

Initial Environmental Examination

Document Stage: Final
Project Number: 57258-001
December 2024

BAN: Northwest Distribution Network Modernization Project

Network Infrastructure Development and Modernization of Distribution System in NESCO Area

Prepared by Northern Electricity Supply PLC (NESCO) for the Asian Development Bank.

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CURRENCY EQUIVALENTS

Tk	Taka – National currency of Bangladesh Tk1.00 = \$0.0083 \$1.00 = Tk120.00

ABBREVIATIONS

ADB	Asian Development Bank
ADMS	Advanced Distribution Management System
BESS	Battery energy storage systems
BFD	Department of Forest
BPDB	Bangladesh Power Development Board
CSEMP	Contractors' Site-Specific Environmental Management Plan
DC	Deputy Commissioner
DEPC	Department of Environmental Pollution Control
DOE	Department of Environment
ECA, 1995	Environmental Conservation Act 1995
ECC	Environmental Clearance Certificate
ECPs	Environmental Codes of Practices
ECR 2023	Environmental Conservation Rule 2023
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ETP	Effluent Treatment Plant
GEF	Global Environment Facility
GHG	Greenhouse gas
GIS	Geographic Information System
GoB	Government of Bangladesh
GRC	Grievance Redress Committee
GRM	Grievance Redressal Mechanism
HDD	Horizontal Direction Drilling
IEE	Initial Environment Examination
ILO	International Labor Organization
JFPR	Japan Fund for Prosperous and Resilient Asia and the Pacific
LCC	Location (Site) Clearance Certificate
LGED	Local Government Engineering Department
MoEFCC	Ministry of Environment, Forest and Climate Change
NDC	Nationally Determined Contribution
NESCO	Northern Electricity Supply Company
OHS	Occupational Health and Safety
PAPs	Project Affected Peoples
PCBs	Polychlorinated biphenyls
PGCB	Power Grid Company of Bangladesh
PLC	Public Limited Company
SCADA	Supervisory control and data acquisition software
SDG	Sustainable Development Goal
SPS 2009	ADB's Safeguard Policy Statement (2009)
UNIDO	United Nations Industrial Development Organization
WB EHS	World Bank Environment Health and Safety
WHO	World Health Organization

WEIGHTS AND MEASURES

1 Acre	Unit of area, equals 3 Bigha, 100 Decimal or 60 Katha
1 Bigha	Equals 20 Katha or 33 Decimal
1 Decimal	Unit of area, equals 435.60 square foot or 40.47 square meter
1 Hectare	Unit of area, equals 2.47 Acre or 247 Decimal or 7.5 Bigha
1 Katha	Equals 1.653 Decimal
1 kg	Kilogram, SI unit of weight (1000 x gram)
1 Liter	Unit of volume in SI
1 m ²	SI unit of area, equals 10.77 square foot
1 ton	Unit of weight, 1000 x Kilogram
Acre	Unit of Area, equals to 4046.86 square meters
BDT	Currency of Bangladesh
dB	Decibel, Unit of loudness of sound
FY	The fiscal year (FY) of the Government of Bangladesh and its agencies ends on 30 June. "FY" before a calendar year denotes the year in which the fiscal year ends, e.g., FY2024 ends on 30 June 2024.
km	Kilometers, Unit of distance
kV	Kilo Volts, Unit of Voltage
Lac	100,000 units
m	Meters, Unit of length
Mm	A thousandth of a meter
MT	Metric Ton, a unit of weight equal to 1,000 kilograms
MW	Mega Watt, 1,000,000 x Unit of Power
SI Unit	International System of Unit
\$	Dollars - Currency of the United States

GLOSSARY

<i>Aman</i>	Groups of rice varieties grown in the monsoon season and harvested in the post-monsoon season. This is generally transplanted at the beginning of monsoon from July-August and harvested in November-Dec. Mostly rain-fed, supplemental irrigation needed in places during dry spells;
<i>Cropping Intensity</i>	It refers to the rising of a number of crops from the same field during one agriculture year. It can be expressed as: $\text{Cropping intensity} = (\text{Total cropped area} / \text{Net sown/cultivated area}) \times 100$;
<i>COVID-19</i>	Coronavirus disease
<i>Khal</i>	A canal, usually with flowing water and sourced from a river or a big lake;
<i>Kharif</i>	Pre-monsoon and monsoon growing season. Cropping season linked to monsoon between March-October, often divided into Kharif-I (March-June) and Kharif-II (July-October);
<i>Kharif-I</i>	An agricultural season (March-June) is characterized by the uncertainty of weather alternating dry and wet spells. Some agricultural potential land remains fallow in this season;
<i>Kharif-II</i>	An agricultural season (July-October) comprises wet and cloudy environment and heavy rainfall but uneven distribution, low solar radiation, high temperature and humidity;
<i>Mauza</i>	It is a type of administrative boundary corresponding to a specific land area within which there may be one or more settlements; terminology used mainly in the Indian sub-content;
<i>Net Cultivable Area</i>	This represents the total area shown/cultivated with crops and orchards. Area sown/cultivated more than once in the same year is counted only once;
<i>Rabi</i>	An agricultural season (November-February) mainly dries with little to no rain and mainly marked with low sun intensity/daylight and low temperature;
<i>Thana</i>	May mean either a local police station or an Upazila (former name of);
<i>Upazila</i>	It is an administrative region (formerly known as 'thana') in Bangladesh. Multiple Upazila form a 'Zila' or a district. Upazila(s) function as sub-unit(s) of a Zila/ district;
<i>Zila</i>	A district: terminology used in Bangladesh. Bangladesh has 64 districts.
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EXECUTIVE SUMMARY

The Northern Electricity Supply Public Limited Company (PLC) is a distribution company, which is responsible for the distribution of electricity in Rajshahi Division and Rangpur Division in the northwest part of Bangladesh. The proposed project is designed to increase the resilience of power distribution infrastructure through network modernization and digitalization, and enhanced management of repairs and recovery. By incorporating resilience in distribution infrastructure, the project will enhance the adaptive capacity of NESCO to mitigate and better manage the extreme weather events induced by climate change and natural hazards. The need for grid modernization is becoming increasingly urgent in Bangladesh because (i) electricity consumption is expected to grow at high rate, (ii) the climate change risk is high, and (iii) the country has an ambitious target for renewable capacity addition. The project is consistent with the 8th Five-Year Plan 2020–2025 to support reliable power supply, and the Perspective Plan of Bangladesh 2021-2041 for sustainable power and energy for a high-income country. The project is also aligned with the Climate Prosperity Plan in 2022 to transform Bangladesh into a climate-resilient and high-income country by 2041 and contributes to the government's NDC in reducing greenhouse gas (GHG) emissions.

The main objective of the project is to digitize the power distribution system and develop network infrastructure for sustainable and reliable power supply to consumers in NESCO. Besides ensuring a reliable and stable power distribution system in NESCO region and strengthening operational efficiency of power distribution network.

Proposed Northwest Distribution Network Modernization Project in the NESCO Area (the Project) has been planned to expand and strengthen NESCO's distribution network. The Project will be implemented over 4 years with a completion date by June 2029. The identified project outputs include: (i) distribution grid modernized and digitalized and readiness to integrate renewable energy resources increased, (ii) climate resilience of power system and adaptive capacity to respond natural hazards enhanced, and (iii) institutional capacity for disaster preparedness and gender mainstreaming increased and the project outcomes will be to ensure reliable, modern and sustainable energy in NESCO area. So as per SDG target 7.1 and as part of the proposed 8th five-year plan, the project proposed by NESCO "Network Infrastructure Development and Modernization of Power Distribution System" under NESCO Area is fully covered.

The objectives of Initial Environment Examination (IEE) report including Environmental Management Plan (EMP) are meeting the requirements of the Government of Bangladesh and ADB's Safeguard Policy Statement (2009). In accordance with the Environmental Conservation Rule 2023 (ECR 2023), the project is not classified with any category so IEE is not required for this project for clearance from Department of Environment (DOE) whilst the proposed project is classified as a Category B project under the ADB's Safeguard Policy Statement (2009) and an IEE is required to assess and manage the anticipated environmental and social risks resulting from the project activities. The possible anticipated negative effects to natural and social environment, can be sufficiently mitigated by site specific mitigating measures to reduce or lessen the potential impacts.

The Project will construct the following power infrastructure: 6 new (3 GIS and 3 AIS) substations and augmentation 10 (1GIS and 9 AIS) substations with installation of 33.73 km source distribution line; 4 transformer workshops; 7 GIS/AIS 33 kV switching station, and 36 nos. construction, extension bay breaker at 14 locations. However, 4 AIS 33kv switching substations installation, shifting and 3 new GIS 33KV switching station installation, commissioning at PGCB SS do not involve any civil works in Rajshahi and Rangpur divisions to provide reliable power supply to number of target beneficiaries of the project such as 17,74,237 households, 26,020 irrigation pumps, 1,60,282 business establishments, 19,768

small industries besides 18002 mosques, temples and educational institutions. The outcomes of the project will improve the quality of life of the people engaged in NESCO areas in 39 (thirty nine) upazilas in 16 (sixteen) districts of the north-western part of the country. In addition, due to the implementation of the project, system losses (both technical and non-technical) will be reduced and will ensure improved customer service, and uninterrupted electricity supply in the project working areas.

The new GIS substations will be automated and be equipped with 2-4 story control buildings, transformers, batteries, internal access roads, surface drains etc. An environmental audit of 9 existing substations which will add new transformers and equipment. The workshops to be constructed will require a shop floor/storage area with built in design complete with oil draining features to sum up, safe electric connections for machines, modern heat chambers, ventilation and lighting (maintaining proper Lux requirements), noise attenuating wall coats/enclosures.

The base study was carried out in the project areas by SGS Bangladesh Ltd, collected six (6) air and noise quality samples from Shalbagan (workshop), Chandipur (S/S), and two (2) groundwater samples from Shalbagan (workshop), chandipur (S/S), and one (1) soil sample from Shalbagan workshop site in Rajshahi. One (1) Air, Noise & GW sample from Bogura in S&D-1 Campus (Substation), and one (1) Soil, GW & SW from ZRS, NESCO Campus (Workshop), Air, Noise, Soil & GW samples from Lalbag (workshop), Air, Noise & GW samples from Campus S&D-1 (Substation), & Baharkasna (Substation), Air & Noise samples from Saidpur, Nilphamari, Air, Noise, Soil & GW samples from SE Office (Workshop) S&D-1 Campus (Substation), Dinajpur and Air, Noise, SW & GW samples from SE office and new substation areas from Pabna.

Lab results of the quality parameters revealed that most the value of the most of parameters in the study areas are within the ECR 2023 standards, National Air Pollution (Control) Rules 2022, and National Noise Pollution (Control) Rules 2006. and rest of the parameters complied with the guideline levels of WHO standard refer to the 'WHO Ambient Air Quality Guidelines 2021 (WHO global air quality guidelines)'.

The average night-time noise level has been measured. Measured average nighttime noise level has found a minimum of 50.4 (dB A) at monitoring location ANL-17, (New Substation Area, Pabna). Daytime and Night-time ambient noise levels measured at all monitoring locations have complied with the standard limit (for Industrial area) except at the three monitoring locations at Rajshahi (ANL-03, ANL-04 and ANL-06) standard set by Noise Pollution (Control) Rules, 2006. Daytime noise level exceedances are due to vehicles and people movement. During night-time, people movement, wind blowing & insect singing etc. are the possible reasons.

The results show that the parameters of surface water samples e.g., pH Value, DO, Total Dissolved Solid (TDS), Biochemical Oxygen Demand (BOD), COD and Coliform level are found within the standard limit of surface water samples except for Dissolved Oxygen at SW-1 (ZRS, NESCO Campus (Workshop), Biochemical Oxygen Demand at SW-2, Thakurgaon, human interventions e.g., agricultural activities can cause high values of DO and BOD in SW-1 and SW-2.

Groundwater samples consisting of parameters of Temperature, pH, DO, Chloride, Color, Sulfate, Nitrate, Nitrite, TSS, TDS, Oil & grease, Arsenic, Calcium, Iron, Potassium, Sodium, Fecal Coliform etc., were analyzed and the results revealed that. faecal coliform was exceeded the ECR 2023 values in five of six locations which may reason of leaching of human faeces, or sewage into the groundwater system.

PCB laboratory analysis was conducted in Groundwater samples; however, PCB trace was not found in any of the Ground water samples of monitoring locations. That means,

groundwater was not impacted by PCB spillage occurring in NESCO workshop sites. Soil samples were collected from 06 (six) sites of Rajshahi – Shalbagan, Bogura- ZRS NESCO Campus, Rangpur – Lalbag, Dinajpur – SE office, Pabna SE office and thankfully no Polychlorinated Biphenyls (PCBs) trace was found in five workshop locations. PCBs are toxic, persistent organic pollutants commonly associated with industrial activities, electrical equipment, and improper waste disposal. The absence of PCBs in the soil indicates that the soil is not polluted by spillage of PCB in the workshops. But improper waste management and leakage of PCB from transformers is very common in the workshop sites, that may indicate future possibilities of PCB contamination in the soil. So, necessary preventative measures should be undertaken by NESCO to avoid this risk in future.

There are no indigenous people in the Project Area, nor will any involuntary resettlement be required for substation construction.

The Project Area is primarily semi-urban/urban, characterized by a medium to high population density with all the associated environmental challenges. Demolition of seven (7) existing, site clearance, and the need for piling to facilitate new substations will further increase noise, vibration and dust levels for the community residing in their vicinity. However, given the baseline conditions, such disturbance will be of small magnitude/minor consequence and not significant, but implementation of mitigation measures will reduce predicted impacts.

The most common environmental risks are dust emission, noise generation, heavy traffic and associated air pollution, and insufficient waste management etc. soil erosion, dust emissions caused by operation of machinery and running vehicles within working areas and along the access routes; exhaust gas emissions from construction vehicles, machinery, and generators; release of waste effluents and solid wastes from construction areas and camps causing soil and water contamination; loss of natural vegetation and trees at project sites; and occupational health and safety (OHS) hazards for the construction staff and other project site personnel, and community health and safety hazards of the pedestrians, local community and others.

To reduce these anticipated impacts, the possible mitigation measures include water sprinkling to suppress dust emissions, using properly tuned vehicles and machinery to minimize exhaust emissions; ensuring that no untreated waste effluents are released to the environment and using appropriate treatment mechanism for this purpose; preparing and implementing waste management and pollution control plans; and preparing and implementing an Occupational Health and Safety (OHS) plan. Additionally, to address the potentially negative environmental impacts of the project, Corrective Action Plan (CAP) on ensuring effective implementation EMP at existing facilities supported by the project appropriate mitigation measures have been included in this IEE. In addition, the CSEMP will be prepared by the construction contractor based upon the generic EMP included in the IEE and will comprise a number of sub-plans including pollution prevention plan, waste management plan, traffic management plan, camp management plan, OHS plan, community health and safety plan, and others. NESCO will supervise, with assistance from Project Implementation Assistance Consultant (PIAC) and monitor contractors to ensure the EMP is followed, and that works are consistent with ADB's Safeguard Policy Statement (2009) requirements.

Implementation of CSEMP by the contractors will be supervised and monitored by NESCO which lists all mitigation measures to control adverse impacts or project construction. The EMP includes (i) the mitigation and compensation measures reflecting national requirements and international good practice, (ii) the requirement to approve contractors' Construction Site specific Environmental Management Plans (CSEMPs) including health and safety risk assessments and health and safety plans, prior to commencement of any works, (iii) an CSEMP to ensure that the mitigation measures are effective, including the monitoring of health and safety incidents; and (iv) the requirement to submit regular environmental monitoring

reports to ADB including reporting on implementation of Corrective Action Plan that addresses environment, health and safety management at existing 9 substations and one workshop. Use of polychlorinated biphenyls (PCBs) and asbestos in the substations will be prohibited. For any existing transformers to be removed from renovation 33/11 kV substations, it must be confirmed that these do not contain PCB oil with environmentally safe and sound storage or disposal. The new 33/11 kV gas insulated substations will use SF6, a potent greenhouse gas, so any leakage will need to be controlled and monitored.

Any unanticipated impacts or requirements for corrective action during implementation will be reported by NESCO to ADB. As part of the corporate organogram, but initially part of the PMU whilst awaiting management approval, an environment, social and gender unit will be set up comprising of three staff, 1 environment focal, 1 Health and safety focal, and 1 social/gender focal to support NESCO with EMP implementation. The Project Implementation Assistance Consultant (PIAC) will have a full-time Environment Specialist, Health and Safety Specialist and Social/labor Specialist. The contractors will be required to have full-time on-site counterpart officers to the PIAC.

A total of 32 stakeholder consultations meetings, Key Informant Interviews (KIIs) with the governmental officials and FGD (focus group discussion) were completed with 465 persons (100% male¹) consulted interviewed for environment² in between June 1-18, 2024, and November 26-28, 2024. The community members were provided with information about the project's activities and results during the consultation meetings. The locals don't know much more about the project's activities, but after hearing, they think that this project will reduce load shedding time and improve access to electricity in their communities. The people who were consulted at Workshop - Shalbagan, Rajshah, expressed concern about the increased volume of traffic, the blockage of local roads due to heavy traffic, and the disruption of their regular movements and excessive noise generation caused by the project activities. In response, the project team stated that other mitigation measures in accordance with IEE will be put into place to lessen the risk to the local community. A traffic management plan will be developed prior to the start of construction, and locals will be informed about the project vehicle schedule during that time.

The disruption of project construction activities in Baharkhashna, Rangpur, including dust emissions, noise pollution, hydraulic horn, labor influx, etc., worried the locals. They therefore recommended avoiding these projected effects on the neighborhood as much as possible and stating that no work should be done at night because seniors will be sleeping in a quiet setting and children are studying. The project team provided the same responses because the same concerns were brought up at other consultation sites.

The IEE report will be disclosed on ADB's website and locally by NESCO on their website, at their head office as well as at the substation sites and site offices with a translation of the Executive Summary into Bengali. The meaningful consultation process will continue during project implementation to ensure that all affected people and other interested stakeholders are fully engaged and can participate in the project's development, particularly before the commencement of works.

During operation and maintenance, NESCO shall monitor any potential health and safety risks, and adverse environmental impacts of the project due to the presence of electricity infrastructure. They are all well understood and can be mitigated by NESCO through Noise and vibration during construction will be managed and the community will be kept informed

¹ The women who participated in environmental consultations were also part of separate gender based social focus groups, as recorded in the Resettlement Plan.

² Public consultations were carried out on the basis of an initial list of subprojects which will be subsequently refined during detailed design by the EPC contractor.

through regular communication.

NESCO will establish and advertise a Grievance Redress Mechanism (GRM) for workers and local communities to raise issues that cannot be dealt with informally by the contractors. Training will be provided under the project for all people involved in the GRM. The affected people will be informed through public consultation that they have a right to have their grievances redressed by the project. Contractors will carry out awareness raising among workers on the GRM at the start of employment onsite. Contact details of the GRM are to be displayed at the substation sites, construction site offices and active construction sites. A suggestion box will be set up at the project sites and will be regularly checked for any grievances received. This will consist of a three-tier bottom-up Grievance Redress Committee (GRC) system - first tier – “Site” level resolution by the NESCO site team; second tier – GRC at the “Project” level; and third tier – GRC at the “Corporate” level. Grievances will be resolved by the NESCO site team at the site level (first tier) as far as possible, but if unresolved at this level, they will be raised to the project level (second tier), and if the complainant is still not satisfied with the resolution, then they will be elevated to the corporate level GRC (third tier). Grievances will be redressed within a maximum of a month from the date of lodging the complaints, with pollution and health and safety issues being redressed immediately. GRC decisions will be on a majority basis. Details of grievances will be disclosed in the environmental monitoring reports from the reporting period of receipt until the reporting period of closure. Complainants can access the national judicial system at any time during the GRM and is not contingent to the resolution of grievance.

This IEE report, including EMP is prepared in adherence to national requirements and international good practice measures³ and mitigation measures have been developed to account for all predicted adverse impacts and risks. The IEE is considered sufficient to meet ADB's Safeguard Policy Statement (2009) requirements for the category B project. In case of any scope, sites or routing change, and/or unanticipated impact during project implementation, the IEE and EMP will be updated as required by NESCO for review as required for ADB's Safeguard Policy Statement (2009) requirements before any related works commence or are allowed to continue.

³ IFC General and Electric Power Transmission and Distribution Environment, Health and Safety Guidelines and the ILO Code of Practice on Safety and Health in Construction

1 Introduction

1.1 Background of the Project and Environmental Impact Assessment

1. The Northern Electricity Supply (NESCO) Public Limited Company (PLC) is a distribution company, which is responsible for the distribution of electricity in Rajshahi Division and Rangpur Division in the northwest part of Bangladesh. The proposed project is designed to increase the resilience of power distribution infrastructure through network hardening, modernization and digitalization, and enhanced management of repairs and recovery. By incorporating resilience in distribution infrastructure, the project will enhance the adaptive capacity of NESCO to mitigate and better manage the extreme weather events induced by climate change and natural hazards. The need for grid modernization is becoming increasingly urgent in Bangladesh because (i) electricity consumption is expected to grow at high rate, (ii) the climate change risk is high, and (iii) the country has an ambitious target for renewable capacity addition. The project is consistent with the 8th Five-Year Plan 2020–2025 to support reliable power supply, and the Perspective Plan of Bangladesh 2021-2041 for sustainable power and energy for a high-income country. The project is also aligned with the Mujib Climate Prosperity Plan in 2022 to transform Bangladesh into a climate-resilient and high-income country by 2041 and contributes to the government's NDC in reducing greenhouse gas (GHG) emissions. Proposed Northwest Distribution Network Modernization Project in the NESCO Area (the Project) has been planned to expand and strengthen distribution NESCO's distribution network. To ensure reliable and affordable power, NESCO has taken the responsibility from Bangladesh Power Development Board (BPDB), on 1 October 2016. Since then, NESCO focuses on extending quality and satisfactory service to their consumers. In northern area of Bangladesh, NESCO is serving with 55 sales and service points, which is covering 17 districts of Bangladesh. The Government of Bangladesh has requested the Asian Development Bank (ADB) to finance the Project. The Project will be implemented over 4 years with a completion date by June 2029. The identified project outputs include: (i) distribution grid modernized and digitalized and readiness to integrate renewable energy resources increased, (ii) climate resilience of power system and adaptive capacity to respond natural hazards enhanced, and (iii) institutional capacity for disaster preparedness and gender mainstreaming increased.

2. As per Sustainable Development Goal (SDG) 7.1 to ensure affordable reliable and modern energy for all by 2030 and as per proposed 8th Five Year Plan (2021-2025) "Smart Grid in NESCO Areas by 2025" Establishment" has been targeted. Implementation of "Network Infrastructure Development and Modernization of Power Distribution System" will ensure reliable, modern and sustainable energy in NESCO area. So as per SDG target 7.1 and as part of the proposed 8th five-year plan, the project proposed by NESCO "Network Infrastructure Development and Modernization of Power Distribution System" under NESCO Area is fully covered.

3. The Project will construct substations, workshops, in Rajshahi and Rangpur divisions to provide reliable power supply to number of target beneficiaries of the project such as 17,74,237 households, 26,020 irrigation pumps, 1,60,282 business establishments, 19768 small industries besides 18,002 mosques, temples and educational institutions. The quality of life of the people engaged in various professions and unemployed will be improved in the NESCO area which consists of 39 (thirty nine) upazilas including Sadar upazila under 16 (sixteen) districts of the north-western part of the country. If the project is implemented, other technical and non-technical losses will be reduced by ensuring improved customer service, and the company will become a relatively cost-effective and profitable company in terms of financial and institutional development. At the same time, if the project is implemented, it will help the NESCO implement "Network Infrastructure Development and Modernization of Power Distribution System". Its operationalization will ensure quality electricity through careful monitoring and control of the overall system and reduce the rate and duration of power

outages. Besides, it will reduce the system loss and increase the revenue collection, and the electricity waste will also reduce the accidents.

4. This Initial Environment Examination (IEE) report, including an Environmental Management Plan (EMP) was prepared for the Project to meet the environment assessment requirements of the Government of Bangladesh and ADB's Safeguard Policy Statement (2009). Following the national requirements of the Environmental Conservation Rule 2023 (ECR 2023), the project is an "Orange category" requiring an Initial Environmental Examination (IEE) report, whilst the proposed project is classified as a Category B project under the ADB's Safeguard Policy Statement (2009), the possible negative effects are not as great as those of Category A projects (significantly negative outcomes that are irreversible, diversified, or unprecedented). As a result of SPS 2009, the expected effects are site-specific and can be sufficiently mitigated by mitigating measures, an initial environmental assessment (IEE) is required to address and manage the potential impacts. Henceforth, following the requirements of ECR 2023, NESCO will submit the IEE report to the Department of the Environment (DoE) for site clearance certificate (SCC) prior to the construction activities.

1.2 Objectives of the Project

5. The main objective of the project is to digitize the power distribution system and develop network infrastructure for sustainable and reliable power supply to consumers in NESCO. Besides ensuring a reliable and stable power distribution system in NESCO region and strengthening operational efficiency of power distribution network.

6. The project's outcome will improve the quality of service, and the rate and duration of power outages will be greatly reduced. Government revenue collection will increase as system losses are greatly reduced, and proper customer and load monitoring is ensured. It will be possible to ensure uninterrupted power supply and ensure improved service through very quick resolution of any untoward electrical incidents. At the same time, due to uninterrupted power supply, many new small and medium industries will be created, and development opportunities will be created in the industrial sector as a result of which the socio-economic condition of the people of the region will improve.

7. There has been no significant progress in poverty alleviation of the people of the region due to the lack of development of the communication system and electricity distribution system in the north-western region of the country with the capital Dhaka. Work on "Network Infrastructure Development and Modernization of Power Distribution System" and modernized power distribution system will provide self-employment of many educated people for quality power supply. Standard, reliable and uninterrupted power supply will be ensured in the North-West zone area through the implementation of the project. As a result, small, medium and large -scale industries will develop and disabled/disadvantaged groups including women can benefit from the employment generated using technology -based machinery. Therefore, the described project will contribute to the income and development of women in the region by creating new employment. Provision of uninterrupted and quality electricity and with the development of the developmental institutions created in the area through a strengthened distribution network that would supply quality and reliable electricity to its residential, commercial and industrial customers in Rajshahi and Rangpur divisions catering to approximately 17,74,237 households, 26020 irrigation pumps, 1,60,282 business establishments, 19768 small industries besides 18002 mosques, temples and educational institutions. The quality of life of the people engaged in various professions and unemployed will be improved in the NESCO area which consists of 39 (thirty-nine) upazilas including Sadar upazila under 16 (sixteen) districts of the north-western part of the country.

1.3 Scope of Work

8. The identified project outputs include:

Name of Output	Major Components
Output 1: Distribution grid modernized and adaptive capacity to respond to climate disasters enhanced.	(i) the establishment of a disaster recovery center and expansion of existing data center, (ii) the installation of power transformer monitoring units and intelligent electronic devices (IED) with fault detection system, integrated with Advanced Distribution Management System, (iii) the upgradation of four transformer repair workshops with improved health and safety and hazardous waste management; and (i) the construction of 6 new 33/11 kilovolt (kV) substations (3 new GIS 33/11 kV and 3 new AIS 33/11 kV Substations), 7 new switching stations, and upgradation or modernization of 10 existing 33/11 kV substations with gender inclusive design (ii) A total of 33.73 km Overhead distribution line will be installed with a total of 765 pole replacement.
Output 2. Institutional capacity for disaster risk management and community resilience increased.	(i) installation of 250 kW rooftop solar with battery storage in NESCO's critical control centers as an emergency backup power system, ⁴ (ii) installation of 400 kW rooftop solar for all schools and community clinics at disaster shelters (schools and clinics) in riverine islands ⁵ ; (iii) provision of awareness training on disaster preparedness and response capacities to vulnerable communities. (iv) provision of energy-based livelihood equipment with skill training to low-income people with a particular focus on women and vulnerable groups; and (v) strengthen the NESCO's institutional capacity in terms of disaster preparedness, emerging smart grid technologies, operation and maintenance, environment, and safety.

9. The Project Scope of Work:

- The construction of Expanding existing data center capacity at NESCO; Setting up 1 (one) Disaster Recovery Center. Installation of 320 sets of IED with Fault Locator & Accessories for fault location detection of distribution network.
- 4 nos. Transformer Workshop construction; Installation of 3 Nos. new GIS Substation & Renovation of 1 no. GIS Substation including installation of 13.8 km source distribution line; 3 Nos. new AIS Substations with installation of 19.93 km source distribution line, 7 Nos AIS & GIS 33 kV Switching station construction and shifting, 10 no. AIS & GIS S/S upgradation, and 36 nos. bay extensions, 1 no. disaster recovery center, ADMS installed for Coordination among SCADA, GIS & SMP;
- The new six (6) substations (3-GIS and 3-AIS) will be automated and be equipped with 2-4-story control buildings, transformers, batteries, internal access roads, surface drains etc.
- An environmental audit of 10 existing substations which will add new transformers and equipment and 14 PGCB substations of the locations of 36 no. future bay extensions were carried out.

⁴ The critical control centers include a disaster recovery center, a data center, and 16 substations.

⁵ The community disaster shelters include 16 schools and 3 clinics at 5 riverine islands (Asariadoho, Alaitoli, Alatuli in Rajshahi region and Hatibandha, Patgram in Rangpur region)

- The workshops to be constructed will require a shop floor/storage area with built in design complete with oil draining features to sum up, safe electric connections for machines, modern heat chambers, ventilation and lighting (maintaining proper Lux requirements, noise attenuating wall coats/enclosures.
- Other components of the Project do not involve construction work and will have no or minimal environmental impact.

Table 1-1: List of Proposed Project Interventions

Package No	Description of Procurement Package as per DPP/TAPP (Goods)	Unit	Quantity
Package-GD1	Design, Supply, Installation, Testing and Commissioning of Lot 1: Data Center Extension	Lot	1
	Lot 2: Disaster Recovery Center	Lot	1
Package- GD2	Supply necessary material, testing, commissioning, installation and training for installation of IED with Fault Location in NESCO PLC & Integration with Smart Distribution System in NESCO	Lot	IED-320 Nos.
Package-GD3	Lot-1: Design, Supply, installation, Testing & Commissioning of 33 kv GIS Switching Substation at Rangpur	Lot	1
	Lot-2: Design, Supply, installation, Testing & Commissioning of 33 kv GIS Switching Substation at Purbo Sadipur (Dinajpur)	Lot	1
	Lot-3: Design, Supply, installation, Testing & Commissioning of 33 kv GIS Switching Substation at Katakali (Rajshahi)	Lot	1
Package- GD4	Lot 1: Design, Supply, Installation, Testing and Commissioning of three (3) nos new 2*20/26.66 MVA 33/11 kV GIS Substations (new) & 1 Nos. 33/11 kV GIS Substation Upgradation..	Nos.	3 Nos. New 2x20/26.66 33/11 kV GIS Substation Installation, Testing, Commissioning on turnkey Basis on NESCO's Own Premises at Chandipur (Rajshahi-2), Bogura (S&D-1) campus, S&D 1 Campur Rangpur at NESCO owned land and 1 Nos. upgradation of GIS Substation at Noyagola (S&D 1, Chapai Nawabganj)
	Lot 2: Design, Supply, Installation, Testing and Commissioning of 1 nos 2*10/13.33 MVA 33/11 kV AIS Substation installation (new) at NESCO own areas.	Nos.	1 nos 2*10/13.3 MVA 33/11 kV AIS Substation at S&D 1 Campus, Dinajpur.
Package-GD5	Lot 1: Design, Supply, Installation, Testing and Commissioning of 1 nos 2*10/13.33 MVA 33/11 kV AIS Substation (new) at Baharkasna under S&D-3, Rangpur.	Nos.	1 Nos. New 2*10/13.33 MVA 33/11 kV AIS Substation Installation, Testing, Commissioning on turnkey Basis at Baharkasna (S&D-3 Rangpur)
	Lot 2: Design, Supply, Installation, Testing and Commissioning of 1 nos 2*10/13.33 MVA 33/11 kV AIS Substation (new) at S&D-1 Pabna.	Nos.	1 Nos new 2*10/13.33 MVA 33/11 kV AIS Substation Installation, Testing, Commissioning on Turnkey Basis at Kodomtola (S&D1 Pabna).

Package No	Description of Procurement Package as per DPP/TAPP (Goods)	Unit	Quantity
Package -GD6	Design, Supply, Installation, Testing and Commissioning of nine (9) Nos. 33/11 kV AIS Substation Upgradation in Rangpur Zone	Lot	9 Nos. 33/11 kV AIS Substation Upgradation in Rangpur Zone
Package- GD7	Lot 1: All necessary Equipment for 2 Nos Distribution Transformer repairing Workshop with Civil Works and Installation at Bogura and Rajshahi.	Lot	Bogura-1 Nos Rajshahi- 1 Nos
	Lot 2: All necessary Equipment for 2 Nos Distribution Transformer repairing Workshop with Civil Works and Installation at Rangpur and Dinajpur.	Lot	Rangpur -1 Nos Dinajpur - 1 Nos
Package- GD8	Design, Supply, installation, Testing & Commissioning of 33 kv Switching Substation installation & Shifting (AIS)	Nos.	4
Package P- GD9	Lot 1: Design, Supply, installation, Testing & Commissioning of 33 kv Bays for future SS expansions at Rangpur Zone and Sabgram, Mohasthan & Puran Bogura grid.	Nos.	17
	Lot 2: Design, Supply, installation, Testing & Commissioning of 33 kv Bays for future SS expansions at Rajshahi circle 1/2, Pabna Circle, Dupchachiya and Naogaon grid Substations.	Nos.	19
Package-P-10	Design, Supply, Installation, and Commissioning of Distributed Solar PV System in Schools of Char Asariadoho & Alatuli (Rajshahi zone), Hatibandha & Patgram (Rangpur zone), Clinics (Char Alatuli/Ashariyadaha), Substations (which are included in ADB project), Data center (Rajshahi) and Disaster Recovery center (Rangpur) with Battery Energy Storage System (BESS)	Lot	Rooftop solar system installation on 16 nos schools, 3 nos community clinics and 15 nos 33/11 kv substation, 1 Data center and 1 Disaster recovery center.

Source: NESCO PLC.

1.4 Objectives of the Initial Environment Examination

10. The project is categorized as Category B in accordance with the ADB's Safeguard Policy Statement (SPS 2009) 2009, to guarantee the environmental sustainability and soundness of projects as well as to facilitate the incorporation of environmental considerations into the project decision-making process and Operational Manual F1, 2013. The main goal of this IEE report is to acquire project clearance from ADB to comply with the SPS 2009 standards..

11. The specific objectives of the IEE study are:

- to identify the environment, health and safety legislative and approval requirements applicable for the project.
- to understand the project to be implemented in consultation with NESCO to inform the impact assessment.
- to identify the current environmental and socio-economic baseline of the study area through desk studies, site visits and field surveys to provide the baseline against which the impact assessment is undertaken.
- to assess the potential environmental impacts, including any residual impacts post-mitigation, of the project considering direct, indirect, cumulative, and induced impacts on biological, physical, social, and physical-cultural resources in the study area during the construction and operation and maintenance phases of the project.
- to identify the preliminary health and safety risks of the project during the construction and operation and maintenance phases of the project.
- to identify mitigation measures to minimize the predicted adverse environmental impacts and risks.
- to undertake consultations with affected communities and other interested stakeholders; and
- to prepare a Grievance Redress Mechanism and an Environmental Management Plan,

including an Environmental Monitoring Plan.

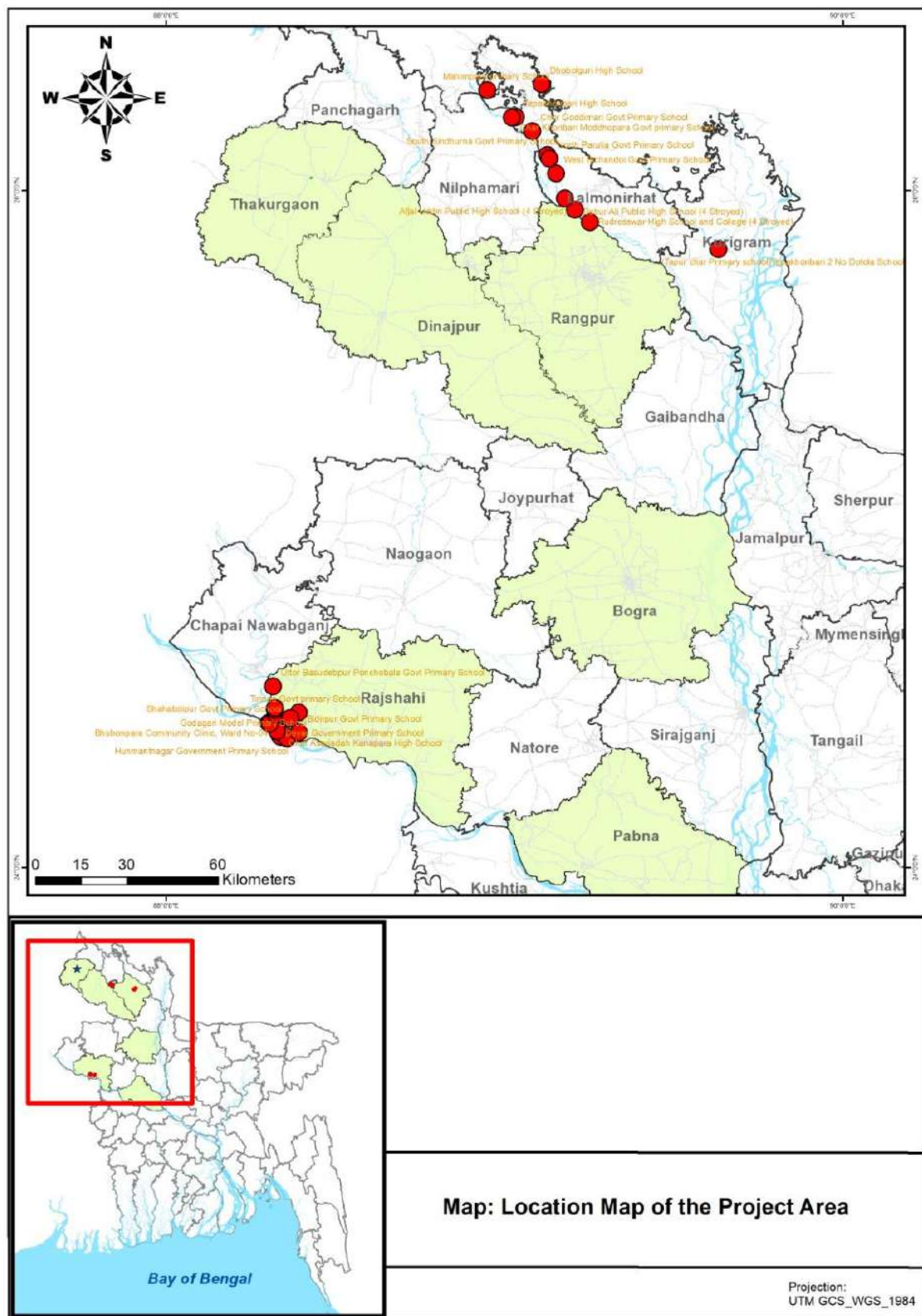
12. With the implementation of this project, the "Network Infrastructure Development and Modernization of Power Distribution System" will be completed, allowing for careful monitoring and control of the entire system to guarantee quality electricity and minimize the frequency and length of power outages. In addition to improving health and safety concerns and lowering accident rates, it can also aid in lowering system loss and increasing revenue collection. It has no adverse effects on the natural environment. Therefore, if the project is carried out correctly, it will benefit the environment.

1.5 Study Area (Project Area of Influence).

13. The proposed project covers the major portion of the Rajshahi and Rangpur division areas so that the entire NESCO distribution area is considered as the study area consisting of consists of 39 (thirty nine) upazilas under 16 (sixteen) districts of the north-western part of the country.

14. Direct impacts will be restricted to the footprint of the project. The site-specific project area of influence for indirect impacts was generally taken as a 500 m radius around the substations.

Figure 1-1: Map of study area showing the project working areas



1.6 IEE Study Team

15. The numbers of experts were engaged in conducting the IEE study including Ecologist/Biologist, GIS Specialist, Sociologist, Air/Noise Modeler etc. In addition, an experienced environmental survey team employed by SGS Bangladesh was also involved to necessary collect data and information from the field level.

Table 1-2: IEE study team information

Sl. No.	Name of the expert*	Position in the Team
1	Rajat Jain	Environmental Expert - International
2	Fauzia Nusrat	Environmental Expert - National
3	Kamrul Hasan	Environmental Expert - National
4	Mohammad Shariful Islam	GIS Specialist

1.6 Structure of the IEE Report

16. The report has been structured in compliance with the requirements of the ADB and DoE requirements.

Chapter 1: Introduction:	The introduction chapter presents a brief overview of the IEE assignment along with the project background objectives and scope of work.
Chapter 2: Legislative and Administrative Framework	Chapter 2 outlines the Policy and Legislation on environment, health and safety issues.
Chapter 3: Description of the Project	Chapter 3 describes the project interventions including the project location, project components and various activities to be undertaken during different phases of implementation, work schedule and project costs.
Chapter 4: Environmental and Social Baseline	This chapter describes the environmental baseline conditions (physical and biological) of the Project area of influence. This chapter also describes the social baseline conditions (population, demographics, settlements, housing, traffic and transport, utilities, economy and employment etc.) of the Project area of influence.
Chapter 5: Alternative analysis	This chapter outlines the alternative analysis of the main project components i.e., the substations sites etc.
Chapter 6: IEE methodology	This Chapter describes the approach, and the methodology followed in conducting the IEE.
Chapter 7: Environmental Audit of Existing Facilities	Audits for existing facilities were conducted, and a Corrective Action plan is presented in this section.
Chapter 8: Environmental Impact and Mitigation Measures	Discusses the potential adverse impacts on the environmental and social components with mitigation measures to be adopted for the pre-construction, construction and post-construction phases of the project.
Chapter 9: Stakeholder Engagement and Information Disclosure	This chapter presents a description of the extent of stakeholder consultation that was undertaken and its outcome
Chapter 10: Grievance Redress Mechanism	The Grievance Redress Mechanism (GRM) which will be adopted by NESCO to address community and worker concerns is outlined in this chapter.
Chapter 11: Implementation Support and Arrangements	The chapter presents the implementation arrangements for the project.
Chapter 12: Environmental Management Plan	This chapter describes the environmental management, mitigation and monitoring measures that will be put in place to reduce the anticipated adverse environmental impacts of the Project to acceptable levels.
Chapter 13: Conclusions and Recommendations	This chapter represents the findings, conclusion and recommendations of the IEE report.

2 Legal and Administrative Framework

2.1 Introduction

17. The chapter focuses on the national policies, development plan, laws and legal framework applicable to the proposed project. The proposed project will be constructed ensuring the existing national rules, legislation and other sustainable principles which enhance the environmental stewardship for the local areas. However, review of relevant policy, strategy and regulatory issues are very important for any project proponent before execution of any project or industry. The proponent must be aware of these requirements and comply with the provisions as applicable and necessary.

18. For this chapter, all relevant environment, health and safety (labor) policies and legislation pertaining to the Government of Bangladesh (GoB), particularly the Environment Conservation Act (ECA) 1995 (with subsequent amendments) and the Environment Conservation Rules (ECR) 2023 were assessed. The ECA and ECR are the main legal instruments related to the environmental impact of project development, obliging all project activity to have the necessary clearance certificate in place. In the following sections, the summary of relevant policies and legislation is presented. NESCO will ensure adherence to all applicable regulations and standards for the environmentally acceptable operation of this Project.

19. ADB categorizes all projects according to the magnitude or scale of their anticipated environmental impact. If in the construction and operation of the project environmentally sustainable management is followed, the impacts would be minor or insignificant.

2.2 Classification of the Subproject

20. Schedule 1 of ECR, 2023 provides the classification of industrial projects and types of development that are common in Bangladesh. indicates the subproject's category and its likely classifications based on this schedule.

Table 2-1: Classification of the Subproject

Package No	Description of Procurement Package as per DPP/TAPP (Goods)	Unit	Quantity	ECR 2023	ADB SPS 2009
Package-P1	Design, Supply, Installation, Testing and Commissioning of Lot 1: Data Center Extension	Lot	1	Not mentioned in the ECR 2023	Category C, equipment only. Category C
	Lot 2: Disaster Recovery Center	Lot	1	Not mentioned in the ECR 2023.	
Package-P2	Supply, testing, commissioning, installation and training for operation & monitoring of IED with Fault Location in NESCO PLC & Integration with Smart Distribution System in NESCO	Lot	IED-320 Nos.	Not mentioned in the ECR 2023	Category B
Package-P3	Lot 1: Design, Supply, installation, Testing & Commissioning of 33 kv GIS Switching Substation at Rangpur	Lot	1	Not mentioned in the ECR 2023	Category B
	Lot 2: Design, Supply, installation, Testing & Commissioning of 33 kv GIS Switching Substation at Purbo Sadipur (Dinajpur).	Lot	1	Not mentioned in the ECR 2023	Category B

Package No	Description of Procurement Package as per DPP/TAPP (Goods)	Unit	Quantity	ECR 2023	ADB SPS 2009
	Lot 3: Design, Supply, installation, Testing & Commissioning of 33 kv GIS Switching Substation at Katakhal (Rajshahi).	Lot	1	Not mentioned in the ECR 2023	Category B
Package-P4	Lot 1: Design, Supply, Installation, Testing and Commissioning of 3 nos 2*20/26.66 MVA 33/11 kV GIS Substations (new) & 1 Nos. 33/11 kV GIS Substation Upgradation with 13.57 km of source distribution line at NESCO own areas.	Nos.	3 Nos. New 2x20/26.66 33/11 kV GIS Substation Installation, Testing, Commissioning on turnkey Basis on NESCO's Own Premises at Chandipur (Rajshahi-2), Bogura (S&D-1) campus, S&D 1 Campur Rangpur at NESCO owned land and 1 Nos. upgradation of GIS Substation at Noyagola (S&D 1, Chapai Nawabganj)	Not mentioned in the ECR 2023	Category B
	Lot 2: Design, Supply, Installation, Testing and Commissioning of 1 nos 2*10/13.33 MVA 33/11 kV AIS Substation installation (new) with 0.33 km of source distribution line at NESCO own areas.	Nos.	1 nos 2*10/13.3 MVA 33/11 kV AIS Substation at S&D 1 Campus, Dinajpur.		
Package-P5	Lot 1: Design, Supply, Installation, Testing and Commissioning of 1 nos 2*10/13.33 MVA 33/11 kV AIS Substation (new) at Baharkasna under S&D-3, Rangpur with 11.6 km of source distribution line at NESCO areas.	Nos.	1 Nos. New 2*10/13.33 MVA 33/11 kV AIS Substation Installation, Testing, Commissioning on turnkey Basis at Baharkasna (S&D-3 Rangpur)	Not mentioned in the ECR 2023	Category B
	Lot 2: Design, Supply, Installation, Testing and Commissioning of 1 nos 2*10/13.33 MVA 33/11 kV AIS Substation (new) at S&D-1 Pabna with 8 km of source distribution line at NESCO areas	Nos.	1 Nos new 2*10/13.33 MVA 33/11 kV AIS Substation Installation, Testing, Commissioning on Turnkey Basis at Kodomtola (S&D1 Pabna).		
Package - P6	Design, Supply, Installation, Testing and Commissioning of 9 Nos. 33/11 kV AIS Substation Upgradation in Rangpur Zone	Lot	9 Nos. 33/11 kV AIS Substation Upgradation in Rangpur Zone	Not mentioned in the ECR 2023	Category B
Package-P7	Lot 1: All necessary Equipment for 2 Nos Distribution Transformer repairing Workshop with Civil Works and Installation at Bogura and Rajshahi.	Lot	Bogura-1 Nos Rajshahi- 1 Nos	Not mentioned in the ECR 2023	Category B

Package No	Description of Procurement Package as per DPP/TAPP (Goods)	Unit	Quantity	ECR 2023	ADB SPS 2009
	Lot 2: All necessary Equipment for 2 Nos Distribution Transformer repairing Workshop with Civil Works and Installation at Rangpur and Dinajpur.	Lot	Rangpur -1 Nos Dinajpur - 1 Nos	Not mentioned in the ECR 2023	Category B
Package-P-8	Design, Supply, installation, Testing & Commissioning of 33 kv Switching Substation installation & Shifting (AIS)	Nos.	4	Not mentioned in the ECR 2023	Category B
Package P-9	Lot 1: Design, Supply, installation, Testing & Commissioning of 33 kv Bays for future SS expansions at Rangpur Zone and Sabgram, Mohasthan & Puran Bogura grid.	Nos.	17	Not mentioned in the ECR 2023	Category B
	Lot 2: Design, Supply, installation, Testing & Commissioning of 33 kv Bays for future SS expansions at Rajshahi circle 1/2, Pabna Circle, Dupchachiya and Naogaon grid Substations.	Nos.	19	Not mentioned in the ECR 2023	Category B
Package-P-10	Design, Supply, Installation, and Commissioning of Distributed Solar PV System in Schools of Char Asariadoho & Alatuli (Rajshahi zone), Hatibandha & Patgram (Rangpur zone), Clinics (Char Alatuli/Ashariyadaha), Substations (which are included in ADB project), Data center (Rajshahi) and Disaster Recovery center (Rangpur) with Battery Energy Storage System (BESS)	Lot	Rooftop solar system installation on 16 nos schools, 3 nos community clinics and 15 nos 33/11 kv substation, 1 Data center and 1 Disaster recovery center.	Not mentioned in the ECR 2023	Category B

2.3 Procedure for Clearance Certificate

21. The environmental assessment process consists of three stages: screening, IEE, and detailed EIA per ECR, 2023. The ECR also contains the procedures for obtaining the SCC and ECC from the DOE for different categories of proposed industrial units or projects. Any person or organization wishing to establish an industrial unit or project must obtain an SCC and ECC from the Director General of DOE. The application for such a certificate must be in the prescribed forms provided together with the prescribed fees laid down in Schedule 6 and Schedule 7, through the deposit of a Treasury Chalan in favor of the Director General of DOE.

22. The procedure of getting the SC and ECC of four categories of project are briefly described as follows.

- (iii) **Green:** Projects categorized as green projects are listed in Schedule 1. The proponent should apply in a prescribed format Form 3: Site Clearance / Environmental Clearance Certificate Application, Rule 9 Sub-Rule (1), Rule 10 Sub-Rule (1), Rule 11 Sub-Rule (1), Rule 12 Sub-Rule (1), Rule 14 Sub-Rule (1), and Rule 23 Sub-Rule (4) along with specified documents.

In addition, as per Schedule 9: Industry or Project Site Selection Guideline, Rule 8 Sub-Rule (kha), Rule 9 Sub-Rule (2), Rule 10 Sub-Rule (2), Rule 12 Sub-Rule (2), and Rule 14 Sub-Rule (2) must be followed by the proponent.

The Client must Deposit/Pay the mentioned amount of fees to DOE per Schedule 7: Site Clearance or Environmental Clearance Certificate Received and its Renewal Fee; Rule 9 Sub-Rule (3), Rule 10 Sub-Rule (3), Rule 12 Sub-Rule (6), Rule 84 Sub-Rule (3), Rule 21 Sub-Rule (14), Rule 22 Sub-Rule (1), and Rule 23 Sub-Rule (4); and DOE will provide the ECC to the applicant within seven (7) days of application subject to their site investigation and satisfaction on the submitted documents. The ECC needs

to be renewed every 5 years.

- (iv) **Yellow:** Projects categorized as Yellow are listed in Schedule 1. The proponent shall apply in a prescribed format Form 3: Site Clearance/Environmental Clearance Certificate Application, Rule 9 Sub-Rule (1), Rule 10 Sub-Rule (1), Rule 11 Sub-Rule (1), Rule 12 Sub-Rule (1), Rule 14 Sub-Rule (1), and Rule 23 Sub-Rule (4) along with specified documents.

Deposit/pay the mentioned amount of application processing fee to DOE per Schedule 6: Site Clearance or Environmental Clearance Certificate Application Process Fee, Rule 10 Sub-Rule (2), Rule 12 Sub-Rule (2), Rule 14 Sub-Rule (2), related documents and detail information and per Schedule 9: Industry or Project Site Selection Guideline, which shall be followed.

The relevant DOE office will conduct a site visit to the project and prepare a report with justification and opinion. Within 8 working days of receiving the application, the DOE office concerned will notify the applicant to pay the fee specified in Schedule 7, provided the information in the application is satisfactory and the on-site inspection is completed.

The Client must Deposit/Pay the mentioned amount of site clearance fee to DOE per Schedule 7: Site Clearance or Environmental Clearance Certificate Received and its Renewal Fee; Rule 9 Sub-Rule (3), Rule 10 Sub-Rule (3), Rule 12 Sub-Rule (6), Rule 84 Sub-Rule (3), Rule 21 Sub-Rule (14), Rule 22 Sub-Rule (1), and Rule 23 Sub-Rule (4); and

After issuance of SCC, the Client submits its application for issuance of ECC to DOE. DOE will provide the ECC to the applicant within seven (7) days of application subject to their site investigation and satisfaction with the submitted documents. The ECC needs to be renewed every 2 years.

- (v) **Orange:** Projects categorized as Orange require proponents to submit an application in a prescribed format Form 3: Site Clearance / Environmental Clearance Certificate Application for Site Clearance, along with Deposit /Payment of the mentioned amount of fees for the project to DOE per Schedule 6, related documents and detail information, submission of an Initial Environmental Examination (IEE) Study report, and compliance with Schedule 9: Industry or Project Site Selection Guideline. After approval from the Authority, the Client must Deposit/Pay the mentioned amount of fees for the project to DOE per Schedule 7 for obtaining the Site Clearance for the project. The relevant DOE office will visit the project site and prepare a report. This report, along with the application, will be sent to the appropriate ECC committee based on the project's serial number listed in Schedule 1. The ECC committee will review the application and the report and decide. The applicant will then be notified to pay the fee listed in Schedule 7 for the SCC issuance; and

Within 21 days from payment of fees per Schedule 7, DOE issues the SCC. Upon obtaining the SCC, the Proponent/Client will apply for an ECC from the DOE. The DOE office will then perform a site visit to ensure SCC compliance and review relevant issues. A report justifying the issuance or rejection of the ECC will be prepared and forwarded, along with the application, to the appropriate ECC committee. The committee will decide within 20 working days of the application date and issue the ECC. If an initial environmental examination of an Orange Category project reveals significant pollution impacts, the ECC Committee may recommend an Environmental Impact Assessment (EIA). With approval from the Director General, the proponent must conduct the EIA. The ECC needs to be renewed every year.

- (vi) **Red:** Projects categorized as Red Projects require proponents to submit an application in a prescribed format Form 3: Site Clearance/Environmental Clearance Certificate Application for Site Clearance, along with Deposit /Payment of the mentioned amount

of fees for the project to DOE per Schedule 6, related documents, detail information, draft Terms of Reference (ToR) of Environmental Impact Assessment (EIA) compliance with Schedule 9: Industry or Project Site Selection Guideline;

Per Schedule 10, Environmental Impact Assessment Scope of Works Guidelines, Rule 14 Sub-Rule (3), a draft Terms of Reference (TOR) will be prepared for the conduct of an Environmental Impact Assessment and submitted to the DOE for approval.

The relevant DOE office will visit the project site to review the documents and all pertinent issues. A report with justifications and findings on the rationale for issuing the site clearance certificate and draft ToR for the EIA will be forwarded to the ECC Committee. Upon receiving the documents, the ECC Committee will review and evaluate them, then submit a report to the Director General (DG) for approval. With the DG's approval, the concerned office will approve the ToR for the EIA within 30 working days.

An EIA study shall be prepared based on DOE's approved TOR. An Environmental Management Plan should be prepared as an integral part of the EIA study according to Schedule 11: Industry or Project Environmental Impact Assessment Study Preparation Guidelines, and Rule 15 Sub-Rule (3). Public consultations for the EIA study shall be carried out; and

The proponent must submit the EIA report to the ECC Committee as per Schedule 11. If the EIA is approved by the DG, the proponent has to pay the fee specified in Schedule-7 within a maximum of 7 working days and the SCC will be issued within 7 working days of submission of fee to the concerned DOE office. After issuance of the SCC, proponent/client will submit the application for issuance of ECC. The relevant DOE office will conduct a site visit to verify the conditions of the SCC and the recommendations of the EIA etc. A report will be prepared and forwarded to the ECC committee. Upon reviewing the reports and documents, the ECC Committee will make recommendations to the DG regarding the issuance of the ECC. Once the DG approves these recommendations, the concerned office will issue the ECC within 30 working days. The ECC needs to be renewed every year.

2.4 Environmental Standards

23. Environmental quality standards of Bangladesh for varying water sources, industrial effluent, discharges and emissions are prescribed under the Environment Conservation Rules 2023.

24. The Noise Pollution (Control) Rules of 2006 established the requirements for ambient noise level, while the Air Pollution (Control) Rules contain provisions for ambient air quality standards. Annex-3 lists the environmental standards.

25. The Bangladesh standards, in general, are less stringent compared to the developed countries. To comply with ADB's Safeguards, the Project must adhere to stricter international standards, such as the World Bank Group's Environmental Health and Safety Guidelines.

Table 2-2: National Environmental Standards

Noise Levels					
Sl. No.	Zones	The Noise Pollution (Control) Rules 2006. (dBA)		WHO Guideline in IFC, 2008 (dBA) as 1 hr. LAeq	
		Day	Night	Day	Night
1	Silent zone	50	40	-	-
2	Residential zone	55	45	55	45
3	Mixed zone (mainly residential area, simultaneously used for commercial and industrial purposes)	60	50	-	-
4	Commercial zone	70	60	70	70
5	Industrial zone	75	70	70	70

Table 2-3: Air Quality Standards

Air Quality				
Parameters	Unit	Bangladesh Standard ⁶	WHO standard	Standard Time (hrs.)
PM _{2.5}	µg/m ³	65	15	24
PM ₁₀	µg/m ³	150	45	24
SO ₂	µg/m ³	80	40	24
NO ₂	µg/m ³	80	25	24
CO	Ppm	5	10	8
O ₃	µg/m ³	100	100	8

Table 2-4: Surface Water Quality Standards

Surface Water Quality		
Parameters	Unit	Bangladesh Standard ⁷
DO	mg/L	≥5
TDS	mg/L	1000
TSS	mg/L	-
EC	µS/cm	-
Turbidity	NTU	-
Ph	-	6-9
Salinity	ppt	-
COD	mg/L	50
BOD	mg/L	≤6
Mercury	mg/L	-
Lead	mg/L	0.1
Cadmium	mg/L	-
Oil and Grease	mg/L	-
Fecal Coliform	MPN/100ml	2.0 indicates (Absent) as per BDS Standard 1240:2021
Total Coliform	MPN/100ml	2.0 indicates (Absent) as per BDS Standard 1240:2021

Table 2-5: Ground Water Quality Standards

Groundwater Quality		
Parameters	Unit	Bangladesh Standard ⁸
TDS	mg/L	1000
EC	µS/cm	-
Turbidity	NTU	5.0
pH		6.5-8.5
Salinity	ppt	-
Total Hardness as CaCO ₃	mg/L	-
Iron	mg/L	0.3-1.0
Arsenic	mg/L	0.05
Manganese	mg/L	0.4
Odor	-	-
Fecal Coliform	MPN/100ml	2.0 indicates (Absent) as per BDS Standard 1240:2021
Total Coliform	MPN/100ml	2.0 indicates (Absent) as per BDS Standard 1240:2021

Table 2-6 : National Environmental Standards

⁶ Air Pollution (Control) Rules, 2022

⁷ Bangladesh Environmental Conservation Rules, 2023- Schedule 2 (Standards for Inland Surface Water, Water Usable for Fisheries).

⁸ Bangladesh Environmental Conservation Rules, 2023, Schedule-2(B).

Noise Levels					
Sl. No.	Zones	The Noise Pollution (Control) Rules 2006. (dBA)		WHO Guideline in IFC, 2008 (dBA) as 1 hr. LAeq	
		Day	Night	Day	Night
1	Silent zone	50	40	-	-
2	Residential zone	55	45	55	45
3	Mixed zone (mainly residential area, simultaneously used for commercial and industrial purposes)	60	50	-	-
4	Commercial zone	70	60	70	70
5	Industrial zone	75	70	70	70
Air Quality					
Parameters		Unit	Bangladesh Standard ⁹	WHO standard	Standard Time (hrs.)
PM _{2.5}		µg/m ³	65	15	24
PM ₁₀		µg/m ³	150	45	24
SO ₂		µg/m ³	80	40	24
NO ₂		µg/m ³	80	25	24
CO		Ppm	5	10	8
O3		µg/m ³	100	100	8
Surface Water Quality					
Parameters		Unit		Bangladesh Standard ¹⁰	
DO		mg/L		≥5	
TDS		mg/L		1000	
TSS		mg/L		-	
EC		µS/cm		-	
Turbidity		NTU		-	
Ph		-		6-9	
Salinity		ppt		-	
COD		mg/L		50	
BOD		mg/L		≤6	
Mercury		mg/L		-	
Lead		mg/L		0.1	
Cadmium		mg/L		-	
Oil and Grease		mg/L		-	
Fecal Coliform		MPN/100ml		2.0 indicates (Absent) as per BDS Standard 1240:2021	
Total Coliform		MPN/100ml		2.0 indicates (Absent) as per BDS Standard 1240:2021	
Groundwater Quality					
Parameters		Unit		Bangladesh Standard ¹¹	
TDS		mg/L		1000	
EC		µS/cm		-	
Turbidity		NTU		5.0	
pH		-		6.5-8.5	
Salinity		ppt		-	
Total Hardness as CaCO3		mg/L		-	
Iron		mg/L		0.3-1.0	
Arsenic		mg/L		0.05	
Manganese		mg/L		0.4	
Odor		-		-	
Fecal Coliform		MPN/100ml		2.0 indicates (Absent) as per	

⁹ Air Pollution (Control) Rules, 2022

¹⁰ Bangladesh Environmental Conservation Rules, 2023- Schedule 2 (Standards for Inland Surface Water, Water Usable for Fisheries).

¹¹ Bangladesh Environmental Conservation Rules, 2023, Schedule-2(B).

Groundwater Quality		
Parameters	Unit	Bangladesh Standard ¹¹
		BDS Standard 1240:2021
Total Coliform	MPN/100ml	2.0 indicates (Absent) as per BDS Standard 1240:2021

2.5 Organizations Related to Enforcement of Environmental Standards

26. Roles and responsibilities of various Ministries and Departments involved in the enforcement of environmental requirements are described below:

Ministry of Environment, Forest and Climate Change

27. The Ministry of Environment, Forest and Climate Change (MoEFCC) is the key Government institution in Bangladesh for all matters relating to national environmental policy and regulatory issues. Realizing the ever-increasing importance of environmental issues, the MoEFCC replaced the Ministry of Agriculture and Forest in 1989 and is at present a permanent member of the Executive Committee of the National Economic Council. This is the major decision-making body for economic policy issues and is also responsible for approving all public investment projects. The MoEFCC oversees the activities of the following technical and implementing agencies.

Department of Environment

28. In order to expand the scope of environmental management and to strengthen the power for achieving it, the Government adopted the Environmental Pollution Control Ordinance in 1977. The ordinance provided the opportunity for the establishment of an Environmental Pollution Control Board, which was assigned with the responsibility of formulating policies and proposing measures for their implementation. In 1982, the Board was renamed as the Department of Environmental Pollution Control (DEPC). Six divisional offices were established in Dhaka, Chattogram, Khulna, Barishal, Sylhet and Rajshahi. A special presidential order renamed the DEPC as the Department of Environment (DoE) and placed it under the newly formed MoEFCC in 1989.

29. The DoE is a Department of the MoEFCC and is headed by a DG. The power of the DG, as given under the Act, may be outlined as follows:

- DG has the power to close activities considered harmful to human life or the environment. The operator has the right to appeal, and procedures are in place for this. However, if the incident is considered an emergency, there is no opportunity for any appeal.
- The DG has the power to declare an area affected by pollution as an ecologically critical area (ECA). DoE governs the type of work or process which can take place in such an area.
- Before undertaking any new development project, the project proponent must take the first Site Clearance Certificate (SCC) and Environmental Clearance Certificate (ECC) from DoE. The procedures to take such clearance are in place.
- Failure to comply with any part of the Environment Conservation Act (ECA₁), 1995, with subsequent amendments, may result in punishment by imprisonment or a fine of or both.

Forest Department

30. This department under the MoEFCC is responsible for the protection and management of all reserve forests in the country. Department personnel extend down to the union level in areas where there are reserve forests. The department has recently started some agroforestry programs, and its officers are also responsible for the protection of wildlife in the forests. Any project/industry that involves cutting down or clearing trees in social forest areas, protected areas, or government-designated forest areas needs permission before construction or industrial activity begins.

Other Related Organizations

31. There are several other organizations which have certain social and environmental functions. These organizations include:

- Ministry of Land: Land Reform and Land Acquisition Directorate is responsible for approval of acquisition or requisition of Immovable Property following the Acquisition and Requisition of Immovable Property Act (ARIPA) 2027.
- Ministry of Water Resources: Bangladesh Water Development Board is responsible to look after the surface water sources mainly rivers, canals, if any activity related to river or canal excavation or re excavation or any other renovation works in large scale, they must take approval from the BWDB before commencement of works.
- Ministry of Fisheries and Livestock: Directorate of Fisheries is responsible for fisheries resources and any activity related to fish diversity or breeding or nesting areas, must take necessary approval from the department of fisheries (DoF).
- Ministry of Labor and Employment

2.6 National Legislations Relevant to Environment

32. National Policies, Legislation, Acts and Rules that are relevant to this proposed project are discussed in the following Table 2.1. Of these, the Environment Conservation Rules (ECR) 2023, are the key legislation.

33. In 2023, MoEFCC approved ECR 2023 as a replacement to the ECR 1997, strengthening the requirements and clarifying the procedures for industries or projects to assess and manage environmental impacts associated with their activities. The ECR 2023 detail provisions for the environmental clearance process, such as on scoping, project categorization, site clearance, environmental assessment, cross-sector and stakeholder consultations, compliance monitoring of the conditions of the ECC, among others. Additionally, the ECR 2023 regulates access to information and stakeholder participation throughout the environmental clearance process, particularly for those activities that require a full EIA. This was absent from the previous ECR, 1997. The ECR 2023 has updated the water quality and sewerage standards, as well as waste emissions and liquid waste standards for industries and projects. However, ECR 2023 does not include noise and odor standards, which were part of the ECR 1997. Standards for ambient air were moved to the Air Pollution Control Rules (APCR) 2022 and noise standards are contained in the Noise Pollution (Control) Rules 2006.

34. Although the ECR 2023 are expected to improve the ECC process, additional guidelines are required to clarify assessment criteria and procedures related to key themes, such as: screening of projects that are not pre-categorized in the ECR, analysis of project alternatives (including the “no-go” option), mitigation hierarchy approach, monitoring program after ECC issuance, resource efficiency, Occupational Health and Safety (OHS), labor and workers’ rights, differentiated treatment of vulnerable groups in the assessment and management measures, among others.

35. Although the list of Ecologically Critical Areas has been removed from the ECR 2023, it has been regularly updated through gazette notifications (DoE, 2019). ECR 2023, as in the 1997 version, kept limited provisions on DoE’s responsibilities of policy formulation, data collection, environmental quality monitoring and enforcement (including, for example, the use of new technologies for oversight activities).

Table 2-7: Relevant Bangladesh Policies and Legislation

Policy/Act/ Rules	Compliance Requirements	Applicability
National Environment	This policy provides a framework for the establishment of legislation for protecting the environment. It outlines all	The Northern Electricity Supply Company PLC

Policy/Act/ Rules	Compliance Requirements	Applicability
Policy, 2018 and Action Plan	the criteria for IEE and EIA approval as well as provides basic framework of environmental action for sustainable development	(NESCO) must follow the policy and comply with provisions while implementing the project.
National Land Use Policy, 2001	Deals with several lands uses including agriculture (crop production, fishery, and livestock), housing, forestry, industrialization, railways and roads, tea and rubber and identifies land use constraints in all these sectors.	Land use patterns will be changed due to the project activities.
National Forestry Policy, 2016	Preservation, management, and exploitation of fisheries resources in inland open water; fish cultivation and management in inland closed water; prawn and fish cultivation in coastal areas and preservation, management and exploitation of sea fisheries resources.	It will not be directly relevant to this project.
Environmental Court Act, 2000	Provides the jurisdictions of environment court, the penalty for violating the court's order, trial procedure in special magistrate's court, the power of entry and search, the procedure for investigation, procedure and power of environment court, the authority of environment court to inspect, appeal procedure and formation of environment appeal court.	It will be applicable in case of violation of the Environment Court Act, 2000.
Wetland Protection Act, 2000	The Playground, Open space, Park, and Natural Wetland Conservation Act 2000 contains provisions for the protection of the playground, open space, park and natural wetland in all mega cities, divisional towns and district town's municipal areas including country's all the municipal areas. The law imposes conditions to take approval from the concerned authority while altering the nature of the abovementioned places which may cause ecological imbalance.	It will not be applicable for this project.
The Forest Act (1927) and the Forest (Amendment) Act (2000)	Categorization of forests as reserve, protected and village forests; Permission is required for the use of forest land for any non-forest purposes and Conservation of private forests and afforestation on wastelands	It will not be directly applicable for this project, however, due to greenery activities in the workshops, and storage centers and others will enhance the natural conditions of these areas that will promote this act.
Bangladesh Climate Change Strategy and Action Plan, 2009	The GOB has prepared the Bangladesh Climate Change Strategy and Action Plan (BCCSAP) in 2008 and revised in 2009. This is a comprehensive strategy to address climate change challenges in Bangladesh. There are 44 specific programs proposed in the BCCSAP under six themes. Establishment of six strategic pillars for action, including (1) food security, social protection, and health, (2) disaster management, (3) protective infrastructure, (4) research and knowledge management, (5) Decreased carbon development, and (6) capacity building and institutional strengthening.	The project will involve greenery activities which will offset carbon emissions. The project promotes energy efficient and cleaner production in industries.
Nationally Determined Contributions (NDCs)	After being approved by COP21 in 2015, 191 Parties went on to sign and ratify the Paris Agreement (PA). The only goal is to veer away from the present route of climate change mitigation and onto a sustainable development trajectory by keeping global warming to 1.5 to 2 degrees Celsius over pre-industrial levels. The Nationally Determined Contributions (NDCs), formerly	After the project is implemented, the NESCO distribution system will be strengthened, ensuring a continuous power supply at the consumer

Policy/Act/ Rules	Compliance Requirements	Applicability
	known as the Intended Nationally Determined Contributions (INDCs) prior to the PA's ratification, are one of its main components. On September 25, 2015, Bangladesh submitted their INDC for the three sectors of power, industry, and transportation to the UNFCCC. Bangladesh then drafted the NDC Action Plan and Implementation Roadmap in 2018. By 2030, Bangladesh's INDC aimed to reduce its greenhouse gas emissions from Business as Usual (BAU) scenarios by 12 million tons (5%) unconditionally, and by an additional 24 million tons (10%) conditionally, with international help, using 2011 as the base year. Bangladesh is revising the NDC as part of the global movement, taking the IPCC's principles into consideration and adding new sectors. Energy, Industrial Processes and Product Use (IPPU), Agriculture, Forestry and Other Land Use (AFOLU), and Waste are all covered in the new NDC. The Third National Communication of Bangladesh, which provides a thorough national GHG emission inventory for 2012, has been used as the basis year for the NDC update.	level. Additionally, the quality and clean energy will be enhanced.
National Adaptation Program (NAP) 2022	Bangladesh has demonstrated initiative and skill in adapting to climate change, as required by Article 18A 1 of the 15th amendment of the Constitution, which focuses on the preservation and enhancement of the environment and biodiversity. Bangladesh has made significant progress over the years in developing its adaptive capacity and resilience by drafting and then putting into place the laws and regulatory frameworks necessary to support sustainable development that is climate resilient. The formulation of the National Adaptation Programme of Action (NAPA, 2005), the Bangladesh Climate Change Strategy and Action Plan (BCCSAP, 2009), the Mujib Climate Prosperity Plan, the Bangladesh Delta Plan 2100, the updated National Environment Policy (2018), the updated Standing Order on Disaster (2019), and other significant accomplishments have cleared the way for effective adaptation to climate change and have established Bangladesh as a leader in the international arena.	By implementing the developed mitigation strategies outlined in the IEE, the project's expected environmental risks will be decreased, supporting the main goal of NAP 2022 of biodiversity preservation and enhancement in the project areas.
Mujib Climate Prosperity Plan 2022-2041	Bangladesh's trajectory is changed by the MCPP from one of vulnerability to resilience to prosperity (VRP). The main objectives of the Plan are to ensure Bangladesh's prosperity by 2041 and to initiate an economic revolution by implementing the following measures: • Boosting economic growth by strengthening the digital economy, supporting internally displaced people, boosting financial protections, expanding our green economic partnerships, and maximizing resilience with loss and damage financing through locally led adaptation hubs. Our goal with this effort is to get us to an upper middle-income position in just ten years. • Strengthening employment in a green economy that is low-carbon, gender-responsive, climate-resilient, resource-efficient, and socially inclusive to create jobs more quickly, upskill workers for high-caliber green tech positions, and significantly raise workplace safety.	Following the project's completion, consumers will have access to good-quality power supply, industrial expansion will accelerate, and job opportunities will arise.

Policy/Act/ Rules	Compliance Requirements	Applicability
	• Encourage traditional living and well-being to benefit from both 21st-century technologies and naturally sustainable, traditional lifestyle habits. Through improved mobility, specific health programs, and support systems, these initiatives seek to save the environment and advance everyone's physical and mental well-being all the while. • Ensure our own energy security, independence, and resilience. We also want to turn into a net global exporter of green energy. We aim to achieve 30% renewable energy by 2030 and up to 40% by 2041 with grid modernization and resilience with the help of foreign and other financial support. One of our major energy projects, the Bongoposagor Independence Array, will restore a mangrove green belt to safeguard our vulnerable coastlines. It is one of the first large-scale hybrid RE-adaptation infrastructure projects. Similar to strategic Energy Hubs, we seek to transform coal plants into green energy establishments like Hydrogen functions.	
Ecologically Critical Area Management Rules, 2016	The Procedure for Declaring Environmentally Endangered Areas and Prohibited Activities in Such Areas are outlined in the Rules. The establishment of an Environment Management Fund and management of public-private partnerships are provided for the preservation and development of environmentally sensitive areas. According to the rules, the department must submit an environment report every five years in addition to annual assessment reports. They also specify the consequences for breaking the rules. In ECA areas, any kind of development activities such as industry, children's parks, development projects, etc., are not allowed. If someone violates these rules, they may face jail, a fine, or both.	Although there are no ECA areas covered by this project, IEE recommendations will be adopted in accordance with national rules and regulations and the ADB Safeguards Policy Statement 2009 to reduce environmental risks.
The Environment Conservation Act, 1995 and amended till October 5, 2010 (hereinafter referred to as ECA).	This Act is the key legislation in relation to environment protection in Bangladesh. It is promulgated for environment conservation, standards, development, pollution control, and abatement. It has repealed the Environment Pollution Control Ordinance of 1977. The Act has been amended in 2000, 2002, 2007 and 2010. Failure to comply with any part of the Environment Conservation Act, 1995 may result in punishment to a maximum of 10 years' imprisonment or a maximum fine of BDT 1,000,000 or both.	This project triggers this act because the project proposes construction, and the provisions of the act apply to all the project intervention phases during the project life cycle to ensure the environment is protected and conserved.
The Environment Conservation Rules, 2023 (hereinafter referred to as ECR)	These rules categorize all the industries and projects as well as the types of environmental assessments that should be conducted in relation to each category of industries or projects. Additionally, this regulation establishes national criteria for environmental quality in water quality and sewage and waste emissions.	The project doesn't require environmental clearance from DOE as it doesn't fall any category of ECR 2023
National 3R Strategy for Waste Management, 2010	The 3Rs are meant to be a hierarchy, in order of importance – 'reduce' followed by 'reuse' and then 'recycle', which classify waste management strategies according to their desirability. The National 3R goal for waste management is to achieve eliminate waste disposal on open dumps, rivers and floodplains and	Applicable as the project will generate waste and thus need to follow the National 3R Strategy for Waste Management

Policy/Act/ Rules	Compliance Requirements	Applicability
	promote recycling of waste through mandatory segregation at source as well as create a market for recycled products and provide incentives for recycling.	
Solid Waste Management Rules, 2021	These rules require (i) source segregation of waste into dry and wet waste, (ii) standards for composting, (iii) anaerobic digestion and waste- to-energy projects, (iv) guidelines for landfilling, and (v) standards for the placement of secondary storage bins, and primary and secondary collection of waste.	Applicable as the project needs to manage solid waste during demolition work, construction and operation.
Hazardous Waste (e-waste) Management Rules, 2021	• The E-waste rule covers the products listed in the Schedule (home appliances, monitoring and control equipment, medical equipment, automatic machines, IT and communication equipment), and establishes obligations for manufacturers, assemblers, collectors, sellers, and consumers of the products. The rule also sets provisions to limit the use of the 10 substances covered by the European Union (EU) Restriction of Hazardous Substances (RoHS) Directive. This regulation entered into force upon publication. The main provisions of this regulation are: • Manufacturers, traders, sellers, transporters, repairers, collection centers, recyclers, dismantlers, etc. of the subject products are required to register with a prescribed form to the DoE. When applying for registration, they shall also submit the Waste Electrical and Electronic Equipment (WEEE) management plan. • Registered manufacturers, recyclers, etc. shall obtain environmental clearance in accordance with the Bangladesh Environmental Protection Rules, 1997 • Manufacturers must establish individual or joint collection centers and set aside funds for the implementation of the WEEE. • For fluorescent lamps and mercury incandescent lamps, if they cannot be recycled, they need to be handed over to collection centers for storage and disposal. • Manufacturers, importers, etc. shall meet the collection targets for the WEEE as specified in the Schedule (10% in the first year of implementation, 20% in the second year, 30% in the third year, 40% in the 4th year, and 50% in the fifth year and thereafter). • To facilitate the proper management of the WEEE, the name, address and contact information of the trader or seller as well as the information on the registered collection center shall be displayed on the product or on the product label, or this information shall be provided to consumers or large consumers. • Traders, sellers and collectors of the WEEE shall receive them from consumers at designated points and transport them to collection centers.	A It's not applicable for this project as the project will not install any pre-paid metering system in the project areas.
Air Pollution Control Rules (APCR), 2022	APCR, 2022 contains air quality standards based on WHO Guidelines (Interim Goals); emissions limit and technical specifications for key sectors; mandates and coordination mechanisms among relevant line ministries to control both household and outdoor air pollution. The rules elevated the air quality management (AQM)	These rules are applicable to this project as it will involve emissions (primarily dust and exhaust emissions) during

Policy/Act/ Rules	Compliance Requirements	Applicability
	dialogue and leadership beyond the environment sector, by establishing the National Committee on Air Pollution Control (NCAPC), a multi-sector decision-making body presided by the Cabinet Secretary to coordinate the APCR implementation and instruct relevant agencies on specific interventions to comply with the new rules. The NCAPC is mandated, for example, to impose emergency measures depending on the levels of air pollution, such as restricting activities of industries or projects, vehicles, or any source of air pollution in a certain area, and closure of educational institutions. APCR also envisages the objectives and minimum requirements of its implementation management tools, such as a National Air Quality Plan (also covering HAP interventions and targets); degraded airsheds declaration and management plan; publication of list of highly air polluting industries and activities; prevention plans; monitoring and control systems. Another relevant regulatory development for AQM refers to the 2019 Amendment of the Brick Manufacturing and Kiln Installation Act, 2013. The amendment set phased targets to reduce the use of clay-fired bricks in public works from 2019 to 2025, except for the construction of base/sub-base of the high-ways. However, implementation of this phased reform is delayed.	construction.
Bangladesh National Building Code (BNBC), 2020	The purpose of the Code is to establish minimum standards for design, construction, quality of materials, use and occupancy, location and maintenance of buildings within Bangladesh to safeguard, within achievable limits, life, limb, health, property and public welfare.	BNBC, 2020 is applicable as this project will involve construction of substations and workshops.
Electricity Act, 2018	• Under this Act, any 'Person' may obtain license to supply electrical energy and/ or lay down or place electric supply lines over or under land (Section 13 – Right of Way) or by acquiring land (Section 14 – Land Acquisition) for the conveyance of electrical energy. For such, the Licensee shall give considerable amount of time and written notification (Section 13) to or acquire the land following land acquisition laws (Section 14) from the landowners. • Under this Act, the Licensee: • Shall obtain permission from appropriate personnel or authorities to open and break up the soil and/ or pavement of any or part of street, railway, tramway, etc. to lay down any line on either side of, underneath or above the aforementioned facilities; the same shall apply in case of laying of line on either side of, submerged in, inside of or above canals, tunnels and /or waterways or do other work following appropriate procedures as stated in Section 6 of this Act. • Shall take prior 'Permissions' from the respective authorities in case of works near other utility services (such as gas, water, sewer, etc.) as well as providing 'Notice' of commencement of work bar emergency as stated in Section 8 of this Act. • NESCO Shall be responsible for any repair-works of road, pavement, sewerage, etc., including refilling of excavated soil and disposal of generated waste as a	NESCO, here the Licensee, shall need to obtain necessary permission, provide appropriate compensation following national laws/Act, and comply with all the requirements described in this Act.

Policy/Act/ Rules	Compliance Requirements	Applicability												
	direct result of their interventions as stated in Section 9 of this Act. - Will be responsible for providing 'Notice' to any Telecommunication and /or Internet Service provider to commence any work related to electrical activities that share their service space whether they are new works or repairing of existing works bar emergency. However, the Licensee shall provide a 'Notice' after completion of emergency work to the service providers as stated in Section 10 of this Act. - Can construct Overhead (Aerial) Lines along or crossing the roads, rail-lines, canals or waterways with prior permission from the Government as stated in Section 11 of this Act. - Make full compensation for any damage, detriment or inconvenience caused by them or by anyone employed by them as stated in Section 12 of this Act.													
Electricity Rules, 2020	This rule has been formulated under section 59 of the Electricity Act 2018. It provides clear guidelines on electricity production, transmission and distribution. In addition to this, it also gives clear direction regarding maintenance and change in electricity line, cable etc. In Rule 51(5) and Schedule-2 of the Electricity Rule, 2020 defines the minimum distance to be maintained on either side of the electric wire, which in fact defines the ROW for transmission and distribution lines and associated safety clearance corridors. And this also defines safety measures relating to electrical works.	This rule is triggered under this project as the rule provides directives regarding permissions and construction and maintenance of power transmission line and distribution line as well as substations. RoW and safety clearance with voltage levels relevant to the Project are given below. There is no specification for 0.4 kV, but as same poles are used as for 11 kV so 11 kV RoW and safety clearances used for 0.4 kV: <table> <tr> <th>Voltage Level (kV)</th><th>RoW (From the either side of the outer conductor (meter))</th><th>Safety clearance from the line unscreened conductor (meter)</th></tr> <tr> <td>2.5</td><td>2.5</td><td>2.5</td></tr> <tr> <td>3.5</td><td>2.8</td><td>3.5</td></tr> <tr> <td>14.0</td><td>3.8</td><td>14.0</td></tr> </table>	Voltage Level (kV)	RoW (From the either side of the outer conductor (meter))	Safety clearance from the line unscreened conductor (meter)	2.5	2.5	2.5	3.5	2.8	3.5	14.0	3.8	14.0
Voltage Level (kV)	RoW (From the either side of the outer conductor (meter))	Safety clearance from the line unscreened conductor (meter)												
2.5	2.5	2.5												
3.5	2.8	3.5												
14.0	3.8	14.0												
Acquisition and Requisition of Immovable Property Act, 2017	Land acquisition and requisition in Bangladesh is governed by a) the Acquisition and Requisition of Immovable Property Act, 2017 (henceforth, the 2017 Act). The 2017 Act provides certain safeguards for the owners and has provision for payment of "fair value" for the property acquired. <i>Chapter 2: Acquisition</i>	Not applicable. This project doesn't require any land acquisition.												

Policy/Act/ Rules	Compliance Requirements	Applicability
	The Deputy Commissioner (DC) in all cases, determines the “market value” of acquired assets on the date of notice of acquisition (notice under Section 9 of the 2017 Act). The assessment of this market value is done considering the average price of immovable properties of the same class, with similar facilities and within the vicinity of the “to be” permanently acquired land and assets. The DC then adds 200% and 300% premium of the assessed value for cash compensation under law (CCL) of the land and assets including house for government and non-governmental acquisitions respectively. For any other losses as specified above, i.e. from (b) to 13, the DC adds 100% premium of the assessed value to pay as compensation. If land acquired has standing crops cultivated by tenants (bargadar) under a legally constituted written agreement, the law requires that part of the compensation money be paid in cash to the tenants as per the agreement. If there is a dispute regarding the amount of compensation, there is an option for arbitration and the procedures for such is in place. <i>Chapter 3: Requisition</i> When any property is required temporarily for a public purpose or in the public interest, the Deputy Commissioner can make a requisition of the property. The Deputy Commissioner may take possession of the property requested and use it for the purpose for which it was requested. The amount of compensation payable for the requisition of any property shall consist of: A recurring payment, in respect of the period of requisition, of a sum equal to the rent which would have been payable for the use and occupation of the property Such a sum may be found necessary to compensate the people interested in all or any of the following matters, namely: Expenses on account of vacating the requisitioned property. Expenses on account of re- occupying the property upon release from requisition; and Damage, other than normal wear and tears, caused to the property during the period of requisition, including the expenses that may have to be incurred for restoring the property to the condition in which it was at the time of requisition. If the persons entitled to compensation do not consent to receive or if there be no person competent to receive the compensation, or if there be any dispute as to the title to receive the compensation or as to the apportionment of it, the Deputy Commissioner shall keep the amount of the compensation in a deposit account in the Public Account of the Republic which shall be deemed payment of the compensation for the requisitioned property without any prejudice to the claim of the parties to be determined by the Arbitrator. Where any requisitioned property is released from requisition, the Deputy Commissioner shall restore it to	

Policy/Act/ Rules	Compliance Requirements	Applicability
	the person from whom the property was requisitioned or to his successor-in-interest or to such other person as may appear to the Deputy Commissioner to be entitled to such restoration.	
Wildlife (Conservation and Security) Act, 2012	This Act provides for the conservation and safety of biodiversity, forest and wildlife of the country by repealing the previous laws, i.e., the Wildlife (Preservation) Act of 1973. The Department of Forest (BFD) has the primary responsibility for implementing this Act. The key features of this Act are: • Prohibition is made in relation to wild animals and plants where no person can hunt any wild animal without a license or willfully pick, uproot, destroy or collect any plant. • Determination of vulnerable, endangered and critically endangered species of wild animals and plants. • Declaration of sanctuary for the conservation of forest and habitat of wildlife and prohibitions made on such sanctuary. • Requirement of license to cultivate, extract, manufacture, rear, export or import any wild animal or part of its body, meat, trophy, uncured trophy or any plant; and • Restriction on import, export and re-export of wild animals and plants.	There is no possibility of damage and disruption of wildlife species and their habitats due to the proposed activities for which mitigation measures need to be implemented.
The National Fisheries Policy, 1999 and Protection and Conservation of Fish Act, 1950 (as amended on February 16, 1995) and Rules, 1985.	The policy broadly aims at fisheries development, regulation of aquaculture, biodiversity conservation and formulation of laws to ban the disposal of any untreated industrial effluents into the water bodies. The act was promulgated for conservation of fish and their protection from indiscriminate fishing, poisoning due to industrial effluent disposal into water, oil spills, etc.	There are only a few water bodies near the Project area. Most of these water- bodies are home to many aquatic species. Therefore, the Protection and Conservation of Fish Act, 1950 and Rules, 1985 are both applicable for this Project. NESCO shall ensure that the aquatic species of this area are not adversely affected due to the project activities.
Noise Pollution (Control) Rules, 2006	The Noise Pollution Rules, 2006 addresses that the sound levels to be no more than 50dB in Silent Zones 4 during daytime (6 am to 9 pm) and 40 dB at night-time (9 pm to 6 am). In residential areas these levels are 55 dB and 45 dB, in mixed area 60 dB and 50 dB, in commercial and industrial areas 70 dB and 60 dB and in industrial areas 75 dB and 70 dB for daytime and night-time respectively.	Material transportation, earthworks, piling and vehicle movements will generate noise in and around the construction sites. Several of the substation sites are very close to residential receptors. NESCO should take these locations into consideration and abide by the Noise Pollution (Control) Rules 2006 by implementing mitigation measures.

Policy/Act/ Rules	Compliance Requirements	Applicability
Bangladesh Labor Act, 2006 (as amended through 2018)	Bangladesh's employment law is regulated by the 2006 Labor Act ("Act") amended up to 2018 and the 2015 Labor Rules ("Rules"). The laws and regulations prescribe working hours, weekly vacations, annual leave, medical leave etc. In addition, it also stipulates that children under 18 years are not allowed to be employed during the project life cycle in hazardous works. Chapters pertaining to occupational health and safety, and compensation due to accidents are entailed below: Health and hygiene - cleanliness of any facility, drinking water supply, ventilation, lighting, dust, etc. Safety - issues regarding safety of machinery, precautions in case of fire, fencing of machinery, work on or near machinery in motion, hoist and lifts protection of eyes, explosive and inflammable dust/gas etc. Special provisions related to health, hygiene and safety for hazardous operations Welfare - provisions to be facilitated in the facility regarding first aid appliances, safety record books, washing facilities, canteens, shelters, room for children, etc. Chapters - chapters pertaining to labor benefits and entitlements are as follows: • Condition of Service and employment • Employment of an Adolescent • Maternity Benefits • Working Hours and Leave • Wages and Payment • Workmen's Compensation for injury by Accidents • Trade Unions and Industrial Relations Regulation of Employment and Safety of Dock Workers	It is applicable because it provides health, safety and wellbeing of work force during project life cycle. NESCO shall ensure compliance with the provisions mentioned in this Act with respect to health and safety management, labor recruitment and working conditions.
Disaster Management Act, 2012	The Act specifies the duties and responsibilities of relevant Ministries/ Divisions of the Government and provides for the establishment of the high-level National Disaster Management Council (NDMC) headed by the Prime Minister and other committees at local levels.	Natural disasters such as earthquakes or thunderstorms may pose severe threats to the substations and transmission and distribution lines of this Project. NESCO shall have a contingency plan in case the Project is hit by a disaster during the construction or operational phase.
Fatal Accident Act, 1885	This Act was promulgated to provide compensation to families for loss occasioned by the death of a person caused by actionable wrong. The company will be liable to pay compensation in case of death of any worker/employee or damages in case death has not ensued, but such circumstances could have resulted in death.	NESCO shall ensure compliance with the provisions mentioned in this Act.
Bangladesh Fire Prevention and Extinction Act, 2003	According to the act every owner of the building takes precautions and other measures necessary for public safety. It clearly depicts, notwithstanding anything contained in any other law, without approval of the Directorate General of Fire Service and Civil Defense	It will directly be applicable for this project for construction and upgrading of substations, and other

Policy/Act/ Rules	Compliance Requirements	Applicability
	regarding fire prevention or extinction, no structural design or layout of multi-storied commercial building shall be approved or amended. For fire extinguish, water shall be collected from nearby any water bodies where the owner of these water bodies or any other person shall not give any objection to use.	infrastructures.
Balumohal and Soil Management Act, 2010.	In order to conduct dredging in any river area designated as Balumohal, the persons or organizations must obtain the required authorization (license) from the office of the Deputy Commissioner (DC) or the Bangladesh Inland Water Transport Authority. Anyone who does not obtain a license from the DC office faces jail time, a fine, or both.	It's not relevant to the project. The project will not undertake any dredging activities from any declared Balumohal. For landfilling, necessary compaction and surface runoff should be maintained to protect the surface water sources near the landfill site if required.
Bangladesh Standards and Guidelines for Sludge Management 2015	All equipment meeting the sample, and its solutions/extracts must exhibit a degree of cleanliness that permits determination of the PCB components within the scope of the detection limit of the procedure. This must be varied by regular blank tests and, if necessary, ensured by performing additional cleaning measures. • Standard laboratory equipment • Freeze-drying system • Capillary gas chromatography with electron captures detector (ECD) • Gas-chromatographic separation column Columns for preliminary liquid-chromatographic purification	Applicable as the project needs to manage PCBs during construction and operation periods.

36. Besides Bangladesh Labor Act 2006, based on the information available, below are some salient features of occupational health and safety laws and rules in Bangladesh as of June 2015.

Table 2-8: List of legislation relating to Occupational Health and Safety

Policy/Rules	Compliance requirements	Relevance to the project
The Bangladesh Occupational Safety, Health and Environment (OSHE) Policy 2013	The OSHE Policy was introduced in 2013 and provides guidelines for the promotion of occupational safety and health in Bangladesh. It aims to create safe and healthy working conditions for workers, prevent workplace accidents and diseases, and promote a culture of safety and health in the workplace.	It is directly relevance to the project for ensuring good housekeeping, and well beings of worker's health and safety and natural environment during construction and operation periods.
The Bangladesh National Building Code (BNBC)	The BNBC includes provisions related to the construction, maintenance, and safety of buildings, including workplace buildings. It sets standards for structural design, fire safety, electrical safety, and other safety measures to ensure safe working conditions in buildings.	It's directly relevance to the project. The project will involve construction of workshops, substations and other infrastructures.
The Bangladesh Fire Prevention and Firefighting Act 2003	The Fire Prevention and Firefighting Act establishes provisions for fire safety in buildings, including workplaces. It sets	It's directly applicable for this project to prevent fire accidents and arrangement of firefighting

Policy/Rules	Compliance requirements	Relevance to the project
	requirements for fire prevention measures, fire detection and suppression systems, emergency exits, and fire drills in workplaces to prevent fire accidents and ensure the safety of workers. According to the Fire Prevention and Extinction Act of 2003, a license from the Directorate General of Fire Service and Civil Defense is required for anyone wishing to utilize a facility as a warehouse or workshop. If this part is broken, there will be a three-year jail sentence or a fine, and the building and any belongings stored inside will be taken back. Notwithstanding anything in other laws, Section 7 states that no multi-story commercial building's structural design or layout may be allowed or changed without the Directorate General of Fire Service and Civil Defense's approval with reference to fire prevention or extinction. According to Section 18, breaking Section 7 will result in a six-month jail sentence or a fine.	equipment in the working areas particularly for workshops are mandatorily required.
Bangladesh Labor Act 2006	Provides safety for the workforce during the construction period. The act provides guidance on the employer's extent of responsibility and the workmen's right to compensation in case of injury caused by accident while working.	It is directly relevant to the project during construction and operation period.

Table 2-9: List of legislation relating to the Occupational Health and Safety

Policy/Rules	Compliance requirements	Relevance to the project
The Bangladesh Occupational Safety, Health and Environment (OSHE) Policy 2013	The OSHE Policy was introduced in 2013 and provides guidelines for the promotion of occupational safety and health in Bangladesh. It aims to create safe and healthy working conditions for workers, prevent workplace accidents and diseases, and promote a culture of safety and health in the workplace.	It is directly relevance to the project for ensuring good housekeeping, and well beings of worker's health and safety and natural environment during construction and operation periods.
The Bangladesh National Building Code (BNBC)	The BNBC includes provisions related to the construction, maintenance, and safety of buildings, including workplace buildings. It sets standards for structural design, fire safety, electrical safety, and other safety measures to ensure safe working conditions in buildings.	It's directly relevance to the project. The project will involve construction of workshops, and other infrastructures.
The Bangladesh Fire Prevention and Firefighting Act 2003	The Fire Prevention and Firefighting Act establishes provisions for fire safety in buildings, including workplaces. It sets requirements for fire prevention measures, fire detection and suppression systems, emergency exits, and fire drills in workplaces to prevent fire accidents and ensure the safety of workers. According to the Fire Prevention and	It's directly applicable for this project to prevent fire accidents and arrangement of firefighting equipment in the working areas particularly for workshops are mandatorily required.

