system and additional source of water;
    - Site entrance, roadway and emergency exist;
    - Assembly points;
    - Truck parking area; and
    - Surrounding location.
- Notebook, Pad and Pencil; and
- List of Key Personnel with addresses, telephone number etc.

## 8.7 Assembly Points

A safe place far away from the plant should be pre-determined as an assembly point where in case of emergency personnel evacuated from the affected areas are to be assembled. The plant workers, contract workers and visitors should assemble in assembly point in case of emergency and the time office clerk should take their attendance so as to assess the missing persons during emergency.

## 8.8 The Key Personnel for Emergency in the plant

The following key personnel will play vital roles during the emergency in the plant. Their roles and responsibilities for the emergency management are also given below:

a. Works Main Controller.

b. Works Incident Controller.

c. Other Key Officers
- Communication Officer;
- Security and Fire Officer;
- Telephone Operators;
- Medical Officer;
- Administrative Officer.

### a. Works Main Controller

The General Manager of the plant should act as main controller. His duties are to:

- Assess the magnitude of the situation and decide whether the evacuation of staff from the plant is needed;
- Exercise and direct operational control over areas other than those affected;
- Maintain a continuous review of possible development and assess in consultation with work incident controller and other key personnel;
- Liaison with Police, Fire Service, Medical Services, Factory Inspectorate and other Government Agencies;
- Direct and control rehabilitation of affected area after emergency; and
- Ensure that evidence is preserved for enquiries to be conducted by statutory authorities.

The Works Main Controller will declare the emergency and he will instruct gate office to operate the emergency siren after assessing the gravity of the situation.

### b. Work Incident Controller

He is the next responsible officer after the work of main controller. Generally, the plant manager is designated as work incident controller. In case of emergency, he will rush to the place of occurrence and take overall charge and report to the works main controller by personnel communication system like cell phones or walky-talky and inform about the magnitude of emergency. His duties are to:

- Assess the situation and considering the magnitude of emergency he will take decision and inform Communication Officer to communicate the news of emergency to different agencies.
- Give direction to stop all operations within the affected area;
- Take the charge of Main Controller till the Main Controller arrives;
- Order for shutdown and evacuation of workers and staffs from affected area;
- Inform all Key Personnel and all outside agency for help;
- Inform security and fire officers and Fire Services;
- Ensure that all non-essential workers/staff are evacuated to assembly point and areas searched for casualties;
- Report all significant development to Communication Officer; and
- Advise to preserve evidence of emergency into the cause of emergency.

### c. Other Key Personnel and their duties

#### 1. Communication Officer

On hearing the emergency siren/alarm:

- He will proceed to the control center and communicate to work incident controller;
- He will collect information from the emergency affected area and send correct message to work main controller for declaration of emergency;
- He will maintain a logbook of incident;
- He will contact all essential departments.
- He will take stock of the meteorological condition from local meteorological department;
- He will communicate all information as directed by the work's main controller.

#### 2. Security and Fire Office

The Security or Fire officer will be responsible for the firefighting. On hearing the emergency alarm/siren:

- He will reach the incident area with fire and security staff;
- He will inform through telephone or walky-talky to the communication officer;
- He will inform to the work incident controller about the situation and requirement of outside help like Fire Service and other mutual aid members;
- At the site, the entire fire squad member will respond to the advice and information given by the works incident controller; and
- The security will control the visitors and the vehicle entry

### 3. Telephone Operator

In case of fire is discovered but no emergency siren is operated, he shall ensure the information about the location of the fire/emergency incident from the persons discovered/notices the above and communicate to different Key Personnel immediately with clear message.

### 4. Medical Officer

The Medical Officer with his team will report to the works incident controller on hearing the fire/emergency siren immediately. The ambulance will be parked nearest to the site of the incident. Names of injured and other casualties carried to the Hospital will be recorded and handed over to Works Incident Controller. The ambulance will carry the injured to the nearest ho spital for treatment.

### 5. Personnel/Administrative Officer

He should work as a liaison officer liaising with works main controller and other essential departments such as Police, Press and Statutory authorities. His responsibilities shall include:

- To ensure that casualties receive adequate attention to arrange additional help if required and inform relatives.
- To control traffic movement into the factory and ensure that alternative transport is available when needed.
- When emergency is prolonged, arrange for the relief of personnel and organize refreshment and catering facilities.
- Arrange for finance for the expenditure to handle the emergency.

## 8.9 Emergency Procedure

Safety Operating Procedure of Emergency Response Plan means executing step by step operation of any Emergency situation which can occur inside the plant.

- **Based on these events, the required actions are determined. For Example:**
  - Declare emergency
  - Siren/Sound and alert
  - Evacuate danger zone
  - Close main shutoffs
  - Call for external aid
  - Initiate rescue operation
  - Attend to casualties
  - Fight against the hazard.
- **The final consideration is a list and the location of resources needed:**
  - Medical supplies
  - Auxiliary communication equipment

- Power generator
- Chemical and radiation detection equipment
- Emergency protective clothing
- Mobile equipment
- Firefighting equipment
- Ambulance
- Rescue equipment.
- Trained personnel

Any person noticing the emergency should report to their Department Head / Shift Executive / Shift Supervisor either in person or through the intercom. The department Head / Shift Executive / Shift Supervisor on receipt of the emergency shall visit the site to assess the situation. If the situation is an emergency, then he calls for an emergency.

## 8.10 Emergency facilities

The following facilities should be provided in the plant to tackle any emergency at any time:

- Fire protection and firefighting facilities (a pool/tank capacity is about 300 $m^3$ will be preserved at the project site for emergency use during fire accident);
- Emergency lighting and standby power.
- Emergency equipment and rescue equipment:
  - Breathing apparatus with compressed air cylinder.
  - Fire proximity suit.
  - Resuscitator.
  - Water gel Blanket.
  - Low temperature suit.
  - First aid kit.
  - Stretchers.
  - Torches.
  - Ladders
- Safety Equipment:
  - Respirators.
  - Gum boots.
  - Safety helmets.
  - Asbestos Rubber hand gloves.
  - Goggles and face shield.
  - Wind direction indicator.

### 8.10.1 Alarm System

Alarm systems vary and will depend on the size of the works area - simple fire bell, hand operated siren -break open type, fire alarm etc. Automatic alarm may be needed for highly hazardous nature of plant.

### 8.10.2 Communication System

Communication is a key component to control an emergency. The following communication system may be provided in the plant:

- Walky-Talky.
- Telephone (internal and external);
- Cell Phone.
- Intercom.
- Runners (verbal or written messages).

### 8.10.3 Siren for Emergency

Siren for emergency should be different from the normal siren. The emergency siren should be audible to a 1 KM radius. The emergency siren should be used only in case of emergency.

### 8.10.4 Escape Route

The escape route from the plant should be clearly marked. The escape route will be the shortest route to reach out of the plant area to open area, which leads to assembly point. This route should be indicated on the layout plan attached to the Emergency Plan.

### 8.10.5 Evacuation

All non-essential staff should be evacuated from the emergency site. As soon as the emergency siren rings the workers have to shut down the plant and move to the assembly point. The plant shutdown procedure in case of emergency should be prepared and kept ready and responsible people should be nominated for the purpose.

### 8.10.6 Counting of Personnel

All personnel working in the plant should be counted. Time office persons should collect the details of personnel arriving at the assembly point. These should be checked with the attendances of regular workers; contract workers present on the site on the day of emergency. The accident control should be informed, and arrangements should be made for searching missing persons in the emergency affected area. The employees' address and contact number of next to kin should be maintained in the time office so that during emergency relatives of those affected due to emergency may be informed accordingly. Information in respect of emergency should be given to the media and other agencies.

### 8.10.7 All Clear Signal

After control of emergency the work incident controller will communicate to the works main controller about the cessation of emergency. The main controller can declare all clear by instructing the time office to sound "All Clear Sirens".

### 8.10.8 Mutual Aid System

Mutual aid schemes should be introduced so that in case of emergency necessary help from mutual aid partners may be extended. Essential elements of this scheme are:

- Mutual aid must be a written document signed by the Chief Executive of the industries concerned.
- Specify key personnel who are authorized to give requisition of materials from other industries.
- Specify the available quantity of material/equipment that can be spared.

- Mode of requisition during emergency.
- Mode of payment/replacement of material given during an emergency.
- May be updated from time to time based on experience gained.

Mock drills in emergency planning should be conducted once in 6 months and sequence of events should be recorded for improvement of the exercise. Exercises on Onsite Emergency Planning should be monitored by the Factory Inspectorate and the high officials of the organization, and the plan is reviewed every year.

## 8.11 Activities Due to Emergency

- Attendees of the incident place shall inform the Control Room & Emergency Response Team in case of emergency.
- Stop work immediately and vacate the workplace.
- Shut down the electrical connection.
- All employees will go to the designated Fire Assembly Point located & mark in the specific area of the factory.
- Any Emergency Response Team member or designated person shall notify the fire department and fire service and important person by phone.
- Once the fire department has been notified and it is safe to do so, trained Fire Fighting team may attempt to extinguish small fires. All fires need to be reported to the senior authority.
- When the incident place has been evacuated a head count shall be done by the designated person accounting for all employees on place including those who may be trying to extinguish the fire.
- A List of personnel in place, updated and current will be kept in the Personnel office.
- The Emergency Response Team is responsible for ensuring the requirement of fire department and gives all pertinent information.
- The facility should provide first aid attendants as well as medical equipment suitable for the people if any injury took place during an incident and quickly react to give maximum medical facility.

## 8.12 Emergency Response for Natural Hazards

**Flood**

- Evacuate the people from flooded areas and send them to a safe area.
- Switch of the power supply from effected area.
- Remove all types of obstructions from the drainage system.
- Coordinate with the Emergency Response Team and take action as per their guidelines.
- In case of any accident in human life please call the first aid team and get medical attention as soon as possible.
- Call the local fire brigade through communication system in case of worst or out of control situation.
- In case of over flood, geobag and sandbag to protect adverse effect.

**Cyclone**

- Switch off the Power Supply of Sub-station.
- Close all the ins & outdoors where possible wind enters.
- Open windows, exhaust at the top of the walls if present and allow the wind to go from the top which enters into the plant shades.
- Instruct all the associates including workmen not to allow them to go outside till the wind & cyclone effect reduces to the normal level.
- After the cyclone, inform the Emergency Response Team to investigate the property loss in the plant for further action.

**Earthquake**

- Isolate electrical supply wherever it is possible.
- Do not use elevators.
- All electric connections of the plant should be cut off at that time and the important thing is that everybody will go to a safe place near the building.
- Ensure fire and siren alarm systems are on all floors. During earthquake all the employees will come down in safe place in a row through stairs after hearing the alarm.
- Have to follow the instructions regarding earthquakes.
- Have to evacuate as per evacuation plan.
- We should have a Rescue Team to help the injured employees or who get down. And they will also take the injured employees to a safe place.
- Check availability of security personnel and have a chat with them in view of likely immediate action to be taken.
- Empty such tanks which are installed in vertical and relatively unstable conditions.
- Take a review of material storage and ensure that maximum of such material is removed from places from where it can fall down. Uniform Material distribution at the lowest height from floor is the safest way of storage.
- Immediate ready to use all Emergency equipment like stretchers, breathing equipment, PPEs, Dewatering, portable welding gas cutting equipment, emergency lights, Battery-operated public-address equipment, Ropes, lifting tackles, trolleys, emergency medical equipment, etc.
- Emergency transport vehicles shall be parked in the open so that it is free from any falling object.
- Identify critical and weak areas of the building and organize to support them adequately to prevent collapse.
- Check storage of Hazardous Chemicals to comply with normal storage safety requirements.
- Keep Fire Hydrant accessible, Keep newest and good conditioned fire hoses and Fire extinguishers readily available.
- Remove unwanted combustible material.
- Review that room heaters, electric hot plates and other sources of ignition that are normally used in winter situations are operated, handled and stored safely.

- Ensure that flammable liquids i.e. Petrol, Diesel and other petroleum products are stored in secondary containment with due precautions.
- Over and above ensure that personnel are alert and do not panic.
- Ensure the average 6 feet height of raw materials and finish good.

## 8.13 Emergency Response Plan for Other Hazards

### 8.13.1 Fire

- Evacuate the people from Fire occurred surrounding area and send through safe exit direction.
- Remove unwanted combustible material.
- Keep cool and do not panic.
- Inform the substation and electrician to get the affected area isolated from the power supply.
- Keep Fire Hydrant accessible.
- Keep the newest and good conditioned fire hoses and Fire Extinguishers readily available.
- Ensure one operator is always present at Hydrant system area when using the fire Hydrant system.
- If the fire is very small, use the correct Fire Extinguisher for extinguishing the fire.
- Try to isolate the fire by removing the surrounding inflammable material from within reach of fire.
- In case of a big fire use the local Hydrant system for extinguishing the fire.
- If the fire is beyond the control inform the security or higher authority to call local fire Brigade and Inform Senior manager (Factory In charge) or Emergency Response Team.
- On arrival of the fire brigade paved way for them reach the exact site of fire.
- In case of any accident in human life please call the first aid team and get medical attention as quickly as possible.

### 8.13.2 Fatal Accidents

- During emergency operation if there is any injured person, carry out victim /causality to the security room and Conference Room also OHS Room beside the support of company recommended nursing home.
- Call First Aid Team and carry out the first aid with the help of first aid item.
- Inform Emergency Response Team.
- If the accident is severe then call an emergency vehicle and immediately rush the injured person to a local hospital or company recommended nursing home.
- Fill in the accident report form with the help of a witness and deposit the same to the Emergency Response Team.

### 8.13.3 Utilities Failure

Examples of utility failure that may occur are electrical outage, plumbing failure/flooding, ventilation problems and/or elevator failure. In the event of a failure, immediately notify the Emergency Response Team.

- For emergencies and potential danger or after hours call to Control room.
- In a situation where a building needs to be evacuated, please proceed to the building specific evacuation area.
- Turn off equipment, machines and computers.
- Assist disabled persons as needed.
- Do not use elevators.
- Stay at the designated evacuation area until the fire department or designated representative has given the “all clear” to re-enter the building.

## 8.14 Reporting and Documentation

The following aspects need to be communicated for the emergency reporting:

- While witnessing or receiving notification of an emergency, as much information as possible should be taken and/or conveyed to the relevant emergency activation authority.
- Where possible, all information should be logged in written form with time and date included and provided to the EHS Manager of plant.
- Personnel working on the site may, at any time, be exposed to an emergency which could take many forms, for example (but not limited to):
    - ✓ Injuries and/or fatalities
    - ✓ Fires and/or explosions
    - ✓ Extreme weather
- For proper recordkeeping need to maintain some regular procedure as-
    - ✓ Emergency Response Plan
    - ✓ Emergency training records
    - ✓ Previous incident record
    - ✓ Module and materials used for training.
    - ✓ Emergency preparedness drill/rehearsal
    - ✓ Evaluation feedback from training and emergency drills.
    - ✓ Records and information about previous incidents
- When an emergency occurs, an appropriate and prompt response is required, providing precise action to control, correct and return the site to a safe condition. Timely action will also be required to protect people, the environment and property from damage.
- All near misses and unsafe acts will be written in logbooks / reported in the 'Near miss, unsafe acts, hazards and sub-standard conditions report' and verbally communicated to the concerned Site Supervisor within a reasonable time. All accidents and incidents will be immediately reported to the EHS Manager, and requisite forms completed.

# CHAPTER 9

## Stakeholder Consultation & Information Disclosure

# 9 STAKEHOLDER CONSULTATION AND INFORMATION DISCLOSURE

## 9.1 Introduction

Participation is a process, through which stakeholders influence and share control over development initiatives, the decisions, and the resources, which affect them. The effectiveness of the environment and social management plan is directly related to the degree of continuing involvement of stakeholders in the Project development process. Participation of stakeholders in the Projects is also a primary requirement in developing an appropriate environment and social management plan that addresses the Project's requirements and is suited to the needs of the stakeholders. Stakeholder's involvement also vastly increases the probability of successful implementation of the management plan. To make the consultation and disclosure process effective and fruitful, comprehensive planning is required to assure that local government, host population, and Project staff interacts regularly and purposefully, throughout all stages of the Project and contribute toward a common goal.

## 9.2 Scope and Specific Objectives

The broad objective of the stakeholder engagement and involvement process is to provide authorities, as well as interested and affected stakeholders with the opportunity to identify issues, concerns, and opportunities regarding the proposed Project and to address key stakeholder concerns during the preparation of the IESE for the Project. Specific objectives for stakeholder consultations are as follows-

- To address relevant issues including those perceived as being important by other sectoral agencies, public bodies, local communities, affected groups and others.
- To improve information flows between proponents and different stakeholders, improving understanding of a Project.
- To identify important environmental and social characteristics or mitigation opportunities.
- To ensure that the magnitude and significance of impacts has been assessed properly; and
- To improves the acceptability and quality of mitigation and monitoring process.