Policy/Rules	Compliance requirements	Relevance to the project
	Extinction Act of 2003, a license from the Directorate General of Fire Service and Civil Defense is required for anyone wishing to utilize a facility as a warehouse or workshop. If this part is broken, there will be a three-year jail sentence or a fine, and the building and any belongings stored inside will be taken back. Notwithstanding anything in other laws, Section 7 states that no multi-story commercial building's structural design or layout may be allowed or changed without the Directorate General of Fire Service and Civil Defense's approval with reference to fire prevention or extinction. According to Section 18, breaking Section 7 will result in a six-month jail sentence or a fine.	
Bangladesh Labor Act 2006	Provides safety for the workforce during the construction period. The act provides guidance on the employer's extent of responsibility and the workmen's right to compensation in case of injury caused by accident while working.	It is directly relevant to the project during construction and operation period.

2.7 ADB's Safeguard Policy Statement, 2009

37. ADB's environmental and social safeguards form the cornerstone of its support for inclusive economic growth and environmental sustainability in Asia and the Pacific. In July 2009, ADB's Board of Directors approved the new Safeguard Policy Statement (SPS) governing the environmental and social safeguards of ADB's operations. The key safeguard areas which must be addressed are (i) environmental; (ii) involuntary resettlement; and (iii) indigenous peoples.

38. The environmental objectives of the SPS are to ensure the environmental soundness and sustainability of projects and to support the integration of environmental considerations into the project decision-making process." The objectives also include helping borrowers strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

39. ADB adopts a set of specific environment and social safeguard requirements that borrowers or clients are required to meet in addressing environmental and social impacts and risks associated with a specific project. ADB's environmental safeguards emphasize development and implementation of a comprehensive EMP. Key elements of EMPs are mitigation measures, monitoring programs, budgets, and institutional arrangements for implementation. In addition, the environmental assessment process emphasizes meaningful consultation, information disclosure, and consideration of alternatives.

40. ADB will not finance projects that do not comply with its safeguard policy statement, nor will it finance projects that do not comply with the host country's social and environmental laws and regulations.

41. The safeguard policy statement applies to all ADB-financed and/or ADB-administered sovereign and non-sovereign projects, and their components, regardless of the source of financing.

42. ADB's Safeguard Policy Statement (2009) defines the requirements to be followed with regards to project screening and classification, information disclosure, consultation and participation, due diligence, monitoring and reporting, local grievance redress mechanisms,

and ADB's Accountability Mechanism.

Table 2-10: Applicable ADB Safeguards Policies to the Project

#sl	ADB SPS 2009	Requirement	Relevance to the project
1.	Environmental Assessment	ADB's Safeguard Policy Statement (2009) requires screening as early as possible to (i) determine the significance of adverse impacts; and (ii) identify the level of assessment and institutional resources required; and (iii) determine disclosure requirements. A project's category is determined by its most environmentally sensitive component, including direct, indirect, cumulative, and induced impacts in the project's area of influence. Each project is scrutinized as to its type, location, scale, and sensitivity and the magnitude of its potential environmental impacts.	The IEE report discusses impacts associated with project activities.
2.	Environmental planning and management	As per this requirement, the borrower should prepare an environmental management plan (EMP) that addresses the potential impacts and risks identified by the environmental assessment. The EMP should include the proposed mitigation measures, environmental monitoring and reporting requirements, emergency response procedures, related institutional or organizational arrangements, capacity development and training measures, implementation schedule, cost estimates and performance indicators.	Project specific management and monitoring plans are also developed and discussed in the IEE Report.
3.	Information Disclosure	ADB's Safeguard Policy Statement (2009) requires information about environmental safeguard issues to be made available in a timely manner, in an accessible place, and in a form and language(s) understandable to affected people and other stakeholders, including the general public, so they can provide meaningful inputs into project design and implementation. For illiterate people, suitable communication methods will be used.	During project implementation NESCO will need to submit the following for posting on ADB's website: (i) final and updated IEE and corrective action plans upon receipt by ADB; and (ii) environment monitoring reports submitted by NESCO during project implementation upon receipt by ADB.
4.	Consultation and participation	ADB's Safeguard Policy Statement (2009) requires communities, groups, or people affected by proposed projects, and civil society to be engaged by NESCO through information disclosure, consultation, and informed participation in a manner commensurate with the risks to and impacts on affected communities. Meaningful consultation processes are defined as those that are, (i) beginning early in the project preparation stage and being carried out on an ongoing basis throughout the project cycle; (ii) providing timely disclosure of relevant and adequate information that is accessible to affected people; (iii) being free of intimidation and coercion; (iv) being gender inclusive and responsive; and (v) enabling the incorporation of all relevant views of affected people and other	Necessary consultations were held in the project areas of NESCO, and consultation summary added in the IEE report.

#sl	ADB SPS 2009	Requirement	Relevance to the project
		stakeholders in decision making.	
5.	Local grievance redress mechanisms and ADB's Accountability Mechanism	The borrower/client should establish a mechanism to receive and facilitate resolution of affected peoples' concerns, complaints and grievances about the project's environmental performance, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the affected people. Affected people can also take complaints to ADB's Accountability Mechanism as a last resort, although they should approach the local GRM in the first instance; but the GRM should not impede access to the country's judicial or administrative remedies.	NESCO has an established Grievance Redress Mechanism (GRM) system including a complaints box, online register, designated phone numbers for 24 hrs. etc. NESCO will use their existing GRM system to receive complaints, grievances from the affected people, consumers and others.
6.	Monitoring and reporting	ADB's Safeguard Policy Statement (2009) requires complying with national laws and regulations and implements the EMP as provided in the legal agreements, submitting periodic environment monitoring reports to ADB on their implementation performance.	Given the Project is category B for environment, NESCO is required to (i) establish and maintain procedures to monitor EMP implementation and progress toward intended outcomes; (ii) document and disclose environmental monitoring results, identifying necessary corrective actions, in periodic environmental monitoring reports; (iv) follow up on these corrective actions to ensure progress toward the desired outcomes; and (v) submit the periodic environmental monitoring reports as agreed with ADB. In this case semi-annual environmental safeguards monitoring reports are required to be submitted up until the completion of construction reverting to annual throughout the operation period until project closure. ADB will also monitor projects on an ongoing basis until a project completion report is issued.
7.	Unanticipated Environmental Impacts	If unexpected environmental impacts are discovered during project implementation, the borrower/client will either update the environmental assessment and EMP or create a new one to identify potential impacts, weigh alternative options, specify resources and mitigation strategies, and provide necessary support to address unanticipated issues during project implementation.	No such unanticipated impact is identified. However, if any unforeseen circumstances take place, corrective action should be taken by NESCO.
8.	Environmental Audit of Existing	Relevant external experts will conduct environmental audits when the project involves	NESCO has already conducted environmental

#SI	ADB SPS 2009	Requirement	Relevance to the project
	Facilities	ongoing operations or facilities to identify any locations where the project may create or is creating environmental risks or consequences. If no further significant expansion is anticipated, the audit serves as the project's environmental evaluation. Major components of an environmental audit report often consist of the following: The documents include: (i) an executive summary; (ii) a description of the facilities, including past and present activities; (iii) a summary of all applicable environmental laws, regulations, and standards at the local, state, and federal levels; (iv) an audit and site investigation procedure; (v) findings and areas of concern; and (vi) a corrective action plan that outlines the necessary corrective actions, along with a timeline and associated costs, for each area of concern.	audits of existing facilities including substations, augmentation of substations, bay extensions, switching stations, store sites, etc., and it has been added in EMP of the IEE report.
9.	Occupational and Community Health and Safety:	To ensure that workers are in a safe and healthy working environment, the NESCO will consider the risks that are specific to the industry in which they operate as well as the classifications of hazards that are present in their work locations, such as chemical, biological, and physical hazards, by (i) identifying and minimizing, to the extent that is reasonably practicable, the causes of potential hazards to workers; (ii) providing preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; (iii) providing appropriate equipment to minimize risks and requiring and enforcing its use; (iv) training workers and providing them with appropriate incentives to use and comply with health and safety procedures.	NESCO will take steps to prevent accidents, injury, and disease arising from, associated with, or occurring during the construction and operation periods.
10.	Bid and contract documents	In civil works contracts and bidding agreements, the borrower/client will include the safeguard requirements to guarantee that contractors appropriately carry out the agreed procedures. ADB and the borrower/client will devise and agree upon means to ensure that ADB's safeguard policy principles and requirements are completely complied with in cases where national safeguard rules and regulations deviate from the safeguard policy statement, including Safeguard Requirements.	NESCO will incorporate the EMP recommendations into the bidding and contract documents. Contractors will be responsible for complying with the EMP requirements and NESCO will supervise it accordingly.
11.	Conditions for Award of Contract and Commencement of Work	To ensure that contractors appropriately implement the agreed measures, the borrower/client will include the safeguard requirements in bidding documents and civil works contracts. Budgeting for safeguard requirements (design modifications, compensation payments, etc.) has been a major implementation challenge. Other issues have included (i) putting mitigation measures into place; (ii) making sure that safeguard plans are updated considering changes in scope and detailed engineering design; (iv) enhancing agency oversight at the contractor level; and (v)	NESCO will ensure that contractors appropriately implement the agreed actions mentioned in the conditions for awards of contracts.

#sl	ADB SPS 2009	Requirement	Relevance to the project
		guaranteeing sufficient ADB supervision and compliance monitoring, particularly oversight on the ground.	

2.7.1 ADB's Environmental Safeguards Categorization

43. **Category of the project:** Table below represents ADB's system of Project Categorization. Accordingly, this project has been categorized into Category B as no significant irreversible, diverse or unprecedented adverse environmental impacts are anticipated. The projected environmental impacts are site-specific and mostly will occur during the construction phase. They can be readily mitigated through the implementation of an Environmental Management Plan following national requirements and good international industry practice.

Table 2-11: ADB's Environmental Safeguards Categorization and Requirements

Category	Definition	Assessment Requirement
A	Likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented, and may affect an area larger than the sites or facilities subject to physical work.	Environmental Impact Assessment (EIA)
B	Likely to have adverse environmental impacts that are less adverse than those of Category A. Impacts are site-specific, few if any of them irreversible, and in most cases mitigation measures can be designed more readily than Category A.	Initial Environmental Examination (IEE)
C	Likely to have minimal or no adverse environmental impacts.	No environmental assessment is required but the environmental implications of the project will be reviewed.
FI	Project involves investment of ADB funds to or through a Financial Intermediary (FI).	FIs will be required to establish an Environmental and Social Management System (ESMS) commensurate with the nature and risks of the FI's likely future portfolio to be maintained as part of the FI's overall management system.

Source: ADB. Safeguard Policy Statement 2009, p. 19. <http://www.adb.org/sites/default/files/institutional-document/32056/safeguard-policy-statement-june2009.pdf>

2.8 Compliance with NESCO Health Environment and Safety Requirements

44. NESCO is dedicated to conducting business in a way that is safe, effective, and considerate of the environment. However, when it comes to routine compliance monitoring regarding environmental, health, and safety issues, NESCO has not yet developed any guidelines or policies pertaining to Environment, Health, and Safety (EHS). Furthermore, "An environment, social, and gender unit will be set up comprising of three staff, one environment focal, one H&S focal, and one social/gender focal to support NESCO with EMP implementation as part of the corporate organogram, but initially part of the PMU whilst awaiting management approval."

45. However, the project will follow the more stringent standards of national and international good practices related to environment, health and safety including those set out in the IFC Environment, Health and Safety (EHS) General Guidelines 30 (30 April 2007). Table 2.4 presents national and World Health Organization standards for noise and air quality referred to by these guidelines. The IFC EHS Guidelines for Electric Power Transmission and Distribution (30 April 2007) also need to be considered while designing the substations and transmission and distribution lines, and in undertaking the environmental assessment. These guidelines require consideration of terrestrial and aquatic habitat alteration, electric and

magnetic fields, hazardous materials, occupational health and safety and community health and safety. The project is required to comply with these guidelines regarding assessment of potential impacts and management measures, performance indicators and monitoring guidelines. As a project proponent, NESCO shall follow the IFC EHS Guidelines for this project and shall also ensure that all appointed contractors and their subcontractors follow these guidelines.

46. ADB's prohibited investment activities list will also apply. Thus, any use of CFCs, PCBs, and asbestos containing materials will be prohibited. In relation to child labor, considering capacity for supervision, no under 18s will be permitted to work on the construction site or in operational areas due to the hazardous nature of work involved.

2.9 Comparison of Environmental Safeguard Requirements between ADB and Bangladesh

47. Table 2-12 below presents a summary comparing the environmental safeguard principles/requirements of ADB and the government.

Table 2-12: Comparison of Environmental Safeguard Principles

ADB			Government	Gaps (if any)
No.	Principles	Delivery Process		
1	Use of screening process to determine the appropriate environmental assessment	Uses sector-specific rapid environmental assessment checklist for screening and assigns categories based on potential impacts: • A-EIA required (irreversible, diverse or unprecedented adverse environmental impacts) • B - IEE required • C - no environmental assessment required but a review of environmental implications • FI - ESMS required	ECA1 1995 and ECR, 2023 set screening criteria to classify industries/projects based on potential environmental impacts as follows: Green (pollution-free), Yellow, Orange and Red (environmental impacts). The screening criteria are based on project or industry type and do not consider the scale and location. The category determines the level of environmental assessment.	No major gaps, This IEE for Orange category project under ECR, 2023 is equivalent to an IEE for ADB category B project
2	Conduct an environmental assessment	• IEE - Identify potential impacts on physical, biological, physical cultural resources, and socioeconomic aspects in the context of the project's area of influence • Assess potential transboundary and global impacts, including climate change	Requirement for environmental assessment based on industry/project category. For the Orange category projects/industries, IEE is required.	No major gaps, this IEE has been prepared to meet national and ADB requirements
3	Examine alternatives	• For Category A projects analyze alternatives to the	Regulations (i.e., ECA1 1995 and ECR, 2023) do not require specifically the	No major gaps, not required by law or for ADB

ADB			Government	Gaps (if any)
No.	Principles	Delivery Process		
		project's location, design, and technology - Document rationale for selecting the project location, design, and technology - Consider "no project" alternative	identification and analysis of alternatives	category B project but discussion on analysis of alternatives has been included.
4	Environmental planning and management	- Follow the mitigation hierarchy – avoid, minimize, mitigate, offset - Key considerations include no significant harm to third parties, polluter pays principle, the precautionary approach and adaptive management. - EMP to include mitigation, monitoring, performance indicators, emergency procedures, capacity development, schedule, budget and implementation arrangements.	EMP and procedures for monitoring included in the IEE (i.e., for orange category projects)	No major gaps, the EMP has been prepared to meet national and ADB requirements
5	Carry out meaningful consultation and GRM	- Starts early and continues during implementation - Undertaken in an atmosphere free of intimidation - Gender inclusive and responsive - Tailored to the needs of vulnerable groups - Allows for the incorporation of all relevant views of stakeholders - Establish a grievance redress mechanism	- Public consultation is required as per ECR 2023 - Grievance redress mechanism is not mentioned in ECA1 1995 and ECR 2023 - IEE format required by DoE includes stakeholders' consultation	No major gaps for consultation, but no requirement for GRM. However, GRM is established per the ADB requirement
6	Timely disclosure of draft environmental assessment (including the EMP)	- Draft IEE prior to appraisal - Final or updated IEE upon receipt	No requirement for public disclosure of environmental reports but DoE posts the Minutes of the Meeting on the application for environmental clearance certificate to its website.	No requirement for public disclosure of environmental reports, but the IEE and environmental

ADB			Government	Gaps (if any)
No.	Principles	Delivery Process		
			http://www.doe-bd.org/minutes.php	monitoring reports will be disclosed in NESCO website per the ADB requirement
7	Implement EMP and monitor effectiveness	• Monitor and document progress on EMP implementation. • Corrective action if non-compliance is identified. • Disclose environmental monitoring report submitted by borrowers upon receipt	Environmental clearance is subject to annual renewal based on compliance of the conditions set by DoE	No requirement for public disclosure of environmental reports, but the IEE report will be disclosed in NESCO website per the ADB requirement
8	Biodiversity	• Avoid areas of critical habitats • Procedures for implementing projects in natural habitats, critical habitats, and Legally Protected Areas • Use of precautionary approach to the use, development and management of renewable natural resources	ECA1 1995 and ECR 2023 identifies ecologically critical areas and the rules to protect them	No major gaps, biodiversity impacts are considered in the IEE per national and ADB requirements
9	Pollution prevention and control	• Use pollution prevention and control technologies and practices consistent with good international practices • Refers to IFC/World Bank's Environmental Health and Safety (EHS) General Guidelines 2007 (or any update) • If national regulations differ, more stringent will be followed • If less stringent levels are appropriate in view of specific project circumstances, provide full and detailed justification	• Effluent standards, emission standards included in ECA1 1995 and ECR 2023 • Ambient air quality in Air Pollution Control Rules (APCR) 2022 • Ambient noise levels included in Noise Pollution Control Rules 2006	No major gaps but the most stringent levels will be applied to the project, pollution impacts are considered in the IEE per national and ADB requirements
10	Health and safety	• Provide workers with safe and healthy	Occupational health and safety standards included in	No major gaps, health and safety

ADB			Government	Gaps (if any)
No.	Principles	Delivery Process		
		working conditions Refers to IFC/WB EHS General Guidelines 2007 (or any update)	the Bangladesh Labor Law 2006 amended to 2018, and Bangladesh Labor Rules 2015.	risks are considered in the IEE report per national and ADB requirements
11	Physical Cultural Resources (PCR)	• Conserve Physical Cultural Resources (PCR) and avoid destroying or damaging them • Use of field-based surveys and experts in the assessment • Consult affected communities on PCR findings • Use chance find procedures for guidance	Preservation and protection of cultural resources are within the Antiquities Act 1968.	No major gaps, PCR impacts are considered in the IEE report per national and ADB requirements

ADB = Asian Development Bank, DoE = Department of Environment, EARF = Environmental Assessment and Review Framework, ECA1 = Environment Conservation Act, ECR = Environment Conservation Rules, EHS = Environmental Health and Safety, EIA = Environmental Impact Assessment, EMP = Environmental Management Plan, ESMS = Environmental and Social Management System, FI = Financial Intermediary, IEE = Initial Environmental Examination, NGO = Non-Governmental Organization, PCR = Physical Cultural Resources, ToR = Terms of Reference, WB = World Bank.

2.10 International and Regional Treaties, Agreements and Conventions

48. Bangladesh has signed and ratified most of the major international treaties, conventions and agreements. The Constitution of Bangladesh explicitly mandates to protect and improve the environment and to preserve and safeguard the natural resources, biodiversity, wetlands, forests and wildlife for the present and future citizens (Article 18A). A screening was carried out of these treaties regarding their applicability to this project. Key international/regional conventions and declarations agreements that Bangladesh is signatory to and relevant for the project are provided in Table below. The interventions proposed under the project shall be implemented in compliance with the requirements of these applicable international regional conventions and declarations to which Bangladesh is a party.

Table 2-13: Relevant Environment Related International Convention and Treaties

International Convention and Treaties	Status and remarks
International Labour Organization (ILO) conventions and protocol	ILO conventions and protocol conventions and protocol ratified by Bangladesh related to the core labor standards.
Stockholm Convention of Persistent Organic Pollutants (POPs) (1972)	This ensures environmentally sound management and the disposal of POPs including PCBs. Bangladesh signed this convention on 23 May 2001. The convention gives governments until 2025 to phase out "in-place equipment" such as electrical transformers containing PCBs, as long as the equipment is maintained in a way that prevents leaks. It grants them another three years to destroy the recovered PCBs. The recovered PCBs must be treated and eliminated by 2028.
Convention on the Conservation of Migratory Species of Wild Animals, Bonn, 1979 (Amended 1988)	This provides a framework for agreements between countries important to the migration of species that are threatened
Convention on International Trade in Endangered Species of Wild Fauna and Flora,	This provides a framework for addressing over harvesting and exploitation patterns which threaten plant and animal species. Under this convention governments agree to prohibit or regulate trade in

International Convention and Treaties	Status and remarks
Washington, 1973 (Popularly known as CITES)	species which are threatened by unsustainable use patterns
Protocol to the United Nations Framework Convention on Climate Change (Kyoto, 1992)	Applicable to achieve stabilization of greenhouse gas (GHG) concentrations in the atmosphere at a level low enough to prevent dangerous anthropogenic interference with the climate system, SF6 is a GHG used in gas insulated substations and switchgear.
United Nations Framework Convention on Climate Change (Rio De Janeiro, 1992)	Applicable as the proposed project might emissions GHG from project components from all GIS substations.
The Vienna Convention for the Protection of the Ozone Layer, 1985	The Vienna Convention, concluded in 1985, is a framework agreement in which States agree to cooperate in relevant research and scientific assessments of the ozone problem, to exchange information, and to adopt "appropriate measures" to prevent activities that harm the ozone layer.
Basel Convention (1993)	Applicable; Bangladesh is a signatory to Basel Convention but it did not sign the Basel Ban Amendment that deals particularly with wastes and hazardous wastes management and its transboundary movement.

2.11 Management Options of PCBs in Bangladesh

49. The project "Environmentally Sound Management and Final Disposal of PCBs¹²", funded by the Global Environment Facility (GEF), was implemented from August 2017 by the United Nations Industrial Development Organization (UNIDO) in Bangladesh. The project was nationally co-executed by the Ministry of Environment Forests and Climate Change (MoEFCC) /Department of Environment, Bangladesh. The main objective of this project is to assist the power sector of the country in fulfilling its obligation under the Stockholm Convention by reducing the release of PCBs to the environment and disposal of 500 tons of PCB containing equipment, oil and waste in an environmentally sound manner.

50. A preliminary inventory of PCBs and unintentionally produced POPs (uP-POPs) was established as part of the NIP project, which was supported by UNDP and the Ministry of Environment Forests and Climate Change (MoEFCC) with GEF as financing agency. The Department of Environment (DoE) of MoEFCC was the implementing agency of NIP project.

51. During the preparation of the original National Implementation Plan (NIP) in 2006 a preliminary inventory was carried out. There were no facilities for identification of PCB content in electrical equipment. There were also no environmentally sound management standards for handling, storage and service of PCB equipment. The UNIDO delegation's visit in 2013 has confirmed a lack of proper maintenance practice and storage standards for phase-out of operation equipment in transformer maintenance workshops in Bangladesh. The maintenance and repair of oil transformers is carried out without proper knowledge of PCB associated risks and potential cross examination of clean equipment with PCB. However, private sectors was active in the area of transformer oil regeneration. Neither legal nor regulatory framework on PCBs nor technical guidelines for the environmentally sound management of PCBs have been established in Bangladesh. From the given baseline scenario and without the project intervention, it is expected that new equipment will be contaminated further if not addressed and managed properly.

52. Additionally, there are no institutional and legislative policies specific to POPs, or to environmentally sound management of hazardous chemicals and wastes. The main legal base for environmental issues is given in the National Environmental Policy adopted in 1992. The main thrust of the policy is sustainability, including provisions for pollution prevention and corrective measures, and the enablement of framing new laws in all sectors necessary to control activities concerning environmental degradation (MoEF, 2005).

¹² <https://www.thegef.org/projects-operations/projects/4858>

3 Description of the project

3.1 Project Background

53. The Government has given top priority in power sector development and committed to providing access to electricity to all citizens across the country. To achieve this goal a number of reform measures were undertaken. As a part of this Reform Programs by way of unbundling the Power Sector and increasing efficiency by ensuring accountability and better services in the field of Generation, Transmission and Distribution through reduction of distribution system loss and strengthening the financial position, Northwest Zone Power Distribution Co. Ltd. was constituted as an electricity distribution company in August 2005 under the Companies Act, 1994 as a Public Limited Company. The Manpower of the Distribution, Northwest Zone (Rajshahi Division and Rangpur Division comprising of 16 districts and 47 upazilla excluding REB area) of erstwhile Bangladesh Power Development Board (BPDB) was put under 'Lien' being the employees of NWZPDCL on October 01, 2016. NWZPDCL signed the Memorandum of Understanding (MOU) and Provisional Power Sales & Purchase Agreement (PSPA) with BPDB on August 01, 2016. After signing the Agreements, the operational activities of NWZPDCL commenced on October 01, 2016, by taking over the distribution system of the then Distribution, Northwest Zone of BPDB. NWZPDCL commenced its functioning from October 2016 independently.

54. The company consists of seven (07) operation and maintenance (O&M) circles and 60 (sixty) distribution divisions/units. The maximum electricity demand of NESCO is about 896 MW. The electricity supply of the populations under NESCO area (2 million consumers) is provided by the existing 82 nos. 33/11 kV Sub-Stations whose capacity is 2221/2936 MVA. According to IEPMP 2023, NESCO area has seen a relatively high growth rate, annually 5.21%, in the last few years. It is expected to expand 5.1 times by 2050 and reach a demand of 4.4 GW.

55. So, it's clear that the population is demanding more and more electricity to be consumed day by day and hence, the distribution capacity should be strengthened parallel with their demand.

56. For efficient operation, utilities in developed countries including Japan are working on acquisition and analysis of data such as voltage, current and power factor. They try to optimize the configuration of the distribution line systems to minimize losses and to reduce the duration of outages. Digitizing information on operations and facilities is a key to achieving these objectives. Introducing high-speed communication technologies also supports them. In addition, to promote hybrid overhead/underground distribution system, it is necessary to follow international standards along with improved technologies to support construction of facilities, measurement technology specific to the system and technologies on the underground configuration. The following measures are proposed to improve the operational efficiency of facilities.

- Improvement of communication environment
- Facility management using GIS (Geographic Information System)
- Data management is integrated with DMS, DAS, SCADA and distribution simulation software
- Underground related technology (system configuration, equipment configuration, construction technology, and measurement technology)
- Ensuring cyber security at GIS, SCADA, DAS, DMS etc. systems

57. Meanwhile, demand side management (DSM) is also an effective measure for effective use of facilities. In areas where a large amount of RES, is connected to the grid, it is reported that net electricity demand, or total demand derived from difference between the actual electricity consumption and the amount of RES output deviates greatly from expected one to

depend on the time of day.

3.2 Project locations

Table 3-1: The working locations of the project

SL No.	Division	District	City Corporation/ Pouroshova/ Upazila	Remarks
1	Rajshahi	Rajshahi, Chapai Nawabganj, Natore, Pabna, Naogaon, Bogura, Joypurhat, Sirajganj	Poba, Godagari, Chapai Nawabganj, Sadar, Gomostapur, Shibganj, Nachole, Tanore, Natore Sadar, Pabna Sadar, Iswardi, Shirajganj Sadar, Bogura Sadar, Shibganj, Dupchachiya, Kahalu, Adamdighi, Jaypurhat Sadar, Naogaon Sadar.	Rajshahi City corporation and Pourashava under NESCO area of Rajshahi division.
2	Rangpur	Rangpur, Gaibandha, Nilp hamari, Kurigram, Thakur gaon, Lalmonirhat, Dinajpur, Panchagarh.	Gaibandha Sadar, Gobindaganj, Polashbari, Kurigram Sadar, Saidpur, Nilphamari Sadar, Joldhaka, Kishoreganj, Dimla, Lalmonirhat Sadar, Dinajpur Sadar, Parbotipur, Fulbari, Bochaganj, Thakurgaon Sadar Ponchogor Sadar, Debiganj, Hatibandha, Kaliganj, Patgram, Tetulia.	Rangpur City corporation and Pourashava under NESCO area of Rangpur division

Source: NESCO

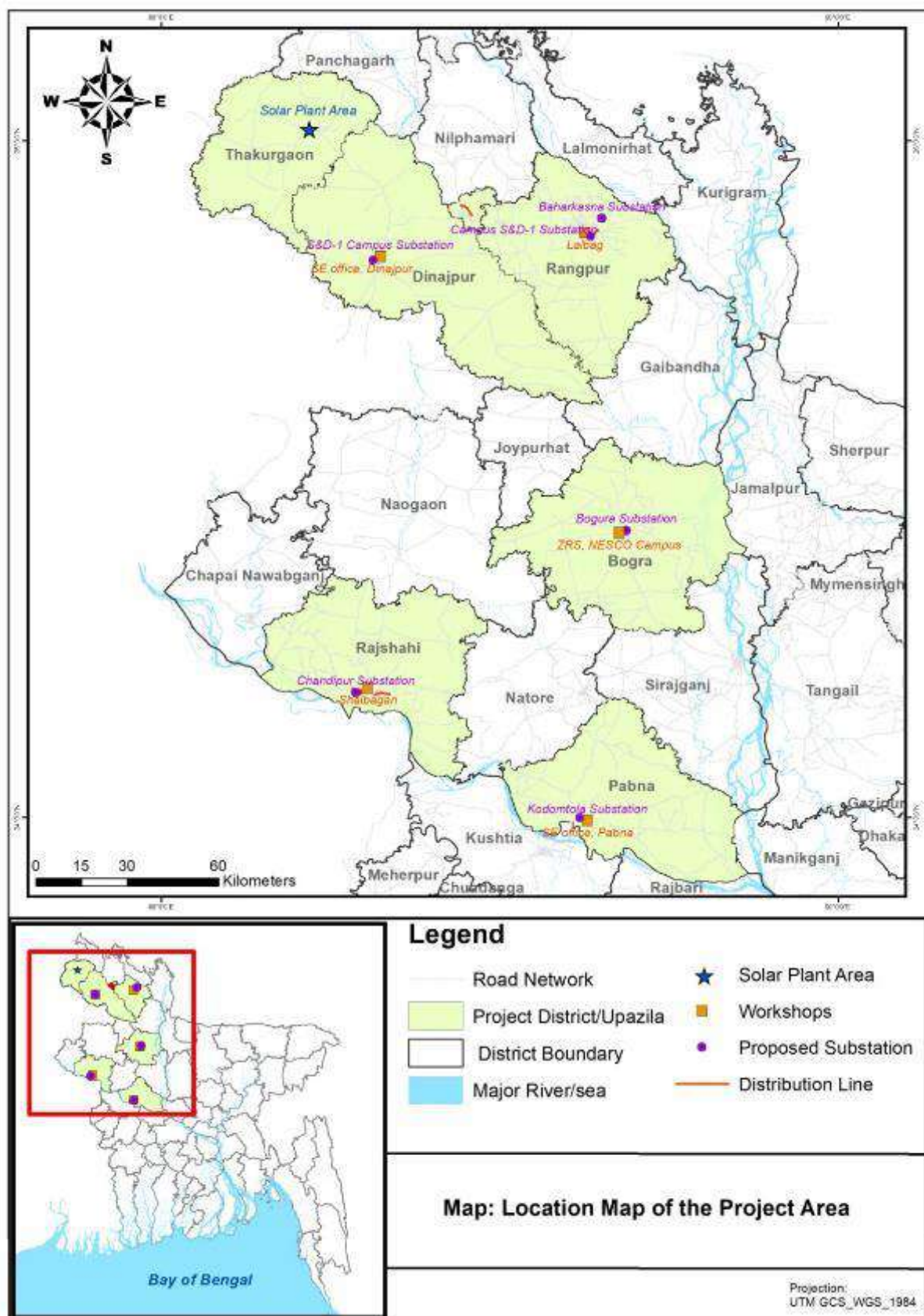


Figure 3-1: Project Working Areas

3.3 Project Components

58. The list of project components is given in Table below.

Table 3-2: List of project components

Name of Component	Major Activities
Component- 1: Distribution grid modernized and digitalized and readiness to integrate renewable energy resources increased.	• Establishment of disaster recovery center, and expansion of data center capacity. • Advanced Distribution Management System (ADMS) integration of power transformer monitoring units and intelligent electronic device with existing SCADA (supervisory control and data acquisition software), GIS (geographical information system).
Component- 2: Resilience of distribution network improved and adaptive capacity to respond to climate disasters enhanced.	• Installation of power transformer monitoring system and intelligent electronic device with fault detection system • Upgradation of 4 transformer repair workshops with sustainable process and waste management plan • Construction of 7 switching stations and 6 new 33/11 kV substations (3 GIS and 3 AIS), and upgradation of 10 existing 33/11 kV (9 AIS & 1 GIS) substations with GESI responsive designs.
Component- 3: Institutional capacity for disaster preparedness and gender mainstreaming increased.	• Provide basic training on disaster preparedness and response capacities to vulnerable communities • Support energy-based livelihoods through access to electrical appliances, technologies, and skills with a particular focus on women and disabled persons, • Strengthen NESCO's institutional capacity in terms of disaster preparedness, emerging smart grid technologies, operation and maintenance, environment, and safety.

Table 3-3: Physical features of new substations

Name of the proposed substations	Typical features								
	Transformer Capacity (MVA)	GPS coordinate	Land Ownership	Insulation Medium Power Circuit Breaker	Transformer	Control System	Communication System	Fault detector	Fire Protection System
Chandipur S& DD-2, Rajshahi	2*20/26 MVA GIS SS	24.36927 88.57466 83	NESCO	SF ₆ Gas	Oil Insulated	Both manual and automation	Optical fiber communication	Relays	Auto Fighting Water Spray System
S&D1 Campus (GIS), S & DD-1, Bogura	2*20/26 MVA GIS SS	24°50'55.99"N 89°22'29.22"E	NESCO	SF ₆ Gas	Oil Insulated	Both manual and automation	Optical fiber communication	Relays	Auto Fighting Water Spray System
Campus S&D-1, NESCO, Rangpur (GIS) S & DD-1, Shapla Rangpur	2*20/26 MVA GIS SS	25.74067 386, 89.25554 66	NESCO	SF ₆ Gas	Oil Insulated	Both manual and automation	Optical fiber communication	Relays	Auto Fighting Water Spray System
Kodomtola (GIS) S&DD-1, Pabna	2*10/13.33 MVA AIS SS	23°59'30.68"N, 89°15'32.85"E	Private land	VCB	Oil Insulated	Both manual and automation	Optical fiber communication	Relays	Auto Fighting Water Spray System
Baharkasna (S&D-3), Rangpur	2*10/13.33 MVA AIS SS	25°46'13.72" 89°18'2.34"E	Private land	VCB	Oil Insulated	Both manual and automation	Optical fiber communication	Relays	Auto Fighting Water Spray System
S&DD-1, office campus, Shuihari, Dinajpur	2*10/13.33 MVA AIS SS	25.77101 587, 89.30151 78	NESCO	VCB	Oil Insulated	Both manual and automation	Optical fiber communication	Relays	Auto Fighting Water Spray System
Noyagola GIS S&DD-1, Chapainabang (only Transformer)	1*20/26 MVA GIS SS	24°37'1.54"N 88°18'5.85"E	NESCO	SF ₆ Gas	Oil Insulated	Both manual and automation	Optical fiber communication	Relays	Auto Fighting Water Spray System

Source: NESCO

Table 3-4: Physical features of Bay extensions

SN	Name of the Proposed Substation	GIS location	Bay Extension Work		
			Bay Extension at another end SS	Future Required Bay	Locations
1	132/33kV Substation Nurpur, Pabna,	24.023537N 89.234008E	Bay breakers: 132/33 kV AIS bay extension at Nurpur Substation	33 kV-5	Nurpur, Pabna,
2	Jaynagar Grid, 132/33kV Substation, Ishwardhi, Pabna	24.0958611N 89.085011E	Bay Extension: 132/33kV AIS bay extension at Ishwardhi, Pabna	33 kV-3	Jaynagar, Iswardi, Pabna
3	Natore grid		Bay Extension: 132/33kv AIS Bay Extension at Natore.	33kv-1	
4	Rangpur grid	25.728784 N, 89.252020 E	Bay Extension: 132kV AIS bay extension at Lalbag, Rangpur grid	132kV: 2	Rangpur grid, Lalbag, Rangpur
5	Taraganj, Rangpur, 132/33kV Grid	25°48'39,6"N 89°6'2.4"E	Bay Extension: 132kV AIS bay extension at Taraganj, Rangpur	33KV-2	Taraganj, Rangpur
6	Shabgram, Bogura, 132/33kV Substation	24.868358N, 89.410684E	Bay Extension: 132kV AIS bay extension at Shabgram, Bogura,	33 kV: 4	Sabgram, Bogura
7	Mohasthangarh 132/33kV Substation, Bogura	24.959325N, 89.653548E	Bay Extension: 132kV AIS bay extension at Mohasthangarh, Bogura,	33KV: 2	Mohasthangarh, Bogura,
8	Puran Bogura, 132/33kV Substation	24.840685N, 89.350772E	Bay Extension: 132kV AIS bay extension at Puran, Bogura,	33 kV: 1	Puran Bogura, Bogura City
9	Dupchachia 132/33 kV (Bogura)	24.86649N, 89.162596E	Bay Extension: 132kV AIS bay extension at Dupchachia, Bogura,	33kV: 5	Dupchachia, Bogura
10	132/33kV Grid, Golarhat, Saidpur	25.812725N 88.884384E	Bay Extension: 132kV AIS bay extension at Golarhat, Saidpur	33kV: 3	Niyamatpur, Saidpur, Nilphamari
11	132/33kV Hatibandha Grid, Nilphamari	26.208975N, 89.087896E	Bay Extension: 132kV AIS bay extension at Hatibandha Grid, Nilphamari	132kV: 2	Hatibandha Grid, Nilphamari
12	32/33kV Amnura Grid, Chapainawabganj	26.634564N 88.401984E	Bay Extension: 132kV AIS bay extension at Amnura Grid, Chapainawabganj	33 kV: 2	Amnura Grid, Chapainawabganj
13	132/33kV Naogaon Grid	24.803365N, 88.964283E	Bay Extension: 132kV AIS bay extension at Naogaon Grid	132kV: 3	Naogaon Grid, Naogaon

Source: NESCO

3.4 Advantages and Disadvantages of GIS substations

59. Advantages of GIS substations¹³:

- **Safe:** Gas insulated Substations are very safe and operating personnel are protected by the earthed metal enclosures. While the Substation is in operating condition the Operating personnel can touch the compartment.
- **Reliable:** The complete enclosure of all live parts guards against any impairment of the insulation system.
- **Space Saving:** SF6 switchgear installations take up only 10% of the space required for the conventional installations.
- **Economical:** Initial high investment is required for installation, but the cost can be comparable for the less maintenance, reliable, safe operation against conventional substation.
- **Maintenance Free:** An extremely careful selection of materials, an expedient design and a high standard of manufacturing quality ensures a long service life with practically no maintenance requirement.
- **Low Weight:** Low weight due to aluminum enclosure, corresponds to low-cost foundations and buildings.

60. Disadvantages of GIS substations:

- Cost is higher compared to Air Insulated Substation (AIS) or conventional substation.
- Procurement of SF6 gas and supply of gas to the site is problematic.
- Normally this type of substation is an indoor type and requires separate building.
- Maintaining Cleanliness is very important. Dust or moisture inside the compartment causes the flash overs.
- When a fault occurs internally, the outage period will be very long. The damage effect will also be severe.

3.4.1 Site description of Switching Stations

61. The physical features of switching stations have been depicted below:

¹³ <https://discover.hubpages.com/technology/Gas-Insulated-Substation>

Table 3-5: Physical features of switching stations

Physical features	Name of the site						
	Pabna (PGCB 132/33 kV Substation)	Thakurgaon (PGCB Thakurgaon)	Chapainawabganj (PGCB substation)	Kathakali 132 kV PGCB, Kathakali	Rangpur (PGCB 132/3 kV Rangpur)	Purbosadipur (PGCB Purbasadpur 230/132/33	Hatibanda (Proposed 132/33 kV PGCB Hatibanda)
GPS coordinate	24.02364 N 89.2348 E	26.038661 N 88.4254701 E	24.58018 N 88.28962 E	24.36613 N, 88.67731 E	25.7284547 N 89.2523990 E	25.7540545 N 88.6787523 E	26.2079886 N 89.0886984 E
Area of Land (Sq.meter)	190	250	170	190	249.73	890.3	933.57
Landfilling Required (Cu.m)	231.65	NA	NA	NA	228.35	678.42	NA
Land ownership	NESCO	NESCO	PGCB	PGCB	NESCO	NESCO	PGCB
Address/village/upazila/zila/electric circle/electric division	Nurpur grid,Pabna sadar.	Harinariyan pur, Thakurgaon sadar	Kumar para, Chapai sadar	Katakhali, Rajshahi	Lslbag,Katwali Thana, Rangpur	Purbo Sadipur, Dinajpur	Shujhari, Dinajpur
Major Road	Pabna sadar upozila road (230m, East)	Power station to colony road (55m, North)	Rajshahi Nawebganj HWY (120m, North)	Dhaka-Rajshahi HWY 100m South	Dhaka-Rangpur HWY (230m east)	Rangpur-Dinajpur HWY 280m north	Rangpur- Dinajpur HWY (100m east)
Distance from nearest bazar/hat	Bil Baduria Bazar8.83m North	Kajipara market,250m South	Haripur marker (1100m, south-east)	Katakhali bazar west 300m	Lalbag bazar 700m North	dosmail bus stand (650m west)	Buttuli bazar 850m north
Distance from Nearest Archaeological/ religious site	150m, South	300m, North-East	150m South	250m west	200m west	150m South	300m -East
Available hospital facilities	4000m	4000m	650m	1050m	1050m	450m	200m
Land type	Unused land of NESCO (110%)	Unused land of NESCO (110%)	Unused land of NESCO (110%)	Govt. Land	Govt. Land	unused land of NESCO (110%)	unused land of NESCO (110%)
Demolition	NA	NA	NA	NA	NA	NA	NA
Educational Institute	200m	350m	605m	150m	850m	500m	600m
Distance from nearby surface water system (Khal)	NA	Dead shuk river900m, North	Mahanda river south 1200m	padma 2.5 km in south	NA	Dhepa river (2.33km west)	Dhepa river100m west
Nos of trees will be affected	Mango-3, Raintree-1	NA	NA	NA	Banana -8, Narkel -1	NA	(33)-mango-4, Lychee-8, Guava-4, papaya-8, Shegun-3, Neem1, Sajna-3

Source: NESCO

3.5 Detailed Design and Construction Works for Substations and Switching station & Bay extension

62. The following items should be considered in detailed design and construction work:
- Contractor and construction worker recruitment (it is anticipated that about 40-60 skilled and unskilled construction workers will be needed to build each substation or bay extension)
 - Survey work
 - Detailed design, including provision of seismic design, climate risk and adaptation, pollution control (e.g., 110% bunding of transformers, impermeable bunded oil and waste storage areas), safety (e.g., fire management) requirements
 - Establishment of construction camps for the workers
 - Establishment of temporary access routes (no new access roads, provision of signage etc.)
 - Establishment of material storage areas and work sites
 - Site clearance
 - Demolition works, where necessary (collection and removal of demolition waste)
 - Earthworks to create development platforms
 - Sourcing and transport of materials and equipment to site
 - Electrical equipment installation
 - First aid and firefighting arrangements
 - Testing and commissioning of electrical equipment

3.6 Phase-wise Activities of Construction Works

Table 3-6: List of phase-wise construction activities

Components	Activities		Operation period
	Pre-construction	During Construction	
Substations, Switching Stations and Bays	Tender documents preparation	Landfilling (184.52 m3) at Campus S&D-1, NESCO, Rangpur (GIS) S & DD-1, Shapla Rangpur. For construction of switching station at 231.65 m3 (Pabna PGCB 132/133kV SS), 228.35m3 (Rangpur PGCB 132/133kV SS) and 678.42m3(Purbosadipur PGCB 132/133kV SS, Dinajpur)	Operation and maintenance (O&M)
	Contractor and construction worker recruitment	Establishment of construction camps for workers	Implementation of Operational Health & Safety (H&S) and other Plans (EMP) throughout the operation period.
	Topographical survey	Establishment of temporary access routes	
	Soil investigation, including land contamination survey	Establishment of material storage areas and work sites	
	Asbestos survey (for demolition)	Demolition at Chandipur S& DD-2, Rajshahi (12' x 22' sq.ft., guard room); S&D1 Campus (GIS), S & DD-1, Bogura (40' x 50'-Vending Station) Campus S&D-1, NESCO, Rangpur (GIS) S & DD-1, Rangpur (25' x 30'- Void unused structure & space); and S&DD-1, office campus, Shuihari, Dinajpur (22675 sq.ft.)	

Components	Activities		
	Pre-construction	During Construction	Operation period
		Kodomtola S&DD-1 abandoned building -363.7m2	
	Detailed design Selection of construction camps and other temporary facilities Preparation of CEMP	Clearing site and site remediation Sourcing and transport of materials and equipment to site Civil and structural work (piling work, RCC work, control building installation) Equipment installation Testing and commissioning Implementation of CEMP with Construction Health & Safety (H&S) Plan and other subplans throughout	
Disaster recovery center (DRC) and Data center expansion	Electrical wiring and other pre-works activities	Installation of equipment	Implementation of Occupational Health and Safety and other plans (e.g., fire safety) following EMP.
Workshops	Tender documents preparation	Establishment of construction camps for workers	Operation and maintenance (O&M)
	Contractor and construction worker recruitment	Establishment of temporary access routes	Implementation of Operational Health & Safety (H&S) and other Plans (EMP) throughout the operation period.
		Establishment of material storage areas and work sites	
	Soil investigation, including land contamination survey		
	Asbestos survey (for demolition)	Shalbagan, Rajshahi-An abandoned tin shed store of 71.47m2, ZRS Bogura-10m2 long Wall need to demolish, Dinajpur-1535 sqft.	
	Detailed design	-	
	Selection of construction camps and other temporary facilities Preparation of CEMP	Site clearing and site remediation	
		Transport of materials and equipment	
		Civil works (Excavation/trench cutting, foundation, RCC works), concrete works	
Distribution Lines	Tender documents preparation	Establishment of construction camps for workers	Operation and maintenance (O&M)
	Contractor and construction worker recruitment		Implementation of Operational Health & Safety (H&S), community health and safety and other Plans (EMP)
		Establishment of material storage areas and work sites	
		Site clearing	

Components	Activities		
	Pre-construction	During Construction	Operation period
		Transport of materials and equipment	throughout the operation period.
		Civil works (Excavation), concrete works	
	Detailed design	Site clearing	
	Selection of construction camps and other temporary facilities		
	Preparation of CEMP	Pole replacement and stringing of conductors.	
Solar Rooftop	Tender documents preparation	Establishment of installation camps	Operation and maintenance (O&M)
	Contractor and construction worker recruitment	Using RTS (roof top survey) for assessing the suitability of a building roof for installation of solar panels.	Implementation of Operational Health & Safety (H&S), battery management and other Plans (EMP) throughout the operation period
	Selection of construction camps	Establishment of material storage areas and work sites	
	Civil works		
	Detailed design	Transport of materials and equipment	
		Installation of materials and equipment	

3.7 Work Schedule

63. The entire construction period for all elements of the project will be approximately 2 years. However, the estimated time will be extent or reduced based on field conditions. The details of the work schedule are in Table below.

64.

Table 3-7: Work schedule

Table 3-8: List of work schedule

Package No	Description of Procurement Package as per DPP/TAPP (Goods)	Unit	Quantity	Indicative Dates		
				Invitation for Tenders	Signing of Contract	Completion of Contract
Package-P1	Design, Supply, Installation, Testing and Commissioning of Lot 1: Data Center Extension	Lot	1	1 January 2026	30 June 2026	31 December 2027
	Lot 2: Disaster Recovery Center	Lot	1	1 January 2026	30 June 2026	31 December 2027
Package-P2	Supply, testing, commissioning, installation and training for operation & monitoring of IED with Fault Location in NESCO PLC & Integration with Smart Distribution System in NESCO	Lot	IED-320 Nos.	6 March 2026	6 September 2026	6 March 2028
Package-P3	Lot-1: Design, Supply, installation, Testing & Commissioning of 33 kv GIS Switching Substation at Rangpur	Lot	1	2 November 2025	2 April 2026	2 November 2027
	Lot-2: Design, Supply, installation, Testing & Commissioning of 33 kv GIS Switching Substation at Purbo Sadipur (Dinajpur)	Lot	1	2 November 2025	2 April 2026	2 November 2027

Package No	Description of Procurement Package as per DPP/TAPP (Goods)	Unit	Quantity	Indicative Dates		
				Invitation for Tenders	Signing of Contract	Completion of Contract
	Lot-3: Design, Supply, installation, Testing & Commissioning of 33 kv GIS Switching Substation at Katakali (Rajshahi)	Lot	1	2 November 2025	2 April 2026	2 November 2027
Package-P4	Lot-1: Design, Supply, Installation, Testing and Commissioning of 3 nos 2*20/26.66 MVA 33/11 kV GIS Substations (new) & 1 Nos. 33/11 kV GIS Substation Upgradation.	Nos.	3 Nos. New 2x20/26.66 33/11 kV GIS Substation Installation, Testing, Commissioning on turnkey Basis on NESCO's Own Premises at Chandipur (Rajshahi-2), Bogura (S&D-1) campus, S&D 1 Campur Rangpur at NESCO owned land and 1 Nos. upgradation of GIS Substation at Noyagola (S&D 1, Chapai Nawabganj)	24 April 2025	24 October 2025	24 April 2027
	Lot-2: Design, Supply, Installation, Testing and Commissioning of 1 nos 2*10/13.33 MVA 33/11 kV AIS Substation installation (new) at NESCO own land.	Nos.	1 nos 2*10/13.3 MVA 33/11 kV AIS Substation at S&D 1 Campus, Dinajpur.	24 April 2025	24 October 2025	24 April 2027
Package-P5	Lot-1: Design, Supply, Installation, Testing and Commissioning of 1 nos 2*10/13.33 MVA 33/11 kV AIS Substation (new) at Baharkasna under S&D-3, Rangpur with 11.6 km of source distribution line at NESCO areas.	Nos.	1 Nos. New 2*10/13.33 MVA 33/11 kV AIS Substation Installation, Testing, Commissioning on turnkey Basis at Baharkasna (S&D-3 Rangpur)	1 September 2026	2 March 2027	2 September 2028
	Lot-2: Design, Supply, Installation, Testing and Commissioning of 1 nos 2*10/13.33 MVA 33/11 kV AIS Substation (new) at S&D-1 Pabna with 8 km of source distribution line at NESCO areas	Nos.	1 Nos new 2*10/13.33 MVA 33/11 kV AIS Substation Installation, Testing, Commissioning on Turnkey Basis at Kodomtola (S&D1 Pabna).	1 September 2026	2 March 2027	2 September 2028
Package - P6	Design, Supply, Installation, Testing and Commissioning of 9 Nos. 33/11 kV AIS Substation Upgradation in Rangpur Zone	Lot	9 Nos. 33/11 kV AIS Substation Upgradation in Rangpur Zone	24 April 2025	24 Octobet 2025	24 April 2027
Package-P7	Lot-1: All necessary Equipment for 2 Nos Distribution Transformer repairing Workshop with Civil Works and Installation at Bogura & Rajshahi	Lot	Bogura- 1 Nos Rajshahi- 1 Nos	1 April 2026	1 October 2026	1 April 2028
	Lot-2: All necessary Equipment for 2 Nos Distribution Transformer repairing Workshop with Civil Works and Installation at Rangpur & Dinajpur	Lot	Rangpur- 1 Nos Dinajpur- 1 Nos	1 April 2026	1 October 2026	1 April 2028

Package No	Description of Procurement Package as per DPP/TAPP (Goods)	Unit	Quantity	Indicative Dates		
				Invitation for Tenders	Signing of Contract	Completion of Contract
Package-P-8	Design, Supply, installation, Testing & Commissioning of 33 kv Switching Substation installation & Shifting (AIS)	Nos.	4	2 November 2026	2 April 2027	2 November 2028
Package P-9	Lot-1: Design, Supply, Installation, and Commissioning of Bay requirements for future SS expansions at Sabgram, Mohasthan & Puran Bogura grid and grids in Rangpur Zone	Nos.	17	2 November 2025	2 April 2026	2 November 2027
	Lot-2: Design, Supply, Installation, and Commissioning of Bay requirements for future SS expansions at Dupchachiya and Naogaon grid substations, grid Substations in Rajshahi circle 1/2, Pabna Circle	Nos.	19	2 November 2025	2 April 2026	2 November 2027
Package-P-10	Design, Supply, Installation, and Commissioning of Distributed Solar PV System in Schools of Char Asariadoho & Alatuli (Rajshahi zone), Hatibandha & Patgram (Rangpur zone), Clinics (Char Alatuli/Ashariyadaha), Substations (which are included in ADB project), Data center (Rajshahi) and Disaster Recovery center (Rangpur) with Battery Energy Storage System (BESS)	Lot	Rooftop solar system installation on 16 nos schools, 3 nos community clinics and 15 nos 33/11 kv substation, 1 Data center and 1 Disaster recovery center.	1 October 2025	1 December 2025	30 June 2027

Source: DPP, NESCO JULY 2025

3.8 Site Surveys

65. For substation site preparation, a topographic survey along with soil investigation needs to be conducted. NESCO has already conducted soil investigation of the proposed Chandipur S& DD-2, Rajshahi, Kodomtola (GIS) S&DD-1, Pabna (New Land), S&D1 Campus (GIS), S & DD-1, Bogura, Campus S&D-1, NESCO, Rangpur (GIS) S & DD-1, Rangpur, Baharkasna (S&D-3), Rangpur, S&DD-1, office campus, Shuihari, Dinajpur, and Noyagola GIS S&DD-1, Chapainababgang (only Transformer).

66. For existing structures such guard room of 12' x 22' square foot at Chandipur S& DD-2, Rajshahi, vending station (40' x 50' square foot) at S&D1 Campus (GIS), S & DD-1, unused structure & space (25' x 30' square foot) at Campus S&D-1, NESCO, Rangpur (GIS) S & DD-1, Rangpur, and old buildings (22675 square foot) will be required to demolish for the construction of the above mentioned substations. So, asbestos survey will be required during the site preparation phase with an asbestos management plan.

67. In addition, environmental inventory survey was conducted at each component such as 07 nos of new substation sites at different locations, 8 nos of substation Augmentation/renovation sites, 14 different Bay extension sites, at 04 different areas for 4 new workshops sites, 8 switching stations sites, Zonal Office- Lalbagh, Rangpur, Rajshahi etc.

3.9 Resource Requirements- Water, Land, Power, Materials

Water Requirements:

68. Water requirements for the planned Sub-Stations, workshops etc., activities will be limited, primarily in the washrooms, and washing facilities in the workshops. So, the water will not be more stressed during construction and operation of the project.

Land Requirements:

69. The construction of 7 nos of new substation will be carried out on NESCO's land except Kodomtola (GIS) S&DD-1, Pabna (New Land), (23°59'30.68"N, 89°15'32.85"E), and

Baharkasna (S&D-3), Rangpur (25°46'13.72"N, 89°18'2.34"E) which are to be on private land. The bay extensions, and switching stations will take place on PGCB's land, and workshops will be on NESCO's land.

Power Requirements:

70. The adjacent substations will provide electricity to the construction workshops; nevertheless, the substations' power connections will be connected from the 132/33 kV PGCB's substations.

Materials Requirement: Most of the equipment to be installed will be provided from abroad for this Project. Procurement of domestic materials for this Project will be restricted to local materials such as bricks, sand, cement and poles from existing licensed facilities (e.g., quarries) which will be utilized for construction works. No new quarries or borrow area sources will need to be opened for this Project. Major items of equipment are listed in the Table below.

Table 3-9: Major Electrical Equipment

Item description	
33/11 kV, 20/26.66 MVA Power Transformer, 33/0.4 kV, 200 kVA Station Auxiliary Transformer, 36 kV, 1600 A, 31.5 KA, for 3 Sec outdoor type Vacuum circuit breaker along with accessories	
33 kV, Single phase Lightning Arrester (Polymer insulator, ZnO-type),	
33 kV busbar for the whole (existing new portion) substation with ACSR MARTIN conductor	
33kV & 11 kV Disc Insulator set with necessary suitable front and back connecting clamps	
Suitable Bus Bar Droppers, Conductors, connectors and outdoor marshaling kiosk, hardware clamps nuts bolts.	
a) Terminal Tension clamp with fittings, b) PG Clamp set for fixing the shield wire with the gantry steel structure, c) Support clamp.	
2x150 mm ² grounding copper conductor, Grounding rod (Earthing electrode) dia 16mm each 6 Meter length.	
33 kV Control Metering and Relay Panel for 33/11 kV, 20/26.66 MVA Power Transformer & Existing Renovation with relay Differential + 3 O/C + 1 E/F, 1 REF & 1 SEF, 33 kV Protection, Control Metering Panel for 33 kV Line Feeder with 2 O/C + 1 E/F Ins. + 2 Directional O/C + 1 Directional E/F.	
Sub-station galvanized steel structure materials 2 beam (fabricated), 2 tower (fabricated)	
11 kV 2000A, 31.5 KA for 3 sec Transformer incoming panel comprising 3 phase busbars 2500A including 11 kV CT (1800-900/5-5A), 11 kV PT, HV and LV isolating plug and sockets draw out type VCB with auxiliary switches operating mechanism etc.	
Overhead 11 kV 800A, 31.5 KA for 3 sec Line Feeder panels, comprising 3 phase busbars 2500A, including 11 kV CT (200-400/5-5A), two pole OC and single pole EF Relays for IDMT protection, Ammeters, Voltmeters, kWh m, HV and LV isolating plug and sockets draw out type VCB with auxiliary switches operating mechanism etc.	
12 kV Bus Coupler with riser unit comprising 3-Phase bus bars 2500A, VCB 2000A, 31.5 KA for 3 sec. 1-Phase CT of ratio 1800-900/5/5A. 2 O/C + 1 E/F Relays and all other accessories as required.	
11 kV PT panel including 11 kV Busbars HV and LV isolating plug and sockets and other accessories as necessary.	
11 kV 2x1Cx500 sq.mm XLPE (Cu) Power Cable for phase and 2x150mm ² XLPE Cu Cable for neutral (300+100); 11 kV, 3 core XLPE copper cable 185 Sq. mm per phase with 11 kV cable termination kits (indoor & outdoor both).	
11 kV, outdoor type line Isolator 800A, 31.5 kA for 3 sec. with earthing blade gang operated vertically break with supporting steel structure with necessary connectors and accessories.	
Substation Control, Protection, Automation and Metering Equipment, switchgear	
Steel Structures, Conductors, Insulators, Connectors of 132kV, 33 kV and 11 kV	

Source: DPP/TAPP, NESCO.

3.10 Pollution source and characterization

Table 3-10: Pollution source and characterization

Pollution category	Sources
Air emissions	Dust, exhaust gas: Construction sites- excavation, trenching, backfilling, and demolitions.

Pollution category	Sources	
Noise emission	Construction sites- excavation, trenching, backfilling, and demolitions, substation augmentation/ renovation sites etc.	
Waste: Hazardous waste and non-hazardous	<Hazardous waste> plastic fuel, oil, or chemical containers, transformer oil or solvent-soaked rags, broken or used electrical equipment (e-waste) <Non-hazardous waste> All household and kitchen garbage, packaging waste (plastics, paper, cardboard, wood, etc.), and building waste (concrete, brick, rubble, iron scrap, etc.)	Hazardous waste- Substation augmentation/ renovation sites; storage sites, labor campsites and construction sites. Non-hazardous waste: labor camp, storage areas, construction sites.
Water discharges	Grey water and surface runoff (rainwater)	Work camps will generate gray water during the construction phase, and the planned Sub-Station's pavement and building roofs will allow storm water or runoff to traverse the working areas.

3.11 Construction Activities

3.11.1 Construction of Substations and Switching station & Bay extension

Table 3-11: Construction of Substations and Switching station & Bay extension

Types	Brief description
Landfilling	- To prevent water logging during the monsoon seasons during the time of operation, the Campus S&D-1, NESCO, Rangpur (GIS) S & DD-1, Shapla, Rangpur, site will require landfilling at least three meters deeper than it is now. - This will require 184.52 cubic meters of sand, mostly loaded onto drum trucks, from approved vendors. To prevent surface runoff from settling and the water in the sand matrix from draining to the ground, bamboo shutters will be erected around the property.
Demolition of Existing Buildings	- A 12' x 22' guard room at Chandipur S& DD-2, Rajshahi; a 40' x 50' vending station at S&D1 Campus (GIS), S & DD-1, Bogura; a 25' x 30' (unused structure & space) at Campus S&D-1, NESCO, Rangpur (GIS), S & DD-1, Rangpur; and a 22675 square foot office campus at S&DD-1, Shuihari, Dinajpur are among the items that will be demolished during the construction period. - To minimize dust emissions, the interiors of the structures will be soft stripped whenever feasible, with windows and walls remaining in situ until the very end. Water will also be utilized to decrease dust. The demolition debris will be separated into different categories, such as solid, hazardous, and inert trash, before being taken off-site for disposal, recycling, or reuse. To minimize disruption to nearby properties, demolition operations will only be carried out during the day. Prior to the start of any noisy demolition, a notice will be given.
Site Clearance and Development Platform	- Substations, switching stations, and the Bay extension won't require any tree removal during construction, but other necessary clearing—like development platforms. - The contractor will level the soil on the site, use water to provide the necessary compaction, and import sand from approved suppliers to prepare the development platform.
Foundations	- The installation of the substation foundations will occur when the land has been cleared. To help design the foundations of the control buildings and other structures and to help choose the type of foundation treatment, geotechnical studies will be carried out during the site survey. - The specifications of the design will determine the excavation's depth. To backfill, the removed dirt will be stored. In addition to lowering the

Types	Brief description
	noise and vibration levels that the nearby properties will suffer, the results of the geotechnical study will be used to recommend the type of treatment, such as pre-cast RCC piling or in-situ concrete piling. Compared to other construction operations, the noise produced by using an auger or screw is significantly lower than that of impact and vibratory hammers, which can produce noise levels as high as 120 dB(A). The kind of soil will affect the quantity and depth of pilings. Compacted excavated soil and local sand from approved suppliers will be used for backfilling the excavated portion and foundation.
Control Building Construction	- Refurbishment of the current control building, control room, and a new two-story control building (300 square meters per floor) in each substation, 225 sq. meter per floor) containing an office space, switchgear room, and control room, Lighting, Small power, and ventilation and emergency DC lighting for GIS & Control building, control building with trench covers and cable supports, will be built. - The transformers will be installed on the ground floor of the Control Building. All the 33kV switchgear with Control cum relay panel, 11kV switchgear with Control cum relay panel and all other LV Panels are to be accommodated in second floor. The building must have provision for carrying and uplifting 33 kV and 11 kV Switchgear for emergencies. - There is enough space for 2 cars at the control building with the specification being the same as the service road. - The construction of substation buildings will involve the use of premium bricks, coarse sand, and cement up to the roof. - The building's roof, walls, and interior walls will all be plastered in compliance with the necessary three-week curing period. After that, the building's roof and walls will be painted with plastic paint or distemper. The building's windows, door shutters, and glass fittings will all get wood or Thai aluminum work done.
Sanitary Works and Water Supply System	- Such as sanitary laying of sewerage line of either polyvinyl chloride (PVC) or RCC, installations, fittings and fixtures of toilet accessories will be done in the buildings. - Sanitary waste will be managed through the existing municipalities sewerage network. The water supply system, where available, will be activated for the staff and the workers of the substation site during and after construction. Water will be supplied by installation of submersible underground water pumps.

3.11.2 Project Associated Facilities and Existing Facilities

71. The construction of the six (6) new substations (3 GIS and 3 AIS) with installation of 33.73 km of source distribution line at NESCO areas, 7 (seven) switching stations, thirty six (36) Bay extensions at 14 locations, ten (10) substation augmentations/renovations, four (4) new workshops, disaster recovery center (1), data center extension(1), etc. will be funded by the ADB. All the contract packages will be awarded for these project facilities following international competitive bidding and ADB procurement rules. The contractor will be required to comply with the EMP of the Project in undertaking these works. For these works, contracts will be locally awarded by NESCO following its own procurement rules. In addition, installing at Campus S&D-1, NESCO, Rangpur (GIS) S & DD-1, Shapla Rangpur substation will be undertaken by the NESCO. All these associated works have been assessed in the scope of this IEE, the EMP for them will also be followed by the contractors, under the supervision and monitoring of NESCO.

3.11.3 Testing and Commissioning of Equipment

72. Each piece of equipment will be tested in accordance with the standards and specifications after it has all been installed. If every test passes, the substations will be commissioned appropriately.

3.11.4 Reinstating the Site

73. The site will be restored, including the foundations and other areas near the boundary fence lines, when the substations are built, and the cables are laid and deployed.

3.11.5 Operation and maintenance of Substations

74. After commissioning is complete, the contractor will turn over the assets to NESCO. Nevertheless, if faults or defects in the engineering, design, materials, or workmanship are discovered and reported during the defect liability period, they will have to be fixed, repaired, or replaced. NESCO will be responsible to take care of the substations to handle asset O&M, conduct inspections, and perform any necessary repairs.

75. NESCO carries out maintenance and operations in accordance with its yearly plan, which is created annually. All cables, lines, and substations are covered by this design. The NESCO Standard Operating Procedures (SOPs), which are a component of the NESCO Integrated Management System (IMS), are followed for operation and maintenance. SOPs will be revised with assistance from the capacity development initiative.

3.11.6 Estimated Cost of the Project

76. The estimated cost of the project is given in Table below.

Table 3-12: Estimated Project Cost

Funding	Lac BDT	Million USD ¹⁴
Government of Bangladesh (GoB)	15992.76	13.11
NESCO	5967.30	4.89
ADB	96483.36	79.08
Total	118443.41	97.08

(Note: ADB has a grant portion of 2 million USD which is included through a TA project)

Source: DPP, NESCO

3.12 Workshops

3.12.1 Introduction

77. A total of 5 no of Transformer repairing workshops with civil works will be constructed under this project. The details are given in the Table below.

Table 3-13: List of workshops

Sl. No.	Name of the workshop	Type	Landowner ship	Demolition requirement	GPS location	Location
1	Shalbagan, Rajshahi	All new	NESCO	No	24°23'0.43"N, 88°36'34.37"E	Shalbagan, Rajshahi
2	ZRS, Bogura (Near Rest house)	All new	NESCO	No	24°50'29.97"N, 89°21'10.38"E	Near NESCO rest house, Bogura
3	Lalbag, Rangpur	Extension with equipment	NESCO	No	25°43'43.88"N, 89°15'10.73"E	Lalbag, Rangpur City
4	Dinajpur	All new	NESCO	YES (1535 sqft)	25°37'25.53"N, 88°38'20.05"E	Balubari, Dinajpur

Source: NESCO

¹⁴ 1 \$ = 122 BDT, Date: 14-05-2024

3.12.2 Physical features of workshops

Table 3-14: Site conditions of workshops

Type of features	Name of the site			
	Workshop Building, Lalbag, Rangpur	Shalbagan, Rajshahi	ZRS, Bogura (Near Rest house)	Workshop building, Balubari, Dinajpur
Area of land	678.18m ²	535.54 m ²	1025.55m ²	401.43m ²
Land Ownership	NESCO	NESCO	NESCO	NESCO
GPS Location	25°43'44.27"N 89°15'9.25"E	24°23'0.75"N 88°36'34.48"E	24°50'31.72"N 89°21'10.10"E	24°37'26"N 88°38'20"E
Major Road	National Highway- Dhaka to Rangpur Hwy (200m, East)	Highway- Rajshahi to Naogaon Hwy (200m, West)	Major Road- Shat Matha to WAPDA Road (2km, East)	Dinajpur-Rangpur Highway (200m- North)
Distance from home/residents	Town- Shantibag (230m, North)	Town- New Market (2km, North)	Town- Tin Matha (600m, west)	Dinajpur City (100m- West)
Distance from nearest bazar/hat	Market Area- Lalbag Bazar (800m, North)	Market- Shalbagan Bazar (500m, North)	Nair Uddin Bogra Khan Mazar (380m, West)	Bahadur bazar (750m-East)
Altitude	54m	35m	22.71m	35m
Distance from Nearest Archaeological/ religious site	N/A	300m, East	100m, East (Mosque)	130m-South (Mosque)
Available hospital facilities	1.5km (from right side)	550m from back side.	4000m from the left side.	300m from front side
Land type	Plain land	Plain land	Plain land	Plain land
Land filling	N/A	N/A	N/A	N/A
Agricultural land	N/A	N/A	N/A	N/A
Road accessibility	4m (local road)	7m (local road)	16m (Local Road)	5m from left side (Local Road)
Demolition/Loss of existing buildings/structures	N/A	An abandoned tin shed store of 71.47m ²	10m ² long Wall need to demolish and Some trees need to be removed.	Yes (1535 sqft)
Educational Institute	300m from the right side.	200m from right side	4000m from the left side.	200m from front side
Distance from existing OHT line	220 kV	220 kV- Adjacent (5m, East)	220kV (30m- South)	33/11kV-5m (West)
Distance from Wildlife sanctuary, national park, protected areas, ecological critical areas etc.	N/A	N/A	Reserve Forest (250m)	N/A
Distance from nearby surface water system (Khal)	N/A	340m from the back side.	150m from back side	Kanchannadi River (2km-West)
Nos of trees will be affected	N/A	3: Plum Tree (1), Guava Tree (1), Jack-Fruit (1), Mango (1)	11: Mahogany Tree (2), Mango (3), Jackfruit (6)	10: Jackfruit (4), Mango (3), Medicinal plant (2) and Mahogany (1)

Source: Site survey, 2024.

3.12.3 Civil works

Table 3-15: List of civil works

SL. No	Item Name	Total Area/Quantity				
		Rajshahi	Bogura	Pabna	Rangpur	Dinajpur
1	Distribution Transformer Repairing Workshop Building	6739 sqft.	6,990 sqft.	6,990.	1000 sqft.	6,990 sqft.
2	Overhead Electric travelling crane	1 no	1 no	1 no	1 no	1 no
3	Storage Area For- (i) PCB Suspected Transformer (Fenced and Bounded Concrete Area). (ii) Storage Area for Non-Repairable Transformers or Auction Area. (iii) Storage Area for Repairable Transformers	3,500 sqft.	3,500 sqft.	3,500 sqft.	3,500 sqft.	3,500 sqft.
4	Waste oil collection System & Air Exhaust System with minimum 3 Air Filter in each.	1 set	1 set		1 set	1 set
5	Other equipment & Test sets	Lot	Lot		Lot	Lot

3.12.4 Major Equipment

Table 3-16: List of major equipment for workshops

Sl, No.	Major Items
1	High Voltage Testing Set (30 kV)
2	Transformer Oil Breakdown Test Set(80kV)
3	Oil Centrifuging Machine (2000 LPH)
4	Digital Insulation Tester (0-10 kV)
5	Winding Machine (HT)
6	Moisture Containing in Transformer test set.
7	Clip on meter
8	Secondary Current Injection Test Set 100 Amp
9	Drying and Heating Chamber 5m×3m×2.5m
10	Chain Pulley Block
11	Gas Welding Set
12	Electric Arc Welding Set
13	Dissolve Gas Analyzer.
14	Core cutting Machine

3.12.5 Estimated cost

Table 3-17: Estimated cost of construction of workshops

SL No	Workshop Name				Total Price (Lac Tk)
1	Rajshahi	Distribution	Transformer	Repairing Workshop	970.03
2	Bogura	Distribution	Transformer	Repairing Workshop	970.00
3	Rangpur	Distribution	Transformer	Repairing Workshop	804.51
4	Dinajpur	Distribution	Transformer	Repairing	977.24

	Workshop	
Total		3,721.79

Source: DPP, NESCO

4 Environmental and Social Baseline

4.1 Introduction

78. As a part of the environmental assessment of the proposed project, an environmental baseline study has been carried out. This section includes the existing environmental baseline status of the Project area, covering both the natural and social environments. The analysis was completed using a combination of secondary data sources in addition to baseline studies to establish an understanding of the environmental and socio-economic baseline of the Project areas.

79. The likely impacts on the environment are based on the actual and foreseeable project activities. For the impact assessment, wherever necessary, professional judgment, experience, and knowledge of similar projects will be used. Data for this chapter were collected from:

Secondary Sources: This included data from literature reviews, maps, and monitoring reports.

Primary Sources: This included gathering information from field surveys, laboratory analysis, and public consultations in the project area.

80. The baseline condition of environmental quality in the locality of the project site serves as the basis for the identification, prediction, and evaluation of impacts. Data was collected from secondary sources for the macro-environmental setting like climate (temperature, rainfall, and humidity), physiography, geology, etc. Firsthand information has been collected to record the micro-environmental features within and adjacent to the project area.

81. The following section describes the baseline environment into four broad categories. The categories are Physical Environment, Biological Environment, Environmental Quality, and Socio-economic environment.

4.2 Location Setting and Extent

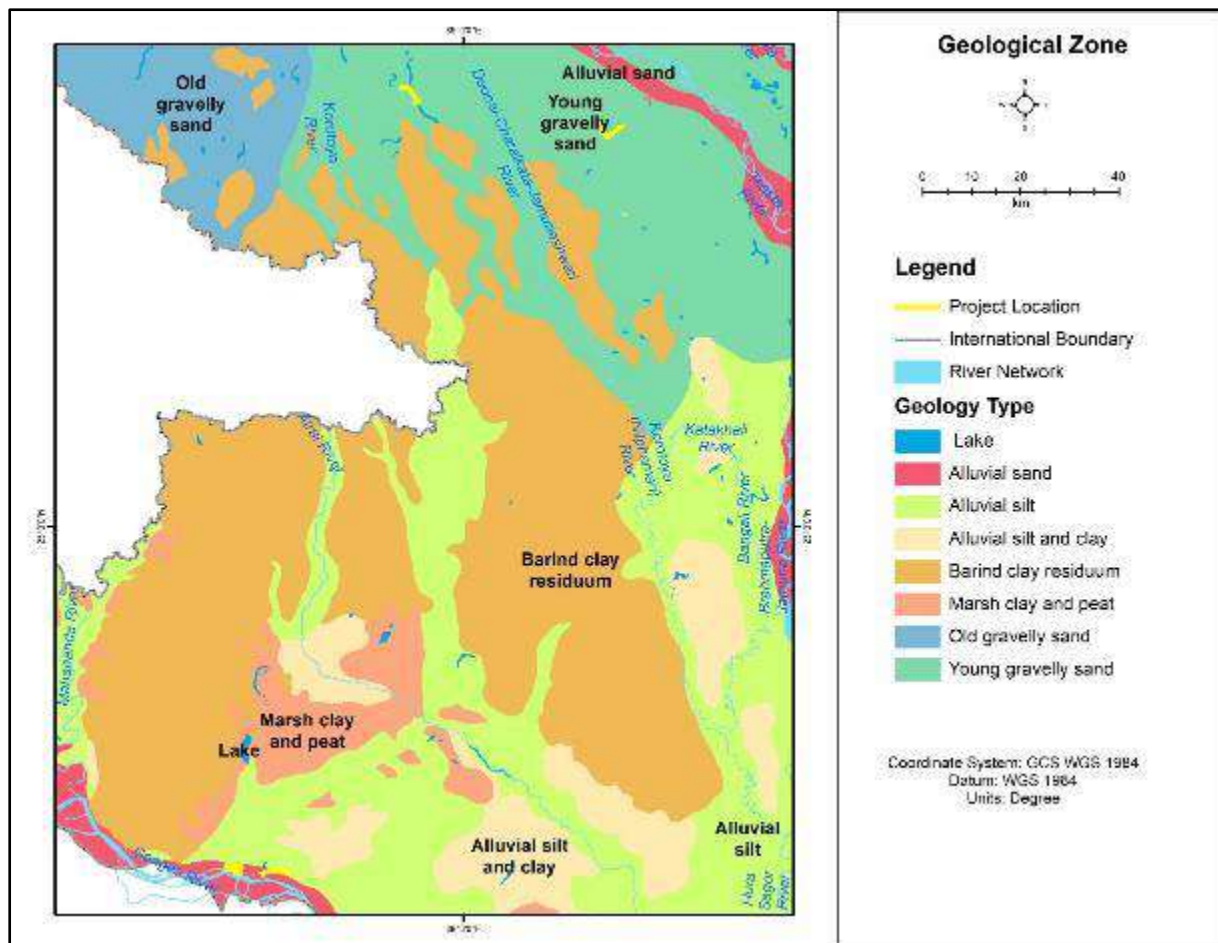
82. The Proposed project working areas covering different parts of the country which stretches a number of districts in Bangladesh. The project components are distributed mainly 16 districts, namely Rajshahi, Chapai Nawabganj, Natore, Pabna, Naogaon, Bogura, Joypurhat, Rangpur, Gaibandha, Nilphamari, Kurigram, Thakurgaon, Lalmonirhat, Dinajpur, Panchagarh.. The districts are characteristically almost the same in terms of ecology, biodiversity, and geology. The small physiographical differences among the districts are also mentioned and explained in the baseline section as appropriate. The project areas or Area of Influence (AoI) have been considered to analyze the existing physical, environmental, ecological, and social environment.

4.3 Physical Environment

4.3.1 Geology and Topography

Geology

83. According to the Geological Survey of Bangladesh (GSB), the proposed project area falls into the following geological units “Alluvial Sand”, “Alluvial Silt” and “Alluvial Silt Clay” and “Young Gravelly sand”.



Source: Geological Survey of Bangladesh, 2001

Figure 4-1: Geological map of Bangladesh showing the project area

84. **Alluvial sand:** Sand is generally surrounded and constitutes channel, bar, and levee deposits along rivers and larger tributaries. Brahmaputra River sand ranges in size from coarse to fine, Padma and Meghna River sand is medium to fine. Grain size decreases generally from north to south and away from channels. Brahmaputra sand contains mostly quartz, feldspar, mica, and significant amounts of heavy minerals, indicating that the sands are first-cycle sediments from the Himalaya Mountains and the Shillong Plateau. Ganges sand contains fewer heavy minerals; its composition reflects source areas in the Himalayan Mountains and the Indian Shield. Meghna sand contains quartz-rich, reworked sediments from sandy Tertiary rocks in the Fold Belt mixed with sediments derived from igneous rocks of the Shillong Plateau.

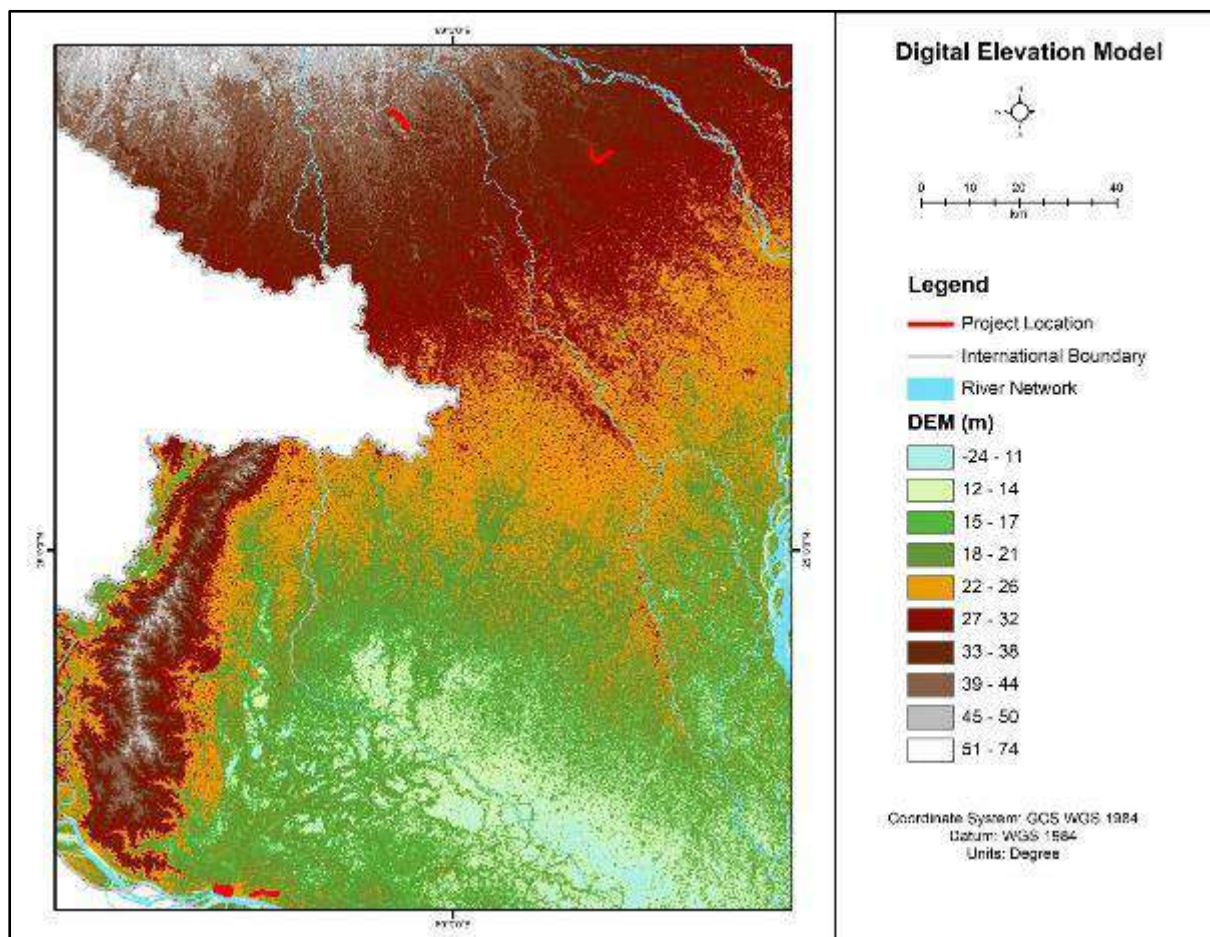
85. **Alluvial silt:** Light- to medium-grey, fine sandy to clayey silt. Commonly poorly stratified; average grain size decreases away from main channels. Chiefly deposited in flood basins and inter stream areas. The unit includes small back swamp deposits and varying amounts of thin, interstratified sand deposited during episodic or unusually large floods. Most areas are flooded annually. Included in this unit are thin veneers of sand spread by episodic large floods over floodplain silts.

86. **Alluvial silt and clay:** Medium to dark grey silt to clay, color is darker as the amount of organic material increases. The map unit is a combination of alluvial and paludal deposits, including flood-basin silt, back swamp silty clay, and Organic-rich clay in Sag ponds and large depressions. Some depressions contain peats. Large areas underlain by this unit are dry only a few months of the year.

Topography

87. Most of Bangladesh is plain land except the hilly regions to the east and northeast. The plain land mainly consists of fluvial-deltaic sediments deposited by the Padma, the Brahmaputra (currently named Jamuna), and the Meghna River systems.

88. The elevation of the major part of the floodplain ranges from 3 to 5 meters. As the floodplains approach the Himalayas from the northern part of the Chattogram District the elevation gradually increases.



Source: Geological Survey of Bangladesh, 2001

Figure 4-2: Digital Elevation Model of the project activity areas

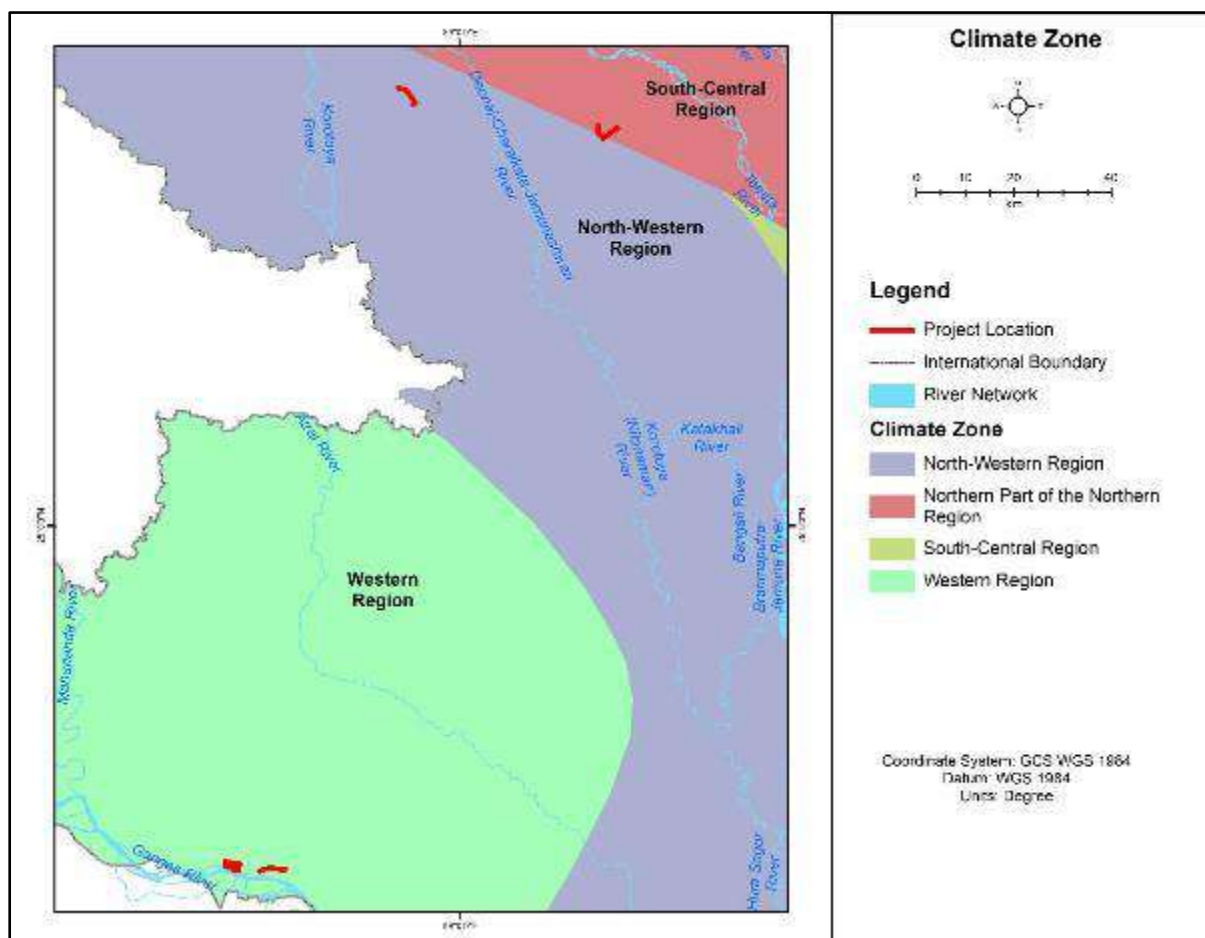
89. A digital elevation model (DEM) or 3-D representation of the terrain surface of the study area is shown with a height range in Source: Geological Survey of Bangladesh, 2001

90. . The contour of the study area is generated from the Advanced Space Borne Thermal Emission and Reflection Radiometer (ASTER) relief maps. Topo sheets were not available for the study area and therefore all the relevant information was extracted from the Shuttle Radar Topography Mission (SRTM) DEM only. All the processing was done with the ARC GIS 10.1 software. The contour map derived from DEM shows that the topography of the study area is in a relatively plain land region. The highest elevation levels are 21 m whereas the lowest is - 24 m.

4.3.2 Meteorology and Climate Change

91. Climatic sub-regions of Bangladesh are presented in **Error! Reference source not found.** and project location falls under the Western Region, Northwestern region, and Northern part of the northern region. The climate of Bangladesh is heavily influenced by the Asiatic monsoon. The monsoonal influence results in three distinct seasons:

- Pre-monsoon hot season (from March to May).
- Rainy monsoon season (from June to September); and
- Cool dry winter season (from October to February).



Source: Rashid, Haroun Er, 1991

Figure 4-3: Climatic zones in Bangladesh

92. Northern part of the northern region (C) This is an area of extremes. In summer the mean maximum temperature is well above 32°C whereas in winter the mean minimum is below 10°C. The summer is dry, with a scorching westerly wind, but the rainy season is very wet, with 2,000 to 3,000 mm of rainfall.

93. North-western (D) Except that the extremes are less, and the rainfall is lower, this zone is like the northern part of the northern region. The lower rainfall makes this area both atmospherically and pedologically drier.

94. Western region (E) comprises the greater Rajshahi district and parts of adjacent districts. This is the driest area in Bangladesh with rainfall generally below 1,500 mm and summer humidity less than 50%. In summer, it is the hottest and driest of all climatic zones. The mean summer maximum temperature is over 35°C.

95. Bangladesh is in the tropical monsoon region, and its climate is characterized by high temperatures, heavy rainfall, often excessive humidity, and fairly marked seasonal variations.

Temperature, Rainfall, and Humidity of the Proposed Project Areas:

96. January is the coldest month in Bangladesh. However, the cold winter air that moves into the country from the northwestern part of India loses much of its intensity by the time it

reaches the northwestern corner of the country. Average temperatures in January vary from about 17°C in the northwestern and northeastern parts to 20°-21°C in the coastal areas. In late December and early January, the minimum temperature in the extreme northwestern and northeastern parts of the country reaches within 4 to 7 degrees of freezing point.

97. Average temperatures in April vary from about 27°C in the northeast to 30°C in the extreme west-central part of the country. In some places in Rajshahi and Kushtia districts, the maximum temperature in the summer season rises to 40°C or more. After April, the temperature decreases slightly during the summer months, which coincides with the rainy season.

98. The lowest average relative humidity (57%) was recorded in Dinajpur in March. The least humid months in the eastern areas are January to March. Here the lowest monthly average of 58.5% was recorded at Brahmanbaria in March. The relative humidity is everywhere over 80% from June through September. The average relative humidity for the whole year is 70.5% at Pabna.

4.3.3 Natural Hazards (Geological and Climate)

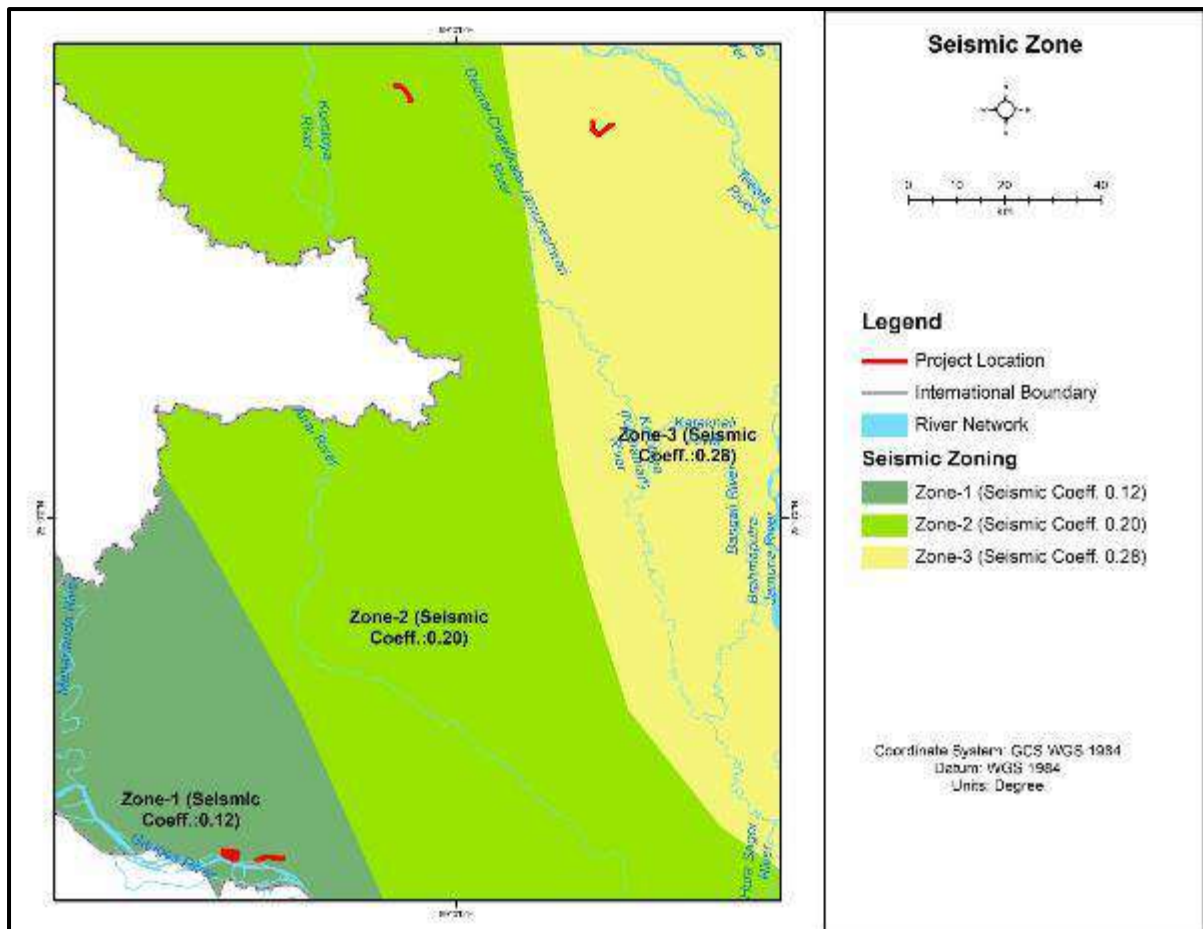
Seismic Activity:

99. Bangladesh has continually been one of the seismically active regions of the world and has experienced numerous large earthquakes during the past 200 years.

100. Many seismic tectonic studies have been undertaken on the area comprising the Indo-Burman ranges and their western extension in northern India. A seismic zoning map of Bangladesh was proposed in 1979 by the Geological Survey of Bangladesh (GSB) dividing the country into three seismic zones which was accompanied by an outline of a code for earthquake-resistant design. Later, a new updated seismic zoning map and detailed seismic design provisions were incorporated into the Bangladesh National Building Code (BNBC, 1993).

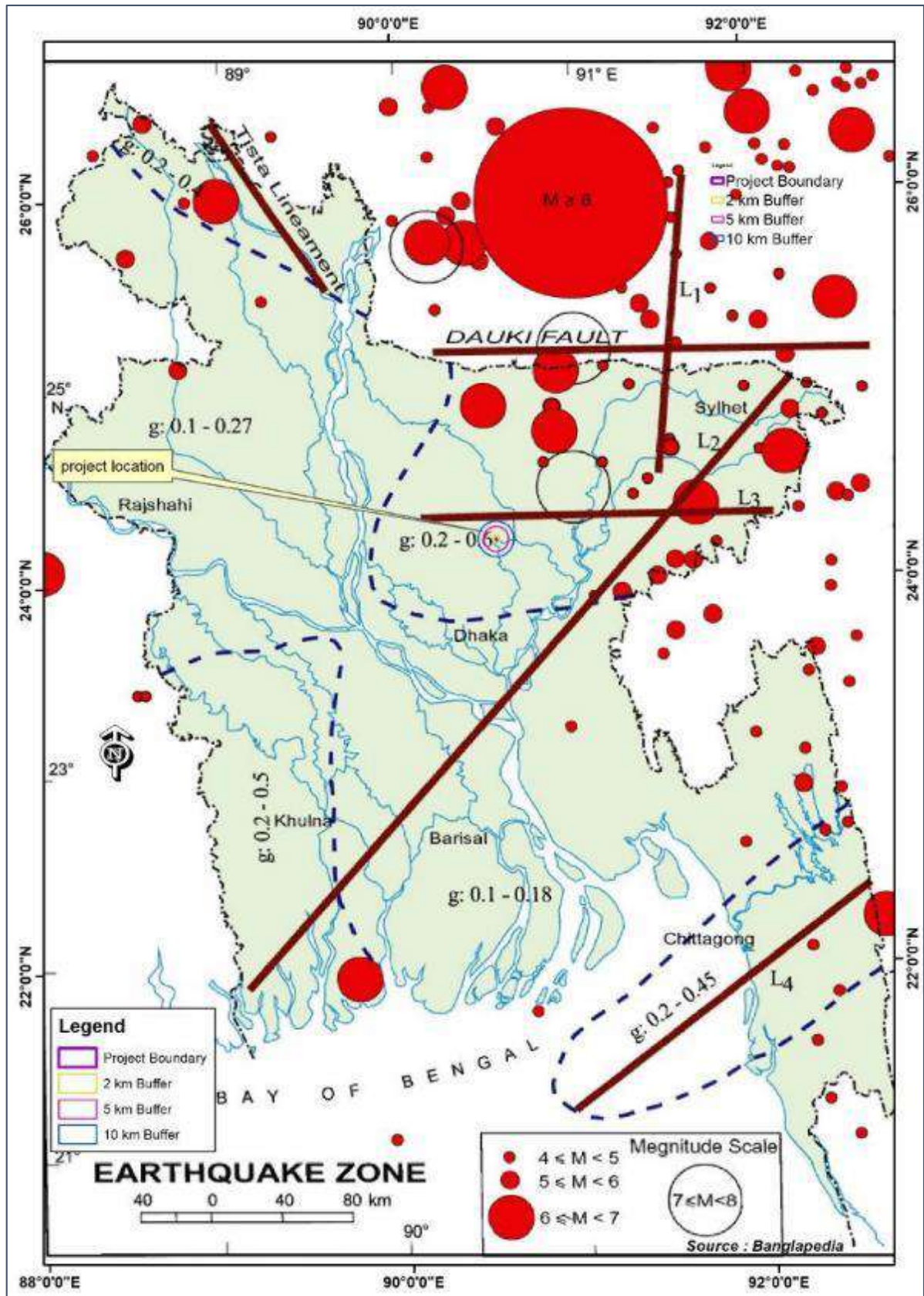
101. Based on the severity of the probable intensity of seismic ground motion and damages, Bangladesh has been divided into three seismic Zones: Zone I, Zone II, and Zone III as shown in Figure 4.4. with Zone III being the most severe.