## 9.3 Approach and Methodology for Stakeholder Mapping and Analysis

The approach adopted for mapping and analyzing involves mapping of the key stakeholders (directly and indirectly) and assessing their significance, influence and impact on the project. The methodology adopted is described below:

The significance of a stakeholder group is categorize considering the magnitude of impact (type, extent, duration, scale, frequency) or degree of influence (power, proximity) of a stakeholder group and urgency/likelihood of the impact/influence associated with the particular stakeholder group in the project context. The magnitude of stakeholder impact/influence is assessed by taking the power/responsibility of the stakeholder group and is categorized as negligible, small, medium, and large. The urgency or likelihood of the impact on/influence by the stakeholder is to assess on a scale of low, medium, and high. The overall significance of the stakeholder group is assessed as per the matrix provided in Table 9-1 below.

**Table 9-1: Stakeholder Mapping Matrix**

| | | Sensitivity /Vulnerability / Important Resource / Receptor | | |
|---|---|---|---|---|
| | | **Low** | **Medium** | **High** |
| Magnitude of Impacts | Negligible | Negligible | Negligible | Negligible |
| | Small | Negligible | Minor | Moderate |
| | Medium | Minor | Moderate | High |
| | Large | Moderate | High | High |

## 9.4 Stakeholder Mapping

Stakeholder Mapping is a process of examining the relative influence that different individuals and groups have influence over a Project as well as the influence of the Project over them. The purpose of a stakeholder mapping is to:

- Study the profile of the stakeholders identified and the nature of the stakes.
- Understand each group's specific issues, concerns as well as expectations from the Project that each group retains.
- Gauge their influence on the Project.

Based on this understanding, the stakeholders are categorized into High Influence/ Priority, Medium Influence/ Priority and Low Influence/ Priority. The stakeholders who are categorized as high influence are those who have a high influence over the Project or are likely to be heavily impacted by the Project activities and are thus high up on the Project proponent's priority list for engagement and consultation.

Similarly, the stakeholders categorized as medium influence are those who have a moderate influence over the Project or even though they are to be impacted by the Project, it is unlikely to be substantial and these stakeholders are thus neither high nor low in the Project proponent's list for engagement. On the other hand, the stakeholders with low influences are those who have a minimal influence on the decision-making process or are to be minimally impacted by the Project and are thus low in the Project proponent's engagement list.

## 9.5 Stakeholder Identification

The consultant undertakes an ongoing and transparent consultation process to ensure that views of the Interested and Affected Parties are appropriately considered. For each type of stakeholder, the consultant tailors a checklist/interview guideline highlighting key issues to be discussed and type(s) of information required. **Table 9-2** presents key project stakeholders who has been consulted.

**Table 9-2: Stakeholder Mapping for the Project**

| Stakeholders | Category of Stakeholder | Brief Profile | Rating of Impacts (Sensivity/ Vulnerability) | The magnitude of Impact/ Influence | Basis of Influence Rating |
|---|---|---|---|---|---|
| **Project Management** | | | | | |
| Muktagacha Solartech Energy Limited (MSEL) | Primary | • Muktagacha Solartech Energy Limited (MSEL) is the primary project proponent who owns a controlling stake of 100% in the project. | High | - Impact of Project on Stakeholders: Large<br>- Influence of Stakeholder on Project: Medium | - The primary project proponents;<br>- Responsible for all the project related risks and impact liabilities;<br>- Primary financial beneficiaries;<br>- Responsible for the entire project-related risks and impact liabilities. |
| **Community** | | | | | |
| Local Community | Primary | • Primarily includes the adjacent community to the project site. | Moderate | - Impact of Project on Stakeholders: Medium<br>- Influence of Stakeholder on Project: Medium | - The project will bring development to the area;<br>- Improvement in infrastructure in the area;<br>- Increase in employment opportunities and preference in the job;<br>- Business or economic conditions, access to health facilities, and |

| Stakeholders | Category of Stakeholder | Brief Profile | Rating of Impacts (Sensivity/ Vulnerability) | The magnitude of Impact/ Influence | Basis of Influence Rating |
|---|---|---|---|---|---|
| | | | | | education will be improved.<br>- Increase of local conflict<br>- Increase of Traffic congestion<br>- Chanses of Communicable diseas |
| Affected People (Landowners, Land users) | Primary | • Primarily they are the land owners of the proposed solar power plant area or agricultural labors, fish farmers who worked on those lands. | High | - Impact of Project on Stakeholders: Large<br>- Influence of Stakeholder on Project: Medium | - The landowners have leased or sold their land to the project.<br>- The laborers who worked on these lands on a temporary basis have lost part of their livelihood. |
| Vulnerable Groups (poor, old aged, women and destitute) | Primary | • The marginal groups within the project area primarily comprise landless households as a result of the land loss, households below the poverty threshold, | Minor | - Impact of Project on Stakeholders: Small<br>- Influence of Stakeholder on Project: Medium | - Employment opportunity during the pre-construction and construction phase;<br>- Prioritization for getting further assistance if any; |

| Stakeholders | Category of Stakeholder | Brief Profile | Rating of Impacts (Sensivity/ Vulnerability) | The magnitude of Impact/ Influence | Basis of Influence Rating |
|---|---|---|---|---|---|
| | | women-headed households, old aged and destitute. | | | |
| Local Farmers | Secondary | • Farmers in the area are primarily engaging in agricultural activities. | Moderate | - Impact of Project on Stakeholders: Medium<br>- Influence of Stakeholder on Project: Medium | - Use to cultivate agricultural lands in the project surrounding area;<br>- Decrease of cultivable lands |
| Fish Farmers | Secondary | • Fish farmers in the area are primarily engaging in fish farming activities. | Moderate | - Impact of Project on Stakeholders: Medium<br>- Influence of Stakeholder on Project: Medium | - Use to cultivate fish in the project surrounding area; |
| Local Workers and Laborers | Primary | • Laborers and workers were recruited from the area of influence mostly during the pre-construction and construction phase of the project. | Moderate | - Impact of Project on Stakeholders: Medium<br>- Influence of Stakeholder on Project: Medium | - Responsible for undertaking mostly un-skill and semiskilled based work during the pre-construction and construction phase of the project;<br>- Engagement level primary in the construction part of the work. |
| **Regulatory/Administrative Authorities and Agencies** | | | | | |

| Stakeholders | Category of Stakeholder | Brief Profile | Rating of Impacts (Sensivity/ Vulnerability) | The magnitude of Impact/ Influence | Basis of Influence Rating |
|---|---|---|---|---|---|
| Department of Environment (DOE), Bangladesh | Primary | • The Department of Environment (DOE) is the primary government regulatory authority for environmental protection in Bangladesh. | High | - Impact of Project on Stakeholders: Medium<br>- Influence of Stakeholder on Project: Large | - Government Regulatory agency to provide Environmental Clearance (EC) to the project based on evaluation and approval of the Environmental Impact Assessment (EIA) study;<br>- Responsible for monitoring the project's Environmental compliance throughout the project lifecycle; |
| Department of Agriculture (DoA) | Secondary | • DoA is responsible for agricultural development. | Moderate | - Impact of Project on Stakeholders: Medium<br>- Influence of Stakeholder on Project: Medium | - Government Regulatory agency to provide Clearance to the project for using the agricultural lands; |
| Department of Fisheries (DoF) | Secondary | • DoF is responsible for fisheries development, conservation, maintenance of the fish sanctuary. | Moderate | - Impact of Project on Stakeholders: Medium<br>- Influence of Stakeholder on Project: Medium | - No major influence on project-related activities;<br>- Influence can be increased if the project proponent engages directly with the |

| Stakeholders | Category of Stakeholder | Brief Profile | Rating of Impacts (Sensivity/ Vulnerability) | The magnitude of Impact/ Influence | Basis of Influence Rating |
|---|---|---|---|---|---|
| | | | | | implementation of the proposed project. |
| Department of Social Welfare | Secondary | • The local governmental agency is responsible for the implementation of government social welfare schemes. | Minor | - Impact of Project on Stakeholders: Low<br>- Influence of Stakeholder on Project: Medium | - No major influence on project-related activities; |
| Other Regulatory and Permitting Authorities | Primary | | High | - Impact of Project on Stakeholders: Medium<br>- Influence of Stakeholder on Project: High | - Primary involvement during the pre-construction, construction, and operation phases. |
| **Political Administration** | | | | | |
| Union/Upazila Political Administration | Secondary | • Elected representative of people at Union/Upazila level for a fixed tenure. | Moderate | - Impact of Project on Stakeholders: Medium<br>- Influence of Stakeholder on Project: Medium | - The key linkage between the community and the project proponent; |
| Ward leaders and local representatives | Primary | • An elected representative at ward level for a fixed tenure. | Moderate | - Impact of Project on Stakeholders: Medium<br>- Influence of Stakeholder on Project: Medium | - Issuance of no objection certificate as the representative of the local level representative; |

| Stakeholders | Category of Stakeholder | Brief Profile | Rating of Impacts (Sensivity/ Vulnerability) | The magnitude of Impact/ Influence | Basis of Influence Rating |
|---|---|---|---|---|---|
| | | | | | - Plays an important role in providing public opinion and sentiment on the project;<br>- Empowered to provide consent and authorization for the establishment of the project on behalf of the community. |
| **Other Institutional Stakeholders Groups** | | | | | |
| Local NGOs and Community and Social Welfare Groups (CSWG) | Secondary | • Microfinance agencies, social welfare groups, and charitable organizations working in the area. | Minor | - Impact of Project on Stakeholders: Low<br>- Influence of Stakeholder on Project: Medium | - No major involvement in the project as of today;<br>- Possible inclusion during future stages of the project with respect to project-related community welfare activities. |
| Printed and Electronic Media | Secondary | | Moderate | - Impact of Project on Stakeholders: Medium<br>- Influence of Stakeholder on Project: Medium | - Public watchdog on the project-related activities;<br>- No major influence on the project. |

## 9.6 Information Disclosure and Consultation

During the field visit and baseline data collection, a significant number of consultations were conducted. The stakeholders those were consulted including local people, local farmers, landowners, local businessmen, project affected people, female group, local influential person, fish farmers, government officials such as Upazila fisheries officer, Upazila sub-assistant agriculture officer, assistant engineer (public health), local schoolteachers, local elected representatives and manager of local NGO. The details of consultations held with issues raised or discussed and suggestions provided by the respective stakeholders are presented in the following sub-sections.

A combination of mixed methods of information disclosure and consultation process was adopted during IESE preparation. The method selected for consultation was designed keeping in mind the profile of the stakeholders, types of information desired, and the level of engagement required. In each consultation session, the consultant introduced themselves, introduced the project, and the purpose of engagement with the respective stakeholder. The primary methods followed in the consultation process are:

- Key Informant Interview (KII).
- Focus Group Discussion (FGD); and
- Public Consultation.

Selective photographs of the KII, FGD and Socioeconomic Survey shown in 12.2Appendix C:.

### 9.6.1 Key Informant Interview (KIIs)

A Key Informant Interview (KII) is a qualitative and in-depth interview conducted with individuals who possess knowledge about the happenings and affairs within a particular community. In this study, KIIs were conducted with the local union parishad member, local influential person, landowners, government officials such as Upazila fisheries officer, Upazila sub-assistant agriculture officer, assistant engineer (public health), headmaster of the nearest school of the proposed project, and manager of BRAC. Their opinion/suggestion is given below in the following Table 9-3.

**Table 9-3: Details of Consultations Held for the Project**

| Date | Details of Participants | Category | Issues Discussed | Response/Suggestions Made |
|---|---|---|---|---|
| 28/04/2024 | Md. Shafikul Islam Manik, Union Parishad Member, Mankon, Muktagacha | • UP Member | • Perception about the proposed project<br>• Details about the land status of the proposed project<br>• Details about the lease payment process; any conflict observed regarding the payment process.<br>• Importance of the project for the local community<br>• Expectations and Suggestions | • The UP member is already informed about the proposed project, and he has also given his land as lease to the proposed project.<br>• As per the UP member, the 95% of the proposed project land is basically a wet land, which was used for cultivation and fisheries before more than 15 years.<br>• He is satisfied with the amount of land lease payment, and he stated that the amount was finalized by negotiation between local people and the proposed project authority considering the market value. No conflict was observed during the payment procedure.<br>• All leased lands are free from adverse claimant and also have clear land ownership.<br>• There was a drainage system through where the rainwater passed to the canal. But the drain got blocked due to change of land usage of the surrounding area. The member requested a new drainage system for passing through the rainwater.<br>• He is quite optimistic about the proposed project as the proposed project will bring development in his area. However, he demands employment opportunities for the local people.<br>• The preparation and implementation of the Stakeholder Engagement Plan should be ensured by MSEL. |

| Date | Details of Participants | Category | Issues Discussed | Response/Suggestions Made |
|---|---|---|---|---|
| 28/04/2024 | Abdul Mottaleb, Bechukhali Market, 6 no Mankon, Muktagacha | • Local Elite Person | • Information about the proposed project<br>• Details about the proposed project land<br>• Importance of the proposed project<br>• Status of the land affected people<br>• Suggestions and expectations | • The proposed project authority started to select the land in 2022 and started to finalize their deeds in 2023.<br>• Around 95% of the land of the proposed project is wetland. The rest of the land is used for agricultural purposes and fish culturing purposes.<br>• Still now, no conflict has occurred between local people and project authorities regarding the land lease and payment issues.<br>• There are also no possibilities of any conflict between the proposed project workers and local people.<br>• This project will be very helpful for the local people. Local people are facing huge difficulties due to the continuous loadshedding. Through the proposed project, an uninterrupted supply of electricity will be available in the area is likely to be expected.<br>• proposed project will provide employment opportunities during its construction and operation phase.<br>• A few numbers of workers used to work on the proposed project land as agricultural labor and fish farmer on seasonal/ temporary contract. None of them was fully dependent on this land due to the seasonal based work. All of them are doing the same work in other lands.<br>• Quickly starting the proposed project work is highly suggested. |

| Date | Details of Participants | Category | Issues Discussed | Response/Suggestions Made |
|---|---|---|---|---|
| | | | | • Recruitment of the local people during construction and operation phase is also expected. |
| 28/04/2024 | Mahabubul Alam, Raghunathpur, Kashimpur, Muktagacha | • Landowner (Land Seller and Lessor) | • Total amount of his land provided to the proposed project<br>• Previous usage of his land<br>• Present status of the land users of his land<br>• Details about the land lease and land selling procedure | • He sold 19.50 decimals and gave lease 3 acres to the proposed project.<br>• He used to give his lands to a local person by lease before the proposed project started the land procurement process.<br>• He usually gave his lands lease for around one to three years and claimed BDT 2000 per katha (6.5 decimals) for a single year.<br>• The lease holder, who used to lease these lands, now works in a Garments at Dhaka. And the Agri-labors of that lands are now working in various types of jobs – some are working in other lands of the village, some have started small business, and some have moved to Dhaka for better livelihood options.<br>• The landowner has given his land lease to the proposed project authorities for 20 years. He will get 3000 BDT per katha (6.5 decimals) for a single year and this amount will increase 10% in every five years.<br>• He has sold his land to the proposed project authorities for BDT 1 lakh and 40 thousand per katha (6.5 decimals). He used his land selling payment for buying new land. |
| 28/04/2024 | Mst. Jahanara Begum, Nimuria, | • Female Landowner, Former Female member | • Amount of land given lease to the proposed project | • She is the first person who have given her land as lease to the proposed project. |

| Date | Details of Participants | Category | Issues Discussed | Response/Suggestions Made |
|---|---|---|---|---|
| | Mankon, Muktagacha | | • Satisfaction about the payment procedure and payment amount<br>• Details land history of the proposed project area<br>• Present status of the land users<br>• Any adverse claimant in the land leased by proposed project<br>• Importance of the proposed project in the locality | • She has given around 1 acre of land as lease to the proposed project.<br>• The proposed project authority paid her payment on time. She is satisfied with the land lease payment amount and used it for buying new land.<br>• The land has been remaining fallow for more than 15 years.<br>• 15 years ago, the land was used for agricultural purposes. The rainwater passed through a clear drainage system. But, due to agricultural practices and fish culturing in surrounding areas, the drainage system got blocked. As a result, water logging occurred in the area and the land became unsuitable for agricultural practices.<br>• The people who were working in the proposed project land on temporary basis are now working in the local rice mills, oil mills.<br>• No adverse claimant was observed in the project land.<br>• The project will be helpful for the development of the local area. The wetland was unused for more than 15 years. The proposed project is using the land and the landowners become economically benefited. |
| 29/04/2024 | Showkot Alam, Sub-assistant Agricultural Officer, | • Department of Agriculture | • Details about the proposed project land<br>• Description about the major crops, production rate, cropping pattern of the upazila | • Most of the land of the project area is wetlands.<br>• The major crops of the upazila are paddy (Boro and Aman).<br>• Most of the agricultural lands of this upazila are double cropped land. |

| Date | Details of Participants | Category | Issues Discussed | Response/Suggestions Made |
|---|---|---|---|---|
| | Muktagacha, Mymensingh | | • Details about irrigation during dry season<br>• Availability of farmer's association and their responsibilities<br>• Agricultural status of the proposed project land<br>• Possibility of labor shortage due to the proposed project<br>• Suggestions | • The major cropping pattern of the upazila is Boro-Fellow-Aman.<br>• The farmers irrigate ground water during the dry season, but loadshedding creates difficulties during the irrigation time.<br>• There are some farmers' associations in the upazila on the basis of different agricultural projects, who usually work with the common interest of the farmers regarding cultivation. But no farmers' associations are available in the proposed project area.<br>• The proposed project may lease some local agricultural lands which are mostly single cropped land.<br>• The local farmers will be available for working in the proposed project as unskilled labor. This will not occur any kind of labor shortage, because the local agricultural system is now becoming modern and start to use advance machineries.<br>• The proposed project won't be harmful to the area.<br>• Creating Employment opportunities for local people is highly suggested. |
| 29/04/2024 | Md. Tarikul Islam, Senior Upazila Fisheries Officer, Muktagacha, Mymensingh | • Department of Fisheries | • Details of fishing practices in the upazila<br>• Locally used fishing gears<br>• Availability of fish sanctuaries, registered fish farmers or fish farming communities<br>• About the availability of artificial fish breeding and its season | • Mostly fish culture is available in Muktagacha Upazila.<br>• There are 46 hatcheries in this upazila who usually perform different categories of Larval Rearing activities. There are also two fish feed industries situated at Banarpara and Natun Bazar. |

| Date | Details of Participants | Category | Issues Discussed | Response/Suggestions Made |
|---|---|---|---|---|
| | | | • Potential impacts of proposed project on local fisheries sector and local area | • Usually, local fish farmers use a specific net locally known as '*Ber Jal*' for fishing purposes in the area.<br>• No protected fish sanctuary is available in the upazila.<br>• There are no registered fish farmers or fish farmer community available in the upazila.<br>• Artificial fish breeding is available in the upazila which is mostly conducted within the month of march to July.<br>• There are no anticipated negative impacts of the proposed project on the fisheries sector of the proposed project area. Rather, the project can increase job opportunities as well as business opportunities in the proposed project area. |
| 29/04/2024 | Md. Nayeb Ali Khan, Assistant Engineer (Public Health), Muktagacha, Mymensingh | • Department of Public Health and Engineering | • Sources of drinking water in the upazila<br>• Status of the availability and accessibility of local people to safe drinking water facilities<br>• Current groundwater depths and quality in the proposed project area<br>• Status of arsenic and iron contamination in the project area<br>• Impact of proposed project on ground water<br>• Suggestions | • Local people of the upazila use submersible pump, deep tubewell and shallow tubewell to collect their regular drinking water.<br>• Water is always available in the area.<br>• There are around 17000 to 18000 tube wells within the upazila of which one-third are installed by the Government and the rest are privately installed.<br>• At present the depth of the tube well is 200 to 250 feet.<br>• The quality of drinking water is too good.<br>• No arsenic contamination has been found in any tubewell. Iron contamination is too low. (Around 2% to 3%)<br>• No adverse impact of proposed project on ground water. |

| Date | Details of Participants | Category | Issues Discussed | Response/Suggestions Made |
|---|---|---|---|---|
| | | | | • Requested to provide solar energy support for extracting ground water in some remote areas. |
| 29/04/2024 | Md Mujibur Rahman, Headmaster, Jagiruddin High School | • Headmaster of Nearest Educational Institution | • Common educational opportunities in the proposed project area<br>• Impacts of proposed project on the educational sector of the proposed project area<br>• Status of the local skill labors and the plans the local educational institutions are following to increase the number of skilled labors to address the demand of the proposed project<br>• From which area does the majority come to the school?<br>• Any suggestion or comment or opinion that needs to be considered during the implementation of the proposed project | • There are a primary school, three high schools including vocational education opportunities, and two Alim Madrasas in the proposed project area. Within these educational institutions, Jagiruddin High School is the nearest one to the proposed project site (Within 200 meters).<br>• No possible impacts on the educational institution are anticipated due to the proposed project.<br>• The proposed project will have the need of skilled laborers. At present, the local skilled labors have moved towards Dhaka and other cities for occupational purposes. The local educational institutions are now including vocational education opportunities to increase the number of skilled laborers in the proposed project area to meet the need of the proposed project.<br>• The respondent stated that they will include vocational training within two to three years.<br>• The high school students reside in different areas within approximately a five-kilometer radius.<br>• Some of the students at this school come from Raghunathpur. They have to reach school by walking for three to four kilometers as there is no direct access road from Raghunathpur to Nimuria. The headmaster urged to the proposed project to construct a pavement road beside the |

| Date | Details of Participants | Category | Issues Discussed | Response/Suggestions Made |
|---|---|---|---|---|
| | | | | project boundary as the students can avail easy access to the school. |
| 30/04/2024 | Md. Rafiqul Islam, Manager, BRAC, Muktagacha, Mymenshingh | • NGO | • About the common NGOs in the area and their scope of work.<br>• Major activities do you play in your respective area?<br>• How is this NGO contributing to the local and affected communities? (Socioeconomic development, youth development, IGA, etc.)<br>• The positive and adverse impacts of the proposed project<br>• Recommendations | • There are so many NGOs in the upazila such as ASA, SS, Shakti Foundation and so on who are mainly working with Micro-credit and socioeconomic development of this area.<br>• BRAC usually provides micro-credit loans to the local people. Moreover, this NGO provides different types of training such as rearing poultry, goat, cow, training on agriculture and fisheries and so on. BRAC does not charge any money for this training but provides transportation allowance to the trainees.<br>• BRAC creates awareness and provides legal support to the local people in cases of gender-based violence and early marriage.<br>• BRAC provides support to the local vulnerable person by providing financial support (monthly allowances).<br>• The proposed project will be helpful for the locality because it will reduce the loadshedding[42] problem in the area.<br>• As per the branch manager of BRAC, they are ready to provide training facilities to the local people if the Proposed project authorities request them to do so. |

[42] Load shedding is an energy utility's method of reducing demand on the energy generation system by temporarily switching off the distribution of energy to certain geographical areas.

## 9.7 Public Consultation Meeting

Will be held after submission of Draft Report

## 9.8 Focus Group Discussion

Six Focus Group Discussions were held with the local people, women group, affected people, farmers' community, fish farmers.

**Table 9-4: Details of Focus Group Discussion**

| S/N | Date | Location | Participants | Total Number of Participants | |
|---|---|---|---|---|---|
| | | | | Male | Female |
| 1. | 28/04/2024 | Nimuria, Muktagacha | Local People | 6 | 0 |
| 2. | | Nimuria, Muktagacha | Local Women | 0 | 5 |
| 3. | 29/04/2024 | Nimuria, Muktagacha | Affected People | 5 | 0 |
| 4. | | Raghunathpur, Muktagacha | Farmer's Community | 8 | 0 |
| 5. | 30/04/2024 | Raghunathpur, Muktagacha | Fish Farmers | 4 | 0 |
| 6. | | Raghunathpur, Muktagacha | Local Businessmen Group | 4 | 0 |

**Table 9-5: Summary of Focus Group Discussion with Local People**

| Issues Discussed | Participant's Opinion, comments, and Suggestions |
|---|---|
| General perception about the proposed project | Local people were informed about the proposed project. They got information from the project officials. |
| Any security concern due to the labor influx during the proposed project | As per the participants, there is no possibility of security concern. Rather, due to the proposed project, the security condition of the local area will be developed more. |
| Land use of the proposed project area | The proposed project area is mostly wet land. Only 4 to 5 percent of the project land was used for agricultural and fisheries purposes. |
| Any chance of conflict between local work-seeking people and migrant/external labor | During the proposed project, the necessity of unskilled, semi-skilled and skilled labor will be increased. The proposed project will recruit a lot of local laborers as well as migrant laborers. But there is no chance of occurring the conflict between local work-seeking people and migrant laborers. |
| Any risk of price hikes in these areas | No risk of price hike is anticipated due to the proposed project. Rather, migration of outsides labors will increase the scope of new business and other works (like transportation facilities) in the proposed project area. |
| Number of people dependent on the livelihood with respect to fish culturing/ agricultural activities in the proposed project area | No people were fully or permanently dependent on the proposed project land. Those who were working on that land, were seasonal and daily basis contractual workers. Most of them were migrant labors from the different parts of Bangladesh. The workers, who were involved in working on those fields, are now doing different types of income generating activities such as working in other lands, doing business, working as daily labors, auto and CNG drivers and so on. |
| Any concerning issue regarding gender violence/ | In the proposed project area, there is no issue of gender-based violence and women feel properly secured during outside works. |

| Issues Discussed | Participant's Opinion, comments, and Suggestions |
|---|---|
| women's security due to the project implementation | Local women are aware of their own security and also know the reporting mechanism for the violences against them. No issue regarding gender violence/ women's security due to the project implementation is being anticipated by the participants. |
| Opinion regarding the infrastructural development of the area and risk of accidents due to the increased traffic in the area | There is a possibility of occurring infrastructural development in the proposed project area due to the implementation of the project. Local roads will be more developed. The number of transports will also increase. However, the project should have their own traffic security system and parking areas to reduce the traffic jam and road accidents in the main road. |
| Opinion regarding the land leasing and payment process | The proposed project authority has selected a land which is not usable for more than 15 years due to being inundated. The landowners did not have any income from those lands. But due to the proposed project, the landowners become economically benefitted from those lands. They are also satisfied with their payment amount and payment process. |
| Details about the transmission line | The proposed project will produce electricity and supply it to the local substation of Mymensingh Palli Bidyut Samity. They will supply it through transmission line. The length of transmission line is 8 km and there is existing 276 poles in both side of the Tangail – Mymensingh highway road. The poles mainly owned by the Bangladesh Rural Electrification Board and no privately owned land is going to be acquired for the installment of transmission line poles.<br>Local people were informed about the issues by project authority. |
| Any suggestions/ opinions | The local people suggested starting the implementation of the proposed project as soon as possible. Moreover, they also urged for providing training facility to the local youths and recruit them in the proposed project. |

**Table 9-6: Summary of Focus Group Meeting with Local Women**

| Issues Discussed | Participant's Opinion, comments, and Suggestions |
|---|---|
| General perception about the proposed project | The local females are informed about the proposed project by their household members and neighbors. They think the proposed project will be beneficial for their area through supplying electricity and providing employment facilities to local people. |
| Level of education among women in the project area | The education rate of the female of the study area is too low. But the women are quite conscious about education now. They try to educate their children (both male and female) as far they can. |
| Livelihood pattern of women in the project area | Local women are mostly engaged in household works. Besides, some of them are engaged in small business-like tailoring. A few women are going outside for doing different types of jobs like schoolteachers, factory workers and so on. The women feel fully secured and comfortable during working outside. Their family also supports them for doing income generating activities. |
| Decision making Capacity | In household, the local female of the area participates in the decision-making procedure. They can express their opinions on |

| Issues Discussed | Participant's Opinion, comments, and Suggestions |
|---|---|
| | major issues like for which purposes they use their total household income. |
| Issue of Gender based violence | The local women are aware of the Gender based violence (GBV). No gender-based violence has occurred in the area for many years. They were informed about the GBV issues by the NGO (BRAC), and they also know about the reporting mechanism to address the GBV issues. The local women expect that no gender-based violence or sexual harassment will be occurred due to the intervention of the proposed project. |
| Support from NGO/INGO | There are different local and national NGOs working in the upazila for local development. Among these, the local women expressed that, BRAC used to support them by providing different types of training such as tailoring, rearing poultries and so on. They provide micro-credit loans to the local people and financial support to the vulnerable. Moreover, they provide legal support in special cases like gender-based violence and early marriage. |
| Any possibilities of being affected by the project | As per the participants, there is no possibility of the women being affected by the proposed project. |
| Expectations from the project proponent | Local people should be given preference in terms of employment prospects. The locals, during the discussion, have also suggested that, depending on their ability, they should be given the opportunity to apply for work at the proposed project. The participants have also requested that the project proponent take their expectations into consideration. |

**Table 9-7: Summary of Focus Group Discussion with Affected People**

| Issues Discussed | Participant's Opinion, comments, and Suggestions |
|---|---|
| General perception about the proposed project | The people involved in working on the project land, were informed about the proposed project though their landowners and proposed project authorities. |
| Type of livelihood loss due to the project | Basically, the proposed project land is mostly a wetland. Only a few amounts of land were used for agricultural and fisheries purposes. Mostly the landowner himself used to work on those lands, or sometime gave lease to other people. The labors, who usually worked on those lands, were seasonal labors and worked on daily basis contract. All of them are now doing other income generating activities such as working on other lands, working as daily labor, CNG driver, doing business, moving towards Dhaka or other cities for better livelihood opportunities. |
| Starting time for the land lease process | The land lease process was started from 2023. |
| Details about the landowners and their views | The landowners are quite satisfied due to giving their land lease to the proposed project. Most of the landowners did not have any income from their land as their land was wetlands and unused for more than 15 years. These landowners are now getting an income from those lands. Besides, the landowners are also satisfied with the payment amount and payment procedure also. |

| Issues Discussed | Participant's Opinion, comments, and Suggestions |
|---|---|
| Any adverse claimant in the land | No adverse claimant has been occurred in the proposed project land. |
| Impacts of the proposed project | The proposed project has potential positive impacts on the area. Already the proposed project has leased the unused wet land in the area and made income source from those lands to the landowners. Moreover, the proposed project will reduce the continuous loadshedding problem from the locality through supplying electricity. As a result, the number of small- and large-scale industries will increase in the area, and it will help to increase the employment opportunity as well as business opportunity in the area. |
| Suggestion | It is highly suggested to start the implementation of the proposed project quickly and give priority to the local people in their recruiting process. |

**Table 9-8: Summary of Focus Group Meeting with Local Farmers**

| Issues Discussed | Participant's Opinion, comments, and Suggestions |
|---|---|
| Perception about the proposed project | Mostly the farmers are informed about the proposed project. They are so hopeful about the project as they believe, their area will be developed through the implementation of the project. The agricultural lands of the proposed project area are mostly double cropped. The agricultural laborers are usually hired for a single season on a daily basis contract. Moreover, the agricultural laborers are also hired from other villages. So, no agricultural farmers of that area are fully dependent on this occupation. They have to perform different types of economic activities such as driving, day labor, rickshaw/auto rickshaw pulling, side business and so on. |
| Details about the local agricultural conditions including major crops, cropping patterns, production rate, market price etc. | The major crop of the proposed project area is paddy. Sometimes local people also cultivate mustard in this area. The major cropping pattern is paddy (Boro-Fellow-T. Aman). Usually, they produce 30 to 35 kg of paddy per decimal. The present market price of the paddy is BDT 25 per kg. |
| Challenges during dry season for irrigating purpose | They usually do not face any difficulties for irrigation purposes. Basically, those farmers, whose lands are closest to the project site, collect their irrigation water from the wetland at the project site. The rest of the farmers use to extract ground water by submersible pumps for irrigation purposes. But they face difficulties due to load shedding. As their pumps are fully dependent on electricity, they have to wait for hours or more to collect irrigation water during the loadshedding period. They hope this problem will be solved by the installation of the proposed project. |
| Potential positive and adverse impacts on agriculture due to the industrial and infrastructural development made by proposed project | As per the farmers, the proposed project does not have any direct impact on agriculture. But they think, this project will be helpful for the landowners and also the farmers. The agricultural lands beside the proposed project area are mostly lowlands. They remain inundated during the rainy season. Moreover, the fertility rate of the lands is decreasing day by day. As a result, both the landowners |

| Issues Discussed | Participant's Opinion, comments, and Suggestions |
|---|---|
| | and farmers become unwilling in the agricultural sector and decrease their dependency on it. The project will pay lease amounts to the landowners and create employment opportunities during construction and operation period. Moreover, new industries and factories will be constructed in the proposed project area if the electricity supply increases through the proposed project. As a result, the employment opportunity will also increase for the local people. |
| Details about the agricultural labors working in the proposed project area- daily income, current condition etc. | The agricultural laborers are usually hired for a single season on daily basis contract (BDT 800 to 900 per day). Moreover, the agricultural laborers are also hired from other villages. As a result, no agricultural farmer is fully dependent on this occupation. The availability of agricultural farmers is also decreasing regularly. |
| Possibility of conflicts between local farmers and project workers. | The participants think, labor influx will create new business opportunities in the area. As per the participants, there is no possibility of conflicts between the project workers and the local people. Rather, local people will welcome them and create residential opportunities for the project workers if needed. |
| Required support by the farmer community from the proposed project. | The farmer community requires uninterrupted electricity connection for their irrigation purpose. Moreover, they demanded employment opportunity in the proposed project. |
| Any livelihood change observed in the proposed project area. | Livelihood changes are regularly observed in the area from 20 to 22 years ago. Before 20 to 22 years, the proposed project land was fully used for agricultural purposes. Rainwater could not stay there due to proper drainage system. The drainage system was passing through fellow lands. But later on, people started to use those lands for cultivation and fish farming. Due to the change of land use, the drain got blocked and the proposed project land started to get inundated. Thus, the local farmers started to change their livelihood. |
| Have you received any compensation for your losses like crops, trees or livelihood? | MSEL only paid the lease amount to the lessor and selling price to the land seller. Moreover, MSEL have given approval to local people to use the project lands for both agricultural and fish farming purposes till the construction work for the project get started. |
| Any suggestion. | The participants suggested to provide sufficient electricity facility the proposed project area as the local people face a huge problem due to continuous loadshedding. Moreover, they demanded employment opportunities for the local people. They also requested the proposed project authority to construct a road network in their area for the usage of local people as well as the project workers. It will help to increase business facilities in that area. |