102. The subproject locations are fall under all three zones where the seismic zone coefficient for this area is $Z_{III}=0.28$, $Z_{II}=0.20$ and $Z_I=0.12$. Zone III has vulnerability for earthquakes with a risk of a possible earthquake reaching magnitude up to seven on Richter Scale. The historical seismic intensity and locations along with fault line are shown in Figure 4.5.



Source: BNBC 2020

Figure 4-4: Map showing Earthquake Zones of Bangladesh with the project area

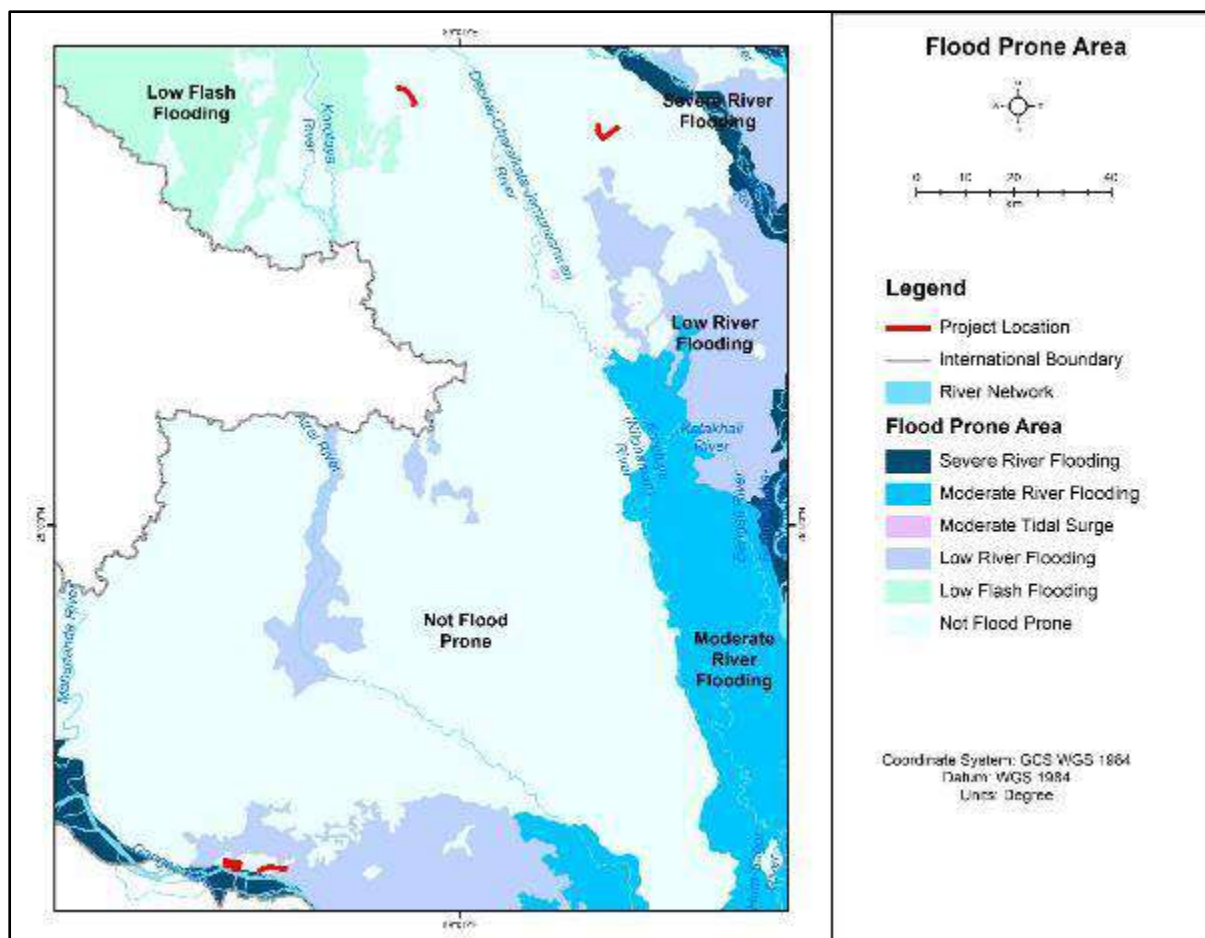


Source: Geological Survey of Bangladesh (GSB)

Figure 4-5: Seismic intensity and the historical records of earthquake in and around Bangladesh

Flood:

103. The map of the flood-prone area in Bangladesh is shown in **Error! Reference source not found.** Due to the geographical location of the project, the area is not flood prone.



Data Source: BARC.

Figure 4-6: Flood Map of Bangladesh with project area

104. Floods are an annual phenomenon in Bangladesh. Normally the most severe floods occur during July and August. There are four types of floods in Bangladesh (DMB, 2010):

- Monsoon floods along major rivers during the monsoon rains (June-September).
- Flash floods caused by overflowing of hilly rivers of eastern and northern Bangladesh (Normally during April-May and September-November).
- Rain floods caused by drainage congestion during heavy rains; and
- Coastal floods caused by storm surges

Storms:

105. All the project areas experience various types of storms throughout the year due to their geographical location and climate.

Nor' westers (Kalbaishakhi):

106. Nor' westers, locally known as Kalbaishakhi, are thunderstorms that occur during the pre-monsoon and monsoon seasons in the project areas, typically from March to June. These storms are characterized by strong winds, thunder, lightning, and heavy rainfall.

107. Nor' westers often provide relief from the scorching heat of the pre-monsoon period but can also cause damage to crop, infrastructure, and property due to lightning strikes, gusty winds, and torrential rains.

Tornadoes:

108. Although relatively rare compared to nor 'westers, tornadoes occasionally occur in the project areas, particularly during the pre-monsoon and monsoon seasons. Tornadoes are

characterized by rotating columns of air extending from thunderclouds to the ground.

109. Tornadoes can cause localized destruction, including damage to buildings, trees, and crops, as well as injuries and fatalities. They often occur in association with severe thunderstorms and convective weather systems.

Hailstorms:

110. Hailstorms, although less common than other types of storms, can occur in Bangladesh, especially during severe thunderstorms associated with nor 'westers or other convective weather systems. Hailstorms can damage crops, vehicles, and infrastructure, particularly in the project areas.

Drought:

111. Droughts are common in the northwestern districts of Bangladesh (i.e. Barind Tract) in recent decades. Rainfall is comparatively less in Barind Tract than in the other parts of the country. However, drought can also occur in areas that usually enjoy adequate rainfall and moisture levels. Inadequate pre-monsoon showers, a delay in the onset of the rainy season or early departure of the monsoon may create drought conditions in Bangladesh. The eastern part is prone to drought mainly because of rainfall variability in the pre-monsoon and the post-monsoon periods.

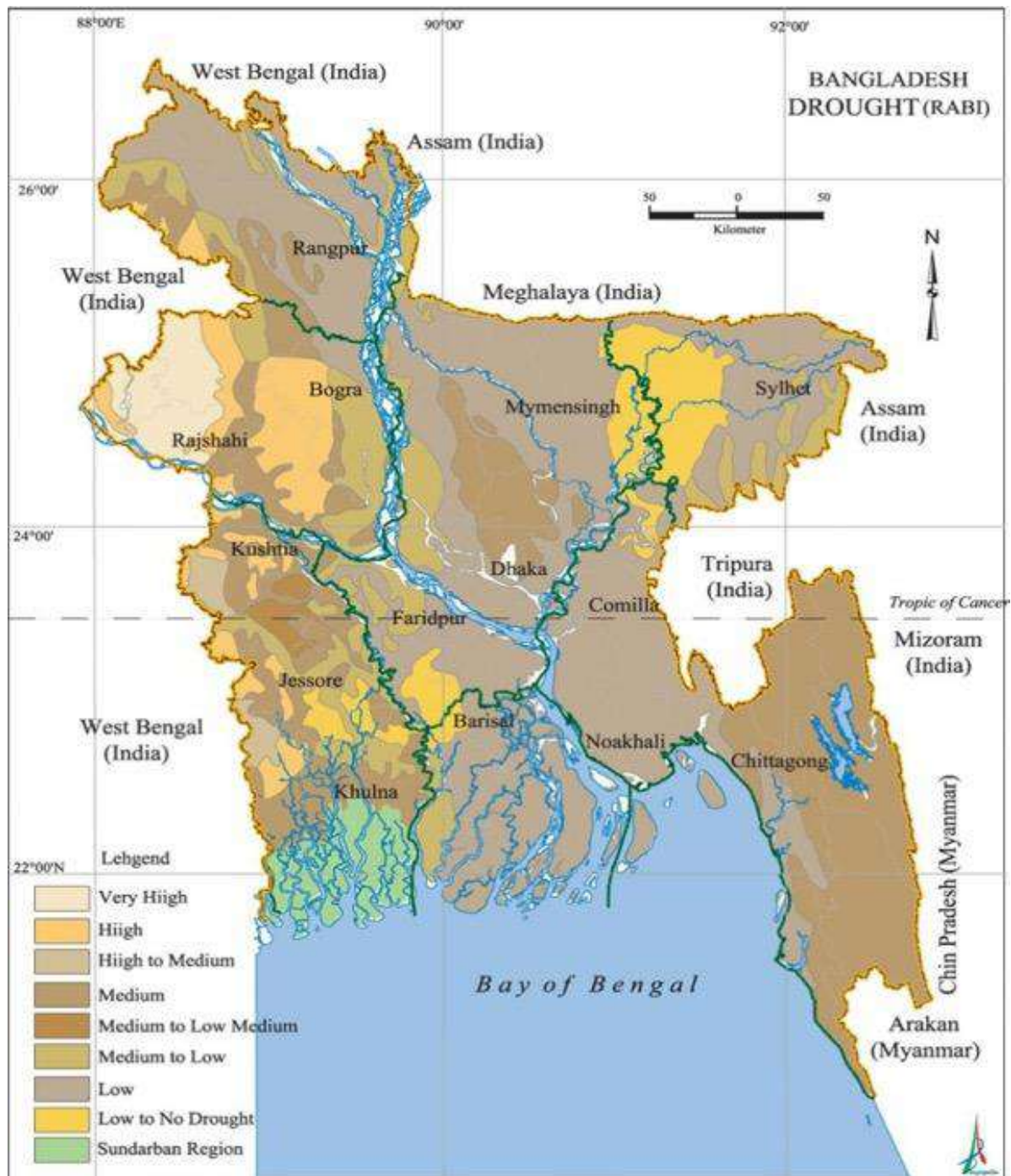


Figure 4-7: Drought Map of Bangladesh

4.3.4 Water Resources

112. Bangladesh and the western portion of the Indian State of Bengal are located within the 'Bengal Basin'. This basin includes the world's largest river delta, which occupies some 140,000sq km (the Ganges-Padma, Jumna-Brahmaputra-Tista and Meghna rivers and numerous tributary complexes), as well as the world's largest submarine fan complex (the Bengal Fan). These river systems have a combined annual sediment load of 1.5 to 2.4 billion metric tons per year.

113. The headwaters of both the Ganges-Padma and Brahmaputra-Jamuna-Tista River systems are situated in the main Himalayas ranges. Water for the Meghna River, originating from the Shillong Plateau, drains one of the heaviest rainfall areas of the world. Flooding is an

annual occurrence in Bangladesh mainly during the rainy season from May to October.

114. In Bangladesh, rainfall and trans-boundary river flows are the main sources of surface water. Bangladesh has an average annual surface flow of approximately 1,073-million-acre feet (MAF), of which about 870 MAF (93%) is received from India as inflow, and the remaining 203 MAF (7%) as rainfall. This magnitude of water is sufficient to cover the whole of Bangladesh to a depth of 9.14m. Approximately 132 MAF (65% of rainfall and 12% of total) is lost in evaporation (114.30 cm) and the remainder, approximately 5million cubic feet (MCF) flows out to the Bay of Bengal which includes a sediment load of 1.5-2.4 MCF.

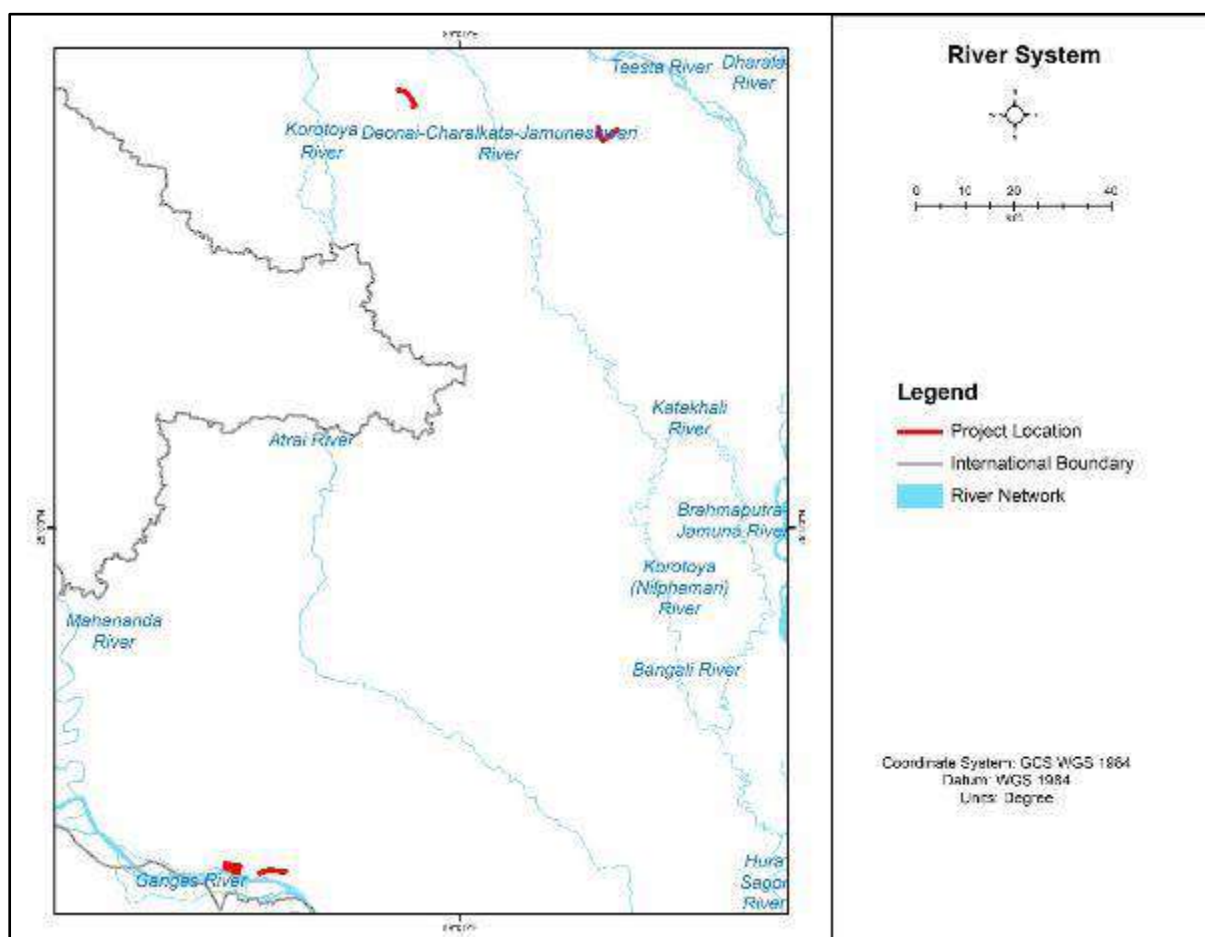


Figure 4-8: Map shows the River System of the study area

115. **Rajshahi:** Rivers in Rajshahi, there are ten rivers in this district, totaling 146 km in length. The main river is the Padma (Ganges). Other rivers include Mahananda, Baral and Barnai.

116. **Pabna:** The district is intersected by rivers of varying magnitude. The river system, though, is constituted by the Padma and the Jamuna with their interlacing offshoots and tributaries. Besides these flowing streams, the interior has the abandoned beds of old rivers, most of which are dry except in the rain.

117. **Bogura:** There are many rivers in the Bogra District. Karatoya is the central divider of the water channel in the district. The other rivers may be classified into the eastern and western systems. Some of the major rivers in this district are Bangali, Jamuna, Nagar, Tulshiganga, Ichamoti.

118. **Rangpur:** Rivers in Rangpur, including Tista, Jamuneshwari, ghaghat, karatoya,

Chikali, Akhira.

119. **Dinajpur:** The main rivers of the district are the Dhepa, the Punarbhaba, and the Atrai rivers.

120. **Chapainababgang:** The main rivers in Chapai Nawabganj district, Bangladesh are the Ganges and the Mahananda.

121. **Panchagarh:** The Main rivers: Karatoya, Atrai, Mahananda, Tangon, Dahuk, Patharaj, Talma, Nagar.

122. **Gaibandha:** The main rivers: Brahmaputra, Jamuna, Tista, Karatoya, Bangali, Ghaghat.

123. **Nilphamari:** The main rivers Tista, Jamuneshwari, Buri Tista, Ghagat.

4.3.5 Physiography

124. Physiography is the description including form, substance, arrangement, and changes of especially, natural features. According to the Physiography of Bangladesh, the study area falls under the physiographic unit of the Ganges River Floodplain, Tista Floodplain, and Barind Tract.

Tista floodplain:

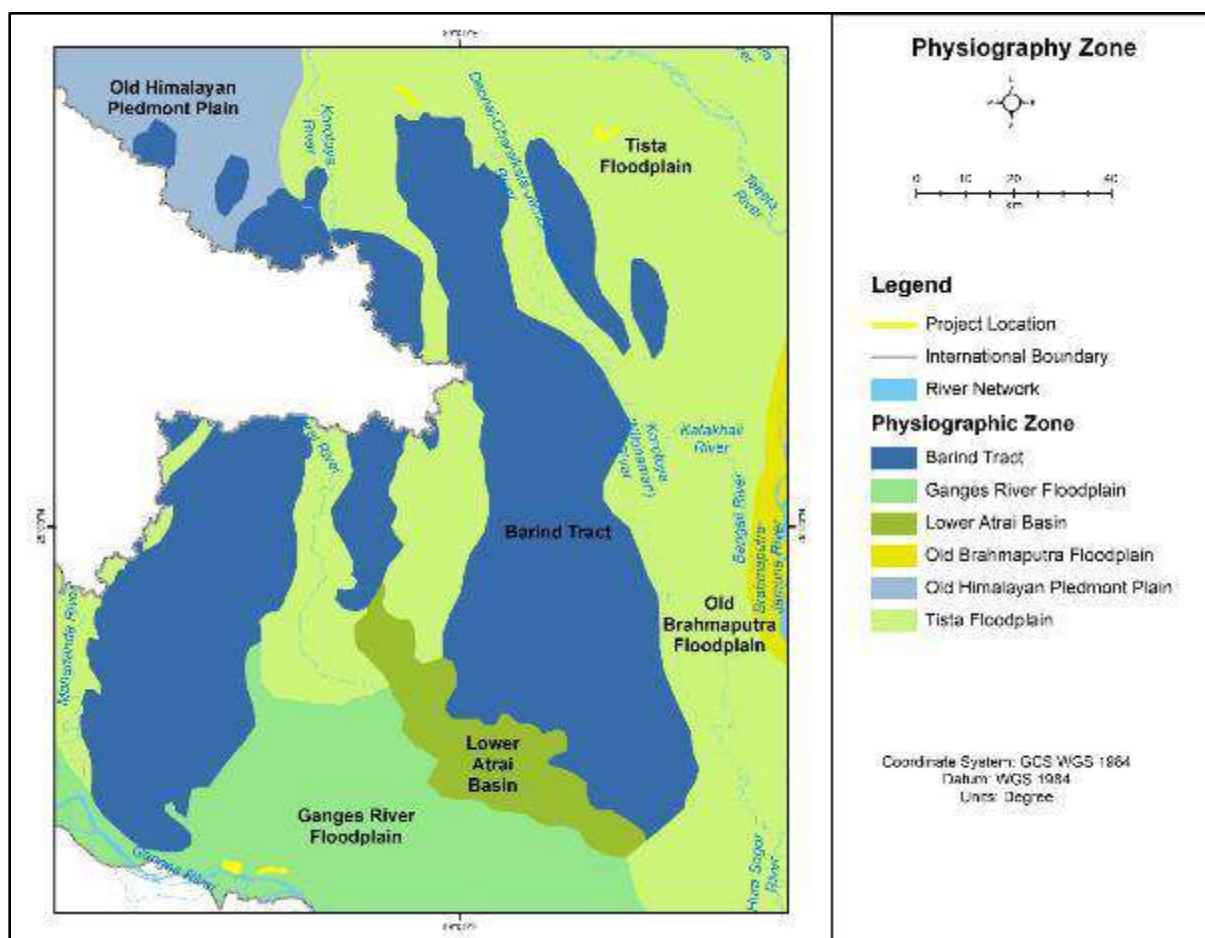
125. A big sub-region stretches between the Old Himalayan Piedmont Plain in the west and the right bank of the N-S flowing Brahmaputra in the east. An elongated outlier representing the floodplain of the ancient Tista extends up to Sherpur (Bogra district) in the south. Most of the land is shallowly flooded during monsoons. There is a shallow depression along the Ghaghat river, where flooding is of medium depth. The big river courses of Tista, Dharla, and Dudhkumar cut through the plain.

The Ganges River floodplain:

126. The Ganges River floodplain comprises the active floodplain of the Ganges and the adjoining meander floodplain. The latter mainly comprises a smooth landscape of ridges, basins, and old channels. The relief is locally irregular alongside the present and former river courses, especially in the west, comprising a rapidly alternating series of linear low ridges and depressions. The Ganges channel is constantly shifting within its active floodplain, eroding and depositing large areas of new char land each flood season, but it is less braided than that of the Brahmaputra-Jamuna. Ganges alluvium is calcareous when deposited, but most basin clays and some older ridge soils have been decalcified and acidified in their upper layers; lime is found only in the subsoil or substratum of such soils. Clay soil predominates in basins and on the middle parts of most ridges, with loamy soils (and occasionally sands) occurring mainly on ridge crests.

Barind Tract:

127. Barind Tract comprises the mid and lower western part of the Rajshahi division, between the Ganges and Brahmaputra. The largest one of the three Pleistocene upland blocks, the Barind Tract spreads over an area of about 7,770 sq km. In the south, the Barind Tract is an older Pleistocene Terrace forming a small plateau with a flat or - in some sectors - a slightly undulating surface. This terrace consists of reddish and yellowish and partially mottled clays and is characterized morphologically by a dendritic drainage pattern, which is typical of all older Pleistocene terraces in Bangladesh. The Barind unit is comparatively at higher elevations than the adjoining floodplains. The contours of the tract suggest that there are two terrace levels - one at 40m and the other between 19.8 and 22.9m. Therefore, when the floodplains go underwater during monsoon the Barind Tract stands free from flooding and is drained by a few small streams. About 47% of the Barind region is classified as highland, about 41% as medium-high land, and the rest are lowland. The depression at the southeast of the Barind Tract is called the Bhar Basin. It includes parts of the Rajshahi and Pabna districts, with its center in the vast marshy area called the Chalan Beel.



Source: SRDI, 1997; Rashid, 1991 and Reimann, 1993

Figure 4-9: Physiography map of Bangladesh showing the project area

4.3.6 Soil

128. Most of the soils within Bangladesh are alluvial (rather than colluvial) in origin and have been deposited over time by the various river networks that drain into the Bay of Bengal. However, this has not created uniformity of soil types and physio-chemical soil characteristics can vary considerably based on factors such as age, relief, biological activity, parent material and anthropogenic influences.

129. In general, most of the soils within the country, particularly those found within alluvial floodplains, share the following broad characteristics (Brammer, 1996 and Rashid, 1991):

- Moderately fertile to fertile.
- Clay to loam structure (including sandy loams).
- Slightly to moderately acidic; and
- Relatively deep (often around 4 km including underlying shale/sandstone layers).

130. Another unique characteristic of alluvial soils in Bangladesh is their rapid rate of formation, which is primarily attributed to the significant deposition of sediments as well as warm, humid climate.

131. The subproject activities sites can be classified as Noncalcareous grey floodplain soils, Noncalcareous brown floodplain soils, Calcareous brown floodplain soils, Calcareous dark grey floodplain soils which are described below and depicted in Figure 4.10.

grey gleans. They extensively occupy Tista, Karatoya-Bangali, Jamuna, middle Meghna and eastern Surma-Kushiyara floodplains. However, there are considerable regional differences in the proportions occupied by individual soil textures. Silt loam texture is dominant in the Tista meander floodplain whereas silty clays are predominant in the Ganges tidal floodplain and in the Surma-Kushiyara floodplain. But the Jamuna floodplain has a more even distribution of silt loam, silty clay loam and silty clays. Most of these soils have been included in Eutric Gleysols.

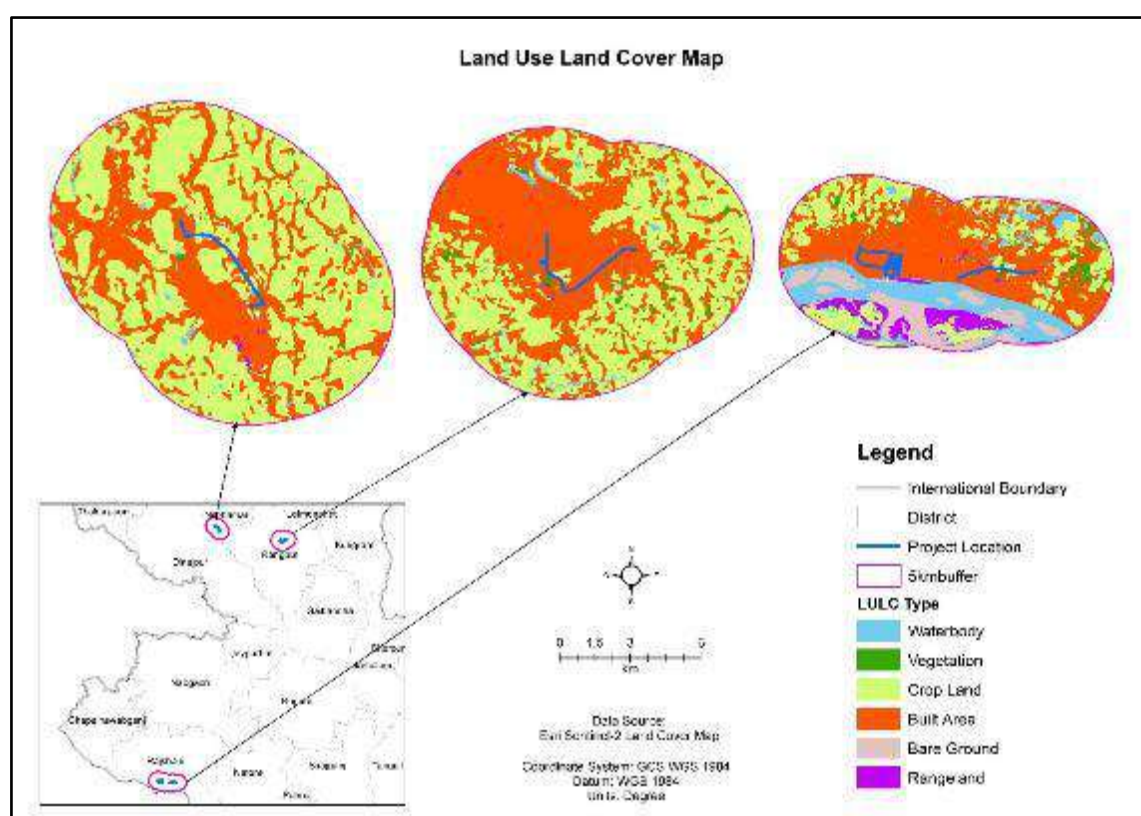
133. **Noncalcareous brown floodplain soils:** Moderately well to imperfectly drained floodplain ridge soils with an oxidized cambic B horizon; not calcareous within 125 cm of the surface. Topsoil and upper subsoil generally are medium to strongly acidic; lower layers are less acidic to neutral.

134. **Calcareous brown floodplain soils:** Moderately well to imperfectly drained floodplain ridge soils with an oxidized cambic B horizon; calcareous throughout or within 125 cm of the surface.

135. **Calcareous dark grey floodplain soils:** Seasonally flooded soils with a cambic B horizon which is either dominantly grey and/or has prominent grey gleyans or pressure faces; calcareous within 125 cm of the surface. Many basin soils have a neutral to acid topsoil and a neutral subsoil over a calcareous substratum at 40–60 cm.

4.3.7 Land Use

136. Land use inventories are an essential component in land resources evaluation and environmental studies due to the changing nature of land use patterns. This revealed that the land use/land cover consists mainly of agricultural land, built areas, waterbodies, etc. In the subproject activities area, the major land use goes to Settlements/built area and cropland with waterbodies.



Data Source: Esri Sentinel-2 Land Cover Map

Figure 4-11: Land use map shows the land use pattern of the study area

4.3.8 Agricultural Resources

4.3.8.1 Agro-Ecological Zone (AEZ)

137. Bangladesh is an agricultural country and near about 80% people of Bangladesh are directly or indirectly involved with agriculture. The Agroecological Zones (AEZ) database is

being extensively used for national and local level production planning purposes. The agroecological resources are increasingly playing an important role in agricultural planning, technology transfer and specific bio-physical resource utilization Programme activities. According to the most recent assessment was completed by the Soil Resource Development Institute (SRDI, 1998) which classified Bangladesh into 30 AEZs. This 30 AEZ are sub divided into 88 Agro-ecological sub regions. Again, these are divided into 535 Agro-ecological units. The subproject activities area contains the following AEZs.

Tista Meander Floodplain

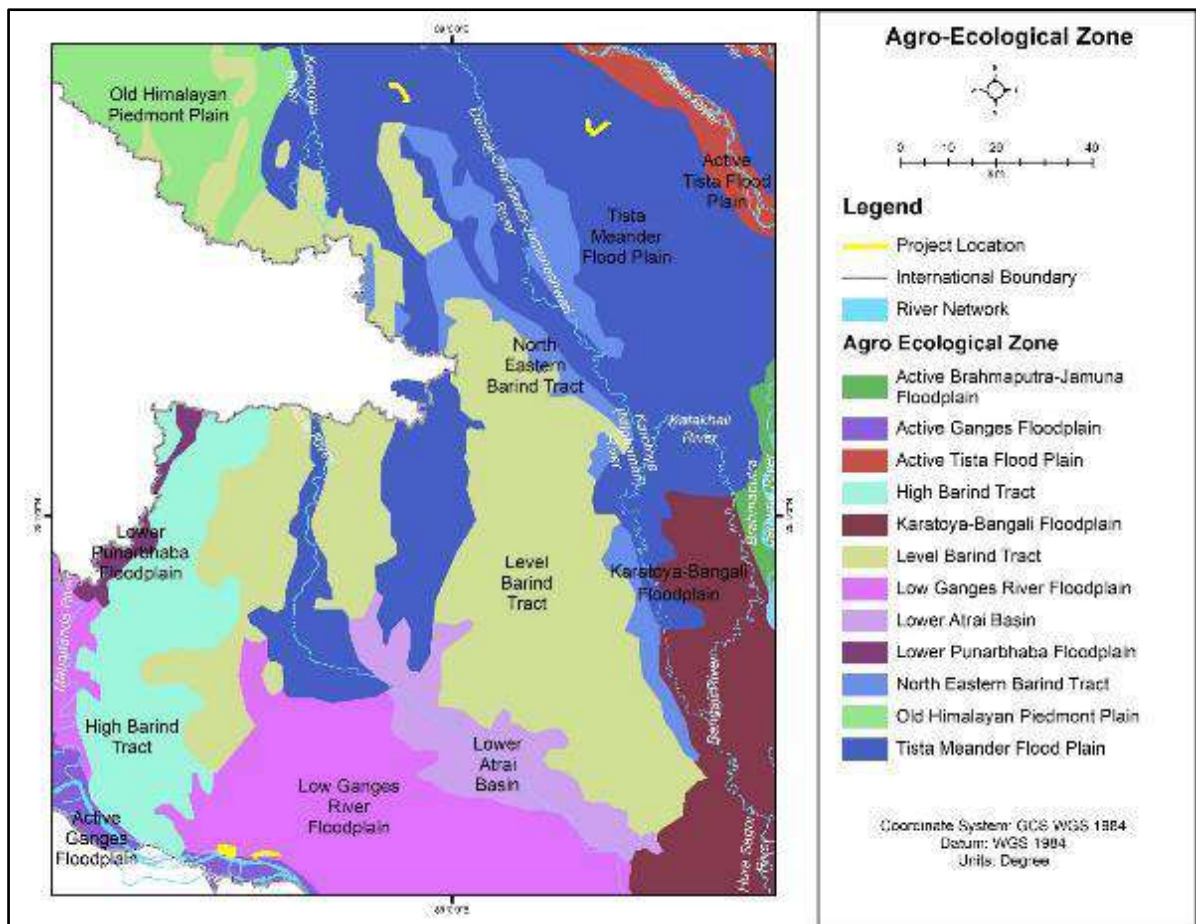
138. This region occupies major part of the Teesta floodplain as well as the floodplains of the Atrai, Little Jamuna, Karatoya, Dharla and Dudkumar rivers. Most areas have broad floodplain ridges and almost level basins. There is an overall pattern of olive brown, rapidly permeable, loamy soils on the high floodplain ridges, and grey or dark grey, slowly permeable, heavy silt loam or silty clay-loam soils on the lower land and parent materials rich in minerals. Eight general soil types occur in the region; of which, Noncalcareous Grey Floodplain and Noncalcareous Brown Floodplain soils predominate. They are moderately acidic throughout, low in organic matter content on the higher land, but moderate in the power parts. Fertility level, in general, is low to medium. Soils in general have a good moisture holding capacity.

139. Location: Most of greater Rangpur, eastern parts of Panchagarh and Dinajpur, northern Bogra and parts of Joypurhat, Naogaon and Rajshahi districts.

High Ganges River Floodplain

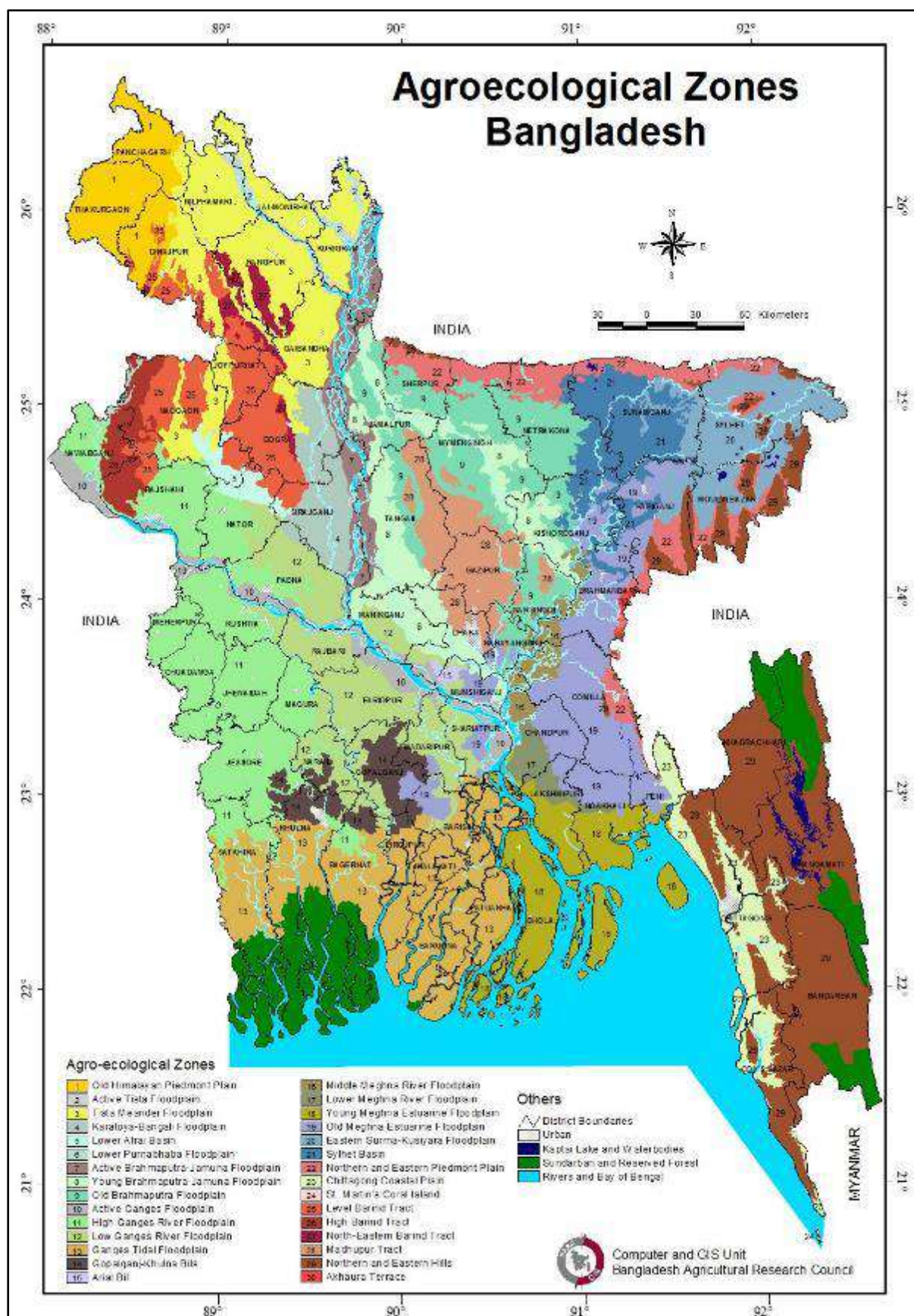
140. This region includes the western part of the Ganges River Floodplain which is predominantly highland and medium highland. Most areas have a complex relief of broad and narrow ridges and inter-ridge depressions, separated by areas with smooth broad ridges and basins. There is an overall pattern of olive-brown silt loams and silty clay loams on the upper parts of floodplain ridges and dark grey, mottled brown, mainly clay soils on ridge sites and in basins. Most ridge soils are calcareous throughout. General soil types predominantly include Calcareous Dark Grey Floodplain soils and Calcareous Brown Floodplain soils. Organic matter content in brown ridge soils is low and higher in dark grey soils. Soils are slightly alkaline in reaction. General fertility level is low.

141. Location: Nawabganj, Rajshahi, Southern Pabna, Kushtia, Meherpur, Jessore, Chuadanga, Jhenaidah, Magura, and northern parts of Satkhira and Khulna districts together with minor areas in Naogaon and Narail districts.



Source: BARC

Figure 4-12: Agro-ecological Zones Map of Bangladesh Represents the Project Areas

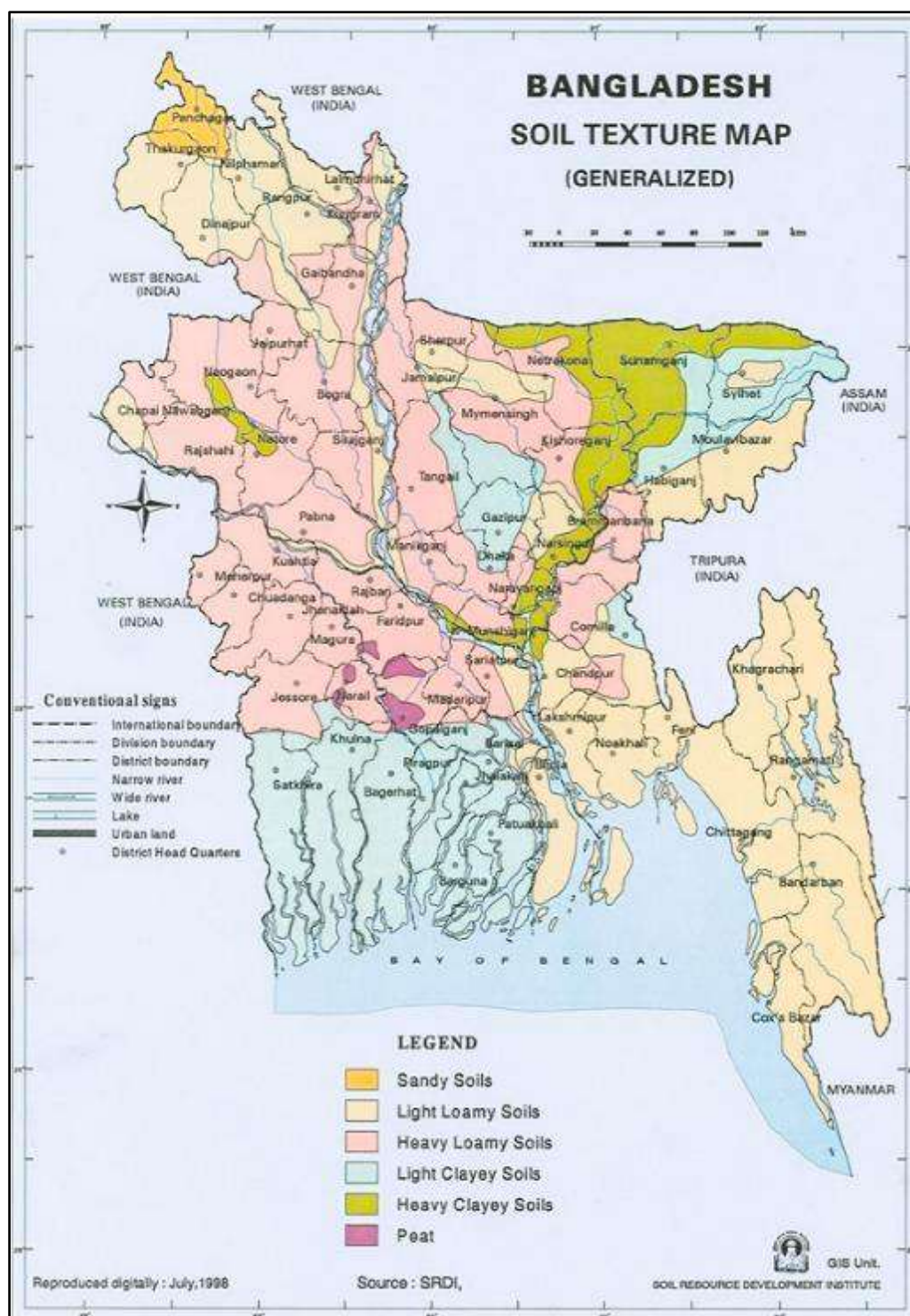


Source: BARC

Figure 4-13: Agro-ecological Zones Map of Bangladesh

4.3.8.2 Soil Texture

142. The relative size of the soil particles is expressed by the term soil texture, which refers to the fineness or coarseness of the soil. More specifically, texture is the relative proportion of the different size groups or separates. Generally, materials larger than 2 cm in diameter are called stones, materials between 2 cm and 2 mm in diameter are called gravel, and the materials smaller than 2 mm in diameter are called fine earth. Texture is an important property of soil. The texture greatly determines the land use capability methods of soil management.



Source: SRDI

Figure 4-14: Soil Texture Map of Bangladesh

143. The soils of Bangladesh are mainly loam in texture. Central and southwest parts of Bangladesh are heavy loam, whereas the north and southeastern parts are light loam in texture. The coastal areas of the south, southwest, and central parts are clayey in texture. Sandy soils occupy a small portion of the northern part of Bangladesh.

144. In the floodplains of Bangladesh there is a general textural gradation from riverbank to basin sides north to south with the fine-textured soils predominantly occurring towards the south. There is also textural gradation from riverbank to basin sides. The major agricultural soils in Bangladesh have moderate textures with the majority ranging from loam or silt to silty loam to silty clay loam. Only a relatively few soils in Bangladesh belong to the extreme textural classes. With respect to textural aspects, the majority of the Bangladesh soils appear to be suitable for having quick resilience.

4.3.8.3 Cropping Pattern and Intensity in the Study Area

145. Cropping patterns and intensity in Bangladesh are influenced by various factors including climate, soil fertility, land availability, market demand, and socio-economic conditions. The major crops are depicted below the study area as per districts.

Table 4-1: District wise Major Crops grown in the study area

District	Major Crops
Bogura	Paddy (Aus, Aman & Boro), Wheat, Maize, Potato, Groundnut, Lentil, Mustard, Jute
Pabna	Paddy (Aus, Aman & Boro), Wheat, Maize, Potato, Groundnut, Lentil, Mustard, Lichi, Jute, Onion
Chapainawabganj	Paddy (Aus, Aman & Boro), Wheat, Maize, Potato, Chickpea, Lentil, Mustard, Mango, Jute
Rajshahi	Paddy (Aus, Aman & Boro), Wheat, Maize, Potato, Chickpea, Groundnut, Lentil, Mustard, Mango, Lichi, Jute, Onion
Rangpur	Paddy (Aus, Aman & Boro), Wheat, Maize, Potato, Mustard, Mango, Lichi, Jute
Dinajpur	Paddy (Aus, Aman & Boro), Wheat, Maize, Potato, Mustard, Mango, Lichi, Jute, Onion
Panchagarh	Paddy (Aus, Aman & Boro), Wheat, Maize, Potato, Groundnut, Mustard, Jute
Gaibandha	Paddy (Aus, Aman & Boro), Wheat, Maize, Potato, Groundnut, Lentil, Mustard, Jute
Nilphamari	Paddy (Aus, Aman & Boro), Wheat, Maize, Potato, Mustard, Jute

Source: BAMIS (Bangladesh Agro-Meteorological Information Service)

Table 4-2: Land Utilization of the Study area by District (2021 -2022)

District	Total	Forest	Current fallow	Single cropped	Double cropped	Triple cropped	Quadruple Cropped	Net cropped
Area in '000' acres								
Bogura	716	0	2	7	293	220	5	525
Pabna	587	0	10	33	234	105	1	373
Chapainawabganj	421	0	25	65	161	61	0	287
Rajshahi	599	0	5	105	237	126	4	472
Rangpur	593	3	6	20	300	143	3	466
Dinajpur	851	18	1	48	409	218	3	678
Panchagarh	347	5	2	26	167	72	0	265
Gaibandha	523	0	1	56	250	77	0	383
Nilphamari	382	1	1	5	194	89	1	289
Total	5019	27	53	365	2245	1111	17	3738

Source: Yearbook of Agricultural Statistics-2023

Table 4-3: Intensity of Cropping of the Study area by District (20-21 and 21-22)

District	Total Area	Net cropped area		Gross Cropped area		Intensity of Cropping	
		2020-21	2021 -22	2020-21	2021 -22	2020-21	2021 -22
Bogura	716	527	525	1279	1273	243	243
Pabna	587	374	373	821	820	220	220
Chapainawabganj	421	290	287	573	570	198	199

District	Total Area	Net cropped area		Gross Cropped area		Intensity of Cropping	
		2020-21	2021 -22	2020-21	2021 -22	2020-21	2021 -22
Rajshahi	599	476	472	980	973	206	206
Rangpur	593	468	466	1065	1061	228	228
Dinajpur	851	680	678	1534	1532	226	226
Panchagarh	347	267	265	578	576	216	217
Gaibandha	523	383	383	783	787	204	206
Nilphamari	382	290	289	666	664	230	230

Source: Yearbook of Agricultural Statistics-2023

4.3.9 Environmental Quality

146. The environmental baseline monitoring was carried out is to determine the ambient air, water, and soil quality and ambient noise levels and how they are currently affected by anthropogenic activities in the project area of influence. Monitoring is usually conducted to determine the quality of the ambient environment before the start of any kind of project related activities, as it provides a means of comparison with impact monitoring during the project implementation. It will also be used simply to check whether any unexpected change is occurring in existing conditions.

147. Primary tests were conducted by a recognized laboratory of SGS Bangladesh Limited. The environmental parameters for air, water, soil and noise were conducted at 6 new sub-stations locations, and 5 workshops using standard methodologies, taking into consideration location of sensitive receptors, to collect the baseline environmental data. The environmental baseline results are attached to Annex 5.

148. Table below shows the locations where the baseline data collection has been obtained. A more comprehensive analysis of air, water, and noise at the subproject sites will be conducted by the EPC Contractors before commencing the construction when the substation designs are being finalized, details are provided in the Environment Monitoring Plan in Annex 1.

149. A regular monitoring of all relevant parameters during the construction, operation, and maintenance phase by the EPC contractor will further describe the pollutants loads in the ambient environmental conditions and provide for effective implementation of the Environment Management Plan and adherence to international good practices by the EPC Contractors and NESCO.

Table 4-4: Environmental monitoring and sample collection locations

SL	Location	Civil works	Area	Co- Ordinate	Parameters
Workshop*					
1	Rajshahi	Demolition & new construction	Shalbagan	24.38345, 88.60976	Air & noise, Soil, GW
2	Bogura	New	ZRS, NESCO Campus	24.84202, 89.35326	Soil, GW, SW
3	Rangpur	Demolition & new construction	Lalbag	25°43'45.31"N 89°15'7.66"E	Air & noise, Soil, GW
4	Dinajpur	Demolition & new construction	SE office, Dinajpur	25°39'29.67"N 88°38'51.40"E	Air & noise, Soil, GW
Substations					
1	Rajshahi	New	Chandipur	24.369696 N, 88.574641 E	Air & noise, GW
2	Pabna	New	Kodomtola	23.99055, 89.25892	Air & noise, SW, GW

Sampling points are located at Rajshahi -Six (06) points, Bogura – One (01) point, Rangpur – Five (05) points, Saidpur – One (01) point, Dinajpur – Two (02) points, Thakurgaon – One (01) point and Pabna – One (01) point respectively. The GPS coordinates of monitoring locations are as follows and google map in **Error! Reference source not found.**

Table 4-5: GPS coordinates of Air Quality monitoring locations:

ID – AAQ (Ambient Air Quality)	GPS Co-Ordinates
AAQ-01	24°23'1.59"N; 88°36'34.44"E
AAQ-02	24°22'11.17"N; 88°34'28.47"E
AAQ-03	24°21'54.91"N; 88°40'11.40"E
AAQ-04	24°22'13.89"N; 88°34'0.52"E
AAQ-05	24°22'11.77"N; 88°34'58.54"E
AAQ-06	24°22'10.73"N; 88°35'22.20"E
AAQ-07	24°50'55.59"N; 89°22'29.07"E
AAQ-08	25°43'45.31"N; 89°15'7.66"E
AAQ-09	25°43'43.24"N; 89°15'8.33"E
AAQ-10	25°46'14.00"N; 89°18'1.62"E
AAQ-11	25°43'37.60"N; 89°16'41.85"E
AAQ-12	25°43'47.74"N; 89°15'16.62"E
AAQ-13	25°48'25.97"N; 88°53'23.37"E
AAQ-14	25°37'26.52"N; 88°38'19.34"E
AAQ-15	25°39'30.18"N; 88°38'50.09"E
AAQ-16	26°2'16.21"N; 88°25'37.54"E
AAQ-17	23°59'30.49"N; 89°15'32.64"E

Methodology:

155. Adopted methodologies of sampling and laboratory analysis of ambient air quality parameters are presented in the table below.

Table 4-6: Sampling Method and Analysis of Air Quality Monitoring

Parameters	Sampling Method	Laboratory Analysis Method
PM ₁₀	✓ Sample of ambient air is to be carried out by Respirable Dust Sampler. ✓ Sampling is conducted for 24 hours at a flow rate of 1.38 m³/min. ✓ Sampler placed at an open area (minimum 20 m clearance from any tall structures or vegetations / trees / shrubs) to prevent disturbance ✓ After completion of sampling, each filter paper with trapped PM shall preserve in airtight Polly packet and is again packed in an envelope. All samples to be accompanied by Chain of Custody (CoC) forms for QA/QC purpose.	IS 5182 (Part 23):2006 - Methods for Measurement of Air Pollution, Part 23: Respirable Suspended Particulate Matter (PM ₁₀), Cyclonic Flow Technique
PM _{2.5}	✓ Sample of ambient air is to be carried out by Fine particulate monitor. ✓ Sampling is conducted for 24 hours at a flow rate of 15 LPM. ✓ Sampler placed at an open area (minimum 20 m clearance from any tall structures or vegetations / trees / shrubs) to prevent disturbance ✓ After completion of sampling, each filter paper with trapped PM shall preserve in airtight Polly packet and is again packed in an envelope. All samples to be accompanied by Chain of Custody (CoC) forms for QA/QC purpose.	In House Gravimetric Method
SO ₂	✓ Gaseous pollutants are absorbed in 30 mL of absorbing solution.	IS 5182 (Part 2):2001 - Methods for Measurement of Air Pollution, Part

Parameters	Sampling Method	Laboratory Analysis Method
	✓ Sampling is conducted for 24 hours. ✓ Gaseous samples preserve in plastic containers with levels of sampling details and carries in icebox (preserved at 4oC) from site to SGS laboratory at Dhaka. All samples to be accompanied by Chain of Custody (CoC) forms for QA/QC purpose.	2: Sulphur Dioxide
NO _x	✓ Gaseous pollutants are absorbed in 30 mL of absorbing solution. ✓ Sampling is conducted for 24 hours ✓ Gaseous samples preserve in plastic containers with levels of sampling details and carries in icebox (preserved at 4oC) from site to SGS laboratory at Dhaka. All samples to be accompanied by Chain of Custody (CoC) forms for QA/QC purpose.	IS 5182 (Part 6):2006 - Methods for Measurement of Air Pollution, Part 6: Oxides of nitrogen
CO	✓ Sampling conducted using portable gas sensor ✓ Sampling conducted for <1 hour with interval of 20 minutes. The readings are then averaged.	Real-Time Electrochemical Sensor (In House, in-situ)

Meteorological Information:

156. Meteorological Information of ambient air quality sample collection is presented in the table below.

Table 4-7: Meteorological data for Ambient Air Quality

Weather Condition							
Sample ID	GPS LOCATION	Temperature (°C)		Humidity (% RH)	Wind Speed (m/s)	Wind Direction	Rainfall (mm)
		Max	Min				
AAQ-01	24°23'1.59"N; 88°36'34.44"E	37.8°C	29.9°C	50.9%	3.78 m/s	Northeast side.	0.0
AAQ-02	24°22'11.17"N; 88°34'28.47"E	37.8°C	29.6°C	50.9%	3.78 m/s	Northeast side.	0.0
AAQ-03	24°21'54.91"N; 88°40'11.40"E	37.8°C	29.7°C	48.1%	3.35 m/s	Northwest side	0.0
AAQ-04	24°22'13.89"N; 88°34'0.52"E	37.8°C	29.7°C	48.1%	3.35 m/s	Northwest side	0.0
AAQ-05	24°22'11.77"N; 88°34'58.54"E	36.9°C	28.2°C	51.0%	5.59 m/s	North South Side	0.0
AAQ-06	24°22'10.73"N; 88°35'22.20"E	36.9°C	28.2°C	51.0%	5.59 m/s	North South Side	0.0
AAQ-07	24°50'55.59"N; 89°22'29.07"E	34.7°C	27.3°C	77.4%	5.59 m/s	Southwest Side.	28.7
AAQ-08	25°43'45.31"N; 89°15'7.66"E	31.6°C	26.3°C	76.4%	3.35 m/s	Northwest Side.	22.4
AAQ-09	25°43'43.24"N; 89°15'8.33"E	31.6°C	26.3°C	76.4%	3.35 m/s	Northwest Side.	22.4
AAQ-10	25°46'14.00"N; 89°18'1.62"E	30.7°C	26.4°C	84.8%	3.80 m/s	Northwest Side.	27.4
AAQ-11	25°43'37.60"N; 89°16'41.85"E	30.7°C	26.4°C	84.8%	3.80 m/s	Northwest Side.	27.4
AAQ-12	25°43'47.74"N; 89°15'16.62"E	29.9°C	26.3°C	85.3%	4.24 m/s	Northeast side.	33.9
AAQ-13	25°48'25.97"N; 88°53'23.37"E	30.7°C	26.6°C	85.2%	3.80 m/s	Southwest Side.	24.9
AAQ-14	25°37'26.52"N; 88°38'19.34"E	30.6°C	25.9°C	81.8%	4.69 m/s	Southeast Side.	31.3
AAQ-15	25°39'30.18"N; 88°38'50.09"E	30.6°C	25.9°C	81.8%	4.69 m/s	Southeast Side.	31.3
AAQ-16	26°2'16.21"N; 88°25'37.54"E	29.5°C	25.8°C	88.0%	4.92 m/s	Northwest Side.	33.1
AAQ-17	23°59'30.49"N; 89°15'32.64"E	35.2°C	27.6°C	60.5%	3.80 m/s	Southeast Side.	0.0

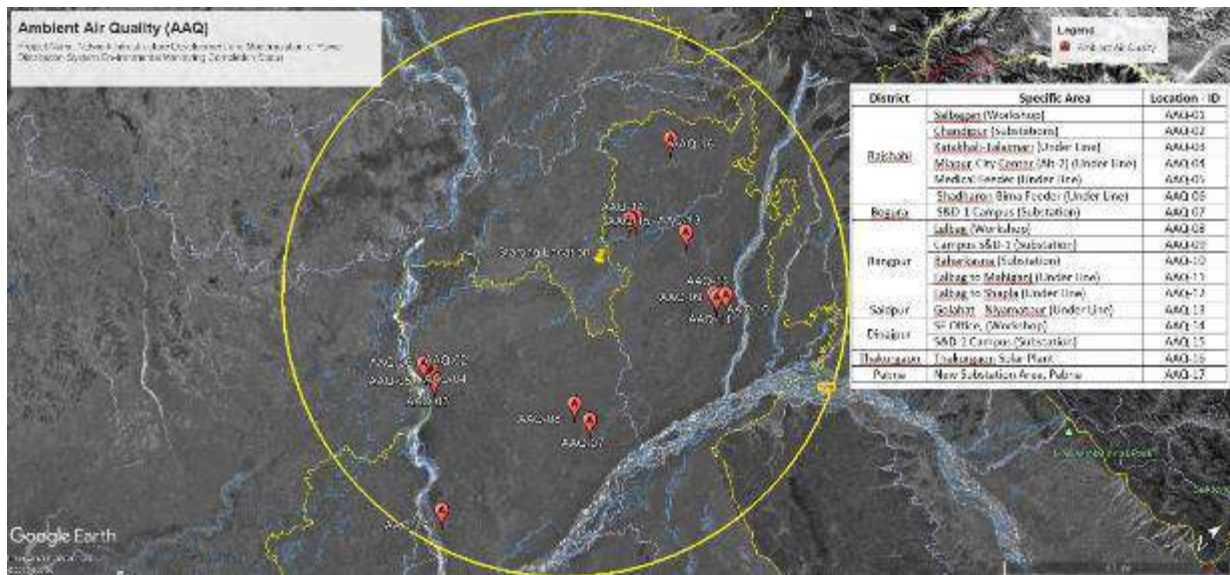


Figure 4-16: Location of Ambient Air Quality shown in Google Maps

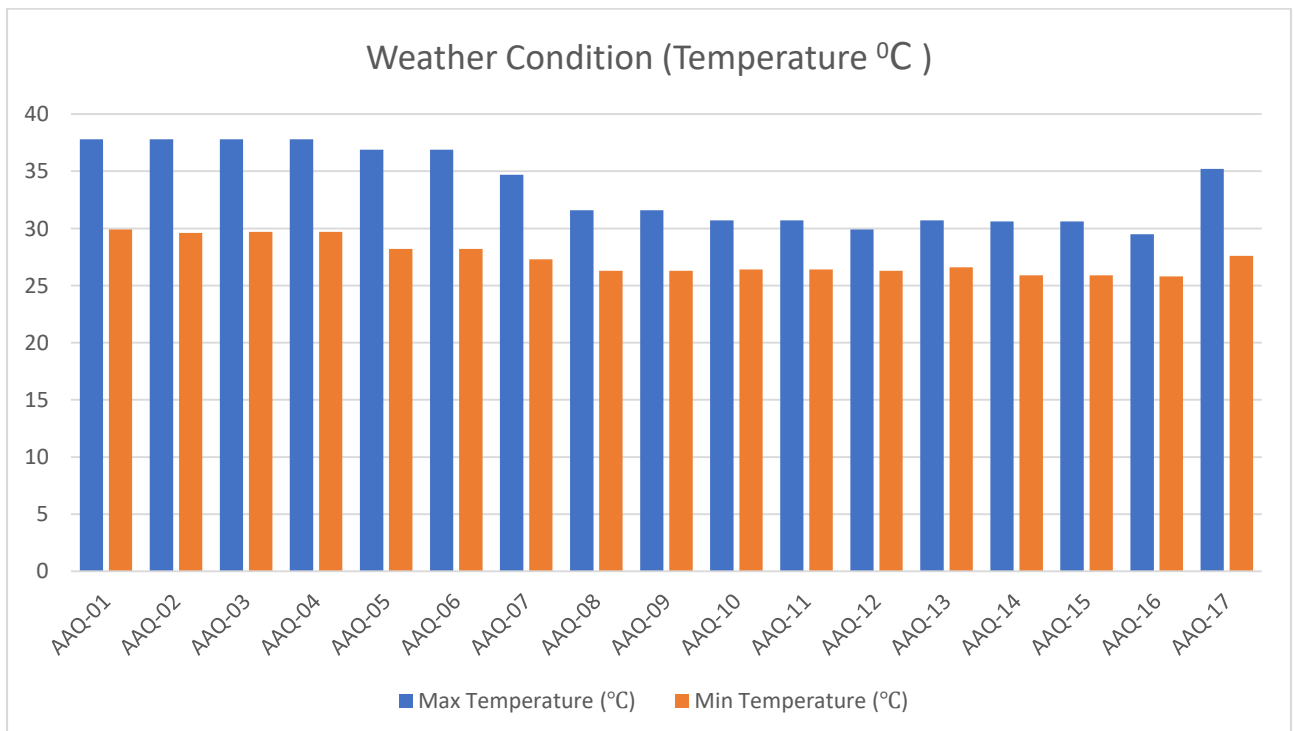


Figure 4-17: Graph showing the Weather Condition (Temperature °C)

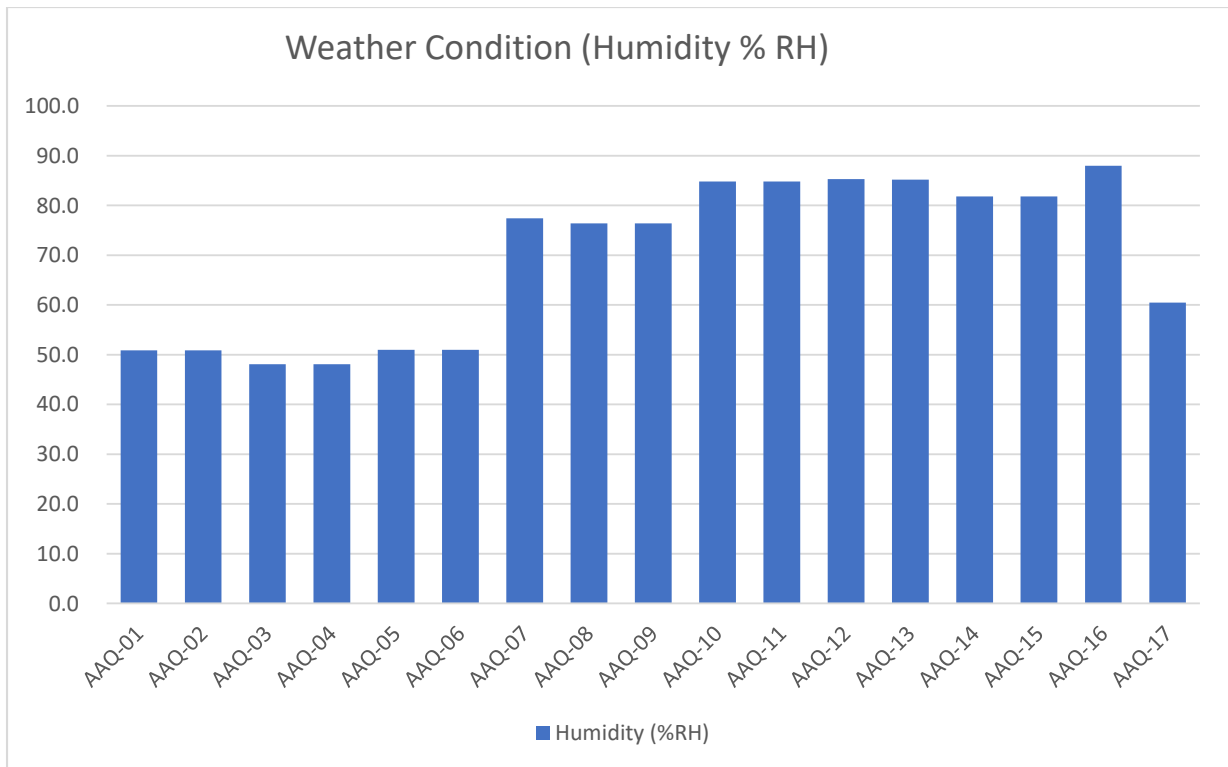


Figure 4-18: Graph showing the Weather Condition (Humidity %RH)

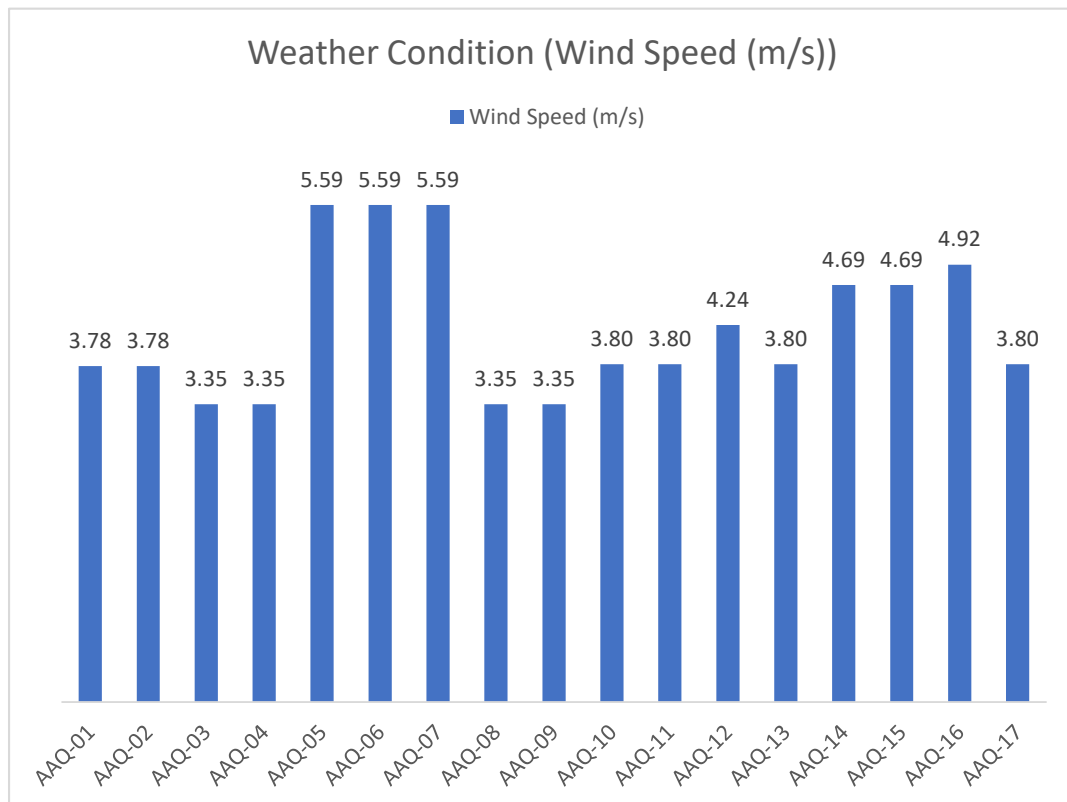


Figure 4-19: Graph showing the Weather Condition (Wind Speed m/s)

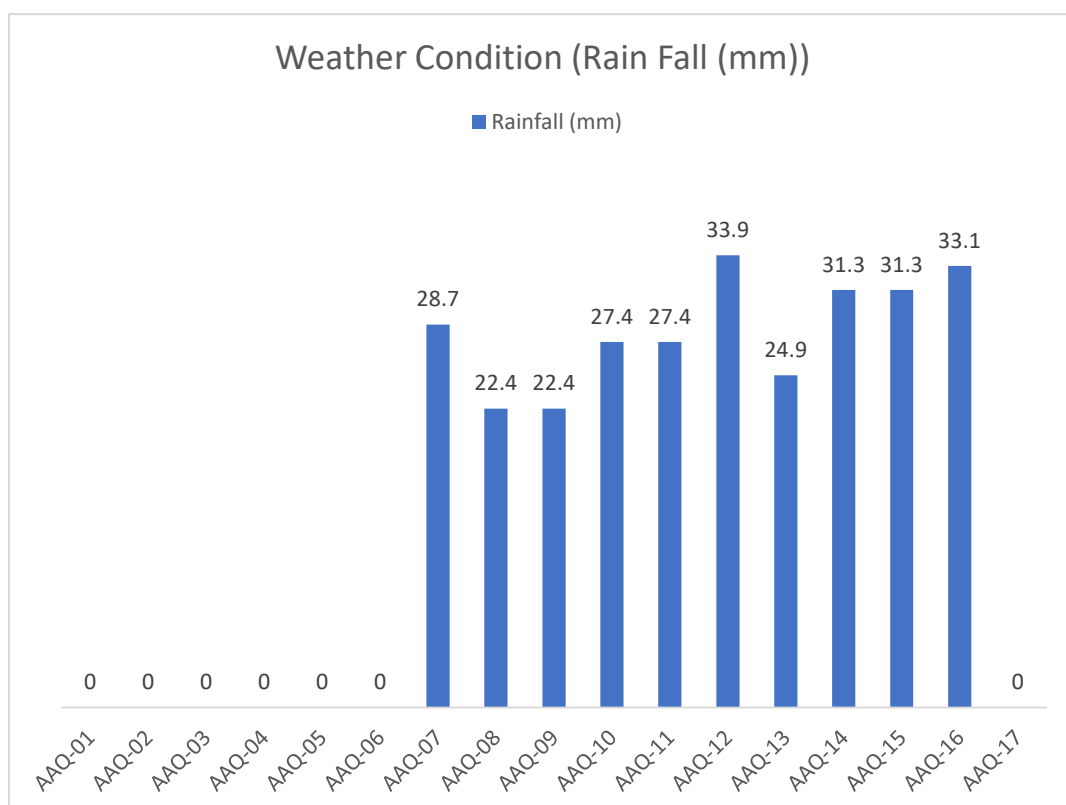


Figure 4-20: Graph showing the Weather Condition (Wind Speed m/s)

Result and Analysis:

Ambient air quality monitoring findings have been summarized in the table below.

Table 4-8: Analysis of Ambient Air Quality Monitoring Results

Ambient Air Quality (AAQ)									
SL.	Location	Area	ID	PM ₁₀	PM _{2.5}	SO _x	NO _x	CO	O ₃
1	Rajshahi	Salbagan (Workshop)	AAQ-01	34.99	19.12	<2.5	<5.0	1.8	<0.1
2		Chandipur (Substations)	AAQ-02	14.17	8	<2.5	<5.0	1.3	<0.1
3		Katakhali-Talaimari (Under Line)	AAQ-03	53.52	14.44	<2.5	<5.0	1.8	<0.1
4		Miapur-City Center (Alt-2) (Under Line)	AAQ-04	78.76	7.96	<2.5	<5.0	1.7	<0.1
5		Medical Feeder (Under Line)	AAQ-05	35.49	5.65	<2.5	<5.0	2.2	<0.1
6		Shadharon Bima Feeder (Under Line)	AAQ-06	40.23	11.81	<2.5	<5.0	2.1	<0.1
7	Bogura	S&D-1 Campus (Substation)	AAQ-07	22.9	6.67	<2.5	<5.0	1.4	<0.1
8	Rangpur	Lalbag (Workshop)	AAQ-08	28.11	21.39	<2.5	<5.0	1.4	<0.1
9		Campus S&D-1 (Substation)	AAQ-09	16.32	5.37	<2.5	<5.0	1.4	<0.1
10		Baharkasna (Substation)	AAQ-10	28.82	5.23	<2.5	<5.0	1.3	<0.1
11		Lalbag to Mahiganj (Under Line)	AAQ-11	21.44	8.01	<2.5	<5.0	1.6	<0.1
12		Lalbag to Shapla (Under Line)	AAQ-12	26.17	8.56	<2.5	<5.0	1.9	<0.1

Ambient Air Quality (AAQ)									
SL.	Location	Area	ID	PM ₁₀	PM _{2.5}	SO _x	NO _x	CO	O ₃
13	Saiadpur	Golahat - Niyamatpur (Under Line)	AAQ-13	17.92	8.13	<2.5	<5.0	1.9	<0.1
14	Dinajpur	SE Office, (Workshop)	AAQ-14	24.98	11.94	<2.5	<5.0	1.5	<0.1
15		S&D-1 Campus (Substation)	AAQ-15	40.29	9.4	<2.5	<5.0	1.2	<0.1
16	Pabna	New Substation Area, Pabna	AAQ-17	24.57	6.2	<2.5	<5.0	1.4	<0.1
Measurement Unit				µg/m ³			mg/m ³		µg/m ³
Bangladesh Standard (Air Pollution Control Rules 2022)				150	65	80	80	20	180
'WHO' AQG level (2021)				45	15	40	25	4	100

Source: Sampling and Analysis done by Laboratory of SGS Bangladesh Limited.

157. Analysis of lab results has been revealed the following status of ambient air quality of site and surrounding areas during present monitoring period:

i) Particulate Matter (PM₁₀)

158. Across the monitoring locations, 24-hours average concentration of particulate matter (PM₁₀) has measured maximum 78.7 µg/m³ at the monitoring location AAQ-4 (Rajshahi - Miapur-City Center _Alt-2_ Under Line) during this monitoring period., From the analysis it has been observed that most of the area of Particulate Matter (PM₁₀) concentration is within the optimum limit according to Air Pollution Control Rules 2022 and WHO Guideline. However, Particulate matter (PM₁₀) at AAQ-03 (Katakhali-Talaimari (Under Line)) has been found 53.52 µg/m³ and AAQ-04 (Miapur-City Center (Alt-2) (Under Line) has been found 78.76 µg/m³ that has been exceed the standard limit according to Air Pollution Control Rules 2022 and WHO Guideline.

ii) Particulate Matter (PM_{2.5})

159. Across the monitoring locations, 24-hours average concentration of particulate matter (PM_{2.5}) has measured maximum 21.3 µg/m³ at the monitoring location AAQ-8 (Rangpur - Lalbag, Workshop) and Minimum 5.2 µg/m³ at the monitoring location AAQ-10 (Rangpur - Baharkasna, Substation) during this monitoring period. From the analysis it has been observed that most of the areas of Particulate Matter (PM_{2.5}) concentration is within the optimum limit according to Air Pollution Control Rules 2022 and WHO Guideline. However, Particulate matter (PM_{2.5}) at AAQ-01 (Shalbagan (Workshop Area)) has been found 19.12 µg/m³ and AAQ-08 (Lalbagh) (Workshop Area) has been found 21.39 µg/m³ that has been exceed the standard limit according to Air Pollution Control Rules 2022 and WHO Guideline.

iii) Oxides of Nitrogen (as NO₂)

24-hours average concentration of NO₂ at all monitoring locations has measured less than 5 µg/m³ during present monitoring period which is within the standard limit according to Air Pollution Control Rules 2022 and WHO Guideline.

iv) Sulphur dioxide (SO₂)

24-hours average concentration of SO₂ at all monitoring locations has measured less than 2.5 µg/m³ during the monitoring period which is within the standard limit according to Air Pollution Control Rules 2022 and WHO Guideline.

v) Carbon Monoxide (CO)

Across the monitoring locations, 24-hours average concentration of Carbon Monoxide (CO) was found maximum 2.2 mg/m³ at the monitoring location AAQ-5 (Rajshahi- Medical Feeder) and Minimum 1.2 mg/m³ at the monitoring location AAQ-15 (Dinajpur - S&D-1 Campus, Substation)) during this monitoring period. From the analysis it has been observed that Carbon

Monoxide (CO) concentration at all monitoring locations is within the optimum limit according to Air Pollution Control Rules 2022 and WHO Guideline.

vi) Ozone (O₃)

Across the monitoring locations, 24-hours average concentration of O₃ has measured less than 0.1 µg/m³ during this monitoring period which is within the standard limit according to Air Pollution Control Rules 2022 and WHO Guideline.

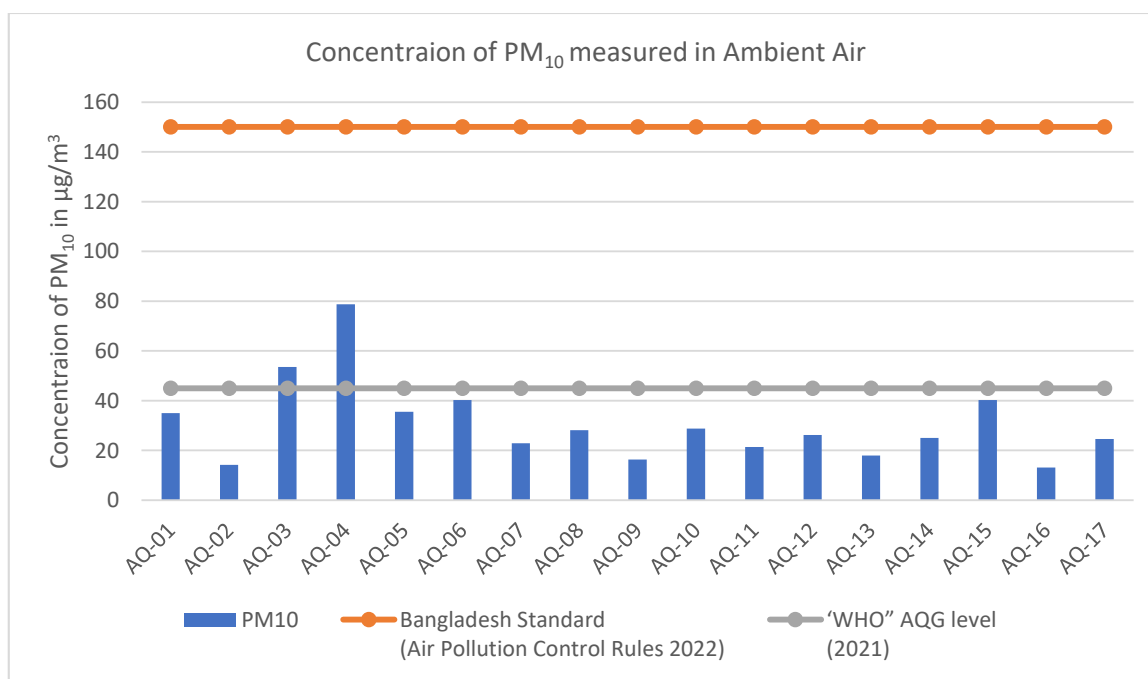


Table 4-9: Graph showing the PM10 concentration in the ambient air.

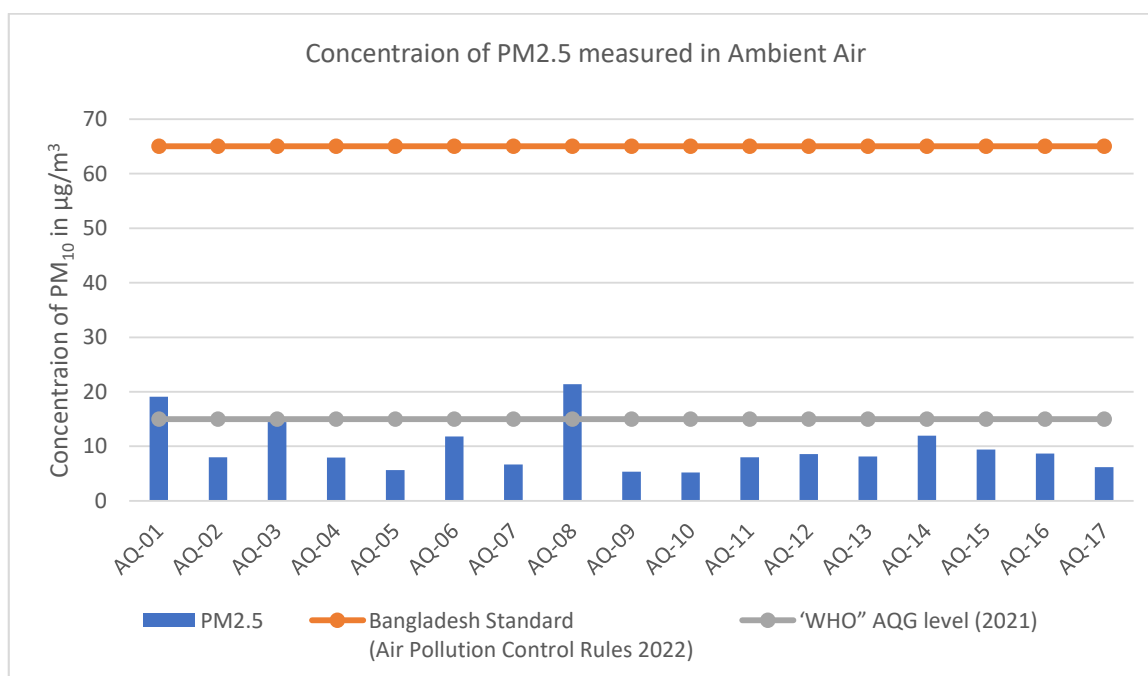


Table 4-10: Graph showing the PM2.5 concentration in the ambient air

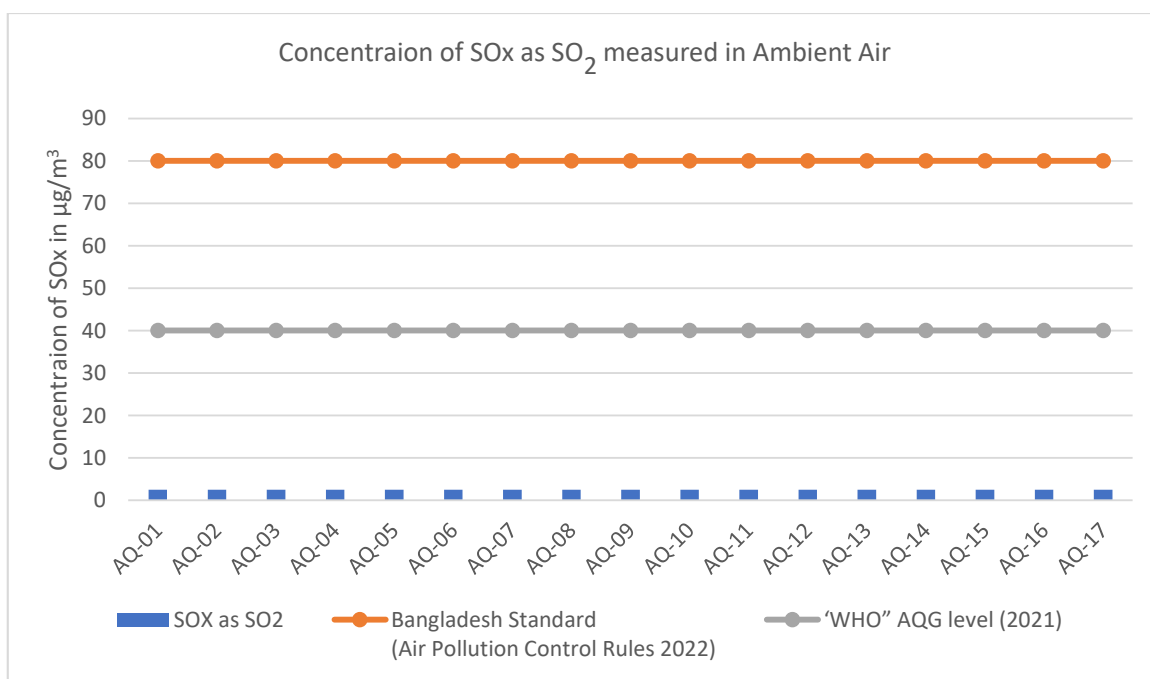


Table 4-11: Graph showing the SO2 concentration in the ambient air

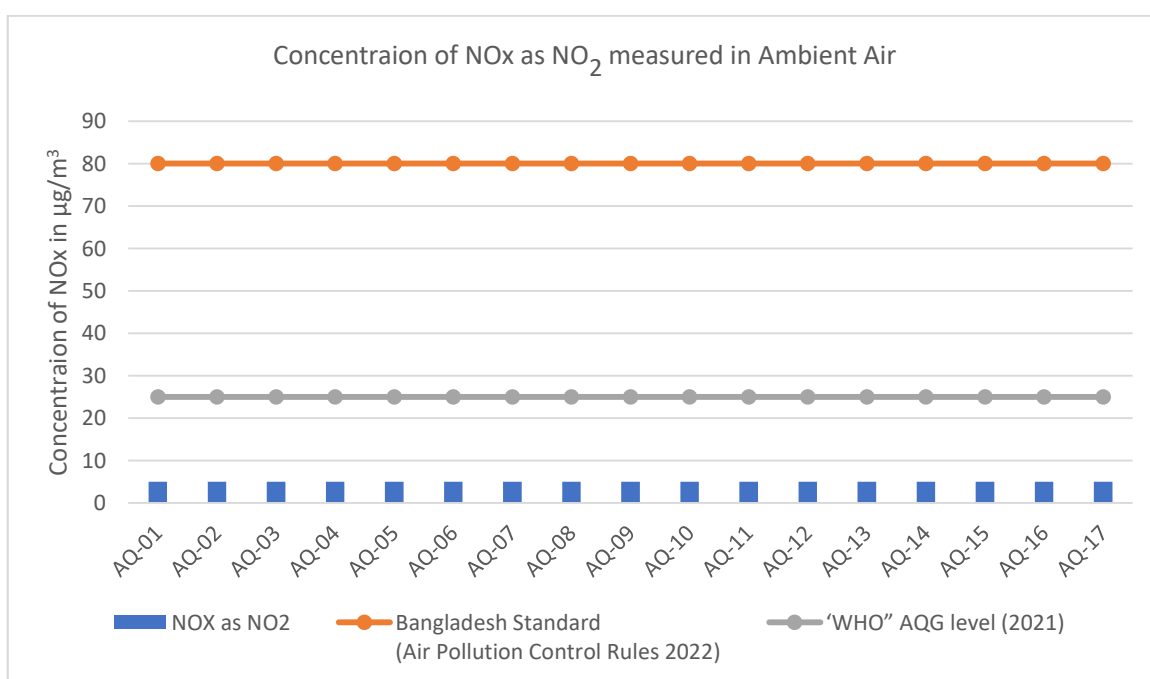


Table 4-12: Graph showing the NO2 concentration in the ambient air.

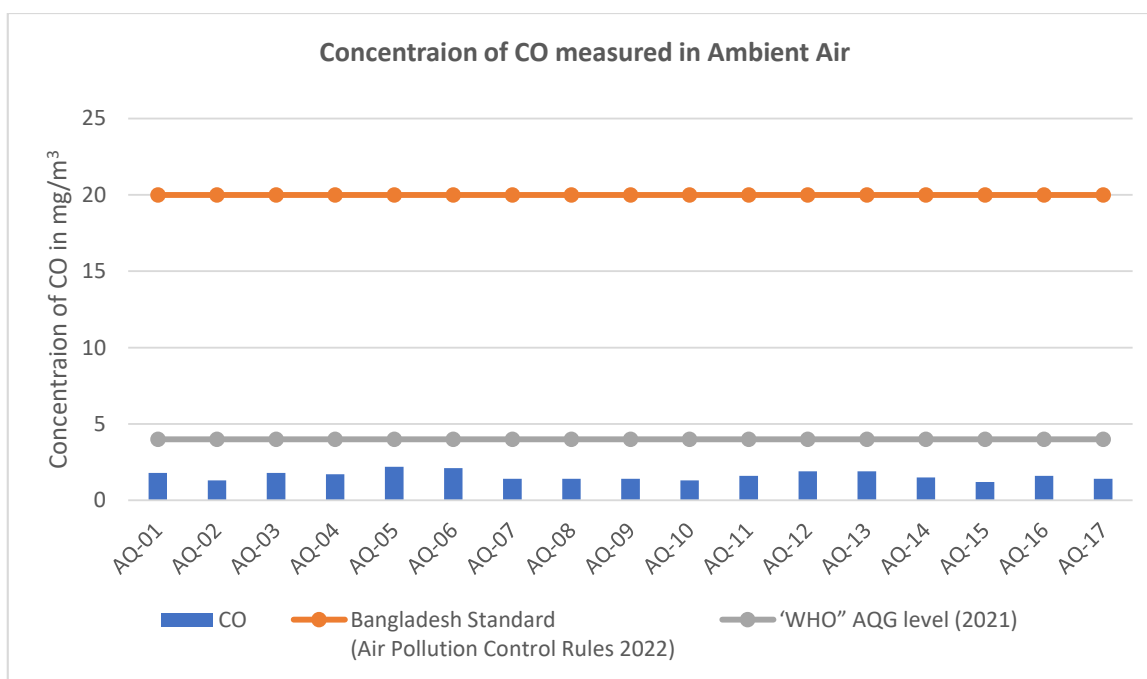


Table 4-13: Graph showing the CO concentration in the ambient air.

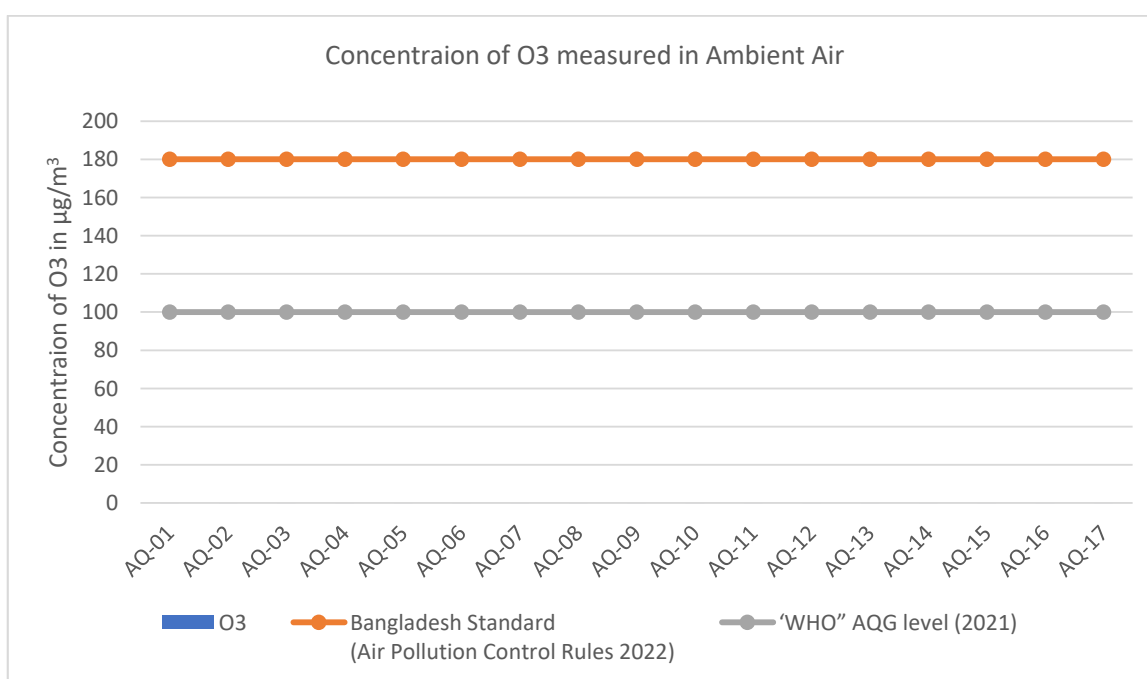


Table 4-14: Graph showing the O3 concentration in the ambient air.

Environmental monitoring and activity pictures:

160. Environmental monitoring and sample collection activity pictures of ambient air quality is presented in the figure below:

Fig: AAQ-01, Shalbagan Workshop Area, Rajshahi GPS Co-Ordinate: 24°23'1.59"N; 88°36'34.44"E Sampling Date: June 25 to 26, 2024	Fig: AAQ-02, Chandipur Substation Area, Rajshahi GPS Co-Ordinate: 24°22'11.17"N; 88°34'28.47"E Sampling Date: June 25 to 26, 2024
Fig: AAQ-03, Talaimari-Katakhali Road, Rajshahi GPS Co-Ordinate: 24°21'54.91"N; 88°40'11.40"E Sampling Date: June 26 to 27, 2024	Fig: AAQ-04, Miapur- City Central ALT2 Line, Rajshahi GPS Co-Ordinate: 24°22'13.89"N; 88°34'0.52"E Sampling Date: June 26 to 27, 2024
Fig: AAQ-05, Goshpara More-Shadharon Bima Feeder, Rajshahi GPS Co-Ordinate: 24°22'10.73"N; 88°35'22.20"E Sampling Date: June 27 to 28, 2024	Fig: AAQ-06, Near New Govt. Degree College Road, Medical Feeder, Rajshahi GPS Co-Ordinate: 24°22'11.77"N; 88°34'58.54"E Sampling Date: June 27 to 28, 2024

29 Jun 2024 10:09:36 am 24°50'55.59"N 89°22'29.07"E Holepatti Road Bogura District Rajshahi Division Altitude: 4.8m Speed: 0.0km/h Index number: 197	30 Jun 2024 3:47:36 pm 25°43'43.24"N 89°15'8.33"E Shapla Chatter Rangpur District Rangpur Division Altitude: 7.8m Speed: 0.1km/h Index number: 193
Fig: AAQ-07, S&D-1 Campus, Substation Area, Bogura GPS Co-Ordinate: 24°50'55.59"N; 89°22'29.07"E Sampling Date: June 29 to 30, 2024	Fig: AAQ-08, S&D-1 Campus, Substation Area, Rangpur GPS Co-Ordinate: 25°43'43.24"N; 89°15'8.33"E Sampling Date: June 30 to July 01, 2024
30 Jun 2024 4:40:24 pm 25°43'44.94"N 89°15'9.04"E Rangpur District Rangpur Division Altitude: 9.6m Speed: 0.0km/h Index number: 201	1 Jul 2024 1:36:03 pm 25°46'13.838"N 89°18'0.174"E 87 Haregach Road Rangpur District Rangpur Division Altitude: 11.0m Speed: 0.0km/h Index number: 250
Fig: AAQ-09, Lalbagh, Workshop Area, Rangpur GPS Co-Ordinate: 25°43'45.31"N; 89°15'7.66"E Sampling Date: June 30 to July 01, 2024	Fig: AAQ-10, Baharkasna, Rangpur GPS Co-Ordinate: 25°46'14.00"N; 89°18'1.62"E Sampling Date: July 01 to 02, 2024
1 Jul 2024 1:47:20 pm 25°43'37.556"N 89°16'42.312"E Rangpur - Kurigram Highway Rangpur District Rangpur Division Altitude: 4.2m Speed: 0.1km/h Index number: 273	2 Jul 2024 1:32:11 pm 25°43'47.858"N 89°15'16.782"E Rangpur GPS Rangpur District Rangpur Division Altitude: 16.4m Speed: 1.8km/h Index number: 309
Fig: AAQ-11, Tazhat, Lalbagh-Mahiganj, Rangpur GPS Co-Ordinate: 25°43'37.60"N; 89°16'41.85"E Sampling Date: July 01 to 02, 2024	Fig: AAQ-12, Near NESCO S&D-3, Lalbagh-Shapla, Rangpur GPS Co-Ordinate: 25°43'47.74"N; 89°15'16.62"E Sampling Date: July 02 to 03, 2024



Figure 4-21: Environmental monitoring and sample collection activity pictures of ambient air quality

4.3.9.2 Ambient Noise Quality

161. Ambient noise can seriously harm human health and interfere with people's daily

activities at school, at work, at home and during leisure time. The main health risks of noise identified by the World Health Organization (WHO) are - pain and hearing fatigue, hearing impairment including tinnitus, annoyance, interference with social behavior (aggressiveness, protest and helplessness) and speech communication, sleep disturbance and all its consequences on a long and short term basis, cardiovascular effects, hormonal responses (stress hormones) and their possible consequences on human metabolism (nutrition) and immune system, and poor performance at work and school. Above a maximum noise level 110dBA hearing impairment can occur, it can also occur if exposed to 80dBA for a period of more than 8 hours a day below these levels the main concern is the noise nuisance.

162. Noise is generated in the project area due to the movement of vehicles like trucks and other vehicles on adjoining main roads. To develop project baseline information for the current prevailing conditions monitoring of dB(A) LAeq* for daytime hours 6AM to 10 PM and nighttime hours 10 PM to 6 AM were undertaken at select locations was collected for a sampling duration of 24 hours with a frequency of every 1 hour ¹⁶.

163. The EPC contractors will collect the full set of environmental baseline data¹⁷ during the pre-construction phase and before any construction as per the environment monitoring requirements set out in the EMOP in Annex 2 using an accredited laboratory¹⁸.

164. All Laboratory Reports (Scanned Copy) of Monitoring results are attached as Annex 13.

Monitoring Locations:

165. Ambient noise quality monitoring program has been carried out at Seventeen (17) locations. Sampling points are located at Rajshahi -Six (06), Bogura – One (01), Rangpur – Five (05), Saidpur – One (01), Dinajpur – Two (02), Thakurgaon – One (01) and Pabna – One (01) respectively. The GPS coordinates of ambient noise level monitoring locations are as follows:

Table 4-15: Noise Monitoring Locations

ID – ANL (Ambient Noise Level)	GPS Co-Ordinates
ANL-01	24°23'1.59"N; 88°36'34.44"E
ANL -02	24°22'11.17"N; 88°34'28.47"E
ANL -07	24°50'55.59"N; 89°22'29.07"E
ANL -08	25°43'45.31"N; 89°15'7.66"E
AAQ-09	25°43'43.24"N; 89°15'8.33"E
ANL -10	25°46'14.00"N; 89°18'1.62"E
ANL -13	25°48'25.97"N; 88°53'23.37"E
ANL -14	25°37'26.52"N; 88°38'19.34"E
ANL -15	25°39'30.18"N; 88°38'50.09"E
ANL -16	26°2'16.21"N; 88°25'37.54"E
ANL -17	23°59'30.49"N; 89°15'32.64"E

¹⁶ Laboratory was requested to report on Lmax, Lmin and Leq 24 hr and so results are not available as Leq 1hr for direct comparison with WHO guidelines.

¹⁷ IFC/World Bank's EHS guidelines will be followed for the monitoring

¹⁸ Accredited Laboratory under Bangladesh Accreditation Act, 2006. Certifications & reports available added in Volume 2 in Annex 13.

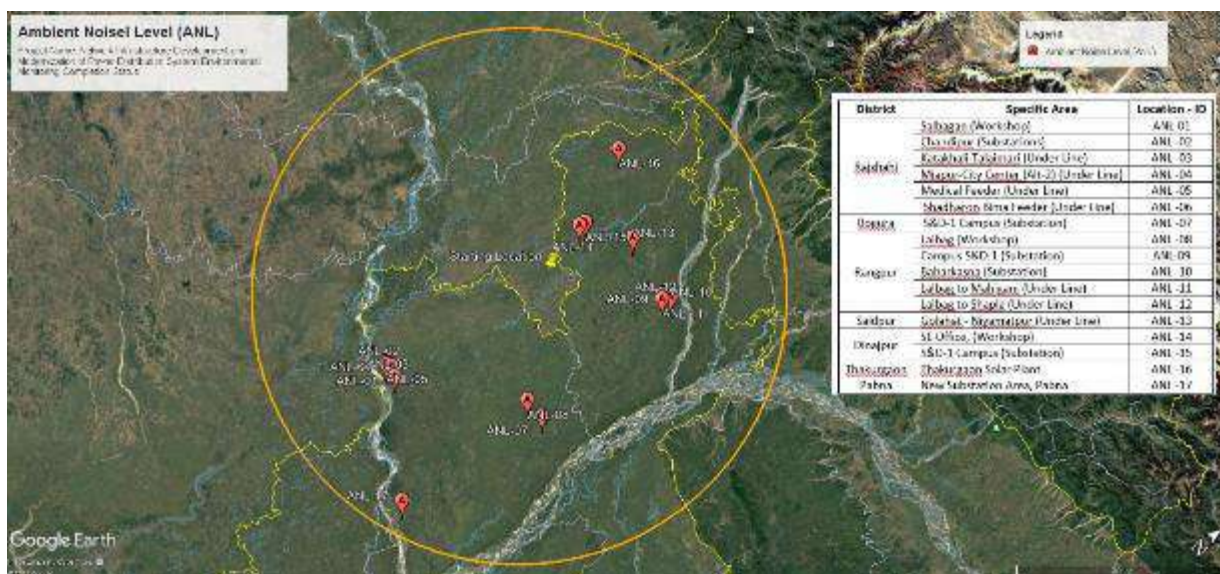


Figure 4-22: Location of Ambient Noise Level shown in Google Maps

Methodology:

166. Monitoring of ambient noise level has been carried out for a period of 24 hours (15 hours daytime [06:00– 21:00] and 9 hours night-time [21:00 – 09:00]) using a Class 1 Sound Level Meter complete with microphone (Model: SL – 4022). The noise is calibrated at site prior to sampling and placed at a height of approximately 1.0 – 1.5 m from ground level. To prevent disturbance from reflecting the surfaces, the noise meter microphone facing towards the noise source with clearance of around 3 meters from any structures is ensured.

Result and Analysis:

Table 4-16: Analysis of Ambient Noise Quality Monitoring Results

SL.	Districts	Location Area	Location Types (Zone) & ID (ANL)	Time	Measured Noise level in dB A	*NPCR 2006	*IFC.20 07	Compliance Status
1	Rajshahi	Salbagan (Workshop)	Mixed	Day	60.0	60	-	Complied
2		Chandipur (Substations)		Night	54.5	50	-	Not Complied
3	Bogura	S&D-1 Campus (Substation)	Commercial	Day	64.3	60	-	Not Complied
4		S&D-1 Campus (Substation)		Night	62.4	50	-	Not Complied
5	Rangpur	Lalbag (Workshop)	Residential	Day	69.7	70	70	Complied
6		S&D-1 Campus (Substation)		Night	69.3	60	70	Not Complied
7	Saidpur	Lalbag (Workshop)	Residential	Day	54.5	55	55	Complied
8		S&D-1 Campus (Substation)		Night	60.6	45	45	Not Complied
9	Dinajpur	Campus S&D-1 (Substation)	Residential	Day	66.7	55	55	Not Complied
10		Baharkasna (Substation)		Night	65.4	45	45	Not Complied
11	Pabna	Golohat - Niyamatpur	Commercial	Day	74.1	55	55	Not Complied
12		Golohat - Niyamatpur		Night	66.1	45	45	Not Complied
13	Dinajpur	SE Office, (Workshop)	Residential	Day	68.1	70	70	Complied
14		S&D-1 Campus (Substation)		Night	68.8	60	70	Not Complied
15	Dinajpur	S&D-1 Campus (Substation)	Residential	Day	57.1	55	55	Not Complied
16		S&D-1 Campus (Substation)		Night	57.0	45	45	Not Complied
17	Dinajpur	S&D-1 Campus (Substation)	Residential	Day	54.3	55	55	Not Complied
18		S&D-1 Campus (Substation)		Night	57.2	45	45	Not Complied
19	Pabna	Pabna		Day	64.5	55	55	Not Complied

SL.	Districts	Location Area	Location Types (Zone) & ID (ANL)		Time	Measured Noise level in dB A	*NPCR ,2006	*IFC.20 07	Compliance Status
		New Substation Area, Pabna	Residential	ANL-17	Night	50.4	45	45	Not Complied

Source: Lab tests result dated 18th July 2024. In-situ Noise measurement performed by the SGS BD Ltd
Figures in RED mean that these test parameters above the IFC guidelines for residential/industrial/commercial areas.

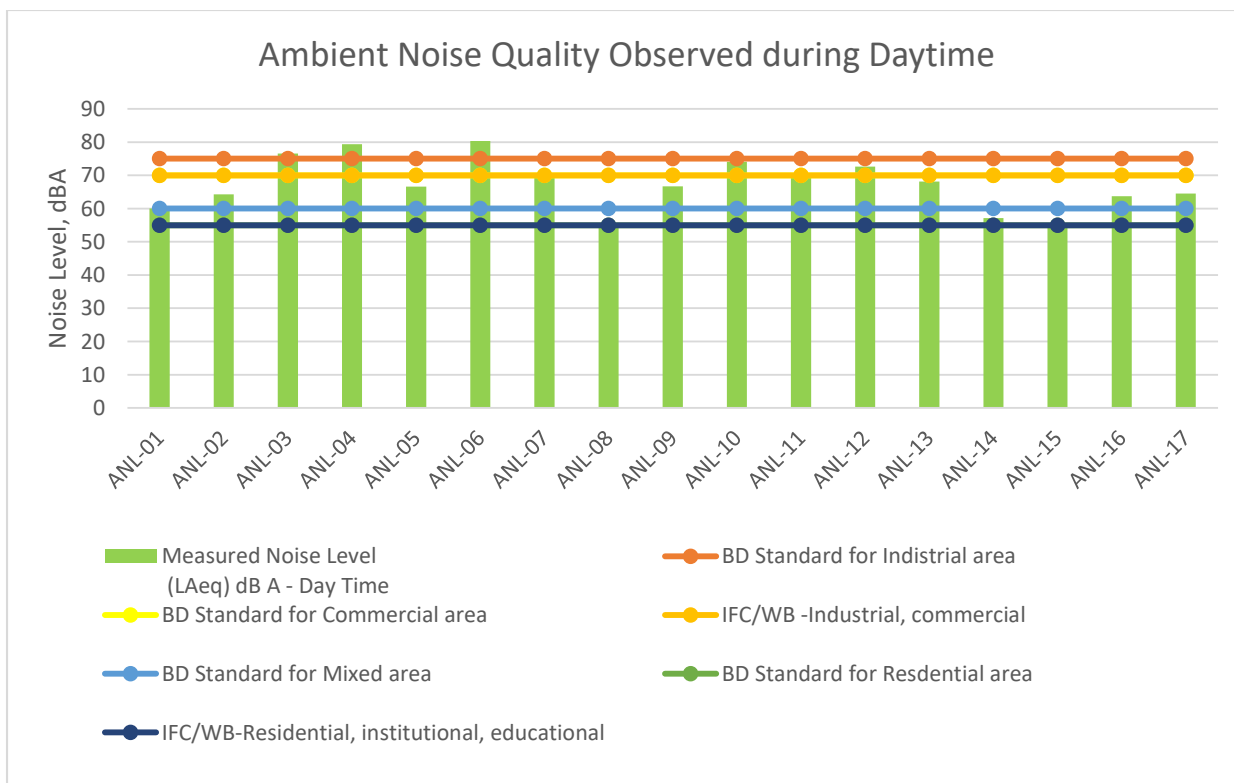


Table 4-17: Ambient Noise Quality Observed at different locations during daytime over the monitoring period.

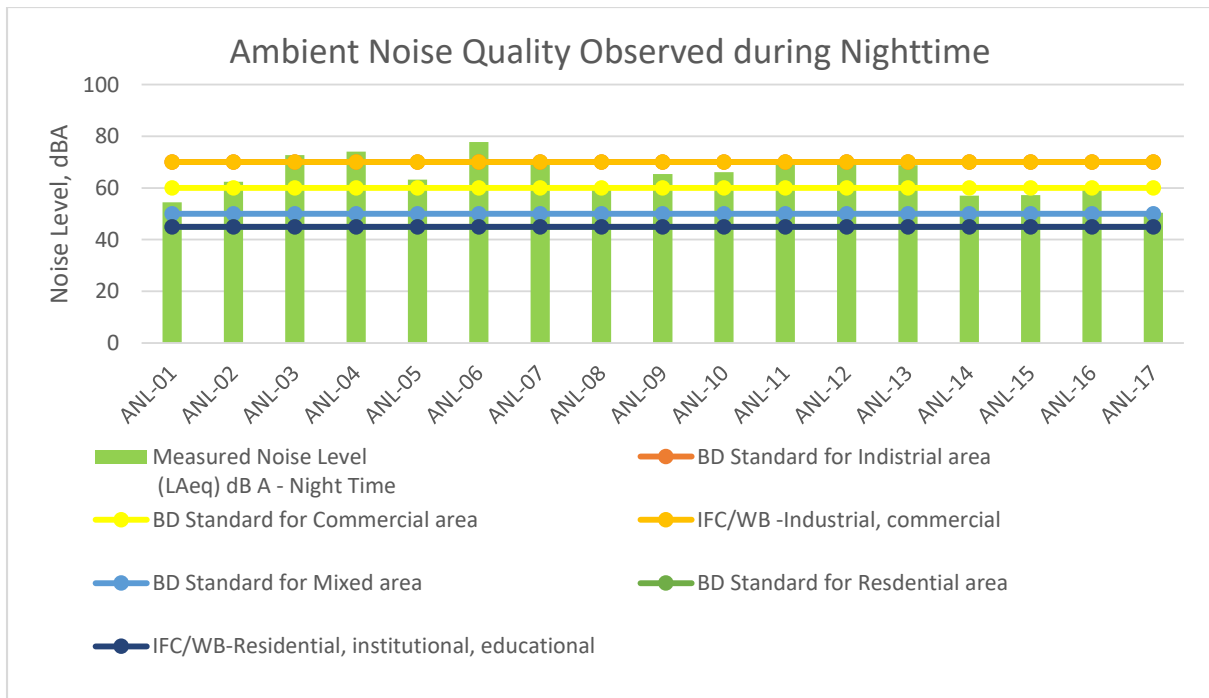


Table 4-18: Ambient Noise Quality Observed at different locations during Nighttime over the monitoring period.

167. Ambient noise monitoring results have been summarized in below **Error! Reference source not found.** Analysis of monitoring results reveals the following status of ambient noise quality of site and surrounding vicinities:

i) Ambient Noise Quality Observed during Daytime

168. Average daytime noise level has been measured maximum 80.3 (dB A) at monitoring location ANL-06 (Rajshahi - Bima Feeder, Under Line). The monitoring location noise level at daytime has been found satisfactory in some section in comparison to the Noise Quality Standard of Noise Pollution (Control) Rules-2006, MoEFCC, Government of Bangladesh. Measured average daytime noise level has found minimum 54.3 (dB A) at monitoring location ANL-15, (Dinajpur - S&D-1 Campus, Substation)

ii) Ambient Noise Quality Observed during Nighttime

169. Average nighttime noise level has been measured maximum 77.8 (dB A) at ANL-06 (Rajshahi - Bima Feeder, Under Line). Measured average nighttime noise level has found minimum 50.4 (dB A) at monitoring location ANL-17, (New Substation Area, Pabna).

Environmental monitoring and activity pictures:

170. Environmental monitoring and sample collection activity pictures of ambient noise quality is presented below figure:

Figure 4-23: Environmental monitoring and sample collection activity pictures of ambient Noise quality

Compliance Status/ Comment:

171. Daytime and Night-time ambient noise levels measured at some monitoring locations (have complied with the standard limit and most of the monitoring location has been exceed the optimum limit set by IFC EHS Guidelines 2007, Noise Pollution (Control) Rules-2006, MoEFCC, Government of Bangladesh.

Day time:



Fig: ANL-01, (Day Time)
Shalbagan Workshop Area, Rajshahi
GPS Co-Ordinate: 24°23'1.59"N; 88°36'34.44"E
Sampling Date: June 25, 2024



Fig: ANL-01, (Nighttime)
Shalbagan Workshop Area, Rajshahi
GPS Co-Ordinate: 24°23'1.59"N; 88°36'34.44"E
Sampling Date: June 25, 2024



Fig: ANL-02, (Day Time)
Chandipur Substation Area, Rajshahi
GPS Co-Ordinate: 24°22'11.17"N;
88°34'28.47"E
Sampling Date: June 25, 2024



Fig: ANL-02, (Night Time)
Chandipur Substation Area, Rajshahi
GPS Co-Ordinate: 24°22'11.17"N;
88°34'28.47"E
Sampling Date: June 25, 2024



Fig: ANL-03, (Day Time)
Talaimari-Katakhali Road, Rajshahi
GPS Co-Ordinate: 24°21'54.91"N;
88°40'11.40"E
Sampling Date: June 26, 2024



Fig: ANL-03, (Nighttime)
Talaimari-Katakhali Road, Rajshahi
GPS Co-Ordinate: 24°21'54.91"N;
88°40'11.40"E
Sampling Date: June 26, 2024

172. From the results, it has been found that, the time-weighted average value of the noise levels at ANL-01 (Salbagan -Workshop), ANL-07 (S&D-1 Campus , Substation Area), ANL-08 (Lalbag -Workshop Area), ANL-13 (Golihat - Niyamatpur -Under Line) & ANL-15 (S&D-1 Campus-Substation) is within the standard limit according to IFC EHS Guidelines 2007, Noise Pollution (Control) Rules-2006, MoEFCC, Government of Bangladesh.

Night- time:



Fig: ANL-04, (Day Time)
 Miapur- City Central ALT2 Line, Rajshahi
 GPS Co-Ordinate: 24°22'13.89"N; 88°34'0.52"E
 Sampling Date: June 26, 2024



Fig: ANL-04, (Night Time)
 Miapur- City Central ALT2 Line, Rajshahi
 GPS Co-Ordinate: 24°22'13.89"N; 88°34'0.52"E
 Sampling Date: June 26, 2024



Fig: ANL-05, (Day Time)
 Goshpara More-Shadharon Bima Feeder,
 Rajshahi
 GPS Co-Ordinate: 24°22'10.73"N;
 88°35'22.20"E
 Sampling Date: June 27, 2024



Fig: ANL-05, (Night Time)
 Goshpara More-Shadharon Bima Feeder,
 Rajshahi
 GPS Co-Ordinate: 24°22'10.73"N;
 88°35'22.20"E
 Sampling Date: June 27, 2024



Fig: ANL-06, (Day Time)
 Near New Govt. Degree College Road,
 Medical Feeder, Rajshahi
 GPS Co-Ordinate: 24°22'11.77"N;
 88°34'58.54"E
 Sampling Date: June 27, 2024



Fig: ANL-06, (Night Time)
 Near New Govt. Degree College Road,
 Medical Feeder, Rajshahi
 GPS Co-Ordinate: 24°22'11.77"N;
 88°34'58.54"E
 Sampling Date: June 27, 2024



Fig: ANL-07, (Day Time)
S&D-1 Campus, Substation Area, Bogura
GPS Co-Ordinate: 24°50'55.59"N;
89°22'29.07"E
Sampling Date: June 29, 2024



Fig: ANL-07, (Night Time)
S&D-1 Campus, Substation Area, Bogura
GPS Co-Ordinate: 24°50'55.59"N;
89°22'29.07"E
Sampling Date: June 29, 2024



Fig: ANL-08, (Day Time)
S&D-1 Campus, Substation Area, Rangpur
GPS Co-Ordinate: 25°43'43.24"N; 89°15'8.33"E
Sampling Date: June 30, 2024



Fig: ANL-08, (Night Time)
S&D-1 Campus, Substation Area, Rangpur
GPS Co-Ordinate: 25°43'43.24"N; 89°15'8.33"E
Sampling Date: June 30, 2024

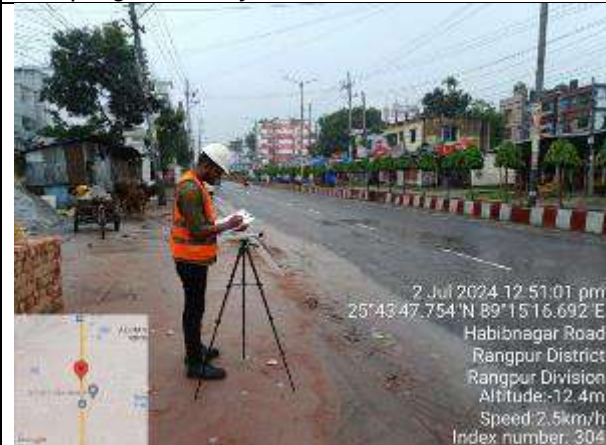


Fig: ANL-09, (Day Time)
Lalbagh, Workshop Area, Rangpur
GPS Co-Ordinate: 25°43'45.31"N; 89°15'7.66"E
Sampling Date: June 30 to July 01, 2024



Fig: ANL-09, (Night Time)
Lalbagh, Workshop Area, Rangpur
GPS Co-Ordinate: 25°43'45.31"N; 89°15'7.66"E
Sampling Date: June 30 to July 01, 2024

173. During the night-time, it has been found that, the time-weighted average value of the noise levels at all monitoring location has been exceeding the standard level according to IFC EHS Guidelines 2007, Noise Pollution (Control) Rules-2006, MoEFCC, Government of

 1 Jul 2024 1:35:15 pm 25°46'13.338"N 89°18'0.174"E 87 Haragach Road Rangpur District Rangpur Division Altitude: 11.0m Speed: 0.0km/h Index number: 247	 1 Jul 2024 9:29:26 pm 25°46'13.254"N 89°17'59.862"E 87 Haragach Road Rangpur District Rangpur Division Altitude: 9.1m Speed: 0.0km/h Index number: 283
Fig: ANL-10, (Day Time) Baharkasna, Rangpur GPS Co-Ordinate: 25°46'14.00"N; 89°18'1.62"E Sampling Date: July 01, 2024	Fig: ANL-10, (Night Time) Baharkasna, Rangpur GPS Co-Ordinate: 25°46'14.00"N; 89°18'1.62"E Sampling Date: July 01, 2024
 1 Jul 2024 3:54:39 pm 25°43'37.506"N 89°16'41.712"E Rangpur - Kurigram Highway Rangpur District Rangpur Division Altitude: 13.7m Speed: 0.0km/h Index number: 280	 1 Jul 2024 10:20:59 pm 25°43'37.47"N 89°16'41.778"E Rangpur - Kurigram Highway Rangpur District Rangpur Division Altitude: 9.2m Speed: 0.6km/h Index number: 299
Fig: ANL-11, (Day Time) Tazhat, Lalbagh-Mahiganj, Rangpur GPS Co-Ordinate: 25°43'37.60"N; 89°16'41.85"E Sampling Date: July 01, 2024	Fig: ANL-11, (Night Time) Tazhat, Lalbagh-Mahiganj, Rangpur GPS Co-Ordinate: 25°43'37.60"N; 89°16'41.85"E Sampling Date: July 01, 2024
 2 Jul 2024 12:51:01 pm 25°43'47.754"N 89°15'16.692"E Habibnagar Road Rangpur District Rangpur Division Altitude: 12.4m Speed: 2.5km/h Index number: 304	 2 Jul 2024 11:09:07 pm 25°43'47.868"N 89°15'16.734"E কবেজ রোড Rangpur District Rangpur Division Altitude: 0.0m Speed: 0.0km/h Index number: 338
Fig: ANL-12, (Day Time) Near NESCO S&D-3, Lalbagh-Shapla, Rangpur GPS Co-Ordinate: 25°43'47.74"N; 89°15'16.62"E Sampling Date: July 02, 2024	Fig: ANL-12, (Night Time) Near NESCO S&D-3, Lalbagh-Shapla, Rangpur GPS Co-Ordinate: 25°43'47.74"N; 89°15'16.62"E Sampling Date: July 02, 2024

Bangladesh.



Fig: ANL-13, (Day Time)
Wapda Mor, Golahat-Niyamotpur, Saidpur
GPS Co-Ordinate: 25°48'25.97"N;
88°53'23.37"E
Sampling Date: July 02, 2024



Fig: ANL-13, (Night Time)
Wapda Mor, Golahat-Niyamotpur, Saidpur
GPS Co-Ordinate: 25°48'25.97"N;
88°53'23.37"E
Sampling Date: July 02, 2024



Fig: ANL-14, (Day Time)
S&D-1 Campus, Dinajpur
GPS Co-Ordinate: 25°39'30.18"N;
88°38'50.09"E
Sampling Date: July 04, 2024



Fig: ANL-14, (Nighttime)
S&D-1 Campus, Dinajpur
GPS Co-Ordinate: 25°39'30.18"N;
88°38'50.09"E
Sampling Date: July 04, 2024



Fig: ANL-15, (Day Time)
S&D-2, Workshop Area, Dinajpur
GPS Co-Ordinate: 25°37'26.52"N;
88°38'19.34"E
Sampling Date: July 04, 2024



Fig: ANL-15, (Night Time)
S&D-2, Workshop Area, Dinajpur
GPS Co-Ordinate: 25°37'26.52"N;
88°38'19.34"E
Sampling Date: July 04, 2024

Reasons for Deviation:



174. **Day Time:** The exceedance of noise levels above acceptable standards can occur due to various reasons. Most of the monitoring locations are near the main road. Daytime noise level exceedances are due to Market, vehicles and people movement. Rain or water on roads adding noise to tyres.

175. **Night-Time:** During night-time, vehicles and people movement, wind blowing & insect singing etc. are the possible reasons.

4.3.9.3 Surface Water quality

176. Surface water sampling program was carried out during wet season (June – July 2024). Surface water samples from three (3) preselected location have been drawn in June - July 2024 for testing at the laboratory.

Monitoring Locations:

177. GPS coordinates of sampling locations are mentioned below.

Table 4-19: Noise Monitoring Locations

ID – SW (Surface Water)	GPS Co-Ordinates
SW-01, (ZRS, NESCO Campus)	24°50'25.99"N; 89°28.47"E

(Workshop Area), Bogura)	
SW-02. (Thakurgaon Area, Thakurgaon)	24°22'11.17"N; 88°34'28.47"E
SW-03, SE office, Pabna	23°59'30.49"N; 89°15'32.64"E

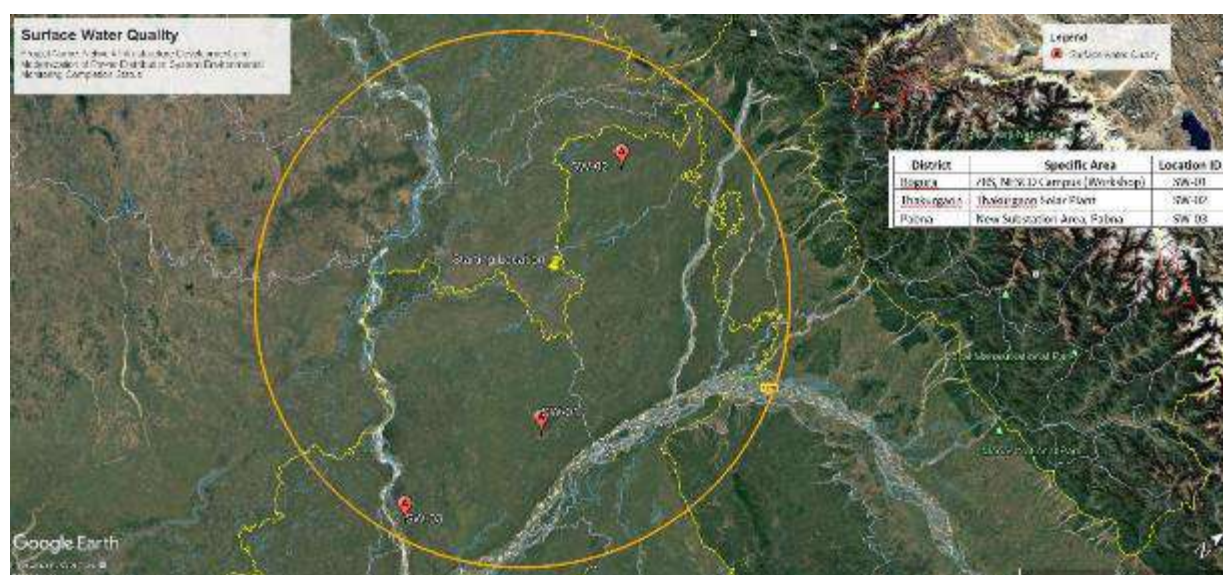


Figure 4-24: Location of Surface water shown in Google Maps

Methodology:

178. Adopted methodologies of sampling and laboratory analysis of surface water quality parameters are presented in below table.

Table 4-20: Sampling Method and Analysis of Surface Water Quality

Parameters	Sampling Method	Laboratory Analysis Method
Temperature (in-situ)	Sampling program has been undertaken according to the procedures outlined in ISO 5667-9:1992 -Water Quality Sampling Guidance.	Analog Thermometer
pH (in-situ)		Electrometric Method by pH Meter
Dissolved Oxygen (DO)		Electrometric Method
Total Suspended Solid (TSS)		APHA 23rd Edition 2017 (2540 D)
Colour		APHA 23rd Edition 2017 (2120 C)
Biochemical Oxygen Demand (BOD5)	Sampling is conducted using a Water Sampler to collect samples. New sampling bottles are rinsed with distilled water for three times and then two times with sample water. All sampling bottles are properly labelled and transported in icebox (4oC) from site to SGS laboratory at Dhaka. All samples accompanied by Chain of Custody (CoC) forms for QA/QC purpose.	APHA 22nd Edition 2012 (5210 B), Analysis carries with BOD Incubator
Chemical Oxygen Demand (COD)		In-House based on APHA 5220 B (23rd Edition 2017)
Total Coliform		APHA 23rd Edition, 2017 (9221 B)

Result and Analysis:

179. Surface water quality test results have been consolidated in the table below.

Table 4-21: Surface water quality test results

Monitoring Parameter	Test Results by Locations			BD ECR 2023 Inland surface water standard (schedule 2, Ka (1) -4.)
	SW-1	SW-2	SW-3	
Temp (0C)	31.2	30.4	36.2	-

Monitoring Parameter	Test Results by Locations			BD ECR 2023 Inland surface water standard (schedule 2, Ka (1) -4.)
	SW-1	SW-2	SW-3	
Colour (Pt-Co)	14.12	27.6	<5	-
pH	7.06	6.50	7.24	6-9
TSS (mg/L)	2	10	10	-
TDS	102	138	330	1000
DO (mg/L)	4.35	5.01	5.20	≥ 5
BOD (mg/L)	3.0	8.0	6.0	≤6
COD (mg/L)	11	32	28	50
Total Coliform2 (MPN/100 ml)	110	140	49	≤5000

Source: Lab result sheet dated 26 July 2024. Sampling and lab tests performed by the SGS BD Ltd
Figures in RED mean they are above BD standards

180. Evaluation of monitoring results includes comparative analysis corresponding to the National standard limits that prescribed in the 'Environment Conservation Rules (ECR) 2023' have revealed the following status of physicochemical characteristics of Bogura, Thakurgaon and Pabna (SW-01, SW-02 & SW-03) aquatic environment during monsoon season. SW-01, SW-02 & SW-03 are 91 m, 250 m and 180 m Away from the project location respectively.

181. According to the Environment Conservation Rules (ECR) 2023 (schedule2 Kha (1)-4, no standard limits (compliance criteria) have been set for (Surface water temperature, Colour, TSS) these parameters.

- Measured **pH levels** at all monitoring locations SW-01, SW-02, SW-03 have been found 7.06, 6.50, 7.24 respectively which is within the national standard limits prescribed in the ECR 2023
- **Total Dissolved Solids** measured maximum 330 mg/L at monitoring locations SW-03 followed by 102 mg/L and 138 mg/L observed at monitoring locations SW-01 and SW-02 respectively. all monitoring locations have been found within the national standard limits prescribed in the ECR 2023.
- Concentrations of Dissolved Oxygen is 5.20 (mg/l) has been found maximum at SW-03. (SE Office, Pabna). SW-01 and SW-02 Concentrations of Dissolved Oxygen is 4.35 (mg/l) and 5.01 (mg/l) respectively. From this result monitoring locations of Thakurgaon (SW-02) and Pabna (SW-03) areas has been found in compliance with the standard prescribed in the ECR 2023.
- Measured concentration of **Biochemical Oxygen Demand (BOD)** has been found maximum of 8.0 mg/L at monitoring location SW-02 followed by 3.0 & 6.0 mg/L recorded at monitoring locations SW-01 and SW-03. BOD of two locations was within the national standard limits prescribed in the ECR 2023 except at location SW-02 (Thakurgaon Area).
- Measured concentrations of Chemical Oxygen Demand (COD) have been found 11 (mg/l), 32 (mg/l) and 28 (mg/l) at SW-01, SW-02 and SW-03 respectively. Maximum concentrations of Chemical Oxygen Demand (COD) 32 (mg/l) have been found at SW-02 (Thakurgaon). Measured concentrations of **Chemical Oxygen Demand (COD)** across the monitoring locations have been found within the national standard limits prescribed in the ECR 2023.
- From the result, the concentration of **Total Coliform** has been found 110 (MPN/100 ml) at SW-01, 140 (MPN/100 ml) at SW-02 and 49 (MPN/100 ml) at SW-03. Across the monitoring locations, **Total Coliform** has been found within the national standard limits prescribed in the ECR 2023.

Compliance Status/ Comments

a) From the analysis, it has been found that the value of pH, DO, Total Dissolved Solid (TDS),

Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and Total Coliform are within the standard limit according to BD ECR'23 Inland surface water standard (schedule 2, Ka (1) -4.). However, Concentration of Dissolved Oxygen (DO) at SW-01 (Bogura) has been found lower than the standard limit.

b) For Colour, TSS standards are not set yet.

Environmental monitoring and activity pictures:

182. Environmental monitoring and sample collection activity pictures of surface water quality is presented in below figure:



Figure 4-25: Environmental monitoring and sample collection activity pictures of Surface water quality

4.3.9.4 Ground Water Quality

183. Groundwater sample program has been carried out from June – July 2024. Groundwater samples from Twelve (12) preselected locations have been drawn in June -July 2024 for testing at the laboratory.

Monitoring Locations:

184. GPS coordinates of sampling locations are mentioned below.

Table 4-22: Ground Water Sampling Location

Location	ID - GW†(Ground Water)	GPS Co-Ordinates
Rajshahi - salbagan	GW-01	24°23'1.59"N; 88°36'34.44"E
Rajshahi - chandipur	GW-02	24°22'11.17"N; 88°34'28.47"E

Location	ID - GW (Ground Water)	GPS Co-Ordinates
Bogua- S&D-1 Campus	GW-03	24°50'55.59"N; 89°22'29.07"E
Bogua- ZRS NESCO Campus	GW-04	24°50'25.99"N; 89°21'16.48"E
Rangpur - Lalbag	GW-05	25°43'43.24"N; 89°15'8.33"E
Rangpur - S&D-1 Campus	GW-06	25°46'14.00"N; 89°18'1.62"E
Rangpur - Baharkasna	GW-07	25°43'47.74"N; 89°15'16.62"E
Dinajpur – SE office	GW-08	25°37'26.52"N; 88°38'19.34"E
Dinajpur – S&D-1 Campus	GW-09	25°39'30.18"N; 88°38'50.09"E
Pabna SE office	GW-11	24°1'18.50"N; 89°14'5.31"E
Pabna New Substation	GW-12	23°59'30.49"N; 89°15'32.64"E

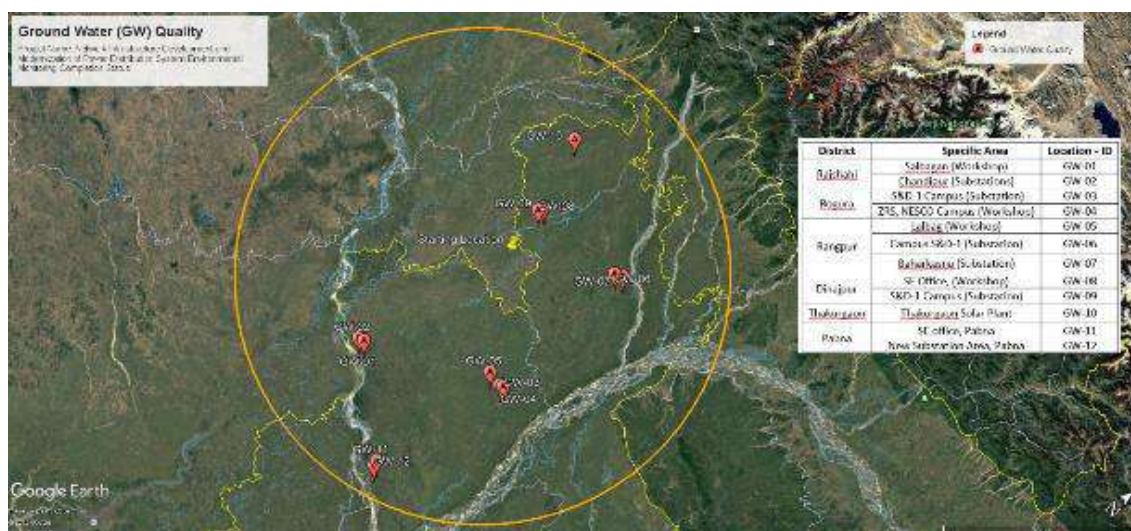


Figure 4-26: Location of Ground water shown in Google Maps

Methodology:

185. Adopted methodologies of sampling and laboratory analysis of groundwater quality parameters are presented in below table.

Table 4-23: Methodologies of sampling and laboratory analysis of Groundwater quality

Test Parameters	Sampling Method	Test Method
Temperature (in site)	Sampling program has been undertaken according to the procedures outlined in ISO 5667-9:1992 -Water Quality Sampling Guidance. New sampling bottles are rinsed with distilled water for three times and then two times with sample water. 5.0 liters of sample have been collected. All sampling bottles have been properly labelled and	Multi meter
pH (in situ)		Multi meter
DO (in-situ)		DO METER
Depth of pump (in situ)		--
Chloride		APHA 23rd Edition 2017 (4500-Cl- B& D)
Colour		APHA 23rd Edition 2017 (2120 C)
Sulphate		APHA 23rd Edition 2017, (4500-SO4E)2-
Nitrate (NO3)		APHA 23rd Edition 2017 (4500-NO3 B)
Nitrite (NO2)		APHA 23rd Edition 2017 (4500-NO2 B)
TSS		APHA 23rd Edition 2017 (2540 D)
TDS		APHA 23rd Edition 2017 (2540 C)
Oil & Grease		APHA 23RD EDITION 2017 (5520-B)
Arsenic (as As)		APHA 23rd Edition (2017) by ICP-OES/MS
Calcium (as Ca)		APHA 23rd Edition (2017) by ICP-OES/MS
Iron (as Fe)		APHA 23rd Edition (2017) by ICP-OES/MS
Potassium (as K)		APHA 22TH Edition 2012 by ICP-

Test Parameters	Sampling Method	Test Method
	transported in ice	OES/MS
Sodium (as Na)	box (4oC) from site	AOAC 19th Edition (2012) by ICP-
	to SGS laboratory at	OES/MS
Fecal Coliform	Dhaka.	APHA 23ND Edition, 2017 (9221 E)
2-Chlorobiphenyl	All samples accompanied by Chain of Custody (CoC) forms for QA/QC purpose.	SO-IN-MUL-TE-022
2,3-Dichlorobiphenyl		
2,4,5-trichlorobiphenyl		
2,2',4,4'Tetrachlorobiphenyl		
2,2',4,4'Tetrachlorobiphenyl		
2,2'4,4'5,6'Hexachlorobiphenyl		
2,2',3,3',4,4',6'Hepatachlorobiphenyl		
2,2',3,3',4,5',6,6'Octachlorobiphenyl		
Polychlorinated biphenyls (PcB)		

Result and Analysis:

186. Groundwater quality test results have been summarized below in the table below.

Table 4-24: Laboratory analysis of Groundwater quality

Parameters	Test Results by Locations												BD Standards	WHO
	GW-01	GW-02	GW-03	GW-04	GW-05	GW-06	GW-07	GW-08	GW-09	GW-10	GW-11	GW-12		
Temperature °C	38.9	31.5	32.7	31.5	29.8	30.9	29.7	32.5	30.9	28.7	32.1	32.2	20-30	-
pH	7.2	5.9	6.15	7.12	6.73	7.02	6.92	6.35	6.78	6.72	6.37	6.94	6.5-8.5	6.5-8.5
DO (mg/L)	5.06	3.42	5.12	4.25	4.89	4.52	5.10	5.01	4.78	4.61	5.12	4.78	-	-
Depth (ft.)	97	94	115	65	60	70	72	65	50	47	120	162	-	-
Chloride (mg/L)	62	8	10	13	10	48	26	33.99	12	37.99	4	8	250	-
Colour (Pt-Co)	7.81	6.25	<5	<5	8.51	<5	<5	<5	7.17	<5	14.68	<5	15	-
Sulfate (mg/L)	59.04	5.77	53.49	5.85	ND	34.47	6.48	32.98	33.14	20.93	<5.00	<5.00	250	-
Nitrate (mg/L)	2.18	0.13	5.12	0.05	ND	12.7	0.86	<0.05	2.96	<0.05	<0.05	<0.05	45	50
Nitrite (mg/L)	ND	ND	ND	ND	ND	ND	ND	<0.02	<0.02	<0.02	<0.02	<0.02	1	3.0
TSS (mg/L)	10	2	ND	ND	12	ND	ND	<1.00	<1.00	16	<1.00	<1.00	10	-
TDS (mg/L)	752	326	572	214	144	478	202	348	140	274	498	572	1000	-
Oil & grease (mg/L)	ND	ND	-	ND	ND	-	-	<1.0	-	-	-	<1.0	0.01	-
Arsenic (ppm)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.05	0.01
Calcium (ppm)	1.64	0.2	2.52	2.28	18.65	20.72	2.7	1.93	6.77	24.25	0.28	0.15	75	-
Iron (ppm)	ND	ND	ND	ND	2.82	ND	ND	ND	ND	13.36	ND	ND	0.3-1.0	-
Potassium (ppm)	2.94	1.02	1.48	1.14	4.28	11.41	1.63	9.58	1.79	12	2.36	1.19	12	-
Sodium (ppm)	38.83	13.98	34.6	12.01	18.51	36.4	13.67	19.66	8.93	200	13.67	24.25	200	-
Fecal Coliform (MPN/100ml)	49	79	79	23	<1.80	<1.80	4.5	<1.80	<1.80	<1.80	<1.80	<1.80	0	0

Source: Lab result sheet dated 26 July 2024. Sampling and lab test performed by the SGS BD Ltd
Figures in RED mean they are above WHO guidelines

187. *Analysis of monitoring results reveals that-*

- i) Concentrations of DO have been measured from 3.42 mg/l to 5.12 mg/l across all locations, but the national standard has not yet been set.
- ii) Measured concentrations of monitoring parameters- Chloride, Colour, Sulphate, Nitrite, Nitrate, TDS, Oil & Grease, Arsenic, Calcium, Potassium, Sodium have been found below the national standards of ECR 2023 set for drinking water quality.
- iii) Concentrations of Total Suspended Solid (TSS) have been found within the national standard limits of ECR 2023 of all the sites except at Rangpur-Lalbag (GW-05) and Thakurgaon (GW-10) and the value is 12 (mg/l) and 16 (mg/l) respectively.
- iv) Measured concentrations of heavy metal parameter - Iron has been found in compliance with the national standards set for drinking water quality at all the sites except at Rangpur - Lalbag (GW-05) and Thakurgaon (GW-10). Measured value is 2.82 (ppm) and 13.36 (ppm) respectively
- v) Concentrations of PCB have been measured <0.05 at locations (GW-01, GW-04, GW-05, GW-08 and GW-11) but no national standard has been prescribed in the ECR'23 for this parameter, but no national standard has been prescribed in the ECR 2023 for this parameter.
- vi) Measured concentrations of Faecal Coliform have been found within the national standard limits at seven monitoring locations and exceeded at GW-01, GW-02, GW-03, GW-04 and GW-07 compared with the values prescribed in the ECR'23. The value is 49 (MPN/100ml) at GW-01, 79 (MPN/100ml) at GW-02, 79 (MPN/100ml) at GW-03, 23 (MPN/100ml) at GW-04 and 4.5 (MPN/100ml) at GW-07. High water temperature in storage tanks can lead to several issues such as the growth of microorganisms, unpleasant odors, and even the degradation of water quality. The detection of fecal coliform bacteria in water samples is an alarming indicator of contamination. The presence of fecal coliforms suggests that other harmful pathogens, such as viruses, parasites, and bacteria, may also be present. These microorganisms can cause gastrointestinal illnesses, diarrhea, dysentery, hepatitis, and other infections, posing significant health risks to communities consuming or using contaminated water.

Compliance Status/ Comments:

188. A comparative analysis of the test results for various water quality parameters, collected from 12 different groundwater locations (GW-01 to GW-12), against the **Bangladesh Environmental Conservation Rules (ECR) 2023** and the **World Health Organization (WHO)** guidelines for drinking water.

- Several locations (GW-01, GW-02, GW-03, GW-04, GW-06, GW-08, GW-09, GW-11, GW-12) exceed the recommended range (20-30°C) set by Bangladesh standards, which may affect the taste and microbial stability of the water.
- Lower pH values in GW-02, GW-03, GW-08 and GW-11 indicate acidic water, potentially causing corrosion in pipes and affecting water taste and safety. These values fall below the BD and WHO guidelines (6.5-8.5).
- The presence of fecal coliform in GW-01, GW-02, GW-03, and GW-04 is concerning as both BD and WHO guidelines set a strict limit of 0 MPN/100 mL for faecal contamination. Immediate remediation measures are needed to address the health risks.
- High iron levels in GW-05 and GW-10 (above the BD standard of 0.3-1.0 ppm) could lead to taste, color, and aesthetic issues in the water.
- Suspended solids exceed acceptable limits in GW-05 and GW-10, affecting water clarity and potentially causing filtration and sedimentation problems.
- Continued testing and monitoring of groundwater sources should be conducted to

ensure that water quality remains in compliance with both BD and WHO standards.

Environmental monitoring and activity pictures:

189. Environmental monitoring and sample collection activity pictures of ground water quality is presented below figure:

 25 Jun 2024 3:22:28 pm 24°23'2.046"N 88°36'34.614"E Chhoto Baa Gram Rajshahi District Rajshahi Division Altitude: 42.0m Speed: 0.0km/h Index number: 31	 25 Jun 2024 1:23:37 pm 24°22'10.908"N 88°14'28.44"E Rajpara Rajshahi District Rajshahi Division Altitude: 29.0m Speed: 0.0km/h Index number: 13
Fig: Ground Water Sampling Shalbagan Workshop Area, Rajshahi GPS Co-Ordinate: 24°23'1.59"N; 88°36'34.44"E Sampling Date: June 25, 2024	Fig: Ground Water Sampling Chandipur Substation Area, Rajshahi GPS Co-Ordinate: 24°22'11.17"N; 88°34'28.47"E Sampling Date: June 25, 2024
 29 Jun 2024 10:33:52 am 24°50'55.584"N 89°22'29.965"E Hotelpathi Road Bogura District Rajshahi Division Altitude: 15.9m Speed: 0.4km/h Index number: 156	 29 Jun 2024 12:20:50 pm 24°50'50.828"N 89°21'10.83"E Puran Bogura Bogura District Rajshahi Division Altitude: 31.4m Speed: 0.1km/h Index number: 166
Fig: Ground Water Sampling S&D-1 Campus, Substation Area, Bogura GPS Co-Ordinate: 24°50'55.59"N; 89°22'29.07"E Sampling Date: June 29, 2024	Fig: Ground Water Sampling ZRS NESCO Campus, Bogura GPS Co-Ordinate: 24°50'25.99"N; 89°21'16.48"E Sampling Date: June 29, 2024
 1 Jul 2024 10:50:06 am 25°44'26.796"N 89°15'20.532"E Rangpur District Rangpur Division Altitude: 14.5m Speed: 0.0km/h Index number: 219	 1 Jul 2024 11:34:24 am 25°43'44.828"N 89°15'59.098"E Rangpur District Rangpur Division Altitude: 11.2m Speed: 0.0km/h Index number: 232
Fig: Ground Water Sampling	Fig: Ground Water Sampling

S&D-1 Campus, Substation Area, Rangpur GPS Co-Ordinate: 25°43'43.24"N; 89°15'8.33"E Sampling Date: June 30, 2024  Fig: Ground Water Sampling Baharkasna, Rangpur GPS Co-Ordinate: 25°46'14.00"N; 89°18'1.62"E Sampling Date: July 01, 2024	Lalbagh, Workshop Area, Rangpur GPS Co-Ordinate: 25°43'45.31"N; 89°15'7.66"E Sampling Date: July 01, 2024  Fig: Ground Water Sampling S&D-1 Campus, Dinajpur GPS Co-Ordinate: 25°39'30.18"N; 88°38'50.09"E Sampling Date: July 04, 2024
 Fig: Ground Water Sampling S&D-2, Workshop Area, Dinajpur GPS Co-Ordinate: 25°37'26.52"N; 88°38'19.34"E Sampling Date: July 04,	 Fig: Ground Water Sampling Thakurgaon DPS, Thakurgaon GPS Co-Ordinate: 26°2'16.21"N; 88°25'37.54"E Sampling Date: July 05, 2024
 Fig: Ground Water Sampling New Substation Area, Pabna GPS Co-Ordinate: 23°59'30.49"N; 89°15'32.64"E Sampling Date: July 08, 2024	 Fig: Ground Water Sampling SE office, New Workshop Area, Pabna GPS Co-Ordinate: 24°1'18.50"N; 89°14'5.31"E Sampling Date: July 07, 2024

Figure 4-27: Environmental monitoring and sample collection activity pictures of

Ground water quality

Table 4-25: PCB Laboratory analysis of Ground Water quality

Parameters	Unit	Test Results by Locations (Ground water)				
		GW-01	GW-04	GW-05	GW-08	GW-11
2-Chlorobiphenyl	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
2,3-Dichlorobiphenyl	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
2,4,5- trichlorobiphenyl	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
2,2',4,4'-Tetrachlorobiphenyl	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
2,2',4,4'-Tetrachlorobiphenyl	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
2,2',4,4',5,6'-Hexachlorobiphenyl	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
2,2',3,3',4,4',6'-Hepatachlorobiphenyl	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Polychlorinated biphenyls (PCB)	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05

Source: Sampling and Analysis done by Laboratory of SGS Bangladesh Limited.

190. **Remark:** Measured concentrations of PCB but not found of PCB in Ground water samples of monitoring locations.

4.3.9.5 Soil Quality

191. Soil sample program has been carried out during June – July 2024. Soil samples from Six (06) preselected location have been drawn in June -July 2024 for testing at the laboratory.

Monitoring Locations:

192. Soil Samples from Six (6) pre-selected locations have been drawn. GPS coordinates of soil sampling locations are mentioned in the table below.

Table 4-26: Soil Sampling Locations

Location	ID – SL (Soil Quality)	GPS Co-Ordinate
Rajshahi - salbagan	SL-01	24°23'1.59"N; 88°36'34.44"E
Bogua- ZRS NESCO Campus	SL-02	24°50'25.99"N; 89°21'16.48"E
Rangpur - Lalbag	SL-03	25°43'43.24"N; 89°15'8.33"E
Dinajpur – SE office	SL-04	25°37'26.52"N; 88°38'19.34"E
Pabna SE office	SL-06	24°1'18.50"N; 89°14'5.31"E

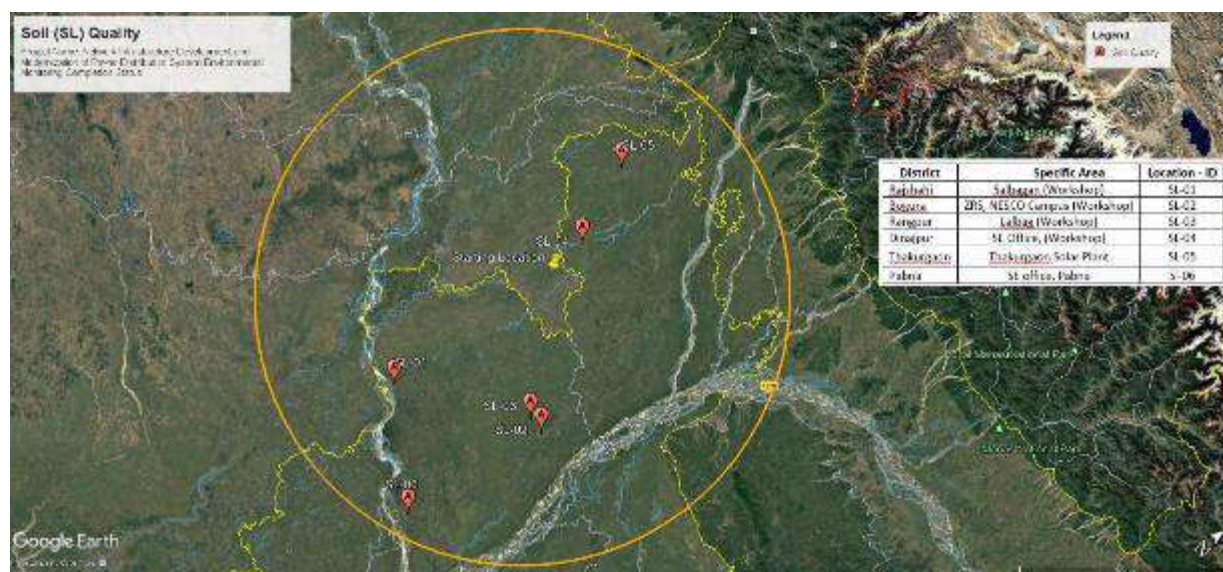


Figure 4-28: Location of Soil Quality shown in Google Maps

Methodology:

193. Adopted methodologies of sampling and laboratory analysis of soil quality parameters are presented in the table below.

Analysis Parameters	Sampling Method	Method
% Silt	Hand Auger uses as per following process prior to collect soil. o Hand Auger washed with distilled water for 3 times and kept in open air for drying prior to collect sample. o Then it is washed again with 5% HNO ₃ and methanol separately to prevent from metal contamination. o 1 kg of sample collected for each sampling location.	F.A.O.U.N 2005
% Clay		F.A.O.U.N 2005
Colour		Visual Examination
Oil & Grease (HEM)		USEPA Method 9071 B
Total nitrogen as N		IS 14684: 1999
Phosphorus as P		ASTM D6349 - 13 (by ICP OES)
Potassium as K ₂ O (Potash)		ASTM D6349 - 13 (by ICP OES)
% Sand		F.A.O.U.N 2005
pH (1:2.5)		IS 2720 (Part 26): 1987
Total Organic Carbon		IS:2720 (Part-22):1972
Chromium (as Cr)	Self-sealed plastic container uses to preserve and deliver the Soil samples to the SGS laboratory at Dhaka. All samples accompanied by Chain of Custody (CoC) forms for QA/QC purpose.	USEPA 3050B/3052
Lead (as Pb)		USEPA 3050B/3052
Cadmium (as Cd)		USEPA 3050B/3052
Arsenic (as as)		USEPA 3050B/3052
Mercury (as Hg)		USEPA 3050B/3052
Polychlorinated biphenyls		USEPA 3540C & 8082A
2-Chlorobiphenyl		USEPA 3540C & 8082A
2,3-Dichlorobiphenyl		USEPA 3540C & 8082A
2,4,5-Trichlorobiphenyl		USEPA 3540C & 8082A
2,2',4,4'-Tetrachlorobiphenyl		USEPA 3540C & 8082A
2,2',3',4,6'-Pentachlorobiphenyl		USEPA 3540C & 8082A
2,2',4,4',5,6'-Hexachlorobiphenyl		USEPA 3540C & 8082A
2,2',3,3',4,4',6'-Heptachlorobiphenyl		USEPA 3540C & 8082A
2,2',3,3',4,5',6,6'-Octachlorobiphenyl		USEPA 3540C & 8082A
Moisture content		IS 2720 (Part 02): 1973

Result and Analysis

194. Analysis of test results has revealed the following statuses that include physical characteristics, nutrients and heavy metal concentrations in soil of respective monitoring locations:

- a) Soil property:
 - I. Colour of monitoring location at SI-01, SL-02, SL-05 and SL-06 have been found 'Gray'. On the other hand, monitoring locations of SL-03 & SL-04 have been found 'Blackish Grey'.
 - II. In topsoil samples of monitoring locations, containment of Moisture has found maximum of 23.3 at SL 06 and minimum of 12.5 at SI-02.
- b) Soil Nutrient: Measured concentrations of soil nutrients of monitoring locations have reflected below.
- c) Soil quality test results have been not found of Total Nitrogen in soil samples of monitoring locations.
- d) Potassium level has measured found maximum 6.06 at SL 04 and minimum 2.55 at SI-03.
- e) Heavy Metal: Among heavy metal monitoring parameters, concentrations of Total Chromium, Lead, Cadmium, Arsenic and Mercury have been found less than lower detection limit.
- f) Measured concentrations of PCB but not found of PCB in soil samples of monitoring

locations.

- In the recent soil testing for Polychlorinated Biphenyls (PCBs) for five workshop locations, no detectable levels of PCBs were found in the samples. PCBs are toxic, persistent organic pollutants commonly associated with industrial activities, electrical equipment, and improper waste disposal. The absence of PCBs in the soil indicates:
- **No PCB Contamination:** The soil appears free from contamination by PCBs, which is a positive outcome as PCBs can pose significant environmental and health risks, including cancer and damage to the immune, reproductive, and nervous systems.
- **Environmental Safety:** The lack of PCBs suggests that the site has not been exposed to PCB-related pollution sources such as improper waste disposal or leakage from electrical transformers.

Table 4-27: Laboratory analysis of Soil quality

Parameter	Unit	Test Results by Locations						NOAA	
		SL-01	SL-02	SL-03	SL-04	SL-05	SL-06	ERL	ERM
Silt %	%	10	9.8	7.9	7.9	9.9	11.9	-	-
Clay %	%	31.7	31.3	35.5	35.6	39.7	43.5	-	-
Colour	-	Grey	Grey	Blackish Grey	Blackish Grey	Grey	Grey	-	-
Oil & Grease (HEM) mg/kg	mg/kg	8	7.5	12.3	13.7	-	5.7	-	-
Total nitrogen as N	mg/kg	0.05	0.05	0.05	0.05	0.05	0.05	-	-
Phosphorus as P mg/kg	mg/kg	6.03	5.32	2.55	6.06	4.42	5.62	-	-
Potassium as K ₂ O (Potash)	% (w/w)	0.02	<0.01	0.03	0.03	<0.01	<0.01	-	-
Sand %	%	58.4	58.9	56.6	56.5	58.4	56.5	-	-
pH (1:2.5)	-	8.44	8.25	8.16	8.34	8.39	8.3	-	-
Total Organic Carbon	%	0.42	0.45	0.37	0.51	0.42	0.47	-	-
Chromium (as Cr)	mg/kg	29.35	29.05	32.71	30.42	31.36	32.32	81	370
Lead (as Pb)	mg/kg	14.01	19.18	10.74	12.14	12.73	11.85	218	8.0
Cadmium (as Cd)	mg/kg	8.9	<1.00	<1.00	1.2	<1.00	<1.00	1.2	9.6
Arsenic (as As)	mg/kg	4.13	2.23	<0.50	1.96	2.72	5.75	8.2	70
Mercury (as Hg)	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.15	0.71
Moisture content	%	14.9	12.5	19.8	18.1	-	23.3	-	-

Source: Sampling and Analysis done by Laboratory of SGS Bangladesh Limited.

Compliance Status/ Comment:

195. There is no Soil Quality Standard yet been set by the Environment Conservation Rules 2023, GOB.

196. The absence of PCBs aligns with environmental safety regulations and standards, ensuring the soil remains uncontaminated and safe for various land use activities, such as agriculture, construction, or habitation.

Environmental monitoring and activity pictures:

197. Environmental monitoring and sample collection activity pictures of soil quality is presented in below figure:



Fig: Soil Sampling,
Shalbagan Workshop Area, Rajshahi
GPS Co-Ordinate: 24°23'1.59"N; 88°36'34.44"E
Sampling Date: July 07, 2024



Fig: Soil Sampling
ZRS NESCO Campus, Bogura
GPS Co-Ordinate: 24°50'25.99"N; 89°21'16.48"E
Sampling Date: June 29, 2024



Fig: Soil Sampling,
Lalbagh, Workshop Area, Rangpur
GPS Co-Ordinate: 25°43'45.31"N; 89°15'7.66"E
Sampling Date: July 01, 2024



Fig: Soil Sampling
S&D-2, Workshop Area, Dinajpur
GPS Co-Ordinate: 25°37'26.52"N; 88°38'19.34"E
Sampling Date: July 04, 2024



Figure 4-29 Environmental monitoring and sample collection activity pictures of Soil quality

Table 4-28: PCB Laboratory analysis of Ground Water quality and Soil quality

Parameters	Unit	Test Results by Locations (Ground water)				
		GW-01	GW-04	GW-05	GW-08	GW-11
2-Chlorobiphenyl	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
2,3-Dichlorobiphenyl	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
2,4,5- trichlorobiphenyl	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
2,2',4,4'-Tetrachlorobiphenyl	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
2,2',4,4'-Tetrachlorobiphenyl	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
2,2',4,4',5,6'-Hexachlorobiphenyl	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
2,2',3,3',4,4',6'-Hepatachlorobiphenyl	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
2,2',3,3',4,5',6'-Octachlorobiphenyl	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Polychlorinated biphenyls (PCB)	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Parameters	Unit	Test Results by Locations (Soil Quality)				
		SL-01	SL-02	SL-03	SL-04	SL-06
Polychlorinated biphenyls	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
2-Chlorobiphenyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
2,3-Dichlorobiphenyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
2,4,5-Trichlorobiphenyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
2,2',4,4'-Tetrachlorobiphenyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
2,2',3',4,6'-Pentachlorobiphenyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
2,2',4,4',5,6'-Hexachlorobiphenyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
2,2',3,3',4,4',6'-Heptachlorobiphenyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
2,2',3,3',4,5',6'-Octachlorobiphenyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1

Source: Sampling and Analysis done by Laboratory of SGS Bangladesh Limited.

Remark: Measured concentrations of PCB but not found of PCB in soil samples and Ground water samples of monitoring locations.

Parameters	Unit	Test Results by Locations (Soil Quality)				
		SL-01	SL-02	SL-03	SL-04	SL-06
Polychlorinated biphenyls	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
2-Chlorobiphenyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
2,3-Dichlorobiphenyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
2,4,5-Trichlorobiphenyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
2,2',4,4'-Tetrachlorobiphenyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
2,2',3',4,6'-Pentachlorobiphenyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
2,2',4,4',5,6'-Hexachlorobiphenyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
2,2',3,3',4,4',6'-Heptachlorobiphenyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1

Source: Sampling and Analysis done by Laboratory of SGS Bangladesh Limited.

198. **Remark:** Measured concentrations of PCB but not found of PCB in soil samples of monitoring locations.

4.4 Biological Environment

4.4.1 Bio-ecological Zones

199. IUCN has classified Bangladesh into 25 Bio-ecological Zones in the context of physiographic and biological diversity. The study area falls mostly under the Bio-ecological Zone 4a: Teesta Floodplain. Details on this bio-ecological zone is presented in **Error! Reference source not found.**

Table 4-29: Information on Bio-Ecological Zone 4a: Teesta Floodplain

Features	Information
Floral diversity:	Trees Aam (<i>Mangifera indica</i>), Kanthal (<i>Artocarpus heterophyllus</i>), Kalo jam (<i>Syzygium cumini</i>), Litchu (<i>Litchi chinensis</i>) Shrubs, Herbs, Climbers, Road-side plants: Bhant (<i>Clerodeudrum viscosm</i>), Danda kalash (<i>Leucus aspera</i>) Trees near water: Jiban (<i>Trema orientalis</i>), Pitali (<i>Trewia nudiflora</i>), Barun (<i>Cratatva nurvala</i>), Hijal (<i>Barringtonia acutangula</i>) Orchids (<i>Rhynchosfylis retusa</i>), Rasna (<i>Vanda roxburghii</i>) Aquatic Plants Kachuripana (<i>Eichhornia crassipes</i>), Shada shapla (<i>Nymphaea nouchali</i>), Panchuli (<i>Nymphoides indicum</i>), Singara (<i>Trapa bispinosa</i>), Bara nukha (<i>Monochoria hastata</i>)
Faunal diversity:	Mammals Five-striped palm squirrel (<i>Funambulus pennanti</i>); Jungle cat (<i>Felis chaus</i>); Tomb bat (<i>Taphozous saccolaimus</i>). Birds Darter (<i>Anhinga melanogaster</i>); Brown fish owl (<i>Ketupa :eylonensis</i>); Black francolin (<i>Francolinus francolinus</i>), Sand lark (<i>Calandrella raytal</i>). Reptiles Three-striped roof turtle (<i>Kachuga dhongoka</i>); Brown roofed turtle (<i>Kacittga smithii</i>); Dark-bellied marsh snake (<i>Xenochrophis cerasogaster</i>); Slender worm luake (<i>Typhlops porrcctus</i>). Amphibians BoulengerOs frog (<i>Rana alticola</i>); Balloon frog (<i>Uperodon globulosus</i>).

4.4.2 Environmentally Critical Areas (ECAs)

200. An Ecologically Critical Area (ECA) is an environmental protection zone in Bangladesh. In 1995, specific areas in Bangladesh could be deemed Ecologically Critical Areas because of the Environmental Conservation Act. The Government after considering the human habitat, ancient monument, archeological site, forest sanctuary, national park, game reserve, wild animals' habitat, wetland, mangrove, forest area, biodiversity, and other relevant factors of the area can declare as ECA. As per the legal mandate, the MoEFCC has declared 13 areas as ECAs. The Department of Environment as a statutory body is entrusted to manage the ECAs. No ECA's present in the study area. The ECA area of Bangladesh is shown in Table 4-30 and Figure 4-30: Ecologically Critical Areas in Bangladesh. However, the project areas don't cover any ECA areas.

Table 4-30: Ecologically Critical Area of Bangladesh

SL#	Areas	Types of Ecosystems	Location	Area (ha)	Year of Declaration
1	Cox's Bazar-Teknaf peninsula	Coastal-Marine	Cox's Bazar	20,373	1999
2	Sundarbans (10 km landward periphery)	Coastal-Marine	Bagerhat, Khulna, Barguna, Pirojpur and Satkhira	292,926	1999
3	St. Martin's Island	Marine Island with coral reefs	Teknaf, Cox's Bazar	1,214	1999
4	Hakaluki Haor	Inland Freshwater Wetland	Sylhet & Moulavibazar	40,466	1999
5	Sonadia Island	Marine Island	Cox's Bazar	10,298	1999
6	Tanguar Haor	Inland Freshwater Wetland	Sunamganj	9,727	1999
7	Marjat Baor	Oxbow Lake	Jhenaidah	325	1999
8	Gulshan-Baridhara Lake	Urban Wetland	Dhaka City	101	2001
9	Buriganga	River	Around Dhaka	1,336	2009
10	Shitalakshya	River	Around Dhaka	184	2009
11	Turag	River	Around Dhaka	3,771	2009
12	Balu	River	Around Dhaka	1,315	2009
13	Jaflong-Dawki	River	Jaflong, Sylhet	1,493	2015

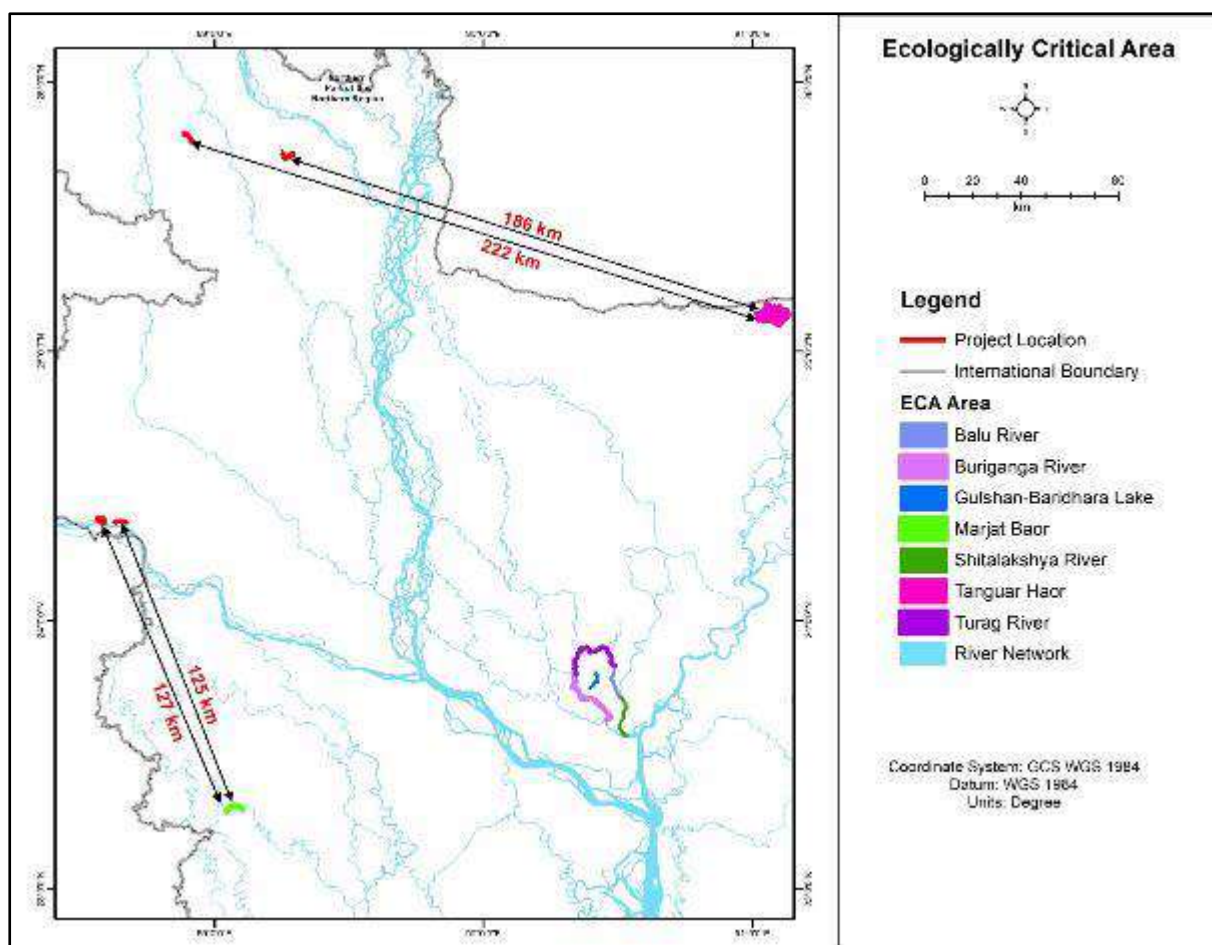


Figure 4-30: Ecologically Critical Areas in Bangladesh

4.4.3 Protected Areas (PAs)

201. The protected area refers to an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity and natural and associated cultural resources and managed through legal or other effective means i.e. the protected area is predominantly a natural area established and managed in perpetuity, through legal or customary regimes, primarily to conserve their natural resources. According to the Wildlife (Conservation and Security) Act, 2012, types of protected areas are National Park, Wildlife Sanctuary, Eco-Park, Botanical Garden, Community Conservation Area, Safari Park, Kunjaban etc. According to the Bangladesh Forest Department's list of protected areas, the closest protected areas (Shingra NP) are about 22 km away on the northern side of the project site.

Table 4-31: Protected Areas of Bangladesh

SL	Protected Areas	Location	Area in (Ha)	Date of declaration
A. National Parks (NP)				
1	Bhawal NP	Gazipur	5022.29	11/05/1982
2	Madhupur NP	Tangail & Mymensingh	8436.13	24/02/1982
3	Ramsagar NP	Dinajpur	27.75	30/04/2001
4	Himchari NP	Cox's Bazar	1729.00	15/02/1980
5	Lawachara NP	Maulavibazar	1250.00	07/07/1996
6	Kaptai NP	Rangamati	5464.78	09/09/1999
7	Nijhum Dweep NP	Noakhali	16352.23	08/04/2001
8	Medhakachapia NP	Cox's Bazar	395.92	04/04/2004
9	Satchari NP	Habiganj	242.91	10/10/2005

SL	Protected Areas	Location	Area in (Ha)	Date of declaration
10	Khadimnagar NP	Sylhet	678.80	13/04/2006
11	Baroiyadhala NP	Chittagong	2933.61	06/04/2010
12	Kuakata NP	Patuakhali	1613.00	24/10/2010
13	Nababganj NP	Dinajpur	517.61	24/10/2010
14	Shingra NP	Dinajpur	305.69	24/10/2010
15	Kadigarh NP	Mymensingh	344.13	24/10/2010
16	Altadighi NP	Naogaon	264.12	14/12/2011
17	Birganj NP	Dinajpur	168.56	14/12/2011
B.	Wildlife Sanctuary (WS)			
1	Rema-Kalenga WS	Habiganj	1795.54	07/07/1996
2	Char Kukri-Mukri WS	Bhola	40.00	19/12/1981
3	Sundarban (East) WS	Bagerhat	122920.90	19/06/2017
4	Sundarban (West) WS	Satkhira	119718.88	29/06/2017
5	Sundarban (South) WS	Khulna	75310.30	29/06/2017
6	Pablakhali WS	Hill tracts	42069.37	20/09/1983
7	Chunati WS	Chittagong	7763.97	18/03/1986
8	Fashiakhali WS	Cox's Bazar	1302.42	11/04/2007
9	Dudpukuria-Dhopachari WS	Chittagong	4716.57	06/04/2010
10	Hajarikhil WS	Chittagong	1177.53	06/04/2010
11	Sangu WS	Bandarban	2331.98	06/04/2010
12	Teknaf WS	Cox's Bazar	11614.57	09/12/2009
13	Tengragiri WS	Barguna	4048.58	24/10/2010
14	Dudmukhi WS	Bagerhat	170.00	29/01/2012
15	Chandpai WS	Bagerhat	560.00	29/01/2012
16	Dhangmari WS	Bagerhat	340.00	29/01/2012
17	Sonarchar WS	Patuakhali	2026.48	24/12/2011
18	Najirganj Dolphin Sanctuary	Pabna	146.00	01/12/2013
19	Silonda Nagdemra Dolphin Sanctuary	Pabna	24.17	01/12/2013
20	Nagarbari-Mohanganj Dolphin Sanctuary	Pabna	408.11	01/12/2013
21	Swatch of No Ground	South Bay of Bengal	173800	27/10/2014
22	Nijhum Dwip MPA	Nijhum Dwip and its adjacent marine water.	318800	24/06/2019
C.	Special Wildlife Sanctuary			
1	Ratargul Special WS	Sylhet	204.25	-
2	Altadighi Special WS	Naogaon	17.34	-
D.	Safari Park			
1	Bangabandhu Sheikh Mujib Safari Park	Cox's Bazar	900.00	-
2	Bangabandhu Sheikh Mujib Safari Park	Gazipur	1390.00	-
E.	Eco- Park (EP)			
1	Sitakundu EP	Chittagong	808.00	1998
2	Modhutila EP	Sherpur	100	1999
3	Madhabkundu EP	Moulavibazar	265.68	2001
4	Banshkhali EP	Chittagong	1200	2003
5	Kuakata EP	Patuakhali	5661	2005
6	Tilagorh EP	Sylhet	45.34	2006
7	Barsijora EP	Moulavibazar	326.07	2006
8	Jamuna bridge West side EP	Pabna	50.02	2008
9	Pirojpur Riverview EP	Pirojpur	2.54	2010
10	Sheikh Rasel Aviary and Eco-Park	Chittagong	210.00	-

Source: Forest Department, July 2018

202. The map of the protected areas is shown in the following Figure 4-31: Protected Areas near Project AOI.

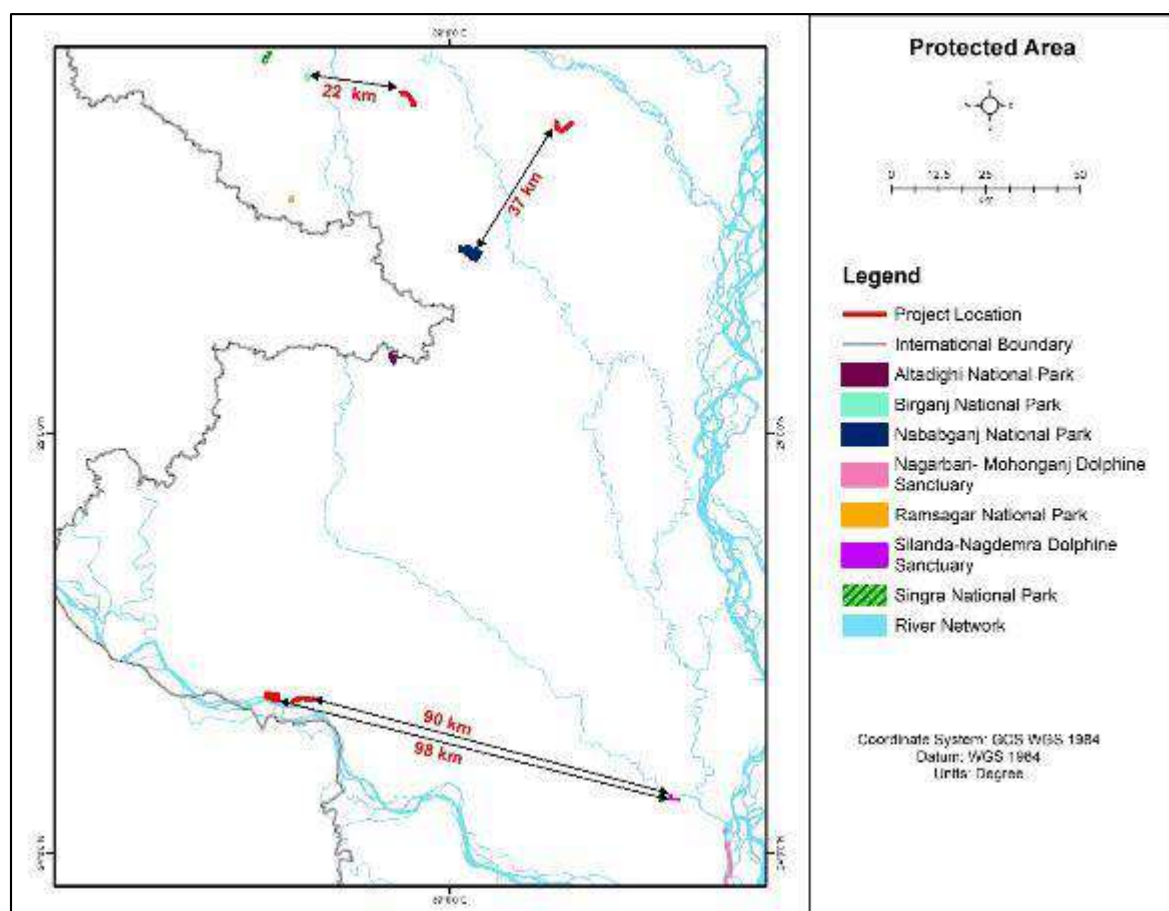


Figure 4-31: Protected Areas near Project AOI

4.4.3.1 IBAT Analysis

203. According to the IBAT analysis (attached in Annex 14), Altadighi, Birganj, Nababganj, Ramsagar and Singra are the nearest protected areas. The following PAs are found within 1 KM of the project areas.

Table 4-32: Protected Areas of AOI

Area name	Within buffer of
Altadighi	1 km
Birganj	1 km
Nababganj	1 km
Ramsagar	1 km
Singra	1 km

Source: IBAT, ADB TA Consultant, January 2024 in Annex 14

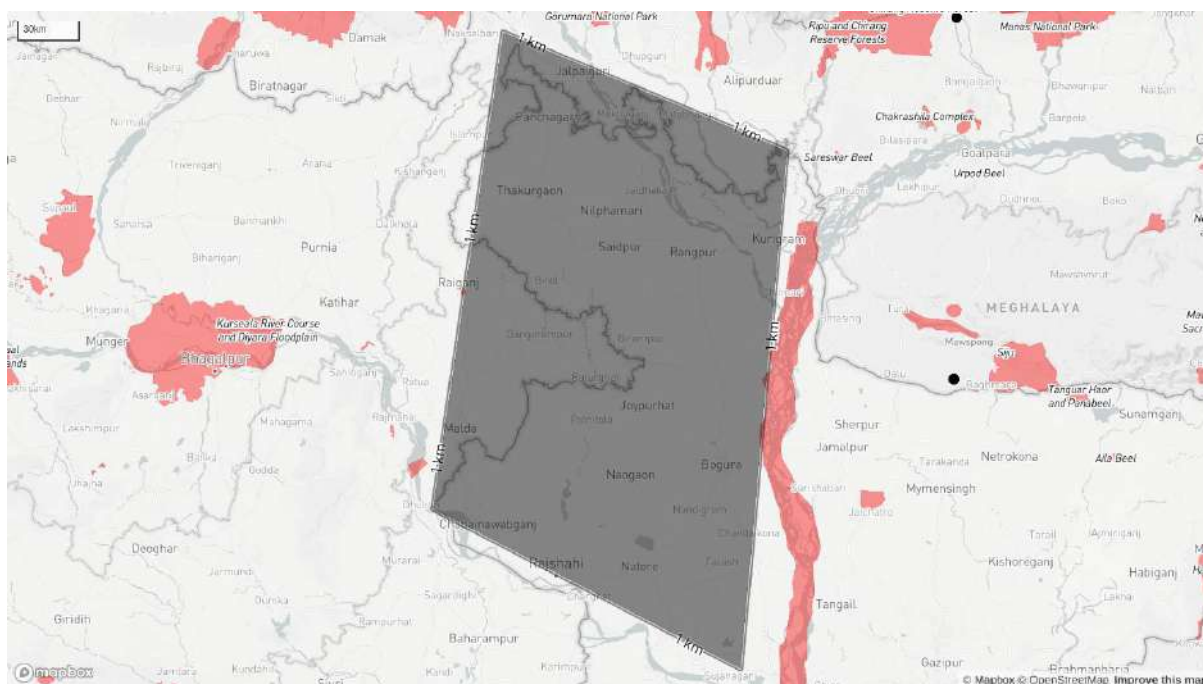


Figure 4-32: Project locations and buffers with 1 KM

4.4.3.1.1 Key Biodiversity Areas

204. The following key biodiversity areas are found within 1 km of the area of interest.

Table 4-33: The Key Biodiversity Areas within 1 KM of the project areas

Area name	Distance
Jamuna-Brahmaputra River	1 km
Kulik (Raiganj) Bird Sanctuary	1 km
Naya Bandh Wetland Complex	1 km

Source: IBAT analysis in Annex 14

4.4.4 Tree cutting or Vegetation Clearance

205. A number of vegetation or trees will be required clearance during the construction period in the project areas. The information is given below:

Table 4-34: List of affected trees or vegetation

Name of Trees	Type of Trees	Big	Medium	Small	Total Trees
Akashmoni	Wood	4	1	0	5
Neem Trees (Azadirachta indica)	Medicinal	0	5	0	5
Battle Nut	Fruits	0	8	1	9
Coconut	Fruits	0	0	3	3
Jujube	Fruits	0	0	4	4
Guava	Fruits	0	9	1	10
Mango	Fruits	0	51	0	51
Papaya	Fruits	0	10	0	10
Blackberry	Fruits	0	5	0	5
Dewa	Fruits	0	0	0	0
Jambura Grapefruits	Fruits	0	4	0	4
Jackfruits	Fruits	0	0	3	3
Lemon	Fruits	0	2	3	5
Total Trees		4	95	15	114

Source: Field Survey 2024, NESCO.



4.4.5 Wildlife species – Common Species

206. The common wildlife species in the project areas are as follows:

Table 4-35: List of common wildlife species in the project area

Sl. No.	Local name	Scientific name
Mammals		
1	Kathbiral	Ratufa bicolor
2	Bon biral	Filisdomesticus
Reptiles		
3	Dura Shap	Enhydrisenhydris
4	TikTiki	Hemidactylusflaviviridis
5	King kobra	Ophiophagus hannah
6	Rasel Viper	Daboia russelii
Amphibians		
7	Kuno Bang	Bufomelanostictus
8	Sona Bang	Ranacyanophyctis
Avian		
9	Shalik (Indian myna)	Acridotheres fuscus

10	Charai (Sparrow)	Passer domesticus
11	Tiye (Parrot)	Psittaciformes
12	Doyel (Magpie)	Copsychus saularis
13	Choto Machranga	Alcedo atthis

Source: Field Survey 2024, NESCO.

4.4.6 Wildlife species- Threatened Species

207. In the IBAT (Integrated biodiversity assessment tool), around 129 different types of species are found within 50 KM of the Area of Influence (AOI) which are mainly Threatened Species following IUCN Red List of Threatened Species, 2024. The species are mainly freshwater and terrestrial types and cover areas approximately 34804 sq. km. The detail list of threatened species is given in Annex 14. (source: IBAT, Jan 2024).

4.5 Socio-economic and Cultural Environment

4.5.1 Administrative Area

208. The proposed project site lies in 9 different districts (Rajshahi, Pabna, Bogura, Rangpur, Dinajpur, Chapainababgang, Panchagarh, Gaibandha, Nilphamari) and 2 administrative Division of North Bengal of Bangladesh. The administrative units for the study area are given in the

209. .

Table 4-36: Administrative Area

District	Total area SQ Km	Upazila/Thana	Municipalities	Union	Village
Bogura	2898.7	12	11	108	2618
Pabna	2376.1	9	9	73	1562
Chapainawabganj	1702.5	5	4	45	1135
Rajshahi	2425.4	13	15	71	1730
Rangpur	2400.6	8	3	83	1492
Dinajpur	3444.3	13	8	101	2131
Panchagarh	1404.6	5	2	43	825
Gaibandha	2114.8	7	3	82	1250
Nilphamari	1546.6	6	4	60	361
Total	20313.6	78	59	666	13104

4.5.2 Population and households

At the time of the 2011 census, the study area had a population of 2,20,89,189. The total household number is 5148015. Total male 11059100 and total female 11030089. Total population and household are depicted in below **Error! Reference source not found..**

Table 4-37: Population and households

Districts	Number of Household	Male	Female
Bogura	867137	1778528	1760765
Pabna	590749	1313771	1310912
Chapai Nawabganj	357982	843000	871249
Rajshahi	633758	1362641	1337047
Rangpur	720180	1501646	1494688
Dinajpur	715773	1569005	1540621
Panchagarh	228581	516090	510049
Gaibandha	612283	1214563	1257117
Nilphamari	421572	959856	947641
Total	5148015	11059100	11030089

4.5.3 Literacy and Sex Ratio

210. The Literacy rate of study area is 47.99 (considered 7 years+ aged people) and sex ratio (M/F) 100.1 as per population census 2011.

Table 4-38: Literacy and Sex Ratio

Districts	Sex Ratio (M/F)	Literacy Rate (7 years+)
Bogura	101	49.38
Pabna	100.2	46.72
ChapaiNawabganj	96.8	42.94
Rajshahi	101.9	52.98
Rangpur	100.5	48.55
Dinajpur	101.8	52.42
Panchagarh	101.2	51.77
Gaibandha	96.6	42.81
Nilphamari	101.3	44.37
Average	100.1	47.99

4.5.4 Religion and cultural heritage

211. Rajshahi has a long tradition of being a peaceful land decorated with religious harmony. Both the Hindus and Muslims are of brotherly nature and live peacefully together. Eid is celebrated with much grandeur and devotion. Durga Puja is the main religious festival of the Hindu community here. Religious institutions 'Mosque 44945, temple 4123, church 209, tomb 769, sacred place 43.

4.5.5 Occupation and Livelihoods

212. The main source of income of residents in the Rajshahi Division is agriculture (60.36%), Other sources include non-agricultural labor, industry, commerce, transport and communication, service, construction, religious service, and rent and remittance (**Source:** Banglapedia & Local Information).

4.5.6 Water and Electricity

213. Sources of drinking water are tube-wells (92.4%), tap (1.9%) and others (5.7%). All wards and unions of the Rajshahi Division are under the rural electrification network. However, only about 45% of households have access to electricity.

4.5.7 Waste management

214. Solid waste management is also an issue for wastewater agriculture as a proportion of enters the drains, ultimately flowing to the fields. The Rajshahi Division area produces approximately 200 metric tons of solid waste per day, of which around 58 metric tons is not collected by the Rajshahi Division and is therefore littered around the city. The RCC is also not responsible for collecting waste from households and in many areas; the communities have organized themselves to collect the waste.

4.5.8 Archaeological, historical treasures and scenic areas

215. Main Building of Rajshahi College (1880), Old buildings of Sardaha Police Academy, Varendra Research Museum Building, Shahid Minar of Rajshahi University, noted sculpture 'Sabash Bangladesh', Memorial Monument at the slaughter place of Rajshahi University, 'Smriti Amlan' at Bhadra, Shahid Minar at Bhuban Mohan Part, BCSIR Laboratory, Sericulture Research and Training Institute, Sericulture Board, Agricultural Research Centre, Fruits Research Centre. Distinctive folk culture of the district includes Gamvira song, Kavigan, Meyeli Geet (folk songs sung by women), rhymes, puppet show, folk drama, folk tale, riddle, etc.

5 ANALYSIS OF ALTERNATIVES

216. One of the objectives of an IEE is to investigate alternatives to the Project. In relation to a proposed activity, an alternative means different ways of meeting the general purposes and requirements of the proposed activity. The following section provides an assessment of the 'no action' alternative, alternative locations, alternative substation and switchgear technologies, alternative power line types etc.

5.1 'No Project' Alternative

217. The "No Action" Alternative in this instance is defined as a decision not to undertake the proposed construction of the Project components. The alternative would have no direct negative environmental impacts since no construction work would be involved.

218. In addition, NESCO will not be able to cope with the increasing demand and the existing power system will remain over-loaded, line losses will also remain high, and the system reliability will progressively decrease, with increasing pressure on the system. NESCO will also forego the opportunity of increasing its consumers' base as well as revenue associated with the system expansion. In view of the above, the 'no project' option is not a preferred alternative.

5.2 Alternative Locations

5.2.1 Substations/Switching stations

219. A total of six (6) new substations are planned at different locations in the NESCO area. The locations have been selected by NESCO based on several criteria, including land availability and connectivity with the existing network. The basic criteria for the selection of a substation are as follows:

- Load demand and power evacuation requirement.
- Site feasibility studies.
- Selection of a site close to the load center to minimize power losses
- Minimum length of power line.
- Selection of voltage level and capacity considering the availability of voltage level and power handling capacity.
- Load flow studies.

220. To minimize the resettlement impact, NESCO prioritizes selecting government-owned land and free from any settlement. There are six proposed 33/11 kV substations, four of which are on the existing NESCO-owned land and therefore do not require any land acquisition.

221. Selection of land also based on site suitability analysis/criteria for selection of land (e.g., size, ownership, number of owners, cost, land type, access, resettlement requirements, drainage, water supply, distance to protected area etc.) (e.g., preference for flat land, not flood prone, avoid protected areas, away from populated areas, in areas of little commercial value etc.).

Types of Switchyards

222. Among the six new substations 3 substations will be AIS and 3 substations will be GIS based on land availability.

223. Many technical differences are involved in the construction of the two types of substations. Air Insulated Switchgear (AIS) is more conventional but requires more land to install and Gas Insulated Switchgear (GIS) is technologically more advanced and requires smaller land parcel but costlier than AIS.

224. The AIS uses air as the primary dielectric from phase to phase, and phase to ground insulation. This type of switchyard was in use for years before the introduction of GIS. Most substations across Bangladesh are AIS. These are in extensive use in areas where space, weather conditions, seismic occurrences, and environmental concerns are not an issue such as rural areas and favorable offsite terrains. In the GIS system, all the live components are enclosed in a ground metal enclosure and the whole system is housed in a chamber full of gas. Gas insulated switchgears (GIS) primarily use Sulphur hexafluoride gas (SF6) as the primary insulation. Though a greenhouse gas, SF6 is non-toxic, maintains atomic and molecular properties even at high voltages, high cooling properties, and superior arc quenching properties. In addition, it is safe. SF6 has superior dielectric properties compared to other gases; thereby providing favorable insulation for the phase to phase and phase to ground moderation. In the substation setup, the gas is contained in a grounded metal enclosure containing the conductors, current and voltage transformers, circuit breaker interrupters and switches. Though the cost of GIS substations is substantially higher compared to the AIS system, GIS substations have been selected for the proposed areas primarily in view of the much smaller land requirements compared to AIS system. In addition, GIS systems are more reliable, safer to operate and maintain, pose minimal safety risks to the local communities, and easier to install.

Sites for Substations

225. Substation sites for the project have been selected and finalized by NESCO. Among the six substation sites four (4) sites are in NESCO's own campus and thereby no land acquisition required.

226. Two lands have been acquired for new substations namely: Kodomtola at Pabna and Baharkashna at Rangpur.

Kodomtola, Pabna:

227. Two sites have been selected for Pabna substation at first. Based on the field visit observation site -2 has been selected for the substation site. The site has been compared and selected based on road accessibility, land elevation and leveling, surrounding conditions and costing of land development. Moreover, site-2 has boundary and gated land with security. Some photos of both sites have been presented below during field visit.





Baharkashna, Rangpur

228. Substation sites for the project have been selected by NESCO and they have already acquired the land. Here the land is acquired by NESCO from authorities and/or owners who need a stable power supply for their factories in the surrounding areas.



5.2.2 Workshops

229. All the workshops are in the NESCO campus area, which is well secured and marked with boundary walls. Thereby open spaces (not used land) have been selected to utilize the vacant spaces.

Workshops:

230. One extension and three new workshops will be built besides the vacant land of old workshops with a new layout plan, up to date machinery including all necessary equipment with crane and improved working conditions.

231. Alternate option for workshops is mainly discarding the old workshop building for store and building a new workshop with proper updated facilities and management options.

Existing workshop	New location
	
Salbagan, Rajshahi	
	
ZRS, Bogura	
	
Balubari, Dinajpur	
	
Lalbag, Rangpur	

6 IEE APPROACH

232. The IEE report has been prepared based on the project activities supplied by NESCO as presented in Chapter 3. Environmental and social data from different sources (BBS, DoE, Department of Meteorology, and other EIA reports) of the proposed project area were collected to prepare an environmental baseline profile as set out in Chapter 4. The ADB TA consultants and focal persons from NESCO undertook exploratory and reconnaissance site visits to visualize the condition of the project site and its surroundings and to identify considerations for the assessment. The IEE study has been done based on both primary and secondary data. Primarily environmental and social data was collected through field work and a set questionnaire. The approach to impact identification includes the application of expert judgment, systematic and sequential approaches, spatial analysis through the application of remote sensing and GIS, and local community participation. The identification of interactions between the project activities and the important environmental and social components was made based on a checklist. This checklist was prepared following the DoE guidelines for selected industries (DoE, 1997), Environmental Guidelines for selected industrial and water development projects (ADB, 1990), ADB's REA Checklist, and the ADB TA consultant's experience with similar projects. Public consultation was also undertaken to obtain the people's view, as suggested in the EIA guidelines. The project components, environmental baseline, possible environmental impacts, mitigation measures and environmental management plan are presented in this report following ADB and DoE's guidelines.

6.1 Purpose of the IEE Study

233. According to Environmental Conservation Rule 2023, the proposed project doesn't fall any category of ECR 2023 and thus Environmental Clearance Certificate is not required from the Department of Environment (DoE). To that end, an initial environmental examination (IEE) along with EMP is acceptable to the DoE as part of the ECC application. The proposed project of NESCO, on the other hand, is categorized as a "B" category sub-project by the ADB (as per SPS 2009) because the potential impacts are site-specific, reversible, and in most cases mitigation measures can be easily designed to manage the impacts.

234. It is anticipated that the IEE document is expected to meet the requirements of both DoE and ADB. This IEE report is part of the process of compliance in accordance with the Government of Bangladesh laws/rules and the ADB Safeguard Policies. The IEE assesses the risks and impacts and provides various environmental and social measures to avoid, reduce, mitigate and compensate for these risks and impacts during preparation, construction and operation of the project.

6.2 Assessment Boundaries

235. The boundaries of the assessment (or the project area of influence) have been divided depending upon the specific environmental and social characteristic to be affected and the type of activity. For example, the potential area of impact for operational phase noise around a substation will be different to the potential area of impact upon soils which will be confined to the areas within the substation boundary. These boundaries are defined in Chapter 4 as part of the overall assessment process.

6.3 IEE Methodology

236. The methodology used to prepare this IEE is based on the requirements of Environment Conservation Rules, 2023, Government of Bangladesh (GOB) EIA Guidelines and ADB's Safeguard Policy Statement (2009) and the joint experience of the consultants involved in the IEE. Specifically, the methodology for this assessment is based on other recent projects funded by ADB in Bangladesh.

237. The study is based on both primary and secondary data and information. The primary data includes data collected from field and expert observations and secondary data includes the review of the Bangladesh Bureau of Statistics and relevant information from Government Departments and published literature. For social baseline, discussions were held with stakeholders including government officials, community representatives and a wide range of current users and project sites dwellers. The main purpose of this approach was to obtain a fair impression on the people's perceptions of the project and its environmental impacts.