**Table 9-9: Summary of Focus Group Discussion with Fish farmers**

| Issues Discussed | Participant's Opinion, comments, and Suggestions |
|---|---|
| General perception about the proposed project | The local fish farmers are informed about the proposed project by the project authorities and local people. As per the fish farmers, the proposed project may not have direct impact on local fish culturing activities, but it will play an effective role on the development of the local area. |
| General types of fishing practices in the proposed project area | Fish culturing is the most common practice in the proposed project area. A very few people are involved in fish capturing from the wet land very rarely. |
| Any protected area or designated fish sanctuary in the project area | No protected area or fish sanctuary is available in the proposed project area. |
| Commonly available species of fishes in the proposed project area | Different types of fish, mostly local fish, are available in the proposed project area. Off them, *shing, taki, puti, tengra, rui, katla, koi, tilapia, shol, magur etc* are mentionable. |
| Is any person engaged in fishing activities in the water bodies in the proposed project area? If yes, please mention the current situation in terms of fishing activities. | Approximately 6 to 10 people capture fish from the wetland of the proposed project area. They usually do these fish capturing activities in their free time. Most of them perform this activity due to their outside interest. They usually capture fish for their own consumption. Generally, they capture *shing, magur, koi, shol, rui, katol* from the wetland. They use net and fishing pole for capturing fish. They have to clean the water hyacinths before they start capturing fish from the wet land. The number of fish is decreasing day by day. Most of the time, they do not have any surplus amount after keeping for consumption. |
| Details about fish culturing and fish farmers. | Some of the local landowners perform fish farming in and around the project area. They usually hire 8 to 10 laborers for a very short period of time during the starting and ending period of the fish culturing process. The laborers only get BDT 500 per day, and they just need to work for only two to three hours in a day on those purposes. They additionally do other income generating activities during the rest of the time.<br>Usually, the fish farmers start fish farming in the Bengali month *Agrahayan and* cultivate it for one year. After one year, they harvest the fish and sell it to the local Fish *Arot* of Kalibari and Muktagacha market. As per the participants, they can harvest around 40 to 60 kg of fish from each katha whose market rate is BDT 200 to 250 per kg. |
| Any changes of livelihood occurred during the proposed project. | As per the participants of the discussion, no loss of livelihood for the fish farmers has been observed. Mostly the fish farmers and fisheries related labors are doing this job as their secondary occupation. All of them are engaged in different permanent occupations like business, daily laboring, agriculture and so on. |
| Impact of proposed project on fish culturing and fish farmers. | The proposed project did not have any direct impact on fish culturing and fish farmers. |
| Any suggestions/ opinions | The participants suggested to provide employment opportunities to the local people. Moreover, the participants also expect local development through the implementation of the proposed project. |

**Table 9-10: Summary of Focus Group Discussion with Business owners**

| Issues Discussed | Participant's Opinion, comments, and Suggestions |
|---|---|
| General perception about the proposed project | The local business owners are informed about the proposed project. They believe the proposed project will be beneficial for their locality as well as their business sector. |
| Major business activities in the area | Local people are engaged in different types of business such as small business, whole sell and retail business of crops and fishes, sawmills, rice mills and so on. |
| Possible impacts of the proposed project | The proposed project will have some potential impacts on the local business sector of the area. Different scopes of new business will be introduced. Many local people will be engaged in business and develop their lifestyle. On the other hand, load shedding is one of the worst problems of this area. Local business owners, particularly those in the grocery sector, are unable to engage in selling refrigerated products such as ice cream and cold beverages. The local people believe that the proposed project will ensure uninterrupted electricity facility in the proposed area. As a result, the business owners will increase their business scope accordingly. |
| The potential areas of business activities have been explored due to the proposed project | At present there is a scarcity of several businesses in the area.<br>After the beginning of the project, these businesses will be needed in the area badly. Moreover, local people will be benefitted by doing these businesses. Some of these businesses are - restaurant business, grocery shop, stationery store, tea stall etc. |
| Expectations and Suggestions | Local business owners suggested starting the project activities quickly so they can develop and increase their business facilities. They also expect that the proposed project will give priority to the local people in the recruitment process. |

## 9.9 Stakeholder Engagement Program

The consultation with the stakeholders will be conducted with the EHS Officer/Admin officer who will also look at the environmental and social aspects and work in collaboration with the nominated person and Plant Manager at the site level. Any grievances from the community relating to any issues that might arise from the project activities will be managed by the nominated EHS/ Admin Officer based at the Site Office. All grievances will be addressed to the plant manager during the construction and operation phase. For any unresolved grievances and grievances related community health and safety, livelihood status of the affected persons, the plant manager will forward the grievances to proposed project authorities who in turn will subsequently forward them to the appropriate authority for redress.

Consultations with the government agencies will be conducted as per the schedule that will be created with the plant manager and EHS/ Admin officer of proposed project. These stakeholders will be informed in advance of the planned project activities. The development of the facilities will be based on the IESE procedures and mitigation issues once an IESE study has been completed.

Consultations with the primary stakeholders will involve meetings, information boards announcements and an Intranet system to appraise the direct employees of Contractors regarding the procedures of emergency response system, incident/accident reporting, grievance redress mechanism, Human Resources Policies and Procedures, welfare measures etc. In addition, communication of general employment conditions, company's code of conduct for the work site, EHS concerns, use of PPEs, information and awareness about the requirements of labour laws and minimum wages, working hours,

grievance redress, retrenchment process etc. should also be conducted with workers engaged with contractors.

Project-related information will be posted on the information boards at the site office as well as at the corporate level. Information on the project milestones will be published in advance on the company's website to be available for the public and non-governmental organizations in the area to comprehend the attitude of the secondary stakeholders. In addition, the company will publish information on the project in the local newspapers.

In turn, if any issues are raised by the stakeholders, the project proponent management comprising of the Grievance Redress Committee at the Site Level will respond accordingly in the shortest possible time. Details of which have been provided in the Grievance Redress Mechanism section of the report.

The responsibility for the SEP implementation will be held by the EHS Officer/Admin officer, and he will be supported by EHS Officer/Admin officer at the site level.

A summary of the consultation activities that the project proponent shall undertake as part of the engagement plan pertaining to the villages around the project area and other stakeholders have been provided in Table 9-11.

**Table 9-11: Consultation Activities Summary**

| Stakeholder | Information to be shared | Proposed timeline/ Frequency | Responsibility |
|---|---|---|---|
| Affected persons if any, land owners, Community Members vulnerable groups, farmers, fish farmers, community adjacent project site, Local Workers and Laborers | • The progress of the work under each phase.<br>• Information on job opportunities<br>• Tenders for petty contractors and vendors<br>• Local Area Development Activities<br>• Grievance Mechanism<br>• LRP Implementation | Ongoing process throughout the Project, Twice in a Month | • Plant Manager,<br>• EHS Officer/Admin officer, Social Safeguard Officer and<br>• Local Leaders (chairman/ word members) of the villages. |
| Government Authorities | • Permits and Approvals<br>• Grievances related to land issues and unresolved grievances<br>• Environment Monitoring reports | Ongoing process throughout the project, Once in a month | • Plant Manager,<br>• EHS & Admin Officer |
| Direct Employees | • Training on dealings with local communities<br>• Grievance Mechanism | Ongoing process throughout the project, Four times in a month | • Plant Manager<br>• EHS & Admin Officer |
| Contractors (Third Party) | • Training on dealing with local communities<br>• Other EHS training | Ongoing process throughout the project, Four times in a month | • Plant Manager<br>• EHS & Admin Officer |
| Lenders | • Information on project status | Ongoing process on a permanent basis, Four times in a month | • Plant Manager and<br>• Designated person from MSEL |

| Stakeholder | Information to be shared | Proposed timeline/ Frequency | Responsibility |
|---|---|---|---|
| | • Submission of annual reports, information on any project-related events that could potentially create an increased risk of the project | | |

### 9.9.1 Proposed Strategy for Stakeholder Engagement

Stakeholder engagement activities will provide stakeholder groups with relevant information and opportunities to voice their views on issues that matter to them/affect them. Two of the important means that have to be followed include briefing material and the organization of community consultation sessions. The briefing material (all to be prepared in the local language) can be in the form of (a) brochures that can be kept in the offices of local self-government (union parishad office) and project office; (b) posters to be displayed at prominent locations and (c) leaflets that can be distributed in the project areas. Periodic consultation meetings will be organized by MSEL to acquaint the communities, target group beneficiaries, and affected persons. Disclosure of information will enhance governance and accountability, specifically with respect to the strengthening of monitoring indicators to help the ADB monitor compliance with the agreements and assess the impact on outcomes. Table 9-12 presents the stakeholder consultation activities that the MSEL/Project authority will undertake for their project. The activity types and their frequency are adapted to the three main project stages: project preparation (including design, procurement of contractors and supplies), construction, and operation and maintenance. The methods used would vary according to the target audience and would include:

- Public/community meetings, separate meetings for women and vulnerable groups.
- Face-to-face meetings.
- Focus Group Discussions/Key Informant Interviews.
- Workshop with the Experts.
- Interviewing stakeholders and relevant organizations.
- Mass/social media communication (as needed).
- Disclosure of written information: brochures, posters, flyers, MESL website.

It also includes the time/frequency and means of verification for checking whether planned stakeholder engagement activities have taken place

**Table 9-12 Proposed Strategy for Stakeholder Engagement**

| Stage | Targeted Stakeholders | Discussion Points | Engagement Method | Location/Frequency | Responsibilities |
|---|---|---|---|---|---|
| Project Preparation | • Project Affected People<br>• People residing in the project area.<br>• Vulnerable households<br>• Local administration and local leadership<br>• Press and Media (if required)<br>• Workers organization<br>• General Public (Job Seekers)<br>• DoE from which permissions/clearances are required.<br>• Supervision Consultants - Third Party Monitoring | • Project scope and rationale<br>• IESE and SEP Disclosure<br>• Project E&S principles<br>• Grievance mechanism process including GRC | • Public meetings, separate meetings for women and vulnerable<br>• Face-to-face meetings<br>• Disclosure of written information: brochures, posters, flyers, and Information boards at the project area in Bangla<br>• Grievance mechanism<br>• MSEL website | • Project area or any adjacent open place for disclosure of Draft IESE and SEP<br>• Throughout SEP development as needed<br>• At a central place convenient for all stakeholders<br>• As and when required at different stages of the construction and operation | Designated officer of MSEL/Project |
| Construction | • Project Affected People<br>• People residing in the project area.<br>• Vulnerable households<br>• Local administration and local leadership<br>• Press and Media (if required)<br>• Workers organization<br>• General Public (Job Seekers)<br>• DoE from which permissions/clearances are required | • Grievance mechanism<br>• Health and safety impacts (EMF, community H&S, community concerns)<br>• Employment opportunities<br>• Project status<br>• Health safety impacts<br>• Environmental and Social concerns | • Information boards in MSEL<br>• Notice board(s) at construction sites<br>• Face-to-face meetings<br>• Public meetings, open houses, training<br>• Training/workshops<br>• Invitations to public/community meetings | • Quarterly meetings during the construction stage<br>• Notice boards are updated weekly<br>• Routine interactions<br>• Brochures in local offices<br>• Daily as needed | Designated officer of MSEL/Project |

| Stage | Targeted Stakeholders | Discussion Points | Engagement Method | Location/Frequency | Responsibilities |
|---|---|---|---|---|---|
| | • Supervision Consultants - Third Party Monitoring<br>• Contractor, subcontractors, service providers, suppliers, and their workers | • Worker grievance mechanism | | | |
| Operation and Maintenance | • Project Affected People<br>• People residing in the project area<br>• Vulnerable households<br>• Local administration and local leadership<br>• Press and Media (if required)<br>• Workers organization<br>• General Public (Job Seekers)<br>• DoE from which permissions/clearances are required<br>• Supervision Consultants Contractor, subcontract | • Satisfaction with engagement activities and GM<br>• GM Process<br>• Status and compliance reports | • MSEL website<br>• GM Process<br>• MSEL newsletter<br>• Face-to-face meetings<br>• Submission of report as needed | • Meetings in Project area (as needed) | Designated officer of MSEL /Project |

**Table 9-13:Stakeholder Engagement Plan Roles and Responsibilities**

| Position | SEP Responsibilities |
|---|---|
| MSEL level | |
| Plant Manager | • Overall responsible for SEP implementation, monitoring and review.<br>• To maintain the SEP and make changes to this document as necessary.<br>• Maintain a confidential register of the persons affected by the project, their resettlement choices, and any other relevant information. |
| Lead – Admin, Accounts and EHS (under Plant Admin) | • Leads stakeholder engagement with govt agencies and contractors.<br>• To provide financial support and capacity building activities to implement |
| Social Officer (under Plant Admin) | • Leads in conducting community engagement activities.<br>• To engage regularly with farmers and landowners, and any other land users as necessary.<br>• To provide details on land survey results, and respond to questions on land-related matters<br>• Provide regular monitoring reports |
| EPC level | |
| Project Coordinator | Regularly monitor and report to HQ |
| Project Manager | • To provide overall assistance in explaining the content of the LRP, the eligibility and entitlement matrix, and details of livelihood restoration measures. |
| Social Safeguard Officer | • Assists in conducting community engagement activities. |

# CHAPTER 10

## Grievance Redress Mechanism

# 10 GRIEVANCE REDRESS MECHANISMS

## 10.1 Introduction

Grievance management is an important component of any project's implementation. Over the duration of a project lifecycle, it encounters numerous instances of conflicts, allegations and dissatisfaction within the working and associated human capital and their interactions. Some of the areas of grievances for the project may include issues regarding land procurement, payment of compensation for land or wages to the workers, issues arising due to allotment of alternate land parcels with diminished productivity or higher upfront costs required for making it fit for cultivation, failure to fulfil commitments, poor management of construction activities, accidents due to inappropriate planning of vehicle movement, etc. The salient features of this Grievance Redress Mechanism (GRM) are transparency and strengthening the existing Grievance Mechanism, through establishing a Standard Operating Procedure (SOP) for grievance handling and direction for documentation and reporting.

## 10.2 Grievance Redress Mechanism for Workers

### 10.2.1 Objective of the GRM

Grievances can encompass minor concerns as well as serious or long-term issues. The grievances may be felt and expressed by a variety of parties including workers, employees, and communities likely to be affected by the social and environmental impacts of the Project. Hence, its impetus to have a robust and credible mechanism to systematically handle and resolve any complaints to the possible extend feasible depending on the type of grievances. The objective of GRM is to as follow's,

- Provide a forum of stakeholders to voice their concerns, queries and resolving issues in a timely matter especially about environmental, health and safety, community, and security issues.
- Provide the stakeholders with a system or channel through which their queries can be channeled and will ensure timely responses to each query; and
- Provide an accessible and credible mechanism to the employee and any stakeholders having a stake in the project to redress their issues and grievances regarding project functioning.

### 10.2.2 Scope

The GRM will be accessible and applicable for all MSEL staff and contractor's workers. People from the community will also be included in the GRM process. The grievance mechanism will manage grievances from workers where operations of both MSEL might have an impact. This Process is designed to provide a system for managing grievance and all complaints received under this procedure shall be tracked until close out, regardless of the process under which they are handled. The GRM also provides a scope for the stakeholders to appear in the court of law in case of any dissatisfaction.

To maximize the effectiveness of the Grievance Mechanism, MSEL shall uphold the following values during the implementation and operation of the system:

- Commitment to fairness in both process and outcomes.
- Transparency.
- Confidentiality; and
- Accessibility

### 10.2.3 Regulatory Framework and Safeguards

The relevant provisions under the following (**Error! Reference source not found.**) regulations, guidelines and pertinent standards are applicable towards the implementation of this Procedure.