6.3.1 Baseline Data Collection and Analysis

238. In order to establish the baseline biophysical conditions within the study area, relevant secondary and primary data was collected and reviewed, a comprehensive field survey was undertaken, and a number of consultations with local people were carried out.

239. Background data and information collected by the team was obtained from published and unpublished sources, e.g., on climate, topography, geology and soils, natural resources, flora and fauna, agriculture, and socio-economic data. Review of alignments using google earth was undertaken. References to all sources used is made throughout the report.

6.3.2 Site Surveys and Audits

240. Several site inspections of the Project area were conducted during June 2024. All substation/renovation substation sites, workshops were visited and where practical (due to distance constraints and vast number of sub-projects) some switching stations and bay extensions were observed.

241. The potential areas of impact have been inspected by the IEE Consultant during April, June 2024 and areas of potential environmental significance assessed carefully. Baseline ecological walkover surveys in April 2024 and instrumental physical environment monitoring (by an accredited laboratory in June 2024) have also been undertaken. Socio-economic surveys by the ADB TA Social Safeguards Consultant Team (responsible for preparation of the Project Resettlement Plan) have been completed in June 2024 for areas around the new substations.

Table 6-1: Physical Monitoring and Surveys Undertaken

Topic	Survey
Noise	Monitoring baseline noise conditions at sub-project locations
Air	Monitoring of baseline air quality at sub-project locations
Water	Monitoring water quality at or close to sub-project locations
Social	Socio-economic Survey and Census near sub-project locations
Soil	Monitoring soil quality at sub-project locations
General site visit	To observe flora and fauna, and general site characteristics as well as the immediate areas around sub-project locations

Physical and Environmental survey:

242. The physical environment parameters surveyed were air quality, noise level, surface water quality and ground water quality and soil sample for PCB in workshop areas. A set of baseline conditions was recorded, once sampling stations were defined, and data was collected. This dataset was then used to predict the likely impacts and will be applied to monitor change (usually negative) during construction and operation.

243. The environmental data collected in the Project area was from both primarily and secondary sources. The secondary sources included the Bangladesh Water Development Board, Bangladesh Meteorological Department, Soil Resource Development Institute, and the International Union for Conservation of Nature (IUCN), Bangladesh. Table 1 shows the outline

of the Project Environmental Quality Sampling programme, although such short-term data are quite inadequate.

Table 6-2: Outline of Environmental Quality Sampling Programme

Analysis	Parameters were Tested	Standard	Sampling Duration	Total Samples
Air Quality	(PM _{2.5} , PM ₁₀ , CO, SO _x , NO _x , O ₃)	APCR 22, WHO	24-hour	17
Noise Level	level (LAeq)	ECR 23, IFC/WB	24 hours (15 hours daytime [06:00–21:00] and 9 hours night-time [21:00 – 09:00])	17
Surface Water	pH, Temp., color, BOD, COD, DO, TSS, TDS and E-coli	ECR 23	NA	3
Ground Water	pH, Temp., color, DO, TSS, TDS, Na, K, As, Ca, Fe, Chloride (Cl ⁻), Sulphate (SO ₄), Nitrate (NO ₃), Nitrite (NO ₂), Oil & Grease and E-coli PCB in workshop locations	ECR 23, WHO	NA	12
Soil sample	pH, Silt %, Clay %, Sand %, Colour, Moisture content, Total N, P, K, Total Organic Carbon, Pb, Cd, Cr, As, Hg, Oil & Grease (HEM) mg/kg and PCB		NA	6

244. Adopted methodologies of sampling and laboratory analysis of environmental quality parameters are presented below:

Table 6-3: Adopted methodologies of sampling and laboratory analysis of environmental quality parameters

Parameters	Sampling Method	Laboratory/ Analysis Method
Ambient Air Quality		
PM₁₀	✓ Sampling of ambient air is carried out by Respirable Dust Sampler [Model 36C12] ✓ Sampling is conducted 24 hours at a flow rate of 1.38 m³/min. ✓ Sampler placed at an open area (minimum 20 m clearance from any tall structures or vegetations / trees / shrubs) to prevent disturbance ✓ After completion of sampling, each filter paper with trapped PM shall preserve in airtight Polly packet and is again packed in an envelope. All samples to be accompanied by Chain of Custody (CoC) forms for QA/QC purpose.	IS 5182 (Part 23):2006 - Methods for Measurement of Air Pollution, Part 23: Respirable Suspended Particulate Matter (PM ₁₀), Cyclonic Flow Technique
PM_{2.5}	✓ Sampling of ambient air is carried out by Fine particulate monitor [Model APS-302] ✓ Sampling is conducted for 24 hours at a flow rate of 15 LPM. ✓ Sampler placed at an open area (minimum 20 m clearance from any tall structures or vegetations / trees / shrubs) to prevent disturbance ✓ After completion of sampling, each filter paper with trapped PM shall preserve in airtight Polly packet and is again packed in an envelope. All samples to be accompanied by Chain of Custody (CoC) forms for QA/QC purpose.	In House Gravimetric Method

SO ₂	✓ Gaseous pollutants are absorbed in 30 mL of absorbing solutions. ✓ Sampling is conducted 24 hours ✓ Gaseous samples preserve in plastic containers with levels of sampling details and carry in icebox (preserved at 4°C) from site to SGS laboratory at Dhaka. All samples are to be accompanied by a Chain of Custody (CoC) forms for QA/QC purpose.	IS 5182 (Part 2):2001 - Methods for Measurement of Air Pollution, Part 2: Sulphur Dioxide
NO ₂	✓ Gaseous pollutants are absorbed in 30 mL of absorbing solutions. ✓ Sampling is conducted 24 hours ✓ Gaseous samples preserve in plastic containers with levels of sampling details and carry in icebox (preserved at 4°C) from site to SGS laboratory at Dhaka. All samples to be accompanied by Chain of Custody (CoC) forms for QA/QC purpose.	IS 5182 (Part 6):2006 - Methods for Measurement of Air Pollution, Part 6: Oxides of nitrogen
CO	✓ Sampling conducted using portable gas sensor ✓ Sampling conducted for <1 hour with interval of 20 minutes. The readings are then averaged.	Electrochemical Sensor
Ozone (O ₃)	✓ Sampling conducted using portable gas sensor ✓ Sampling conducted for <1 hour with interval of 20 minutes. The readings are then averaged.	Electrochemical Sensor
Noise Level		
Noise	✓ Monitoring of ambient noise level has been carried out for 1 hour in daytime (15 hours daytime (0600 – 2100) and 1 hour in nighttime (2100 – 0900)) using a Class 1 Sound Level Meter complete with microphone (Model: SL – 4010 & VB - 8200). The noise is calibrated at site prior to sampling and placed at a height of approximately 1.0 – 1.5 m from ground level. To prevent disturbance from reflecting surfaces, the noise meter microphone facing towards the noise source with clearance of around 3 meters from any structures is ensured.	
Surface water testing		
Color, pH, Temperature, Total Suspended Solids (TSS), Total Dissolve Solids (TDS), Dissolved Oxygen (DO), Biological Oxygen Demand (BOD ₅), Chemical Oxygen Demand (COD) & Coliform (Faecal).	✓ Sampling program has been undertaken according to the procedures outlined in ISO 5667-9:1992 -Water Quality Sampling Guidance. ✓ Sampling is conducted using a vertical Van Dorn Water Sampler (Beta Plus) to collect samples. ✓ New sampling bottles are rinsed with distilled water for three times and then two times with sample water. ✓ All sampling bottles are properly labelled and transported in icebox (4°C) from site to SGS laboratory at Dhaka. ✓ All samples accompanied by Chain of Custody (CoC) forms for QA/QC purpose.	Find table 1.1 below
Groundwater Testing		
Depth of well/pump, Color, Temperature, pH, Sodium (Na), Potassium (K), Total suspended Solids (TDS), Calcium as Ca, Chloride, Sulphates, Nitrate, Nitrite, DO, Faecal Coliform (FC), Arsenic (As), Iron (Fe). And PCB and oil for workshops (5 nos.) mentioned.	✓ Sampling program has been undertaken according to the procedures outlined in ISO 5667-9:1992 -Water Quality Sampling Guidance. ✓ Sampling is conducted using a vertical Van Dorn Water Sampler (Beta Plus) to collect samples. ✓ New sampling bottles are rinsed with distilled water for three times and then two times with sample water. ✓ All sampling bottles are properly labelled and transported in icebox (4°C) from site to SGS laboratory at Dhaka. ✓ All samples accompanied by Chain of Custody (CoC) forms for QA/QC purpose.	Find table 1.2 below

Soil Quality Testing		
pH, Color, Texture, Moisture (%), Organic Matter (%), Total Nitrogen (%), Potassium (K/100g soil), Phosphorus (ppm), Lead (ppm), Arsenic(ppm), Cadmium (ppm), Chromium (ppm), and Mercury (ppm). And PCB and oil for workshops (5 nos.) mentioned.	✓ Use an auger sampler to collect soil samples from various locations. Ensure samples are taken at a consistent depth to maintain uniformity. ✓ Air-dry the soil samples, then mix thoroughly and remove any debris to prepare for testing. ✓ Testing and Analysis: Perform laboratory tests to determine soil properties, such as pH, nutrient levels, and contaminants, and use the results to assess soil health and recommend necessary actions. All samples are properly labelled and transported carefully from site to SGS laboratory at Dhaka. ✓ All samples accompanied by Chain of Custody (CoC) forms for QA/QC purpose.	APHA/USEPA/ISO/IS

Table 6-4: Surface water Test methods

Sl. No	Parameter	Test Method
1	Colour	APHA 23rd Edition 2017 (2120 C)
2	BOD5 at 200 C	APHA 5210 B, 23rd Edi 2017
3	COD	APHA 5220 B, 23rd Edi 2017
4	Dissolved Oxygen (Do)	APHA 4500-O-G, 23rd Edi 2017
5	Total Dissolved Solids	APHA 2540 C, 23rd Edi 2017
6	PH	APHA 4500 H+ B, 23rd Edi 2017
7	Temperature	APHA 2550 B, 23rd Edi 2017
8	Total Suspended Solids (TSS)	APHA 2540 D, 23rd Edi 2017
9	Fecal Coliform	APHA 23RD Edition, 2017 (9221 E)

Table 6-5: Ground Water Quality Test methods

Sl. No	Parameter	Test Method
1	Depth	By rope
2	Colour	APHA 23rd Edition 2017 (2120 C)
3	Temperature	APHA 2550 B, 23rd Edi 2017
4	PH	APHA 4500 H+ B, 23rd Edi 2017
5	Sodium (Na)	APHA 22nd Edition 2012 by ICP-OES/MS
6	Potassium (K)	APHA 23rd Edition (2017) by ICP-OES/MS
7	Total Dissolved Solids	APHA 2540 C, 23rd Edi 2017
8	Calcium (Ca)	APHA 22nd Edition 2012 by ICP-OES/MS
9	Chloride (Cl)	APHA 22nd Edition 2012 (4500-Cl- B)
10	Sulfate (SO4 2-)	APHA 23rd Edition 2017 (4500-SO42- E)
11	Nitrate (NO3)	APHA 22nd Edition 2012, (4500-NO3 B)
12	Nitrite (NO2)	APHA 23rd Edition 2017 (4500-NO2 B)
13	Dissolved Oxygen (Do)	APHA 4500-O-G, 23rd Edi 2017
14	Fecal Coliform	APHA 23RD Edition, 2017 (9221 E)
15	Arsenic (As)	APHA 22nd Edition 2012 by ICP-OES/MS
16	Iron (Fe)	APHA 22nd Edition 2012 by ICP-OES/MS
17	PCB	APHA/USEPA/ISO/IS
18	Oil & Grease	APHA 23rd Edition 2017(5520-B)

Ecology:

245. The ecological survey was conducted by transect walk to determine the ecological condition of the project area. As the sub-project areas are mainly located in urban and peri-urban areas, the following activities were undertaken during the terrestrial and aquatic field surveys.

- **Direct Observation.** The occurrence and abundance of flora and fauna were directly observed while travelling within water bodies, along road edges, across the agricultural fields, and within village groves. Animal presence was also identified based on tracks, footprints, feeding signs, and animal and bird calls.
- **Interviews with Local Residents.** During the field survey period, extensive interviews were conducted with local people to collect information on animal and plant presence, including occurrences, behavior, breeding, distribution, and seasonal appearance.

Environmental audits

246. Environmental audits of the 10 existing substations, 4 workshops have also been completed. The environmental audits were completed by the TA Consultants with assistance with NESCO Environment PMU officials during visits to the substations. The consultant interviewed substation management and staff and inspected the site to observe site conditions and practices. Any 'non-compliances with national regulations and best practice were recorded and have been added to this IEE as part of a corrective action plan (CAP).

Stakeholder Consultation

247. Public consultation was conducted using a set questionnaire. The approach undertaken for consultation meetings involved the following key processes: (i) Identification of Stakeholders, (ii) Undertaking public consultations/Focus Group Discussion (FGDs) and interviews with key stakeholders (KII), and (iii) Summarizing the observations and key findings from the consultations.

248. Stakeholders were identified through systematic consultation with project beneficiaries, project affected people, students, teachers, local government, community people, women, vulnerable and poor members of the community, and other stakeholders who may have an influence over the project. Hence consultations were undertaken with primary stakeholders: beneficiaries, disadvantaged, poor and vulnerable groups, people who may potentially be impacted by the project.

249. Focus group discussions were held with the local community along with disadvantaged and vulnerable members of the community to disseminate information about the project and to understand their views about the project. Women at select locations were also encouraged to participate during the consultation time.

250. All the feedback and suggestions are received, and responses are well documented. Feedback and suggestions will be incorporated into the project design. The IEE will be disclosed to NESCO and ADB websites, Hard copies of the IEE and relevant E&S documents will be kept at project site office and relevant government offices. The summary of IEE will be translated into local languages and will be disclosed with all stakeholders including interested groups.

GIS Mapping

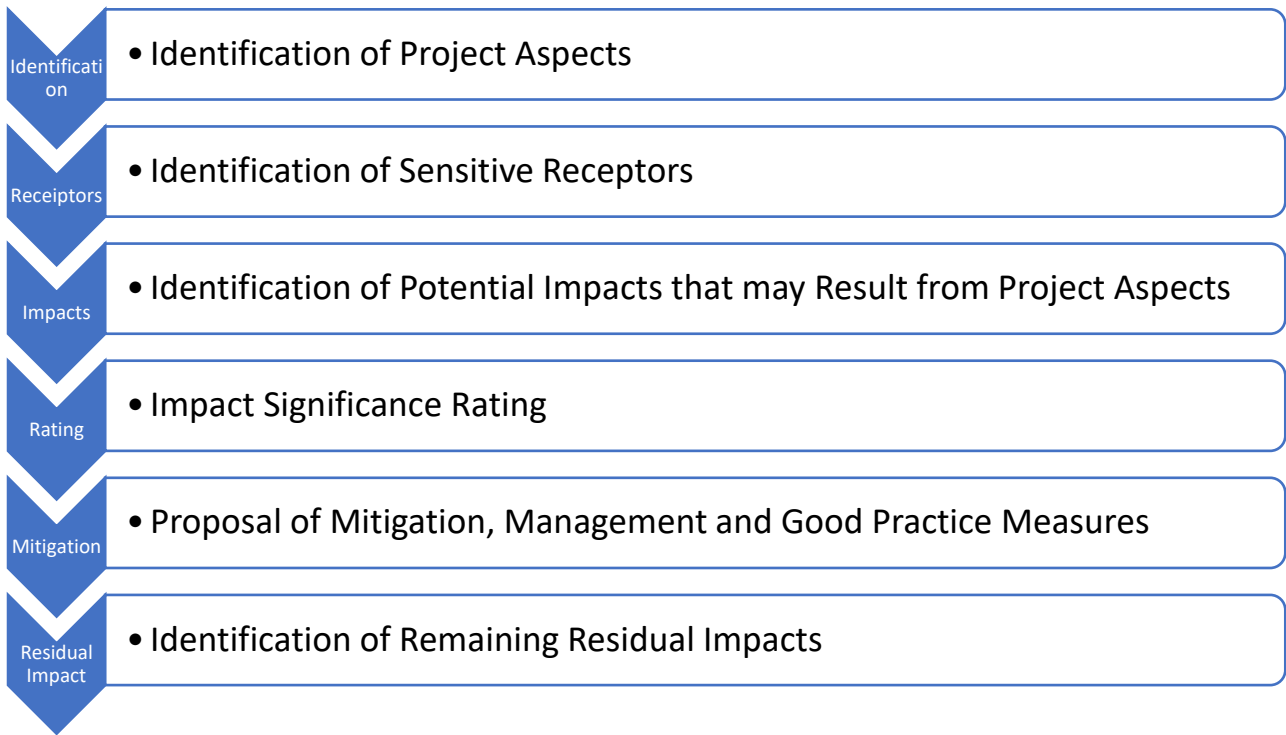
251. Geographical Information Systems (GIS) was used as a specialized analysis and presentation tool. Prior to field investigations, spatial analysis of satellite imagery in Google Earth was used to identify administrative areas and other boundaries and constraints to be considered for both the environmental and social assessments. For example, the administrative boundaries of local government areas were defined, and alignment, settlement areas, and drainage networks were identified. This tool is mainly used for finalization of routes/alignments and locations of project components. These tools also supported detailed on-ground surveys for the inventory surveyors, particularly spatial features that may be directly or indirectly influenced by project activities. The collected information is demonstrated in the

GIS mapping figures throughout this report.

6.3.3 Impact Assessment Methodology

252. This IEE follows a set format during the impact assessment process. As shown in the flow chart and described further below.

Figure 6-1: Impact Assessment Process



Project Aspects

Identification of Sensitive Receptors

253. Once the main aspects of the Project have been identified, any sensitive receptors within the Project area of influence are noted. Examples of sensitive receptors include residents, rivers, groundwater, birds, etc. Identification of receptors is a key part of the impact assessment process as without a receptor there will be no impact. For example, if a substation generates significant noise but there are no sensitive receptors who can hear the noise, then there will be no noise impact on them.

Identification of Significant Environmental Aspects

254. Thirdly, the potential impacts of the identified aspects are outlined and how they could impact upon the identified receptors, in the case above, this could be the movement of a construction vehicles creating dust on an unpaved road which impacts upon local community.

255. The significance of an impact is determined based on the product of the consequence of the impact and the probability of its occurrence. The consequence of an impact, in turn, is a function primarily of three impact characteristics:

- magnitude
- spatial scale
- timeframe

256. Magnitude is determined from quantitative or qualitative evaluation of several criteria including:

- i. Sensitivity of existing or reasonably foreseeable future receptors.
- ii. Importance value of existing or reasonably foreseeable future receptors, described using the following:
 - a. level of public concern.
 - b. number of receptors affected.
- iii. Severity or degree of change to the receptor due to impact, measured qualitatively or quantitatively, and through comparison with relevant thresholds:
 - a. legal or guideline thresholds—established by law or regulation, or good international practice guidelines
 - b. functional thresholds if exceeded, e.g., impacts will disrupt the functioning of an
 - c. ecosystem sufficiently to destroy resources important to the nation or biosphere irreversibly and/or irretrievably
 - d. normative thresholds – established by social norms, usually at the local or regional level and often tied to social or economic concerns
 - e. preference thresholds—preferences for individuals, groups or organizations only, as distinct from society at large
 - f. reputational thresholds—the level of risk a company is willing to take when approaching or exceeding the above thresholds

257. Spatial scale is another impact characteristic affecting impact consequence. The spatial scale of impacts can range from localized (confined to the proposed project sites) to extensive (national or international extent). They also may vary depending on the component being considered.

258. The impact timeframe is the third principal impact characteristic defining impact consequence and relates to either its duration or its frequency (when the impact is intermittent). Impact duration can range from relatively short (less than a month) to long (beyond the life of the Project). Frequency ranges from high (more than 12 times a year) to low (less than once a year). These timeframes will need to be established for each Project based on its specific characteristics and those of the surrounding environment.

259. Once the impact consequence is described based on the above impact characteristics, the probability of impact occurrence is factored in to derive the overall impact significance. The probability relates to the likelihood of the impact occurring, not the probability that the source of the impact occurs. The characteristics are outlined in Table below.

Table 6-6: Characteristics Used to Describe Impact

Characteristic	Sub-components	Terms Used to Describe the Impact
Type		Positive (a benefit), negative (a cost) or neutral
Nature		Biophysical, social, cultural, health or economic Direct, indirect or cumulative or induced
Phase of the Project		Construction and operation.
Magnitude	Sensitivity of Receptor	High, medium or low capacity to accommodate change High, medium or low conservation importance Rare, common, unique, endemic

Characteristic	Sub-components	Terms Used to Describe the Impact
	Importance or value of receptor	High, medium or low concern to some or all stakeholders Locally, nationally or internationally important Protected by legislation or policy
	Severity or degree of change to the receptor	Gravity or seriousness of the change to the environment Intensity, influence, power or strength of the change Never, occasionally or always exceeds relevant thresholds
Spatial Scale	Area affected by impact – boundaries at local and regional extents will be different for biophysical and social impacts	Area or Volume covered Distribution: Local, regional (within Bangladesh)
Timeframe	Length of time over which an environmental impact occurs or frequency of impact when intermittent	Short term or long term Intermittent (what frequency) or continuous Temporary or permanent Immediate effect (impact experienced immediately after causative project aspect) or delayed effect (effect of the impact is delayed for a period following the causative project aspect)
Probability – likelihood or chance an impact will occur		Definite (impact will occur with high likelihood of probability) Possible (impact may occur but could be influenced by either natural or project related factors) Unlikely (impact unlikely unless specific natural or Project related circumstances occur)

Impact Significance Rating

260. The impact significance rating process serves two purposes: firstly, it helps to highlight the critical impacts requiring consideration in the approval process; secondly, it shows the primary impact characteristics, as defined above, used to evaluate impact significance. The impact significance rating system is presented in Table below and described as follows:

Part A: Define impact consequence using the three primary impact characteristics of magnitude, spatial scale and duration.

Part B: Use the matrix to determine a rating for impact consequence based on the definitions identified in Part A; and

Part C: Use the matrix to determine the impact significance rating, which is a function of the impact consequence rating (from Part B) and the probability of occurrence.

261. Using the matrix, the significance of each described impact is rated.

Table 6-7: Method for Rating Significance

PART A: DEFINING CONSEQUENCE IN TERMS OF MAGNITUDE, DURATION AND SPATIAL SCALE			
Definition		Criteria	
MAGNITUDE		Negative	Positive
	Major	- Large number of receptors affected - Receptors are highly sensitive and/or are of conservation importance - Substantial deterioration, nuisance or harm to receptors expected - Relevant thresholds often exceeded - Significant public concern	- Large number of receptors affected - Receptors highly amenable to positive change - Receptors are likely to experience a big improvement in their situation - Relevant positive thresholds often exceeded

PART A: DEFINING CONSEQUENCE IN TERMS OF MAGNITUDE, DURATION AND SPATIAL SCALE				
Definition		Criteria		
		expressed during stakeholder consultation Receiving environment has an inherent value to stakeholders		
	Moderate	- Some receptors affected - Receptors slightly sensitive and/or of moderate conservation importance - Measurable deterioration, nuisance or harm to receptors - Relevant thresholds occasionally exceeded - Limited public concern expressed during stakeholder consultation - Limited value attached to the environment	- Some receptors affected - Receptors are likely to experience some improvement in their situation - Relevant positive thresholds occasionally exceeded	
	Minor	- No or limited receptors within the zone of impact - Receptors not sensitive to change - Minor deterioration, nuisance or harm to receptors - Change not measurable or relevant thresholds never exceeded - Stakeholders have not expressed concerns regarding the receiving environment	- No or limited receptors affected - Receptors not sensitive to change - Minor or no improvement in current situation - Change is not measurable - Relevant positive thresholds never exceeded - No stakeholder comment expected	
TIMEFRAME		Duration of Continuous Aspects	Frequency of Intermittent Aspects	
	Short term / low frequency	Less than 1 month from onset of impact	Occurs less than once a year	
	Medium term / medium frequency	Less than 1 year from onset of impact up to end the project implementation (approximately 5 years)	Occurs less than 12 times a year but more than once a year	
	Long term / high frequency	Impact is experienced during and beyond the project implementation (greater than 5 years)	Occurs more than 12 times a year	
SPATIAL SCALE		Biophysical	Socio-economic	
	Small	Within the defined 'Project area' e.g., footprint	Within the defined 'Project area' e.g., footprint	
	Intermediate	Within the district in which is the facilities are located	Within the municipality in which the activity occurs	
	Extensive	Beyond the district in which the facilities are located	Beyond the municipality in which the activity occurs	
PART B: DETERMINING CONSEQUENCE RATING				
MAGNITUDE	TIMEFRAME	SPATIAL SCALE		
		Small	Intermediate	Extensive
Minor	Short term / low frequency	Low	Low	Medium
	Medium term / medium frequency	Low	Low	Medium
	Long term / high frequency	Medium	Medium	Medium
Moderate	Short term / low frequency	Low	Medium	Medium
	Medium term / medium frequency	Medium	Medium	High
	Long term / high frequency	Medium	High	High
Major	Short term / low frequency	Medium	Medium	High
	Medium term / medium frequency	Medium	Medium	High
	Long term / high frequency	High	High	High
PART C: DETERMINING SIGNIFICANCE RATING				
	CONSEQUENCE			

PART A: DEFINING CONSEQUENCE IN TERMS OF MAGNITUDE, DURATION AND SPATIAL SCALE					
Definition		Criteria			
		Negligible	Low	Medium	High
PROBABILITY (of exposure to impacts)	Definite	Not Significant	Low	Medium	High
	Possible	Not Significant	Low	Medium	High
	Unlikely	Not Significant	Low	Low	Medium
	Negligible	Not Significant	Not Significant	Not Significant	Not Significant

Mitigation, Management and Good Practice Measures

262. Wherever the Project is likely to result in unacceptable impact on the environment, mitigation measures are proposed (over and above the inherent design measures included in the Project description). In addition, good practice measures may be proposed, however these are unlikely to change the impact significance. In the case of positive impacts, management measures are suggested to optimize the benefits to be gained.

263. The following mitigation hierarchy will be utilized in selecting practical mitigation measures for unacceptable impacts as follows (in order of preference):

- Avoid the impact wherever possible by removing the cause(s).
- Reduce (minimize) the impact as far as possible by limiting the cause(s).
- Ameliorate (mitigate) the impact by protecting the receptor from the cause(s) of the impact.

Residual Impacts

264. Once mitigation measures are declared and committed to, the next step in the impact assessment process is to assign residual impact significance. This is essentially a repeat of the impact assessment steps discussed above, considering the assumed implementation of the additional declared mitigation measures.

The final step is providing compensatory measures to offset the impact, particularly where an impact is of high significance and none of the above are appropriate, e.g., for impacts to natural and critical habitat.

6.2.4 Stakeholder Consultations

265. According to the ADB Safeguard Policy Statement (2009):

“The borrower/client will carry out meaningful consultation with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation. Meaningful consultation is a process that:

- Begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle.*
- Provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people.*
- Is undertaken in an atmosphere free of intimidation or coercion.*
- Is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and*
- Enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.*

266. Consultation will be carried out in a manner commensurate with the impacts on affected communities. The consultation process and its results are to be documented and reflected in the environmental assessment report.

267. NESCO have assisted the IEE survey team in stakeholder engagement activities. Stakeholder engagement has been undertaken with the support of the NESCO and the findings presented in this IEE.

7 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

7.1 IESCs Related to the Project and Their Relation

268. The Important Environmental and Social Components (IESC) is likely to be impacted by the proposed project. IESCs for the Physical Environment and Water Resources, Land Use and Agricultural Resources, and Ecological Resources along with their rationales are described in the following tables.

Table 7-1: IESCs on Physical Environment and Water Resources

IESCs	Rationale for selection
Noise and Vibration Levels	Noise and vibration will be generated from the equipment and machinery to be used in the construction work. Therefore, noise levels have been considered as an IESC.
Air Quality	Construction work and movement of construction vehicles might emit dust and other air pollutants in a degraded airshed. Hence, air quality has been considered as an IESC.
Water Quality and Resources	Leakage of fuel, oil and chemicals may spill over to nearby waterbodies or groundwater through the storm water drainage. Sediment laden runoff may also enter nearby waterbodies during construction. Untreated sanitary effluent may also enter surface or ground water. Water (groundwater) is needed for both construction and operation of the substations. Henceforth, water quality and resources have been considered as an IESC.
Topography and Floods	Raising the land at some substations will change the elevation of the land and aggravate the floodplain. Topography and flood risk (to adjacent land) are taken into account as part of IESC.
Drainage and Waterlogging	Surface water drainage and groundwater recharge will be affected by the introduction of substations to currently undeveloped sites, particularly from raising or re-contouring of the lands at some substations; therefore, drainage and waterlogging have been considered as an IESC.
Natural Resources	Raw materials will be required for construction. A small volume of sand will be required for the infill of some substations land. Use of natural resources has been considered as an IESC.
Solid and Hazardous Waste	Solid and hazardous waste will be generated from the construction of substations and workshops. There will also be waste generated from substation and workshop operations. Therefore, solid waste has been considered as an IESC.
Climate change	SF6, a potent greenhouse gas is used as an insulation agent at the GS-type substations. Its emission represents an environmental risk. Hence, climate change has been considered as an IESC.

Table 7-2: IESCs on Land Use and Agriculture Resources

IESCs	Rationale for Selection
Land Use including Crop Production	Construction of power substation, workshop construction will hindrance the regular expansion of residential, commercial and industrial activities. Though the impact on agricultural land will be minimal due to the acquisition of two substation lands. Still, land being a scarce resource; the land use has been selected as an IESC. Land affected by the substations will be dealt with separately in the RAP.
Soil Quality	Construction will result in the loss of topsoil and subsoil beneath the substation sites. Leakage of fuel, oil and chemicals may spill on the soil. Therefore, soil quality has been considered as an IESC.

Table 7-3: IESCs on Socio-economic Resources and Their Rationales

IESCs	Rationale of Selection
Employment Opportunity and Labor Management	Each of the steps of the Project might involve different levels of workers. Hence, employment opportunity and labor management have been selected as an IESC.
Occupational Health & Safety	Occupational Health and Safety (OHS) for the workers and NESCO employees is deemed important throughout the project from the construction to the operational phases. There are risks from undertaking working at height and working with electricity, risks associated with unsanitary conditions, communicable diseases etc. Therefore, occupational health and safety has been selected as an IESC.
Community Health & Safety	Construction of substations and workshops might cause disturbance to the local community. The construction workers may also introduce risks of social conflict, communicable disease etc. For this reason, community health and safety has been selected as an IESC.
Property and Physical Cultural Resources	Given the close proximity of substations, workshops, need for piling the adjacent properties may be damaged by vibration. Private property and physical cultural resources are therefore selected as an IESC.
Road and Traffic Levels	There is an increased potential for traffic disruption and disruption to pedestrians and vehicles due to the construction material and equipment ingress and waste egress from sites under construction along and across roads. For this reason, traffic disruption has been considered as an IESC.
Electricity Supply	Installation of substations might positively affect the distribution capacity of power along with quality. In this regard, distribution capacity and quality service are considered as an IESC.

7.2 Methodology of assessment

269. This chapter describes the impacts and mitigation measures for sub-project components. They have been divided into pre-construction phases (location specific and design phases), construction phase, and operation phase impacts. The chapter is structured according to activities.

270. This portion of the report identifies the environmental and social impacts of the Project (all Components and sub-activities) and proposes mitigation measures to eliminate the impacts, or where this is not possible, reduce their significance. Cumulative, induced and transboundary impacts are addressed at the end of the section under individual headings.

7.2.1 Zone of Influence

271. Taking into consideration the baseline information reported earlier in this document, potential impacts were estimated for the following environmental resources/topic issues in their respective zones of influence shown in Table below.

Table 7-4: Zone of Influence for Resources Studied

Impacts/Topic Issue	Zone of Influence
Land Use, Topography, Soil Erosion and Crop Production	Direct impacts within and immediately adjacent (50m) substations boundaries, and all related project facilities such as temporary labor camps
Climate Change	Global concern
Air Quality and Noise	Receptors up to 500 m substations and all related facilities such as temporary labor camps may be indirectly impacted by dust and noise, although greatest impact will be within about 50m
Surface and groundwater resources	Within up to 50m of substations. Other surface and groundwater resources within up to 500 m of substations and all related facilities such as temporary labor camps may be indirectly impacted by any pollution resulting from the project
Use of Natural Resources (materials)	National concern

Impacts/Topic Issue	Zone of Influence
Waste generation	Divisional concern
Habitat and vegetation	Direct impacts within and immediately adjacent (50m) of substations, and all related project facilities such as access and temporary labor camps
Protected areas/key biodiversity areas (if any)	Up to 10 km of subprojects
Threatened wildlife (if any) (ADB critical habitat triggers)	Over wider project area of analysis encompassing all project components
Other wildlife (if any)	Direct impacts within and immediately adjacent (50m) of substations, and all related project facilities such as temporary labor camps; indirect impacts within up to 500m in relation to dust, noise, and other pollution resulting from the project
Occupational Health and Safety	Construction and maintenance workers including formally and informally employed
Community Health and Safety	Roads, drains, other utilities, structures and community facilities (e.g. schools) within and immediately adjacent (50m) of substations boundaries, and boundaries of all related project facilities such as temporary labor camps Local communities within 500m of substations, and all related facilities e.g. temporary labor camps but particularly those within 50m
World Heritage Sites Monuments	Up to 10km of subprojects
Local Physical Cultural Resources (PCR)	Receptors within up to 50m of substations and all related facilities such as temporary labor camps
Socioeconomic development, including employment opportunities	National concern

7.2.2 Proximity of Project to Sensitive Receptors

272. **Substations.** Identified land for five no of new substations is NESCO own land, however, Kodomtola (GIS) S&DD-1, Pabna (New Land), and Baharkasna (S&D-3) will be built in private land. Rangpur. The table below gives distances from all receptors. There are residential properties or other receptors within 100m of the substation land and workshops. Details in the Environment Audit (Annexure 5).

273. Pertinent receptors for 10 existing substations, 7 switching stations, 36 Bay extensions, 06 new substations, and 4 workshops are also detailed in the Environment Audit are also listed below.

**Table 7-5: Details of repairs nearest to workshop sites
(those within zone of influence are highlighted) (all distances are in meters)**

Important Receptors	Name of the Workshops site			
	Workshop Building, Lalbag, Rangpur	Shalbagan, Rajshahi	ZRS, Bogura (Near Rest house)	Workshop building, Balubari, Dinajpur
Area of land	678.18m ²	535.54 m ²	1025.55m ²	401.43m ²
Major Road	National Highway-Dhaka to Rangpur Hwy (200m, East)	Highway- Rajshahi to Naogaon Hwy (200m, West)	Major Road- Shat Matha to WAPDA Road (2km, East)	Dinajpur-Rangpur Highway (200m-North)
Distance from home/residents	Town- Shantibag (230m, North)	Town- New Market (2km, North)	Town- Tin Matha (600m, west)	Dinajpr City (100m-West)
Distance from nearest bazar/hat	Market Area-Lalbag Bazar (800m, North)	Market-Shalbagan Bazar (500m, North)	Naisr Uddin Bogra Khan Mazar (380m, West)	Bahadur bazar (750m-East)
Distance from Nearest Archaeological/religious site	N/A	300m, East	100m, East (Mosque)	130m-South (Mosque)
Available hospital facilities	1.5km (from right side)	550m from back side.	4000m from left side.	300m from front side
Educational Institute	300m from right side.	200m from right side	4000m from left side.	200m from front side
Distance from existing OHT line	220 kV (20m-West)	220 kV- Adjacent (5m, East)	220kV ((30m-South)	33/11kV-5m (West)
Distance from Wildlife sanctuary, national park, protected areas, ecological critical areas etc.	N/A	N/A	Reserve Forest (250m)	N/A
Distance from nearby surface water system (Khal)	N/A	340m from back side.	150m from back side	Kanchannadi River (2km-West)

**Table 7-6: Details of receptors nearest to substations boundaries
(those within zone of influence are highlighted) (all distances are in meters)**

New Substations Sites:							
SN	Important Receptors	Baharkasna (S&D-3), Rangpur	S&DD-1, office campus, Shuihari, Dinajpur	Kodomtol a (GIS) S&DD-1, Pabna (New Land)	Chandipur S& DD-2, Rajshahi	S&D1 Campus (GIS), S & DD-1, Bogura	Campus S&D-1, NESCO, Rangpur (GIS) S & DD-1, Rangpur
1	Area of land	1130.73 m ²	933.57 m ²	385.4m ²	252m ²	574m ²	184.52 m ²
2	Road access	5m	5m	10m	7m	5m	66m
3	Surface water body	N/A	100m	100m	1000m	164m	150m
4	Mosques	400m	300m	30m	50m	10m	84m
5	Schools	250m	600m	1km	400m	160m	N/A
6	Hospitals	2600m	200m	3km	70m	N/A	N/A
7	Residents	70m	50m	63m	50m	10m	20m
8	Groundwater wells	300	50m	63m	50m	10m	20m
9	Markets	322m	850m	30m	504m	120m	466m

New Substations Sites:							
SN	Important Receptors	Baharkasna (S&D-3), Rangpur	S&DD-1, office campus, Shuihari, Dinajpur	Kodomtola (GIS) S&DD-1, Pabna (New Land)	Chandipur S& DD-2, Rajshahi	S&D1 Campus (GIS), S & DD-1, Bogura	Campus S&D-1, NESCO, Rangpur (GIS) S & DD-1, Rangpur
10	Airport	N/A	N/A	N/A	10km	N/A	N/A
11	Parks	N/A	N/A	N/A	N/A	300m	N/A

Table 7-7: Details of receptors nearest to boundaries (those within zone of influence are highlighted) (all distances are in meters)

SN	Important Receptors	site 1	Site 2	BESS system near 33 kV Substation
1	Area of land	80,708 m ²	-	-
2	Road access	9m	100m	132 kV (150m, North)
3	Surface water body	5m	620m	460m
4	Mosques	150m	50m	300m
5	Schools	100m	200m	200m
6	Hospitals	300m	500m	550m
7	Residents	200m	50m	200m
8	Groundwater wells	200m	50m	200m
9	Markets	500m	500m	300m
10	Airport	NA	NA	NA
11	Parks	NA	NA	NA

274. An environmental inventory survey was conducted to all new substations, substation augmentation sites, substations, switching/bay extension sites, and workshop sites and findings has been incorporated in the relevant section of the IEE report.

7.3 Physical Resources

7.3.1 Air Quality

275. According to Chapter 4,3,9, on air quality baseline, PM 10 is only high at two locations while PM 2.5 are moderately high in other two locations where primary air quality measurements were undertaken¹⁹. This section discusses emissions of atmospheric pollutants during construction and operation of the Project and associated mitigation measures to be adopted.

7.3.1.1 Pre-construction Phase

Impacts

276. These project activities will also give rise to the emission of dust particles. However, the volume of soil being excavated at any site is relatively small for substation sites. As most sites are on flat land as per site visits, there is no or minimal requirement for any sand filling at any site concerned.

Mitigation Measures

277. To supplement the current baseline data and to provide a basis for monitoring the contractor will undertake air quality monitoring per the EMoP to confirm current background levels in the subproject areas prior to the commencement of any activity on-site.

7.3.1.2 Construction Phase

Impacts

278. Project activities include excavation and earthworks for substations, and panel

¹⁹ When compared to WBG/IFC guidelines 2007

foundations, movement of vehicles carrying the construction materials and operation of equipment and plant will deteriorate the local air quality (mainly PM2.5, PM10, NOx, SOx and CO). Exhaust emissions will be generated by construction equipment and plants during construction. Motor vehicles that will be used to carry construction materials would cause air quality impact by emitting pollutants (e.g., NOx, SOx, PM) through exhaust emissions.

279. These project activities will also give rise to the emission of dust particles. However, the volume of soil being excavated or sand filling at any site is relatively small (with the possible exception where the extent will be more) and therefore impacts are only anticipated limited to the construction sites and adjacent areas including material transportation roads also if proper mitigations were not considered properly. In the absence of mitigation to control air pollution, short term, localized exceedance of national air quality standards, especially for particulate matter, may occur although impacts are readily mitigated and reversible in short term.

280. The is mainly located in a semi-urban area; whereas workshops will be mostly in urban/semi-urban areas with medium air quality and will involve limited excavation and earthworks with few sensitive receptors such as houses of local people were found within 5m to 50m at Workshop - Shalbagan, Rajshahi, SS - Mahigang Rangpur, SS – Baharkashna, Rangpur, - Thakurgaon etc.. So, in the main unmitigated impacts on ambient air quality will be minor in magnitude and of low significance.

281. For new substations/other switching substations etc. the area of impact will be less significant.

282. Upgrading of existing substations will not result in significant air quality impacts due to the minor scope of work at these sites which include replacing transformers, expanding outdoor gantry structures erection on already constructed foundations.

283. All subprojects have sensitive human receptors present as per the inventorisation survey details attached in Annex 5. Sensitive receptors within 150m of the sites are shown in Tables below.

Table 7-8: Sensitive Air Quality Receptors for new substations

#	Sub-activity	Distance to nearest residential receptor	Approximate Number of Receptors within 150m
1	- Excavation and trenching - Concrete works - Backfilling works - Installation works	Residents	70m
		Schools	30m
		Mosques-	160m
		Markets	30m

Table 7-9: Sensitive Air Quality Receptors – Workshops

#	Workshops	Buildings in 50m, including community facilities	Distance to Nearest Residential Property
1	Workshop Building, Lalbag, Rangpur	Distance from home/residents	230m
		Distance from nearest bazar/hat	800m
		Available hospital facilities	1.5km
		Educational Institute	300m
2	Shalbagan, Rajshahi	Available hospital facilities	200m
		Educational Institute	2km
		Available hospital facilities	200m
		Educational Institute	300m
3	ZRS, Bogura (Near Rest house)	Available hospital facilities	2km
		Educational Institute	600m
		Available hospital facilities	380m,
		Educational Institute	4km

#	Workshops	Buildings in 50m, including community facilities	Distance to Nearest Residential Property
4	Workshop building, Balubari, Dinajpur	Available hospital facilities	200m
		Educational Institute	300m
		Available hospital facilities	200m
		Educational Institute	130m

Table 7-10: Sensitive Air Quality Receptors –

#		Receptors in 200m, including community facilities	Distance to Nearest Residential Property
1	Site-1: Site clearance Excavation Backfilling Installation works	Residents	200m
		Schools	100m
		Mosques-	150m
2	Site-2: Site clearance Excavation Backfilling Installation works	Residents	50m
		Schools	200m
		Mosques-	50m

Mitigation Measures

284. To manage dust and combustion emissions a range of good practice measures will be applied to all project components. These measures are outlined in detail in the Project EMPs as found in Chapter 12 and Annex 1. Specific measures to manage dust in Rajshahi/Rangpur divisions where the impacts will be most significant, include:

- Ensure an adequate supply of bowzers and carry out watering for dust control at least twice a day within 50m of work sites but more often if needed: in dry weather with temperatures of over 25°C, or in windy weather. Dust control measures will also be implemented on all access roads within 50m of residential/sensitive receptors. Avoid overwatering as this may make the surroundings muddy.
- Soil scattered on pavements and roads shall be immediately swept up to avoid windblown dust.
- Vehicle movements will be restricted to defined access routes and demarcated working areas (unless in the event of an emergency).
- A strict Project speed limit of at most 30km/hr will be enforced for Project vehicles using unmade tracks.
- Excavated materials will be stockpiled where practical away from sensitive receptors, such as homes, schools, and health facilities. Where this is not possible, ensure regular watering of stockpiles to prevent dust impacts.
- Keep stockpiles of soil, aggregate and waste materials covered with canvas or tarpaulin when spoiling heaps are not active to avoid suspension or dispersal of fine soil particles during windy days and to prevent disturbance by stray animals.
- Locating material storage areas with larger stockpiles at least 500m from residential property and other sensitive receptors to avoid fugitive dust.
- Positioning any stationary emission sources (e.g. diesel generators, compressors, etc.) as far as practical from sensitive receptors (houses, schools, clinics, mosques, etc.)
- Imposing speed limits on construction vehicles to minimize exhaust and dust emissions along haulage routes where sensitive receptors are located (houses, schools, clinics, mosques, etc.) and limiting engine idling to maximum 5 minutes.
- Vehicles carrying fine aggregate materials will be sheeted with canvas or tarpaulin to help prevent dust blow and spillages.

- Cleaning dust from the metaled access road immediately after construction work is completed.
- Only use cutting, grinding, or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g., suitable local exhaust ventilation systems.
- Undertake weekly dust soiling checks of surfaces of adjacent properties during earthworks and help with cleaning of external surfaces of property if dust is evident.
- If there is an increase in existing background air pollution or complaints are received contractors will be required to implement additional dust mitigation e.g., barricading/isolating sources of dust, use of wheel wash etc.
- Ensure all pavements and excavated areas are restored as soon as construction activities within each works section are completed (within 15 days).

Substations

- Ensure an adequate supply of bowsers and carry out watering for dust control at least twice a day within 50m of work sites but more often if needed: in dry weather with temperatures of over 25°C, or in windy weather. Dust control measures will also be implemented on all access roads within 50m of residential / sensitive receptors. Avoid overwatering as this may make the surroundings muddy.
- Vehicle movements will be restricted to defined access routes and demarcated working areas (unless in the event of an emergency).
- A strict project speed limit of at most 30km/hr will be enforced for Project vehicles using unmade tracks.
- Excavated materials will be stockpiled where practical away from sensitive receptors, such as homes, schools, and health facilities. Where this is not possible, ensure regular watering of stockpiles to prevent dust impacts.
- Avoid storing spoils at the vicinity of site for a long period of time. Haul spoils on a regular basis to ensure more efficient handling and management at the disposal sites. Use temporary storage sites for spoils that will be used for backfilling, but location should be away from sites so as not to create any negative impact on aesthetics in the area;
- To minimize excess spoils for disposal, use some for beneficial purposes such as in any other construction activities, or to raise the level of low-lying areas,
- Keep stockpiles of soil, aggregate and waste materials covered with canvas or tarpaulin when spoil heaps are not active to avoid suspension or dispersal of fine soil particles during windy days and to prevent disturbance by stray animals.
- Vehicles carrying fine aggregate materials will be sheeted with canvas or tarpaulin to help prevent dust blow and spillages.
- Only use cutting, grinding, or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g., suitable local exhaust ventilation systems.
- Undertake weekly dust soiling checks of surfaces of adjacent properties during earthworks and help with cleaning of external surfaces of property if dust is evident.
- If there is an increase in existing background air pollution or complaints are received contractors will be required to implement additional dust mitigation e.g., barricading/isolating sources of dust, use of wheel wash etc.
- Ensure all pavements and excavated areas are restored as soon as construction activities within each works section are completed (within 15 days).
- Avoid storing spoils at the vicinity of site for a long period of time. Haul spoils on a regular basis to ensure more efficient handling and management at the disposal sites. Use temporary storage sites for spoils that will be used for backfilling, but location should be away from sites so as not to create any negative impact on aesthetics in the area.
- To minimize excess spoils for disposal, use some for beneficial purposes such as in any other construction activities, or to raise the level of low-lying areas

Other

- The volume of construction being lower in most other project components, the contractor will still implement the above measures but in a more controlled way and based on public complaints.
- Avoid storing spoils at the vicinity of site for a long period of time. Haul spoils on a regular basis to ensure more efficient handling and management at the disposal sites. Use temporary storage sites for spoils that will be used for backfilling, but location should be away from sites so as not to create any negative impact on aesthetics in the area
- To minimize excess spoils for disposal, use some for beneficial purposes such as in any other construction activities, or to raise the level of low-lying areas.

285. To supplement the current baseline data and to provide a basis for monitoring the contractor will undertake air quality monitoring per the EMoP to confirm current background levels in the subproject area prior to the commencement of any activity on-site. Further on-going air quality monitoring will be completed at the baseline locations throughout construction and in areas where any complaints from residents are received.

7.3.1.3 Operation Phase

286. The air quality impact of the operational phase will be minimal.

Impact Summary and Assessment of Significance

287. The table below provides an assessment of the significance of potential air quality impacts before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 7-11: Potential Impacts to Air Quality

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Release of exhaust gases	Airshed, nearby communities, and sensitive ecological	H	H	M	L	MAJ	MT	SMA	MED	DEF	M
C	Dust	Airshed, nearby communities and sensitive ecological	H	H	H	H	MAJ	MT	SMA	MED	DEF	M

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / SMA: Small/ H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely.

7.3.1.4 Residual Impacts

Table 7-12: Project Air Quality Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	Release of exhaust gases	Medium	Generic mitigation measures will ensure residual impacts will be reduced to low significance	Low
C	Dust	Medium	Generic mitigation measures will ensure residual impacts will be reduced to low significance, mainly due to the potential impacts associated with construction works.	Low

7.3.2 Noise and Vibration

288. According to Chapter 4.3.9 on Noise pollution quality baseline, Leq is high universally for all project areas²⁰ in daytime and Night-time ambient at some monitoring locations (have complied with the standard limit and most of the monitoring location has been exceed the optimum limit set by IFC EHS Guidelines 2007, Noise Pollution (Control) Rules-2006, From the results, it has been found that, the time-weighted average value of the noise levels at ANL-01 (Salbagan -Workshop), ANL-07 (S&D-1 Campus , Substation Area), ANL-08 (Lalbag - Workshop Area), ANL-13 (Golihat - Niyamatpur -Under Line) & ANL-15 (S&D-1 Campus-Substation) is within the standard limit according to IFC EHS Guidelines 2007, Noise Pollution (Control) Rules-2006, MoEFCC, Government of Bangladesh.

289. However, as the time-weighted average value of the noise levels of ANL-02 (Chandipur -Substations), ANL-03 (Katakhali-Talaimari _Under Line), ANL-04 (Miapur-City Center, Alt-2 Under Line), ANL-05 (Medical Feeder _Under Line), ANL-06 (Shadharon Bima Feeder _Under Line), ANL-09 (Campus S&D-1 _Substation), ANL-10 (Baharkasna), ANL-11 (Lalbag to Mahiganj _Under Line), ANL-12 (Lalbag to Shapla _Under Line), ANL-14 (SE Office_Workshop), ANL-16 (S&D-1 Campus _Substation), and ANL-17 (New Substation Area, Pabna) has been exceeded the Noise level Standard of IFC EHS Guidelines 2007, Noise Pollution (Control) Rules-2006, MoEFCC, Government of Bangladesh. This section discusses the impacts of noise and vibration during construction and operation of the Project and associated mitigation measures to be adopted.

7.3.2.1 Pre-construction Phase

Impacts

290. During Pre-construction noise will be generated from the removal and/or cutting of vegetation, transporting construction materials to the site, temporary worker camps and any overnight accommodation etc.

291. Leq (daytime) is are observed for some locations to be high when compared to WBG/IFC guidelines residential areas (which are significantly there in),; the significant reasons behind posing noise in the project area might be due to adjoining market areas, wind speed, vehicle's movement, public gathering and so on.

Mitigation Measures

292. Key mitigation during the design phase relates to sitting of equipment within

²⁰ If compared to IFC Residentials standards, most of them are high, but if considered for commercial/industrial area, then only four areas are non-conforming.

substations, and selecting equipment (mainly transformers and switch gear) that guarantees noise levels; whereas other components such as , substations etc. Specifically, EPC Contractors will ensure that the design enables operation to always comply with 1-hour LAeq 70 dB(A) at the site boundary, 55dB(A) outside the fence line if located within a commercial zone, 45 dB(A) at the nearest residential properties including those in commercial zones, and 40dB(A) within 100m distance from silent zones. This shall be achieved by:

- Use low noise generating equipment e.g., less than 55dBA sound level at 1m; and
- Ensuring proper layout of substations so transformers are the furthest distance possible from the adjacent receptors to minimize corona noise/transformer hum experienced. Transformers of low MVA does not require erection of any acoustically designed enclosure or fence will be installed around transformers Specific substations where receptors have been identified within 50m include for installation: Chandipur GIS station

293. EPC Contractors for all components will be responsible for the preparation and implementation of a Pollution Prevention Plan covering noise management.

7.3.2.2 Construction Phase Impacts

294. During construction, noise will be generated from the movement of construction vehicles, the operation of plant, equipment, and machinery on-site, presence of construction workers at the construction site, temporary worker camps and any overnight accommodation etc. Depending on ground conditions encountered, resulting in a increased temporary background noise as well as ground vibration. These project activities will create noise impacts and in the absence of mitigation, short term, localized exceedance of noise standards/guidelines may occur although impacts are readily mitigated and reversible with ease in short term.

295. Per the Government of Bangladesh noise standards and WHO community noise guidelines, noise levels should not exceed 50 dBA (daytime) and dBA (nighttime) in 'silent zones', 55 dBA (daytime) and 45 dBA (nighttime) in residential settings, 60 dBA (daytime) and 50dBA (nighttime) in mixed areas, 70 dBa (day time) and 60 (night time) in commercial areas and 75dBA (day time) and 70 dBA (night-time) in in industrial areas

296. The combination of machinery being used at any one time during the construction phase will vary and noise levels will fluctuate accordingly. The table below indicates the timescale for various activities and the types of equipment required.

Table 7-13: Construction Activities and Sound Levels

#	Activity	Timescale Per Tower	Equipment	Typical Sound Level Data at 10m* (NPCR 2006)
Pre-construction period				
1	Clearing and grading activities	2 days	Grader** Bulldozer (20t) Pick-up truck	60 50
2	Transporting materials to the site	2 days	Pick-up truck Lorry (4 axle)	60 50
3	Temporary worker camps	2 days	Accommodation arrangement	60 50
Construction Period				
3	Constructing foundations	2 weeks	Excavator (22t) Bulldozer (20t) Backhoe (8t) Pneumatic Tools Pick-up truck	60 50 60 50

#	Activity	Timescale Per Tower	Equipment	Typical Sound Level Data at 10m* (NPCR 2006)
			Lorry (4 axle)	60
				50
4	Assembling and raising the Gantries/structures/panels	1 week	Crane (110t) Pick-up truck	60
			Lorries (4 axle)	50
5	Earthing equipment	2 days	Auger drills Pick-up truck	60
			Backhoe (8t)	50
6	Restoring the Site	2 days	Bulldozer (20t) Backhoe (8t)	60
				50

* Based on BS 5228 – 1:2009 – Assumes each piece of equipment working 25% of the day

** Based on data from US DOT FHA (<https://www.nrc.gov/docs/ML1805/ML18059A141.pdf>)

***Value cross-matched with Mixed Zone as per National Pollution (Control) Rules 2006

297. Based on these activities the following noise levels can be assumed based on each piece of equipment in operation for 25% of a ten-hour working day²¹.

Table 7-14: Estimated Noise Levels for Various Construction Activities

Sl.	Activity	Sound Level dBA LAEQ 10 HR (NPCR 2006)		
		10m	100m	150m
1	Clearing and Grading	60	50	50
2	Transporting materials to site	60	50	50
3	Constructing foundations and anchors	60	50	50
4	Assembling and raising the gantries for bay extensions/substation erection	60	50	50
5	Earthing of equipment	60	50	50
6	Installing the equipment at substations/workshops	60	50	50
7	Restoring the Site	60	50	50

298. Substation Construction / Rehabilitation Noise - The combination of machinery being used at any one time during the substation works phase will vary and noise levels will fluctuate accordingly. In general noise levels at 15m distance from the source are anticipated to be no greater than 85 dBA²² 103, and around 66 dBA at 100m, based on equipment operation for 50% of a ten-hour working day. Substation works may take approximately 6 months to complete at each site, meaning that elevated noise levels during the construction phase can be anticipated for at least 6 months at the identified receptors in Table xxx. No piling or blasting is required.

299. Workshops construction Noise: The different types of machinery and equipment being used at the construction sites during the construction of workshops that will elevate the noise level. It is anticipated that noise levels at 15m distance from the source are anticipated to be no greater than 85 dBA²³, and around 66 dBA at 100m, based on equipment operation for 50% of a ten-hour working day. The construction works may take approximately 6-12 months to complete at each site, meaning that elevated noise levels during the construction phase can be anticipated for at least 6 months at the identified receptors.

300. **Methodology**: The ambient noise standards are provided for within the Noise Pollution

²¹ The listed noise levels is an assumption based on thumb rule for the type of equipment considered and is illustrative in nature only and can be updated by contractor based on requirements and detailed design

²² [https://ia.cpuc.ca.gov/environment/info/ene/mesa/attachment/A1503003%20ED-SCE-01%20Q.PD-01%20Attachment%20\(Revised%20Noise%20Levels%20Construction%20Equipment\).pdf](https://ia.cpuc.ca.gov/environment/info/ene/mesa/attachment/A1503003%20ED-SCE-01%20Q.PD-01%20Attachment%20(Revised%20Noise%20Levels%20Construction%20Equipment).pdf)

²³ [https://ia.cpuc.ca.gov/environment/info/ene/mesa/attachment/A1503003%20ED-SCE-01%20Q.PD-01%20Attachment%20\(Revised%20Noise%20Levels%20Construction%20Equipment\).pdf](https://ia.cpuc.ca.gov/environment/info/ene/mesa/attachment/A1503003%20ED-SCE-01%20Q.PD-01%20Attachment%20(Revised%20Noise%20Levels%20Construction%20Equipment).pdf)

(Control) Rules 2006. The Noise Pollution Rules, 2006 addresses that the sound levels to be no more than 50dB in Silent Zones⁴ during daytime (6 am to 9 pm) and 40 dB at night-time (9 pm to 6 am). In residential areas these levels are 55 dB and 45 dB, in mixed areas 60 dB and 50 dB, in commercial and industrial areas 70 dB and 60 dB and in industrial areas 75 dB and 70 dB for daytime and night-time respectively. The important receptors were considered to estimate the noise level.

301. Monitoring of ambient noise level has been carried out for a period of 24 hours (15 hours daytime [06:00– 21:00] and 9 hours night-time [21:00 – 09:00]) using a Class 1 Sound Level Meter complete with microphone (Model: SL – 4022). The noise is calibrated at site prior to sampling and placed at a height of approximately 1.0 – 1.5 m from ground level. To prevent disturbance from reflecting the surfaces, the noise meter microphone facing towards the noise source with clearance of around 3 meters from any structures is ensured.

302. Tables below indicate that most of the construction activities are likely to result in some intermittent elevated noise levels for short periods of time (depending upon the length of construction), especially during foundation works.

Table 7-15: Sensitive Noise Receptors-New Construction

#	Sub-activity	Distance to nearest residential receptor	Approximate Number of Receptors within 150m
1	- Excavation and trenching - Concrete works - Backfilling works - Installation works	Residents	70m
		Schools	30m
		Mosques-	160m
		Markets	30m

Table 7-16: Sensitive Noise Receptors – Workshops

#	Workshops	Buildings in 50m, including community facilities	Distance to Nearest Residential Property
1	Workshop Building, Lalbag, Rangpur	No receptors found within 50m	-
2	Shalbagan, Rajshahi	No receptors found within 50m	-
3	ZRS, Bogura (Near Rest house)	No receptors found within 50m	-
4	Workshop building, Balubari, Dinajpur	No receptors found within 50m	-

Table 7-17: Sensitive Air Quality Receptors –

#		Buildings in 50m, including community facilities	Distance to Nearest Residential Property
1	Site-1	Distance from home/residents	70m
		Distance from nearest bazar/hat	10m
		Available hospital facilities	10m
		Educational Institute	66m
2	Site-2	Available hospital facilities	70m
		Educational Institute	10m
		Available hospital facilities	10m
		Educational Institute	66m

Mitigation Measures

303. To manage potential noise impacts during construction of all components a range of good practice measures will be applied to all project components. The important mitigation measures will be to inform people in advance of noisy activities and to ensure that construction in residential areas is only undertaken during daytime periods. Other measures such as installation of temporary noise barriers can also be applied.

304. EPC contractors must schedule construction activities so as to minimize nuisance to sensitive receptors (houses, schools, clinics, mosques, etc.) i.e. avoid works at night, on weekend, during holidays, school exam periods, etc. Where practical work should avoid the weekend. Work close to schools will be scheduled for holiday periods to avoid disturbance to students.

305. Where possible EPC Contractors will avoid soil compaction, piling, and other vibration inducing activities as much as possible. In locations where this is unavoidable the EPC Contractor will identify properties within the zone of influence and undertake pre-construction structural surveys to identify the level of risk. If risk of structural damage to properties identified due to current condition consideration of alternative construction methods or temporary relocation of occupants during work if at risk shall be undertaken. Structural or cosmetic damage to be repaired by the EPC Contractor to at least pre-project condition at their own cost.

306. Contractors must undertake quantitative noise assessment of construction works using internationally recognized noise modelling software to confirm that noise standards can be achieved for the site alone without additional noise mitigation. If required to meet noise standards contractor to install noise barrier etc. If not possible, Noise from piling will be contained to stipulated levels using attenuating screens as per Guidelines for Community Noise, World Health Organization (WHO), 1999. Properties adjacent are to be consulted one-to-one and subject to structural survey and photographic record in case of vibration impact during construction.

307. In locations where this is unavoidable, the EPC Contractor will identify properties within the zone of influence and undertake pre-construction structural surveys to identify the level of risk. If risk of structural damage to properties identified due to current condition consideration of alternative construction methods or temporary relocation of occupants during work if at risk shall be undertaken. During any HDD or piling work, the EPC Contractor shall install monitors during construction to monitor structural movement. Structural or cosmetic damage to be repaired by the EPC Contractor to at least pre-project condition at their own cost.

308. To supplement the current baseline data and to provide a basis for monitoring the contractor will undertake noise quality monitoring per the EMoP to confirm current background levels in the subproject area prior to the commencement of any activity on-site. Further on-going noise quality monitoring will be completed at the baseline locations throughout

construction and in areas where any complaints from residents are received.

Operational Phase

309. **New Substation Noise** - Substations typically have at least one pair of step-down transformers that emit noise most commonly in the low frequencies below 100Hz. In addition, the noise hum is specific to each site. During the day the noise humming from the transformer is typically hidden, or masked, behind noise from traffic and industry. At night, when the background noise drops, the hum becomes more perceptible.

310. Baseline noise monitoring at substations and workshops shows an average of 67 dB daytime and 60 dB nighttime at the project locations as noted in Section 4.9.13 for noise quality. The difference in ambient noise levels is assumed to be associated with daytime human activities around the substation as substation noise is not anticipated to change throughout the day (unless for maintenance). It can therefore be assumed that the average noise levels at the boundary of sites is around 67dB, which is higher than IFC guideline limits and national standards for nighttime noise in a residential area. Some of the new substations are to be located close to residential receptors - 5 m

311. , existing substation Noise - For existing substations the Project involves the installation of new modern equipment which will have noise levels lower than, or at a maximum, the same as existing equipment meaning that there is unlikely to be an increase in noise levels from the SS of more than 3dBA above existing ambient noise levels.

312. NESCO will take a precautionary approach such as regulatory physical inspection, noise recording, maintenance works at a regular interval etc. to ensure that operational noise levels do not impact negatively upon residential receptors. (suggested to install noise barriers in the EMP). However, the contractor will prepare design for proper location, sizing and type of noise barrier to be erected.

Impact summary and assessment of significance

313. The table below provides an assessment of the significance of potential noise and vibration impacts before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 7-18: Noise and Vibration Potential Impacts

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	General construction activities	Local community	H	M	L	M	MAJ	ST	SM A	MOD	DEF	M
	Workshop	Local community	H	M	M	M	MED	ST	SM A	MOD	DEF	M
		Local community	H	M	M	M	MED	ST	SM A	MOD	DEF	M
O	New Substation Noise	Local community	L	M	L	M	MOD	LT	SM A	MOD	DEF	M
	Workshop	Local community	L	L	L	L	L	UN	UN	UN	UN	L
		Local community	L	L	L	L	L	UN	UN	UN	UN	L

[illegible]

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / SMA: Small/ H/F: High Frequency / M/F: Medium Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely.

Residual Impacts

Table 7-19: Residual Noise and Vibration Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	General construction activities	Medium	Some short-term elevated noise impacts may occur during the daytime. Keeping work to short durations and the use of temporary mobile noise barriers should reduce the noise levels to acceptable levels during the working day.	Low
	Work shop	Medium	Some short-term elevated noise level may occur during the daytime only. Keeping work to short durations and the use of temporary mobile noise barriers should reduce the noise levels to acceptable levels during the working day.	Low
		Medium	Some short-term elevated noise level may occur during the daytime only. Keeping work to short durations and the use of temporary mobile noise barriers should reduce the noise levels to acceptable levels during the working day.	Low
O	New Substation	Medium	Noise barriers will reduce noise levels to acceptable limits.	Not significant
	Workshop	Low	No significant noise will be anticipated in this stage.	Insignificant
		Low	Short term elevated noise level will occur during operation and maintenance works.	Low

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / SMA: Small/ H/F: High Frequency / M/F: Medium Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely.

7.3.3 Soils

314. This section discusses potential impacts on soils during construction and operation of the Project and associated mitigation measures to be adopted.

7.3.3.1 Pre-construction Phase

Impacts

Historically Contaminated Land

315. Soil conditions at the 9 existing substations were similar with some degree of contamination of oil from spillage/leaks in one or more spots, mostly under the transformers. In Mahigong SS defunct power transformers and DTR at Katkipara SS were observed to be stored in the with significant oil leakage into open soil. Oil leaks from transformers were noted at the following locations:

- Moderate: Rangpur Workshop inside shop floor
- High –Mahigonj SS, Neomatpur, Golaganl, Fakripara

316. Hazardous and non-hazardous waste scattered across the site. Oil leaks noted below transformers. It is possible that transformer oil could be contaminated with PCBs.

317. Existing substations (and PGCB substations for switching stations listed above in Table 1.1 in Chapter 1) will be surveyed during the design phase to assess the potential for contaminated land to be present in the proposed installation works area. If signs of potential contamination are present in this area, e.g., oil storage tanks, operational or old leaking transformers, oil staining, etc. further soil sampling and testing shall be undertaken in the work area to determine the level of soil contamination (for oil/hydrocarbons and PCBs). If soil contamination is noted in the work area, a method statement for the management and disposal of the contaminated soil will be prepared and submitted to NESCO. The method statement will follow the requirements for disposal as noted below under waste management.

318. The guidelines of UN Industrial Development Organization (UNIDO) must be followed in handling all transformers since due to recycling of oil none can be guaranteed PCB free; and the contractor should test all transformers removed by the project.

319. Soil samples have been sent for PCB laboratory analysis and results are expected in September-October 2024. If PCB contamination is confirmed, the transformers will need to be dechlorinated and/or disposed of by 31 December 2025 with the support of DOE who are currently examining available options. If PCB transformers are found, DOE is also considering the need to undertake soil sampling at the affected sites. If at-risk transformers are found in the workshop no work is started until DOE has concluded its work. If the works must be expatriated the area where the PCB transformers are stored must be marked, and soil samples sent abroad for PCB testing by the contractor to inform the strategy for remediation.

320. For the workshops, oily sludge waste is small and a concern, except for waste oil which is taken by a contractor. , is disposed of to the municipalities who do not have a sanitary landfill meaning it is open dumped. It is recommended NESCO establish hazardous waste storage areas at the workshops and an MOU with O&M operator for proper disposal of such hazardous waste.

Soil Properties and Compaction

321. Soil compaction of topsoil and subsoil may occur around substation sites due to extensive earthwork.

Soil Erosion and Soil Loss

322. Erosion is a natural process by which wind and rain wear away soils that have poor cohesion or are sloping. Where the land surface is disturbed and when vegetation and topsoil are removed, erosion rates increase. After reinstatement of topsoil temporarily removed from the worksites during construction or at the temporary storage areas, the soil is less cohesive and is much more easily erodible in wet weather.

323. The principal potential contaminants associated with the construction activities are the same as those listed below for hydrology. The soil can also be contaminated if substances from hazardous waste storage leach into the ground or if raw sewage is discharged onto the ground. This can occur at both work sites and camp sites.

Aggregate Requirements

324. Any aggregate required for the construction of new substations and workshops, (e.g., filling material beneath panel pads), for substation works will be obtained from state-licensed quarries and/or borrow pits. Extraction and use of aggregates constitutes a depletion of non-renewable natural resources.

Mitigation and Management Measures

Mitigation Measures

325. Existing substations will be surveyed during the design phase to assess the potential for contaminated land to be present in the proposed installation works area. If signs of potential contamination are present in this area, e.g., oil storage tanks, operational or old leaking transformers, oil staining, etc. further soil sampling and testing shall be undertaken in the work area to determine the level of soil contamination (for oil/hydrocarbons and PCBs). If soil contamination is noted in the work area, a method statement for the management and disposal of the contaminated soil will be prepared and submitted to NESCO. The method statement will follow the requirements for disposal as noted below under waste management.

326. To manage leaks from oil containing equipment substations designs will include at minimum 110% impermeable bunds to transformers/storage areas used for oils etc. including Soak Pit and Oil collecting pit as follows:

- An oil soak pit shall be designed and provided below each oil filled transformer / reactor to accommodate at least 150% of total quantity of oil contained in the transformer / reactor with minimum 300 mm thick layer of gravels / pebbles of approximately 40 mm size (spread over a steel iron grating / trans rack) providing free space below the grating.
- Alternatively, an oil soak pit shall be provided below each transformer or reactor, to accommodate one third of total quantity of oil contained in the transformer / reactor with minimum 300 mm thick layer of gravels/ pebbles of approximately 40 mm size (spread over a steel iron grating/ trans rack) providing free space below the grating provided a common remote oil collecting pit of capacity at least equal to oil quantity in the largest size transformer or reactor is provided for a group of transformers or reactors and bottom of the soak pit below the transformer or reactor shall be connected to the common remote oil collecting pit with drain pipe of minimum 150 mm diameter with a slope not less than 1/96 for fast draining of oil or water through gravity from soak pit to the common remote oil collecting pit.
- Every soak pit below a transformer or reactor shall be designed to contain oil dropping from any part of the transformer or reactor.
- The common remote oil collecting pit and soak pit shall be provided with automatic pumping facility, to always keep the pit empty and available for an emergency.
- The disposal of transformer oil shall be carried out in an environmentally friendly manner.
- A 110% bunded, secure storage area will also be provided at SS sites for oil.

327. To manage leaks from oil containing equipment substations designs will include at minimum 110% impermeable bunds to transformers/storage areas used for oils etc. A 110% bunded, secure storage area will also be provided at SS sites for oil.

328. Fuel and other lubricants will need to be stored at the construction sites. Best industry practice will be required to ensure that accidental spills and discharge to the soil. EPC Contractors for all components will be responsible for the preparation and implementation of a Pollution Prevention Plan covering and environmentally sound and safe storage, use, and disposal of all fuels, chemicals and oils and oils used on site and an emergency preparedness and response plan in the event of any leaks or spills (e.g., of oil, etc.). The plan should also include procedures for surveying and sampling potentially contaminated sites as well as restore disturbed work zones beyond the boundary of sub-activity sites. Both will form part of Contractor' Site EMP (CSEMPs).

Spoil Disposal

329. Excavated material from substation/ will be reused in landscaping inside the NESCO

campuses and compacted. Disposal of spoil from any site (including contaminated soils) are discussed below under waste management to be prepared by contractors.

330. EPC Contractors for all components will be responsible for the preparation and implementation of a Pollution Prevention Plan covering and environmentally sound and safe storage, use, and disposal of all fuels, chemicals and oils and oils used on site and an emergency preparedness and response plan in the event of any leaks or spills (e.g., of oil, etc.). Both plans will form part of CSEMPs.

Construction Waste and Hazardous Materials Disposal

331. Construction-related garbage, excavated soil and hazardous items must be handled and stored carefully, adhering to local laws. To guarantee appropriate handling of these materials, a specific location identified by DoE²⁴ will be chosen, where the materials will be temporarily deposited before being relocated as soon as feasible. In order to facilitate the easy transportation of these items away from the site, the dumping zone would essentially be chosen as per GOB or local officials permit, not inside the substation/workshop area but close to the boundary line where the primary project entrance will be situated. Easy loading and unloading of the disposed goods into the disposal carrying trucks is ensured by the dumping site close to the entrance.

332. In case of the project boundary being comparatively small and therefore not having the available space for waste disposal, then the disposal site should be selected beside the project location with the approval of the appropriate authority.

7.3.3.2 Construction Phase

Impacts

333. During the construction phase all soil contamination will be managed in accordance with the Pollution Prevention Plan.

334. During construction phase, there is a high risk of accidental spills and leakages (from Transformer oil (electrical transformers; SF6 (GIS substations and circuit breakers); battery acid (battery backup systems); minor maintenance chemicals (paints, lubricants, gases); waste transformer oil) that may occur from fuel and oil tanks, vehicles and machinery and storage of chemicals used in construction areas, yards, batching plants, worker camps, and residential areas and from storage sites. These spills can pollute soils and contaminate surface water and groundwater in the area. Waste effluent from temporary facilities such as camps and offices can also contaminate soil and surface run off.

335. Disturbance of soils during construction of all project components including substations, , etc operation of machinery ranging from HDD, piling machines, movement of vehicles etc., may lead to destruction of the integrity of upper soil layers. Damaged soil is more readily eroded and washed into water courses during rainfall events and can also form dust during dry periods. This effect will be significant due to the need of access roads construction which will further damage the integrity of soil apart from vehicle movement.

336. High rainfall can also potentially cause accelerated erosion particularly in excavated areas. The significance of impact on soil pollution and soil erosion is characterized as Medium. To manage topsoil and prevent soil erosion and pollution from hazardous materials a range of international good practice e.g., GIIP (Good International Industry Practice of IFC for Environment, Health and Safety) measures will be applied to all project components. These measures are outlined in detail in Annex 5: ECPs.

²⁴ Hazardous waste cannot be dumped except locations identified by DOE

337. As part of the overall construction management process, EPC Contractors for all components shall conduct bi-monthly training of workers on pollution prevention control including good housekeeping and how to clean up oil/fuel/chemical spills and dispose of contaminated sorbent material which would be treated as a hazardous waste. This will include emergency preparedness and response procedures (drills) in case of spill. Training for subcontractors before commencement of work will also be completed.

Mitigation Measures

338. The following mitigation measures will be implemented:

- The contractor will prepare and implement a Pollution Prevention Plan prior to the start of the work. Proper baseline data will be collected.
- Contractors will be required to implement the measures prescribed in the Environmental Code of Practices (ECP), which will be included in the contracts.
- Contractors will be required to take appropriate measures to avoid and contain any spillage and pollution of the soil
- Contractor will confine the contaminants immediately after such accidental spillage
- Contractors will collect contaminated soil, treat and dispose of them in an environmentally friendly manner
- All areas intended for storage of hazardous materials to be quarantined and provided with adequate facilities to combat emergency situations complying with all the applicable statutory stipulations.
- Topsoil to be best ripped and stockpiled where practical.
- Temporary stockpiles to be protected from erosion.
- For sewage waste from camps, appropriate treatment arrangements such as septic tanks and soakage pits will be installed on site. Water will percolate into the ground so there will be no discharge. Alternatively, sewage from construction camps and other facilities will be collected and transported to nearby municipal sewage treatment plants.
- The monsoon season will be avoided to carry out construction activities particularly excavation to the extent possible to minimize soil erosion.

339. New Substation: Excavated soil will be stored properly in a separate location selected by NESCO for backfilling purposes and covered with hard polythene or tarpaulin to protect surface runoff during heavy rainfall and these materials will be reused to backfill the trench after completion of pile works/ base works. 184.52 cubic meters of landfilling will be needed at Campus S&D-1, NESCO, Rangpur (GIS) S & DD-1, Shapla Rangpur. It is recommended that sand from the outside be used for landfilling rather than soil, and essential compaction be guaranteed once the landfilling process is complete. There won't be any surface runoff or soil erosion throughout the landfilling period if the sand is delivered by drum trucks.

340. Workshops: Back filling of the excavated area of the foundation and floor of the substation sites will be carried out using both local sand and excavated soils and compacted in a finest way. Soil compaction shall create a final development platform 3 m above the Highest Flood Level (HFL).

7.3.3.3 Operational Phase

Impacts

Leaks and Spills

341. Without suitable containment measures, it is possible that leaks of oil from oil containing equipment could impact upon soil (and groundwater). However, all new substations will be constructed and existing substations upgraded (with corrective action) in accordance with the specific national guidelines. Broadly, an oil soak pit to be designed and provided below each oil filled with a transformer to accommodate at least 150% of total quantity of oil contained in the transformer. However, there remains a risk that spills and leaks of oil could occur from oil storage areas and old oil containing equipment.

Spoils from Piling and HDD operations

342. Contractor will monitor locally and implement suitable containment measures for slurry from the HDD and piling operations at respective locations, it is possible that leaks of slurry could impact upon soils, groundwater and surface water if not handled properly.

343. The mitigation and management measures on the soil during the operation phase will be prepared by the contractor.

Mitigation Measures

344. Workshops: In order to prevent soil erosion, paved surfaces should be used when replacing PCBs or fixing transformers. Additionally, soil pollution should be avoided by properly storing materials in separate bins. In the event of a leak, contaminated soil must be extracted and disposed of in a safe location designated by NESCO, after consulting with local DOE officials as needed.

345. Substations sites: To prevent adverse effects like soil erosion, boundary walls must be carefully maintained. Additionally, PCB or oil leaks must be appropriately controlled to avoid any impact on the soil.

346. : Surface runoff can cause soil erosion; however, to lessen its effects, install fences, retaining walls, or drainage systems to reroute water flow. Mulching the area surrounding locations is another efficient way to stop soil erosion, as there are other suitable mitigating measures like collecting rainwater and routinely cleaning and maintaining the , among other things.

Impact summary and assessment of significance

347. The table below provides an assessment of the significance of potential impacts to soil before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 7-20: Potential Impacts to Soils

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Soil Compaction	Soils including agricultural land	M	M	L	-	MOD	MT	SMA	LOW	POSS	L
C	Soil Erosion	Soils including agricultural land, and local vegetation	L	M	L	-	MOD	ST	SMA	LOW	POSS	L
C	Soil contamination from spills and leaks	Soils including agricultural land, local vegetation and community	L	H	L	L	MAJ	LF	SMA	MED	POSS	M
C	Aggregate requirements	Natural resources	L	M	L	-	MOD	ST	SMA	LOW	POSS	L
C	Disturbance of contaminated land from existing substations/workshop	Substation soils and surrounding environment	L	M	L	M	MOD	LT	SMA	MED	POSS	M
O	Soil contamination from spills and leaks at substations	Substation soils and surrounding environment and community	L	H	L	M	MAJ	LT	SMA	HIG	POSS	L

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / SMA: Small/ H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible / UNLIKE: Unlikely.

Residual Impacts

Table 7-21: Soils Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	Soil Compaction	Low	Soil compaction and soil erosion is not likely to result in significant impacts during the construction phase.	Not significant
C	Soil Erosion	Low	Implementation of the proposed	Not significant

			mitigation measures will further limit the potential for impacts to occur.	
C	Soil contamination	Medium	Mitigation will ensure that any residual impacts are of low significance.	Low
C	Aggregate requirements	Low	No residual impacts are anticipated if licensed existing sources are used.	Not significant
C	Contaminated land from Substations	Medium	The measures outlined above will ensure that any potentially significant soil contamination is identified and removed from the site to authorized disposal locations. No highly significant residual impacts are identified as long as these procedures are followed.	Low
O	Spills and leaks at substations	High	Construction of containment measures according to GIIP will ensure that leaks and spills at substations do not result in highly significant impacts.	Low

7.3.4 Hydrology, Water Resources and Water Quality

348. This section discusses potential impacts on hydrology, water resources and water quality during construction and operation of the Project and associated mitigation measures to be adopted.

7.3.4.1 Pre-construction phase

Impacts

349. The Project will involve the use or generation of some or all the following materials that have the potential to contaminate surface waters:

- Fuels and lubricating oils.
- Paints and solvents.
- Leachate from hazardous waste storage areas (if any) at campsites and work zones.
- Raw sewage from camp sites. Waste generated is usually oily sludge, waste seals etc. which will be addressed in the hazardous waste disposal section of the EMP.
- Waste generated is usually oily sludge, waste seals etc. which will be addressed in the hazardous waste disposal section of the EMP.

350. Substation sites are located away from surface water courses, and it is considered unlikely that significant contamination of water courses from these materials during construction can occur, has a water body that will be retained as a water source for the park while the store is only one subproject that will be located close to surface waters and groundwater sources, per Table below.

Table 7-22: Ground and Surface Water Receptors

#	Location	Groundwater	Surface water
1	Campus S&D-1, NESCO, Rangpur (GIS) S & DD-1	800m (Tubewell)	Local Khal (150m)
2	Chandipur S& DD-2, Rajshahi	200m (Tubewell)	Local Khal (50m)
3	S&D1 Campus (GIS), S & DD-1, Bogura	50m (Tubewell)	Korotoya River (100m)
4	Kodomtola (GIS) S&DD-1, Pabna	30m (Tubewell)	100m (Pond), Lake-380m of North
5	S&DD-1, office campus, Shuihari, Dinajpur	500m (Tubewell)	1 km (Local River)
6	Workshop Shalbagan, Rajshahi	200m (Tubewell)	NA
7	Workshop Lalbagh, Rangpur	200m (Tubewell)	NA

#	Location	Groundwater	Surface water
8	Workshop ZRS, Bogura (Near Rest house)	75m (Tubewell)	250m (Wetland)

Drainage

351. Drains adjoining the HDD operations and may be affected by sediment laden surface water runoff, spills, while substation drains can have traces of hazardous materials and untreated sanitary wastewater. If piling is required, the method statement for management of piling mud is to be prepared to ensure the immediate adjacent waterbody is protected, there must be no discharge of piling mud to surface water.

352. However, the nearest sources as per Table above may be affected by surface water runoff, spills, leaks of hazardous materials and untreated sanitary wastewater and as a result, open defecation may also be an issue during construction if toilets are not provided for workers. There may also be wastewater from washing construction equipment and vehicles. There is also a risk that there could be untreated disposal of sanitary wastewater and spills and leaks of oil and other hazardous liquids during substation works and any pollution could impact upon any local groundwater users. However, the risk of major spills and leaks during construction is relatively low.

353. The possibility of minor groundwater contamination also exists from any spills or leaks of from and discharge of the wastewater if not carefully controlled may impact on surface water. To maintain natural water flow, natural drainage should be considered in the design of the workshop/SS, etc., with adequate openings.

Ground water

354. Although large volumes of construction water are not anticipated to be required at each worksite, there will be the need for technical and drinking water supplies during the construction phase, but construction related water could be sourced using ground water if no viable surface water or canal is available in near vicinity. For the substations new borewells will be provided. However, uncontrolled exploitation of water resources could impact upon the existing users of the water resources.

Mitigation measures

355. At substations all new transformers; oil and waste storage areas; and septic tanks/soak aways shall be located at least 50m from drainage and borewells to reduce pollution risk. If closer proximity is required due to site layout further assessment will be carried out to demonstrate using a source-pathway-receptor model, there will be no adverse impact on aquatic ecology or human health. Wastewater will be connected to existing sewerage system or septic tank with soak away so no untreated wastewater will be disposed of to surface water or ground in operation, septic tank/soakaway effluent to meet national general wastewater standards.

Drainage

356. Regarding drainage, adequate drainage design will be provided at the substations to manage runoff during operation. The design consultant is preparing the plan, and the contractor will implement the same as approved by NESCO and ADB after the award.

357. At this stage the EPC Contractors for all components will prepare and implement them

358. **Pollution Prevention Plan** covering the protection of water resources and environmentally sound and safe storage, use, and disposal of all fuels, chemicals and oils used on site and an emergency preparedness and response plan in the event of any leaks or spills (e.g., of oil, etc.) or an incident such as flood.

359. If piling is required at the site and a method statement for management of piling mud is to be prepared to ensure the immediate adjacent waterbodies are protected, there must be no discharge of untreated piling mud to surface water. Piling of foundations leads to drainage of waste slurry and drilling fluids into water canals and flat lands that adversely impact the drainage in the area.

360. Workshops foundation designs will incorporate adequate drainage with designs checked to confirm that good international practice in design is followed. The EPC contractors should fix outfalls and preserve the natural drainage system during detailed design and as-built preparation. The outfalls should be mainly local ponds, local canals, rivers and wetlands. The details are given in the Table below.

Table 7-23: Location of storm drainage outfalls

#	Location	Outfall location (Surface water)
1	Campus S&D-1, NESCO, Rangpur (GIS) S & DD-1	Local Khal (150m)
2	Chandipur S& DD-2, Rajshahi	Local Khal (50m)
3	S&D1 Campus (GIS), S & DD-1, Bogura	Korotoya River (100m)
4	Kodomtola (GIS) S&DD-1, Pabna	100m (Pond), Lake-380m of North
5	S&DD-1, office campus, Shuihari, Dinajpur	1Km (Local River)
6	Workshop Shalbagan, Rajshahi	NA
7	Workshop Lalbagh, Rangpur	NA
8	Workshop ZRS, Bogura (Near Rest house)	250m (Wetland)

361. At all sites the EPC Contractors design team will conduct flood and drainage risk assessments and incorporate effective drainage design (allowing for climate change) to prevent possible flooding or waterlogging during the wet season, whilst ensuring that surface runoff from the project site is no more than the greenfield runoff rate. The areas requiring special foundations and those prone to flooding should be avoided.

Ground water

362. For drainage, or groundwater sources within 50m of any sub-activity (baseline water quality sampling will be required (per EMoP) to confirm current background levels in the subproject area prior to the commencement of any activity on-site. Further on-going water quality monitoring will be completed at the baseline locations throughout construction and at areas where any complaints from residents are received.

363. Any drilling or excavation works within 50m of boreholes and wells for any component sub-activity will require pre-construction and post construction water quality monitoring against national drinking water standards to ensure no contamination of the local community supply. If any water pumps and water supply networks are damaged during work the contractor must provide the affected users with an adequate, alternative drinking water supply meeting national standards whilst immediately repairing the damage caused.

364. Permissions for any new borewell installation at any new substation shall be obtained including NOC as Bangladesh's Groundwater Management Ordinance of 1985 together with agreement of local communities before drilling and abstraction. A water meter will be provided on the borewell for monitoring of water abstracted.

7.3.4.2 Construction Phase

Impacts

365. At subproject sites the EPC Contractors will ensure proper flood and drainage at all construction sites must be implemented (allowing for climate change) to prevent possible flooding or waterlogging during the wet season, whilst ensuring that surface runoff from the project site is no more than the greenfield runoff rate. The contractor shall ensure that any areas requiring special foundations and HDD locations prone to flooding should be avoided during construction in the rainy season.

Mitigation Measures

366. To manage potential impacts to hydrological resources during construction of all components a range of good practice measures will be applied to all project components.

367. The final surface level of all project sites shall be at least 0.5 m above the existing ground level and highest flood level and shall be constructed in such a way as to be adequately drained to prevent washouts and flooding impacts to adjacent properties.

7.3.4.3 Operational Phase

Impacts

368. Extreme flood events associated with climate change could impact upon project infrastructure. The substation yard can be submerged during the rainy season due to water logging in adjoining drainage in the area.

369. During rainy season, the substations and towers are susceptible to lightning strikes which may result in electrocution and fires. This issue is addressed through climate change adaptation measures to be included in the detailed design and below under geohazards.

370. NESCO centrifuges and reuses transformer oil, rewinds transformer cores, and refills them at transformer repair workshops, potentially resulting in hazardous waste oil and some wastewater generation from handwashing. To avoid this anticipated risk, addressing the potential environmental impacts associated with the generation and disposal of wastewater, ensuring compliance with relevant regulations and minimizing any adverse effects on the surrounding environment. For example, toilet facilities should be provided to the labor camps and construction camp sites.

371. Leaks of oil from substation equipment/workshops and stores could impact upon groundwater, but the requirements outlined above under Soils will ensure that leaks and spills are managed in accordance with national guidelines and best practice. Adequate drainage needs to be provided at new SS/workshops to manage site run-off during the operational phase.

372. site is situated in low-lying area (though the land may not be required to be raised²⁵) necessitating ensuring natural drainage systems should be considered to reroute water flow and collecting rainwater and routinely cleaning and maintaining the , can help to reduce the impact on the local hydrology and water system.

Impact summary and assessment of significance

373. The table below provides an assessment of the significance of potential impacts to hydrology, water resources and water quality before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 7-24: Potential Impacts on Hydrology, Water Resources and Water Quality

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Contamination of surface water	Ground and surface water, local community, wildlife	L	H	L	L	MAJ	ST	SMA	MED	POSS	M
C	Water use	Ground water, local community	L	M	L	-	MOD	ST/LT	SMA	LOW	DEF	L
C	Contamination of groundwater	Ground water	L	M	L	L	MOD	ST/LT	SMA	LOW	POSS	L
C	Damage to water supply	Local community	M	H	H	-	MAJ	ST	SMA	MED	POSS	M
O	Contamination of water resources	Ground and surface water, local community, wildlife	L	M	L	L	MOD	LT	SMA	MED	POSS	M

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / SMA: Small/ H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible / UNLIKE: Unlikely.

Residual Impacts

Table 7-25: Residual Impacts – Hydrology, Water Resources and Water Quality

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	Contamination of surface water	Medium	The mitigation measures outlined above will ensure that residual impacts are not significant.	Not significant
C	Water use	Low	The mitigation measures outlined above will ensure that residual impacts are not significant.	Not significant
C	Contamination of groundwater	Low	The mitigation measures outlined above will ensure that residual impacts are not significant.	Not significant

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	Disruption of water supply	Medium	Temporary disruptions may still occur. Residual impacts will be low as impacts will be short term.	Low
O	Contamination of water resources	Medium	Measures adopted as part of designs should ensure there are no leaks and spills that would affect surface and groundwater	Not significant

7.4 Geohazards

374. This section therefore discusses potential impacts geohazards may have on the Project during construction and operation phases and associated mitigation measures to be adopted.

7.4.1.1 Pre-Construction Phase Impacts

Floods

375. Maps for Rajshahi and Rangpur divisions indicate several sub-activity sites are located close to rivers, or in low lying areas. No specific information was provided during site visits which indicates that new infrastructure is in flood prone areas.

Seismic Events

376. Much of the Project area is highly seismic. Seismic activity could damage project infrastructure leading to secondary impacts such as power outages and accidents involving people living close to damaged lines.

Lightning Events

377. Transformers and substations nearby may experience elevated currents and voltages because of lightning strikes. Transformer malfunctions or complete failure may arise from these induced currents, which can also harm winding insulation and cause insulation failures.

378. Lightning events are documented in all government statistics based on locations which can be used by the contractor to make an appropriate design to ensure proper protection.

Landslides

379. There are no Landslide prone areas in project area.

Forest Fires

380. No sub-activity sites have been reported as being affected by forest fires.

Drought

381. No sub-activity sites have been reported as being affected by drought.

Mitigation Measures

382. All designs will incorporate specific measures, as required by national design and construction codes, to mitigate the risk of damage from seismic events, and other natural hazards including flooding lightning, and landslides. All structural designs will be checked and seismic safety by an independent expert, separated to the design team, to confirm national and international good practice standards are met.

383. Workshops foundation designs will incorporate adequate drainage with designs checked to confirm that good international practice in design is followed. The contractors will determine the location of the storm drainage outfall in consultation with municipal officials and also consult with local residents to ensure that discharge from the /SS drainage system does not result in waterlogging of adjacent private or agricultural land. The outfall should ideally be connected to a natural waterbody or an existing drainage system, if available.

384. At all sites the EPC Contractors design team will conduct flood and drainage risk assessments and incorporate effective drainage design (allowing for climate change) to prevent possible flooding or waterlogging during the wet season, whilst ensuring that surface runoff from the project site is no more than the greenfield runoff rate. The areas requiring special foundations and those prone to flooding should be avoided.

Further:

- All sub-project sites shall be constructed above the highest flood level of the area.
- All sub-projects shall be designed for seismic requirements of the site.
- Gas insulated substations (GIS) shall be constructed in locations where space is a major constraint.
- The final surface level of substations is at least 0.5 m above the existing ground level and highest flood level and shall be constructed in such a way as to be adequately drained to prevent washouts and flooding impacts to adjacent properties.

7.4.1.2 Construction Phase

Impacts

385. At substations and tower sites the EPC Contractors will ensure proper flood and drainage at all construction sites must be implemented (allowing for climate change) to prevent possible flooding or waterlogging during the wet season, whilst ensuring that surface runoff from the project site is no more than the greenfield runoff rate. The contractor shall ensure that any areas requiring special foundations and those prone to flooding should be avoided during construction in the rainy season.

Mitigation Measures

386. The final surface level of tower sites shall be at least 0.5 m above the existing ground level and highest flood level and shall be constructed in such a way as to be adequately drained to prevent washouts and flooding impacts to adjacent properties.

387. Further:

- The substation or switchyard shall be maintained at the highest flood level to protect the site from the floods,
- The substation shall be designed for seismic requirements of the site.
- Gas insulated substations (GIS) shall be constructed in seismic prone areas, very heavily polluted areas and for locations where space is a major constraint.

7.4.1.3 Operation Phase

Impacts

388. The substation yard can be submerged during the rainy season due to water logging in adjoining drainage in the area. All substations are in low lying areas that would be filled using sand.

389. During rainy season, the substations and towers are susceptible to lightning strikes which may result in electrocution and fires.

Mitigation Measures

390. The design of all sites shall ensure that proper flood and drainage at all sites must be cleaned and maintained to prevent possible flooding or waterlogging during the wet season.

391. All equipment needs to be provided with ground earthing through strips and wires respectively for suitable earthing. Every substation, must have lightning arrests at the boundaries as well as equipment to avoid such strikes. NESCO staff during operation must ensure all these are in proper working conditions.

Impact summary and assessment of significance

392. The table below provides an assessment of the significance of potential geohazards before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 7-26: Potential Geohazard Impacts

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
O	Floods	Project infrastructure	L	H	L	-	MAJ	LF	SMA	MED	POSS	M
O	Seismic Events	Project infrastructure	L	L	L	-	MAJ	LF	SMA	MED	POSS	L
O	Lightning strikes	Project infrastructure	L	H	L	-	MAJ	LF	SMA	MED	POSS	M
O	Forest Fires,	Project infrastructure	-	-	-	-	LOW	LF	-	MED	UNLIKE	NIL

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / SMA: Small/ H/F: High Frequency / M/F: Medium Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible / UNLIKE: Unlikely.

Residual Impacts

Table 7-27: Residual Impacts - Geohazards

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
O	Floods	Medium	Ensuring designs account for potential flood risks will help reduce potential impacts, but given the uncertainties associated with climate change impacts in mountainous areas cannot be ruled out.	Low
O	Seismic Events	Low	None identified, as long as earthquake loading and national design standards are considered.	Not significant
O	Lightning strikes	Medium	Ensuring designs account for potential lightning strike risks will help reduce potential impacts, but given the uncertainties associated with climate change impacts cannot be ruled out.	Low
O	Forest Fires,	NIL	None identified	Not significant

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
	strikes			

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / SMA: Small/ H/F: High Frequency / M/F: Medium Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible / UNLIKE: Unlikely.

7.5 Biodiversity

8.4.1. Designated Sites and Critical Habitat (if any)

393. This section discusses potential impacts on designated sites, and critical habitats (if any) during construction and operation of the Project and associated mitigation measures to be adopted. The IBAT analysis revealed that Altadighi, Birganj, Nababganj, Ramsagar and Singra are the designated Protected Areas within 1 km of the project sites. However, the other Key biodiversity areas such as Jamuna-Brahmaputra River, Kulik (Raiganj) Bird Sanctuary, and Naya Bandh Wetland Complex are also within 1 km of the project areas. In addition, it is estimated that around 129 threatened species are also existing within the project areas following the IUCN Red list of threatened species, 2024.

7.5.1.1 Pre-construction Phase

Impacts

394. Screening of Project sub-activities has shown that:
- None of the proposed project sub-activities are in Environmentally Sensitive Zones (ESZ)²⁶; or forest areas.
 - To ensure there are no impacts to designated sites of ecological importance.

Mitigation Measures

395. To ensure there are no impacts to designated sites of ecological importance. The following mitigation measures will be applied:

- Pre-construction ecology surveys need to be conducted to confirm no unanticipated impacts; this includes bird surveys during appropriate periods round the year for the migratory and local birds in the area.
- Construction to be conducted only during the dry season when the birds present will be fewer in numbers.

7.5.1.2 Construction Phase

Mitigation Measures

396. Awareness training for workers will help limit potential construction phase impacts to the wildlife which could stray into construction areas. Training will need to be provided for workers on identification of threatened species, dos and don'ts in relation to disturbance to local and migratory birds.