**Table 10-1:Relavent Appliable Regulatory Framework and Safeguard**

| Reference | Full Title |
|---|---|
| National Labour Laws | Bangladesh Labour Act 2006 |
| National Labour Rules | Bangladesh Labour Rules 2015 |
| Electricity Regulation | The Electricity Act 2018 |
| Occupational Health and Safety | National Occupational Health and Safety Policy 2013 |
| EBRD Performance Requirement 2 - Labour and working conditions | Employee grievance mechanism Guidance note |

### 10.2.4 Roles and Responsibilities

Below are the roles and responsibilities of MSEL and EPC contractor officials and staff in managing the workers' GRM. The Grievance Committee will be headed by the Plant Manager.

**Table 10-2: Roles and Responsibilities for Workers' GRM**

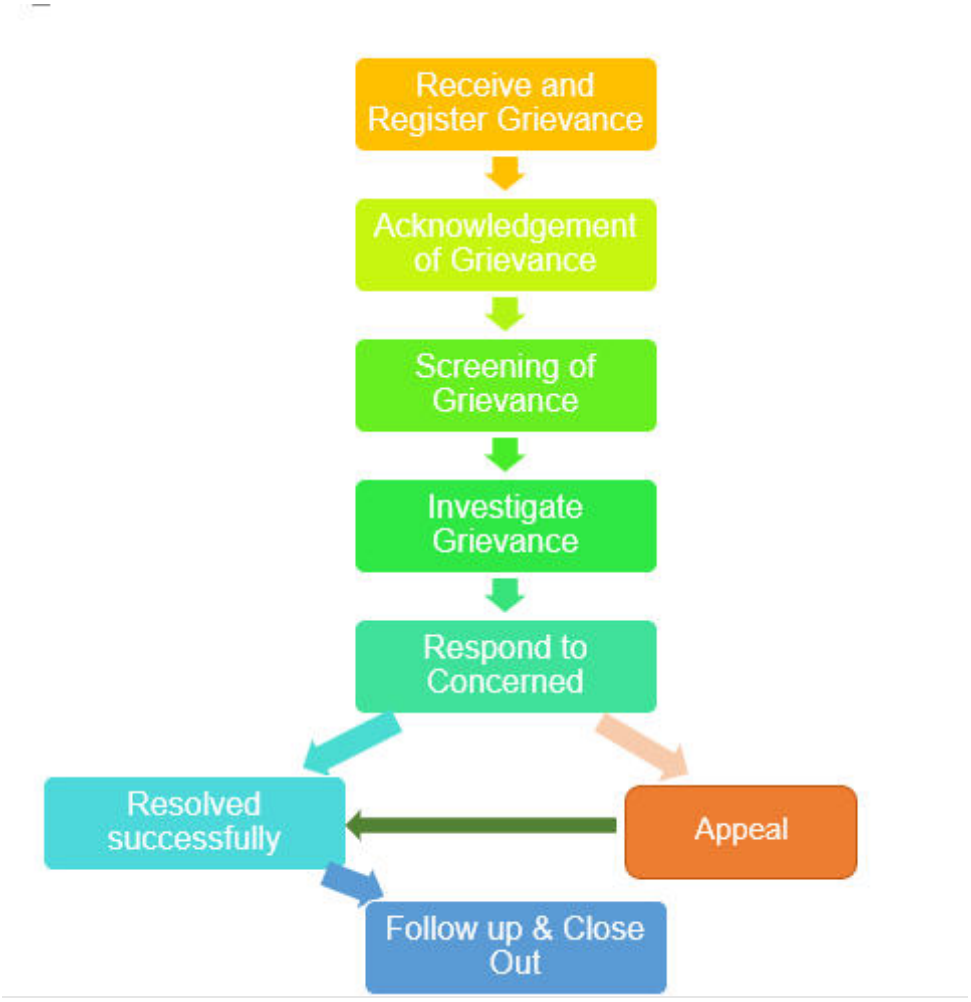
| Position | GRM Responsibilities |
|---|---|
| MSEL level | |
| CEO/Managing Director | • Manages Level 3 grievances |
| Plant Manager | • Overall responsible for SEP implementation, monitoring and review<br>• Heads the GRM Committee<br>• To assist in the resolution of grievances. |
| Lead – Admin, Accounts and EHS (under Plant Admin) | • Member of the GRM Committee<br>• Conducts information dissemination on internal GRM<br>• Records internal grievances<br>• Conducts monitoring of internal grievance resolution<br>• Prepares internal GRM report |
| Social Officer (under Plant Admin) | • Member of the GRM Committee<br>• Conducts information dissemination on external GRM<br>• Records external grievances<br>• Conducts monitoring of external grievance resolution<br>• Prepares external GRM report<br>• To raise awareness about the grievance mechanism and support the resolution of grievances. |
| EPC level | |
| Project Coordinator | Regularly monitor and report to HQ |
| Project Manager | • Member of the GRM Committee |
| EHS Personnel | • Member of the GRM Committee<br>• Assists in conducting information dissemination on internal GRM<br>• To assist in the resolution of grievances.<br>• Assists in conducting GRM investigation<br>• To take the lead in managing the Grievance Mechanism |
| Social Safeguard Officer | • Member of the GRM Committee<br>• Assists in conducting information dissemination on external GRM<br>• Assists in GRM investigation |

| Position | GRM Responsibilities |
|---|---|
| | • To raise awareness about the grievance mechanism and support the resolution of grievances. |

### 10.2.5 Grievance Redress Process

To ensure that all people lodging grievances are protected against any inappropriate behaviours or actions, such as retaliation, all information shall be treated with confidentiality. In situations where there may be circumstances and due to the nature of the investigation or disclosure, it will be necessary to disclose the identity of the complainant. In such circumstances, every effort will be made to inform such person(s) before such disclosure is made. Moreover, reasonable steps will be taken to protect the grievance owner from any victimization or detriment because of having made a disclosure. The grievance redress flow chart has been presented below.

**Figure 10-1: Grievance Redress Process**




#### 10.2.5.1 Lodging of Grievances

Stakeholders can submit their grievances through a number of methods, but not limited to the following:

- In Person: To Executive Welfare/Department Head/Site or Contractor Supervisor
- Over telephone using the following number **+8801896045316**

- In writing: Through Grievance boxes, will be placed in different strategic locations- MSEL worker rest room and in the main entrance. All grievance boxes will be opened by the EHS and Admin officer once a week.
- Grievance boxes will also be installed (upon consultation with the local elites) in the community at convenient locations for receiving grievances from the community people.

*Note: Any worker or community people who prefers not to reveal his /her identity can also lodge grievances anonymously, the same will be recorded by the EHS and Admin officer for the required process.*

#### 10.2.5.2 Recording and Acknowledging of Grievances

All formal grievances will be logged in to the Grievance Register. The EHS and Admin officer shall formally acknowledge the receipt of any grievance as soon as possible and shall be informing the complainant about the timeframe in which a response can be expected except in the case of anonymous grievances. The Grievance shall be bearing a summary of the grievance, which shall be read to and acknowledged by the complainant.

#### 10.2.5.3 Screening of Grievances

Grievances will be screened depending on the level of severity in order to determine who the grievance owner will be and how the grievance is approached. The following three levels of screening shall be followed for this purpose.

**Table 10-3: Three Level Screening Procedure**

| Category | Description | Grievance Owner (GO) |
|---|---|---|
| Level 1 | Grievances that pose no risk to the company and can be resolved at the level of Social Officer. Such grievances require no investigation and can be resolve in no less than 15 days. | Social Officer |
| Level 2 | Grievances that require investigation and may pose minor threat to Company reputation. Such investigation should not be less than 30 days | Plant Manager |
| Level 3 | Potentially high risk and need intervention of the Chief Executive Officer/ Managing Director. Such grievances may jeopardize the reputation of the Company and may pose conflicts with the communities and/or workers. The level 3 grievances will be resolved in 45 days | Chief Executive Officer/ Managing Director -MSEL |

In cases where grievance is considering out-of-scope for the grievance mechanism, the EHS and Admin Officer would draft a response for signature by the Chief Executive Officer/ Managing Director explaining why it is out-of-scope and providing any guidance of where to go to get the issue addressed (if possible).

#### 10.2.5.4 Investigation of Grievances

The grievance owner is responsible for investigating the grievance. The investigation may require the grievance owner to make site visits, consult employees, and complete other activities. Records of meetings, discussions and activities all need to be recorded during the investigation. Proposed GRM for investigating cases is given below.

A three-tier mechanism will be adopted.

**Tier 1:** The complaints/grievances may be received by the Project head in charge of the concern department/projects or by the Grievance Officer verbally or through written applications. The EHS and Admin officer will review the complaints and efforts will be made to resolve them in consultation with the complainant. The grievance/complaint should be resolved within 15 days from the date of receipt of the complaint will be made. In case the aggrieved is not satisfied with the solution provided Tier 1 he may escalate it to Tier 2.

**Tier 2:** Complaints/grievances that cannot be resolved at Level 1 or if the aggrieved is not satisfied with the decision of the Tier 1 can appeal for redress only such cases would be taken up at Tier II. The Plant Manager and EHS and Admin officer will resolve cases under TIER 2. The entire process of investigation would be completed within 30 days of the complaint being referred to Tier II.

**Tier 3:** The 3rd Level will be the Grievance Redress Committee (GRC) in MSEL operations. The third tier will address high brevity issues, which may pose a threat to the company. Moreover, the committee will also address grievances that cannot be addressed or resolved at Tier 2 may be brought up to the GRC. The CEO/ MD of MSEL will head the GRC, along with the present of existing Plant Manager. The GRC will resolve the matter within a period of 45 days from the date of receipt of the complaint at Tier 3.

Court of Law: If the grievance/complaint is not resolved at GRC Level or the complainant is not satisfied with the solution provided by GRC, the person may approach Court of Law.

Note: In cases of grievances not resolved within the stipulated timeline mentioned above and may stretched up to 6 months or so, in such situation the EHS and Admin officer shall communicate and update the Complainant on the status of the investigation on a weekly basis.

#### 10.2.5.5 Action Taken

Following investigation, the grievance owner for all Level 2 and 3 grievances shall discuss the grievance and of grievances cannot be resolved outcome of the investigation in the monthly Plant Management meetings. The purpose of this is to identify the actions to be taken for resolving the grievance in consensus with the Plant Manager. Once all actions have been completed and the grievance owner feels the grievance has been resolved, they will then formally advise the complainant via their preferred method of contact.

#### 10.2.5.6 Follow Up and Close Out

The grievance owner will make contact with the complainant after the grievance is resolved. If the stakeholder accepts the proposed resolution, the agreed actions are implemented. Such resolutions are recorded in the Grievance Register with supporting documentation. Hence, the resolution of the grievance will be formally closed out. This includes signature and dates from the complainant that will be documented in the Grievance Register.

#### 10.2.5.7 Appeal

In cases where a stakeholder is unsatisfied with and/or unwilling to accept the resolution actions proposed, the grievance may be escalated to the Plant Manager for further review and final decision. The Plant Manager reviews the case and determines if further reasonable action is possible. The complainant may also appeal to the court of law in case of any dissatisfaction with the grievance redress process.

#### 10.2.5.8 Notification

The procedure will be made aware to all the workers and employees. Notification will include:

- A summary of the procedure and how it can/should be used; and where people can go and whom they can talk to if they have any grievance. This should be mandatorily covered as part of the E&S Induction Program being implemented by MSEL.
- Details of the process, such as who is responsible for receiving and responding to grievance.
- When stakeholders can expect a response, safeguards are in place to ensure confidentiality.

All these information will be widely and regularly publicized and communicated in a manner appropriate to the audience through either meetings, trainings, or distribution of fliers/brochure in a format and languages that are readily understandable by stakeholders.

#### 10.2.5.9 Monitoring and Reporting

In order to ensure that the procedure is effectively functioning, the EHS and Admin shall be performing a monthly review of the following parameters to be featured in the quarterly E&S performance reporting.

- Number of open grievances by grievance level and type;
- Timeframes for closure by grievance level and type; and
- Repeat of grievance from the same stakeholder.
- Resolution and Agreements of GRM

## 10.3 Grievance Redress Mechanism for Community People

### 10.3.1 Objective and Purpose of the GRM

Grievances can encompass minor concerns as well as serious or long-term issues. The grievances may be felt and expressed by the local and fence line communities, local authorities likely to be affected by the social and environmental impacts of the Project. Hence, its impetus to have a robust and credible mechanism to systematically handle and resolve any complaints to the possible extent feasible depending on the type of grievances.

The purpose of GRM is to

- Provide a forum for the community to voice their concerns, queries and resolving issues in a timely matter especially with regard to environmental, health and safety, community and security issues.
- Provide a system or channel through which their queries can be channeled and will ensure timely responses to each query; and
- Provide an accessible and credible mechanism for the communities having a stake in the project to redress their issues and grievances in regard to project functioning.

### 10.3.2 Scope

The GRM will be accessible and applicable for communities including local/nearby communities might have an impact on account of the MSEL operation. This Process is designed to provide a system for managing grievance and all complaints received under this procedure shall be tracked until close out, regardless of the process under which they are handled. The GRM also provide a scope for the stakeholders to appear in the court of law in case of any dissatisfaction.

To maximize the effectiveness of the Grievance Mechanism, MSEL shall uphold the following values during the implementation and operation of the system:

- Commitment to fairness in both process and outcomes;
- Transparency;
- Confidentiality; and

- Accessibility

### 10.3.3 Regulatory Framework and Safeguard

The relevant provisions under the following (Table 10-4) regulations, guidelines and pertinent standards are applicable towards the implementation of this Procedure.

**Table 10-4:Relavent Appliable Regulatory Framework and Safeguard**

| Reference | Full Title |
|---|---|
| National Labour Laws | Bangladesh Labour Act 2006 |
| National Labour Rules | Bangladesh Labour Rules 2015 |
| Electricity Regulation | The Electricity Act 2018 |
| Occupational Health and Safety | National Occupational Health and Safety Policy 2013 |
| EBRD Performance Requirement 2 - Labour and working conditions | Employee grievance mechanism Guidance note |

### 10.3.4 Roles and Responsibilities

Below are the roles and responsibilities of MSEL and EPC contractor officials and staff in managing the external GRM. The Grievance Committee will be headed by the Plant Manager.

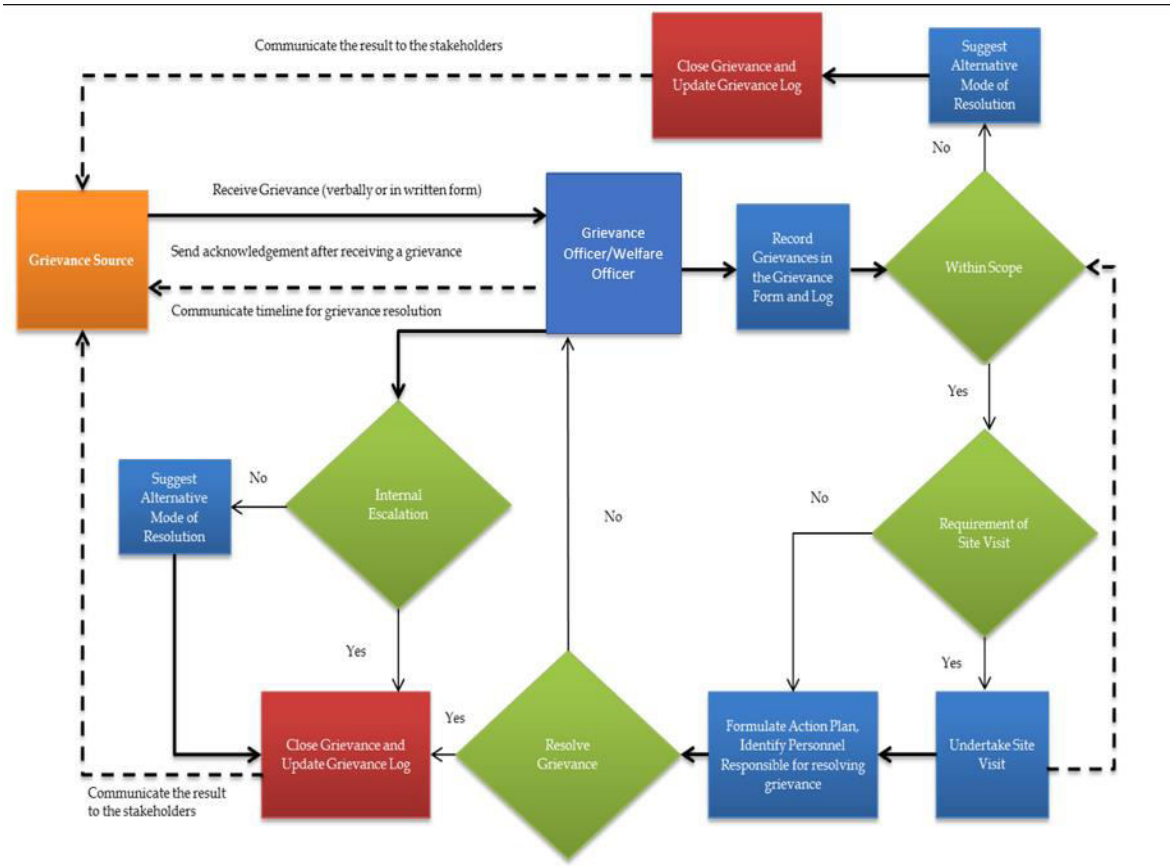
**Table 10-5: Roles and Responsibilities for External GRM**

| Position | GRM Responsibilities |
|---|---|
| MSEL level | |
| CEO/Managing Director | • Manages Level 3 grievances |
| Plant Manager | • Overall responsible for SEP implementation, monitoring and review<br>• Heads the GRM Committee<br>• To assist in the resolution of grievances. |
| Lead – Admin, Accounts and EHS (under Plant Admin) | • Member of the GRM Committee<br>• Conducts information dissemination on internal GRM<br>• Records internal grievances<br>• Conducts monitoring of internal grievance resolution<br>• Prepares internal GRM report |
| Social Officer (under Plant Admin) | • Member of the GRM Committee<br>• Conducts information dissemination on external GRM<br>• Records external grievances<br>• Conducts monitoring of external grievance resolution<br>• Prepares external GRM report<br>• To raise awareness about the grievance mechanism and support the resolution of grievances. |
| EPC level | |
| Project Coordinator | Regularly monitor and report to HQ |
| Project Manager | • Member of the GRM Committee |
| EHS Personnel | • Member of the GRM Committee<br>• Assists in conducting information dissemination on internal GRM<br>• To assist in the resolution of grievances. |

| Position | GRM Responsibilities |
|---|---|
| | • Assists in conducting GRM investigation<br>• To take the lead in managing the Grievance Mechanism |
| Social Safeguard Officer | • Member of the GRM Committee<br>• Assists in conducting information dissemination on external GRM<br>• Assists in GRM investigation<br>• To raise awareness about the grievance mechanism and support the resolution of grievances. |