7.5.1.3 Operation Phase

Impacts

397. During operations, ensure no bird electrocution occurs at any substation sites and not affected negatively at site.

²⁶ Ecological impact will be assessed by Ecology Experts during design stage.

Mitigation Measures

398. Awareness training for workers will help limit any potential operation phase impacts to any wildlife in the area for proposed SS sites and its adjacent areas.

Impact summary and assessment of significance

399. The table below provides an assessment of the significance of potential impacts to critical habitat and designated sites before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 7-28: Potential Impacts to Critical Habitat and Designated Sites

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C/O	Impacts to PAs	PA	L	H	M	L	MAJ	L/F	SMA	MED	UN	L
C/O	Impacts to KBA	KBA	L	H	M	-	MAJ	L/F	SMA	MED	UN	L

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / SMA: Small/ H/F: High Frequency / M/F: Medium Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely/POSS: Possible: / UNLIKE: Unlikely.

Residual Impacts

Table 7-29: Residual Impacts – Critical Habitat and Designated Sites

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C/O	Impacts to PAs	Low	There are no PAs in the area.	Not significant
C/O	Impacts to KBA	Low	There are no KBAs in the area	Not significant

8.4.2. Flora and Fauna

400. This section discusses potential impacts on flora and fauna during construction and operation of the Project and associated mitigation measures to be adopted.

7.5.1.4 Pre-Construction Phase

Impacts

Natural Vegetation

401. None of the substations are within natural habitat, they are all located within modified landscapes, e.g. agricultural land, existing substations, or rural areas – as such no specific ecological studies of these sites are required, other than confirming the number and types of trees to be felled at these sites.

402. None of the NESCO substations/workshops are within natural habitat, they are all located within modified landscapes, e.g., agricultural land, existing substations, or semi-urban/urban areas – as such no specific ecological studies of these sites are required, other than confirming the number and types of trees to be felled at these sites.

Habitat Surveys and Tree Cutting

403. During the design phase the EPC Contractor shall complete a habitat survey in order to confirm the area and type of modified at SS. The detailed survey shall include the number and species of trees, and the quality of tree cover lost, to calculate the loss of trees for the detailed design. During the detailed surveys area, a field ecologist will also record any fauna observed in the project area.

404. None of the NESCO substations/workshops are within natural habitat, they are all located within modified landscapes, e.g., agricultural land, existing substations, or semi-urban/urban areas – as such no specific ecological studies of these sites are required, other than confirming the number and types of trees to be felled at these sites.

Mitigation

405. All substations and their associated infrastructure shall follow the measures outlined below:

- Contractor to employ field ecologists to undertake map habitat and species encountered and enumerate the number and species of trees requiring to be cut and lopped, submit survey report alongside design.
- Presence or absence of sensitive receptors identified in IEE to be confirmed by field ecologists during route surveys. Adaptive management measures to be applied according to the findings of the surveys, e.g., realignment of route towards road center to avoid tree roots, etc.
- Carefully select the areas for installation within substation sites to avoid or at least minimize the need to cut/trim trees by avoiding areas with a high concentration of trees.
- Foundations to be dug to avoid the area beneath tree crowns (zone for root protection) and other vegetation. Foundations to avoid the tree crowns especially mature trees.

7.5.1.5 Construction Phase

Impacts

406. During the construction phase, the key potential impacts to flora and fauna relate to vegetation clearance within work sites, vehicle movements, the siting of construction camps and the presence of workers. The table below discusses these generic impacts in more detail.

Table 7-30: Generic Construction Phase Impacts

Activity	Impact
Habitat loss, degradation, fragmentation and simplification	Most habitats will be restored naturally substations following construction resulting in effects of short-term degradation and disturbance only. Only minor long-term habitat loss is expected to occur in the immediate areas beneath towers although many of these areas are already modified due to the setting of existing towers in these locations Substations – Most substations are open land. However, some trees are present on sites, and they will be cleared for construction. The number of trees to potentially be cut are listed in Table below.
Direct mortality of fauna in vicinity of site	Vegetation clearance at can lead to direct fatalities of fauna. Indirect fatalities can also occur when excavations (for foundations) are left open. Impacts are likely to be on individuals not population level. Collisions with vehicle construction can also occur.
Disturbance to sensitive species	Construction dust, noise and visual disturbance can result in short term, localized effects, although any animals in the area will become habituated to the noise. The nosiest activities are associated with excavation of foundations and HDD sites as well as vegetation at SS This may result in a short-term adverse effect. Impacts are likely to be at an individual level, not a population level.
Spread of non-	Spread of non-native or invasive species will reduce the ecological value of an area.

Activity	Impact
native or invasive species	
Poaching and deliberate killing of animals	The introduction of a temporary workforce to the area may increase the risk of poaching / deliberate killing of animals by workers at or near temporary construction camps.
Fisheries	The development of substations, and workshops is expected to have no effect on aquatic species, including fish species.

407. During construction work one of the most immediate impacts of substation sites and construction is the removal of trees inside the premises. This clearance is necessary to create space for project equipment layout. Depending on the project design, removal of small numbers of trees, including mature and ecologically significant specimens. Construction activities associated with substations, s and building such as excavation and installation of foundations which can disturb the soil structure and impact tree roots. Soil compaction, erosion, and changes in drainage patterns can affect the health and stability of trees in the vicinity of the construction site.

408. The Project will also require the removal of trees of various sizes and species. The SES survey and tree inventory survey found varieties of trees on proposed substations as listed below.

Table 7-31: Sub-Project-wise Tree Cutting Requirements

Name of Trees	Type of Trees	Big	Medium	Small	Total Trees
Akashmoni	Wood	4	1	0	5
Neem Trees (Azadirachta indica)	Medicinal	0	5	0	5
Bettle Nut	Fruits	0	8	1	9
Cocunut	Fruits	0	0	3	3
Jujubi	Fruits	0	0	4	4
Goyava	Fruits	0	9	1	10
Mango	Fruits	0	51	0	51
Papaya	Fruits	0	10	0	10
Blackbery	Fruits	0	5	0	5
Dewa	Fruits	0	0	0	0
Jambura Grapefruits	Fruits	0	4	0	4
Jackfruits	Fruits	0	0	3	3
Lemon	Fruits	0	2	3	5
Total Trees		4	95	15	114

Source: Census and IOL Survey by SSCL, June 2024 and May 2025

Mitigation Measures

409. Tree felling at NESCO sub-projects (and at existing NESCO substations/ – if required) will be completed in accordance with national requirements

410. Prior to the cutting of any tree field for any sub-project site, Contractor's ecologists will survey the trees in the area to ensure there are no nesting birds present in the tree. If nests are present, the Ecologist will determine the most suitable actions to avoid harm to the nests and birds. If any special status species (IUCN VU, CR, EN) are observed in the trees, ADB will be informed by NESCO and tree cutting ceased until appropriate mitigation plans have been prepared by the Contractor.

411. Locating construction camps away from sensitive areas and enforcing a

poaching/hunting/fishing ban on construction workers will help ensure that there are no significant adverse effects. Speed limits on vehicles and restrictions to existing and/or dedicated haul routes will prevent direct mortality and disturbance from vehicles. Pre-clearance site surveys and the movement of animals out of the working corridor will prevent direct mortality. There may be some low level unavoidable direct mortality, but this would not be significant in the short or long term.

412. Pre-clearance surveys of invasive species combined with the demarcation and treatment of non-native species will prevent their spread. Monitoring post-construction will ensure that newly restored areas are not inundated with non-native species from adjacent areas. Use of GIIP such as cleaning of machinery before being imported to site, wheel washes on site, etc. will avoid importing invasive species.

413. This risk relating to poaching can be reduced by appropriate worker training sessions and implementation of a strict code of conduct with regards to treatment of local fauna.

7.5.1.6 Operational Phase

414. No impacts are foreseen during operations.

Impact summary and assessment of significance

415. The table below provides an assessment of the significance of impacts to flora and fauna before implementation of the proposed mitigation measures.

Table 7-32: Potential Impacts to Flora and Fauna

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Loss, degradation/fragmentation of habitat	Terrestrial wildlife – birds, bats, etc.	L	H	M	-	MAJ	MT	SM A	MED	DEF	M
C	Loss of trees	Trees	M	M	M	M	<ED	LT	MED	MED	DEF	M
C	Physical damage (road kills, accident, loss of roosts/nesting sites, etc.)	Terrestrial wildlife – birds, bats, etc.	L	H	M	-	MAJ	MT	SM A	MED	POS S	M
C/O	Poaching	Terrestrial wildlife	L	H	L	-	MAJ	MT	SM A	MED	UN	L
C	Vehicle Movement	Terrestrial	L	H	L	-	MAJ	MT	SM A	MED	UN	L

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
	nts	wildlife										
C	Spread of non-native / invasive species	Terrestrial / Habitats	L	M	L	-	MAJ	MT	SMA	MED	POSS	M

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / SMA: Small/ H/F: High Frequency / M/F: Medium Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely.

Residual Impacts

Table 7-33: Residual Flora and Fauna Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	Loss, degradation/ fragmentation of habitat	Medium	Revegetation and tree compensation payments should help ensure that there are no significant residual impacts in the project area which is generally a modified environment.	Not significant
C	Loss of trees	Medium	The proposed mitigation measures should ensure that residual impacts are low.	Low
C	Physical damage (road kills, accident, loss of roosts/nesting sites, etc.)	Medium	The proposed mitigation measures should ensure that residual impacts are low.	Low
C/O	Poaching	Low	Awareness training for workers will help limit potential project impacts, but it is still possible that they could stray into sensitive areas.	Low
C	Vehicle Movements	Low	The proposed mitigation measures should ensure that impacts are not significant.	Not significant
C	Spread of non-native / invasive species	Medium		Not significant

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / SMA: Small/ H/F: High Frequency / M/F: Medium Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely.

7.6 Socioeconomic

7.6.1 Social Infrastructure (including Utilities)

7.6.1.1 Pre-Construction Phase

Impacts

416. Construction of Substations/workshops/ etc. are less likely to impact upon physical infrastructure as they are sited to avoid sensitive sites. However, impacts such as construction vehicles during construction, and noise from transformers during operation still needs to be considered. Traffic impacts from construction of sites are likely, but the volumes of construction traffic moving between construction sites will be medium in intensity.

Mitigation Measures

417. During this phase the EPC Contractors for all components will be responsible for preparing and implementing a Traffic Management Plan. They will also provide information to the public about the scope and schedule of construction activities and expected disruptions and access restrictions at least 72 hours before the disruptions.

418. EPC contractors must meet their environmental safeguard obligations including prompt reinstatement of damaged utilities etc. and must also ensure that all public spaces are restored to their original condition within 15 days of works completion.

419. A Project high-level committee which will be established to coordinate construction works under the Project and Rajshahi and Rangpur divisions municipal corporations to appoint a dedicated contractor for the NESCO project related road surfacing works (if required) to ensure timely reinstatement. The high-level committee must also be requested to cooperate with NESCO to enable them to meet their environmental safeguard obligations including prompt reinstatement of damaged utilities etc. Municipal corporations must also ensure that all public spaces are restored²⁷ to their original condition within 15 days of works completion. Continuous dust suppression measures should be implemented on the damaged road surface until the contractor has fully reinstated those roads.

420. Prior to the commencement of work all activities will be announced in local papers, at least one month in advance of work.

7.6.1.2 Construction Phase

Impacts

421. Substation construction / rehabilitation in semi-urban/urban areas will have adverse impacts in urban areas. However, outside of the urban impacts to social infrastructure are likely to be relatively minor.

422. No significant pressure on social infrastructure such as hospitals and clinics are anticipated as the number of workers at any one sub-activity will not be significant and it is unlikely that the health facilities will be impacted by periodic visits resulting from accidents at work sites.

423. No significant impacts to water supply are anticipated if permits are obtained for the drilling of boreholes and associated water extraction.

Mitigation Measures

424. During construction mitigation measures relating to maintaining access to properties, schools, businesses, etc. and managing access roads according to best practice will be implemented by all EPC Contractors. They will also be responsible for liaising with utilities to identify, avoid and maintain their operation throughout the construction period, e.g., by obtaining necessary clearances from other utilities that could be affected by the project.

²⁷ Continuous dust suppression measures should be implemented on the damaged road surface until the contractor has fully reinstated those roads

425. Road safety will also be a key aspect during the construction phase. Of specific relevance to these types of works the following measures shall be applied:

- Stockpiling of spoil and any new equipment (conductor reels, etc.) shall be away from properties and only in designated areas where no access will be blocked.
- Where the execution of the works requires single-lane operation on/beside the public road the contractor will provide and maintain all necessary barriers, warning signs and traffic control signals per the EMP and to the satisfaction of the local authority. Wherever traffic diversions, warning signs, traffic control signals, barriers and the like are required, the contractor will install them prior to commencing work in that area.

7.6.1.3 Operation Phase

Impacts

426. No significant impacts to social infrastructure and utilities are anticipated during the operational phase. No impacts on power supply are foreseen. Potential impacts from noise, water slurry disposal and EMF are discussed in other parts of this report.

Mitigation Measures

427. Since no significant impacts on social infrastructure and utilities are anticipated during the operational phase there are no mitigation measures required.

Impact summary and assessment of significance

Table below provides an assessment of the significance of potential impacts before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 7-34: Potential Impacts to Social Infrastructure

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Impacts from Piling	Local community	H	M	M	-	MAJ	ST	SMA	MED	DEF	M
C	Access	Local community	H	M	H	-	MAJ	ST	SMA	MED	DEF	M
C/O	Impacts on water supply	Local community	H	M	H	-	MAJ	ST	SMA	MED	POS	M
C	Impacts on schools and other social infrastructure	Local community	M	H	H	-	MAJ	ST	SMA	MED	DEF	M

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / SMA: Small/ H/F: High Frequency / M/F: Medium Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible / UNLIKE: Unlikely.

Residual Impacts

Table 7-35: Social Infrastructure Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	Impact from Piling	Medium	Implementation of effective noise management, timing of piling and removal of slurry from site ensure residual impact as Low	Low
C	Access	Medium		Low
C/O	Impacts on water supply	Medium	Mitigation measures included in this IEE should ensure that all utilities are identified and impacts on them, including water supply networks, are avoided.	No significant impact
C	Impacts on schools and other social infrastructure	Medium	Implementation of the Traffic Management Plan and other mitigation measures should ensure that no significant residual impacts remain.	No significant impact

7.6.2 Land Acquisition and Temporary Damages

428. This section discusses the issue of land acquisition and compensation and associated mitigation measures to be adopted.

7.6.2.1 Pre-construction Phase

Impacts

Land Use

429. Construction of the two substations (SSs) will cause permanent impacts as land will be acquired whereas workshops will be constructed on NESCO land. Project impacts include the loss of land, primary and secondary structures, trees, and other assets could result from construction²⁸ of 2 substations, workshops and buildings.

Substation/Workshop

430. The total land required for six sub-stations to be constructed by NESCO. Among them, four substations will be developed in NESCO's own land and remaining two substations e.g., Kodomtola (GIS) S&DD-1, Pabna and Baharkasna (S&D-3), Rangpur will be constructed in private lands requiring acquisition of 345.4 square meters and 1130.73 square meters land respectively. The construction of the six new sub-stations, one store, one workshop and one training center will require demolition of old buildings (details in Table below). The rehabilitation of 10 existing sub-stations and three workshops will not require any additional land. The private land is acquired through sale deeds after a process of negotiation. Hence, there is no involuntary resettlement impact for obtaining land for these six sub-stations

431. **Land details:** The sale of land for two substations will be on willing owner buyer agreement

Mitigation Measures

432. All temporary construction facilities required, including laydown and storage areas, will be located within the boundaries of NESCO land (substations) except for overnight accommodation that could be provided on existing properties off-site. Where this is not possible, the EPC Contractor will provide a centrally covered warehouse for storage of construction materials. No public or private land requiring clearance of vegetation or supporting forest habitat or having waterbodies is to be used.

7.6.2.2 Construction Phase

Impacts

433. The construction stage impact on land and damage to the crops will be mainly for whereas for other two substations, the lands have no assets or crops.

Mitigation measures

Substation/Workshops Activities

434. A total of 26.35 acres of land is required for this project, of which 9.30 acres are for substations, resulting in permanent impacts. For the 2 nos substation, 1.55 acres of land will be acquired following ARIPA 2017.

Table 7-36: Details on Land requirements and demolition works.

²⁸ Detailed design will determine if which and how many structures, trees etc will be finally affected.

Name of the proposed substations	Transformer Capacity (MVA)	GPS coordinate	Required Land (Sq. meter)	Civil works	Landfilling Required (Cu.m)	Land ownership	Required demolitions
Chandipur S& DD-2, Rajshahi	2*20/26 MVA GIS SS	24.36927 88.5746683	252	All	N/A	NESCO	12' x 22' (guard room)
Kodomtola (GIS) S&DD-1, Pabna	2*10/13.33 MVA GIS SS	23°59'30.68"N , 89°15'32.85"E	345.4	All	N/A	Private land	No
S&D1 Campus (GIS), S & DD-1, Bogura	2*20/26 MVA GIS SS	24°50'55.99"N 89°22'29.22"E	574	All	N/A	NESCO	40' x 50' (Vending Station)
Campus S&D-1, NESCO, Rangpur (GIS) S & DD-1, Shapla Rangpur	2*20/26 MVA GIS SS	25.74067386, 89.2555466	184.52	All	184.52	NESCO	25' x 30' (Void unused structure & space)
Baharkasna (S&D-3), Rangpur	2*10/13.33 MVA GIS SS	25°46'13.72"N 89°18'2.34"E	1130.73	All	N/A	Private land	No
S&DD-1, office campus, Shuihari, Dinajpur	2*10/13.33 MVA GIS SS	25.77101587, 89.3015178	933.57	All	N/A	NESCO	22675 sqft.
Workshop, Balubari, Dinajpur	-	25°37'25.53"N 88°38'20.05"E	-	All	NA	NESCO	1535 sqft.
Training Canter, litchi bagan, Rajshahi	-	24°22'14.74"N , 88°35'25.88"E	-	All	NA	NESCO	1870 sqft.

7.6.2.3 Operations Phase

435. No land acquisition is foreseen currently during operations.

Impact summary and assessment of significance

436. The table below provides an assessment of the significance of potential land acquisition and compensation impacts before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 7-37: Potential Impacts of Land Acquisition and Temporary Damages

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance

C	Land Acquisition and Crop and tree loss	Local population	L	H	M	-	MAJ	MT	SM A	MED	DEF	M
C	Private property damage	Landowners and users	L	H	H	L	HIGH	LT	Small	MED	DEF	M

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / SMA: Small/ H/F: High Frequency / M/F: Medium Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible / UNLIKE: Unlikely.

Residual Impacts

Table 7-38: Land Acquisition and Temporary Damages Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	Land Acquisition and Crop and tree loss	Medium	No significant impacts are anticipated if the RP is implemented correctly. A GRM has been prepared to manage complaints received during this process. Other temporary impacts during the construction phase will be managed by the RP as noted above.	Not significant
C	Unintentional private property damage	Medium	No significant residual impacts are anticipated if the RP is implemented correctly.	Not significant

7.7 Waste Management and Hazardous Materials

437. This section discusses the impacts of waste management during construction and operation of the Project and associated mitigation measures to be adopted.

7.7.1.1 Pre-Construction Phase

Impacts

Waste Management

438. Disposal of waste materials, both hazardous and non-hazardous, from worksites can be difficult to manage due to the de-centralized nature of the works along the alignments. Without suitable waste containers and without adequate training, workers could dump waste materials haphazardly around the work sites which could create pollution events. Waste management is, however, easier to control at the substations.

439. Various waste types will be generated at worksites during the construction phase:

- Inert construction waste – e.g., concrete, bricks, soil, packaging waste (cardboard, plastic, wood)
- Domestic waste – e.g., food waste.
- Liquid waste, some of which will be classed as hazardous – e.g., waste oil (non-PCB), sanitary discharge.
- Contaminated soil from existing substations. Soil conditions at the 9 existing substations and 1 workshop shows some degree of contamination of oil from

spillage/leaks in one or more spots, mostly under the transformers. Oil Spillage was observed at Mahigonj, Katkipara, Neomatpur and Golaghat, Setabgonj Substation, Balubari Substation and Fakirpara Substation substations, However, no leaks were found in Panchagarh substation, Upasahar substation, and Gaibandha Substation sites.

- Old electrical equipment from existing substations, some of which will be classed as hazardous – e.g., old transformers, lead acid batteries, and could contain PCBs (though DOE has conducted investigations to remove and store all suspected PCB transformers in segregated storage at Rajshahi, Rajshahgahi and Rangpur, workshop/store. The exact or estimated volumes of each waste type will vary from substation to substation.

440. Some of the electrical equipment to be replaced may also be removed and sent to other substations for re-use at these sites. NESCO will make the decision on the equipment to be re-used based on the functionality of the equipment to be replaced and the needs of other substations.

441. In addition, some new switching substation sites will be established at existing substations (14 PGCB SS). Site visits to these sites have indicated that old electrical equipment is stored in these areas. This equipment will need to be removed by NESCO. At this stage, it is not possible to say that any such equipment should be disposed of as it is possible that it is still classified as assets by the utility, and it is possible that it could be used for spare parts in the future. Any equipment for disposal must be provided in an environmentally safe and sound manner with no debris and residual contamination from oil spills and leaks on handovers.

442. This Project does not include the requirement for the EPC Contractors to remove and dispose of scrap. This activity is the responsibility of NESCO, who will be responsible for following national waste management regulations relating to disposal of waste.

443. No licensed company is involved in national level and even local level at Rajshahi, Rangpur to manage the hazardous wastes commercially in Bangladesh. So, necessary coordination should be made with local DOE to handle and disposing of hazardous waste at local level.

Hazardous Materials

PCBs

444. Polychlorinated Biphenyls (PCBs) are a persistent organic pollutant, a highly hazardous chemical. PCBs can potentially be found in oil containing equipment at substations, specifically in older equipment such as transformers and circuit breakers. PCBs, when they leak from equipment, are hazardous to human health as well as environmental pollutants.

445. Environmental audit of the 9 existing substations identified the presence of old equipment, particularly transformers that leak oil, (Any suspected depending on the date of manufacture and schedule of oil replacement. Based on assessment against United Nations Industrial Development Organization (UNIDO) guidance at Rajshahi, Rangpur and Bogura workshops/Stores were identified as being having transformers suspected of containing PCBs. and oils²⁹ and

Other Hazardous Liquids

446. Other general hazardous liquids will be stored at work sites and at substations, e.g., fuel, solvents, etc. Spills and leaks of these liquids can result in soil and water pollution. This

²⁹ PCBs should be managed properly following the National Oil and Spill Contingency Plan (NOSOP) of Government of Bangladesh

issue is discussed above under Soils and Hydrology section 8.2. 3..

Mitigation

447. The EPC Contractors, for all components, will prepare and implement a **Waste Management Plan** dealing with all solid and hazardous waste as well as wastewater generated in an environmentally sound and safe manner. Where possible it will ensure surplus materials will be reused or recycled, disposal will be the last resort.

448. Old electrical and mechanical equipment will need to be removed from some sites. This equipment will be transported to NESCO designated workshop/store for reuse or recycling using PCB authorized vendors as per the condition of the equipment, if fit for use they will be stored for reuse by NESCO or they will be auctioned off as scrap material. Disposal of old transformers and other hazardous wastes shall be per national regulations. Other wastes will be recycled using DOE authorized vendors or suitably engineered and licensed waste management facilities for inert or solid waste. Any PCB contaminated transformers will be disposed of from NESCO storage sites as per the DOE directions in conformance to UNIDO guidelines.

Mitigation measures

449. The EPC Contractor for substations/ will provide a well-designed, covered area where materials can be segregated. The waste storage area will be of sufficient size to accommodate all anticipated storage requirements and can be locked, is well-ventilated and will not reach extreme temperatures. Fuel/oil/chemical/waste storage areas must have an impervious floor and be bunded so that the capacity of each bund is sufficient to contain at least 110% of the maximum design storage capacity within storage area, not connected to the surface water drainage system.

450. 24V, 30V, 48V, 110V, 220V DC batteries will ideally be lithium-ion type instead of lead acid or nickel cadmium to reduce hazardous waste generation although all battery types are e- waste and must follow Bangladesh Hazardous (E-waste) Management Rules 2021. A separate room for batteries will be provided with ventilation and an exhaust fan for taking out fume gases and provision of remote monitoring of batteries (if not staffed) and exhaust fan will also be made.

7.7.1.2 Construction Phase

Impacts

451. During the construction phase, typical waste management issues can be managed through simple mitigation measures outlined in Annex 1. Waste materials will be disposed of at licensed facilities in Rajshahi and Rangpur divisions.

Mitigation measures

452. Regarding spoil material, two specific mitigation measures are required to be implemented by EPC Contractors:

- No licensed company is involved in national level and even local level at Rajshahi, Rangpur to manage the hazardous wastes commercially in Bangladesh. So, necessary coordination should be made with local DOE to handle and disposing of hazardous waste at local level.
- Any areas of oil leaks beneath existing equipment to be removed will be excavated, stored in labelled metal drums and returned to the Contractors facilities for storage according to **method statements**. The labelled containers will include a reference number which correlates with the removed transformer which will be tested for PCBs using rapid test kits. If the PCB tests indicate that the transformer oil is contaminated, the container containing the soils will be labelled as PCB waste. PCB waste shall be stored, handled and disposed

of in line with national regulations. Oil contaminated waste, not PCB contaminated, will also be disposed of according to national regulations.

7.7.1.3 Operation Phase

453. During this phase NESCO will be responsible for ensuring waste management and disposal in line with national waste management regulations. They will also be responsible for implementing the corrective actions specified in the corrective action plan (Chapter 7).

Impact summary and assessment of significance

454. The table below provides an assessment of the significance of potential waste management and spoil disposal impacts before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 7-39: Waste and Spoil Disposal Potential Impacts

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Improper management and disposal of solid / liquid waste	Local community / water bodies/ agricultural land	L	M	L	L	MIN	ST	SMA	LOW	POSS	L
C	Improper management and disposal of hazardous waste (including contaminated soil)	Local community / water bodies/ agricultural land	L	H	L	H	MAJ	ST	SMA	MED	POSS	M

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / SMA: Small/ H/F: High Frequency / M/F: Medium Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible / UNLIKE: Unlikely.

Residual Impacts

Table 7-40: Waste and Spoil Material Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	Improper management and disposal of solid / liquid waste	Low	No significant residual impacts anticipated.	Not significant
C	Improper management and disposal of hazardous	Medium	Following the requirements of this IEE and the need to audit waste management contractors will ensure that there will be no significant residual hazardous	Not significant

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
	waste (including contaminated soil)		impacts.	

7.8 Green House Gas Emissions

7.8.1 Sulphur Hexafluoride (SF6)

7.8.1.1 Pre-Construction/Construction

Impacts

455. In relation to climate change, SF6 is a non-toxic greenhouse gas used as a dielectric in gas insulated substations (GIS) as well as switch gear and other electrical equipment. has a global warming potential of 22,800 carbon dioxide equivalent (CO2e) i.e., equivalent to an average car covering 160,000 km. Due to high global warming potential, SF6 contributes to climate change if it is released into the atmosphere during operation, maintenance or during end of-life disposal. The SF6 contained in GIS and switchgear equipment varies greatly according to type and manufacturer.

456. Major leak of SF6 from project-installed equipment is the worst-case scenario but could easily occur during operation if equipment is not well maintained, or at end of life if the equipment is not appropriately disposed. Climate change is a global concern, however, the impact of a worst-case SF6 release from the project will be negligible in percentage terms compared to the 36 billion annuals global CO2e emissions.

457. SF6 can have impacts on the health of workers and the environment. However, there are no leakages involved during pre-construction or construction phases.

Mitigation Measures

458. During the pre-construction phase EPC Contractors, as part of their CSEMP, will be responsible for the preparation and implementation of a **Pollution Prevention and Climate Change** from emissions of hazardous gas.

459. An Emergency **Response Plan** comprising specific requirements to manage SF6 will be prepared and implemented to deal with the event of an accidental leak.

460. Although no significant impacts relating to climate change from leaks of SF6 are anticipated it is still prudent to manage SF6 at GIS substations and breakers in some substations according to best practice as follows:

- Design of any gas insulated equipment will comply with international norms and standards for handling, storage, and management of SF6.
- Equipment to be hermetically pressure sealed “sealed for life” units and be tested and guaranteed by the supplier at less than 0.1% leakage rate.
- Installation designed and operated so that any leakage will trigger an alarm at the nearest concerned staffed substation requiring O&M staff to rectify the situation immediately.
- Provide SF6 leakage detector at each substation

7.8.1.2 Operations

Impacts

461. Greenhouse gas (GHG) emissions from implementation of the proposed project are estimated using the World Bank's Guidance Manual: Greenhouse Gas Accounting for Energy Investment Operations, Version 2.0 January 2013 (hereinafter "Guidance Note") and IPCC 2006 guidelines. The sources of emissions are considered for accounting GHG from the Project. The sources and the estimates are given below.

462. Impacts relevant to this source result from technical loss reductions in the GIS substations being supported by the project. Losses can be reduced by upgrading overloaded or not properly sized transformers, increasing conductor capacity, installing reactive power equipment, and undertaking other types of maintenance interventions. The losses in the Substations in Bangladesh are generally estimated as 3.13 percent. The direct generation emissions associated with these losses (emission factor: 0.6545 tCO₂/MWh) are estimated to be 0.2 million tCO₂e per year and 6.03 million tCO₂e for the entire life of the project, assuming that the life of the project is 30 years. (1820 MVA = 1820 MW. $1456 \times 365 \times 24 = 12,754,560$ MWh. $0.6545 \times 12,754,560 \times 0.0313 = 261,288$ tons of CO₂ equivalent; $261,288 \times 30 = 7.83$ million tons of CO₂ equivalent.) The project will support the producing of green electricity by investing in renewable energy and smart grid technology leading to reduced losses and emissions. It also supports providing improved access to communities which is included in the universally aligned list attached to the Joint MDB Methodological Principles for Assessment of Paris Agreement Alignment (PAA).

Mitigation Measures

463. Operational phase mitigation will focus on the management of SF₆. Specific requirements for GIS substations and switchgears include:

- During operation, regular visual and technical inspections will be undertaken, SF₆ leakage detection kits will be provided at each substation, and remote gas pressure alarms are to be installed where daily inspection is not an option, such that any leaks can be immediately addressed.
- Regular monitoring of the switchgear and GIS station will also be undertaken to ensure no leaks of SF₆, in line with national regulations.

464. Further, NESCO does not currently have procedures for safe disposal of SF₆. Therefore, NESCO must ensure SF₆ is first removed in accordance with International Electrotechnical Commission (IEC) standard 61634 to a very low pressure so losses of SF₆ are less than 0.5% at end of life and then reused, or recycled, or safely. Accordingly, NESCO will need to define a safe SF₆ retrieval arrangement, with appropriate handling, storage, disposal process for end-of-life equipment in accordance with international good practice.in participation with suitable SF₆ management organizations

Impact summary and assessment of significance

465. The table below provides an assessment of the significance of potential GHG emission impacts before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 7-41: Potential Impacts to Greenhouse Gases

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Release of SF6 gases	Airshed, nearby communities, and sensitive ecological sites	L	M	L	M	MED	ST	SMA	JIG	DEF	M

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / SMA: Small/ H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible / UNLIKE: Unlikely.

Residual Impacts

Table 7-42: Project Air Quality and Greenhouse Gas Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C/O	Release of SF6 gases	Medium	Mitigation measures will ensure residual impacts will be reduced to medium significance	Medium

7.9 Social and Cultural Aspects

7.9.1 Community Health & Safety

466. This section discusses potential health and safety impacts to the local community during construction and operation of the Project and associated mitigation measures to be adopted.

7.9.1.1 Pre-construction Phase

Impacts

Substations/ workshops

467. Include a secure boundary fence or wall around the substations that is sufficiently high it cannot be climbed over, provide a gated, surfaced vehicular access for entry/exit off public highway having adequate sight lines for all drivers and warning signs of entranceway for road users. Ensure this is applicable to all substations to be rehabilitated, per the Corrective Action Plan. Fence and kiosk to feature written and visual warning signs that meet the IEEE standards to include the ISO 7010 "Hazard Type: Electrical Symbol" warning of the risk of electrocution.

468. Pre-construction is another important phase for community health and safety. During this phase the EPC Contractors, for all phases, will be responsible for the preparation and implementation of a **Community Health and Safety Plan** outlining all of the relevant measures in this EMP relating to community health and safety. The Community Health and Safety Plan shall include flow chart and contact details to deal with that situation should any community member be impacted during the work. Additionally, a **Traffic Management Plan** will be prepared considering both the safety of pedestrians and vehicles and need to avoid traffic congestion; it is to be developed in consultation with relevant local authorities to ensure

proper execution of traffic controls including where temporary blockage of one lane of the road or footpath is needed for installation.

469. Contractor needs to plan for Community safety and security due to rapid movement of vehicles bringing in material, equipment, wastes and manpower to construction sites. The incoming of outsiders from different areas for construction at substations/workshops/ and maintenance can make people, especially women and children frightened in terms of outstation labor. Material movement and erection works during construction phase.

Mitigation Measures

470. During the design/pre-construction phase, it is important that all infrastructure is designed with the safety of the community in mind. The design requirements will be different for the various sub-activities; however, the general theme of the design phase is that all Project infrastructure will be constructed in accordance with national safety codes and safety clearances. On a sub-activity basis, the following safety measures will need to be followed by the EPC Contractors designers.

Substations/workshops

- Separation walls or fire barrier walls shall be provided between the transformers / reactors or between transformers / reactor & nearby buildings.
- Designs will ensure that there can be no illegal access to substations//workshops.
- Include a secure boundary fence or wall around the project infrastructure that is sufficiently high it cannot be climbed over, provide a gated, surfaced vehicular access for entry/exit off public highway having adequate sight lines for all drivers and warning signs of entranceway for road users. Ensure this is applicable to all sub-project components that need to be rehabilitated, according to the Corrective Action Plan.

EMF

471. 33 kV infrastructure does not have any significant impacts from EMF from substation transformers. The EPC Contractors for the substations will provide EMF calculations to NESCO for review. If the results show that EMF levels above ICNIRP reference levels at properties close to the substation, the use of shielding equipment/materials to decrease electromagnetic field exposure included will be provided.

7.9.1.2 Construction Phase

Impacts

472. The Project has the potential to increase the threats to community safety and security during the construction phase. The key types of impacts are likely to be:

- Potential conflict between workers, security personnel and local community members resulting in upset or injuries, in particular, SAEH issues due to interaction between Project workers and women in the local communities.
- Increased hazards (e.g., open excavations and worksites). Children are specifically vulnerable to these types of hazards.
- Increased risk of road/traffic accidents causing injuries or fatalities. Project activities will result in increased traffic flows on certain roads that are used by local residents. Children are also specifically vulnerable to road accidents.

473. All these impacts are likely to be most significant in Rajshahi and Rangpur where SS works will be undertaken, and population density is high. In other semi-urban and rural areas, the risk of impacts to the community will be lower but still needs to be managed.

474. The most likely potential impacts on community health in the construction phase are:

- Increase in dust, noise and water pollution
- Increase in disease vectors such as rodents (if food/drink is not stored properly and solid/liquid wastes are not managed adequately) with accompanying increased

incidence of vector-borne diseases.

- Increased risk of enhanced incidences of communicable diseases arising from interaction between workers living in the construction camps with local people. There will be a risk of communicable diseases (e.g., COVID-19, TB, and sexually transmitted diseases such as HIV/AIDS) passing through the workforce and possibly into the community.
- Increased risk of water-borne diseases if liquid and solid waste management is not implemented effectively.

Mitigation Measures

475. During the construction phase EPC Contractors for all components will review measures to mitigate community health and safety impacts on a regular basis, and consult community leaders every six months, informing them on the status of implementation and results, and discussing any changes needed to the **Pollution Prevention Plan** or the **Community Health and Safety Plan** in advance of proposed changes. They will undertake face-to-face with all communities/residents and schools, health centers, places of worship and community centers within 50m of the substations to keep them fully informed of the nature of work and latest schedule, notifying them individually prior to the commencement of works of the intended start date and schedule.

476. Construction near schools will be completed in the summer and construction in commercial areas, crowded area, religious places and public area will be done at night and after prior consultation with stakeholder groups.

477. A range of other general good practice measures (Annex-5 ECP) will be employed by the EPC Contractors for all sub-components relating to the provision of access, which is key for all works, and road safety. These measures will be supplemented by specific measures relating to Substations/workshop works.

7.9.1.3 Operational Phase

Impacts

478. During this phase the EPC Contractors, for all phases, will be responsible for the preparation and implementation of a Community Health and Safety Plan outlining all of the relevant measures in this EMP relating to community health and safety.

Mitigation Measures

479. Due to the presence of security staff and security perimeter fencing, no operational phase impacts are anticipated relating to the substations as long as they are maintained.

480. During the operational phase NESCO will be responsible for ensuring that all required operational phase corrective actions for existing substations to be rehabilitated are completed by the Corrective Action Plan (Chapter 7).

Impact summary and assessment of significance

481. The following table provides an assessment of the significance of potential impacts to the local community before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 7-43: Potential Impacts to Community Health and Safety

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Accidents at work sites (including traffic accidents)	Local community / Livestock	M	M	H	-	MAJ	ST	SMA LL	MED	POSS	M
C	Social conflicts	Local community	M	M	H	-	MAJ	ST	SMA LL	MED	POSS	M
O	Accidents involving electrical equipment	Local Community	M	M	H	-	MAJ	LT	SMA LL	HIG	POSS	H

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / SMA: Small/ H/F: High Frequency / M/F: Medium Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely.

Residual Impacts

Table 7-44: Community Health and Safety Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	Accidents at work sites (including traffic accidents)	Medium	A range of mitigation measures have been provided to help manage the risk of accidents occurring. However, despite these measures it is still possible that accidents could occur due to unforeseen circumstances.	Low
C	Social conflicts	Medium	Proposed mitigation measures, including the development of and implementation of a community health and safety plan should ensure that social conflicts are minimized during the construction and operational phases. No significant impacts anticipated.	No significant impact
O	Accidents involving electrical equipment	High	The safety measures recommended in this IEE, coupled with national safety standards, should ensure that all infrastructure is constructed and maintained to a standard which prevents significant impacts to community health and safety.	No significant impact

7.9.2 EMF

7.9.2.1 Preconstruction/Construction

Impacts

482. 33 kV infrastructure such as s do not produce significant external electric fields. However, measures should be put in place to warn the public about the dangers to avoid potential accidents and fatalities during the operational phase.

Mitigation Measures

483. The EPC Contractor for the substations/s will provide EMF calculations to NESCO for review. If the results show that EMF levels above ICNIRP reference levels at properties close to the substation/ the use of shielding equipment/materials to decrease electromagnetic field exposure included will be provided.

7.9.2.2 Operational Phase

Impacts

484. Typical fields are lower than the maximum field because the loads are usually lower.

Mitigation Measures

485. Given the proximity of residential settlements to the site-specific assessments should be conducted to evaluate EMF levels in the area.

486. Although no significant impacts have been identified associated with EMF for 33 kV equipment, NESCO should still undertake periodic monitoring of EMF at each subproject location to ensure ICNRP occupational and community EMF exposure levels (reference and peak values) are achieved within the subproject boundary and outside of the fence line respectively.

7.9.3 Workers' Rights and Occupational Health and Safety (OHS)

7.9.3.1 Pre-construction Phase

Impacts

487. The main Project-related activities that may result in OHS issues are:

- Accidents involving the use of heavy equipment.
- Accidents involving working at height.
- Accidents involving live power lines and equipment.
- Accidents involving construction vehicles.
- Accidents due to lack of, or poor application of, personal protective equipment (PPE).
- Accidents involving wildlife e.g. snake bites, etc.
- Interaction with hazardous materials e.g. PCBs or asbestos
- Poor sanitary and welfare conditions at camps and work sites.
- Lack of first aid and medical facilities.
- Lack of firefighting equipment.
- SEAH
- Exposure to EMF and SF6.

488. There are accidental risks coming out from several hazards or events associated with different types of construction activities. The following table shows the type of hazards/ Event/ risks, along with their sources and consequences for workers that need to be considered during design stages:

Table 7-45: Occupational health and safety issues during construction stage

Hazard/Event/risks	Source(s)	Consequence(s)
Struck by	Falling/moving pipe, tools/debris dropped from elevated location, vehicles;	Health injury and loss of life
Falls	Fall from elevated areas, towers, high heights etc.	Health injury and loss of life
Electrocution	Cutting and welding, cable gallery, Switch yard etc.	Health injury and loss of life
Fire and Explosion	Cable gallery, power transformer, switch yard, switch yard control, flammable chemical, power transformer, etc.	Health injury and loss of life
Noise Pollution	Noise and vibration from heavy Machinery and civil construction work;	Hearing complexity, scaring wildlife, livestock, human beings, etc.
Traffic Accident	On site and off site;	Health injury, life loss, property damage etc.
Unsafe Working Place	Lack of safe working conditions, employees having contagious disease;	Health injury, electrocution, organ disease outburst, loss of health, loss of life

489. There are no written hazardous materials or solid and hazardous waste management systems and guidelines for substation personnel; there were no written Environment, Health and Safety procedures or training to prepare staff for emergencies. Inadequate Personal Protective Equipment (PPE) and first aid was recorded at all substations. /Workshops

Mitigation Measures

490. Workers' rights including occupational health and safety need to be considered to avoid accidents and injuries, loss of man-hours, labor abuses and to ensure fair treatment, remuneration and working and living conditions. These issues need to be considered not only for workers who are directly employed by the Project but also sub-contractors and those that may be informally employed, including daily labor.

491. Most mitigation measures for the design phase relate safe design of sub-project to protected workers. The provided mitigation measures described in EMP are based primarily on national safety standards and the requirements of WBG EHS Guidelines. Further, for all component construction works EPC Contractors will be required to undertake a health and safety risk assessment through a workshop during the design (and at other key stages) so it can inform both design and pre-construction preparations, considering both occupational and community H&S risks resulting from subsequent stages of the project. The facilitated workshop will involve the design and construction team of the EPC Contractors and operational (NESCO) staff.

492. During the pre-construction phase an important focus will be on the establishment of plans and workers contracts to ensure that provisions are in place to manage the health and safety of workers and ensure workers' rights are respected. Specifically, the following are required:

493. **Occupational Health and Safety Plan & Emergency Response Plan(s).** H&S plan to include emergency preparedness and response plan including flow chart and contact details to deal with situation should any construction worker or community member in the event of an incident during the work. The requirements of the OHS Plan are included in the EMP attached in Annex 1. The plan will also include an **OHS training Plan**.

494. **Labor Management Plan** addressing employment of migrant workers, sanitation and welfare, gender-based violence/sexual exploitation, abuse, and harassment prevention etc.

495. **Camp / Accommodation Management Plans** depending upon the site location and requirements of EPC Contractor.

496. **Code of Conduct (CoC)** and information video/brochure/leaflet for distribution to all workers during induction addressing culturally acceptable practices etc. CoC must be informed by the SEMP and address the following aspects:

- Zero tolerance in respect of health and safety.
- Requirement on always wearing PPE on site.
- Zero tolerance of bribery or corruption.
- Respect for local community and customs, avoiding community conflict situations.
- Zero tolerance of illegal and unacceptable activities/behavior, including but not limited to engagement in: prostitution; gender-based violence/sexual exploitation, abuse, and harassment; illegal sale or purchase of alcohol; sale, purchase, or consumption of drugs; gambling; fighting.
- Alcohol and drugs policy and testing regime.
- Role of workers in good housekeeping.
- Role of workers in maintaining good hygiene including COVID-19 measures e.g., social distancing.
- Respect of wildlife and the environment.
- Description of disciplinary measures for infringement of the code of conduct and other employer rules (e.g., immediate removal from site, fine etc.) will be included in staff contracts.

497. During pre-construction EPC Contractors shall also establish, through their Labor Management Plan, procedures for engagement of the workforce, for example through setting targets for local employment based on initial assessment of the labor market for unskilled and semi-skilled work force. EPC Contractors shall also ensure mitigation measures included in EMP are included in workers contracts, including measures relating to working hours and salary and provision of insurance for workers.

498. Health and safety risk assessment for exposure to PCBs to be undertaken before removal/maintenance/repair/connection work is undertaken on any existing transformers at the workshops.

7.9.3.2 Construction Phase

Impacts

499. The Project is expected to create at least 50-100 direct employment opportunities per HV power line and 50 per substation during the peak of the construction period. Most workers will be engaged by the EPC Contractor and will consist of an unskilled, semi-skilled to skilled workforce. During the operational phase maintenance works will be undertaken by existing NESCO staff.

500. The expected impacts on worker rights and H&S because of construction, activities and Project operation are as follows:

- Risk to workers H&S due to hazardous construction activities and inadequate living conditions; and
- Violation of workers' rights.

501. Risks exist for construction workers particularly those who have not received adequate

training or are familiar with the hazards associated with the construction of electrical infrastructure projects or medical unfit for the work involved. Inexperience workers under the age of 18 would be particularly vulnerable from working on a hazardous construction site. Health and safety hazards faced while working at construction sites, handling machines, plant and equipment, driving vehicles etc. could result in minor or major injuries, potentially in the worst-case even death. In particular, work at heights and work with electricity are particularly dangerous activities required to implement the project. Only trained, medically fit workers are permitted to work with electricity and at height. Construction workers will be required to handle materials such as cement, chemicals, fuels, etc. which will increase health risks if personal protective equipment is not used.

502. Poorly designed temporary worker camp/overnight accommodation and sanitation and welfare facilities may pose a health threat and nuisance to the workers due to unsanitary and unhealthy conditions. Uncontrolled vending of food and drinking water at worksites may also pose a risk with respect to the transmission of diseases like typhoid, diarrhea, and dengue fever. Migrant and illiterate workers can be particularly vulnerable.

Mitigation Measures

503. Extensive provisions for the health and safety of workers during the construction phase are included in EMP. These measures are based on the requirements of national regulations and WBG EHS Guidelines. The measures relate to all components, except for the following items which focus more specifically on certain sub-activities:

504. PCB at Existing Substations - Unless transformers have been certified PCB free workers interacting with them must wear suitable chemical and/or oil-resistant gloves, goggles, and protective clothing whilst taking samples and/or working with transformers. Water supply to sink/shower and eye wash station to be provided on-site during work due to risk of PCB meeting skin.

505. In the absence of documentary evidence (e.g., contract specifications or certification for the supply of original transformers, maintenance records for oil replacement including material safety data sheet, or transformer oil test results etc.) for given transformers confirming they are PCB-free, all old transformers must be considered by the staff at risk of containing PCBs. Mineral oil-filled transformers were not designed to use PCBs, but many have been found to be contaminated with PCBs due to oil changes etc. If existing transformers are at risk of containing PCBs NESCO will request the contractors to test them to inform their compliance with the Government of Bangladesh Regulation of Use, Handling and Disposal of Polychlorinated Biphenyls by 31.12.25 (such testing by contractor is included in EMoP scope). In NESCO dechlorinating or removing those confirmed as containing PCBs from the distribution network by 31.12.25 follow national regulations for transport, storage, and disposal through facilities capable of safely transporting (closed trucks) and disposing of hazardous waste containing PCBs.

7.9.3.3 Operational Phase

Impacts

506. Working with live equipment during maintenance and operation of the substations/workshops/ also involves safety risks specifically relating to electrocution. The environmental audit completed for 9 substations noted that safety requirements and training and awareness of NESCO staff were found to be inadequate.

507. The measure ensures that aspects such as fire safety, sanitation and noise levels are all accounted for in substations and workshops designs. A range of design measures have been proposed to ensure the safe management of SF6 under the topic of air quality above. When an arc is formed in SF6 gas small quantities of lower order gases are formed. Some of

these by-products are toxic and can cause irritation in the eyes and respiratory systems. This is a concern if the interrupters are open for maintenance or at disposal of the interrupters. Normally these impacts only occur in enclosed areas.

508. The National Institute for Occupational Safety and Health (NIOSH) and other US government agencies do not consider the EMF a proven health hazard³⁰. However, according to the WBG EHS Guidelines for Electric Power Transmission and Distribution- 2007, electric utility workers typically have a higher exposure to EMF than the general public due to working in proximity to electric power lines. Spot EMF reading using smartphone-based app undertaken for the environmental audit of 25 substations indicated that levels were mostly low at all locations, inside office and near gates, varying between 21 uT – 52 uT”.

Mitigation Measures

509. During the Operational phase NESCO will be responsible for following all national labour laws and health and safety laws and regulations (including those for sanitation and welfare). Other best practice measures will also be employed during the operational phase at substations, such as ensuring all electrical hazards feature written and visual warning signs that meet the IEEE standards to include the ISO 7010 "Hazard Type: Electrical Symbol" warning of the risk of electrocution and that potable water will be supplied that meets national drinking water standards and ISO 10500 drinking water parameters (full suite).

Impact summary and assessment of significance

510. Table below provides an assessment of the significance of potential impacts to workers before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 7-46: Potential Impacts to Workers

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Accidents involving workers	Contractors / staff / sub-contractors	M	M	L	M	MOD	ST	SMALL	MED	POS S	M
C/O	Inadequate sanitation and welfare	Contractors / staff / sub-contractors	M	M	L	M	MOD	ST	SMALL	MED	POS S	M
C	Workers' rights ignored.	Contractors / staff / sub-contractors	M	L	L	L	MOD	ST	SMALL	MED	POS S	M
O	Health and Safety of	Staff	M	M	L	M	MOD	LF	SMALL	MED	POS S	M

³⁰ <https://www.cdc.gov/niosh/docs/96-129/default.html>

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
	Workers ³¹											

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / SMA: Small/ H/F: High Frequency / M/F: Medium Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible / UNLIKE: Unlikely.

Residual Impacts

Table 7-47: Worker Residual Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C/O	Inadequate sanitation and welfare	Medium	Provision of adequate sanitation and worker welfare conditions should ensure that there are no significant residual impacts.	Not significant
O	Accidents involving workers	Medium	Mitigation measures proposed should help reduce the potential for accidents to occur. However, accidents cannot be completely ruled out during the lifecycle of the Project.	Low
C	Workers' rights are ignored.	Medium	Impacts anticipated not to be significant after application of mitigation measures.	Not significant
O	Health and Safety of Worker	Medium	Impact anticipated to adhere to safe work conditions for operational staff	Low

7.9.4 Physical Cultural Resources

511. This section discusses the impact upon physical cultural resources (PCR) during construction and operation of the Project and associated mitigation measures to be adopted.

7.9.4.1 Pre-construction Phase

Potential Impacts

512. Sites of Cultural, Archaeological and Historical Significance (PCR) need to be conserved and protected during project design.

Mitigation Measures

513. EPC Contractor for all components will be required to conduct an inventory of physical cultural resources in and adjacent to the RoW and within 50m of substations/Workshops prior to the start of any works. Where any PCR is identified within the RoW they will be demarcated and where any are found to be directly impacted, due to their presence within the RoW micro-alignment changes will be made to avoid impact on the sites.

514. All local PCR adjacent to the worksites will be identified and temporary barriers are placed around them to ensure no damage by equipment and machinery.

³¹ Despite mitigation, working near high-voltage equipment presents risks of electric shock, arc flash, or electrocution, which can be severe or fatal. Moreover, workers exposed to EMF, noise, and other hazards over extended periods may still face health risks, albeit reduced through controls

7.9.4.2 Construction Phase

Impacts

515. There are no international, national or state important archaeological, historical, religious or cultural sites at the substation sites or close to new and existing substations/workshop. However, it could still be possible that chance finds could occur during excavation works for any of components.

Mitigation Measures

516. A **Chance Find Procedure** (ECP 21 discussed approach to be adopted by contractor) will be developed by the contractor for implementation for all components in the event physical cultural resources are found. The procedure will include at least the following:

- If suspected physical cultural resources are encountered, all work at the find site should be immediately halted.
- The find should be assessed by a competent local official managing cultural issues, and procedures to avoid, minimize or mitigate impacts to such physical cultural objects should be agreed in writing with them.
- Work should not begin until the procedures to avoid, minimize or mitigate impacts to the physical cultural resources have been agreed and implemented in full.
- If avoidance is not feasible, and no alternatives to removal exist, and the Project benefits outweigh the anticipated cultural heritage loss from removal which is unlikely unless in case of resource of local value, following clearance of ADB the physical cultural resources should be removed and preserved using the best available technique in accordance with relevant provisions of national heritage protection laws and decrees.
- Records should be maintained of all finds, including chain of custody instructions for movable finds.
- All construction workers to be made aware of the chance-find procedure and types of findings to be reported.

7.9.4.3 Operation Phase

Impacts

517. No impacts are anticipated during operations.

Mitigation Measures

518. No mitigation measures are required.

Impact summary and assessment of significance

519. The table below provides an assessment of the significance of potential impacts to PCR and cultural landscape before implementation of the proposed mitigation measures that are discussed in the rest of this section.

Table 7-48: PCR Potential Impacts

Phase	Potential Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Risk of Exceeding Legal Threshold	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
C	Damage to Local PCR	Local PCR	L	M	M	-	MOD	ST	SMA	LOW	POSS	L
C	Unanticipated PCR	Unidentified PCR	L	M	L	-	MOD	ST	SMA	LOW	POSS	L

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / SMA: Small/ H/F: High

Frequency / M/F: Medium Frequency / L/F: Low Frequency / LT: Long term / MT: Medium Term / ST: Short term / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely.

Residual Impacts

Table 7-49: Residual PCR & Cultural Landscape Impacts

Phase	Potential Impact	Potential Impact Significance	Residual Impact	Residual Impact Significance
C	Unanticipated PCR	Low	Implementation of a chance find procedure will ensure that residual impacts are not significant	Not significant
C	Local PCR	Low	Mitigation measures provided should ensure that there are no significant residual impacts	Not significant

7.10 Cumulative and Induced Impacts

520. Given the wide coverage of the Project across Rajshahi and Rangpur divisions, it is possible that other projects may be on-going at the time of sub-activity construction which could lead to cumulative impacts. However, it is not possible at this stage to make regional assessments of such projects without extensive consultations across the whole of the state.

521. Cumulative impacts³² are defined as the combination of multiple impacts from existing projects, the proposed project, and anticipated future projects that may result in significant adverse and/or beneficial impacts that cannot be expected in the case of a stand-alone project.

522. Induced impacts are the adverse and/or beneficial impacts on areas and communities from unintended but predictable developments caused by a project, which may occur later or at a different location.

523. One key cumulative impact of the Project relates to the cumulative nature of all the proposed sub-activities. Some of them will be constructed in close proximity to each other, e.g., substations Workshops, but these activities will be completed by the contractor (s) working under the same PMU and therefore works at these sites can be closely coordinated, equipment and camp sites could be shared, and environmental and social issues can be managed by the same contractor's EHS staff. Thus, the risk of significant negative cumulative impacts occurring will be minimal.

524. Another key cumulative impact will be that of air quality, dust and health and safety in Rajshahi and Rangpur divisions, where other projects may be on-going close to Project sites. Here particular attention to dust management should be given and close coordination between NESCO and the Municipal Corporation is needed to ensure that works near one another are avoided as far as practical to reduce the potential for significant cumulative impacts.

525. The cumulative effect of all projects in the operational phase will be hugely beneficial to the local population and will induce growth in the regional economy.

526. No changes to land use are expected to be induced.

7.10.1 Cumulative Impact on Biodiversity

527. The cumulative impact of power infrastructure to be developed based on biodiversity was considered as part of the ecology assessment. According, the contractor will need to hire Ecology expert to develop baseline as well as prepare Ecology plan in consultation with PIAC.

³² Environment Safeguards- A Good Practice Sourcebook Draft Working Document (December 2012).

7.10.2 Cumulative Impact on Electricity Supply

528. The project will increase the availability and reliability of power. With the improvement of the 33 kV network, a number of prevailing issues in electricity supply to load centers in Rajshahi and Rangpur divisions will be resolved. It will provide a solution to the low voltage problems encountered and improve the reliability of electricity supply to consumers of said areas. This will have a positive cumulative impact of the project that will have benefits to the local communities living in the areas with unreliable power supplies.

7.11 Transboundary Impacts

529. The Project will not result in any significant transboundary impacts.

530. The impacts of climate change are universal, and its impact will be on the entire ecosystem that includes the Bay of Bengal. The use of SF₆ is only limited to 9 circuit breakers and 3 GIS substations in the project. However, among non-CO₂ greenhouse gases, sulfur hexafluoride (SF₆) has the strongest greenhouse effect. SF₆ gas was included as one of the six restricted-use greenhouse gases in the Kyoto Protocol, which was signed by the parties to the United Nations Framework Convention on Climate Change (UNFCCC) as early as 1997. It has an atmospheric lifespan of roughly 3,200 years and a global warming potential (GWP) of 24,300. This indicates that, in terms of its impact on global warming, 1 kg of SF₆ that spilled into the atmosphere is comparable to around 24.3 tons of CO₂. Global SF₆ emissions have built up in the atmosphere and will continue to do so, affecting the ecosystem over time³³.

³³ <https://www.sciencedirect.com/science/article/abs/pii/S1385894723028978>

8 STAKEHOLDER ENGAGEMENT AND INFORMATION DISCLOSURE

8.1 Public Consultation Requirements

532. According to the ADB Safeguard Policy Statement (2009):

“The borrower/client will carry out meaningful consultation with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation. Meaningful consultation is a process that:

- It begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle.*
- Provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people.*
- Is undertaken in an atmosphere free of intimidation or coercion.*
- Is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and*
- Enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.*

Consultation will be carried out in a manner commensurate with the impacts on affected communities. The consultation process and its results are to be documented and reflected in the environmental assessment report.

8.2 Stakeholder Engagement Activities

533. The main objectives of the stakeholder consultation are:

- To inform local people about the goal and objective of the proposed project
- To let people know about the components of the proposed project.
- To aware people about the problems that could be created from the proposed project.
- To obtain suggestions (mitigation measures, enhancement measures, contingency measures, compensation measures) to resolve those problems
- To confirm that all the affected parties and stakeholders have been adequately consulted and have been part of the various decision-making processes

8.2.1 Identification of Stakeholders

534. Stakeholders include all those who affect and are being affected by policies, decisions or actions within a particular system. Stakeholders can be groups of people, organizations, institutions and sometimes even individuals. Stakeholders can be divided into primary and secondary stakeholder categories.

8.2.2 Primary Stakeholders:

535. Primary stakeholders are people who would be directly benefited or impacted by a certain project intervention. In the case of the proposed Project, the primary stakeholders include the people fall under the direct impact area and those who reside within and in the immediate vicinity of the project area. The primary stakeholders of the Project include NESCO, farmers, the owners of households to be impacted, small business community as well as Shopkeepers, pedestrians and students. Primary stakeholders identified and consulted during the present IEE study include communities to be benefitted and/or affected by the Project

8.2.3 Secondary stakeholders:

536. This category of stakeholders pertains to those who may not be directly affected but have interests that could contribute to the study, play a role in implementation at some stage, or affect decision making on Project aspects. In this Project, concerned government departments and line agencies fall under this category.

537. Secondary stakeholders for the Project include local government institutions (LGI) like City Corporation, Union Parishad; other government agencies like Department of Environment, Bangladesh Forest Department, Bangladesh Railway and BWDB etc., civil society representatives, NGOs and general public at large.

538. The stakeholders have been classified in accordance with the level of influence they have over the Project as well as their priority to the Project proponent in terms of importance.

539. The influence and priority have both been primarily rates as:

- **High Influence/Priority:** This implies a high degree of influence of the stakeholder on the Project in terms of participation and decision making or high priority for NESCO to engage that stakeholder.
- **Medium Influence/Priority:** This implies a moderate level of influence and participation of the stakeholder in the Project as well as a priority level for NESCO to engage the stakeholder who are neither highly critical nor are insignificant in terms of influence.
- **Low Influence/Priority:** This implies a low degree of influence of the stakeholder on the Project in terms of participation and decision making or low priority for NESCO to engage that stakeholder.

540. Based on the above attributes, the following Table below delineates the stakeholders identified for the Project and their analysis

Table 8-1: Stakeholder Mapping for the Project

# SI	Stakeholders	Category of stakeholder	Brief profile	Influence status	Basis of Influence Rating
Management					
1	Project affected persons (PAPs)	Primary	Loss of land by the acquisition for the construction. Loss of trees	Medium	• No major restrictions around the Project site • Project bring development to the area • Increase in employment opportunities and preference in job during construction phase • Improvement in electrical supply and infrastructure in the area • Minimize impact
2	NESCO	Secondary	NESCO is the Project proponent that own a controlling stake of 100% in the Project	Highest	• Primary Project proponent • Responsible for construction and operation of this Project • Primary financial beneficiaries • Responsible for all the Project related risks and impact liabilities
3	Community	Primary	Economic losses caused by the project activities.	Medium	• No major hindrances around the project site. • Low impact with lower significance • Betterment of electricity supply at HHs level.
Regulatory/Administrative Authorities					
4	Department of Environment (DOE)	Secondary	The Department of Environment is the primary government regulatory authority for	High	Responsible for environmental clearance, management and monitoring including necessary compliance throughout the Project lifecycle

# SI	Stakeholders	Category of stakeholder	Brief profile	Influence status	Basis of Influence Rating
			Environmental protection in Bangladesh.		
5	Bangladesh Forest Department (BFD)	Secondary	The Department of Forest is the primary government regulatory authority for protection of forest in Bangladesh.	High	Responsible for forest protection, conservation and management and provide permit for cutting trees during construction phase

8.3 Stakeholder Engagement

541. In order to ensure effective engagement and open, frequent dialogue with local communities and other key stakeholders, a stakeholder engagement plan is designed throughout the life of the Project. This plan is to be developed and implemented in order to identify stakeholders and their issues of concern, establishes the methods for consultation, and provides a specific action plan for stakeholder engagement throughout the life of the Project.

Table 8-2: Stakeholder Engagement Plan

Key Stakeholders		Brief Description
Project Proponent	:	Northern Electricity Supply PLC (NESCO)
Local people	:	Businessmen, Service holder, Farmers, Day Labor, Teacher, Transport Worker, Homemaker, Student, Shopkeeper, etc.
Engagement Methods		
IEE phase	:	Organizing consultation meetings by inviting key stakeholders above at draft scoping report and draft IEE report
Pre-construction/ Construction phase/ Regular operation Phase	:	- Regular communication with the local community through personal contact. - Meeting with the representative of upazila on the quarterly basis. - Participatory meeting with upazilas. - Interpersonal Interview with upazila.
Information Disclosure		
IEE phase: Pre-construction/ Construction phase/ Regular operation Phase	:	- Disclosures of draft IEE report in NESCO website and ADB website following the ADB Statement 2009 (SPS 2009 at pre-construction stage - Environmental Monitoring Report (EMR) will be disclosed by ADB website semi-annually during the construction period.
Grievance mechanism process and complaints register All phase	:	- Receiving complaints and opinions from the public on a regular basis through the engagement method. - Meeting with the representative of upazila. - Participatory meeting with upazila.

8.3.1 Consultation Process

542. The consultation process for an Initial Environmental Examination (IEE) typically involves several steps to ensure thorough assessment and compliance with environmental

regulations. Here's a general outline of the consultation process:
543.

Preparation and Scoping: The process begins with scoping out the IEE, which involves identifying the project's scope, objectives, potential environmental impacts, and stakeholders. This initial step helps in determining the focus areas for the consultation process.

Identification of Stakeholders: Identify all relevant stakeholders who might be affected by the project or have an interest in its environmental aspects. This could include local communities, government agencies, non-governmental organizations (NGOs), and experts in relevant fields.

Notification and Public Disclosure: Notify stakeholders about the proposed project and its potential environmental impacts through various means, such as public notices, advertisements, or direct communication with stakeholders. Make project information, including the IEE report, available to the public for review and feedback.

Public Consultation Meetings: Organize public consultation meetings or workshops where stakeholders can provide input, ask questions, and express their concerns regarding the project's environmental aspects. These meetings should be conducted in accessible locations and formats to ensure maximum participation.

Consultation with Government Agencies: Engage relevant government agencies responsible for environmental regulation and management to seek their input and ensure compliance with regulatory requirements. This may involve submitting the IEE report for review and obtaining necessary permits or approvals.

Consultation with Experts: Consult with environmental experts, scientists, and other relevant professionals to assess potential environmental impacts more comprehensively and identify mitigation measures to minimize adverse effects.

Feedback and Revision: Consider all feedback received during the consultation process and incorporate relevant suggestions or concerns into the IEE report. Revise the report as necessary to address any identified issues or gaps.

Finalization and Submission: Finalize the IEE report incorporating all necessary revisions and submit it to the relevant authorities for review and approval. Ensure that the report accurately reflects the findings of the consultation process and demonstrates compliance with environmental regulations.

Monitoring and Follow-Up: Implement any mitigation measures identified in the IEE report and monitor the project's environmental performance during its implementation. Conduct periodic reviews to assess the effectiveness of mitigation measures and address any emerging issues.

8.4 Public Consultation Meetings (PCM)

A two-way communication strategy was used for conducting the consultation meeting. The conversation was mostly based on questions and answers and open discussion with a limited time scale. The participants discussed relevant queries or questions on the project activities and NESCO replied to their feedback on the questions or queries asked by the participants. Mainly 3 steps procedures were followed to commence the consultation meeting at the NESCO areas mainly in Rajshahi, Rangpur and Thakurgaon.

Step-1(a): Communication- NESCO officially sent invitation letters to the different governmental offices such as local DOE offices, DoF offices, DAE offices, BFD offices and Social Welfare offices regarding the consultation meetings about date, time and place of the meetings.

Step-1(b): NESCO informed the local community people via face-to-face invitations including different consumers, social leaders, political leaders, and others.

Step-2: Consultation- A three (3) nos of consultation meetings was held at Rajshai, Rangpur and Thakurgaon on 26th November 2024, 27th November 2024 and 28th November 2024 respectively and participatory approach was followed to receive the opinions of interested parties and from the participants.

Step-3: Participations- It means participation by interested groups, local community people (mainly NESCO consumers) to share their views/opinions on the proposed project activities, suggestions for locally led environmental practices, and improve compliance, harmony, and others etc.

In the consultation meetings, the consultant of NESCO given the power point presentation on project activities, procedures for environmental data collection, analysis, identifying the potential environmental impacts and suggested mitigation measures to reduce the anticipated impacts, enforcement of implementation of mitigation measures, monitoring, supervision procedures etc.

After the presentation, participants openly discussed issues related to the proposed project activities, improvement of environmental practices and future consultation process etc.

Table 8-3: Session plan of Public Consultation Meetings

PCM for Rajshahi:

Opening by Chief Engineer (Planning & Development), NESCO, Rajshahi	Time: 10:30 AM
Introductory sessions by Md. Fazlur Rahman, Executive Engineer, NESCO H/Q, Rajshahi	Time: 10:40 AM to 10:50 AM
Presentation by Kamrul Hasan, Environmental Consultant of NESCO on Project Activities, Environmental Impact and Mitigation Measures, monitoring and supervision etc.	Time: 11:00 AM to 11:45 AM
Open discussions by the Participants, responses by the NESCO	Time: 11:45 AM to 12: 30 PM.
Concluding Remarks by Executive Director (Engineering), NESCO H/Q, Rajshahi	Time: 12:30 PM to 12:40 PM

PCM for Rangpur:

Public Consultation Meeting (PCM): Bidyut Bhaban, Rangpur, Date of the event: 27 th November 2024.	
Opening by Chief Engineer (Planning & Development), NESCO, Rajshahi	Time: 10:30 AM
Introductory sessions by Md. Fazlur Rahman, Executive Engineer, NESCO H/Q, Rajshahi	Time: 10:40 AM to 10:50 AM
Presentation by Kamrul Hasan, Environmental Consultant of NESCO on Project Activities, Environmental Impact and Mitigation Measures, monitoring and supervision etc.	Time: 11:00 AM to 11:45 AM
Open discussions by the Participants, responses by the NESCO	Time: 11:45 AM to 12: 30 PM.
Concluding Remarks by Chief Engineer (Engineering), NESCO, Rangpur	Time: 12:30 PM to 12:40 PM

Table 8-4: Discussion summary of Public Consultation Meeting at Rajshahi

Sl. No.	Questions/ issues asked by the participants	Queries and discussion	Replied by the NESCO PLC and Consultant
1	Abul Kalam Azad, Union Parishad Chairman, Hologram Union, Rajshahi Sadar Upazila.	In Miapur, our living area, an industrial plant is being built there, and they didn't take any remedial measures for protection of the natural environment. Dust generation is excessive, wastewater is released in the open places, that is dangerous, and our health is in danger. We complaints everyday but they didn't response. My question is whether this proposed project will act in the same way?	Replied by CE (Planning & Development): No, this project will not build any plants in Rajshahi, we will construct a training center, workshop, substation, renovation of existing substations, switching stations and bay breakers, so, from our activities, natural environment will not be affected so much. However, we will take remedial actions to control dust emission and other pollutions to protect the natural environment.
2	Husna Mumtaz, Deputy Director, Social Welfare Department, Rajshahi.	This is a very great initiative for organizing such a event and we are informed about the upcoming project and environmental issues. My question is, please consider some compensation to the marginal people if they are directly affected during the project implementation. And this engagement should be an integral part of the project during implementation for engagement of a large local people. Thanks once again for the invitation in this meeting.	Replied by CE (Planning & Development): we believe that from our project activities, no marginal people will be directly affected, however, we will surely consider the compensation plan if anyone is affected. And we will continue this type of stakeholder engagement in future, particularly during the project implementation period.
3	Shimul, Nesco consumer, Miapur, Rajshahi.	We see that NESCO is installing Underground Cables along the roadsides in our area. If the road will be extent in future, then, these UG cables will be in the middle of the road. So, any kind of development should be considered the future expansion plan and need close coordination with Roads and Highway and City Corporations and other governmental organizations as required.	Replied by CE (Planning & Development): Thanks for this question. Though it is not related to this proposed project, we are always working with close coordination with the respective government departments. For UG Cables installation, we have received the NOC from the Roads and Highway and aligned with their plan. So, as per their current plan, we are installing our UG cables.
4	Ali Hossain, NESCO consumer, Rajshahi	For clearing the electricity line, tree cutting and trimming is a regular job, sometimes we find that big trees are also cleared for construction of electricity line. So, NESCO can take trees removing technology to take trees from one place to other and it will protect our environment healthier.	Replied by CE (Planning & Development): Still this type of technology is not available in Bangladesh. Once it is available in Bangladesh, NESCO will take this technology and using in the field level.
5	Md. Shorab Hossain, NESCO	NESCO overhead line crossing the densely populated areas. We are not constructing our residential	Replied by CE (Planning & Development): Though this question is not related to this

Sl. No.	Questions/ issues asked by the participants	Queries and discussion	Replied by the NESCO PLC and Consultant
	consumer, Katakali, Rajshahi	construction works due to this overhead line. So, can NESCO shift this line for the sake of our interest?	proposed. However, if you apply to shift the line, we can take further steps in this regard.
6	Sadrul Islam, Director, Chamber of Commerce and Industry, Rajshahi.	We are pleased to see the project activities, regulatory requirements and NESCO commitment to reduce environmental pollution as much as possible. I wanted to know how we will benefit from this project. Particularly, for the existing industry and new industry set up!	Replied by CE (Planning & Development): After success implementation of this proposed project, the quality of electricity will improve, and loadshedding will be reduced in a significant level.
Closing remarks: Executive Director (Engineering): Environmental Mitigation Measures will be considered as per the suggestion of the ADB team during implementation of the project. There are some other issues like billing rates, tree cutting etc. Pls. inform us about your specific questions in our H/Q, local offices, we will reply to your queries, we always welcome your valuable comments, suggestions, so, NESCO always is working for the consumers' interest, expansion of service, and commitment to ensure quality electricity at all levels of customers. So, we can extend our initiative to discuss with you further, even, over the project implementation periods. Finally, it is very enthusiastic that you all participated actively and provided your feedback, suggestions that will all be incorporated in the project execution period. Thanks once again for your role, for your participation and proactiveness. Hope we will meet you again and again.			

Table 8-5: Discussion summary of Public Consultation Meeting at Rangpur

Sl. No.	Questions/ issues asked by the participants	Queries and discussion	Replied by the NESCO PLC and Consultant
1	Masudur Rahman, Inspector, Department of Environment, Rangpur Divisional Office.	As per what I understand from the presentation, this project is preparing the IEE report. Public consultation is required for the red category project for EIA study where separate Terms of Reference (TOR) is required prior to EIA study. This is new for me for PCM for Orange Category project. Anyway, I appreciate the initiative, and DOE is welcomed also. This type of arrangement will expedite the implementation of ECR 2023 clauses at the field level. I may request you how can you assess and fix the project category as orange category following the ECR 2023? The second question is, did the project receive the site clearance from the DOE?	Replied by the Consultant of NESCO, I would like to thank you for your queries. Under this project, no building constructions will be undertaken except the 2-story control building in the new (06) substation. In the second question, I will inform you that still we don't apply to DOE for site clearance. So, once we apply for site clearance, you will be informed. Thanks.
2	Md. Uddolla, local consumer, NESCO	I want to demand uninterrupted power supply in our areas. Currently we're facing an acute power crisis in the daytime. So, how can NESCO ensure for	Replied by CE (Planning & Development), though this question is not directly related to our proposed project, the goal is to

Sl. No.	Questions/ issues asked by the participants	Queries and discussion	Replied by the NESCO PLC and Consultant
		uninterrupted power supply in NESCO areas?	strengthen the power supply in our area. After implementation of this project, NESCO areas in Rangpur will get better electricity supply and loadshedding schedule will be reduced subsequently.
3	Abul Kalam Azad, Headmaster, Rangpur Zilla School.	My question is: is there any possibility of affecting the agricultural land due to implementation of this proposed project? We are concerned about this because we are losing our agricultural land day by day due to different kinds of development projects in our areas!	Replied by CE (Planning & Development), no impact is anticipated on the agricultural land due to implementation of this proposed project. All of the project activities will be carried out in NESCO own land. So, no impact on agricultural land is anticipated.
4	Md. Rafiqul Islam, Instructor, Rangpur Textile College.	As I know many industries still are struggling to get the power connection to their industries. May I request NESCO to take quick initiatives to supply the electricity to the new industry without delaying?	Replied by CE (Planning & Development), NESCO always welcomes the industry and is ready to provide electricity, because industry owners are the biggest customers of NESCO. So, if the industry falls within the NESCO areas and applies for power connection, NESCO will take necessary action as early as possible.
5	Dewan Md. Abu Hena, Project Director of NESCO	I will inform you that NESCO always tries to serve the customers with uninterrupted power supply. It is our job so sometimes we cannot be able to provide it because of demand and supply gaps. But we are trying at best. Hope in future, the consumers will get better and quality electricity at their doorsteps. Under this proposed project, we will construct one transformer repair workshop and 4 new substations and 10 nos. substation augmentation, 06 new substation, 36 bays and bay extension in 14 locations, 7 switching stations, 33.73 km distribution line and solar rooftop at the remote areas and new SS sites. Meanwhile, we need local support to implement the project successfully in Rangpur zone.	-
6	Md. Hasibur Rahman, Project Coordinator, proposed ADB project.	We would like to thank you for your participation, and valuable recommendations that will help us	-

Sl. No.	Questions/ issues asked by the participants	Queries and discussion	Replied by the NESCO PLC and Consultant
		to implement the project in an environmentally friendly way. We shall consider your opinions, views, and suggestions to reduce the negative impacts on the natural environment. We will establish a grievance redress mechanism (GRM) system to record and resolve the grievances received locally. So, we could interact with you in many ways. We will organize such types of meetings and workshops in future to make good coordination with the local people during implementation of the project.	
7	Concluding Remarks by Md. Mizanur Rahman, Chief Engineer (Project & Planning), NESCO.	Thanks for coming and participating in the meeting. We are happy to get you all in the meeting room and we note down your points that will be reflected in the project implementation period. I want to recap the project activities such as 9 nos. of substation augmentation, 2 nos. of new substations, 1 no. transformer repairing workshop. We shall protect our natural environment, and we take remedial measures as suggested in the IEE report during the construction period following the ADB guidelines. We believe this project will be implemented in an environmentally friendly way. Thanks once again for your participation and valuable suggestions. Hope in future we will meet again and again.	

Relevant Photographs of PCMs:



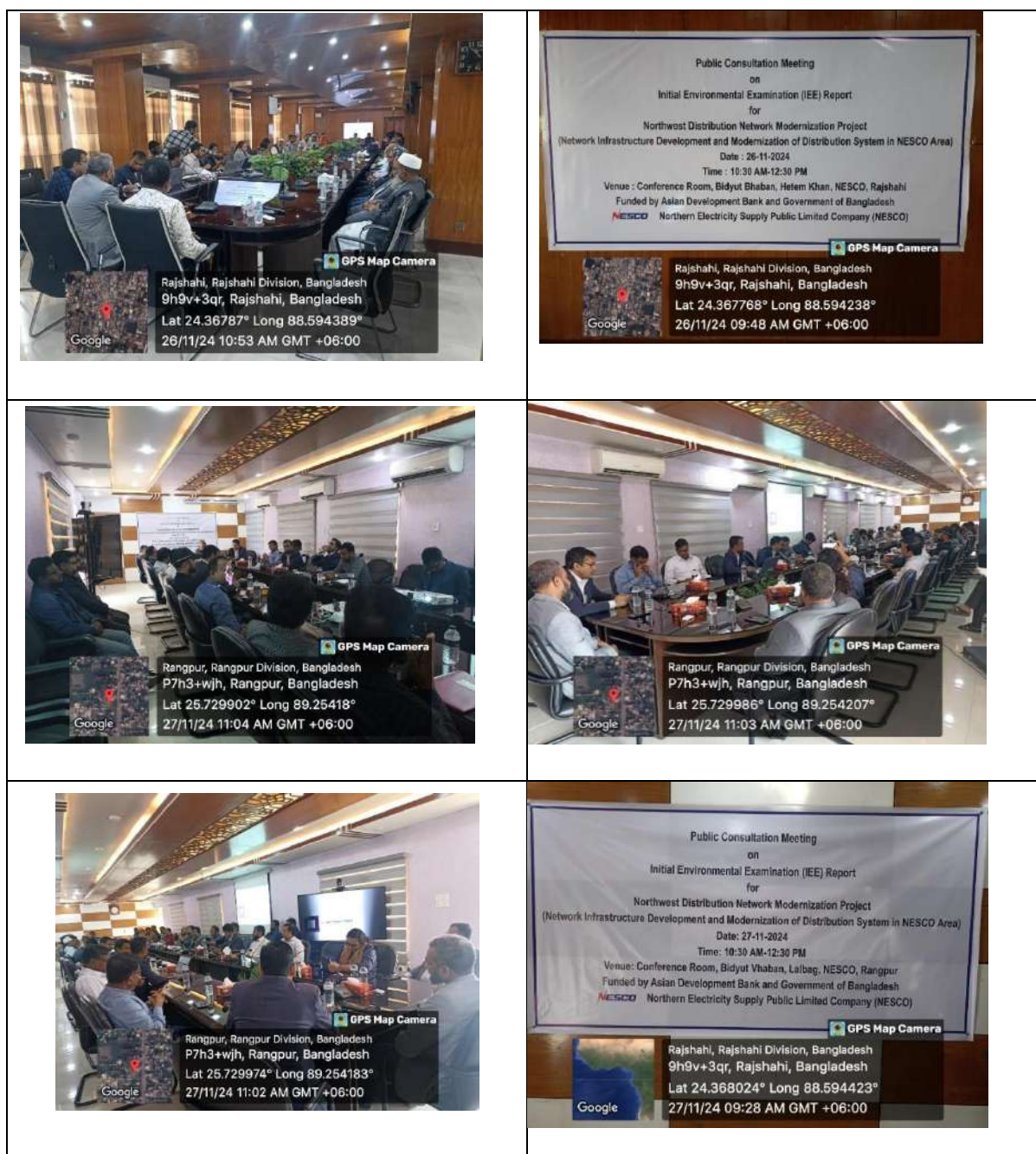


Figure 8-1: Relevant Photographs of Public Consultation Meetings (PCMs)

8.5 Stakeholder Consultation Meetings (SCM)

544. Public Stakeholder consultation meetings were conducted in the project areas in June 2024. Discussions were carried out in a number of towns at proposed substation sites.³⁴ A total of 57 consultation meetings was held with 643 persons, of which 31 was one female participants (4.8% male³⁵) consulted interviewed for environment³⁶. Table 9-3 below provides the details of participants of the public consultation conducted by the IEE consultant team.

³⁴ The location of the closest residential properties; all receptors with boundaries falling within 500m of boundary of buildings need to be included in consultations undertaken during detailed design stage by EPC contractor.

³⁵ The women who participated in environmental consultations were also part of separate gender based social focus groups, as recorded in the Resettlement Plan.

³⁶ Public consultations were carried out on the basis of an initial list of subprojects which will be subsequently refined during detailed design by the EPC contractor.

545. The following issues were discussed:

- Project siting adversely impacting the water or soil resource in the locality
- Type of trees in the area: fruit/non fruit/forest/ rare/endangered species etc.
- Wild, endemic, endangered animals in the project area
- Type of agriculture/crops in the area
- Number of households in the upazila, area populated by ethnic minorities etc.
- General socio-economic standing and economic activities.
- Land use, cropping pattern (seasonal), types of crops, average land holding size etc.
- organizations of a social nature (NGOs/CBOs/ Civil Society) active in the area
- Critical issues or concerns of the local people regarding the project

Table 8-6: Locations and the Number of Participants at Public and Women's Consultations

SL No	Component Name	Date	Location	Type of participants	Public Consultati on		Gender Consultatio n		Total participa nts
					Male	Female	Male	Female	
A	New Substations (land in acre)								
1	Chandipur S& DD-2, Rajshahi	20 and 29 May, 2024	Rajapara Thanarmor, Rajshahi	Housewife, Business, Mechanic, Service and Vanpolar	11	2	3	12	28
2	Kodomtola (GIS) S&DD-1, Pabna (New Land)	31-May-24	Bolorampur, Asutospur, Pabna	Housewife, Agriculture, Business, Service	13	3	1	14	31
3	S&D1 Campus (GIS), S & DD-1, Bogura	01-Jun-24	Near Shat matha, Sutrapur, Bogura City	Housewife, Agriculture, Business, Service	15	1	2	14	32
4	Campus S&D-1, NESCO, Rangpur (GIS)	01-Jun-24	Alamnagar, kotwali, Rangpur	Housewife, Agriculture, Business, Service and Student	11	0	1	7	19
5	Baharkasna (S&D-3), Rangpur	01-Jun-24	Shahebganj, Kotwali, Rangpur City	Housewife, Business, Service and Student	9	1	1	7	18
6	S&DD-1, office campus, Shuihari, Dinajpur	04-Jun-24	Suihari, Nayanpur, Dinajpur	Housewife, Agriculture, Business, Service and Student	11	0	1	8	20
7	Noyagola GIS S& DD-1, Chapainabganj	10-Jun-24	Noyagola, Noyagola sadar, Chapainawa bganj	Housewife, Business, Mechanic, Service, Atu Driver & Student	19	5	3	20	47
	Sub Total				89	12	12	82	195
B	Substation Augmentation/renovation (33/11 AIS Substation Renovation)								
1	Fakirpara under S&DD-1, NESCO, Dinajpur,	04-Jun-24	Fakirpara, Kotwali, Dinajpur	Housewife, Business, Service and Agriculture	10	0	1	7	18
2	Balubari under S&DD-2, NESCO Dinajpur.	05-Jun-24	Balubari, Prannathpur, Kotwali, Dinajpur	Housewife, Business and Atu Driver	10	1	1	7	19

SL No	Component Name	Date	Location	Type of participants	Public Consultation		Gender Consultation		Total participants
					Male	Female	Male	Female	
3	Upasahar under S&DD-2, NESCO, Dinajpur,	05-Jun-24	Upasar-6, Shekhpura, Kotwali, Dinajpur	Housewife, Business, Driver and Student	9	0	2	8	19
4	Setabgonj under ESU, NESCO, Setabgonj.	05-Jun-24	Dhantola, Buchaganj, Dinajpur	Housewife, Business, Driver, Service and Student	12	0	1	9	22
5	Panchagarh substation under S&DD-Panchagarh.	10-Jun-24	Mithapukur, Dhakkamara Panchagarh	Housewife, Business and Agriculture	15	0	2	15	32
6	Katkipara under S&DD-2, NESCO, Rangpur.	02-Jun-24	Katkipara, Shatgarah, Kotwali, Rangpur	Housewife, Business, Mechanic, Service, Agriculture & Student	8	0	9	13	30
7	Mahigonj under S & DD-3, NESCO, Rangpur,	01-Jun-24	Nasniya, Kotwali Rangpur	Housewife, Business, Service, Agriculture, Driver, labour & Student	15	0	1	8	24
8	Dhanghora under S&DD-2, NESCO, Gaibandha.	04-Jun-24	Dhangora, Bollomjar, Gaibandha	Housewife, Business, Service and, Agriculture	14	0	1	14	29
9	Niamotpur under S&DD, NESCO, Saidpur, Nilphamari,	04-Jun-24	Niamatpur, Saidpur Sadar, Nilphamari	Housewife, Service, Shopkeeper, Farmer, Driver and unemployment	13	0	1	14	28
Sub-total					106	1	19	95	221
C	Substation Bay Extensions (Type Bay Breaker)								
1	Nurpur grid, Pabna	11-Jun-24	Nurpur, Radhanagar, Pabna	Housewife, Business, Mechanic, Driver, Rikshaw and Student	9	0	2	7	18
2	Jaynagar grid, Ishwardi, Pabna	09-Jun-24	Jaynagar wapda, jaynagar, Ishwardi, Pabna	Housewife, Business, Service and Student	10	0	2	7	19
3	Saydabad grid, Sirajganj (proposed)	10-Jun-24	Jhawel, Kodda, Sirajganj	Housewife, Business, Mechanic, Driver, Rikshaw and Student	11	0	0	8	19
4	Amnura Grid, Chapainawabganj	11-Jun-24	Amnura, Jhilim, Chapainawabganj	Housewife, Business, and Student	10	0	1	8	19
5	Sabgram Grid, Bogura	02-Jun-24	Chakalam, Sabgram, Bogura Sadar, Bogura	Housewife, Business, Service and, Agriculture	14	1	2	15	32

SL No	Component Name	Date	Location	Type of participants	Public Consultation		Gender Consultation		Total participants
					Male	Female	Male	Female	
6	Mohasthan Grid, Bogura	02-Jun-24	Hatibandha, Nagarkandi, Raynagar, Shibganj Bogura	Housewife, Business, Service and, Agriculture	13	1	0	15	29
7	Puran Bogura Grid, Bogura	02-Jun-24	Puran Bogura, Bogura Sadar, Bogura	Housewife, Business, Service and, Agriculture	12	4	0	14	30
8	Dupchachiya grid, Bogura	03-Jun-24	Jagonathnagar, Dupchachiya, Bogura	Housewife, Business, Service and, Agriculture	12	0	0	14	26
9	Naogaon Grid	03-Jun-24	Pirojpur, Naogaon Sadar, Naogaon	Housewife, Business, Service	13	1	0	14	28
10	Golahat grid, Sayedpur, Nilphamari	07-Jun-24	Golahat, Saidpur Sadar, Nilphamari	Housewife, Business, Service, Agriculture and Driver	14	2	0	14	30
11	Taraganj grid SS	05-Jun-24	Bolabari, Ikorchali, Taraganj, Rangpur	Housewife, Business, Service and, Agriculture	13	0	1	14	28
Sub-total					133	9	8	138	278
D	Substation switching station and Bay Extensions (Type Bay Extension and Switching Station)								
1	Rangpur (PGCB 132/3 kV Rangpur)	01-Jun-24	Alam nagar, Kotwali, Rangpur	Housewife, Business, Service, and Student	9	0	1	8	18
2	Borokhata grid, Hatibandha (Proposed)	06-Jun-24	Naricaltola, Romoniganj, Hatibandha Lalmonirhat,	Housewife, Business, Farmer, Van and Driver student	8	0	0	13	21
Sub-total					17	0	1	21	39
E	Substation switching Station (GIS/AIS 33 kv GIS/AIS 33 kv Switching station and bay construction, extension, shifting)								
1	Pabna AIS (only Panel Shifting)	02-Jun-24	Nurpur, Radhanagar, Pabna	Housewife, Business, Service and, Agriculture	14	0	0	14	28
2	Kathakali 132 kV PGCB, Kathakali	10-Jun-24	katakali, Som sadipur, Rajshahi	Housewife, Business, Service and, Ato Driver	11	0	1	8	20
3	Purbosadipur (PGCB Purbasadpur 230/132/33)	04-Jun-24	Purbo Sadipur, Baldanga, Sundarpur, Kaharul, Dinajpur	Housewife, Business, Service, Agriculture and Student.	12	0	1	8	21
4	Thakurgaon (PGCB Thakurgaon)	06-Jun-24	Sit Chilagong, Sadar thana, Thakurgaon	Housewife, Business, Service, Ato and Driver Student.	11	0	2	16	29

SL No	Component Name	Date	Location	Type of participants	Public Consultation		Gender Consultation		Total participants
					Male	Female	Male	Female	
5	Chapainawabganj (PGCB substation)	10-Jun-24	Horipur, Sadar Thana, Chapainawabganj	Housewife and Business	10	0	1	8	19
Sub-total					58	0	5	54	117
G	Workshops								
1	Shalbagan, Rajshahi	29-May-24	Powerhouse road, Chotobagan, Chandima, Rajshahi	Housewife, Service, Electrician and line man	11	0	0	12	23
2	ZRS, Bogura (Near Rest house)	01-Jun-24	Puran bogura, Malgram, Bogura	Housewife, Business, Service, and Agriculture	13	0	0	14	27
3	Pabna	31-May-24	Nurpur, Radhanagar, Pabna	Housewife, Business, Service, and Agriculture	14	0	0	13	27
4	Lalbag, Rangpur	01-Jun-24	Alam nagar, Kotwali, Rangpur	Housewife, Business, Service and Student.	9	1	1	7	18
5	Dinajpur	05-Jun-24	Balubari, Prannathpur, Katwali Dinajpur	Housewife, Business, and Auto Driver	10	0	0	7	17
Sub-total					57	1	1	53	112
H	,Equipment & Softwires								
2	Disaster Recovery Center, Lalbagh		Lalbagh, Rangpur		0	0	0	0	0
4	Data Centre Expansion		Lalbagh, Rangpur		0	0	0	0	0
5	Cyber Security		Software & system		0	0	0	0	0
Sub-total					24	1	0	17	42
Grand Total					465	22	48	442	11023

Source: SES June 2024 and RP tables

546. Members of the affected local communities participated in the voluntary public consultation sessions to express their views about the proposed project. They aired their opinions freely on the project, its impact, and suggestions for mitigating adverse impacts. People. Incorporation of environmental concerns of the affected persons into the project design through public consultation can help NESCO and the EPC contractors avoid or minimize conflict situations and enable the affected persons to provide meaningful inputs into the project design and implementation process.

547. During public consultation, the project-affected local communities gained a reasonable knowledge about the potential impacts of the project and thus grievances which may arise in the future. They were also informed about the Grievance Redressal Mechanism (GRM) to be followed by NESCO for making complaints, including the place and the person responsible to contact in this regard.

548. Similarly, Table below provides a summary of environmental concerns raised during public consultations conducted during the field surveys,

Table 8-7: Summary Findings of Stakeholder Consultation Meetings (SCM) in Relation to Environment

No	Issues/Concerns Discussed	Requests and Suggestions from the Participants	Project Response
1	General perception about and awareness of the proposed project	Local people believe this project will provide a better supply of electricity.	Yes, a high-quality supply of electricity will be ensured following the completion of this project.
2	Irrigation and sources of water used by the local communities	Underground water is usually used for irrigation, while surface water sources are also used for crop production in some areas. But electricity needs to be cut off during the crop season to promote higher yields.	The supply of electricity will be further developed after this project.
3	Loss of residential/commercial structures due to the project	We sincerely hope that this project won't have an impact on our residential or commercial buildings, but if it does, we advise taking a different route to minimize the projected losses.	Some businesses can be impacted by the construction of project infrastructure and may have to close until the work is finished. Nonetheless, the initiative will make sure to minimize the loss to the greatest extent feasible.
4	Loss of community life if any marketplaces or community activities affected	Reducing the loss to the community level at any marketplaces or community activities should be considered in a greater extent.	The local community will be consulted regularly, and information about the project activities will be disseminated. The residents in the community won't be impacted by other activities like workshops, substations, or other structures.
5	Protected areas (national park, protected forest, religiously sensitive sites, historical or archaeological sites), if any	The local community should be notified if any trees need to be trimmed or chopped.	Yes, this project will inform the local people if any trees in their areas need to be cut down.
6.	Current environmental conditions in the area – air, dust, noise conditions in the area.	No specific issue raised by the local community regarding this question.	The project team explained that although there won't be a major drop in local air quality as a result of project activities, there may be dust emissions by excavation, trenching, and material movement at the site, which will worsen local air quality temporarily. Periodically take the required precautions, like soaking/wetting the dry surface, to lessen this impact.
7	Project siting adversely impacting the water or soil resource in the locality	The local people were curious about any information pertaining to soil or water pollution due to the project activities.	The project team replied that Project activities won't have any appreciable effects on soil and water contamination.
8	Type of trees in the area: fruit/non fruit/forest/ rare/endangered species etc.	The local community was worried about whether tree removal would be necessary as a result of project activities, and if so, what sorts of trees would need to be removed?	The project team responded that some trees will be impacted by the construction of substations, and workshops, and clearance will be needed to ensure that project activities proceed as planned.

No	Issues/Concerns Discussed	Requests and Suggestions from the Participants	Project Response
			However, due to the project activities, communities' trees will not be affected.
9	General socio-economic standing and economic activities. Land use, cropping pattern (seasonal), types of crops, average land holding size etc.	10,000-12,000 sqft, mainly paddy (Boro & Aman) Land use: Residential, commercial & agricultural. Size: 5000 ~6000 sqft. Mainly paddy Land use: Residential & commercial. Size: 3000 ~4000 sqft. Rare (mainly paddy) Land use: Mostly agricultural. Size: 15000 sqft. Mainly paddy, sugarcane	The project will minimize losses to the community level, structures, and other land use patterns, but it won't have a significant impact on the socioeconomic conditions.
10	Other organizations of a social nature (NGOs/CBOs/ Civil Society) active in the area	So many NGOs are working in the project areas like ASA, Dhaka Ahsania Mission, Grameen Bank, Padakkhep, Manbik Unnoyan Songstha etc.	The project will coordinate with all the local NGOs as part of stakeholder engagement plan during construction and operation period.
11	Critical issues or concerns of the local people regarding the project	Heavy loads of traffic, major or minor road blockage due to heavy traffic etc., will be commonly occur during the construction period.	The project shall implement the necessary mitigating actions to lessen these projected effects. Other adaptations will be used, and materials will typically be delivered to the site at night.

549. Table below lists site-specific concerns requiring further attention at detailed design stage by contractors and NESCO

Table 8-8: Subproject-Specific Concerns Noted During Public Stakeholder Consultation Meetings (SCM)

No	Subject/Location	Issues/Concerns Discussed	Project Response
1	Workshop, Shalbagan, Rajshahi	Heavy load of traffic during construction period	Traffic Management Plan will be prepared based on the local road conditions and following in the construction period.
2	Training center, Puran Bogura, Bogura	Dust suppression, excessive noise generation, heavy traffic etc.	To reduce dust suppression, water sprinkled conducts regularly and Traffic management plan will be prepared and working hours will be limited to only daytime.
3	SS - Balubari, Dinajpur	Road blockage due to heavy traffic during construction activities	Construction materials will be transported to the site at nighttime to avoid road blockage during construction period, and other measures will be undertaken as per Traffic management plan developed by the project.
4	Baharkasna (S&D-3), Rangpur	starts with construction activity, disturbance to the neighborhood	To avoid disturbance to the local community, construction activities will be undertaken only in the daytime from 07 AM to 06 PM.

Action taken: ³⁷

550. The EMP includes steps to ensure contracts undertake effective pollution control using regulated monitoring mechanisms specified in EMoP. EMP also contains clauses to ensure documentation of tree loss, health and safety for the community as well as the workers at all sites during construction. To ensure the nearest residential population is not affected adversely due to the construction of substation due to high dust, surface water and noise pollution, the contractor will be required to have effective Traffic Management, dust suppression and noise screens. Accordingly, the EMP contains stringent clauses for the contractor to follow which will be monitored closely by contractors EHS and labor officers as well oversight by SIC and NESCO site engineer.