### 10.3.5 Grievance Redress Process

To ensure that all people lodging grievances are protected against any inappropriate behaviors or actions, such as retaliation, all information shall be treated with confidentiality. In situation where there may be circumstances and by due to the nature of the investigation or disclosure, it will be necessary to disclose the identity of the complainant. In such circumstances, every effort will be made to inform such person(s) before such disclosure is made. Moreover, reasonable steps will be taken to protect the grievance owner from any victimization or detriment because of having made a disclosure. The grievance redressal flow chart has been presented below.




#### 10.3.5.1 Lodging of Grievances

Communities can submit their grievances through a number of methods, but not limited to the following:

- In Person: To Executive Welfare/ CEO- MSEL
- Over telephone using the following number **+8801896045316**
- In writing: through Grievance boxes, will be located outside the entrance of the plant

#### 10.3.5.2 Recording and Acknowledging of Grievances

All formal grievances will be logged into the Grievance Register. The Welfare Officer shall formally acknowledge the receipt of any grievance as soon as possible and shall be informing the complainant about the timeframe in which a response can be expected except in the case of anonymous grievances. The Grievance shall be bearing a summary of the grievance, which shall be read to and acknowledged by the complainant.

#### 10.3.5.3 Screening of Grievances

Grievances will be screened depending on the level of severity in order to determine who the grievance owner will be and how the grievance is approached. The following three levels of screening shall be followed for this purpose.

| Category | Description | Grievance Owner (GO) |
|---|---|---|
| Level 1 | Grievances that pose no risk to the company and community health, safety and security; and can be resolved at the level of the Social officer. Such grievances require no investigation and can be resolve in no less than 15 days. | Social Officer, |
| Level 2 | Grievances that require investigation and may pose a minor threat to Company reputation and community health, safety and security. Such investigation should not be less than 30 days | Plant Manager |
| Level 3 | Potentially high risk and need intervention of the chairperson. Such grievances may jeopardize the reputation of the Company and may pose conflicts with the communities. The level 3 grievances will be resolved in 45 days | Chief Executive Officer (CEO)/ MD - MSEL |

In cases where grievance is considering out-of-scope for the grievance mechanism, the Welfare Officer would draft a response for signature by the CEO- MSEL explaining why it is out-of-scope and providing any guidance of where to go to get the issue addressed (if possible).

#### 10.3.5.4 Site Inspection and Investigation of Grievances

Depending upon the sensitivity of the issue, and nature of the complaint, a site inspection may be required, but not in all cases. The purpose of the site inspection will be to check the validity and severity of the grievance. For this purpose, the personnel appointed by the CEO-MSEL may also undertake discussions with the concerned external stakeholder. The inspection will be undertaken within seven working days of receiving the grievance. Post site inspection, the assigned individual will investigate the problem, communicate an update to the concerned complainant, and identify measures to resolve the grievance as appropriate.

Records of meetings, discussions and activities all need to be recorded during the investigation. Proposed GRM for investigating cases is given below.

A three-tier mechanism will be adopted.

**Tier 1:** The complaints /grievances may be received by the Grievance Officer verbally or through written applications. The Grievance Officer/Social officer will review the complaints and efforts will be made to resolve them in consultation with the complainant. The grievance/complaint should be resolved within 15 days from the date of receipt of the complaint will be made. In case the aggrieved is not satisfied with the solution provided Tier 1 he may escalate it to Tier 2.

**Tier 2:** Complaints /grievances that cannot be resolved at Level 1 or if the aggrieved is not satisfied with the decision of the Tier 1 can appeal for redressal only such cases would be taken up at Tier II. The CEO-MSEL/ Managing Director and Welfare officer will resolve cases under TIER 2. The entire process of investigation would be completed within 30 days of the complaint being referred to Tier II.

**Tier 3:** The 3rd Level The third tier will address high brevity issues, which may pose a threat to the company that cannot be addressed or resolved at Tier 2 may be brought up to this tier. The CEO of MSEL will head this stage, along with the present of existing members of the Plant. The entire process at this stage will resolve the matter within a period of 45 days from the date of receipt of the complaint at Tier 3.

**Court of Law:** If the grievance/ complaint is not resolved at third level or the complainant is not satisfied with the solution, the person may approach Court of Law.

*Note: In cases of grievances not resolved within the stipulated timeline mentioned above and may stretched up to 6 months or so, in such situation the Welfare officer shall communicate and update the Complainant on the status of the investigation on a weekly basis.*

#### 10.3.5.5 Action Taken

Following investigation, the grievance owner for all Level 2 and 3 grievances shall discuss the grievance and of grievances cannot be resolved outcome of the investigation in the monthly Grievance Redress meetings. The purpose of this is to identify the actions to be taken for resolving the grievance in consensus with the Welfare Officer and Plant Manager. Once all actions have been completed and the grievance owner feels the grievance has been resolved, they will then formally advise the complainant via their preferred method of contact.

#### 10.3.5.6 Follow Up and Close Cut

The grievance owner will make contact with the complainant after the grievance is resolved. If the complainant accepts the proposed resolution, the agreed actions are implemented. Such resolutions are recorded in the Grievance Register with supporting documentation. Hence, the resolution of the grievance will be formally closed out. This includes signature and dates from the complainant that will be documented in the Grievance Register.

#### 10.3.5.7 Appeal

In cases the complainant is unsatisfied with and/or unwilling to accept the resolution actions proposed, the grievance may be escalated to the Welfare officer/ plant manager for further review and final decision. The Welfare officer/ plant manager reviews the case and determines if further reasonable action is possible. The complainant may also appeal to the court of law in case of any dissatisfaction with the grievance redressal process.

#### 10.3.5.8 Communication and Publication of the GRM

For the effective implementation of the GRM procedure, the GRM will be communicated/ disclosed to the local communities and local administration through written and verbal communication. The mediums to be used for this purpose are public meetings, public announcements and other communication channels such as display of GRM provisions in Union Parishad offices, and other key locations which includes:

a. How it can/should be used; and where people can go and whom they can talk to if they have any grievance.
b. Details of the process, such as who is responsible for receiving and responding to grievance;
c. When stakeholders can expect a response, safeguards in place to ensure confidentiality.

All this information will be widely and regularly publicized and communicated in a manner appropriate to the audience in a format and languages that are readily understandable by the community during the initial stage of implementation. A time-to-time engagement with the community will be undertaken to re-orient the community of the GRM.

#### 10.3.5.9 Monitoring

In order to ensure that the procedure is effectively functioning, the Welfare Officer shall be performing a monthly review of the following parameters to be featuring in the quarterly E&S performance reporting.

- Number of open grievances by grievance level and type;
- Number of open grievances
- Number of closed grievances
- Number of grievances which exceeded the defined timeline
- Number of grievances in which an alternate route for resolution was suggested
- Repeat of grievance from the same stakeholder

# CHAPTER 11

## Climate Risk Vulnerability Assessment

# 11 CLIMATE RISK VULNERABILITY ASSESSMENT

This chapter provides a legal and regulatory framework, covering national requirements as well as guidelines and standards to address the environmental and social risks of the proposed project and its associated components and to protect and conserve the environment from any adverse impacts. This chapter intends to discuss the regulatory context, which is directly related to environmental compliance, which must be adhered to by all parties involved in the project throughout the planning, construction, operation, and decommissioning.

## 11.1 Introduction

Climate change is leading to an increasingly unstable and potentially chaotic global setting for both infrastructure and the communities it supports. As the Earth's average temperature continues to climb, there's a growing prevalence of natural disasters like heightened instances of extreme heat, more frequent and severe extreme weather occurrences, prolonged droughts, and rising sea levels.[43] Furthermore, changes in policy, market dynamics, and legal frameworks are causing significant disruptions to the products, services, and systems that form the backbone of infrastructure assets, as countries worldwide shift towards a low-carbon economy.

Muktagacha Solartech Energy Limited (Developer) intends to develop a 20MWAC Solar PV project at Muktagacha in Mymensingh division of Bangladesh (24°43'51.12" N, 90°11'53.12"E). The project has been awarded by Bangladesh Power Development Board (BPDB) with an aim to increase the renewable energy footprint in the country.

Regarding the diverse consequences of climate change, there is widespread acknowledgment that ongoing greenhouse gas emissions will result in additional warming of the Earth. It's widely understood that surpassing a global average warming of 2°C above preindustrial levels could result in severe economic and social repercussions. These implications may include substantial regional and local climate alterations. Therefore, infrastructure projects like the proposed one must be engineered to accommodate anticipated climate changes and implement suitable plans and measures to adapt as necessary.

## 11.2 Objectives

This report has been prepared for the Client to assess the climate-related risks and opportunities associated with the construction and operation of the Project. This report has been prepared in accordance with the ADB Safeguard requirements and has considered the following:

- The current and anticipated climate change risks (transition and physical).
- Plans and processes are proposed to manage these risks, i.e., to mitigate or control; and,
- Project's compatibility with Bangladesh's national climate commitments

## 11.3 Scope of Assessment

The physical risk assessment encompasses evaluating potential climate-related risks linked to the construction and operation of the Project. This includes examining how these risks might impact the local community, businesses, and customers, and considering how the Project may exacerbate or mitigate these risks.

The scope of the transition risk and opportunity assessment covers the transition risks and opportunities for the Project, and its supply chain in relation to the low-carbon economy.

[43] Intergovernmental Panel on Climate Change, 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the IPCC, https://www.ipcc.ch/report/ar5/syr/

## 11.4 Definitions

**Physical Risks:** Can be event driven (acute) or longer-term shifts (chronic) in climate patterns and may result in direct damage to assets, resources or supply chain impacts, input prices, market impacts, liability due to failure to foresee and mitigate losses from any physical risks:

- Acute Risk: refer to those that are event-driven, including increased severity of extreme weather events, such as cyclones, hurricanes, or floods.
- Chronic Risk: refer to longer-term shifts in climate patterns (e.g., sustained higher temperatures) that may cause sea level rise or chronic heat waves.

**Transition risks:** Related to the transition to a low-carbon economy, including risks specifically associated with:

- Market and Technology Shifts: Relating to collapse in demand for products due to policy shifts, stranding of assets due to market shifts.
- Policy and Legal Changes: Including increased liability due to failure to foresee and mitigate losses from any transition risks.
- Reputation: Reputational damage resulting from an organization's limited response to mitigation needs.

## 11.5 Physical Climate Context of the Study Area

The project area in Mymensingh district is hot and humid during summer while short and mild winters with heavy rain during monsoon season. The area has a tropical wet and dry climate. The period from mid-April to mid-June is the hottest and driest season while monsoon season commences from early mid-May till mid-October. The area also experiences heat stress due to high temperature and flood due to frequent waterlogging which is exacerbated by heavy rainfall during summer monsoon season[44].

Mean annual temperature and rainfall for the area (Mymensingh) is indicated below:

| | Annual | Winter (December, January, February) | Spring (March, April, May) | Summer (June, July, August) | Autumn (September, October, November) |
|---|---|---|---|---|---|
| Mean temperature (ºC) (1991-2020) | 24.98 | 19.00 | 26.29 | 28.58 | 26.07 |
| Precipitation (mm) (1991-2020 | 2205 | 11.01 | 161.6 | 389.9 | 172.7 |

## 11.6 Climate Change Policy Context

In line with ADB Safeguard Requirement 1, this assessment has considered the Project's compatibility with Bangladesh's national climate commitments. A summary of Bangladesh's climate change policy and is provided below.

[44] https://ncc.portal.gov.bd/sites/default/files/files/ncc.portal.gov.bd/page/af95f19d_c59b_4e49_9911_4a8eb9999b53/2021-0121-13-19-0b6388114e1326c32714a6c906747ad5.pdf

### 11.6.1 Bangladesh's Nationality Determined Contribution (NDC)

The Paris Agreement envisioned 196 Parties uniting with the aim of reshaping their development paths, with the goal of constraining global warming to a range of 1.5°C to 2°C above pre-industrial levels. Each Party under the Paris Agreement is obligated to formulate, communicate, and uphold successive Nationally Determined Contributions (NDCs) outlining their intended actions. These NDCs represent the collective efforts of each country to lower national emissions and adapt to the effects of climate change.

Bangladesh's Intended Nationally Determined Contributions (INDC) propose an unconditional reduction of around 5% (equivalent to 12 million tons) in greenhouse gas (GHG) emissions from the Business as Usual (BAU) scenario by 2030. Additionally, there's a conditional reduction target of 10% (equivalent to 24 million tons) in GHG emissions compared to the base year of 2011, contingent upon support from the international community. The Bangladesh National Action Plan for 2030 aims to decrease black carbon emissions by 40% and methane emissions by 17%. Furthermore, there's a target to reduce national primary energy consumption per unit of GDP by 20% by 2030 compared to the 2013 level, with an expected total saving of 113 billion m3 of gas equivalent during this period.

In Bangladesh, the highest contribution to greenhouse gas (GHG) emissions in the energy sector comes from Industry (24.91% of the total), followed by Power (23.24% of the total) and Transport (8.86% of the total)[45]. Mitigation measures, funded through internal resources and contingent upon current local capacity, would be implemented in the unconditional part of the Nationally Determined Contributions (NDC). Conditional emission reduction, reliant on international funding and technological support, would be implemented accordingly. In the unconditional scenario, a reduction of 6.73% of GHG emissions in the respective sectors is targeted by 2030, with 95.4% of the reduction coming from the energy sector, 2.3% from agriculture, and 2.2% from the waste sector. In contrast, the conditional scenario aims for a reduction of 15.12% of GHG emissions in the respective sectors by 2030. Out of this, 96.46% will be from the energy sector, 0.65% from agriculture, and 2.97% from the waste sector, respectively. The conditional mitigation measures would only be implemented if there is external financial or technological support, in addition to the proposed actions outlined in the unconditional scenario.

Bangladesh has made significant strides in promoting renewable energy, with the installation of around 6 million solar-home systems, contributing to the adoption of environmentally friendly technologies like solar energy, bio-gas plants, and Effluent Treatment Plants throughout the country. Additionally, the government has embraced a comprehensive 100-year strategic plan known as the Bangladesh Delta Plan 2100, aimed at fostering sustainable development. Furthermore, the government has formulated the Bangladesh National REDD+ Strategy (BNRS) to curb carbon emissions from the forestry sector. Initiatives such as the planting of 10 million tree saplings by the Bangladesh Forest Department (BFD) and 5.4 million Palm trees by the Ministry of Disaster Management and Relief are underway across Bangladesh, serving as carbon sinks to mitigate emissions.

To address climate change and promote low-carbon economic growth, Bangladesh has established the Bangladesh Climate Change Strategy and Action Plan (BCCSAP) and the National Adaptation Programme of Action (NAPA), initially developed in 2005 and later revised in 2009. Despite contributing less than 0.35% of global emissions, Bangladesh has implemented mitigation measures aligned with the objective of limiting warming to 2 degrees Celsius. The country has committed to a long-term goal of not surpassing the average per capita greenhouse gas (GHG) emissions for developing nations. Bangladesh continues to pursue actions aimed at embracing a low-carbon development pathway.

[45] Ministry of Environment, Forest and Climate Change, Government of The People's Republic of Bangladesh, https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Bangladesh%20First/NDC_submission_20210826revised.pdf

### 11.6.2 Increasing Solar demand in Bangladesh

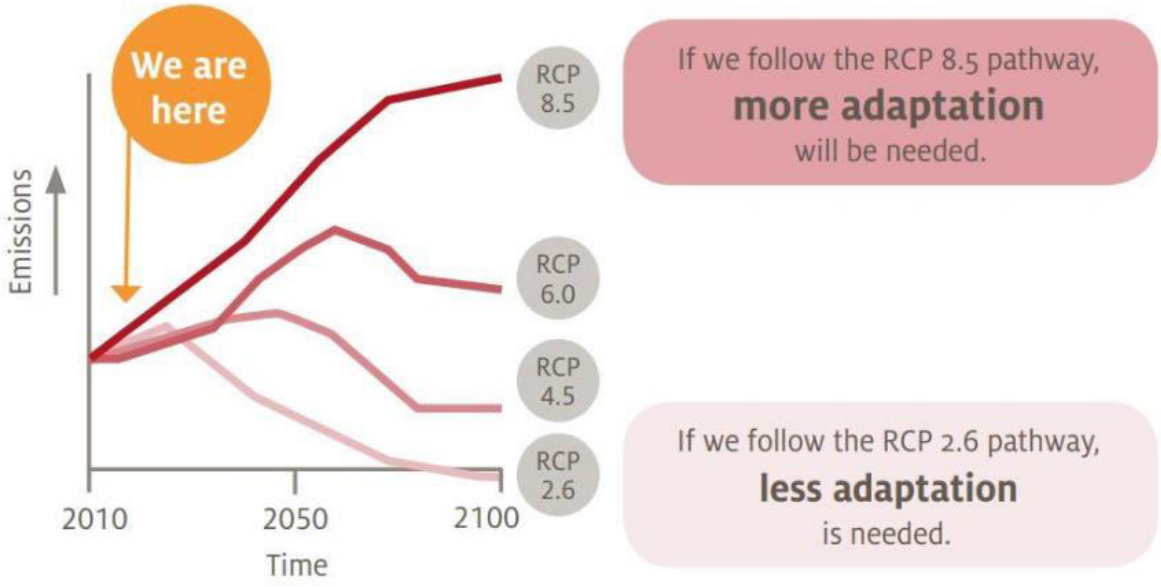
Renewable energy is becoming increasingly popular in Bangladesh. By April 2023, renewable sources accounted for 3.2 million megawatt-hours (MWh) out of the total energy consumption of 31,0430 MWh in the country. Projections suggest that by 2030, renewable energy will contribute over 4,130 MWh, constituting half of the country's power generation. Given Bangladesh's ample sunlight, there's potential to harness 1.7 to 3.4 gigawatts (GW) of solar energy, potentially replacing oil-fired power plants. Additionally, wind power could reduce plant operations by up to 4 GW during nighttime.

According to the Bangladesh solar energy market analysis, an annual growth rate of more than 8.56% is expected within 2022-2027. The increase in electricity demand in major cities like Dhaka, Chittagong, Khulna, and Rajshahi is expected to drive the market during the forecasted period.

## 11.7 Assessment Methodology

In adherence to the requirements outlined in ADB SR1, this section delineates the methodology employed for conducting the Climate Change Risk Assessment (CCRA). The process began with desk-based research to acquire future climate change projection data specific to the Project location. Subsequently, a staged approach was employed to identify potential physical climate-related risks associated with the Project.

**Figure 11-1: Representative Concentration Pathways to predict the Future Climate Impact**




Source: National Climate Change Adaptation Research Facility, 2023

Figure 11-1 shows emission trajectories over time in terms of Representative Concentration Pathways (RCPs), developed by the Intergovernmental Panel on Climate Change (IPCC). RCPs present possible physical states of the future climate, where GHG concentration is dependent on the level of mitigation action undertaken between now and then. RCPs are based on global research and existing literature and comprise four scenarios: RCP8.5, RCP6.0, RCP4.5 and RCP2.6 (Intergovernmental Panel on Climate Change (IPCC), 2014), each reflecting a different concentration of global GHG emissions reached by 2100.

- **RCP2.6** – Major GHG mitigation scenario (atmospheric concentration levels of 430 – 480 ppm $CO_2$-e by 2100).
- **RCP4.5** – Some GHG mitigation, stabilization scenario (atmospheric concentration level of 580-720 ppm $CO_2$-e by 2100).

- **RCP6.0** – Some GHG mitigation, stabilization scenario (atmospheric concentration levels of 720-1,000 ppm $CO_2$-e by 2100); and
- **RCP8.5** – Very high GHG emissions scenario, little effort to reduce emissions (atmospheric concentration levels of >1,000 ppm $CO_2$-e by 2100).

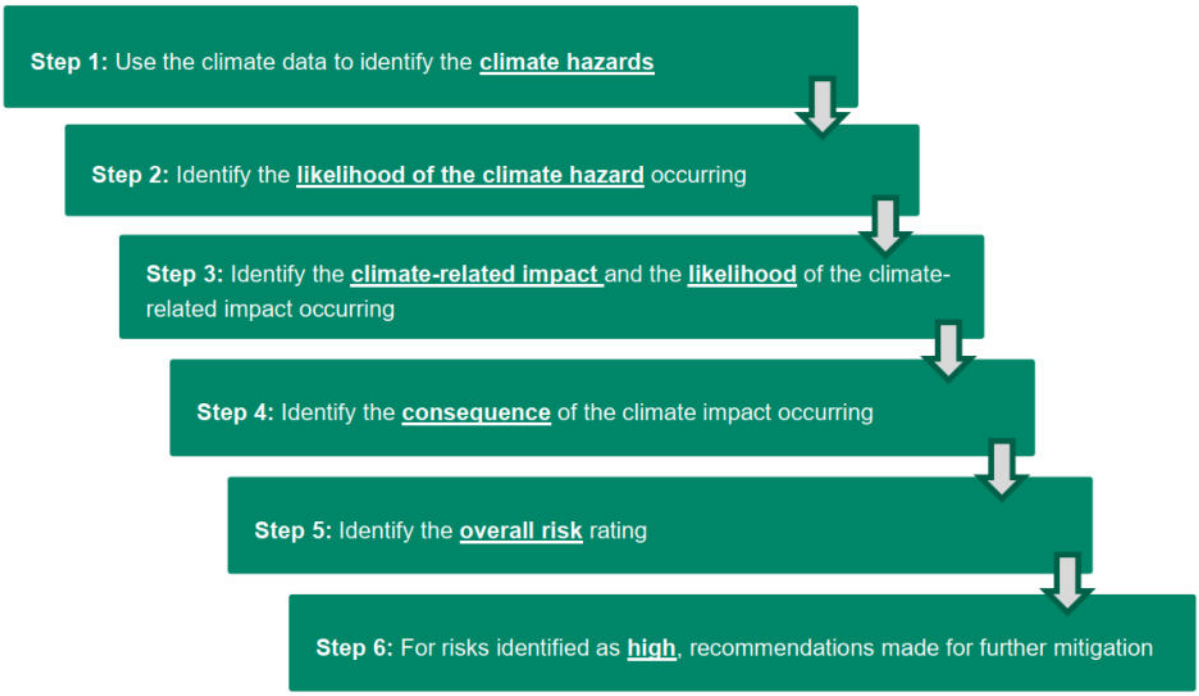
Climate projections for Representative Concentration Pathways (RCPs) 4.5 and 8.5 were evaluated to assess potential impacts and consequences on the construction and operation of the project. RCP8.5 represents a pathway characterized by the highest concentration of emissions, which is likely to result in heightened intensity and severity of extreme weather events. This scenario is indicative of inadequate policy responses and an increased risk of physical asset damage. On the other hand, RCP4.5 presents a scenario where some greenhouse gas (GHG) mitigation measures are implemented, leading to potentially less severe impacts compared to RCP8.5.

### 11.7.1 Physical Risk Assessment

Time horizons: Physical climate-related risks during the construction and operation of the Project were considered following time frames as specified in Climate Change Knowledge Portal (CCKP) by World Bank:

- Projections for the next 10-20 years represent a range of averages between 2020-2039 which cover construction, commissioning, and the beginning of the operational design life.
- Projections covering the remainder of the operational design life representing a range of averages up to 2059 to reflect the 40-year operational design life of the project.

Risks were evaluated and prioritized based on their likelihood, which considered factors such as current and projected future climate conditions, and consequence, which incorporated professional expertise, judgment, and available evidence regarding vulnerabilities, thresholds, and criticalities. This assessment aimed to identify priority risks for the project.



#### 11.7.1.1 Step 1: Use climate data to identify the climate hazards

Mymensingh region data has been used from the World Bank Climate Change Knowledge Portal (CCKP)[46] and ThinkHazard[47] developed by the Global Facility for Disaster Reduction and Recovery. These are two globally recognized databases for climate data projections. Climate projections data have been obtained from the World Bank CCKP, which uses multi-model ensembles, as they represent the range and distribution of the most plausible projected outcomes when representing expected changes. Climate change variables (e.g., mean temperature, maximum daily temperature, precipitation etc.) have been downloaded from the World Bank CCKP to identify potential hazards, such as:

- Higher mean temperatures
- Higher maximum temperatures, more frequent hot days, and more frequent heatwaves
- Changing pattern in rainfall
- More frequent and more intense heavy rain

Due to the uncertainty of climate change projections for wind, data has not been collected for this variable.

#### 11.7.1.2 Step 2: Identify the likelihood of the climate hazard occurring

Using the data gathered in Step 1, the likelihood of the climate hazard occurring at the Project for each time period was assessed as high, moderate, low, or negligible, considering the relative change from existing conditions. The description of the level/rating of hazard is shown in Table 11-1.

**Table 11-1: Description of the Level/rating of Hazard**

| Description | Rating |
|---|---|
| Without taking measures to mitigate the hazard and risk, high levels of damage can be expected to occur within the Project or human lifetime. | High |
| Potentially damaging events can be expected to occur within the Project or human lifetime and measures to mitigate the hazard and risk should be considered. | Moderate |
| Potentially damaging events are less likely to occur within the Project or human lifetime but are still possible. Measures to mitigate the hazard and risk would be prudent at critical locations. Hazard has been classified based on long-term averages, and there is still potential that damaging events could occur in this timeframe. | Low |
| Available data suggest that potentially damaging effects are unlikely to occur, on average, in the Project or human lifetime. Hazard has been classified based on long-term averages, and there is still potential that damaging events could occur in this timeframe. | Negligible |
| No dataset covering the chosen location is currently available | No Data Available |

[46] World Bank Group (2020) Climate Change Knowledge Portal

[47] ThinkHazard is a web-based flagging system for highlighting various environmental hazards in a particular area. It is developed by the Global Facility for Disaster Reduction and Recovery (GFDDRR), which is a partnership managed by the World Bank.

#### 11.7.1.3 Step 3: Identify the climate-related impact and the likelihood of the climate related impact occurring

The potential impacts associated with climate hazards have then been identified. For example, the impacts associated with higher temperatures, more frequent hot days, and more frequent heatwaves, could include:

- Increased heat stress/ heat exhaustion of workers.
- Increased energy demand due to increased cooling requirement or air conditioning; or
- Equipment / machinery failure.

The likelihood of the impact occurring has then been rated as high, moderate, low or negligible based on knowledge of the Project's operations, existing climate conditions, and the site's vulnerability to the climate hazard. The likelihood of the climate-related impact occurring has been adjusted based on whether the impact being considered is going to occur every time the hazard occurs or not. Vulnerability and exposure to climate hazard have been considered when identifying the likelihood of the climate-related impact, as this could drive / reduce the scale of the impact.

#### 11.7.1.4 Step 4: Identify the consequence of the climate-related impact

The potential climate impacts have then been identified, for example, a consequence of heat stress in the workforce might be reduced revenue and higher costs from negative impacts on workforce. The significance of the consequence has been rated as high, moderate, low or negligible based on the following criteria:

- High: Significant disruption to operations, unable to deliver services, resulting in high financial losses.
- Moderate: Disruption to operations and ability to deliver services, resulting in some financial losses/ cost implications.
- Low: Minor disruption to operations but does not significantly impact ability to deliver services.
- Negligible: Negligible disruption to operations does not impact ability to deliver services.

#### 11.7.1.5 Step 5: Identify the overall risk rating

The overall risk rating for the short and medium-term time horizons was determined by assessing the combination of the likelihood of the climate-related impact occurring, and the consequence, as per the risk assessment matrix in Table 11-2.

**Table 11-2: Overall Physical and Transition Risk Rating**

| | | Likelihood of climate-related impact occurring | | | |
|---|---|---|---|---|---|
| | | Negligible | Low | Moderate | High |
| Consequence | Negligible | N | N | L | L |
| | Low | N | L | L | M |
| | Moderate | L | L | M | H |
| | High | L | M | H | H |

#### 11.7.1.6 Step 6: Recommendations for further mitigation

For risks identified as high, after taking account of measures incorporated into the Project design to the climate change impact, further recommendations have then been provided to reduce the risk.

### 11.7.2 Transition Risks and Opportunities

An assessment of the key transition risks and opportunities associated with the transition to a low carbon economy for the Project has been undertaken. For this assessment, RCP2.6 and 4.5 were used.

According to the 2021 World Energy Outlook published by the International Energy Agency, climate-related disclosures regarding risks and opportunities should encompass at least two scenarios: one reflecting a lower level of warming and another surpassing 2°C. This approach is crucial for gaining a deeper understanding of the potential impacts or implications of climate change on the respective organization.

RCP 2.6 is considered the most appropriate climate scenario for considering transition risks as it assumes drastic action in terms of climate policy, emissions regulation/reduction, and technological growth. It also represents the climate scenario most closely aligned with delivering the Paris Agreement targets related to limiting the level of global temperature change.

RCP4.5 is considered because the projected temperature in this scenario is more than 2°C ranging between ~2.5°C to ~3°C[48] unlike other higher emission scenarios emitting more than 3°C, and therefore unrealistic for the study.

The assessment focused on risks and opportunities over the following timeframes:

- 2021-2025
- 2026-2035
- Beyond 2035

Risks and opportunities were ranked and assessed according to Likelihood (based on research into carbon policy, legislation, and pricing) and Consequence (based on professional knowledge and judgement and existing evidence and data on vulnerabilities, thresholds, and criticalities) and to determine priority risks and opportunities.

The stepped approach includes:


### 11.7.2.1 Step 1: Identify if transition risk or opportunity is relevant

A screening of the transition risk and opportunity categories, listed below, was undertaken to determine which are relevant to the Project.

Examples of transition risks:

- Policy & Legal: Carbon reporting obligations. Regulation of existing products
- Technology: Costs for lower emissions technology
- Reputation: Increased stakeholder concern

Examples of transition opportunities:

[48]Pielke, R., Jr, Burgess, M. G., & Ritchie, J. (2021, March 23). Most plausible 2005-2040 emissions scenarios project less than 2.5 degrees C of warming by 2100. https://doi.org/10.1088/1748-9326/ac4ebf

- Resource Efficiency: More efficient production processes. Increased recycling. Reduced water usage.
- Energy Source: Use of low emissions energy.
- Products & Services: Development of new products.
- Markets: Access to new markets.
- Resilience: Adoption of energy efficiency measures.

#### 11.7.2.2 Step 2: Identify the likelihood of the transition risk/opportunity occurring

The likelihood of climate-related transitional risks and opportunities has been evaluated through desk-based research into Bangladesh's carbon policy, legislation, pricing, and updates to the Nationally Determined Contribution. This likelihood will be ranked from high (very likely) to negligible (unlikely) for the duration of the Project.

The likelihood of the transition risk occurring has been based on current Bangladesh policy and it should be noted that any future changes in national policy could influence the future likelihood of the transition risk occurring.

#### 11.7.2.3 Step 3: Identify the consequence of the transition risk/opportunity occurring

The consequences of each transition risk and opportunity have then been identified. The consequence is any effect on the Project's operations as a result of the transition risk or opportunity. Consequences have been rated as high, moderate, low or negligible based on the criteria in Table 11-3.