551. During operations, almost all the villagers raised the issue of safety due to the construction of substations in their vicinity mostly due to lightning and electrocution. Therefore, the substation design should include proper design measures.

Gender Related

552. There is not data currently regarding women consultation yet.

553. However, the project EMP and EMoP are framed to ensure local population specifically the women and children are not inconvenience due to construction activities and labor in vicinity of construction sites. Accordingly, the EMP contains stringent clauses for the contractor to follow to ensure gender safety which will be monitored closely by contractors EHS and labor officers as well as oversight by SIC and NESCO site engineer.

8.6 FGD's

554. Focus Group Discussions (FGDs) were held with the communities who live close to the proposed sub-project construction sites. The participation of the women was less in the consultation and FGDs due to religious and cultural matters.

555. However, the overall discussions and outputs from the FGDs are:

- General perception about the project and awareness about the proposed project.
- During the construction stage all of the affected households will get proper compensation.
- During rainy season, scare of lightning strikes on electrical infrastructure.
- Status of current environmental conditions in the area – air, dust, noise levels, status of soil in the area.
- Community Health and Safety.
- Labor availability in the Project area or requirement of outside labor involvement.;
- Women development; etc.

Table 8-9: Focus Group Discussion (FGD) by ADB TA Consultant Team

Location	Coordinates	Date	Male Participants	Female Participants	Total participants
Workshop, Nurpur, Pabna	24.02184862 N 89.23465666 E	31.05.2024	Male	-	13
S&D campus Suhari, Dinajpur	25.6578471 N 88.6471671 E	04.06.2024	Male	-	11
Switching station, Lalmonirhat	26.20787436 N 89.088850 E	06.06.2024	Male	-	8

³⁷ These actions taken represent issues that have been incorporated into the project EMP/EMoP attached to this IEE. Any final list of actions taken will be incorporated by the contractor in the CSEMP to be approved by PGCB and ADB after completion of design stage.

Location	Coordinates	Date	Male Participants	Female Participants	Total participants
Substation, Shapla, Rangpur	25.7402542 N 89.2552769 E	01.06.2024	Male	-	11
Substation, Balubari, Dinajpur	25.6241425 N 88.6389432 E	05.06.2024	Male	-	10
Switching station, Lalbag, Rangpur	25.73850379 N 89.25239459 E	01.06.2024	Male	-	09
Substation, Uposhohor, Dinajpur	25.6142859 N 88.6467242 E	05.06.2024	Male	-	09
Substation, Niamoyput, Nilphamari	25.78025325 N 88.91052269 E	04.06.2024	Male	-	12
Workshop, Lalbag, Rangpur	25.72888284 N 89.25238755 E	01.06.2024	Male	-	09
Sab station, setabgonj, Dinajpur	25.7958989 N 88.4677888 E	05.06.2024	Male	-	12
S&D-1 Campus, shujhari Dinajpur	25.6578471 N 88.6471671 E	04.06.2024	Male	-	11
Substation, Fakirpara, Dinajpur	25.6438827 N 88.6477904 E	04.06.2024	Male	-	10
Workshop, choto bongram, Rajshahi	24.38378357 N 88.60963667 E	29.05.2024	Male	-	07
Substation, Dhangur, Gaibandha	25.03228079 N 89.508532 E	04.06.2026	Male	-	13
Workshop, Balubari, Dinajpur	25.6241425 N 88.6389432 E	05.06.2024	Male	-	12
Substation Baharkhasna, Rangpur	25.77051246 N 89.30059355 E	01.06.2024	Male	-	09
Substation Katkipara, Dinajpur	25.7501341 N 89.2317207 E	02.06.2024	Male	-	07
Switching station, Purbo Sadipur	25.7548909 N 88.6788304 E	04.06.2024	Male	-	12
Substation, Mahigonj, Rangpur	25.73365069 N 89.29206178 E	01.06.2024	Male	-	15

Table 8-10: Summary of Focus Group Discussion (FGD) (Local Community/ Officials/ Occupational Groups) by ADB TA Consultant Team

Location	Coordinates	Date	Participant's Opinion
Workshop, Nurpur, Pabna	24.02184862 N 89.23465666 E	31.05.2024	• Dust control • Noise reduction • Air quality management • Water quality protection • Increased traffic volume • Local road blockage • Public health and safety management etc.
S&D campus Suhari, Dinajpur	25.6578471 N 88.6471671 E	04.06.2024	• Dust control • Noise reduction • Air quality management

Location	Coordinates	Date	Participant's Opinion
			• Water quality protection • Increased traffic volume • Local road blockage • Public health and safety management etc.
Switching station, Lalmonirhat	26.20787436 N 89.088850 E	06.06.2024	• Dust control • Noise reduction • Air quality management • Water quality protection • Increased traffic volume • Local road blockage • Public health and safety management etc.
Substation, Shapla, Rangpur	25.7402542 N 89.2552769 E	01.06.2024	• Dust control • Noise reduction • Air quality management • Water quality protection • Increased traffic volume • Local road blockage • Public health and safety management etc.
Substation, Balubari, Dinajpur	25.6241425 N 88.6389432 E	05.06.2024	• Dust control • Noise reduction • Air quality management • Water quality protection • Increased traffic volume • Local road blockage • Public health and safety management etc.
Switching station, Lalbag, Rangpur	25.73850379 N 89.25239459 E	01.06.2024	• Dust control • Noise reduction • Air quality management • Water quality protection • Increased traffic volume • Local road blockage • Public health and safety management etc.
Substation, Uposhohor, Dinajpur	25.6142859 N 88.6467242 E	05.06.2024	• Dust control • Noise reduction • Air quality management • Water quality protection • Increased traffic volume • Local road blockage • Public health and safety management etc.
Store, puran Bogura	24.84190548 N 89.35286701 E	01.06.2024	• Dust control • Noise reduction • Air quality management • Water quality protection • Increased traffic volume • Local road blockage • Public health and safety management etc.
Workshop, Lalbag, Rangpur	25.72888284 N 89.25238755 E	01.06.2024	• Dust control • Noise reduction

Location	Coordinates	Date	Participant's Opinion
			• Air quality management • Water quality protection • Increased traffic volume • Local road blockage • Public health and safety management etc.
Substation, Setabgonj, Dinajpur	25.7958989 N 88.4677888 E	05.06.2024	• Dust control • Noise reduction • Air quality management • Water quality protection • Increased traffic volume • Local road blockage • Public health and safety management etc.
S&D-1 Campus, shujhari Dinajpur	25.6578471 N 88.6471671 E	04.06.2024	• Dust control • Noise reduction • Air quality management • Water quality protection • Increased traffic volume • Local road blockage • Public health and safety management etc.
Substation, Fakir para, Dinajpur	25.6438827 N 88.6477904 E	04.06.2024	• Dust control • Noise reduction • Air quality management • Water quality protection • Increased traffic volume • Local road blockage • Public health and safety management etc.
Workshop, choto Bongram, Rajshahi	24.38378357 N 88.60963667 E	29.05.2024	• Dust control • Noise reduction • Air quality management • Water quality protection • Increased traffic volume • Local road blockage • Public health and safety management etc.
Substation, Dhanghur, Gaibandha	25.03228079 N 89.508532 E	04.06.2026	• Dust control • Noise reduction • Air quality management • Water quality protection • Increased traffic volume • Local road blockage • Public health and safety management etc.
Workshop, Balubari, Dinajpur	25.6241425 N 88.6389432 E	05.06.2024	• Dust control • Noise reduction • Air quality management • Water quality protection • Increased traffic volume • Local road blockage • Public health and safety management etc.
Substation Baharkhasna, Rangpur	25.77051246 N 89.30059355 E	01.06.2024	• Dust control • Noise reduction

Location	Coordinates	Date	Participant's Opinion
			• Air quality management • Water quality protection • Increased traffic volume • Local road blockage • Public health and safety management etc.
Substation Katkipara, Dinajpur	25.7501341 N 89.2317207 E	02.06.2024	• Dust control • Noise reduction • Air quality management • Water quality protection • Increased traffic volume • Local road blockage • Public health and safety management etc.
Switching station, Purbo Sadipur	25.7548909 N 88.6788304 E	04.06.2024	• Dust control • Noise reduction • Air quality management • Water quality protection • Increased traffic volume • Local road blockage • Public health and safety management etc.
Substation, Mahigonj, Rangpur	25.73365069 N 89.29206178 E	01.06.2024	• Dust control • Noise reduction • Air quality management • Water quality protection • Increased traffic volume • Local road blockage • Public health and safety management etc.

Table 8-11: Summary Findings of FGD's in Relation to Environment

556. The table below lists site-specific concerns requiring further attention at detailed design stage.

No	Issues/Concerns Discussed	Requests and Suggestions from the Participants	Project Response
1	Project siting adversely impacting the water or soil resource in the locality	No impact is anticipated.	The project will implement the environmental management plan to address any kinds of adverse impacts to the natural and socio-economic resources.
2	Type of trees in the area: fruit/non fruit/forest/rare/endangered species etc.	If trees need to be cleared, then tree plantation plans should be implemented.	A comprehensive tree plantation plan will be executed and there is a separate budget head to implement the tree plantation plan in the project areas.
3	Wild, endemic, endangered animals in the project area	NA	No endangered animals are found in the project areas.
4	Type of agriculture/crops in the area	Mainly paddy field, (Aus, Amon and Boro rice) and other kharif crops cultivating in these areas.	Due to the project activities, agricultural land will not be affected.
5	Number of	No ethnic households in the project	Dinajpur is a place of Saotal, a

No	Issues/Concerns Discussed	Requests and Suggestions from the Participants	Project Response
	households in the upazila, area populated by ethnic minorities etc.	areas.	prominent indigenous group, however, the project will examine the impacts to the ethnic communities during the implementation period.
6.	General socio-economic standing and economic activities.	Mainly agricultural activities are prominent, however other occupations like service, driving, fishing, small business etc., are also common in the project areas.	During the implementation of the project, locals will get access to hire by the contractors as much as possible.
7	Land use, cropping pattern (seasonal), types of crops, average land holding size etc.	3 crop seasons of agricultural activities, common types are mainly aush, aman, boro and other robis crops (Khariff-II).	No impact is anticipated to the land use patterns due to the project activities.
8	organizations of a social nature (NGOs/CBOs/ Civil Society) active in the area	Local and national NGOs are working in the project areas and other social organizations are also actively involved in these areas.	Necessary coordination will be made with these organizations during project implementation.
9	Critical issues or concerns of the local people regarding the project	Not mentioned.	No critical issues were raised by the local people.
10	Other observations	NA	No specific observations were made by the local people during consultation.
11	Project siting adversely impacting the water or soil resource in the locality	Local people believe that this project will not adversely affect the local water bodies or soil resources. However, they suggested to focus it during the project implementation period carefully.	The project will mitigate any kinds of adverse impacts to the air, noise, water, and soil resources during the implementation period.
12	Type of trees in the area: fruit/non fruit/forest/ rare/endangered species etc.	The common tree types are mainly fruits, timber, and shrubs.	The project will implement the tree plantation plan (1:3) if one tree cut three trees will be planted during the implementation period.

Table 8-12: Subproject-Specific Concerns Noted During FGD's

No	Sub-project/ Location	Issues/Concerns Discussed	Project Response
1	SS - Shapla Rangpur. And Workshop - Shalbagan, Rajshahi	Better supply of electricity They would like to participate in safety monitoring and controlling activities They think that this project will not negatively impact the current environmental conditions in the area – air, dust, noise conditions. Heavy load of traffic Local road blockage due to heavy traffic and	Yes, after completion of this project, a better electricity supply will be ensured. As much as possible, the project will involve local people at different events like training, meetings, workshops etc. Before construction works, the contractors will prepare the traffic management plan (TMP) and implement it properly to avoid local road blockage and it is true that

		Local land use pattern changes etc.	traffic volume will be increased due to project work, but TMP will reduce this impact. Due to the project implementation, the land use changes will occur in selective locations only.

Action Taken:

557. Contractor's EMP and EMoP will ensure rigorous monitoring of air and water quality, biodiversity, and ecological health to assess and mitigate any adverse impact to local communities. Sensitive Receptor mapping has been conducted within 1 km of the project area to record filling station, gas line, primary school, residential and commercial areas etc. Tree enumeration has been done to ensure any tree loss is fulfilled and small businesses will be documented to ensure no loss is inflicted on them.

558. GRM and public consultation will be conducted in on-going mode by the PIAC and contractor. The GRM procedure layouts transparent communication and active community participation in decision-making processes related to the environmental management.

8.7 Key Informant Interviews (KII)

559. The key informant interviews (KIIs) were held with the officials of Department of Environment (DOE), Department of Fisheries (DOF), and Bangladesh Forest Department (BFD) in Rajshahi, Rangpur and Thakurgaon while conducting the public consultation meetings on 26th November 2024, 27th November 2024 and 28th November 2024 respectively.

Table 8-13: The summary of KIIs with the officials of Department of Environment (DOE)

Question No.	Discussion Topics/issues	Opinions by the representatives of the Department of Environment		
		AD, DOE Rajshahi District	Inspector, DOE Rangpur Division	Sample collector cum inspector, DOE Thakurgaon District Office
1	NESCO PLC will implement the project in two divisions (Rajshahi and Rangpur divisions), which is funded by the ADB, and GoB. Following ECR 2023, we can submit the application to DOE H/Q as the project areas cover two divisions. So, what do you think about the submission proposal?	We suggest submitting the application to Rajshahi District office following the ECR 2023. After that, we will conduct the site visit and will forward the application with the site visit report to Rajshahi Divisional Office, Bogura. As the project is orange category, the divisional office will issue the site clearance. NESCO can split the applications in two, one for Rajshahi and other for Rangpur areas.	In this regard, we suggest submitting the application to DOE H/Q, Dhaka. As the project areas cover two divisions. If DOE H/Q sends us queries or for site visit reports, we will act accordingly. Please discuss it with the Director (ECC) also. I think he is the right person to suggest you submit your applications.	Usually if the project covers two more divisions, the application should be submitted to the DOE H/Q. It is easy to handle the whole project for DOE. However, if the DOE H/Q wants any support in favor of your application we will provide it.
2	The project has prepared the IEE report based on the baseline study, assessed the anticipated impacts	After discussion with you, I think the project has assessed the environmental impacts following ECR 2023. We hope, if these	If the assessment will follow ECR 2023 it means the project meets the DOE requirements also. However, once you	Once we receive your application our team led by the AD will assess the impacts and mitigation

Question No.	Discussion Topics/issues	Opinions by the representatives of the Department of Environment		
		AD, DOE Rajshahi District	Inspector, DOE Rangpur Division	Sample collector cum inspector, DOE Thakurgaon District Office
	and suggested mitigation measures for the proposed project. The project is orange category as per ECR 2023. So, your opinion is important regarding our IEE preparation, particularly for the process, identified potential impacts and recommended mitigation measures.	mitigation measures are properly implemented during project implementation it will fulfill the ECR 2023 requirements as well as DOE requirement also.	submit the application to DOE then DOE will finally assess the project impacts and mitigation measures. So, if required, DOE will provide additional conditions in the Site Clearance.	measures and we will visit the plant site physically. After the site visit, we will send our recommendations to the divisional office or H/Q for further necessary steps.
3	How can DOE help the project authority to mitigate the impacts at an advanced level?	DOE is a regulatory authority. Usually, we will visit the site during construction and operation period. Sometimes we will inform the project authority about site visits, but most of the time we will make sudden visits. If we identify large scale pollution released from the project works, we will take administrative action against the project authority in accordance with ECR 2023, such as, fine, shutdown the project works, or hearing with the project authority. So, we will request you strictly maintain the Site clearance condition during implementation of the project.	DOE will always be helpful, we want to support the project authority to control the pollution, but our focus will be mainly the conditions of the site clearance certificate. So, the project authority should strictly follow the site clearance conditions during implementation of the project. If the project authority invites us for meetings, workshops and other events, we will willingly participate and support the project authority for environmentally friendly implementation.	Our district office is very friendly, we are closely working with the project authority and industries to prevent pollution or control pollution to the natural environment. So, if the project authority has any issue, and needs any kind of support, the DOE local office will act on it accordingly. Please come and share your views, we will support you all time.

Table 8-14: The summary of KIs with the officials of Department of Fisheries

Question No.	Discussion Topics	Opinions by the representatives of the Department of Fisheries	
		Fisheries Extension Officer, Rajshahi	District Fisheries Officer, Rangpur
1	NESCO PLC will implement the project in two divisions (Rajshahi and Rangpur divisions), which is funded by the ADB, and GoB. Are there any issues from the	As I learnt from the consultation meeting, this project doesn't have any large impact on the local fish species. However, construction waste can negatively affect the local	As you know that already many fish species destroyed and extinct. So, we should take care of every action. Though this project will not harmfully cause for the

Question No.	Discussion Topics	Opinions by the representatives of the Department of Fisheries	
		Fisheries Extension Officer, Rajshahi	District Fisheries Officer, Rangpur
	Department of Fisheries that should be incorporated in the IEE?	fish species in the surface water system if the waste is not properly maintained and properly disposed of in the designated areas. So, our suggestions to keep all the waste in the waste bin and disposed of in the safe place which are far away from the local surface water sources.	local fish species, it is necessary to keep solid waste and liquid waste appropriately to prevent leakage to the surface water sources.
2	How can DOE help the project authority to mitigate the impacts at an advanced level?	DOF can help the project authority to identify the impact on the fisheries in the project working areas. We may jointly conduct the study, or we can work together to celebrate Fisheries week, which is the biggest annual program of DOF. However, if the project authority identifies unusual impacts to the local fish species and informs us we can support the project authority as soon as possible and collect the samples and identify the causes.	In the Rangpur area, already many local fish species are extinct such as gutum, boikali, gazar, guchi baim, tara baim, kakila and others. The water volume in the river systems in these areas is also decreasing day by day and industrial effluence is discharging directly to the rivers and destroying the fish diversity in these areas. In addition, if the project wastes sweeping up to the surface water that will destroy the fish species. So, we should focus extensively on protecting the fish ecosystem in the project areas.

Table 8-15: The summary of KIIs with the officials of Bangladesh Forest Department

Question No.	Discussion Topics	Opinions by the representatives of Department of Fisheries		
		Officer in Charge, Social Forest Division, BFD, Rajshahi,	Officer, Social Forest Division, BFD, Rangpur	Forest Ranger, BFD, Thakurgaon
1	This project will require tree cutting from the NESCO campus or the project areas. So, what will be the process for tree cutting? Is NOC required from the forest department?	No NOC is required from the forest department. As the NESCO is a governmental organization, trees owner is also the government of Bangladesh. So, for tree cutting, DC office will give the approval and forest department will be asked to fix the price of the proposed trees. So, after submission application to the DC for tree	If NESCO identified the total nos of trees which will be required to clear down and inform the local forest department, the forest department will assess the present market values of the proposed trees in advance that will reduce the total requiring time and NESCO will apply to the DC office directly	Forest office will assess the market values of trees based on size, species and age. Two types of assessment will be carried out for timber and non-timber trees. So, after a physical visit to the site, the total assessment will be accomplished. This assessment report will be submitted to the DC office and

Question No.	Discussion Topics	Opinions by the representatives of Department of Fisheries		
		Officer in Charge, Social Forest Division, BFD, Rajshahi,	Officer, Social Forest Division, BFD, Rangpur	Forest Ranger, BFD, Thakurgaon
		cutting permission, and if the forest department receives the DC office instruction for assessing the trees' value, then, forest department will physically visit the site and assess the values of the trees.	for permission with the forest department report. Once NESCO gets DC's office approval, NESCO will call bidding for selling the trees locally.	NESCO separately. Once NESCO receives the DC's approval, they can call local bidding based on the forest department assessment report.
2	NESCO will implement the tree replantation plan to their campus after completion of project work. So, are there any suggestions of the forest department for tree plantation in the project areas?	Forest department suggests both fruits and non-fruits species (timber) for plantation. If NESCO plants fruit species, the species should be local species and distance should be maintained at least 6m from one sapling to another sapling. If plants are timber species, then, 3 meters minimum distance should be maintained.	In the Rangpur Forest office, there is a big nursery, so, if NESCO wants to get the sapling from the forest department's nursery NESCO can do it. We always encourage ourselves to avoid exotic species like Akashmoni (<i>Acacia auriculiformis</i>), Eucalyptus (<i>Eucalyptus globulus</i>) for plantation. For fruit trees the minimum distance should be 6m and for timber species, minimum distance will be 3 meters.	No NOC is required from the forest department, but the forest department will fix the present market values based on trees size, and age which will be incorporated in the bidding documents of NESCO. It will also help NESCO to get the clearance from the DC office. In addition, for replantation, if NESCO likes to discuss it with us, we will support NESCO as required. We can even make national tree plantation week in the NESCO campus.

560. Details of public consultations are in Annex 6. Complete details of the people's perception of the subproject as discussed during the public consultations is presented in Annex A6.1. Annex A6.2 gives the lists locations where the consultations were held and their photographs respectively.

8.7.1 Key Stakeholder Feedback and Findings

Table 8-16: Key Stakeholders Feedback (KII)

#	Area of Improvement	Suggestions for Improvement	Project Response
1	Inter-departmental coordination mechanism	Local people should be informed about the project activities, the project authority should take the appropriate steps to ensure effective coordination with all relevant stakeholders, including the local community, NGOs, and departments.	Necessary coordination at field level, project level and inter-departmental level will be held regularly, particularly at the time of construction.

#	Area of Improvement	Suggestions for Improvement	Project Response
2	Grievance Mechanism	The project should have a robust grievance redress structure in place where locals can file concerns about project activities that could negatively impact them. This mechanism needs to be operational.	Any customer can file a grievance using NESCO's well-established grievance redress procedure by using the online form, calling, or even dropping their complaint in the complaints box. Nonetheless, the project will improve the NESCO grievance resolution system and make it more open, transparent, and usable for everyone.
3	Reinstatement of damaged pavements and civic infrastructure	The project should explicitly specify that any structures impacted by its operations will either receive compensation or be restored to their pre-damage state.	The project will take great care to prevent any damage to any structures, but in the unlikely event that it does, appropriate mitigation steps will be taken; these may include paying compensation or properly rehabilitating the site.
4	Continuous Stakeholder Consultation	The project should guarantee that community members will be consulted on a regular basis and that all stakeholders, including NGOs and government departments, are well-coordinated.	The project has a plan for engaging stakeholders, which will be carried out regularly during the duration of the project to improve ties with the community and other departments as needed.

Action Taken:

561. The main concern of Key stakeholders stems from contractor's accountability as they commit various irregularities while working and how it could be controlled and NESCO can work with them and community through a proper GRM to ensure no untoward incident happens.

562. Accordingly, the EMP contains stringent clauses for the contractor to follow which will be monitored closely by contractors EHS and labor officers as well as oversight by PIAC and NESCO site engineer.

8.8 Positive Perceptions

563. All participants agreed to provide unconditional support to the proposed project as the project is going to solve the electricity problem faced by them and finally their life will be comfortable. Participants during the consultation mentioned that since the power supply is very poor there are no small-scale industries in this area. Once there will be assured power supply it will help in better economic development of the area. People will start planning about establishing small scale industries in the area and as a result there will be more employment opportunities.

564. All participants during the consultation mentioned that they will participate during the implementation of the project. As the proposed project is very important to address the problem of electricity in their area, the community extended their full support in the implementation of the project.

8.9 Stakeholder Engagement Plan

565. One of the essential elements of a meaningful consultation is that the consultations take place during all stages of the project. The consultation and disclosure process for the

Project will need to address the entire range of stakeholders, including but not limited to the stakeholders identified and consulted during preparation of this IEE. In order to ensure that the consultations held during this project preparatory phase also continue during construction and operation phase, it is important to allocate responsibilities clearly. The responsibility of consultation with local community and project affected persons will be handled by the EPC contractors. The EPC contractor will prepare a site level information disclosure and stakeholder engagement plan with a calendar spread across the construction period. For each site (substations the consultation proforma in Annex 5 is to be completed during detailed design.

566. The information to be shared with local communities and affected people by the EPC contractor will include the following:

- Project design (substation sites, workshops etc.) and their potential impacts.
- Construction/implementation schedule.
- Grievance Redress Mechanism which affects persons and local communities can use to register their concerns and seek appropriate redress.

Table 8-17: Stakeholder's engagement Plan over the life cycle of the project covering pre-construction, construction and Operation Period

Sl. No.	Types of consultation	Target Participants	Frequency	Subprojects sites
Pre-construction & Construction period				
1	FGD	Local community,	Bi-weekly	New substation sites. Workshops, tec.
2	Face to face meeting	NESCO officials, Local Govt. Officials and NGO officials etc.	Monthly	New Substation, Substation Augmentation, workshops and store etc.
Operation Period				
3	Meetings, workshops	Local community (including consumers), NESCO officials, Local govt. officials and local NGO officials.	Quarterly	New substation sites, and augmentation sites.

8.10 Information Disclosure

567. Communications with the community will be critical to the success of the Project. Specific mitigation measures to ensure communications with the community are effective and on- going, include:

- Local disclosure of the IEE including an executive summary translated into Bangla via the NESCO website, NESCO offices, existing substations, and other construction site offices.
- Provide brochures and posters on the main findings of the IEE and where the full version can be accessed, as well as a translation of the executive summary of the IEE, will be printed in Bangla and made available/displayed for public scrutiny at places easily accessible to affected people.
- Provide notice boards at all substations, construction site offices and active work sites including details of the GRM including the name, designation, contact numbers, address of both the NESCO and contractor's GRM focal persons plus the timeline and process of redressal together with a suggestion box that will be regularly checked for any grievances received.
- Prepare a **Project Safety Awareness** leaflet to be distributed to all homes within the vicinity of the work sites. The leaflets shall provide information relating to the risks of interfering with the HV network. The leaflets will be written in non-technical language and will provide illustrations where practical.
- Local communities as well as individual property owners within 500m are to be consulted

when selecting sites for temporary construction facilities outside of substations prior to finalization of their location.

- NESCO will create a WhatsApp Group of Ward member. Before construction community leaders/ ward members will be informed through WhatsApp messages

568. NESCO, with support from EPC contractor and PIAC, will provide relevant information in a timely manner, in an accessible place, and in a form and language understandable to affected persons and other stakeholders. The IEE will be made available in the corporate and site offices of NESCO and NESCO and at the project site office of concerned EPC contractors. The executive summary of the IEE will also be made available to the district revenue offices and be made available in local languages (Bangla) in the form of leaflet for distribution during consultation. The draft IEE will be disclosed on the ADB and NESCO websites. Subsequently, the updated IEE as per the final design will also be disclosed on ADB's website and in NESCO websites. The environmental monitoring reports on EMP implementation will also be posted on the ADB website and on the websites of NESCO.



KII with AD, DOE, Rajshahi district office.



Fisheries Extension Officer, DoF, Rajshahi



Social forest officer, BFD, Rangpur



Inspector, DOE Rangpur Division

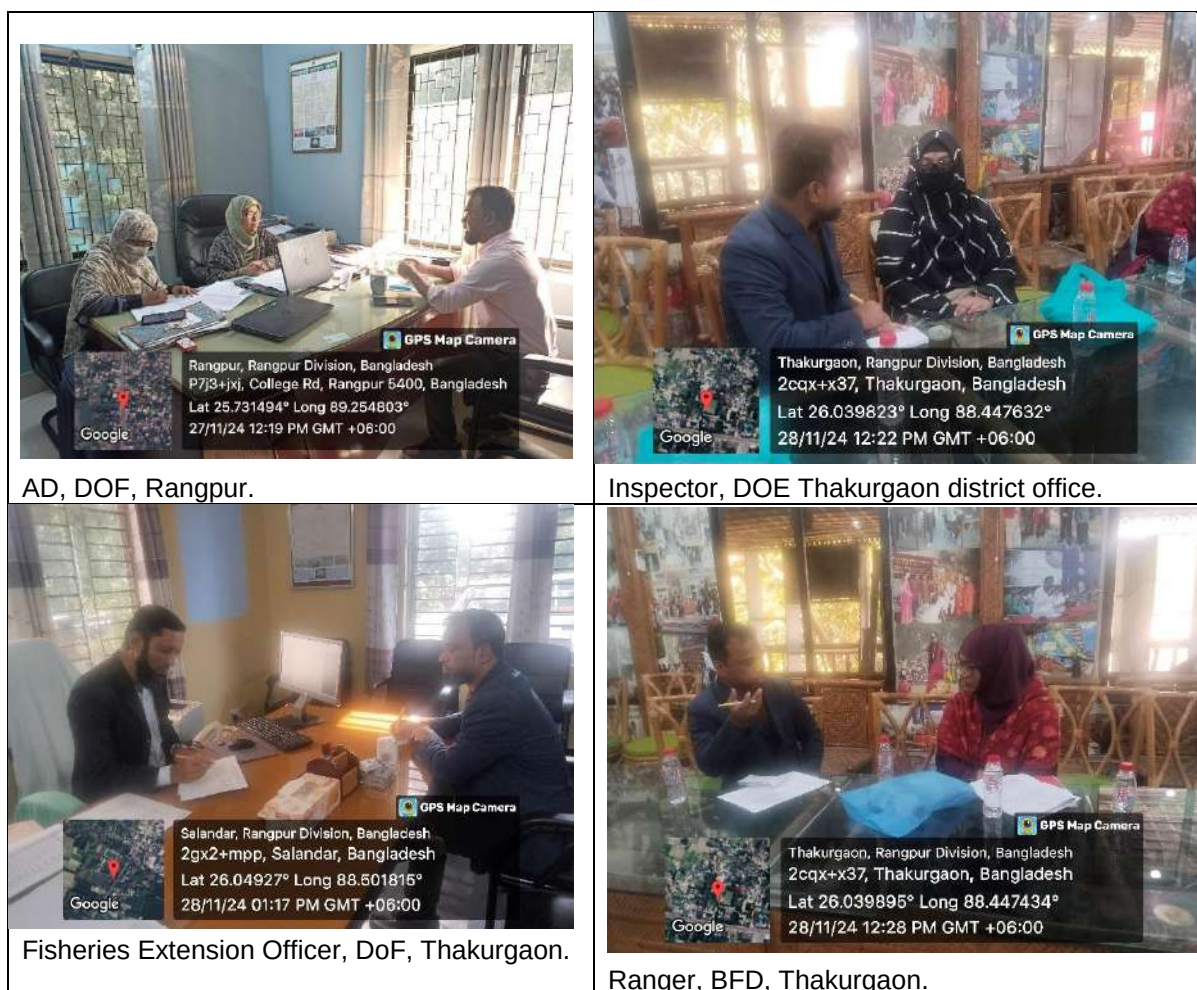


Figure 8-2: Relevant photographs of KIIs with the officials of DOE, DOF and BFD.

9 Grievance Redress Mechanism

9.1 Introduction

569. A grievance redress mechanism (GRM) will be established to prevent and address community concerns, complaints, and grievances and reduce risks, and assist the project to maximize environmental and social benefits. In addition to serving as a platform to resolve grievances, the GRM has been designed to help achieving the following objectives: (i) open channels for effective communication, including the identification of new environmental/social issues of concern arising from the project; (ii) demonstrate concerns about community members and their environmental well-being; and (iii) prevent and mitigate any adverse environmental/social impacts on communities caused by project implementation and operations.

570. The GRM is accessible to diverse members of the community, collectively called the “project affected persons” (PAPs), including more vulnerable groups such as women and the elderly. Opportunities for confidentiality and privacy for complainants are to be honored. The project level GRM can be an effective tool for early identification, assessment, and resolution of complaints on projects. Understanding when and how a GRM may improve project outcomes can help both project teams and beneficiaries improve results.

571. The GRM is an integral part of the Project’s EMP and will also cover resettlement related issues, and be common for the project, across issues of environmental management and social impacts management.

9.2 Grievance Redress Mechanism

572. Unforeseen problems and issues may arise due to construction and operational activities. Construction work of the project could result in various inconveniences to the public, such as, civil construction works generating noise and dust which can create disturbances for the local community, restrictions to public places, heavy vehicular movement, health and safety matters, issues related to labor influx, etc. The impact of the project may raise numerous grievances and complaints on the part of the affected people. Therefore, to resolve these issues, NESCO will establish a project-level grievance redress mechanism to receive and facilitate resolution of the affected persons’ concerns, complaints, and grievances about the project’s environmental and social performance, which is easily accessible to the aggrieved parties, transparent and accountable in grievance handling and responding both effectively and efficiently to the grievances reported by the affected parties while winning the confidence of the complainants. A well-established and well-functioning GRM would be able to resolve the grievances locally and avoid lengthy court procedures which on the other hand could generate adverse implications on the timely implementation of the project together with reputational risks to key stakeholders.

573. NESCO will establish a procedure to deal with and resolve any queries as well as address complaints and grievances about any irregularities. In this regard, a policy and/or guideline will be prepared and adopted for assessing and mitigating potential environmental and social complaints/impacts through a GRM. The GRM will deal with complaints and grievances related to both social/and environmental issues of the project.

574. The GRM will not prevent access to the country’s judicial or administrative remedies, which are not a part of the GRM.

9.3 Grievances Resolution Process

575. A three-tier bottom-up Grievance Redress Mechanism (GRM) will be established in this project. First, there will be Site level grievance redress committees (SGRCs) at the site/contractor level; second, at the local level, thereafter, called the Project level GRC (union/municipality level); and thirdly, the corporate level GRC (CGRC) at the project level to give room for grievances to be reviewed. There will be an informal tier with the contractor before the three formal tiers begin.

576. NESCO will establish the GRM before the commencement of construction works. The Local and Project level GRCs will be established through gazette notifications from the Ministry of Power, Energy and Mineral Resources concerned. The affected people (APs) will be informed through public consultation that they have a right to have their grievances redressed by the local committees as well as by the project management. Most of the grievances will be resolved at the site or local-level GRC, but those cases that cannot be resolved at the local level will be forwarded to the project-level GRC. Grievances will be redressed at the latest in a month from the date of lodging the complaints, with pollution and, health and safety issues being redressed immediately. GRC decisions will be on a majority basis. Details of grievances will be disclosed in the environmental monitoring reports from the reporting period of receipt until the reporting period of closure. If any disputant is unhappy or unsatisfied with the outcome of the Project level GRC, he/she may file cases in the courts. Irrespective of the stage reached or decision of the GRC, any unhappy complainant is free to approach a local court of law. In fact, an aggrieved person may parallelly approach both the GRC and a court of law at any time.

9.3.1 Informal Resolution

577. Before a formal grievance is submitted to the three-tier system, the contractors will have the opportunity to informally resolve grievances. For grievances that are immediate and urgent (e.g., dust, noise, spills, inappropriate behaviour, worker conflict, community health and safety etc.) they are best resolved informally. The contractor will be able to consult the NESCO PIU site team and resolve these matters informally.

9.3.2 Site Level GRC

578. If an informal resolution is not sufficient, site level GRC as the first formal tier will be involved in finding solutions to the problem. The following composition is proposed for the Site level GRC (SGRC) with Site Engineer from NESCO and the contractor.

Table 9-1: Site level GRC Composition

1.	Site Engineer, NESCO	Convener
2.	Representative of EPC contractor	Member
3.	AP/Representative of AP	Member

579. If agreeing on a solution acceptable to all parties is not possible within the first tier of the grievance mechanism, the complaint will be referred to the next level of GRM procedure that will be handled by the Project level GRC.

9.3.3 Project Level GRC

580. The following composition is proposed for the Project level GRC (PGRC) with representations from NESCO, the contractor, local public representatives, representatives of affected people including women in the Project area to ensure a participatory process and to allow voices of the affected communities in the grievance procedures.

Table 9-2: Project level GRC Composition

1.	Assistant Engineer, NESCO	Convener
2.	Representative of ESS Wing or PIAC	Member-Secretary
3.	Representative of EPC contractor	Member
4.	Councilor of ward of the municipality/city corporation concerned	Member
5.	Female Member of ward of the municipality/city corporation concerned (especially if the complainant is female)	Member
6.	Representative of AP	Member

581. A representative of AP (based on the recommendation of EPC contractor and approved by the Convener) will be a member of the PGRC. A community leader will be invited by the Convener to represent or provide a representative of the APs to the PGRC. The Member-Secretary of PGRC will be available and accessible to PAPs to address concerns

and grievances and schedule a weekly review and status update. Unresolved cases will be forwarded to the CGRC. The PGRC is empowered to take decisions, but it requires the approval of the Project Director for implementation of the decisions (which will be forwarded to the Project Director for approval and finalization). The Female member/ward councilor will participate in the grievance redress sessions if the complainant is a female.

Terms of Reference (ToR) for PGRC

582. The scope of work and the Terms of Reference (ToR) for the PGRC are:

- The PGRC shall review, consider and resolve grievances related to social and environmental mitigation during implementation of the Project.

583. Any grievances presented to the PGRC should ideally be resolved on the first day of hearing or within a maximum period of two weeks except complicated issues requiring additional investigations. Grievances of indirectly affected persons and/or persons affected during project implementation due to social or environmental problems will also be reviewed by PGRC.

- PGRC will justify and recommend the impact and Entitled Persons including their entitlements as identified by NESCO Contractor/PIAC.
- PGRC decisions should ideally be arrived at through consensus, failing which resolution will be based on majority vote.
- All categories of losses including Entitled Persons (EPs) will be identified during finalization of Right of Way (ROW) by NESCO's Consultant/PIAC and to be finalized through the Project Level Grievance Redress Committee (PGRC).
- The LGRC will verify and recommend all the identified losses, EPs and their entitlements. Accordingly, PGRC will send all recommendations with relevant documents to the Project Director, NESCO for approval.
- The PGRC will not deal with any matters pending in the court of law.
- A minimum of three members (in addition to the Member Secretary) shall form the quorum for the meeting of the PGRC to proceed.
- Recommendation of PGRC will be approved by the Project Director.

9.3.4 Corporate-level GRC

584. The Corporate-level GRC (CGRC) will review all unresolved cases involving social and environmental issues of the project. The Project Director will be the head of the CGRC. The composition of the CGRC will be as follows:

Table 9-3: Corporate level GRC Composition

1	Project Director, PIU, NESCO	Chairperson
2	Senior Safeguard Specialist(s) of NESCO's Environmental and Social Safeguards Wing (ESS Wing) or Representative of PIAC Safeguard Team	Member-Secretary
3	Deputy Project Director, PIU, NESCO	Member
4	Team Leader of EPC contractor	Member
5	A representative of the aggrieved party	Member
6	A representative of the Ministry concerned or civil society	Member

585. The Member Secretary in the CGRC will provide necessary knowledge and information regarding relevant standard policies and international protocols. He/she will also set examples of resolving such grievances from other development projects. The CGRC should establish fairness and transparency in the resolution of grievances of project-affected people. In case of technical or environmental issues as well as any legal matters, the Engineering or Safeguards Team Leader of the EPC contractor will advise the CGRC of the situation at the construction site of concern. In specific cases, the environmental and social development specialists of ESS Wing or external legal advisors may be consulted, if required.

Terms of Reference (ToR) for CGRC

586. The scope of work and the Terms of Reference (ToR) for CGRC are:

- Review, consider and settle unresolved grievances forwarded by CGRCs related to social and environmental issues, with regular fortnightly review of grievance-status and resolution.
- Any grievances presented to the CGRC should ideally be resolved within two-four weeks from the date of receiving the complaints from CGRC.
- In case of complicated cases, the CGRC Members can request additional information or carry out field level verifications.
- Resolutions should be based on consensus among Members, where all the decisions may be taken on majority vote.
- The CGRC will not deal with any matters pending in the court of law.
- All members are required to form the quorum for the meeting of the CGRC

587. The resolutions of the GRC will be approved by the Project Director with records kept. Based on approved grievance resolution, action will be taken by the EPC contractor and the payment for any recommended entitlement to the Entitled Persons will be paid by the PIU.

588. The above mentioned three tiers will serve to resolve any grievances, but if the PAPs are not satisfied with the decision of the GRC, they have the right to take grievance to a court of law at any stage in the grievance redress process. The project grievance procedure does not impede access to the country's judicial or administrative remedies. Affected people can approach the court of law at any time and independently of the project's grievance redress process. Affected people may (subject to eligibility criteria) also access ADB's Accountability Mechanism³⁸ whereby people adversely affected by ADB-financed projects can express their grievances, seek solutions, and report alleged violations of ADB's operational policies and procedures, including environmental and social safeguard policies.

9.4 Processes for Filing Grievance Cases

589. GRC procedures and operational rules will be publicized widely through community meetings and pamphlets and information on focal contact persons, how to file grievance etc. will be placed on the billboards of the construction sites/project site sites in the local Bangla language so that the PAPs are aware of their rights and obligations, and procedure of grievance redress. In addition, NESCO has a 24-hour call center number (Hot line number-16603) for receiving grievances which will be linked to the project. Grievances will be filed without any fear and stress and stakeholders may also raise grievances anonymously if they wish through a drop box on site. The EPC contractors will support the affected persons in drafting the grievances. All grievances must be submitted in writing to the Chair, PMU level GRC. But the grievances that need immediate action for the case like dust, noise, spills, inappropriate behavior, worker conflict, community health and safety etc. may also be raised to the respective construction site/ site office personnel even verbally or in written. The Project will set up systems to provide a written receipt of the recorded grievance to the complainant (at their address or through email/text message) with written updates every two weeks or final resolution within a month. The resolutions of the GRC will be approved by the Project Director with records kept at site and project level.

590. The affected person himself/herself or appointed agents such as local elected officials/legal advisors are to represent the complainants. All GRC documents will be maintained by NESCO for review and verification by ADB or other relevant parties involved in the project. The NESCO Field Office(s) and ESS Wing will act as the Secretariat to the project GRCs. As a result, the records will be up-to-date and easily accessible on-site. If dissatisfied

³⁸ There are two parts to ADB's Accountability Mechanism, (i) problem solving led by ADB's special project facilitator can assist the complainant in finding solutions to their problems, (ii) providing a process through which those affected by projects can file requests for compliance review by ADB's Compliance Review Panel.

with the decision/verdict of the GRC, the affected person may request a further review of the decision of GRC by the PGRC. In such cases, the case will be forwarded to the Convener of the CGRC with all documentation. All grievances no matter how minor and quickly resolved (i.e., informal and site level to corporate level GRC) must be recorded, including the actions/resolutions taken and reported in the environmental monitoring reports submitted to ADB.

591. The grievances from the APs will be addressed through the process described below in listed in Table below.

Table 9-4: Grievance Redress Process

Steps	Process
STEP 1: Site level GRM (On-Site Resolution)	Informal grievance resolution: mostly related to day-to-day construction related complaints which can be resolved by the contractor and/or PIU through necessary dialogue with the affected persons and will not require the intervention of a GRC unless remaining unresolved after one week. The contractors and Site Engineer will agree a site-level grievance handling and recording protocol, as the initial first step in the GRM process. Whatever the source and the form in which the grievance/complaint is received and its nature, it should be accepted and registered in the grievance register. For any urgent matter, in particular emergency and health and safety issues that are potentially creating a danger to life, the contractors and/or Site Engineer will take note of the grievance/complaint and ensure immediate action is taken. Similarly short-term issues (e.g. dust, noise, leaks, inappropriate behavior, conflict, etc.) may be corrected immediately under the direction of the contractor and/or Site Engineer, in collaboration with respective construction workers. In case of impending damage to structures, flora or fauna, or physical cultural resources, the Site Engineer shall have the power to get contractors to halt works until corrective action is taken. For longer-term grievances, the Site Engineer will sort the grievances for their eligibility, level of urgency and by their nature (suggestions or comments, grievances/complaints related to adverse impacts of the project on an individual or group, violations of national law, etc.). The Site Engineer will send a formal reply to the complainant within 3 working days of the receipt of the grievance/complaint, to acknowledge receipt, provide the complaint's registration number, and set up a meeting in the presence of the contractor's project manager within one week of the grievance being received. Through the first formal reply, the complainant will be informed of the process and of his/her possibility to subsequently escalate the complaint in case no resolution was found at this stage; contacts to step 2 will be included. During the meeting participants will agree on the course of action to be taken and the timeline for resolution. Details of the meeting will be documented; the minutes of the meeting will be signed by both the complainant and the Site Engineer and annexed to the grievance log file. If both parties do not agree on a resolution, the complaint may be escalated to the second level of GRM. If both parties agree, the contractor (and subcontractors, as applicable) will take remedial action, keeping the complainant informed at each stage or every fortnight, whichever the shortest. Such actions should be taken in the briefest delay, within a maximum timeframe of 30 days. However, all simple complaints will be resolved within 7 days of the meeting being held. Following resolution, if the complainant is not happy with the resolution or if no action has been taken within the agreed timeframe, they can escalate the grievance to the second step of GRM. The one-week timeline for resolutions may only be extended if the AP (Affected Person) requests for a later date for the meeting based on availability. If they have difficulty travelling to meeting locations upon short notice, the location of the meeting must be made flexible. If workers wish to file a complaint and are not comfortable logging it with the first level of the GRM as employees of the contract they are complaining about, they can file it directly to the Site Engineer or the second level of GRM.
Step 2: Project level GRC	The aggrieved affected persons can formally lodge their grievances at GRC in PIU including if there is failure of negotiation at project site level. Alternatively, the Site Engineer may pass the grievance to second level. The Assistant Engineer will review the complaint and prepare a Case File for GRC hearing and resolution. Assistant Engineer will send within 3 days of receipt a letter to

Steps	Process
	the complainant acknowledging receipt and that a formal hearing will be held with the GRC to agree a resolution action plan and timeline for it, at a date fixed (no more than one week after lodgment) by the GRC members in consultation with aggrieved Affected Persons. The one-week timeline may only be extended if the Affected Person requests for a later date for the meeting based on availability. If they have difficulty travelling to meeting locations upon short notice, the location of the meeting must be made flexible. On the date of hearing, the aggrieved Affected Person will meet with the GRC members who will note down the statements of the complainant and then if needed investigate the claim further if it cannot be resolved at the meeting. The decision will be issued by the Member Secretary of the GRC and signed by other members of the GRC. The case record will be shared with the complainant Affected Person by the Assistant Engineer. As for the first level, the second level may have two outcomes: if the parties found a resolution and the complainant signed their approval of the resolution, such actions should be taken in the briefest delay, within a maximum timeframe of 4 weeks. However, all simple complaints will be resolved within 7 days of the meeting being held. If no resolution has been reached, grievance is forwarded to the third level of the GRM.
Step 3: Corporate level GRC	If any aggrieved AP is unsatisfied with the GRC decision at Project level or in case the Project is unable to provide a resolution at their level in case of any sensitive cases, then the next option will be to lodge grievance to the corporate level GRC. The Safeguards Specialist/PIAC representative will review the complaint and compile the documents³⁹ of the complainants and the Affected Person must provide them with any necessary documents supporting the claim for forwarding to the corporate level GRC. The Safeguards Specialist/PIAC representative will send a letter to the complainant within 3 days of receipt acknowledging receipt and that a formal hearing will be held with the GRC to agree a resolution action plan and timeline for it, at a date fixed (no more than two weeks after lodgment) by the GRC members in consultation with aggrieved Affected Persons. The two-week timeline may only be extended if the Affected Person requests for a later date for the meeting based on availability. If they have difficulty travelling to meeting location upon short notice, the location of the meeting must be made flexible. On the date of hearing, the aggrieved Affected Person will meet with the GRC at the Project office (GRC members will need to travel to the Project office). The GRC members will note down the statements of the complainant, review the case record file and then if needed investigate the claim further if it cannot be resolved at the meeting. The decisions will be issued by the Chairman of the GRC and signed by other members of the GRC. The case record will be shared with the complainant Affected Person by the Safeguards Specialist/PIAC representative. If the parties found a resolution and the complainant signed their approval of the resolution, such actions should be taken in the briefest delay, within a maximum timeframe of 4 weeks. However, all simple complaints will be resolved within 7 days of the meeting being held. The responsibility of corporate level GRC is to take higher level decisions or approval related to sensitive cases and when negotiation with Affected Persons fails at Project level. If the complainant is still dissatisfied after this stage, they may avail themselves of the court of law or complain to ADB's RM.

592. The flow chart showing the GRM is presented in Figure below.

9.5 Grievance Redress Documentation and Monitoring

593. NESCO will be responsible for recording the complaints, steps taken to address a grievance, a minute of the meetings, and preparation of a report for each complaint. Records of all grievances received, whether minor or major, whoever it was first addressed to, including name and contact details of the complainants, date and time of the complaints received, relation of the complainants to the project, nature of grievances, details of all meetings held,

³⁹ Affected Persons will not be charged for the services of GRC.

including participants, date, issues discussed and decisions taken, agreed corrective actions taken towards resolution of the grievance and when these actions were implemented and by whom, log of all formal communication sent to the complainant informing of the evolution of the process; and the final outcome will be recorded and kept in the Project and Corporate offices by the Site Engineer/Assistant Engineers respectively to whom all grievances, no matter who there were addressed to, must be flagged up the chain.

594. It is recommended that a project-wide grievance handling database be set up by the Assistant Engineer replicating the project logs to be kept at project level. Once a resolution has been proposed to the complainant, they will be asked to sign a form acknowledging receipt of that proposal and providing their approval or refusal, as applicable; this form will be added to the grievance/complaint register and once all actions are taken the associated entry will be closed but not deleted. All GRC meeting deliberations and decisions will be recorded and will be available for public reference. The log must be publicly available, and the number of grievances recorded and resolved, and the outcomes will be displayed/disclosed at the Project and Corporate Offices. All complaint-related documentation such as the minutes of the meetings and decisions will be summarized and become part of the environmental monitoring reports submitted to ADB.

595. The Assistant Engineer must report fortnightly to the Safeguards Specialist/PIAC representative on all grievances received and their status, GRM will be a topic at monthly Project and corporate level project review meetings. The same information will be included in the environmental monitoring reports which will be submitted to ADB. The complaint handling process will be reported to ADB through the quarterly progress reports as well as the semi-annual/annual environmental monitoring reports.

NESCO and the contractor will need to provide staff for and allocate budget⁴⁰ for the GRM that will sufficiently cover the costs of its operations including initial awareness raising, capacity development training, support services, field inspections, meetings, documentation, and supplies etc. All costs incurred in GRC meetings, consultations, communication and reporting/information dissemination will be borne by NESCO.

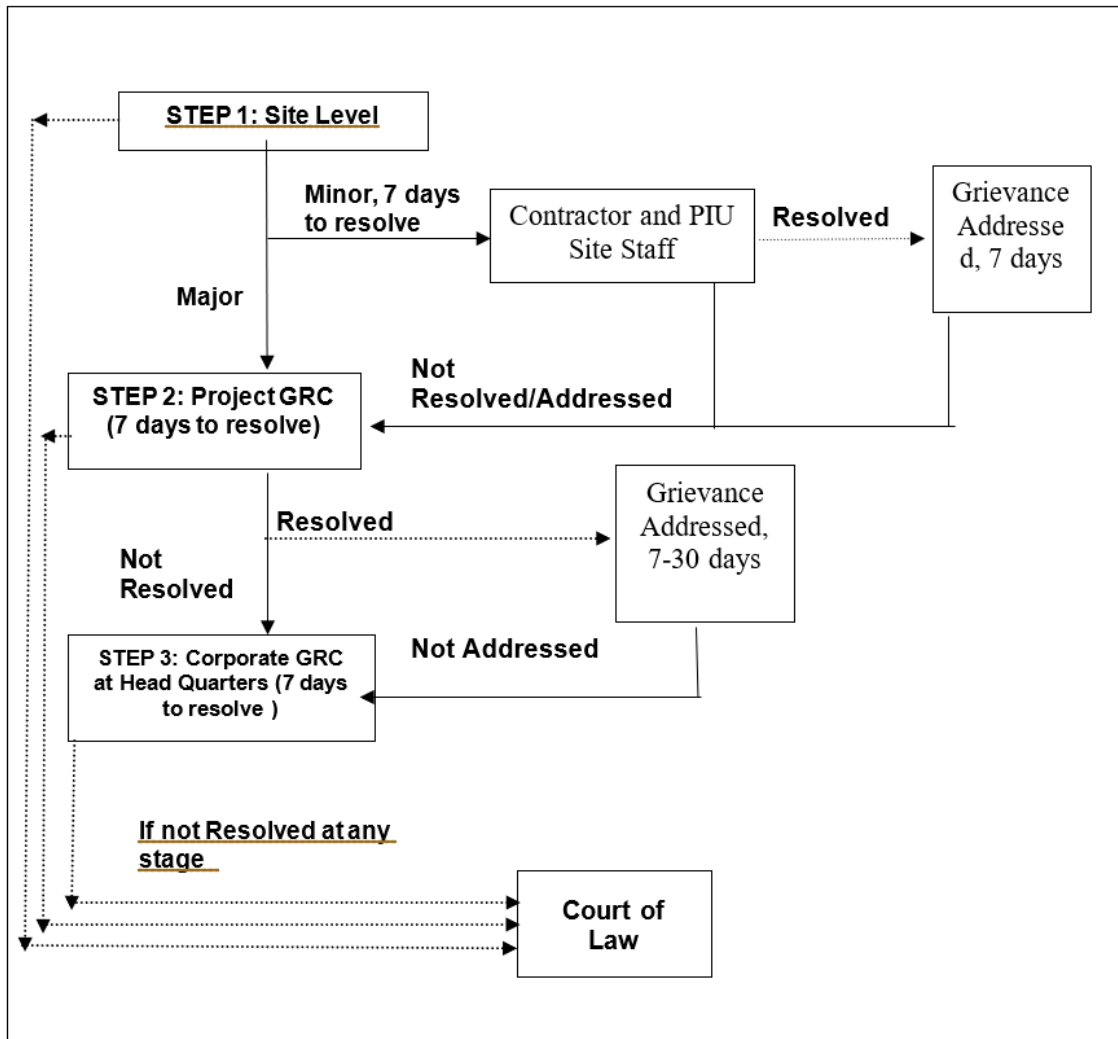
9.6 Disclosure on GRM

596. The formation and effectiveness of GRM will be communicated to the affected people across the project area as part of overall consultation and disclosure process of the project. It will be publicized widely through community meetings and pamphlets and information on focal contact persons, how to file grievance etc. will be placed on the billboards of the construction sites/project site offices in Bangla and any other local languages so that people are aware of their rights and obligations, and procedure of grievance redress. The EPC contractors and PISCs will assist NESCO in disseminating the GRM related information to the people. Special efforts should be made to ensure that poor and vulnerable households are made aware of grievance redress procedures and entitlements. Grievances will be filed without any fear and stress and stakeholders may also raise grievances anonymously if they wish through a drop box on site. ADB's accountability mechanism will also be informed to the Affected People by PIU.

597. All costs involved in resolving the complaints/grievances (meetings, consultations, communication, and reporting/information dissemination) will be borne by NESCO and any complaints resolution pertaining to EPC contractors and the EMP related complaints will be borne by the EPC contractors.

Figure 9-1: Process of Grievance Redressal Mechanism

⁴⁰ Included as part of EMP costs



(*) Affected Persons can approach the court of law at time during the grievance redressal process.

(**) For Health and Safety issues including danger of fatality, grievances must be addressed immediately.

10 Implementation of Support and Arrangements

10.1 Supervision, Monitoring and Reporting Arrangements

598. NESCO will submit environmental monitoring reports to ADB on a semi-annual basis up until the completion of construction and on an annual basis during operation, within 15 days from the end of each reporting period i.e., June and December. Submission of environmental monitoring reports will be required from loan efficiency. In between, NESCO will submit quarterly progress reports including an update on environment safeguards implementation following the template in the PAM.

599. The Contractor's EHS management team will establish their own internal systems for supervising, monitoring and reporting their EMP implementation. During the design, pre-construction and construction phases, contractors shall prepare and submit monthly EHS progress reports by an agreed template to the PMU of NESCO which will form part of their quarterly progress reports and the quarterly progress and semi-annual monitoring reports to be submitted to ADB by NESCO. The monthly EHS progress reports shall indicate any design changes made by the Contractor from the project as assessed in the IEE, and the Contractor's performance (including the performance of all their sub-contractors and any third parties) during pre-construction and construction regarding environmental safeguards implementation. The Contractor will also attend monthly meetings convened by NESCO to discuss EHS issues and establish a H&S Committee including worker representation who will also meet monthly.

600. The environmental monitoring reports of NESCO will describe the physical progress of the project, any scope or design changes, compliance with the loan covenants about safeguards, implementation of mitigating measures described in the EMP, quantitative monitoring data and analysis, GRM implementation, and any noncompliance issue and corresponding corrective actions. Once cleared by ADB's environment specialists, the monitoring reports will be posted on ADB's website as required by its Safeguard Policy Statement (2009) and ADB's Access to Information Policy and disclosed by NESCO on its website and locally to the communities through notices boards, leaflets, brochures, or handouts.

601. In the event of any unanticipated environmental impacts including location, route, design or scope changes during implementation, or if monitoring identifies a breach of performance standards that should be complied with by NESCO and/or their Contractors, Contractors must inform NESCO if they are the ones to become aware of such a situation. NESCO will immediately need to inform ADB, assess the significance of such impacts, evaluate the options available to address the unanticipated impact, and submit to ADB a time-bound and budgeted corrective action plan or updates in the IEE/EMP for review and clearance as required.

602. Complete photographic records and documentary records will be kept by the Contractors covering all activities on the construction site as well as key locations such as receptors adjacent to substations, off-site access roads, construction stores, sanitation and welfare facilities, labor camps, or overnight accommodation etc. Photographs and condition surveys of all key locations will be taken prior to construction activities beginning, to provide the environmental baseline. Copies of all geo-referenced photographs/condition surveys will be submitted to the PMU along with the contractor's monthly EHS progress report. Specifically, the Contractor will be responsible for the documents and reports in Table xx. Documentation and records to be kept by all parties in hard copy as well as electronic format are as follows (not an exclusive list):

- Definitive IEE and EMP (as disclosed on the ADB website)
- Legal register (of all applicable national legislation)
- National Environmental Clearance (EC) documentation
- Tree felling permits, vehicle emission test certificates etc.
- Training plan and training records with attendance records and photographs of the training
- Stakeholder engagement plan and records of all consultations undertaken with

- photographs and attendance records
- Records of emergency preparedness and response drills with photographs and attendance records
- Document review and approval records
- CSEMPs/H&S and other sub-plans and copies of approval records
- Contractor (subcontractor) certifications and insurances
- Contractor (subcontractor) worker records including documentation of working hours
- Completed site checklists and photographic records
- Non-compliance notifications and corrective action instructions
- Contractor and operational accident record and incident reports
- GRM register

603. NESCO and their contractors will facilitate DOE and ADB carrying out the following monitoring actions to supervise project implementation:

- Conduct periodic site visits during the project implementation to confirm compliance with the national environmental clearance, ADB's Safeguard Policy Statement 2009, the project's loan covenants and EMP requirements.
- Review and comment on the periodic EMRs submitted to ensure that adverse impacts and risks of the project are mitigated as was planned and agreed with ADB, that any corrective actions required have been duly implemented, and that the GRM is fully functional.
- Work with NESCO to rectify to the extent possible any failures to comply with their safeguard commitments, as covenanted in the loan agreement, and exercise remedies to re-establish compliance as appropriate.
- Prepare a project completion report that assesses whether the objective and desired outcomes of the EMP have been achieved, considering the baseline conditions, and monitoring results.

604. For this purpose, NESCO and their contractors will provide ADB with access to the project site and all requested information on the project. For any ADB supervision missions NESCO or their contractors will provide all ADB staff with a project site health and safety induction and adequate PPE in accordance with Table 2.7.1 of the WBG IFC EHS General Guidelines - Occupational Health and Safety Section and ILO Code of Practice on Safety and Health in Construction.

Table 10-1: Main Documents Required from NESCO and Contractor

Documents	Originator	Destination of the documents	Submission Timing		
			Design and pre-construction period	Construction period	Operation period
Bid and contract documents including EMP requirements	NESCO	ADB	X (Once, prior to the issue and on award)		
Training Plan	PIAC	NESCO	X (Once, prior to the design approval)		
Stakeholder Engagement Plan	PIAC	NESCO	X (Once, prior to the design approval)		
Health and Safety Risk Assessment	Contractor	PMU and PIAC	X	X (at minimum annually updated and upon	

Documents	Originator	Destination of the documents	Submission Timing		
			Design and pre-construction period	Construction period	Operation period
		(ESSU)		commissioning for handover to NESCO)	
Ecology survey and Pre-construction baseline monitoring reports	Contractor	PMU and PIAC (ESSU)	X (Once, prior to the start of construction)		
Updated IEE for changes in sub-projects	NESCO	ADB	X (Once, prior to the design approval)		
Final design for approval	Contractor	PMU and PIAC	X (Once, prior to the start of construction)		
CSEMP, H&S including other subplans for approval (including subplans)	Contractor	PMU and PIAC (ESSU)	X (Once, prior to the start of construction)	X (Updated through construction as needed/reviewed monthly)	
Environmental, health and safety checklists including worker accommodation	Contractor	PMU and PIAC (ESSU)		X (Every week, to be completed daily)	
Environmental, health and safety checklists including worker accommodation	PIAC	PMU (ESSU)		X (Weekly checks of active construction sites, at least monthly visits to each contract package)	
Monthly EHS progress reports including EMoP results and records and records of monthly training and daily toolbox training plus incident records and grievances	Contractor	PMU and PIAC (ESSU)	X (Every month)	X (Every month)	
Monthly EHS progress reports on status of EMP implementation and observations from site visits, minutes of site EHS meetings, incident records, grievances etc.	PIAC	PMU (ESSU)	X (Every month)	X (Every month)	
Lost time and fatality incident reports	Contractor NESCO O&M	PMU and PIAC (ESSU) Onward Submission to ADB		X (24 hours)	X (24 hours)
Environmental Monitoring Report	PMU (ESSU)	ADB	X Semi-annually from	X Semi-annually	X Annually until

Documents	Originator	Destination of the documents	Submission Timing		
			Design and pre-construction period	Construction period	Operation period
			loan effectiveness		PCR issued
Completion Report	PMU (ESSU)	ADB			X

10.2 Implementation Arrangements

10.2.1 Government of Bangladesh

605. The Ministry of Power, Energy and Mineral Resources (MPEMR) is the main Project coordinating body on behalf of the government..

10.2.2 NESCO's Management, PMU, PIU and O&M Staff

606. NESCO will take the overall responsibility for environmental and social performance of the project, implementation of the EMP and approving the detailed designs, CESMP, H&S Plan, and other plans as required. NESCO has already established a dedicated PMU to lead Project implementation. The PMU is headed by a Superintending Engineer with 5 Executive Engineers from Design & Inspection, Procurement and System Planning department of NESCO; 1 Deputy General Manager from ICT division; 1 Deputy Manager from ICT, 5 Subdivision Engineers from Rangpur Project, Rajshahi Project, Smart Meter Project, Civil Dept. of NESCO; 2 Assistant Engineers. The Proposed Project's Organogram contain 1 Project Director (Chief Engineer/Superintending Engineer); 1 Deputy Project Director (Executive Engineer); 1 Executive Engineers; 2 Sub-divisional Engineer; 4 Assistant Engineers and 6 Sub-Assistant engineers. NESCO needs to ensure sufficient PMU staff and budget resources are assigned to implement the safeguards requirements, supervise, and monitor the EMP as per the roles and responsibilities set out therein.

607. NESCO/PMU will be required to submit semiannual environmental monitoring reports reverting to annual upon operation up until the ADB project completion report is issued, along with submission of quarterly environmental progress updates (as part of the project's quarterly progress reports). Environmental monitoring reports will be due by the 15th of the month following the period end. These reports will be disclosed on ADB's website and locally per the IEE.

608. Individual PIU (s) manage each contract package will have a team of engineers assigned to it for full time supervision, including day-to-day supervision of environment, health and safety with support of ESSU and PIAC. The subdivision and assistant engineers assigned to each contract package can be responsible for day-to-day checks, they will need on-the-job training regarding Safeguards issues.

609. A key role of the PMU/PIU is to supervise and monitor environmental safeguards compliance and report to ADB. On commissioning of the project components these will be turned over to NESCO O&M staff to operate and maintain. NESCO O&M workers will need to abide, in their behaviour and work, to directives issued by their employer with regards to environmental, health and safety management.

10.2.3 NESCO's Environment and Social Unit (ESSU)

610. The Environment and Social Unit (ESSU), comprising of 3 qualified engineers who serve as delegated environmental staff, who have no safeguards capacity to address both environment and social safeguards to assist PMU on issues related to environmental and social management and supervise the Project Implementation Assistance Consultant and contractors. Given there are several project components distributed over the two divisions and the in-house unit also supports other projects, it is unlikely they alone can ensure the oversight required for satisfactory safeguard implementation.

611. The ESSU will review the regular monthly progress reports of the contractor and PIAC on EMP compliance, to be sent to the Project Director of the Project Management Unit (PMU) throughout the construction period. They will also review the semiannual environmental monitoring reports produced by the PIAC during construction and be responsible for preparing the annual environmental monitoring reports once operational for submission to ADB.

612. Safeguards Implementation Consultants will support PMU and ESSU to supervise and monitor the construction contractors to ensure design compliance and quality assurance of the construction activities. The Safeguards Implementation Consultants, comprising environmental and social development specialists along with gender specialists, will also supervise the contractors for CSEMP and H&S Plan implementation.

613. The contractors in turn will also have environmental, health & safety (EHS) officers and ecologists (as needed) who will be tasked to first develop CSEMP and H&S Plan in accordance with the present EMP and then responsible for its implementation during construction activities. The ESSU will support the PMU to approve these plans.

614. Capacity development will be required to build up the environmental and social management capabilities of the PMU and ESSU with help from PIAC.

615. Specifically, for this project, the ESSU staff will be delegated to work as part of the PMU (reporting to PD) to support EMP implementation, supervision, monitoring and reporting. A key role of the ESSU (E&S Officer) will also be to manage the Grievance Redress Mechanism (GRM) at project level on behalf of the PMU. The ESSU Manager will be given authority to instruct the PMU and be given delegated authority to instruct the Contractor to undertake corrective action in relation to any lapses in compliance with national laws and regulations or the EMP implementation.

616. The ESSU will assist the PMU on issues related to environment, health and safety, labor and social management and work together with the PIAC and Contractors' EHS staff. Contractors will submit progress reports on environment, health and safety and social issues to the PMU monthly during the pre-construction and construction period. The ESSU technical staff and PIAC will review them and report any issues to the PMU, compile quarterly environment safeguards implementation updates to be shared with the ADB through the quarterly progress reports, as well as preparing the semi-annual environmental monitoring reports with PIAC on behalf of PMU up to the end of construction and then on an annual basis during the operation phase.

617. During operation, ESSU will continue to ensure and report on EMP implementation by the NESCO O&M staff and be responsible for the annual environmental monitoring report submission.

618. The ESSU will provide facilitation support to the PIAC in providing environmental training to the PMU staff and contractors responsible for implementing the EMP during the construction phases of the project.

10.2.4 Project Implementation Assistance Consultant (PIAC)

619. The PMU will engage a Project Implementation Assistance Consultant (PIAC) with inputs required for the individual experts and their responsibilities for supervision of construction contractors. PIAC will ensure compliance with Safeguards documentation – IEE/EMP, CEMP, H&S Plan and other sub-plans while adhering to detailed design standards and to assure the quality of the construction activities by all contractors. The PIAC will also support the updating of the IEE in response to final route alignments of the contractor before work can be started.

620. The PIAC will also include consultants to supervise the contractors on EMP implementation. For this purpose, PIAC will engage one Environmental Specialist¹⁵ PM, one

Health and Safety Specialist 15PM, one Social Development Specialist (Stakeholder Engagement and Labor) 15 PM on an intermittent basis. Other technical experts were brought into the PIAC team as required to address the EMP requirements. The level of input required over the project implementation period needs to be sufficient to ensure weekly and monthly site checks, updating of the IEE etc.

10.2.5 Contractor and Subcontractors (if any)

621. The Contractor is responsible for the implementation of the EMP with supervision and monitoring by the PMU and PIAC supported by the ESSU staff. The requirement to undertake relevant mitigation and monitoring actions as set out in the EMP applies to the construction site as well as off-site locations such as construction stores and at any labor camps or overnight accommodation provided. The contractor is required to ensure that the EMP requirements are cascaded down to all sub-contractors undertaking work regardless of whether they are formally or informally employed. It is recommended the EMP be included in all subcontracts and the number of subcontractors in the chain be minimized to facilitate compliance with EMP requirements.

622. All construction workers, whether formally or informally employed, will need to abide, in their behaviour and work, to directives issued by their employer with regard to environmental, health and safety management.

623. Contractors will have a corporate EHS policy and environmental management certification preferably ISO 14001 (or equivalent) and EHS certification such as ISO45001 or equivalent.

624. The Contractors will include the following dedicated, full-time, site-based staff on their EHS team: (i) Environmental Specialist (including with expertise in Pollution Control including oil management), (ii) Health and Safety Specialist, (iii) Social and community liaison officer, (iv) Labor officer, (v) EHS Site Supervisors, / . Other technical experts were brought into the EHS team as required to address the EMP requirements. The contractor will provide one EHS Supervisor for each sub-project site under construction. This person will be based on-site full-time to ensure the health and safety of all workers and local communities. The EHS Supervisor will act as the main contact for the EHS Team and act on its advice regarding EMP implementation. If there is more than one active site or the construction team at a site comprises more than 50 persons, each EHS Supervisor will be supported by additional full-time, dedicated, on-site Health and Safety steward(s). There should be at least one full-time on-site supervisor/steward for each active site and construction team of up to 50 people. For the construction works a suitable number of Health and Safety Steward(s) will be required depending on how the contractor undertakes the work since the workers may be more dispersed compared to substation works. No work should be undertaken without H&S supervision. If a contractor is awarded more than one contract package, then an entirely separate EHS team is to be employed for each of them. Contractors are to also ensure their subcontractors appoint an EHS representative for each construction site.

625. The EHS Team will be tasked to develop the CSEMP, H&S Plan and subplans in accordance with the EMP and be responsible for ensuring its implementation during the construction activities, supported by enough 24-hour onsite EHS Supervisors/H&S stewards. During construction, the EHS team will continually update the CSEMP, H&S Plan and subplans and oversee and report to PMU on the operation of the Project EMP/CSEMP/H&S Plans throughout the contract period.

Contractor Staffing

626. The Environment Officer will be the Contractor's main focal point for all environmental, social, health and safety issues associated with the Project. They will be a suitably qualified and experienced full-time member of staff and must be on site at least five days per week with an alternative available during periods of annual or sick leave of more than 1-2 days. The required qualifications in the role of Environment Officer are as follows:

- BSc and MSc degree in environmental sciences or related subject.
 - At least 15 years of experience in environmental assessment and management planning including for electrical infrastructure projects
 - At least 10 years of on-site environment supervision, including experience of EMP implementation on at least five construction/electrical infrastructure projects of a similar type, location, size and scale
 - Experience of pollution control including oil, PCB and SF6 management.
627. Specifically, the Environment Officer shall be responsible for the following:
- Identifying any areas of environmental sensitivity to be avoided with the support of field ecologists.
 - Translate mitigation requirements written in the ECC/Project EMP through developing CSEMP/H&S Plans and its sub-plans into practical measures on the ground.
 - Ensure that all contractor management, subcontractor management, and construction workers are fully aware of the environmental sensitivities of the sites and their responsibilities, as outlined in the Project EMP/CSEMP/H&S/ECC (e.g., through back-to-back contract provisions, formal induction and training provision, daily toolbox talks ahead of construction works etc.).
 - Supervise construction works with regular site walkovers and spot-checks (audits) of compliance, take field notes and photographs to demonstrate compliance or non-compliance with the Project EMP/CSEMP/H&S plans and its sub-plans/ECC.
 - Participate in monthly meetings with the PMU, PIAC and ESSU to discuss EMP implementation progress and any EHS concerns,
 - Coordinate completion of quantitative environmental monitoring in accordance with the EMoP requirements.
 - Maintain environmental records e.g., training records, EMoP results, waste records etc.
 - Act as the contractor's GRM focal to keep affected persons informed of work and be available to receive and deal with any grievances at the project site level. The H&S and Social, Community Liaison and Labor Officers will help with managing all social and labor related grievances. They will also act as the GRM focals for workers receiving and recording grievances in the logbook.
 - Prepare weekly environmental checklists and monthly EHS progress reports that shall be submitted to PMU (ESSU) for review. The PIAC will provide a template of the checklist to the contractor, the monthly reports will also include general progress with the project and EMP implementation with photographs, regular site visits and spot checks (audits) undertaken, training provided, environmental incidents, e.g., spills of liquids, health and safety incidents, progress with any environmental initiatives, e.g., energy savings, recycling, community awareness etc., records of any environmental monitoring, conclusions and recommendations (corrective action), impacts on unanticipated changes in projects etc.
628. The qualifications for the H&S Officer are:
- BSc and MSc degree in health and safety or related subjects.
 - National Examination Board in Occupational Safety and Health (NEBOSH) or Institution of Occupational Safety and Health (IOSH) certification or similar.
 - At least 10 years of experience in health and safety risk assessment and management planning including for electrical infrastructure projects
 - At least at least 5 years on-site H&S supervision experience including risk assessment and management planning for at least five construction/electrical infrastructure projects of similar type, location, size, and scale.
629. The main responsibilities of the H&S Officer will be:
- Facilitate H&S Risk Assessments for detailed design and for specific construction work activities.
 - Produce H&S Plans for the construction work with subplans for specific construction work activities.
 - Provide H&S training, including effective daily toolbox training sessions at each work

- site with the support of sufficient numbers of 24-hour onsite EHS Supervisors and H&S Steward(s).
- Participate in monthly meetings with the PMU, PIAC and ESSU to discuss EMP implementation progress and any EHS concerns,
 - Establish a H&S Committee including appropriate representatives from NESCO, PIAC, contractor and subcontractor management, and a representative number of construction workers and hold monthly meetings together with the Social, Community Liaison and Labor Officer to address any concerns,
 - Conduct routine site inspections and issue internal stop notices, if necessary, for unsafe activities.
 - Maintain H&S statistics records for near misses, as well as incidents.
 - Keep records of accidents and report them accordingly with lessons learned to avoid future repeats.
 - Undertake awareness raising activities to make the community aware of the H&S risks posed by the Project.
 - Preparation of weekly H&S checklists and provide H&S input to the Contractor's monthly EHS progress reports.
 - Support the Environment Officer as a GRM focal for workers receiving and recording grievances in the logbook.
630. The qualifications for the Social Community Liaison Officer are:
- BSc degree in social sciences and related expertise.
 - At least 10 years of experience in stakeholder engagement
 - At least at least 5 years of on-site stakeholder engagement experience including experience of construction/electrical infrastructure projects of similar type, location, size, and scale.
631. The main responsibilities of the Social, Community Liaison Officers will be:
- Produce stakeholder engagement plans for the construction work
 - Develop community awareness raising materials and lead on the delivery of community awareness raising activities.
 - Participate in monthly meetings with the PMU, PIAC and ESSU to discuss community awareness and stakeholder engagement progress and any community concerns,
 - Participate in the H&S Committee and hold monthly meetings together with the H&S Officer,
 - Support the Environment Officer as a GRM focal for stakeholders receiving and recording grievances in the logbook.
632. The qualifications for the Labor Officer are:
- BSc degree in social sciences and related expertise.
 - At least 10 years of experience in labor management planning
 - At least 5 years of on-site labor management experience including experience of construction/electrical infrastructure projects of similar type, location, size, and scale.
633. The main responsibilities of the Labor Officer will be:
- Produce labor related management plans for the construction work
 - Ensuring management of construction workers is per national requirements with labor camps and other contractors provided accommodation meeting international good practice standards of ILO.
 - Develop code of conduct and provide code of conduct training, including regular toolbox training sessions at each work site.
 - Maintain labor records including copies of insurances, contracts and working hours, eligibility of construction workers for employment etc.
 - Participate in monthly meetings with the PMU, PIAC and ESSU to discuss EMP implementation progress and any labor concerns,
 - Participate in the H&S/Labor Committee and hold monthly meetings together with the H&S Officer,
 - Preparation of weekly sanitation and welfare facility checklists and provide labor input to contractors monthly EHS progress reports.

- Support the Environment Officer as a GRM focal for workers receiving and recording grievances in the logbook.

10.3 Institutional Structure and Responsibilities

634. The organogram of the PMU, including ESSU, shows Annex 7 which depicts the institutional arrangement - the responsibilities of NESCO's PMU (ESSU) as well as the PIAC and construction contractor(s). The roles and responsibilities of the PMU, ESSU, Consultant Team and contractor for the implementation and monitoring of EMP have been outlined in the following Table.

Table 10.2: Roles and Responsibilities for EMP Implementation

Organizations	Responsibilities
NESCO Management	• Appointing ESSU within NESCO to the project as a constituent part of PMU to support EMP implementation during construction and operation and expanding the staffing inside of two years of loan effectiveness. ESSU staff is currently engineers designated to perform safeguards requirements for ADB. However, ADB requires ESSU to be staffed with suitably qualified and experienced environmental, social, and health and safety matters to ensure implementation of safeguards across NESCO operations. Additional staff or consultants may be engaged by the ESSU full-time or intermittently, as needed to support. • Ensuring adequate management support, budget, staff, and other resources are allocated to satisfactorily implement, supervise, and monitor implementation of the EMP during all phases. • Ensuring that all PMU (ESSU) and O&M staff support and attend all capacity development and training activities provided for them. • Adopting a zero-tolerance approach to H&S and developing and adopting systems, institutional arrangements, and guidelines (standard operating procedures) to ensure compliance with national environment, health and safety, social and labor laws and regulations and international good practice across NESCO operations and its projects. • Once operational, any contractors hired for maintenance works or decommissioning will be supervised and monitored by NESCO (ESSU) with roles and responsibilities being the same as those of the contractors for the construction. • Ensure that monitoring reports (semi-annual during construction and annual during O&M phase) are submitted to ADB up until the project completion report is issued.
PMU	• Ensure effective implementation of construction of the project in accordance with the definitive EMP. Seek the support of ESSU for (i) updating the national EIA for the purposes of Environmental Clearance, and (ii) updating the IEE/EMP subject to ADB review and clearance because of any location, route, design or scope changes.⁴¹ • Ensuring adherence to all applicable national environment, health, safety, and labor laws and regulations in force at the time. • Ensuring adherence to ADB's Safeguard Policy Statement (2009), the related IFC Environment, Health and Safety (EHS), general and power transmission and distribution guidelines (2007) and the ILO Safety and Health in Construction guidelines (2022). • Recruitment and supervision of Project Implementation Assistance Consultant (PIAC). • Incorporating the EMP into the bidding and contract documents before issuing tenders and contract awards. • Reviewing bids to ensure they are in accordance with the EMP requirements prior to contract award. • Ensuring the IEE with at least the executive summary translated into Bangla is disclosed on the NESCO website with hard copy available at construction sites and full translation free of charge into Bangla if it is requested by the public, publishing the key findings and availability through notices boards, leaflets, brochures, or handouts. • Reviewing and approving the contractor's detailed designs as well as CSEMP/H&S Plan and subplans to ensure they incorporate and are in accordance with the EMP requirements.

⁴¹ Per national requirement, an Environmental Impact Statement needs to be prepared to secure an Environmental Clearance Certificate. In the context of ADB SPS 2009 requirement, an IEE is required. The EIA constitutes the IEE in this document and given updates since the EC was granted will be resubmitted to DOE as part of renewing the EC for the Project.

Organizations	Responsibilities
	- Implementing the EMP throughout all phases or, if responsibilities are delegated, supervising, and monitoring its implementation by the contractor with support of ESSU. - Ensuring all necessary national permits and permissions, and any requirements for renewal, are complied with before the commencement of related work, maintain records with copies of all the clearances, permits, licenses, and insurances obtained. - Ensuring the contractor provides adequate training to their subcontractors and all workers including daily EHS toolbox talks and emergency response drills; suggesting topics for the training based on site observations. - Undertaking, with the support of ESSU and PIAC, monthly EHS meetings including site walkover inspection to determine the status of EMP implementation by the contractor during construction as well as random “spot check” site visits to audit their EMP implementation. Minutes of meetings and findings of site walkover inspections will be attached to the EMRs to be submitted to ADB. - Identifying areas for improvement, unsafe acts, and any noncompliance with the EMP by the contractor and/or NESCO staff and instructing corrective actions to be taken by them to bring implementation back on track. - Thoroughly investigating all unanticipated impacts, near-misses, incidents, and chance finds; preparing a detailed incident report where applicable, identifying and instructing on corrective actions particularly to avoid any repetition of near-misses and accidents. - Monitoring and reporting with support of ESSU on EMP implementation include reporting on EMP implementation in quarterly progress reports and preparing semi-annual EMRs for submission to ADB up until the completion of construction, reverting to annual up until the ADB project completion report, or for longer period if it is required by the ADB PCR. - Reporting to ADB of any noncompliance or breaches with ADB safeguard requirements in a timely manner and take corrective actions promptly. Developing and taking all requisite corrective action in case of any noncompliance with the EMP including repair of any property damage and financial compensation (insurance) for health and safety incidents. - Reporting any unanticipated impacts, accidents, and chance finds to ADB within 48 hours of them occurring along with a corrective action plan. - Reporting immediately to ADB any grievances submitted to the GRM upon receipt.
ESSU	Supervising Project Implementation Assistance Consultant Team for the implementation of EMP. Closely coordinate with other concerned agencies, local governments and communities to support implementation of EMP/CSEMP Ensure effective implementation of EMP components not directly tasked to the contractor including components dealing with indirect, induced and cumulative effects, as well as plans and measures for O&M phase. ESSU will review the ES related reports and submit it to PMU for approval.
PIAC	- Appointing one environmental, , one social development (stakeholder engagement and labor) specialist as key team members as well as part-time technical specialists such as field ecologists, to ensure adequate supervision and monitoring of the contractors and capacity development. - Providing a suite of training activities for NESCO staff and contractors in relation to awareness raising on EMP implementation. - Supporting PMU in reviewing contract documents for inclusion of EMP measures before contract award, detailed designs and CSEMP/H&S Plans in accordance with the EMP requirements. - Supervising contractors for EMP implementation and preparing monthly reports to submit to PMU. - Supporting the ESSU in updating the environmental assessment, preparing inputs to quarterly progress reports, semi-annual EMRs for submission to ADB up until the completion of construction.
Contractor	- Preparation and implementation of CSEMP/H&S Plan and subplans which needs to be cleared by PMU and PIAC prior to mobilization. - Ensuring adequate budget, staff and other resources are allocated to comply with and implement the contractor's responsibilities under the EMP and to supervise and monitor the active construction site to protect the environment and ensure the health and safety of all workers and affected communities. - Recruitment of at least one Environmental Officer, one Health and Safety (H&S) Officer, one Social, Community Liaison and Labor Officer, (for), and sufficient 24-hr EHS Supervisors/H&S Steward(s) for each active construction site and construction team of more than 50 persons to be able to undertake regular on-site supervision and monitoring activities before the commencement of works.

Organizations	Responsibilities
	• Implementing of all measures and responsibilities allocated to the EPC Contractor under the EMP for the full duration of the contractor's involvement including maintenance period. • Ensuring adherence to all applicable national and state environment, health, safety, and labor laws and regulations in force at the time. • Ensuring adherence to ADB's Safeguard Policy Statement (2009) and the related IFC Environment, Health and Safety (EHS) general and power transmission and distribution guidelines (2007) and the ILO safety and health in construction (2022) and ILO worker accommodation guidelines. • Whilst NESCO will obtain ECC, the Contractor will be required to obtain any necessary outstanding permits and permissions before the commencement of related work. Copies of all clearances, permits, licenses, and insurances to be kept. • Ensuring the detailed design reflects the EMP requirements; seeking to ensure it has the same or no worse impact than the indicative designs which were assessed in the IEE. • Supporting NESCO to update (as required) the IEE in respect of the detailed design by providing sufficient details to inform a revised project description and any subsequent reassessment of impacts and risks. • Undertaking and documenting a facilitated health and safety (H&S) risk assessment considering for all phases. • Adopting a zero-tolerance approach to H&S on the project, enforce all workers to comply with the H&S requirements of the EMP including the wearing of appropriate PPE on the construction site. • Ensuring that all construction workers including all formal and informal employees and subcontractors understand their responsibilities to implement the EMP and mitigate environmental impacts and risks associated with pre-construction and construction activities. • Providing EHS training for subcontractors, formal and informal construction workers and other personnel as required. • Supporting NESCO in undertaking ongoing consultation and implementing the site-level GRM; in particular, the contractor's GRM Focal shall thoroughly document details of complaints and make its best efforts to resolve the complaints at project site level; all this information is to be included in the contractor's monthly reports to NESCO. • Undertaking environmental monitoring as set out in the Environmental Monitoring Plan (EMoP) during pre-construction and construction and documenting both qualitative and quantitative monitoring ESSU; for quantitative monitoring the contractor is to hire surveyors and accredited, and quality assured, third-party laboratories. • Participating in monthly meetings with the PMU, PIAC and ESSU to discuss EMP implementation progress and any EHS concerns and establishing an H&S Committee who will also meet monthly. • Submitting monthly environmental management reports to NESCO (monthly EMP reports will be stand-alone but included as part of the contractors' monthly progress reports) relating to the work undertaken over the reporting period and documenting the environmental measures including monitoring activities that have been carried out, problems encountered, record data including near misses and accidents, grievances received, and follow-up actions that were taken (or will be taken) to correct the problems. • Informing NESCO immediately in case of any approved detailed design changes or unanticipated environmental impacts occurring during implementation, and as required, provide any information needed to NESCO to enable them to promptly update the national EIA for Environmental Clearance or the IEE/EMP for clearance by ADB before any changes are implemented. • Informing NESCO within 24 hours in case of chance find or accident on site and providing an incident report within 48 hours with corrective action detailing how reoccurrence will be prevented. • Inform NESCO immediately in case of any non-compliance and help them to prepare as necessary a corrective action plan for clearance by ADB. Contractors are required to implement all necessary corrective action requested by NESCO to ensure the project remains in compliance with national and state regulatory requirements, ADB's SPS 2009, the project's loan covenants and EMP requirements.

11 ENVIRONMENT MANAGEMENT PLAN

11.1 Introduction

635. ADB's Safeguard Policy Statement (SPS) 2009 requires that an Environmental Management Plan (EMP) be prepared to ensure construction and operation of the Northwest Distribution Network Modernization Project (the Project) will be undertaken in accordance with its safeguard requirements. This Chapter describes the EMP of the Project. It defines the roles and responsibilities for implementation, supervision and monitoring by NESCO and their Contractors; lists the mitigation measures which are to be implemented to reduce potential impacts and risks to a level acceptable to ADB and national regulatory authorities; gives guidance to the Contractors for preparation of their Contractors' Site Specific Environmental Management Plans (CSEMP) and Health Safety Plan (H&S) under the contract; gives an outline of the monitoring requirements to ensure that the mitigation measures are effective, the capacity development requirements to ensure all parties understand what is required, and, the corresponding cost of the mitigation, supervision and monitoring activities.

636. The primary aim of the EMP is to avoid, minimize, mitigate or compensate for potential negative environmental impacts and risks of the Project by identifying general and site-specific mitigation measures to be followed, and to support positive impacts where possible by enhancement measures. In doing so, it seeks to ensure compliance with (i) ADB's Safeguard Policy Statement 2009 requirements and international good practice as set out in the related International Finance Corporation (IFC) Environment, Health and Safety (EHS), General and Electric Power Transmission and Distribution guidelines, and (ii) applicable national environmental, health and safety requirements, including the international agreements which the Government of Bangladesh (GoB) is a signatory to, as well as having cognizance of the sensitivity of local ecological and human receptors in the project area of influence around each project site.

637. The specific objectives of the EMP are to:

- Summarize the potential negative environmental impacts and risks arising from the various activities associated with the construction, and operation and maintenance phases of the Project.
- Facilitate the implementation of mitigation measures to avoid, minimize, mitigate or compensate all negative impacts and risks from the design phase, through the pre-construction, construction, and the operation and maintenance phases of the Project.
- Define the roles, responsibilities, and obligations of NESCO's Project Implementation Unit (PIU) supported by a Project Implementation Assistance Consultancy (PIAC) and the environmental and social unit (ESSU) of NESCO.
- Set out the roles, responsibilities, and obligations of NESCO's Contractors and other third parties; and
- Define a supervision and monitoring mechanism, plus environmental reporting requirements to check if mitigation measures are effective and ensure the environmental compliance of the Project.

The EMP reflects the legal requirements of the Bangladesh government on environment, health and safety and ADB's Safeguard Policy Statement (2009) including international good practice related to the negative environmental impacts and risks predicted during implementation. It requires adherence to guideline levels and national standards; prohibits the use of PCBs in new transformers and the use of asbestos containing materials in new construction; and requires NESCO and their contractors to undertake community awareness raising activities on the health and safety risks of construction and utility electrical equipment.

638. The generic parts of the EMP are applicable to all contract packages regardless of whether they will follow ADB or NESCO procurement requirements. In addition, work-specific measures are provided for the seven different types of contract package as shown in Table below. Pertinent requirements related to equipment specifications will also need to be

incorporated into the contract packages for the supply of different equipment and other items under the Project.

11.2 EMP Structure

639. The definitive version of the EMP cleared by ADB is the most recent version disclosed on its website, and it is against this that environment safeguards performance will be monitored by ADB. The EMP is a living document and may be updated as appropriate during project implementation, including in the event of any unanticipated impacts including design changes. However, any updated EMP will have to be cleared by ADB and disclosed on the ADB website. Prior to the approval of detailed designs, NESCO will identify and review the implications of any design changes to the Project as assessed in the IEE and consult ADB regarding the need to update the IEE and thus EMP considering any variations put forward by their Contractors. If required, the IEE will be updated by NESCO for review, clearance, and disclosure by ADB before NESCO supported by the Project Implementation Assistance Consultancy (PIAC) approve the Contractors designs and the start of any related works by their Contractors including site establishment and vegetation clearance.

640. NESCO will award 7 contract packages (which involve civil works) following ADB procurement requirements. The Contractors for all civil works packages will be contractually bound to implement the EMP. NESCO will ensure the EMP forms part of all bidding and contract documents for all works contract packages. During design and pre-construction, and construction, the Contractors will be responsible for implementing all relevant measures for the works in their contract package under the supervision of NESCO supported by their PIAC up until handover of the infrastructure to NESCO. Any updates to it will be incorporated through a contract variation into the contract document. The Contractors must always follow the current version of the EMP which is the version disclosed on ADB's website.

641. To ensure the mitigation and monitoring measures are implemented, the environmental monitoring plan (EMoP) will be followed by NESCO supported by their PIAC. Some quantitative monitoring in the EMoP will be delegated to the Contractors to undertake. In addition, in case of any requirement for corrective action due to noncompliance to the EMP during project implementation, these must be identified and immediately reported to ADB. Appropriate corrective action/s will be agreed between ADB and NESCO to bring the project implementation back on track. Corrective actions must be time-bound, budgeted and agreed between ADB and NESCO. The Contractors will cover the costs where corrective action is required due to noncompliance on behalf of the Contractor, its subcontractors or third parties it engages with the EMP.

642. This EMP covers the following:

- the proposed Corrective Action Plan for existing facilities (existing 9 substations, 14 bay extensions, and 7 switching stations) is to be implemented by NESCO.
- the Mitigation Plan, covering the mitigation of impacts and risks (during detailed design and pre-construction; construction, and operation and maintenance), including activity-specific and site-specific mitigation for the 6 no. substation sites (3 GIS and 3 AIS substations), 4 no workshops, 10 no substation augmentation, , Part of this plan is the requirement for Contractors to develop Contractor' Site Specific Environmental Management Plans (CSEMPs), H&S Plan, Biodiversity Management Plan, Tree Plantation Plan with several sub-plans, incorporating general measures described in the Environmental Codes of Practice (ECPs);
- a quantitative EMoP including monitoring parameters and performance indicators.
- implementation arrangements, including (a) the organizational roles and responsibilities for mitigation, supervision, monitoring and reporting; (b) capacity building needs; and (c) an initial cost estimate/EMP budget subject to competitive bidding by contractors and PIAC.

643. In addition, NESCO and their Contractors have a role in implementing the grievance

redress mechanism (GRM) for the facilitation of complaints or queries on project-related activities.

11.3 Potential Impacts and Risks

644. The principal purpose of formulating the EMP is to ensure commitments made are translated into implementation. Potentially significant impacts relate to construction; no significant impacts are anticipated during operation.

645. Impacts and risks are summarized as follows:

- Dust generation affects the public and occupants of properties in immediately adjacent buildings due to land filling, levelling works and transportation of materials.
- Noise and vibration cause disruption and disturbance to the public and occupants of properties in immediately adjacent buildings, especially from piling work, mixture machine, brick crusher and grinding machine.
- Use of hazardous materials or PCB, including transformer oils, batteries, and e-waste, and the generation of solid and hazardous wastes for disposal during both construction and operation.
- Loss of mature trees and scrub vegetation at substation sites include potential disturbance to nesting birds during site clearance and requiring 1:3 compensatory plantation as per Tree Plantation Plan.
- No protected area, forest land, natural habitat, or critical habitat is impacted.
- Occupational health and safety risks for workers include working along busy roads, at height in construction of two storied control buildings and with electrical equipment.
- Community health and safety due to the presence of workers, electrical works in the public domain and along busy roads, due to construction traffic, structural safety of immediately adjacent buildings due to vibrations/noise from piling work etc.

11.4 Existing Facility Corrective Action Plan

646. Site inspections of 9 existing substations and 4 workshops related to the 33/11 kV substation augmentation/renovations components were undertaken during April-May 2024. This environmental audit of the existing substations culminated in a Corrective Action Plan (CAP) to amend any noncompliance. This CAP is contained in tables for 9 renovation/augmentation substations for four existing workshops. NESCO will implement the CAP through the Contractors with support from PIAC. This is not applicable to the new substations.