**Table 11-3: Consequence Rating Criteria**

| Consequence | Description |
|---|---|
| High | i.e., costs to transition to lower emissions technologies likely to require company to make significant capital investment and company likely to end up with stranded assets.<br>i.e., Opportunity to significant diversify or expand product portfolio or business activities or significantly increase profits/turnover due to new markets being available. |
| Moderate | i.e., cost to transition to lower emission technologies is likely to require company to make some level of capital investment costs. OR transition related operational costs that could be significant at multiple sites/at group/business wide level.<br>i.e., opportunity to expand product portfolio or business activities or increase profits/turnover due to new markets being available. |
| Low | i.e., costs to transition to lower emissions technologies likely to have any some financial impact on company's operations. OR transition related operational costs resulting in non-significant changes but affecting more than one site.<br>i.e., some potential to expand product portfolio or business activities or increase profits/turnover due to new markets being available. |
| Negligible | i.e., costs to transition to lower emissions technologies unlikely to have any (or very little financial impact on company's operations. OR minor operational cost change at a single location.<br>i.e., little impact of new markets on business activities. |

#### 11.7.2.4 Step 4: Identify the overall risk/opportunity rating

The overall rating for the short, medium, and long-term horizons was determined by assessing the combination of the likelihood of the climate-related impact occurring, and the consequence, as per risk assessment matrixes. The matrix is presented in Table 11-4.

**Table 11-4: Overall Transition Opportunities Rating**

| | | Likelihood of climate-related impact occurring | | | |
|---|---|---|---|---|---|
| | | Negligible | Low | Moderate | High |
| Consequence | Negligible | N | N | L | L |
| | Low | N | L | L | M |
| | Moderate | L | L | M | H |
| | High | L | M | H | H |

#### 11.7.2.5 Step 5: Recommendations for further mitigation

For risks identified as high, further recommendations have then been provided to reduce the risk, for example:

- Monitoring of country climate change legislation, national energy policy, guidance on the low-carbon transition, potential grants to finance the installation of lower carbon technologies.
- Monitoring of market signals, and potential reputational risks including stigmatization of the sector and increased stakeholder or investor concern.

## 11.8 Assessment Findings

This section presents a summary of the potential physical and transition risks and opportunities identified as high for the Project.

### 11.8.1 Physical Risk

Climate projections for RCP4.5 and RCP8.5 were assessed to determine potential impacts and consequences to the construction and operation of the project.

Mean temperature, maximum daily temperature, and number of hot days are expected to increase in Mymensingh with similar (minute differences/more or less similar) magnitude on average for both Bangladesh as well as Mymensingh region under both scenarios. The mean annual temperature in Mymensingh is expected to increase by over 0.84°C (2020-2039) and 1.44°C (2040-2059) as per RCP4.5 while it slightly lowers in magnitude during 2020-2039 (0.82°C) but again increases towards the end of the period (2040-2059) as per RCP8.5. However, both the RCP's projected a rise in mean annual temperature as compared to the 1991-2020 baseline.

By mid-century, the number of hot days (over 35° C) is expected to increase by 24.12 days p.a. (RCP4.5) to 36.22 days p.a. (RCP 8.5). Both scenarios indicate significant anomalies of increase in temperatures and hot spells.

**Table 11-5: Climate-related data pertaining to temperature for scenario RCP 4.5 and RCP 8.5**

| RCP 4.5 | | | RCP 8.5 | |
|---|---|---|---|---|
| Mean annual temperature: increase in ºC from the 1991-2020 baseline | | | | |
| | **2020-2039** | **2040-2059** | **2020-2039** | **2040-2059** |
| Mymensingh | 0.84 | 1.44 | 0.82 | 1.83 |
| Country | 0.85 | 1.42 | 0.85 | 1.83 |

| RCP 4.5 | | | RCP 8.5 | |
|---|---|---|---|---|
| Maximum of daily maximum temperatures: increase in ºC from the 1991-2020 baseline | | | | |
| | **2020-2039** | **2040-2059** | **2020-2039** | **2040-2059** |
| Mymensingh | 0.86 | 1.43 | 0.77 | 1.78 |
| Country | 0.85 | 1.45 | 0.79 | 1.75 |
| Number of hot days (over 35º C): increase in number of hot days from the 1991-2020 baseline | | | | |
| | **2020-2039** | **2040-2059** | **2020-2039** | **2040-2059** |
| Mymensingh | 15.58 | 24.12 | 15.36 | 36.22 |
| Country | 14.51 | 24.39 | 15.01 | 34.63 |

In Mymensingh, mean annual precipitation is expected to increase in both RCP's as compared to the baseline (1991- 2020) though the magnitude of precipitation in RCP8.5 is lower than RCP4.5. The projected precipitation is slightly higher for Mymensingh region than the entire country except in 2020-2039 period (RCP8.5), where it is slightly lower over Mymensingh region than the whole country.

The number of consecutive wet days is expected to increase in RCP4.5 whereas decreases in RCP8.5 as compared to the baseline. However, when seen between both RCP's, it is expected to decrease by mid-century in RCP4.5 whereas it is expected to increase in RCP8.5 though the magnitude of precipitation is much lower in RCP8.5 than RCP4.5. The number of consecutive dry days is projected to decrease by mid-century in both RCP's though it decreases in RCP4.5 and increases in RCP8.5 when compared to the baseline. Number of wet days (>50 mm) is expected to decrease in RCP4.5 while increases in RCP8.5 by mid-century.

**Table 11-6: Climate-related data pertaining to precipitation for scenario RCP 4.5 and RCP 8.5**

| RCP 4.5 | | | RCP 8.5 | |
|---|---|---|---|---|
| Mean annual precipitation (mm): increase in mm from the 1991-2020 baseline | | | | |
| | **2020-2039** | **2040-2059** | **2020-2039** | **2040-2059** |
| Mymensingh | 129.97 | 149.66 | 18.86 | 95.52 |
| Country | 127.3 | 146.7 | 20.17 | 83.19 |
| Consecutive wet days (mm): increase in the number of wet days from the 1991-2020 baseline | | | | |
| | **2020-2039** | **2040-2059** | **2020-2039** | **2040-2059** |
| Mymensingh | 5.34 | 4.82 | -0.94 | -0.43 |
| Country | 4.62 | 5.04 | -0.53 | -1.18 |
| Consecutive dry days (mm): increase in the number of dry days from the 1991-2020 baseline | | | | |
| | **2020-2039** | **2040-2059** | **2020-2039** | **2040-2059** |
| Mymensingh | -14.31 | -16.49 | 4.73 | 1.92 |
| Country | -8.28 | -10.1 | 4.92 | 2.88 |
| Number of wet days with >50mm rain (mm) | | | | |
| | **2020-2039** | **2040-2059** | **2020-2039** | **2040-2059** |
| Mymensingh | 0.44 | 0.38 | -0.13 | 0.23 |
| Country | 0.56 | 0.59 | -0.01 | 0.43 |

By the end of the planned project life, which is around 2055, the following changes to the climate in the area are expected:

- Temperatures will increase along with the number of very hot days.
- Precipitation will increase by mid-century, with longer wet spells and shorter dry spells, but little change in the number of wet days with >50mm rainfall insignificantly.
- Furthermore, according to ThinkHazard (Mymensingh region but also cover project location), there is greater than a 50% chance of encountering weather that could support a significant wildfire that is likely to result in both life and property loss in any given year. Prolonged exposure to extreme heat, resulting in heat stress, is expected to occur at least once in the next five years. Potentially damaging and life-threatening urban, river floods are expected to occur at least once in the next 10 years. The frequency and intensity of these hazards is expected to increase because of climate change.

Physical climate-related risks were assessed separately for construction and commissioning and the operational design life of the project. As the construction period is scheduled to be ±18 months, physical risks associated with climate change are limited to the short-term time horizon.

Risk ratings take planned mitigation measures to reduce, control and respond to risks, into account. No risks were identified as high for the construction and commissioning phase, although the following moderate risks are noted:

- The potential for heat stress and heat exhaustion of construction workers due to increased temperatures and hot days over 35°C;
- The potential for damage to assets and construction equipment resulting from the increased risk of heatwaves; and
- The potential for flooding and waterlogging hampering the construction equipment and gas pipeline due to frequent and more intense heaviness.

No risks were identified as high for the operational design life of the Project, although the following moderate risks are noted:

- Increases in air temperature cause reduced generation efficiency and output, and an increase in operational cost.
- Reduced carrying capacity of lines and increased losses in lines/transformers due to higher annual average and daily maximum temperatures and more hot days >35ºC.
- The potential for heat stress and heat exhaustion of workers due to increased temperatures and hot days over 35°C.
- Heavy rainfall events contributing to moderate infrastructure damage and loss of service.
- The potential for increased risk of disease transmission (e.g., malaria and dengue fever, improved growing conditions for algae and potentially harmful micro-organisms in water courses) due to both increased temperatures and more intense and frequent heavy precipitation.
- Potential contamination from substations and transformers entering the surrounding environment due to more occurrence of heavy precipitation.
- Loss or damage to the plant equipment and transmission line and impacts on human health caused by more frequent and severe heatwaves.
- Damage to on-ground assets as a result of an increase in frequency and severity of flooding and siltation in the nearby flowing waterbodies; and
- Damage to gas pipeline due to more intense and frequent heavy precipitation and severe flooding.
- Extreme weather events, such as stronger and/ or more frequent floods & precipitation causing reduction in the supply and potentially the quality of gas, damage generation and infrastructure, reduce output, and affect security of supply.

Where potential physical climate impacts may cause damage to, or inundate plant's assets, or result in an unforeseen shut down, such impacts could result in impacts on community, customers, or businesses, as follows:

- Flooding resulting from heavy localized precipitation, could damage the electrical wires and associated structures, which could result in shut down and lack of power supply to customers and businesses.
- In the event that extremely hot weather damages equipment or causes a fire in heat-sensitive equipment, this would pose a safety risk to local communities and wildlife.
- Where extreme heat may result in sagging of the electric wires, this could present a risk of electrocution, or fire, to any person in close proximity to the line.

The combined impacts of climate change and the project on the community, business, or customers could therefore be severe, however the impacts would not likely affect if MSEL prepared appropriate mitigation measures to reduce the risk and severity of the impacts.

### 11.8.2 Transition Risks and Opportunities

In transition risk under RCP2.6 scenario, increased cost of raw materials is identified as high from the year 2026 onwards due to increase in input prices such as electricity, water and natural gas. Whereas increased pricing of GHG emissions, enhanced emissions-reporting obligations, mandates on and regulation of existing products and services, substitution of existing products and services with lower emissions, unsuccessful investment in new technologies, cost to transition to lower emissions technology, transition to lower emissions technologies changes transport/logistics options/cost, changing customer behavior, increased cost of raw materials and stigmatization of sector are identified as moderate risk beyond 2035 which could have implications for increased operating costs due to higher compliance requirements.

No transition opportunities under RCP2.6 scenario were identified as high, although the following opportunities are noted as moderate:

- Use of new technologies to improve reliability through investments.
- Development and / or expansion of low emission services because of additional infrastructure required to support increasing demand for low carbon electricity.
- Access to new markets as demand for new transmission assets to connect renewable resources with demand centres increases and the associated electrification of end-users.
- Resource substitutes / diversification through the use of lower carbon materials during construction and maintenance.

Under RCP4.5 scenario, no transition risk and opportunity are identified as high, although in transition risk, changing customer behavior due to reduced demand for goods and services, uncertainty in market signals, stigmatization of sector and increased stakeholder concern are identified as moderate risk.

## 11.9 Conclusions and Recommendations

This section summarizes the main conclusions from the climate change risk assessment, the project's compatibility with Bangladesh's national climate commitments and a number of recommendations to further mitigate and control the physical risks identified as high/moderate.

### 11.9.1 Conclusions

Considering climate change projections for both RCP4.5 and RCP8.5 scenarios, no physical climate-related risks have been identified as high for construction and commissioning. During the operational design life, the following climate-related risk have been identified as high:

- Heat expansion and sagging of electric wires.
- Frequent heatwaves disrupting the operations, loss of assets and reconstruction costs, etc.

- Flooding due to increase in precipitation near the project area and damage to on ground infrastructure, and equipment including substations.

The combined impacts of climate change and the project on the community, business, or customers could be severe, however the impacts will not likely affect the license to operate if JPL prepare appropriate mitigation measures to reduce the risk and severity of the impacts.

In transition risk under RCP2.6 scenario, increased cost of raw materials is identified as high from the year 2026 onwards due to increase in input prices such as electricity, water and natural gas. Whereas increased pricing of GHG emissions, enhanced emissions-reporting obligations, mandates on and regulation of existing products and services, substitution of existing products and services with lower emissions, unsuccessful investment in new technologies, cost to transition to lower emissions technology, transition to lower emissions technologies changes transport/logistics options/cost, changing customer behavior, increased cost of raw materials and stigmatization of sector are identified as moderate risk beyond 2035 which could have implications for increased operating costs due to higher compliance requirements.

In transition opportunity under RCP2.6 scenario, although no risk is identified as high, following risk such as use of new technology, development or expansion of low emission services, access to new markets, resource substitutes through the use of lower carbon materials are identified as moderate.

Under RCP4.5 scenario, no transition risk and opportunity are identified as high, although in transition risk, changing customer behavior, uncertainty in market signals, stigmatization of sector and increased stakeholder concern are identified as moderate risk.

### 11.9.2 Recommendations

A number of measures have been weather risks, ensuring regular monitoring of weather forecasts as well as testing and trialing the emergency response plans will be key for increasing resilience of the infrastructure.

Although overall recommendations such as project planning decisions, project design, construction and emergency response planning methods should consider the high level of the hazards and extreme events. A few of these general recommendations are listed:

- Focused studies on the impacts of climate change on extreme heatwaves should be considered, before deciding whether to design projects to withstand fire of greater intensity than those previously experienced in this region. (consider fire in design?)
- Impacts of flooding due to increase in precipitation caused by climate change should be studied for operation phase of the project. Peripheral incorporated into the project design and included in operational plans and processes to mitigate and control the risks identified. For the physical risks that remain identified as moderate particularly those around extreme Drainage systems should be adequately designed and maintained to avoid any sort of inundation caused by heavy precipitation.(improved drainage?)
- Management measures like preparation of emergency response plans and early warning systems to account for higher frequency of intense precipitation and floods, operational measures like riparian buffer plantations for strengthening resilience and emergency response system. (emergency response protocols)

Although no transition risks have been identified as high, as the likelihood of these risks occurring, as well as opportunities are based on current policy in Bangladesh and market signals, it is recommended that Bangladesh's climate change legislation and national energy policy, as well as changes in market demand are monitored on a regular basis. Energy efficiency improvement measures should be undertaken in offices and the project site through use of energy saving gadgets, energy audits, etc. Climate-related disclosures in terms of GHG emissions should be more aligned with interest of long-term investors towards more sustainable path to avoid any shift that could be expected from investors' end.

# CHAPTER 12

## Conclusion and Recommendations

# 12 CONCLUSION AND RECOMMENDATIONS

## 12.1 Conclusion

Renewable Energy technologies are maturing rapidly and their prices falling steeply, particularly in the case of Solar Photo-Voltaic. This provides Bangladesh with a newly opened, huge opportunity that of deploying a viable yet sustainable alternative to grid-connected power in remote villages.

The negative environmental impacts of the project will mostly take place during the construction stage. The study reveals that the anticipated impacts of the project during the construction phase include changes in traffic conditions, ecological resources, noise levels, and air quality across various significant dimensions. During the operation phase, the primary impact identified is on ground water. The IESE report proposes a management plan designed to minimize these impacts.

Additionally, the project is expected to have significant positive effects during both the construction and operation phases, such as creating job opportunities for local people and boosting business prospects. The local community has expressed interest in the project, recognizing its importance for national development.

A monitoring plan, if properly implemented during the construction and operation phases, will help ensure that corrective measures are taken as needed. Furthermore, additional human and financial resources will be necessary to enhance environmental capabilities and achieve the required statutory compliance and environmental clearance certifications in accordance with the environmental laws of Bangladesh.

## 12.2 Recommendations

Findings and suggestions of IESE study in project planning, design and operation should be considered and implemented with strong monitoring.

- All activities during pre-construction, construction, operation and decommissioning stage should be implemented according to the ESMP.
- The ESMP and all its requirements shall then be added to the contractor's contract, thereby making implementation of the ESMP a legal requirement according to the contract. To ensure compliance with the ESMP the contractor should employ an environmental specialist to monitor and report project activities throughout the project construction phase.
- It is recommended to identify a proper drainage system approach for the project and flood prevention.
- It is recommended to avail ground water withdrawal permission from the appropriate authority.
- ESMP has been formulated considering anticipated impacts. However, further updating of impact management procedure must be made with respect to spatial and temporal regularly based on monitoring of impacts during pre-construction, construction, operation and decommissioning of the proposed project.
- Establishing Institutional arrangement with proper logistic and training for Environment, Health and Safety during pre-construction, construction and operation phases of the project; and
- Construction and operation phase E&S verification audits to evaluate the environmental and social impacts from the project and compare those with the IESE.