Table 11-1: Corrective Action Plan of Existing Substations for Augmentation/Renovations

Non- Compliance Issue	Corrective Action Plan for Existing Substations for Augmentation/Renovations	By whom	By when	Budget (source)
	SHORT TERM CORRECTIVE ACTIONS			
General	- Provide all SS managers with EHS awareness training so they can understand and implement the corrective action that is required at each SS - Provide specific training to all SS managers/workers on PCBs to raise awareness of the risks and the need for compliance with national regulations; the National Implementation Plan (NIP) for the Management of Persistent Organic Pollutants (POPs), as well as the Bangladesh Standards and Guidelines for Sludge Management etc. - Provide specific training to all SS managers/workers on PCBs to raise awareness of the risks and the need for compliance with national regulations; the National Implementation Plan (NIP) for the Management of Persistent Organic Pollutants (POPs), as well as the Bangladesh Standards and Guidelines for Sludge Management etc. for the handling and disposal of PCBs.	PIU with support of PIAC	Upon loan effectiveness	NESCO with training expertise provided under PIAC budget
	Submit a status report for each SS confirming the implementation status of short-term corrective action plan to ADB for clearance prior to commencement of any works at the SS in question.	PIU with support of PIAC	Before access to SS given to contractor	NESCO
	Records of all EHS permits applicable to the SS to be made available at the SS site	NESCO SS Engineer with support PIUs/Electrical Sub-Division under guidance of PIU	Before access to SS given to contractor	NESCO
Housekeeping/waste management	- Prohibit any open burning of waste at the SS site. - Dedicated labelled storage areas for materials and segregated waste; ideally storage will be in a locked area, under cover to provide shelter from the elements, having fully enclosed garbage bins for the disposal of municipal solid waste, and where liquids or leachable materials are stored having an impermeable floor bunded to 110% capacity of the volume that is stored. - If an impermeable floor bunded to 110% is not available in the short-term, liquid and leachable materials/waste to be kept on drip trays to provide secondary containment. - Tidy up the SS ensuring all materials and wastes including cables, broken electrical systems, meters, glass and plastic, oils etc. are collected up, segregated, and stored in the designated and labelled storage areas - Remove (and prohibit any further) end-of-life equipment or waste stored outside the SS boundary relocating it to designated and labelled storage areas within the SS. - Remove all end-of-life equipment that has been built up on site to NESCO stores with storage, transport, and disposal as per the GoB regulations following the waste hierarchy	NESCO SS Engineer with support PIUs/Electrical Sub-Division under guidance of PIU	Before access to SS given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	NESCO

Non- Compliance Issue	Corrective Action Plan for Existing Substations for Augmentation/Renovations	By whom	By when	Budget (source)
	Remove all other waste that has built up on site by appropriately licensed waste management company with all storage, transport, and disposal as per GoB regulations Hazardous waste and Ship Breaking Waste Management Rules, 2011 (ii) Solid waste management rules 2021 (iii) E-Waste Management Rules, 2021, and (iv) National 3 R Strategy for waste management, 2010,			
Transformers and oil leakage	- Filled drums (mineral oil) are all to be sealed and labelled with their contents with safety warnings - MSDS to be available at the SS site for all the materials used on site - Collect up and store empty and filled drums (mineral oil) in a locked, undercover, designated storage area, they should either be stored on an impermeable floor bunded to 110% capacity of volume stored, or if not available in the short-term kept on drip trays to provide secondary containment - Defunct transformers prior to being removed from site are to be placed in a designated storage area, they should either be stored on an impermeable floor bunded to 110% capacity of volume stored, or if not available in the short-term kept on drip trays to provide secondary containment - Inventory to be prepared of existing transformers on site, make, model, risk of PCBs and other details including transformer test report, details any maintenance works undertaken, dates oil changes, leakage incidents etc. - Clearly label all transformers as either containing PCBs, at risk of containing PCBs, or PCB-free provided documentary evidence exists. - Carry out inspections and preventive maintenance to minimize oil leakages; ensure valves, nuts and bolts are fully functional and tightly secured, ensure rubber seals of radiators are intact - Existing transformers in a poor state of repair and which are currently leaking oil to be maintained/repared so they are left in good condition - Health and safety risk assessment for exposure of staff to PCBs to be undertaken before maintenance/repair work is undertaken on any existing SS transformers - Clean up all existing oil spill, excavate any contaminated soil and send for disposal (as hazardous waste) using appropriately licensed waste management company with all storage, transport, and disposal as per the Hazardous waste and Ship Breaking Waste Management Rules, 2011 Hazardous waste and Ship Breaking Waste Management Rules, 2011 - Make available spill management materials (sorbent pads, loose sorbent material, sand, etc.) next to the storage area for immediately soaking up any leaks or spills that do accidentally occur. - Stored transformers must first be moved to an undercover, impermeable 110% bunded storage area, (with separate storage areas for potential PCB containing transformers, non-reparable transformers as well under repair transformers); - Comprehensive soil sampling undertaken to inform a strategy for remediation, anticipated to involve either the removal of soil off-site as approved by DOE to take	NESCO SS Engineer with support PIUs/Electrical Sub-Division under guidance of PIU	Before access to SS given to contractor, or if including corrective action in contract this is to be completed by EPC contractor before they commence works	NESCO

Non- Compliance Issue	Corrective Action Plan for Existing Substations for Augmentation/Renovations	By whom	By when	Budget (source)
	hazardous material or encapsulation if piling can be avoided. The guidelines of UNIDO must be followed in handling all transformers since due to recycling of oil no one can be guaranteed PCB free; and the contractor should test all transformers removed by the project.			
Escape of SF6	- Inventory to be prepared of all SF6 containing equipment on site, their make and model, volume of SF6 contained, details of repair works undertaken, dates of SF6 replenishment, leakage incidents etc. - Provide SF6 leakage detection equipment at all SS supporting SF6 containing equipment. - Carry out inspections and preventive maintenance to minimize SF6 leakages.	NESCO SS Engineer with support PIUs/Electrical Sub-Division under guidance of PIU	Before access to SS given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	NESCO
Noise, EMF, lighting, and ventilation	- Defunct bulbs/lights to be replaced - Provide adequate natural and/or artificial lighting levels to meet the WBG EHS Guidelines on Occupational H&S (<i>Table 2.3.3. Minimum Limits for Workplace Illumination Intensity</i>) within control rooms, toilets, stairways, and other areas having regular staff movements	NESCO SS Engineer with support PIUs/Electrical Sub-Division under guidance of PIU	Before access to SS given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	NESCO
First aid equipment	- Make available fully stocked, in-date first aid kit in a prominent, signed position - Provide eye wash station and water supply to shower located near the storage areas for fuel/oil/chemicals.	NESCO SS Engineer with support PIUs/Electrical Sub-Division under guidance of PIU	Before access to SS given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	NESCO
Fire safety equipment	- Provide sand buckets, full of sand, placed in a prominent, signed location near to fire-risk locations such as transformers and oil storage areas. - Make available fire extinguishers (including for oil and electric fires) in a prominent, signed location near to fire-risk locations such as transformers and oil storage areas with service and expiration dates clearly labelled. - Expired/exhausted fire extinguishers to be refilled/replaced so all are in date.	NESCO SS Engineer with support PIUs/Electrical Sub-Division under guidance of PIU	Before access to SS given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	NESCO
Community H&S	- Doors to control rooms to be kept shut during both day and night. - Security persons are to be deployed at all SS for 24x7 period with rotation/shifts. Number of security guards is to be determined by NESCO based on the size/area of the SS and adjacent land use. - Dedicated shelter to be provided at the site entrance for use by any security guards, shielding them from rain, wind, and extreme (hot and cold) temperatures. - Switch yard area/transformers are also to be fenced having a locked gate with visual and written warning signages including the ISO 7010 Hazard Type: Electrical Symbol warning of the risk of electrocution.	NESCO SS Engineer with support PIUs/Electrical Sub-Division under guidance of PIU	Before access to SS given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	NESCO

Non- Compliance Issue	Corrective Action Plan for Existing Substations for Augmentation/Renovations	By whom	By when	Budget (source)
	- Safety signage with large and colorful display to be placed along SS boundary and at gate with visual and written warning signages including the ISO 7010 Hazard Type: Electrical Symbol warning of the risk of electrocution. - Safety sign to be placed to make local community aware that the SS site is out of bounds.			
Handling emergencies	- Identify and install emergency exit signage on all emergency exits - Keep clear all the emergency exits, remove blockages due to storage of end-of-life equipment - Provide first aid posters including first aid for electrocution incident - Prominently post a list of doctors/emergency health/fire station contacts (names/locations/phone numbers) list in case of emergency - Provide posters on fire safety - Establish and maintain an incident logbook	NESCO SS Engineer with support PIUs/Electrical Sub-Division under guidance of PIU	Before access to SS given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	NESCO
H&S of staff	- Ensure H&S risk assessment is completed for the SS operation and maintenance works undertaken and that appropriate H&S management actions identified (copy of risk assessment and the action plan to be kept on site) - Ensure SS has adequate drainage to avoid damp and wet conditions - Provide storm drainage at the SS with oil-water separator on all drains	NESCO SS Engineer with support PIUs/Electrical Sub-Division under guidance of PIU	Before access to SS given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	NESCO
Old Equipment	A bundled storage area for old equipment / replaced equipment will be established. Must be able to contain at least 1500 liters of oil and be large enough to store a 20-ton transformer	NESCO SS Engineer with support PIUs/Electrical Sub-Division under guidance of PIU	Before access to SS given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	NESCO
Sanitation and welfare facilities	- Provide potable drinking water supply meeting GoB drinking water standards (regular testing of drinking water is included in IEE EMoP scope) - For all existing toilets ensure adequate lightning, repairing of doors, locks, and latches provided as well as hand washing facilities with soap and water - Cleaning of existing toilets daily, use of disinfectants and floor cleaners - Ensure all sources of wastewater connected to septic tank - Ensure that septic tanks are well maintained - Installing a soak away for disposal of the septic tank wastewater, no untreated wastewater should be disposed of to surface water or ground - For the welfare of SS staff during their shifts provide a dedicated cooking area / clean eating area / rest area for staff on-site that meets GoB and ILO worker accommodation requirements	NESCO SS Engineer with support PIUs/Electrical Sub-Division under guidance of PIU	Before access to SS given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	NESCO
	LONG-TERM CORRECTIVE ACTIONS			

Non- Compliance Issue	Corrective Action Plan for Existing Substations for Augmentation/Renovations	By whom	By when	Budget (source)
General	- Develop and adopt corporate wide EHS policy and manuals/procedures (SOP) for SS operation - SOP developed to include guidelines for pollution prevention including management or handling procedures for oil spills, spillage, runoff from leaks off equipment, and waste management, including for hazardous waste management - SOP developed to include guidelines for H&S management including emergency preparedness - Ensure copy of EHS policy and SOP available at all SS - Provide SS managers/workers on training with respect implementation of the SOP - Submit a status report for each SS confirming the implementation status of long-term corrective action plan to ADB for clearance prior to commissioning of the SS in question by the contractor	PIU with support of PIAC	Prior to commissioning by the EPC contractor	NESCO with guidance of ADB TA Consultant in preparing the SOP
Housekeeping/waste management	In SS where a locked, under cover material and waste storage area with an impermeable floor bunded to 110% capacity of the volume stored are not available construct a storage of fuel/oil/chemicals and solid/hazardous waste	NESCO SS Engineer with support PIUs/Electrical Sub-Division under guidance of PIU (either as a separate undertaking or to be included in the scope of EPC contract)	Prior to commissioning by the contractor	NESCO
Transformers and oil leakage	- In SS where existing transformers are at risk of containing PCBs ensure they are tested (such testing is included in IEE EMoP scope) - For those transformers confirmed as containing PCBs ensure these are dechlorinated or removed from site with storage, transport, and disposal as per the Hazardous waste and Ship Breaking Waste Management Rules, 2011, Solid waste management rules 2021, and E-waste management rules 2021 and National 3 R strategy for waste management, 2010the Hazardous waste and Ship Breaking Waste Management Rules, 2011, Solid waste management rules 2021, and E-waste management rules 2021 and National 3 R strategy for waste management, 2010 - In SS, where bund of 110% capacity extending beyond the transformer footprint is not available, retrofit such a bund to existing transformers - Stored transformers must first be moved to an undercover, impermeable 110% bunded storage area, (with separate storage areas for potential PCB containing transformers, non-reparable transformers as well under repair transformers); - Comprehensive soil sampling undertaken to inform a strategy for remediation, anticipated to involve either the removal of soil off-site as approved by DOE to take hazardous material or encapsulation if piling can be avoided. - The guidelines of UNIDO must be followed in handling all transformers since due to recycling of oil no one can be guaranteed PCB free; and the contractor should test all transformers removed by the project. - The guidelines of UN Industrial Development Organization (UNIDO) must be	NESCO SS Engineer with support PIUs/Electrical Sub-Division under guidance of PIU (either as a separate undertaking or to be included in the scope of EPC contract)	Prior to commissioning by the contractor	NESCO

Non- Compliance Issue	Corrective Action Plan for Existing Substations for Augmentation/Renovations	By whom	By when	Budget (source)
	followed in handling all transformers since due to recycling of oil none can be guaranteed PCB free; and the contractor should test all transformers removed by the project. - For substations, waste disposal is a concern, except for waste oil which is taken by a contractor all solid and hazardous waste is disposed of to the municipalities who do not have a sanitary landfill meaning it is open dumped. Oily sludge generated may be collected that cannot be recycled must be disposed of to hazardous waste management to avoid it being open dumped. - It is recommended NESCO establish hazardous waste storage areas at the substation and an MOU with O&M hazardous waste management organization, Stored transformers must first be moved to an undercover, impermeable 110% bunded storage area, (with separate storage areas for potential PCB containing transformers, non-reparable transformers as well under repair transformers). - Comprehensive soil sampling undertaken to inform a strategy for remediation, anticipated to involve either the removal of soil off-site for as approved by DOE to take hazardous material or encapsulation if piling can be avoided. - The guidelines of UNIDO must be followed in handling all transformers since due to recycling of oil no one can be guaranteed PCB free; and the contractor should test all transformers removed by the project. - The guidelines of UN Industrial Development Organization (UNIDO) must be followed in handling all transformers since due to recycling of oil none can be guaranteed PCB free; and the contractor should test all transformers removed by the project. - For substations, waste disposal is a concern, except for waste oil which is taken by a contractor all solid and hazardous waste is disposed of to the municipalities who do not have a sanitary landfill meaning it is open dumped. Oily sludge generated may be collected that cannot be recycled must be disposed of hazardous waste management to avoid it being open dumped. - It is recommended NESCO establish hazardous waste storage areas at the substation and an MOU with an O&M hazardous waste management organization, - Stored transformers must first be moved to an undercover, impermeable 110% bunded storage area, (with separate storage areas for potential PCB containing transformers, non-reparable transformers as well as under repair transformers). - Comprehensive soil sampling undertaken to inform a strategy for remediation, anticipated to involve either the removal of soil off-site as approved by DOE to take hazardous material or encapsulation if piling can be avoided. - The guidelines of UNIDO must be followed in handling all transformers since due to recycling of oil no one can be guaranteed PCB free; and the contractor should test all transformers removed by the project.			

Non- Compliance Issue	Corrective Action Plan for Existing Substations for Augmentation/Renovations	By whom	By when	Budget (source)
Escape of SF6	Install SF6 leakage warning alarm for existing equipment containing SF6	NESCO SS Engineer with support PIUs/Electrical Sub-Division under guidance of PIU (either as a separate undertaking or to be included in the scope of EPC contract)	Prior to commissioning by the contractor	NESCO
Noise, EMF, lighting, and ventilation	- Control panel and other equipment within SS control buildings to be rearranged and placed in a manner to maximizing natural ventilation and light - Switch yard lighting system to be improved so all areas well-lit at night when required	NESCO SS Engineer with support PIUs/Electrical Sub-Division under guidance of PIU (either as a separate undertaking or to be included in the scope of EPC contract)	Prior to commissioning by the contractor	NESCO
Fire safety equipment	Ensure automatic fire alarm, fire suppression systems and firewalls installed	NESCO SS Engineer with support PIUs/Electrical Sub-Division under guidance of PIU (either as a separate undertaking or to be included in the scope of EPC contract)	Prior to commission by the EPC contractor	NESCO
Handling emergencies	- Ensure a SS specific emergency preparedness plan is developed including the communication system and protocols for response to a fire, earthquake, flood, medical emergency etc. and followed for SS operation with regular fire drills and alarm tests conducted (copy kept on site) - Ensure all SS workers receive basic first aid and firefighting training with annual refreshers - Ensure that at least one staff at SS is fully trained as a first aider and fire marshal	NESCO SS Engineer with support PIUs/Electrical Sub-Division under guidance of PIU	Prior to commissioning by the contractor	NESCO
Drainage	- Ensure SS has adequate drainage to avoid damp and wet conditions - Provide storm drainage at the SS with oil-water separator on all drains	NESCO SS Engineer with support PIUs/Electrical Sub-Division under guidance of PIU	Prior to commissioning by the contractor	NESCO

Table 12.4: Corrective Actions for Existing Workshops

Non- Compliance Issue	Corrective Action at Existing Workshop	By whom	By when	Budget (source)
General	- Provide Workshop managers with EHS awareness training so they can understand and implement the corrective action that is required at the Workshop - Provide specific training to Workshop managers/workers on PCBs to raise awareness of the risks and the need for compliance with national regulations; the Regulation of Use, Handling and Disposal of Polychlorinated Biphenyls and the Hazardous and Other Wastes (Management and Transboundary Movement) Rules.	PIU with support of PIAC	Upon loan effectiveness	NESCO with training expertise provided under PIAC budget
	Submit a status report for Workshop confirming the implementation status of short-term corrective action plan to ADB for clearance prior to commencement of any works at the Workshop in question	PIU with support of PIAC	Before access to Workshop given to contractor	NESCO

Non- Compliance Issue	Corrective Action at Existing Workshop	By whom	By when	Budget (source)
	Records of EHS permits applicable to the Workshop to be made available at the Workshop site	NESCO Workshop Engineer with support of PIU	Before access to Workshop given to contractor	NESCO
Housekeeping/waste management	- Prohibit any open burning of waste at the Workshop site - Dedicated labelled storage areas for materials and segregated waste; ideally storage will be in a locked area, under cover to provide shelter from the elements, having fully enclosed garbage bins for the disposal of municipal solid waste - If an impermeable floor bunded to 110% is not available in the short-term, liquid and leachable materials/waste to be kept on drip trays to provide secondary containment - Tidy up the Workshop ensuring materials and waste including cables, broken, meters, glass and plastic, oils etc. are collected up, segregated, and stored in the designated and labelled storage areas - Remove (and prohibit any further) end-of-life equipment or waste stored outside the Workshop boundary relocating it to designated and labelled storage areas within the Workshop - Remove end-of-life equipment that has built up on site to NESCO stores with storage, transport, and disposal as per the GoB regulations following the waste hierarchy - Remove other waste that has built up on site by appropriately licensed waste management company with storage, transport, and disposal as per GoB regulations [including but not limited to the (i) Hazardous and Other (Management and Transboundary Movement) and Amendment, Rules, 2019 (ii) E-Waste Management Rules, 2016, and (iii) Plastic Waste Management Rules, 2016] whilst following the waste hierarchy	NESCO Workshop Engineer with support of PIU	Before access to Workshop given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	NESCO
Transformers and oil leakage	- Waste Filled drums (mineral oil) are to be sealed and labelled with their contents with safety warnings - MSDS to be available at the Workshop site for the materials used on site - Collect up and store empty and filled drums (mineral oil) in a locked, undercover, designated storage area, they should either be stored on an impermeable floor bunded to 110% capacity of volume stored, or if not available in the short-term kept on drip trays to provide secondary containment - Defunct transformers prior to being removed from site are to be placed in a designated storage area, they should either be stored on an impermeable floor bunded to 110% capacity of volume stored, or if not available in the short-term kept on drip trays to provide secondary containment - Inventory to be prepared of existing transformers on site, make, model, risk of PCBs and other details including transformer test report, details any maintenance works undertaken, dates oil changes, leakage incidents etc. - Clearly label transformers as either containing PCBs, at risk of containing PCBs, or PCB-free documentary evidence exists. - Carry out inspections and preventive maintenance to minimize oil leakages; ensure valves, nuts and bolts are fully functional and tightly secured, ensure rubber seals of radiators are intact - Health and safety risk assessment for exposure of staff to PCBs to be undertaken before maintenance/repair work is undertaken - Clean up existing oil spill, excavate any contaminated soil and send for disposal (as hazardous	NESCO Workshop Engineer with support of PIU	Before access to Workshop given to contractor, or if including corrective action in contract this is to be completed by EPC contractor before they commence works	NESCO

Non- Compliance Issue	Corrective Action at Existing Workshop	By whom	By when	Budget (source)
	waste) using appropriately licensed waste management company with storage, transport, and disposal as per Hazardous waste and Ship Breaking Waste Management Rules, 2011, Solid waste management rules 2021, and E-waste management rules 2021 and National 3 R strategy for waste management, 2010, etc. • Stored transformers must first be moved to an undercover, impermeable 110% bunded storage area, (with separate storage areas for potential PCB containing transformers, non-reparable transformers as well under repair transformers. • Comprehensive soil sampling undertaken to inform a strategy for remediation, anticipated to involve either the removal of soil off-site as approved by DOE to take hazardous material or encapsulation if piling can be avoided. • To ensure a “clean” site for the works the remediation must be completed before any other works for the workshops commenced. NESCO is currently working on the project funded by the UN Industrial Development Organization (UNIDO) under supervision of the GOB’s Department of Environment to identify transformers containing PCBs to be phased out by 31 December 2025 under the Stockholm Convention. • Following UNIDO criteria and on-site chlorine testing several transformers have been marked as being a PCB risk, most at-risk transformers are stored on open ground in the workshops although some may still be in service. • The guidelines of UN Industrial Development Organization (UNIDO) must be followed in handling all transformers since due to recycling of oil none can be guaranteed PCB free; and the contractor should test all transformers removed by the project. • Soil samples have been sent for PCB laboratory analysis and results are expected in September-October 2024. If PCB contamination is confirmed, the transformers will need to be dechlorinated and/or disposed of by 31 December 2025 with the support of DOE who are currently examining available options. If PCB transformers are found, DOE is also considering the need to undertake soil sampling at the affected sites. If at-risk transformers are found in the workshop no work is started until DOE has concluded its work. If the works must be expatriated the area where the PCB transformers are stored must be marked, and soil samples sent abroad for PCB testing by the contractor to inform the strategy for remediation. • For the workshops, waste disposal is a concern, except for waste oil which is taken by a contractor all solid and hazardous waste is disposed of to the municipalities who do not have a sanitary landfill meaning it is open dumped. Oily sludge generated may be collected that cannot be recycled must be disposed of to hazardous waste management to avoid it being open dumped. • It is recommended NESCO establish hazardous waste storage areas at the workshops and an MOU with an O&M hazardous waste management organization. Stored transformers must first be moved to an undercover, impermeable 110% bunded storage area, (with separate storage areas for potential PCB containing transformers, non-reparable transformers as well under repair transformers. • Comprehensive soil sampling undertaken to inform a strategy for remediation, anticipated to involve either the removal of soil off-site as approved by DOE to take hazardous material or			

Non- Compliance Issue	Corrective Action at Existing Workshop	By whom	By when	Budget (source)
	encapsulation if piling can be avoided. - To ensure a “clean” site for the works the remediation must be completed before any other works for the workshops commenced. NESCO is currently working on the project funded by the UN Industrial Development Organization (UNIDO) under supervision of the GOB’s Department of Environment to identify transformers containing PCBs to be phased out by 31 December 2025 under the Stockholm Convention. - Following UNIDO criteria and on-site chlorine testing several transformers have been marked as being a PCB risk, most at-risk transformers are stored on open ground in the workshops although some may still be in service. - The guidelines of UN Industrial Development Organization (UNIDO) must be followed in handling all transformers since due to recycling of oil none can be guaranteed PCB free; and the contractor should test all transformers removed by the project. - Soil samples have been sent for PCB laboratory analysis and results are expected in September-October 2024. If PCB contamination is confirmed, the transformers will need to be dechlorinated and/or disposed of by 31 December 2025 with the support of DOE who are currently examining available options. If PCB transformers are found, DOE is also considering the need to undertake soil sampling at the affected sites. If at-risk transformers are found in the workshop no work is started until DOE has concluded its work. If the works must be expatriated the area where the PCB transformers are stored must be marked, and soil samples sent abroad for PCB testing by the contractor to inform the strategy for remediation. - For the workshops, waste disposal is a concern, except for waste oil which is taken by a contractor all solid and hazardous waste is disposed of to the municipalities who do not have a sanitary landfill meaning it is open dumped. Oily sludge generated may be collected that cannot be recycled must be disposed of to hazardous waste management to avoid it being open dumped. - It is recommended NESCO establish hazardous waste storage areas at the workshops and an MOU with an O&M hazardous waste management organization. Make available spill management materials (sorbent pads, loose sorbent material, sand, etc.) next to the storage area for immediately soaking up any leaks or spills that do accidentally occur - Stored transformers must first be moved to an undercover, impermeable 110% bunded storage area, (with separate storage areas for potential PCB containing transformers, non-reparable transformers as well under repair transformers); - Comprehensive soil sampling undertaken to inform a strategy for remediation, anticipated to involve either the removal of soil off-site as approved by DOE to take hazardous material or encapsulation if piling can be avoided. - The guidelines of UNIDO must be followed in handling all transformers since due to recycling of oil no one can be guaranteed PCB free; and the contractor should test all transformers removed by the project.			
Noise, lighting, and ventilation	- Defunct bulbs/lights to be replaced - Provide adequate natural and/or artificial lighting levels to meet the WBG EHS Guidelines on Occupational H&S (<i>Table 2.3.3. Minimum Limits for Workplace Illumination Intensity</i>) within work	NESCO Workshop Engineer with	Before access to Workshop given to contractor, or if including	NESCO

Non- Compliance Issue	Corrective Action at Existing Workshop	By whom	By when	Budget (source)
	area, toilets, stairways, and other areas having regular staff movements	support of PIU	corrective action in contract this is to be completed by contractor before they commence works	
First aid equipment	- Make available fully stocked, in-date first aid kit in a prominent, signed position - Provide eye wash station and water supply to shower located near the storage areas for fuel/oil/chemicals	NESCO Workshop Engineer with support of PIU	Before access to Workshop given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	NESCO
Fire safety equipment	- Provide sand buckets, full of sand, placed in a prominent, signed location near to fire-risk locations such as transformers and oil storage areas - Make available fire extinguishers in a prominent, signed location near to fire-risk locations such as transformers and oil storage areas with service and expiration dates clearly labelled. - Exhaust fire extinguishers to be refilled/replaced so are in date.	NESCO Workshop Engineer with support of PIU	Before access to Workshop given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	NESCO
Community H&S	Safety signage with large and colorful display to be placed along Workshop boundary and at gate with visual and written warning signages including the ISO 7010 Hazard Type: Electrical Symbol warning of the risk of electrocution.	NESCO Workshop Engineer with support of PIU	Before access to Workshop given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	NESCO
Handling emergencies	- Identify and install emergency exit signage on emergency exits - Keep clear the emergency exits, remove blockages due to storage of end-of-life equipment - Provide first aid posters including first aid for electrocution incident - Prominently post a list of doctors/emergency health/fire station contacts (names/locations/phone numbers) list in case of emergency - Provide posters on fire safety - Establish and maintain an incident logbook	NESCO Workshop Engineer with support of PIU	Before access to Workshop given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	NESCO
H&S of staff	- Ensure H&S risk assessment is completed for the Workshop operation and maintenance works undertaken - Ensure Workshop has adequate drainage to avoid damp and wet conditions - Provide storm drainage at the Workshop with oil-water separator on drains	NESCO Workshop Engineer with support of PIU	Before access to Workshop given to contractor, or if including corrective action in	NESCO

Non- Compliance Issue	Corrective Action at Existing Workshop	By whom	By when	Budget (source)
			contract this is to be completed by contractor before they commence works	
Old Equipment	A bounded storage area for old equipment will be established.	NESCO Workshop Engineer with support of PIU	Before access to Workshop given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	NESCO
Sanitation and welfare facilities	- Provide potable drinking water supply meeting GoB drinking water standards (regular testing of drinking water is included in IEE EMoP scope) - For existing toilets ensure adequate lightening, repairing of doors, locks, and latches provided as well as hand washing facilities with soap and water - Cleaning of existing toilets daily, use of disinfectants and floor cleaners - Ensure sources of wastewater connected to septic tank - Ensure that septic tanks are well maintained - Install soak away for disposal of the septic tank wastewater, no untreated wastewater should be disposed of to surface water or ground - For the welfare of Workshop staff during their shifts provide a dedicated cooking area / clean eating area / rest area for staff on-site that meets GoB and ILO worker accommodation requirements	NESCO Workshop Engineer with support of PIU	Before access to Workshop given to contractor, or if including corrective action in contract this is to be completed by contractor before they commence works	NESCO
	LONG-TERM CORRECTIVE ACTIONS			
General	- Develop and adopt corporate wide EHS policy and manuals/procedures (SOP) for Workshop operation - SOP developed to include guidelines for pollution prevention including management or handling procedures for oil spills, spillage, runoff from leaks of equipment, and waste management, including for hazardous waste management - SOP developed to include guidelines for H&S management including emergency preparedness - Ensure copy of EHS policy and SOP available at Workshop - Provide Workshop managers/workers with training with respect to implementation of the SOP - Submit a status report for Workshop confirming the implementation status of long-term corrective action plan to ADB for clearance prior to commissioning of the Workshop in question by the contractor	PIU with support of PIAC	Prior to commission by the EPC contractor	NESCO with guidance of ADB TA Consultant in preparing the SOP
Housekeeping/waste management	In the Workshop where a locked, under cover material and waste storage area with an impermeable floor bunded to 110% capacity of the volume stored are not available	NESCO Workshop Engineer with support of PIU (either as a	Prior to commissioning by the contractor	NESCO

Non- Compliance Issue	Corrective Action at Existing Workshop	By whom	By when	Budget (source)
		separate undertaking or to be included in the scope of EPC contract)		
Transformers and oil leakage	- In Workshop where stored transformers are at risk of containing PCBs ensure they are tested (such testing is included in IEE EMoP scope) - For those transformers confirmed as containing PCBs ensure these are dechlorinated or removed from site with storage, transport, and disposal as per the Hazardous waste and Ship Breaking Waste Management Rules, 2011, Solid waste management rules 2021, and E-waste management rules 2021 and National 3 R strategy for waste management, 2010, etc - Stored transformers must first be moved to an undercover, impermeable 110% bunded storage area, (with separate storage areas for potential PCB containing transformers, non-reparable transformers as well under repair transformers); - Comprehensive soil sampling undertaken to inform a strategy for remediation, anticipated to involve either the removal of soil off-site as approved by DOE to take hazardous material or encapsulation if piling can be avoided. - The guidelines of UNIDO must be followed in handling all transformers since due to recycling of oil no one can be guaranteed PCB free; and the contractor should test all transformers removed by the project.	NESCO Workshop Engineer with support of PIU (either as a separate undertaking or to be included in the scope of EPC contract)	Prior to commissioning by the EPC contractor	NESCO
Noise, lighting, and ventilation	- Workshop machinery to be rearranged and placed in a manner to maximize natural ventilation and light - Workshop yard lighting system to be improved so areas well-lit at night when required	NESCO Workshop Engineer with support of PIU (either as a separate undertaking or to be included in the scope of EPC contract)	Prior to commissioning by the contractor	NESCO
Fire safety equipment	Ensure proper number of fire extinguishers are available	NESCO Workshop Engineer with support of PIU (either as a separate undertaking or to be included in the scope of EPC contract)	Prior to commission by the EPC contractor	NESCO
Handling	Ensure a Workshop specific emergency preparedness plan is developed including the	NESCO	Prior to commissioning	NESCO

Non- Compliance Issue	Corrective Action at Existing Workshop	By whom	By when	Budget (source)
emergencies	communication system and protocols for response to a fire, earthquake, flood, medical emergency etc. and followed for Workshop operation with regular fire drills and alarm tests conducted (copy kept on site) • Ensure workers receive basic first aid and firefighting training with annual refreshers • Ensure that at least one staff at Workshop is fully trained as a first aider and fire marshal	Workshop Engineer with support of PIU	by the contractor	
Drainage	• Ensure Workshop has adequate drainage to avoid damp and wet conditions • Provide storm drainage at the Workshop with oil-water separator on drains	NESCO Workshop Engineer with support of PIU	Prior to commissioning by the contractor	NESCO

11.4.1 Responsibility for CAP Implementation

647. NESCO management and substation in-charge will be responsible for applying any corrective actions under the guidance of the PIU and the PIAC unless PIU delegates them to the respective Contractor through the scope of the contract before access is granted for works located within existing substations. NESCO will be responsible for submitting a report confirming the completion of corrective actions to ADB for clearance prior to the Contractor being given access to the existing substation in question to undertake works including site establishment.

648. The Contractor for those contract packages involving existing substations will be responsible for implementing corrective actions that are delegated to them by NESCO as part of their contractual obligations, in addition to the requirements of the EMP mitigation plan which are to be followed whilst undertaking works in existing substations.

11.5 Contractor's Site Specific Environmental and Management Plans (CSEMPs)

649. The Contractor will be responsible for the development of Contractor's site-specific Environmental Management Plans (CSEMPs) and H&S Plans, setting out in detail how it will implement the measures listed in the Mitigation Plan and other commitments NESCO has made in this Project EMP. The general measures which will be included within them are described in the ECPs. Contractor will need to obtain PIU approval of its CSEMP and H&S Plan prior to the commencement of works which includes site establishment and vegetation clearance. PIAC will support the PIU in reviewing and approving the CSEMPs, H&S, Biodiversity Management Plan and Tree Plantation Plan. NESCO will need to ensure the CSEMP, H&S Plan and other subplans mirror and do not conflict with the Project EMP requirements and any requirement of national laws and regulations. The CSEMP and H&S Plan will be a living document to be updated as required and reapproved by NESCO if construction methods or site conditions change or in response to an accident, near miss etc.

650. The key subplans of the CSEMP which will be prepared and implemented by Contractor will include the H&S Plan:

Demolition and Construction Method Statements describing how each activity involved in demolition (as applicable) and construction works will be undertaken (schedule, access routes, anticipated traffic volumes, and working methods) with respect to ensuring compliance with the Project EMP requirements.

Temporary Facilities Plan, including details and the layout of the various temporary construction facilities required including any access roads, offices and workshops, material storage, laydown areas, refueling areas, waste storage areas, rest areas, sanitation and welfare facilities, construction labor camps or overnight accommodation.

Pollution Prevention Plan, to be prepared with reference to the IFC EHS Guideline environmental requirements including those on Construction and Demolition.⁴² This plan will detail the measures to control noise and vibration and, if required, include separate demolition, piling and blasting management plans. Measures to control dust and air emissions will be included and details of how water resources will be protected, how water discharges including spills and leaks, surface water runoff, bentonite slurry and concrete wash water will be managed. The procedures and designated areas for the environmentally safe and sound storage, transportation and use of fuel, oil, and other hazardous substances, as applicable, will be described. Further, this plan will cover the issue of SF6 management.

Spoil Management Plan on the management of excess spoils from various excavation, site

⁴² https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/ehs-guidelines

levelling and cut and fill activities. Management of drilling and piling muds.

The Piling Management Plan specifically addresses noise and the management of piling mud, for all activities where piling is required. The piling management plan will include measures to avoid water pollution from the use of any bentonite clay slurry - adequate bunding must be provided around piling activities to contain piling mud and decanting ponds will need to be fully enclosed to avoid spills or leaks to adjacent land. Piling fluid must not be intentionally or unintentionally disposed of to surface water untreated or be allowed to damage adjacent land. Sediment laden surface water runoff and discharges must be disposed of to open ground for percolation or passed through a sedimentation tank having adequate settlement tank, to obtain at least 50 mg/l TSS, before being allowed to enter surface water. Use of piling mud treatment equipment to be considered where space constraints exist preventing adequate settlement.

Waste Management Plan, detailing the measures required for the environmentally safe and sound collection, segregation, storage, transportation, and disposal of all solid and hazardous waste referring to the IFC EHS Guidelines on Waste Management and Construction and Demolition. The management of sanitary wastewater will be described. The plan will itemize how wastes can be reduced and recycled - disposal will be the last resort - For example, food waste can be composted, Plastic waste – can be reused and recycled, Other domestic waste e.g., cans, paper etc. much of this will be able to be recycled, Demolition waste e.g., bricks, concrete etc. a lot of which can be reused during construction or by others for their construction, Metals – can be recycled, Wood – can be recycled, and Hazardous used oil can be reused providing that it is taken by suitably licensed vendors to do so. It will identify the suitably licensed reuse/recycling vendors and waste management facilities for the disposal of solid and hazardous wastes to be used by the Contactor. Use of open dump sites for disposal is not permitted and for this reason municipalities must not be relied upon by the Contractor for the disposal of wastes.

Drinking Water Supply and Sanitation and Welfare Plan. This Plan will detail measures to ensure adequate water supply and sanitation and welfare provisions for the temporary construction facilities, including offices, rest areas, washrooms, and construction labor camps or overnight accommodation in order not to cause shortages and/ or contamination of existing drinking water sources and to ensure the safe and healthy working conditions for the laborers.

Health and Safety Plan. The H&S Plan will include:

Safety Training Program – to provide general and specialized training courses for all workers on the site and at all levels of supervision and management. General courses will consist of (i) an initial Safety Induction which all workers will be required to attend prior to being allowed to work on site, all visitors and project workers who have not attended the safety induction course must be always accompanied by inducted workers when within the working area and (ii) periodic safety training refreshers covering similar topics to induction, conducted not less than once every six months. All subcontractor workers will be required to participate in relevant training courses appropriate to the nature, scale, and duration of the subcontract. Since they have heightened risks, only trained workers must undertake certain activities e.g., working at height, working in confined spaces, working with electricity etc. Workers must have attended such training before they are involved in relevant work and the contractor must either offer an internal training course or organize an external specialist training course for attendance. Workers must have a training record of attending a suitable training course. Untrained workers will not be permitted to work at height, enter confined spaces, work with live electricity etc.

Medical Check-Up/Health Surveillance – of workers fitness, eyesight, hearing, respiratory health, and communicable and noncommunicable diseases before works commence; and then repeated every six months by the contractor during construction. Only workers who have passed their fitness test and have the requisite medical clearance must undertake certain

activities e.g., working with electricity etc.

Safety Meetings – to be conducted monthly during construction phase by NESCO. During construction the meetings will require attendance by the safety representatives of all contractors and subcontractors on-site. The minutes of all safety meetings, including actions agreed, will be taken and sent to NESCO within seven days of the meeting.

Safety Inspections – the contractor will regularly inspect, test, and maintain all safety equipment, scaffolds, guardrails, working platforms, hoists and other lifting equipment, ladders and other means of access, lighting and signage, firefighting equipment, first aid kit, stock take and condition of PPE etc. Signs will be graphic and in the languages of workers, kept clear of obstructions and legible to read. Lighting will meet illumination guidelines for the working area as per IFC EHS Guidelines on OHS. Equipment, which is damaged, dirty, incorrectly positioned or not in working order, will be immediately repaired, or replaced by the contractor.

H&S Audit - during construction the contractor's H&S officer and NESCO will undertake monthly audits of compliance with the H&S plan.

Personal Protective Equipment (PPE) as a last resort where risks cannot be avoided – workers will be provided (before they start work) with appropriate PPE at no cost to the workers. PPE provided to workers (regardless formal and informal, directly contracted or subcontracted) in accordance with Table 2.7.1. Summary of Recommended Personal Protective Equipment according to Hazard in IFC EHS Guidelines on OHS including safety shoes, helmets, goggles, earmuffs, and face masks and ensure that this is always worn by them with a strict disciplinary system (no work condition if not compliant) being enforced for any non-compliance.

Work Zone Noise Levels: during construction protective measures need to be provided and as per the IFC EHS Guidelines on OHS, Table 2.3.1. sets the level at 85 dB (A) for 8 hours exposure and will be adopted, as well as 140 dB(C) peak/instantaneous noise exposure for workers working near the high noise generating machinery. High noise work areas must be adequately signposted. In these high noise work areas PPE in the form of sound reducing earmuffs/ear plugs to the workers are to be provided. In the first instance, however, a reduction in noise levels to the lowest practical level must be achieved by adopting suitable preventive measures, such as, use of enclosures with suitable absorption material, etc. Workers operating in the high noise work areas will be given auditory tests as part of health surveillance.

EMF levels at the construction site to be kept within good international practice levels as per ICNRP (reference and peak values) for the occupational exposure.

Electricity: IFC EHS Guideline on Electric Power Transmission and Distribution requirements for working with electricity will be observed with only licensed electricians that meet the requirements set out in them allowed to work on live electricity with strict adherence to safety standards including those listed in said guidelines. Live lines will be deactivated and properly grounded before work is performed on, or in proximity, to the lines and this will be checked and certified in writing by the contractor's H&S Officer in advance. While working at heights personal safety measures such as harnesses, tool bags, ropes etc. will need to be provided.

Occupational and Community Health and Safety (H&S) Plan. This plan will be informed by a facilitated health and safety risk assessment participated in by NESCO/PIAC and the Contractors and detail out workplace and community health and safety measures following the mitigation hierarchy referring to the IFC EHS Guidelines related to H&S and the ILO code of practice.⁴³ If the COVID-19 pandemic is still declared by the World Health Organization

⁴³ https://www.ilo.org/sector/Resources/codes-of-practice-and-guidelines/WCMS_861584/lang--en/index.htm

(WHO) at the time of construction, a sub-plan will set out prevention and protection measures including adequate sanitation and PPE for the workers. Risks of other communicable viral diseases to also be addressed.⁴⁴

Traffic Management Plan. This plan will be prepared in consultation with the respective authorities responsible for roads and traffic. It will identify the off-site routes to be used, entrances and exits off the public road, procedures for the safety of the local community, particularly pedestrians and vulnerable groups, and mechanisms to avoid traffic congestion because of construction traffic movements. A designated person as the traffic controller, wearing colored vest will be engaged in traffic management.

Biodiversity Management Plan setting out procedures for site clearance, tree cutting and earthworks with pre-checks and supervision undertaken by the environmental specialist plus (i) construction worker prohibitions on fishing, hunting, poaching, etc. (ii) an emergency fauna rescue and handling procedure, including contacts of forest department, nearest veterinary etc. and (iii) measures to avoid the spread of invasive species including the installation of washing stations for the pressure washing of vehicles at construction site entrances.

Ecology Survey for Ecology will conduct bird surveys during appropriate periods round the year birds in the project area and prepare report accordingly to submit the PIU/PIAC.

Chance Find Procedure setting out how damage to existing physical cultural resources will be avoided and the procedure to be followed in the event of a chance find incident.

Labor Management Plan addressing the recruitment and management of the workforce including details of sanitation and welfare facilities, construction labor camps or overnight accommodation per ILO guidelines⁴⁵ and a worker code of conduct⁴⁶ to ensure workers have appropriate conduct whilst working and living in the local community. It will ensure compliance with the national labor law including that all workers whether formally or informally employed by the Contractor or their subcontractor(s) have a contract, identification card, the right to stop work, and do not work more than the legal working hours; it will discourage the use of daily workers by subcontractors and ensure adequate keeping of wage records. It will address the encouragement of local and women employment as well as measures needed to protect vulnerable worker groups including gender-based violence/sexual exploitation, abuse, and harassment prevention.

The Emergency Preparedness Plan will be prepared by the Contractor after assessing all potential hazards and emergency scenarios that could be encountered in relation to pollution, health and safety, and security during construction to detail out how they will be quickly and

⁴⁴ Contractors will provide adequate sanitation and welfare facilities including hand washing and PPE in sufficient quantity on-site and at labor camps/overnight accommodation so workers can follow healthy hygiene practices as well as avoiding conditions for vectors to breed; contractors will also consider local health care facilities' capacity to deal with any infections agreeing with the nearest Health Center and/or Hospital for emergency cares of workers. Medical insurance will be provided by contractors for all workers with sick leave allowance to ensure symptomatic workers do not attend site; avoid no-work-no-pay policies, whereby by fear of not getting paid workers would be tempted to report to work and hide any symptoms.

⁴⁵https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/ulti/documents/publication/wcms_116344.pdf with particular attention to providing one bed per worker and lockable storage

⁴⁶ Code must be informed by the SEMP and address the following aspects: Zero tolerance in respect of health and safety; Requirement on always wearing PPE on site; Zero tolerance of bribery or corruption; Respect for local community and customs, avoiding community conflict situations; Zero tolerance of illegal and unacceptable activities/behavior, including but not limited to engagement in: prostitution; gender-based violence/sexual exploitation, abuse, and harassment; illegal sale or purchase of alcohol; sale, purchase, or consumption of drugs; gambling; fighting etc.; Alcohol and drugs policy and testing regime; Role of workers in good housekeeping; Role of workers in maintaining good hygiene; Respect of wildlife and the environment; Description of disciplinary measures for infringement of the code of conduct and other employer rules (e.g., immediate removal from site, fine etc.)

effectively responded to.⁴⁷

Stakeholder Engagement Plan to set out how the Contractor will interact with the local community and other stakeholders, issue advance notice of construction works, and disseminate the GRM, and manage site complaints in line with the GRM for the Project.

Training Plan to set out how the Contractor will provide EHS training to its sub-contractors and all formally and informally employed workers on the construction site including daily toolbox talks flagging their right to stop work if H&S risks are present, as well as awareness raising activities for the local community.

11.6 Environmental Code of Practices for Construction

The following ECPs (Annex 4) contain general, non-activity- or site-specific measures which need to be integrated into the Contractor's CSEMPs for implementation during construction.

The list of ECPs prepared for the Project is:

- ECP 1: Waste Management
- ECP 2: Fuels, Oils and Other Hazardous Substances Management
- ECP 3: Water Resources Management
- ECP 4: Drainage Management
- ECP 5: Soil Quality Management
- ECP 6: Erosion and Sediment Control
- ECP 7: Topsoil Management
- ECP 8: Topography and Landscaping
- ECP 9: Borrow Areas Management (note that borrow areas and dredging are not permitted, only existing licensed sources are to be used)
- ECP 10: Air Quality Management
- ECP 11: Noise and Vibration Management
- ECP 12: Protection of Flora
- ECP 13: Protection of Fauna
- ECP 14: Protection of Fisheries
- ECP 15: Road Transport and Road Traffic Management
- ECP 16: Construction Camp Management
- ECP 17: Cultural and Religious Issues
- ECP 18: Workers Health and Safety
- ECP 19: SF6 Management
- ECP 20: Construction Management in Ecologically Sensitive, Salt Pan, Fishponds and Waterlogged Areas
- ECP 21: Chance Find Procedures
- ECP 22: Personal Protective Equipment (PPE)
- ECP 23: Emergency Preparedness and Response Planning

651. Measures in the IFC EHS General and Electric Power Transmission and Distribution guidelines, ADB's Good Practice Guidance for the Management and Control of Asbestos: Protecting Workplaces and Communities from Asbestos Exposure Risks, the ILO Code of Practice on Safety and Health in Construction are to also be taken on board in preparing the

⁴⁷ Including communication systems and protocols to report an emergency e.g., spills and leaks, health emergency, work-related accident including electrocution, traffic accident, accident involving the community, natural disaster including flooding or cyclones, fire, virus outbreak etc. It will need to be developed in consultation with local emergency services with adequate fire and first aid first-responders based on the construction site to facilitate immediate response. Provide readily available first-aid for workers as well as an ambulance for more serious cases. Make arrangements for a doctor on call and nearest Health Center and/or Hospital for emergency care of workers whether formally or informally employed by the Contractor or their subcontractors. Regular drills will be required involving all workers to prepare for any incident.

CSEMPs.

11.7 Mitigation Plan

652. The Mitigation Plan sets out the plan for avoidance, minimization, mitigation and compensation of impacts and risks during the following three phases:
detailed design and pre-construction.

construction (including demolition when it is being undertaken by the EPC contractor);
operation and maintenance.

653. There are six parts to the Mitigation Plan, as follows, with Parts 2-6 applicable to the respective contract packages:

Part 1: General Mitigation (applicable to all civil works components)

Part 2: New Substations / Substation Augmentation/Renovation

Part 3: Workshops

654. The Mitigation Plan describes the general, activity- and site-specific mitigation measures to address the impacts and risks which have been identified during the impact assessment and ensure compliance with applicable national standards and international guidelines (Annex 2). Performance indicators to check that the measures are being implemented effectively are listed, along with the responsible entities for implementing them and supervising and monitoring their effectiveness (either NESCO, the PIAC and/or the Contractors). The Contractors will be contractually bound to implement these measures plus the more general ECPs by incorporating both into site-specific CSEMPs/H&S Plans and other subplans, as described in the following sections. Measures that must be implemented during the design and pre-construction phase will continue to be implemented by the Contractor during the construction phase.

655. Within the defects liability period of 1.5 years the Contractor will also be responsible for maintenance. Following that, NESCO will take over the responsibilities for both operation and maintenance.

11.8 Capacity Building and Training Requirements

656. NESCO has a dedicated Environmental and Social Unit (ESSU) and is new at EHS requirements proposed by ADB. NESCO's current portfolio of development projects includes 1 on-going project, 1 upcoming project and 1 planned project. However, with only three staff, all of an environmental background the capacity of the Environmental and Social Unit (ESSU) to fulfil its responsibilities falls short of requirements. Typically, international development partners provide relatively short-term implementation support to the ESSU for their projects whilst trying to build in-house capacity through training and mentoring. However, capacity remains low in both manpower and expertise to properly fulfil their mandate.

657. Support for ESSU safeguards implementation in respect of monitoring and reporting is essential during the 4-year implementation period. Such support would include a capacity building component for institutional strengthening of NESCO's ESSU. The NESCO will employ Project Implementation Assistance Consultant (PIAC) who would support NESCO in overall environmental/social management. However, since the overall responsibility of environmental management lies with the NESCO, they need to ensure that the consultants are carrying out their responsibilities properly. For this purpose, it is important that the NESCO engineers/officials receive training on environmental management and monitoring. Such training will assist them in properly overseeing the activities of the consultant engaged in environmental management of the project.

658. NESCO staff who will be working on the project will need to be provided with the appropriate training on environmental safeguards in general and the specifics of management and monitoring requirements. The contractor's staff as well would also need some training and

awareness raising to ensure they fully understand the EMP requirements. As such, a preliminary training program is being proposed to equip NESCO staff and contractor with the needed safeguards capacity. The training modules will be delivered through PIAC, who will bring in technical expertise for any specialized training. The exception is the facilitated H&S workshop which will be attended by the PIAC but organized by the Contractor. Training modules may be changed during project implementation depending on the needs; ESSU will develop a training plan upon loan effectiveness to reconfirm requirements.

Table 11-2: Key EMP Milestones in Implementation Schedule

Training Session	Required Attendees/Recipients	Delivery Mode/Duration	Training Conducted by	Budget Source
Introduction to ADB's Safeguard Policy Statement (2009), IFC EHS Guidelines, national requirements, and Project EMP including EMoP	PMU, ESSU, Contractors' Management and Environment Safeguards Teams	Lecture session, presentation, and discussion. In Person/ 1 day	PIAC	PIAC Budget
Corrective action for existing substations (good practices)	SS staff of NESCO, PMU, ESSU	Lecture session, presentation, and discussion. In Person/ 2 day	PIAC	PIAC Budget
EMP implementation for detailed design, development of CSEMP/H&S plans as well as all sub-plans	PMU, ESSU, Contractors' Design Teams and Environment Safeguards Teams	Lecture session, presentation, and discussion. In Person/ 3 day	PIAC	PIAC Budget
Facilitated H&S workshop (detailed design stage)	PMU, ESSU, PIAC, Contractors' Management, Design, Construction, and Environment Safeguards Teams, SS and O&M representatives of NESCO	Facilitated workshop. In Person/ 1 day	Contractor	Contractor Budget
Ecology survey requirements	PMU, ESSU, PIAC, Contractors' Environment Safeguards Teams	Lecture session, presentation, and discussion. Online/ 0.5 day	PIAC	PIAC Budget
Pollution control and waste management, detailed design considerations for substations	PMU, ESSU, PIAC, Contractors' Management, Design, Construction, and Environment Safeguards Teams, SS and O&M representatives of NESCO	Lecture session, presentation, and discussion. Online/ 0.5 day	PIAC	PIAC Budget
PCB and SF6 awareness raising	SS staff of NESCO, PMU, ESSU, Contractors' Management, Design Teams and Environment Safeguards Teams	Lecture session, presentation, and discussion. Online/ 0.5 day	PIAC	PIAC Budget
GRM operation (initial run at start of project, and then again on handover to operational staff)	PMU GRM Focal Points, ESSU, Contractors' Management and Focal Points, and other GRC committee members	Lecture session, presentation, and discussion. In Person/ 1 day	PIAC	PIAC Budget
EMP implementation for pre-construction and	PMU, ESSU Contractors' Construction and	Lecture session, presentation, and	PIAC	PIAC Budget

Training Session	Required Attendees/Recipients	Delivery Mode/Duration	Training Conducted by	Budget Source
construction, including workshop on CSEMP preparation, review/discussion on implementation of CSEMP/H&S plans as well as all sub-plans	Environment Safeguards Teams	discussion. In Person/ 3 day		
Facilitated H&S workshop (construction stage)	PMU, ESSU, PIAC, Contractors' Management, Design, Construction, and Environment Safeguards Teams, SS and O&M representatives of NESCO	Facilitated workshop In Person/ 1 day	Contractor	Contractor Budget
Environmental quality monitoring requirements; site supervision and monitoring including use of detailed monitoring framework (checklists) and preparing Environmental Monitoring Reports	PMU, ESSU Contractors' Management, Construction, and Environment Safeguards Teams	Lecture session, presentation, and discussion. In Person/ 2 days	PIAC	PIAC Budget
Facilitated H&S workshop (commissioning stage)	PMU, ESSU, PIAC, Contractors' Management, Design, Construction, and Environment Safeguards Teams, SS and O&M representatives of NESCO	Facilitated workshop In Person/ 1 day	Contractor	Contractor Budget
EMP implementation at handover upon commissioning (site restoration and O&M)	PMU, ESSU, Contractors' Management and Environment Safeguards Teams, SS and O&M representatives of NESCO	Lecture session, presentation, and discussion. In Person/ 1 day	PIAC	PIAC Budget

11.9 Implementation Schedule

659. Strictly no contracts will be awarded before the EMP cleared by ADB as disclosed on the ADB website has been incorporated into the contract documentation. Further, no site establishment or construction activity is to take place before NESCO has received and approved the contractor's CSEMP/H&S Plan including all subplans. The tentative implementation schedule of the project is listed in Table below. The contractors will submit a more detailed implementation schedule for the detailed design, pre-construction, and construction once the contract is awarded.

Table 11-3: Key EMP Milestones in Implementation Schedule

	Description	Indicative Time Frame
1	Project Implementation	
A	Bidding Documents Approval	2 September 2025
B	Procurement (Contract Award)	2 March 2026
C	Construction commencement	2 September 2026

	Description	Indicative Time Frame
D	Construction Completion	8 October 2029
E	Defects Liability Period	1.5 years
2	Pre-Construction Phase	
A	Implementation of mitigation measures and conduct environmental monitoring for which NESCO is responsible	8 October 2029
B	Establishment of GRM	May 2025
D	Appointment of the ESSU staff to the project, nomination of PMU focal for EHS on site	Apr 2025
E	Appointment of PIAC	May 2025
F	Implementation of mitigation measures and conduct of environmental monitoring for which contractor is responsible	Upon award of the contract
G	Updating the national EIA and ADB IEE/EMP to reflect detailed design and ADB clearance of the updates	Prior to approval of the detailed design
H	Submission and approval of the Contractor's Specific Environmental Management Plan (CSEMP), H&S Plan	One month before the start of works including any site establishment, site preparation, demolition, and earthworks
3	Construction Phase	
A	Implementation of mitigation measures and conduct of environmental effects monitoring following the EMP and EMoP.	After award of the contract
B	Monthly Progress Report (EHS)	5th day after effective month (covering the month prior)
C	Semi-Annual EMR during construction for submission to ADB	15th day after end of first June or December once loan has been effective for at least one full quarter, the last construction EMR will be submitted after the commissioning and DLP of all works documenting in depth how all pre-construction and construction activities were complied with
D	Restoration of construction sites	Before demobilization of contractor
4	Operation Phase	
A	Implementation of mitigation measures and monitoring activities for operational period	Upon commissioning and the handover to NESCO
B	Annual EMR during construction for submission to ADB	The first operational EMR will be submitted 12 months after the last construction EMR was submitted until the ADB PCR is issued.

11.10 Cost Estimate / EMP Budget

660. Costs will be associated with implementation of the Mitigation Plan, the EMoP and capacity development. The provisional breakdown for the EMP implementation cost is given in Table 12.5.

661. Necessary budgetary provisions must be planned and allocated by NESCO and competitively bid by the PIAC and contractor for their scope of work. The main EMP budget items have been identified, and an indicative budget allocated for each. The budget will be refined during project implementation but enables preparation for financial requirements. For PIAC and contractor related costs there are only an estimate based on an estimate of the construction and installation cost, since the contracts are subject to competitive bidding it will be for the contractor/consultants to reflect in their BOQ and ensure adequate budget is provided in their bids for the EMP implementation.

662. The construction EMoP will be part of the Contractor's contract, whereas the operational EMoP will be the responsibility of the NESCO O&M team.

Table 11-4: Environmental Management Plan (EMP) for New Substations/Bay Extensions and Switching Stations/Existing Substation Upgrades

Project Activity	Impact or Risk	Mitigation/ Compensation/ Contingency/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (implementation, supervision and monitoring)			Budget Source
					NESCO	PIAC	Contractor	
	Detailed Design and Pre-Construction Phase							
Existing Substations audit,14 no. bay extensions, 7 no. switching stations for expansion, and 10 no. existing substation upgrades, overhead distribution line 33.73 km and solar rooftop	Environmental audit has identified gaps in EHS management at existing 9 (nine) substations of NESCO for upgradation plus 14(fifteen) bay extensions and 7(seven) switching stations for expansion which may result in pollution, health and safety risks	- NESCO to undertake the corrective actions set out in the Corrective Action Plan (CAP) for existing substations/switching stations in which work will be undertaken prior to allowing the contractor access to them to start work. Contractor at request of NESCO to address corrective actions as part of their scope of works. - In cases where existing substations/switching stations are on PGCB land NESCO will liaise with PGCB as a third party to implement corrective actions - If asbestos is identified but does not need to be disrupted and is not weathered and appears in good condition, consider leaving it where it is, as main health risks occur when asbestos is moved. If any asbestos will be disturbed by construction works, it must be removed following national requirements and international good practice per EHS General Guidelines on OHS and ADB	Implementation of the corrective action plan, all existing facilities (substations and switching stations) meet national laws and regulations and are consistent with SPS 2009 requirements prior to the contractor being allowed access to them	Prior to access being granted to the contractor	√	√	TBC	NESCO and Contract cost

		Good Practice Guidance for the Management and Control of Asbestos and disposed of as hazardous waste material. - PIAC to submit a report, including photos for each existing substation/switching station, on the status of corrective action implementation, compliance with national laws and regulations, and consistency with SPS 2009 requirements to validate NESCO's compliance with the CAP and submit to ADB for clearance. - CAP must be fully implemented and NESCO must receive ADB clearance of this report before the contractor is given access to an existing substation/switching station to start work. - Once the contractor has access then any non-compliance at the existing substation/switching station will become their responsibility so they must ensure they are satisfied CAP is completed.						
Substation, workshop, solar rooftop and switching station design and construction EHS	Environmental and social impacts of construction and O&M phase -- lack of management of detailed design, construction and O&M leading to environmental degradation, H&S risks for construction and O&M workers as well the local community	- Designs to reflect the requirements of the EMP and international engineering best practice/good EHS practices. - Detailed design to ensure works will only take place on modified habitat found within the boundaries of the allocated land. - Detailed design to minimize the	Detailed Design cleared and approved reflects EMP requirements to minimize impacts and risks on EHS during subsequent stages of the project	Prior to detailed design approval and for implementation during construction	√	√	√	NESCO and Contract Cost

management planning during pre-construction, all components as applicable to the scope of works		need to cut mature trees that are present at the project sites - Detailed design to minimize visual impact and clutter with buildings in keeping with the local vernacular. Landscaping to be included as part of the detailed design to enhance ecology and visual appearance of the allotted site. - Take a life-cycle approach to detailed design, considering the use of construction materials and the energy and water efficiency of buildings and equipment during operation adopting the “green building” concept e.g., using natural ventilation for reducing the need for air conditioners. - Drilling and piling mud must be managed to avoid it being discharged to adjacent land. - New substations/ bay extensions and switching stations situated 500m and existing substation upgrades situated in 50m proximity to residential or other sensitive receptors such as schools and mosques, surface waterbodies including rivers, khals and beels, ponds, and groundwater wells, need to ensure drilling or piling noise and mud is managed to avoid adverse effects on water quality, ecology and the adjacent community.						

	Emissions of SF6, a potent greenhouse gas, to the atmosphere	- Use of alternative insulation medium (such as vacuum circuit breakers or Hydrophobic Cycloaliphatic Epoxy) to be considered as the preferred option. - If no alternative the use of SF6 in gas insulated equipment and its leakage must be minimized. - Detailed design of SF6 insulated equipment (e.g., switchgear) and GIS substations will comply with international norms and standards for handling, storage, and management of SF6. - SF6 insulated equipment and GIS will be hermetically pressure sealed "sealed for life" units, tested and guaranteed by the supplier at less than 0.1% leakage rate. - Equipment purchased by NESCO or the contractor for use on the project is to be accompanied by a letter from the manufacturer stating that it meets these requirements. - GIS and substations with SF6 insulated equipment to be equipped with a Leak Detection System (LDS) for SF6. This will be designed such that any leakage of SF6 will trigger an alarm to the nearest concerned O&M location so that staff may immediately rectify any leak. - Provision of SF6 leakage	Detailed Design cleared and approved reflects EMP requirements including leak detection system with copies of equipment purchase letters included in EMRs, all SF6 project equipment must have <0.1% leakage rate etc.	Prior to detailed design approval and for implementation during construction	√	√	√	Contract Cost

		detection kit at each substation using SF6 for GIS facilities and other facilities using SF6 in the equipment. - SF6 emergency response plan to be prepared by contractor for construction. NESCO in relation to operation to deal with event of an accidental leak.						
	Pollution of soil and water due to discharge of transformer oil or other fuel, oil or chemicals into the environment due to spills or leaks or discharge of wastewater from substation/switching station washrooms	- Use of PCBs will be prohibited in all new transformers and other substation equipment. Equipment purchased by NESCO or the contractor for use on the project is to be accompanied by a letter from the manufacturer stating that it is guaranteed PCB free and to be labelled as PCB free before its installation. - Contractor to provide NESCO with Material Data Sheets (MDS) for insulating oil meeting technical specifications for use in new transformers. - Toilets/washrooms to be connected to either or to septic tank with soakaway sufficient distance from waterbodies – any discharge to surface water must meet the project effluent quality standards in Annex 3. - Detailed design of new substations/bay extensions and switching stations/existing substation upgrades to locate new transformers, storage areas and septic tanks/soak	Detailed Design cleared and approved reflects EMP requirements with copies of equipment purchase letters and MDS included in EMRs.	Prior to detailed design approval and for implementation during construction	√	√	√	NESCO and Contract Cost

		away as far away as possible from any surface waterbodies and groundwater sources to reduce pollution risk. If within 500m of surface water or groundwater well (or for existing substation upgrades 50m) further assessment to be carried out by contractor to demonstrate using a source-pathway-receptor model, there will be no adverse impact on aquatic ecology or human health. - Detailed design of transformers and fuel, oil chemical, and waste storage areas to incorporate impermeable concrete surface bunded to 110% volume which is not connected to the drainage system to collect spills and leaks. - Detailed design of fuel, oil chemical, and materials and waste storage areas to provide for a covered storage area of sufficient size to accommodate all anticipated storage requirements with segregation of wastes, ensure storage areas can be locked, are well-ventilated and will not reach extreme temperatures. Ensure space is also provided in the storage area for solid and hazardous waste garbage bins to be stored.						

		- Provide spill prevention kits (sorbent pads, loose sorbent material, etc.) at storage areas and other at-risk locations within clearly labelled containers. - Guidelines of UN Industrial Development Organization (UNIDO) must be followed in handling all transformers since due to recycling of oil none can be guaranteed PCB free; and the contractor should test all transformers removed by the project. - For substations/bay extensions/switching stations, waste disposal is a concern, except for waste oil which is taken by a contractor all solid and hazardous waste is disposed of to the municipalities who do not have a sanitary landfill meaning it is open dumped. - A small capacity incinerator with in-built pollution control as part of the new substation/bay extension and switching stations/existing substation design that NESCO can also use for substation solid waste that cannot be recycled to avoid it being open dumped. - For existing substations/switching stations comprehensive soil sampling undertaken to inform a strategy						

		for oil spill remediation prior to construction, anticipated to involve either the removal of soil off-site for incineration at the Holcim cement plant approved by DOE to take hazardous material or encapsulation if piling can be avoided and no risk of exposure using source-pathway-receptor approach. – Following soil sampling remediation strategy in line with the IFC EHS contaminated land guidelines to be prepared for approval by NESCO and implementation prior to commencement of the site clearance etc. – Conduct a flood and drainage risk assessment and incorporate effective drainage design (allowing for climate change) to prevent possible flooding or waterlogging of the substation during the wet season, whilst ensuring that surface runoff from the project site is no more than the existing site runoff rate. – No drainage water will be permitted to discharge directly to surface water; oil interceptors are to be fitted on all drainage to catch oil spill.						
	Health and safety risks related to fire safety and emergency response	– Identify presence of any unstable land/steep slopes and avoid these during the detailed design.	Detailed Design cleared and approved reflects EMP requirements	Prior to detailed design approval and	√	√	√	NESCO and Contract

		- Identify presence of floodplain or depressions that get waterlogged in the rainy season and avoid these during detailed design. - Detailed design of control will follow national building and fire safety standards as well as international good practice - Provide fire walls on transformers - Provide fully stocked, in-date first aid kit installed in a prominent, signed position, first aid posters and emergency contacts to also be displayed - Provide eye washing station and water supply to shower located near the storage areas for fuel/oil/chemicals - Detailed design of substations, and switching stations to include fire safety measures including detector, alarm, and firefighting equipment in accordance with national regulations and IFC EHS Guidelines on OHS. - Provide sand buckets, full of sand, placed in a prominent, signed location near to fire-risk locations such as transformers and oil storage areas. - Provide fire extinguishers (including for oil and electric fires) in a prominent, signed location near to fire-risk locations such as transformers and oil storage areas with service and expiration dates clearly labelled.		for implementation during construction				Cost

		- All electrical hazards will feature written and visual warning signs that meet the IEEE standards to include the ISO 7010 "Hazard Type: Electrical Symbol" warning of the risk of electrocution.						
	Impacts on health and safety of O&M workers and the public	- Use of any asbestos containing materials is strictly prohibited, this includes vinyl tiles and cement tiles and certification such materials are asbestos free is to be given. - Include in the design of all substations/switching stations (including existing ones if not already present or in poor condition) and around transformers a secure wall or fence sufficiently high it cannot be climbed over with lockable entry featuring written and visual warning signs to include the ISO 7010 "Hazard Type: Electrical Symbol" warning of the risk of electrocution. - Indoor work areas at substations/switching stations to be well ventilated and naturally or artificially well-lit in accordance with national regulations and the IFC EHS Guidelines on OHS. - For control buildings provide adequate natural and/or artificial lighting levels to meet the IFC EHS Guidelines on Occupational H&S (Table 2.3.3. Minimum	- Detailed Design cleared and approved reflects EMP requirements - Compliance with ICNRP occupational/community EMF exposure levels (reference and peak values)	Prior to detailed design approval and for implementation during construction	√	√	√	NESCO and Contract Cost

		Limits for Workplace Illumination Intensity) - Detailed design of substations/switching stations to ensure EMF levels within the substation boundary are within international good practice levels as per International Commission on Non-Ionizing Radiation Protection (ICNIRP) (reference and peak values) for occupational exposure;⁴⁸ in areas where EMF levels could be exceeded posting of written and visual warning signs. Use of shielding equipment/materials to decrease EMF exposure as required. - Pit latrines and disposal of untreated sanitary wastewater to surface or groundwater is prohibited. Staff will reside off site but detailed design of substations/switching stations to include adequate sanitation and welfare facilities for all workers to be posted at or visiting the substations/switching stations including indoor kitchen (if possible), eating and rest areas and adequate number of indoor toilets/washrooms (one per six staff and separate for men/women with running water hand washing facilities) which are connected to septic tank with soak away. Provide a dedicated						

⁴⁸ <https://www.icnirp.org/cms/upload/publications/ICNIRPEmfgdl.pdf>

		shelter and rest area for the 24-hour security guards, shielding them from rain, wind, and extreme (hot and cold) temperatures. – Disposal of workers generated waste (e.g., plastic bottles) on-site is prohibited and adequate waste storage areas to be incorporated into detailed design. Composting food waste may be permitted on-site if detailed design incorporates enclosed composting facilities (enclosed to avoid the attraction of vermin etc.) located away from accommodation and any property outside the site boundary. – Source of drinking water that meets drinking water standards to be provided to substations. If any surface or groundwater sources are proposed for use in substations, Contractor is to undertake a baseline water quality sampling per EMoP (Annex 2) to confirm its suitability for use. If drinking water standards are not met, a detailed design to consider alternative source or include water treatment facilities (RO) at the substation to facilitate safe drinking water supply. Detailed design to include water meters for monitoring of water abstracted. – Provide gated, safe vehicular access for entry/exit off the public						

		highway having adequate sight lines for all drivers and warning signs of entrance as well as adequate parking for cars. - Final surface level of substation/switching station equipment will be at least 0.5 m above the existing ground level or highest flood level including an allowance for climate change based on the findings of the climate change assessment prepared for the Project (whichever is higher) - Foundations to be constructed in such a way as to be adequately drained to prevent washouts and flooding impacts to adjacent land. - Junctions between new access roads to substations/switching stations and existing main roads should not impede or damage the latter nor pose blockage to any associated drainage channels, irrigation infrastructure, etc.						
	Impacts from dust generated by earthworks	- Detailed design of substations/switching stations to minimize cut and fill and land raising to reduce the extent of sand filling/earthwork and thus dust generation during construction, also maximize reuse of spoil to minimize the need for disposal off site. - During detailed design, contractors will quantify extent of	Detailed Design cleared and approved reflects EMP requirements	Prior to detailed design approval and for implementation during construction	√	√	√	NESCO and Contract Cost

		sand filling/earthworks required, amount of spoil to be generated and location for disposal of excavated spoil through landscaping within the site boundary – generation of excess spoil to be avoided.						
	Impacts due to substation noise	- Detailed design to ensure maximum sound power level of equipment at 1 m is 85 dBA through use of sound attenuation, in areas where these noise levels will be exceeded OHS noise warning signage identifying that ear protection to be worn must be installed as part of detailed design. - Detailed design of transformers and other noise sources to be located as far as practical from the substation site boundary since noise diminishes with distance. - Contractors will be required to measure and confirm the distance from their detailed design and construction work to sensitive receptors to confirm if the noise standards can be met. If any properties are within 100m of the site boundary⁴⁹ then baseline measurements must be	- Detailed Design cleared and approved reflects EMP requirements - Compliance with noise standards applicable to the substation location per Annex 3	Prior to detailed design approval and for implementation during construction	√	√	√	NESCO and Contract Cost

⁴⁹ Per the IEE, general construction impacts and operational noise exceedance in silent zone might be possible up to 100m. However, if the louder types of piling (impact or vibratory hammers) that generate over 85 dBA are intended to be used by the contractor baseline measurements must be carried out at substation/switching station sites with any properties present in 500m due to the increased impact area that will result. For the 10no. existing substations since only limited civil works are required contractor baseline measurements must be carried out at existing substations in silent zone or with residential or other sensitive receptors within 50m of the site.

		carried out during detailed design (refer to EMoP Annex 2) by the contractor who will also undertake quantitative noise assessment using internationally recognized noise modelling software of (i) the detailed design considering low frequencies associated with transformer hum and (ii) construction methods to confirm that noise standards per Annex 3 can be achieved for the substation/switching station alone without additional noise mitigation – industrial levels must be achieved at the site boundary with commercial or residential levels at the nearest properties (as applicable) with silent levels achieved when schools or other silent zone receptors are present. If residential properties or other sensitive receptors are near the substation/switching station boundary, then measurements must be carried out during detailed design and baseline noise calculations (modelling) considering low frequencies associated with transformer hum will be undertaken by the Contractor to demonstrate that the noise standards/guidelines can be met. If background noise levels already exceed the						

		standards/guidelines the design must ensure that noise levels result in a <3dBA increase in background. – Given transformers are generally in the range 60-80 dBA at 1m if outdoors they are to be located at least 5 m inside the substation/switching station site boundary, but this distance will need to be increased to between 20m – 100m depending on the land use adjacent to the substation for noise limits to be met without additional attenuation. The quietest available equipment with manufacturer-supplied noise mitigation will be installed. If noise levels cannot be met through siting and design alone, detailed design to incorporate acoustic barrier designed to international good practice around either the noise source and/or substation site boundary to attenuate noise to level such that noise levels at the receptors will be met. As operational noise is permanent the acoustic noise barrier will need to be a permanent installation as part of the detailed design – Contractor to avoid soil compaction, piling, blasting and other vibration inducing activities as much as possible. The quietest equipment available will						

		be used, noise attenuation measures will include, (i) fitting of high efficiency mufflers to the noise generating equipment; and (ii) keeping acoustic enclosures around piling/drilling equipment. For piling it will not be possible to use the louder types of piling (impact or vibratory hammers) that generate over 85 dBA without resulting in a significant impact because noise from piling equipment of 120 dBA at 1m would exceed 85dBA, the level at which hearing damage is caused at adjacent properties if found within 100m. If noise levels are still exceeded a temporary acoustic noise barrier will be provided or alternatively temporary relocation of occupants during works to a rented property. In locations where soil compaction, piling, blasting and other vibration inducing activities are unavoidable Contractor to identify properties within the zone of influence and undertake pre-construction structural surveys to identify level of risk with reference to the guideline vibration levels per Annex 3. If there is a risk of structural damage to properties due to their current condition, consider alternative construction methods or temporary relocation of occupants during work if at risk to a rented property. Consider the						

		need to install monitors to monitor structural movement. Structural or cosmetic damage to be repaired by Contractor to at least pre-project condition at their own cost.						
	Impacts to surface and groundwater resources	- Construction activities must be planned not to limit the availability of or restrict access to water sources (e.g., groundwater wells) used by local communities; natural flow of any surface water or drains must not be obstructed or if not possible diverted through a drainage system to another direction. - Any piling or excavation works within 500m of groundwater wells used as a drinking water source by local communities will require pre-construction and post construction water quality monitoring against drinking water standards to ensure there is no contamination of the water supply. - Construction water to be sourced from an existing licensed commercial supplier (preferred option especially for potable water supplies), where available, or rainwater harvesting. If using an existing surface water or an existing borewell for construction water, permissions to be obtained from the relevant authorities together with the agreement of local communities.	- Monitoring data demonstrates compliance with national standards - No unresolved grievances regarding water resources	Prior to mobilization and site establishment and for implementation during construction	√	√	√	Contract cost

		- Prior agreement is required by local community users to use any existing surface water/borewell or local piped water either temporarily during construction or permanently for substations; in cases where use of local water source is not agreed, contractors to import tanked water to the project area. - No groundwater will be used in locations without additional groundwater capacity – in other locations contractor will only use groundwater after it has been confirmed through hydrogeological assessment and confirmed by competent authorities and in consultation with the community that there will be no additional stress on groundwater resources as a result. - Permissions of any new borewell installation (for construction or permanent supply to substation/switching station) to be obtained together with agreement of local communities before abstraction, include water meter for monitoring of water abstracted. - Contractor to avoid piling activities as much as possible. If needed a management plan will be prepared for approval. Oil will not be used for drilling or piling fluid. The piling management plan						

		will include measures to avoid water pollution from the use of any bentonite clay slurry - adequate bunding must be provided around piling activities to contain piling mud and decanting ponds will need to be fully enclosed to avoid spills or leaks to adjacent land. Piling fluid must not be intentionally or unintentionally disposed of to surface water untreated or be allowed to damage adjacent land. Sediment laden surface water runoff and discharges must be disposed of to open ground for percolation or passed through a sedimentation tank having adequate settlement tank, to obtain at least 50 mg/l TSS, before being allowed to enter surface water. Use of piling mud treatment equipment to be considered where space						
	Impacts of temporary access roads	- All substations/switching stations will be accessed via the existing road network and no new access road will be constructed, although new entranceways may be created onto main roads. Junctions between new entrances and existing roads will not impede or damage the latter nor any associated drainage channels, public utilities, etc. Adequate sight lines will be provided for safe entrance and exit of vehicles.	- Access roads reinstated to their former condition as compared to photographic record. - No grievances regarding reinstatement of access roads to their former condition.	Prior to mobilization and site establishment for implementation during construction	√	√	√	Contract cost

		- A photographic record will be made of the pre-construction condition of access roads to inform the reinstatement works. After completion of the construction work access roads will be restored to their original condition.						
	Impacts from demolition of buildings including risk of asbestos containing materials being present	- For demolition of buildings to facilitate construction CSEMP to be approved by NESCO to include a demolition management plan with particular attention to dust, noise, disposal of waste etc. - Contractor to employ a competent asbestos surveyor to confirm if asbestos was present prior to demolition work. - If present asbestos remedial action plan developed for approval by NESCO and implemented prior to demolition following national laws and regulations, and international good practice such as ADB's Good Practice Guidance on the Use of Asbestos and disposed of as hazardous waste material. In doing so the contractor will need to employ a specialist subcontractor who will develop a safe method statement and provide sufficient personal protective equipment to their workers etc. Removal will require the deliberate soaking and confining of the asbestos; securing the entire area to stop	- No workers and communities affected by exposure to ACMs	Prior to demolition of buildings and for implementation during construction	√	√	√	Contract cost

		asbestos fibers from escaping etc..						
Construction Phase (including Demolition of Buildings)								
Onsite construction activities; all components as applicable to the scope of works	Asbestos may be encountered at the project site or in the demolished buildings during the construction phase.	- If asbestos is encountered but does not need to be disrupted and is not weathered and appears in good condition, consider leaving it where it is, as main health risks occur when asbestos is moved. However, signage to be installed to warn of presence and to ensure it is not touched. - If any asbestos will be disturbed by construction works, it must be removed following national requirements and international good practice per EHS General Guidelines on OHS and ADB Good Practice Guidance for the Management and Control of Asbestos and disposed of as hazardous waste material. In doing so the contractor will need to employ a specialist subcontractor who will develop a safe method statement and provide sufficient personal protective equipment to their workers etc. Removal will require the deliberate soaking and confining of the asbestos, securing the entire area to stop	- EMP/CSEMP requirements successfully implemented as determined through regular site checks, photographic record etc.	Throughout construction	√	√	√	Contract cost

		asbestos fibers from escaping etc.						
Emissions of SF6, a potent greenhouse gas, to the atmosphere	- Careful installation of SF6 insulated equipment (e.g., switchgear) at AIS substations and new GIS substations following international norms and standards for handling, storage, and management of SF6 to avoid damage/ruptures/leakages of SF6 gas. - Provision of SF6 awareness raising to construction workers and training of O&M staff on the operation of the SF6 LDS and emergency response procedures during the commissioning stages.	- EMP/CSEMP requirements successfully implemented as determined through regular site checks, photographic record etc.	Throughout construction	√	√	√	Contract cost	
Impacts due to dust from earthworks	- Plan the construction site layout so that machinery and dust-causing activities are located away from receptors, as far as is possible. - Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site to fully enclose operations. - Contractors to undertake quantitative air quality monitoring as per the EMoP (Annex 2). In addition to quantitative monitoring (as per EMoP) contractors will undertake weekly dust soiling checks of surfaces of adjacent properties during earthworks and help with cleaning of external surfaces of property if dust is	- EMP/CSEMP requirements successfully implemented as determined through regular site checks, photographic record etc. - No exceedance of air quality levels (Annex 3) or increase in baseline air pollution levels where they are already exceeded. - No outstanding grievances related to impacts from dust and air pollution.	Throughout construction	√	√	√	Contract cost	

		evident. - If air quality levels are exceeded, an increase in existing background air pollution is recorded where they were already exceeded, or complaints are received contractors will be required to implement additional dust mitigation e.g., barricading/isolating sources of dust, use of wheel wash, adjusting working methods, to ensure the levels are met.						
	Impacts due to construction noise	- During night (6am to 10pm) no work will be permitted at sites. - Contractor's maximum working hours (including the movement of heavy vehicles for construction on off-site access roads) will be 7 am – 7 pm. - Residents within 500m will be informed well in advance of the construction schedule for noisy activities taking place on-site. Noisy construction activity at substations/switching stations (especially demolition and piling works) will only take place between the hours of 10 am - 4 pm. No noisy work and heavy vehicle movements will take place on Fridays and during school/college/university exam periods. No work on Saturday, holidays and festival days. Sensitive receptors (including schools and mosques) to be consulted with any other special	- EMP/CSEMP requirements successfully implemented as determined through regular site checks, photographic record etc. - No exceedance of noise levels (Annex 3) or increase in baseline noise levels where they are already exceeded. - No outstanding grievances related to impacts from noise and vibration.	Throughout construction	√	√	√	Contract cost

		days when they would wish noise levels to be minimized. - For substations/switching stations with properties in 50m distance, loud construction noise must be limited to only very short periods of activity to minimize disturbance. - Layout substations/switching stations to keep noisiest construction works the furthest distance possible from adjacent receptors and adopt construction methods that ensure noise generated from construction is minimized. If the noise levels at the site boundary or receptors will exceed the required noise levels, are more than 3dBA above background when already exceeded, or there are complaints then a temporary acoustically designed noise barrier will need to be installed around the substation perimeter to be able to meet required noise level. - Sound levels received by workers must not be over 85 dB(A) during continuation of 8 working hours without wearing PPE. - Contractors to undertake quantitative noise monitoring as per the EMoP (Annex 2). If noise levels are exceeded, an increase in existing or noise levels >3dBA recorded where they were already exceeded, or complaints						

		are received contractor will be required to implement additional noise mitigation e.g., adjusting working methods, or placing of temporary acoustically designed noise barriers to ensure met.						
	Impacts due to lack of hazardous waste management, disposal of transformer oil at substations and switching stations	- The Guidelines of UN Industrial Development Organization (UNIDO) must be followed in handling all transformers since due to recycling of oil none can be guaranteed PCB free; and the contractor should test all transformers and stored (waste) oil that is disturbed by the project. - For substations, waste disposal is a concern, except for waste oil which is taken by a contractor all solid and hazardous waste is disposed of to the municipalities who do not have a sanitary landfill meaning it is open dumped. - Treat contaminated soil in accordance with the approved remediation strategy with removal of contaminated soil off-site for incineration at the Holcim cement plant approved by DOE to take hazardous material or encapsulation if piling can be avoided and no risk of exposure using source-pathway-receptor approach. - Contractor to dispose of any transformers, waste oils and disturbed asbestos containing materials (ACMs) if encountered	- EMP/CSEMP requirements successfully implemented as determined through regular site checks, photographic record etc. - No exceedance of ambient water and soil levels (Annex 3) or increase in baseline contamination levels where they are already exceeded. - No outstanding grievances related to impacts from hazardous waste management.	On the completion of construction works prior to handover to NESCO	√	√	√	Contract cost

		at any project site or in the demolished buildings during the construction phase as hazardous wastes. - If PCBs are present in transformers or waste oil DOE to be consulted to confirm the environmentally safe and sound disposal route available in Bangladesh – the agreed method is still to be determined and may involve management in country or transboundary export to India.						
	Site restoration	- Rehabilitate any disturbed areas beyond the substation/building/switching station infrastructure footprint to through revegetation and landscaping using native species. - All spoils, construction waste and material scrap after erection of substation/building/switching station, gantries and equipment must be removed. The substation boundaries to be cleared of construction waste, footpaths and surroundings to be cleared and restored satisfactorily to the community staying near the substation.	- EMP/CSEMP requirements successfully implemented as determined through regular site checks, photographic record etc.	On the completion of construction works prior to handover to NESCO	√	√	√	Contract cost
O&M Phase (Measures to be Implemented by NESCO management)								
Operation and maintenance activities; all components as applicable	EHS impacts and risks of substation/switching station operations in general	- Prepare operational SOP for substations/switching stations covering pollution control, solid and hazardous waste management, health and safety risk assessments and	- Compliance with GOB regulations - No fatalities or lost time incidents, 100% of H&S incidents including near miss recorded,	Throughout the O&M Phase	√	N/A	N/A	NESCO

to the scope of works		management plans addressing both occupational and community risks and including permit to work system of critical activities such as electrical or work at height and emergency preparedness and response provisions (content will be like those of construction phase but tailored to reflect operational aspects) - Substation/switching station workers will need to be trained in SOP (Annex 4, ECP 16 & 18) and good housekeeping practices including how to clean up oil/fuel spills and dispose of contaminated sorbent material which would be treated as hazardous waste etc. - During maintenance activities mitigation measures applicable to the construction phase are also applicable to NESCO maintenance workers or contractors and are to be followed - Material Safety Data Sheets for all fuel/oil/chemical kept on site to be posted - Records volumes of all types of waste generated and keep transfer records at the substation/switching station with copies of the waste management company's licenses on file. - Defunct batteries (e.g., lead acid) installed at the substations/switching stations at	immediately investigated, and corrective action taken to prevent repeat. - Compliance with noise levels: 1- hour LAeq 70 dB(A) at the site boundary, 60dB(A) within commercial zones, 45 dB(A) at the nearest residential properties including those in industrial and commercial zones and 40dB(A) within 100m of silent zones - Compliance with ICNRP occupational/community EMF exposure levels (reference and peak values) at substations - EMP requirements successfully implemented as determined through regular site checks, photographic record etc. - No outstanding grievances from local communities or other interested stakeholders					

		their end-of-life will need to be disposed of as hazardous waste. - During O&M, internal audits will be undertaken by the NESCO ESS Wing Environment Officer and Health and Safety Officer						
	Gas insulated equipment at substations – release of SF6 as GHG at substations/switching stations	- Inventory to be maintained of all SF6 containing equipment at SS, their make and model, volume of SF6 contained, details of repair works undertaken, dates of SF6 replenishment, leakage incidents etc. - Inventory to be used to monitor SF6 leakage from SS. If the trend of lowering gas pressure is observed, investigate the cause and rectify any leak per the manufacturer's instruction. - If SF6 used on SS location, carry out regular inspections and periodic preventative maintenance to minimize SF6 leakages; monitor SF6 leakage rates using leak detection equipment - SOP to define a safe SF6 retrieval arrangement with appropriate handling, storage, disposal process for end-of-life circuit breakers by a certified industrial waste management company who will need to remove SF6 and treat the equipment prior to disposal in accordance international good practice International Electrotechnical Commission	-					

		(IEC) standard 61634 to ensure SF6 not released to atmosphere.						
	Occupational health safety of maintenance staff - accident risk at substations and switching stations as applicable to the scope of activities	- Maintain incident logbook and medical tests / health check-up of staff - Provide everyone who enters the SS/switching station with an OHS induction - Keep vents/windows unblocked and replace defunct bulbs/lights immediately - Ensure all SS/switching station workers receive basic first aid and firefighting training with annual refreshers - Ensure that at least one staff at SS/switching station is fully trained as a first aider and fire marshal - Maintain fully stocked, in-date first aid kit, keep first aid posters and emergency contact lists that are posted up to date - Maintain firefighting systems including in-date fire extinguishers and full sand buckets and keep fire safety posters up. Carry out regular inspections and periodic maintenance to ensure electrical standards are being implemented. - Keep emergency exits clear at all times and maintain emergency exit signs Maintain written warning signages including the ISO 7010 Hazard Type: Electrical	-					

		Symbol warning of the risk of electrocution. - Collect, segregate, and store in the designated and labelled storage areas all wastes including food wastes for onward disposal as per construction. - Undertake regular pest control using integrated pest management approach Maintain vegetation at the SS/switching station that poses a health and safety hazard Prohibit the use of herbicides, pesticides or burning to control any vegetation growth or to manage vegetation waste. - O&M to be performed only by suitably qualified and experienced workers who are regularly trained staff of NESCO or a contractor under supervision of a Health and Safety Officer following the SOP for H&S. - O&M workers to be given required PPE and other requisite safety equipment, provide sufficient PPE spares available on site for visitors etc. - Sanitation and welfare facilities as per construction will also be required for O&M workers. - Continue to provide potable drinking water supply meeting GoB drinking water standards (regular testing of drinking water is included in EMoP scope) - Cleaning of toilets on daily basis,						

		use of disinfectants and floor cleaners; keep toilets/septic tank/soak away maintained. - Periodic spot monitoring using mobile phone app of noise levels and ambient EMF for substations at the boundary fence/near transformers to ensure they are below the occupational/community noise levels and ICNRP occupational/community EMF exposure levels						
	Community H&S risks – impact on surrounding community, noise, EMF, accidents etc.	- Maintain security and prevent entry by the local community by maintaining adequate boundary fencing or walls, always keeping control room doors and gates shut, and having security persons present 24x7 to prevent unauthorized public access and trespass. - Maintain written warning signages including the ISO 7010 Hazard Type: Electrical Symbol warning of the risk of electrocution. - Regular checks and periodic maintenance of equipment like transformers and capacitors to minimize corona noise emissions.	- .					
	Use of mineral oil for transformers – accidental spillage contaminating both land and water	- Maintain inventory of transformers on site, make, model, risk of PCBs (if any) and other details including transformer test report, details any maintenance works	-					

		undertaken, dates oil changes, leakage incidents etc. – Carry out regular inspections and periodic preventive maintenance to minimize oil leakages; ensure valves, nuts and bolts are fully functional and tightly secured, ensure rubber seals of radiators are intact – The acceptance of mineral oil at substation to be accompanied by Material Safety Data Sheet and certification that it is PCB free. – Waste oil to be disposed of as hazardous waste using appropriately licensed waste management company with environmentally safe and sound storage, transport, and disposal – Maintain spill management materials (sorberent pads, loose sorberent material, sand, etc.) next to storage areas for immediately soaking up any leaks or spills that do accidentally occur						

Table 11-5: Environmental Management Plan for Workshops

Workshops									
Project Activity	Impact	Mitigation/Contingency/Enhancement Measures	Compensation/Enhancement Measures	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
						NESCO	PIAC	Contractor	
	Detailed Design and Pre-Construction Phase								
Existing Work Workshops detailed design and construction EHS management planning during pre-construction	Environmental and social impacts of construction and O&M phase -- lack of management of detailed design, construction and O&M leading to environmental degradation, H&S risks for construction and O&M workers as well the local community due to leakage of PCB oils into the ground and leaching to the groundwater and surface water sources by surface runoff etc.	- Designs of workshops to reflect the requirements of the EMP and international engineering best practice/good EHS practices. - Detailed design to minimize visual impact and clutter in keeping with the local vernacular. Landscaping to be included as part of the detailed design to enhance ecology and visual appearance of the workshops. - Outdoor lighting to be installed must be of low intensity with little or no blue wavelength and operated using passive infrared (PIR) technology movement sensors set at person height so as not to be kept permanently overnight, it must be directional and shielded, so light does not fall outside the site boundary. - Drilling and piling mud must be managed to avoid it being discharged to adjacent land.		Detailed Design cleared and approved reflects EMP requirements to minimize impacts and risks on EHS during subsequent stages of the project	Prior to detailed design approval and for implementation during construction	√	√	√	NESCO and Contract Cost
specifications and design parameters including health and safety, energy-efficient building codes	Structural safety for construction of buildings or erection of equipment (if any). Release of effluents in receptors (air,	Avoid all underground utilities during the design of buildings and workshops. Design buildings in compliance with relevant design standards and codes for energy-efficient, safe buildings Workshop designs to get approval for structural integrity by GOB approved agencies		Approved detailed designs Seismic design in Blueprints	Before the Start of Construction.	PIU/PMU	Design Consultant		Included in construction contract

Workshops								
Project Activity	Impact	Mitigation/Contingency/Enhancement Measures	Compensation/Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
					NESCO	PIAC	Contractor	
and specifications.	water, land).							
	Pollution of soil and water due to discharge of transformer oil or other fuel, oil or chemicals into the environment due to spills for workshop floors or leaks/discharge of wastewater from workshop washrooms	- Use of PCBs will be prohibited for repairing any transformers. Equipment purchased by NESCO or the contractor for use on the project is to be accompanied by letter from the manufacturer stating that it is guaranteed PCB free and to be labelled as PCB free before its installation. - Contractor to provide NESCO with Material Data Sheets (MDS) for insulating oil meeting technical specifications for use in repaired transformers. - Toilets/washrooms to be connected to either or to septic tank with soakaway sufficient distance from waterbodies – any discharge to surface water must meet the project effluent quality standards in Annex 3. - Detailed design of workshops to locate work benches with oil collection and drainage to a pit; storage areas and septic tanks/soakaway as far away as possible from any surface waterbodies and groundwater sources to reduce pollution risk. If within 500m of surface water or groundwater well further assessment to be carried out by contractor to demonstrate using a source-pathway-receptor model there will be no adverse impact on human health.	Detailed Design cleared and approved reflects EMP requirements with copies of equipment purchase letters and MDS included in EMRs.	Prior to detailed design approval and for implementation during construction	√	√	√	NESCO and Contract Cost

Workshops								
Project Activity	Impact	Mitigation/ Contingency/ Compensation/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/ Source
					NESCO	PIAC	Contractor	
		- Detailed design of transformer repair bays, fuel, oil chemical, and waste storage areas to incorporate impermeable concrete surface bunded to 110% volume which is connected to the oil collection system to collect spills and leaks. - Stored transformers must first be moved to an undercover, impermeable 110% bunded storage area, (with separate storage areas for potential PCB containing transformers, non-reparable transformers as well under repair transformers. - Comprehensive soil sampling undertaken to inform a strategy for remediation, anticipated to involve either the removal of soil off-site for incineration at the Holcim cement plant approved by DOE to take hazardous material or encapsulation if piling can be avoided. - To ensure a “clean” site for the works the remediation must be completed before any other works for the workshops are commenced. NESCO is currently working on the project funded by the UN Industrial Development Organization (UNIDO) under supervision of the GOB's Department of Environment to identify transformers containing PCBs to be phased out by						

Workshops									
Project Activity	Impact	Mitigation/ Contingency/	Compensation/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/ Source
						NESCO	PIAC	Contractor	
		31 December 2025 under the Stockholm Convention. - Stored transformers must first be moved to an undercover, impermeable 110% bunded storage area, (with separate storage areas for potential PCB containing transformers, non-reparable transformers as well under repair transformers. - Comprehensive soil sampling undertaken to inform a strategy for remediation, anticipated to involve either the removal of soil off-site for incineration at the Holcim cement plant approved by DOE to take hazardous material or encapsulation if piling can be avoided. - To ensure a “clean” site for the works the remediation must be completed before any other works for the workshops are commenced. NESCO is currently working on the project funded by the UN Industrial Development Organization (UNIDO) under supervision of the GOB’s Department of Environment to identify transformers containing PCBs to be phased out by 31 December 2025 under the Stockholm Convention. - Detailed design of fuel, oil chemical, and materials and waste storage							

Workshops								
Project Activity	Impact	Mitigation/ Contingency/ Enhancement Measures	Compensation/ Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/ Source
					NESCO	PIAC	Contractor	
		areas to provide for a covered storage area of sufficient size to accommodate all anticipated storage requirements with segregation of wastes, ensure storage areas can be locked, are well-ventilated and will not reach extreme temperatures. Ensure space also provided in the storage area for solid and hazardous waste garbage bins to be stored. - Provide spill prevention kits (sorbent pads, loose sorbent material, etc.) at storage areas and other at-risk locations within clearly labelled containers. - Conduct a flood and drainage risk assessment and incorporate effective drainage design (allowing for climate change) to prevent possible flooding or waterlogging of the workshops during the rainy season, whilst ensuring that surface runoff from the project site is no more than the existing site runoff rate. - No drainage water will be permitted to discharge directly to surface water; oil interceptors are to be fitted on all drainage to catch oil spill.						
Fire safety infrastructure in Workshops	Fire hazards in workshop	- Install modern fire control systems/firewalls, building insulation, plumbing and electrical system upgrades - Design of Workshops to include modern fire control systems/firewalls. - Provision of firefighting equipment to	Structural safety and connectivity to utilities to the building Workshops design compliance with	Bidding document to mention detailed specifications	PIU/PMU	Part of detailed Workshops layout and design /drawings		Included in construction contract

Workshops								
Project Activity	Impact	Mitigation/Contingency/Enhancement Measures	Compensation/Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
					NESCO	PIAC	Contractor	
		be located close to electrical installations.	fire prevention and control codes					
	Impacts on health and safety of O&M workers and the public	- Use of any PCB or repair of any transformer containing materials is prohibited. - Indoor work areas at Workshops to be well ventilated and naturally or artificially well-lit in accordance with national regulations and the IFC EHS Guidelines on OHS. For control buildings provide adequate natural and/or artificial lighting levels to meet the IFC EHS Guidelines on Occupational H&S (Table 2.3.3. Minimum Limits for Workplace Illumination Intensity) - Pit latrines and disposal of untreated sanitary wastewater to surface or groundwater is prohibited. Staff will reside off site but detailed design of substations to include adequate sanitation and welfare facilities for all workers to be posted at or visiting the Workshops including indoor kitchen (if possible), eating and rest areas and adequate number of indoor toilets/washrooms (one per six staff and separate for men/women with running water hand washing facilities) which are connected to septic tank with soak away. Provide a dedicated shelter and rest area for the 24-hour security guards, shielding them from	- Detailed Design cleared and approved reflects EMP requirements - Compliance with ICNRP occupational/ community EMF exposure levels (reference and peak values)	Prior to detailed design approval and for implementation during construction	√	√	√	NESCO and Contract Cost

Workshops								
Project Activity	Impact	Mitigation/ Contingency/ Compensation/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/ Source
					NESCO	PIAC	Contractor	
		rain, wind, and extreme (hot and cold) temperatures. - Disposal of workers generated waste (e.g., plastic bottles) on-site is prohibited and adequate waste storage areas to be incorporated into detailed design. Composting food waste may be permitted on-site if detailed design incorporates enclosed composting facilities (enclosed to avoid the attraction of vermin etc.) located away from accommodation and any property outside the site boundary. - Source of drinking water that meets drinking water standards to be provided to workshops. If any surface or groundwater sources are proposed for use in these locations, Contractor is to undertake a baseline water quality sampling per EMoP (Annex 2) to confirm its suitability for use. If drinking water standards are not met, detailed design to consider alternative sources or include water treatment facilities (RO) at these facilities to facilitate safe drinking water supply. Detailed design to include water meters for monitoring of water abstracted. - Provide gated, safe vehicular access for entry/exit off the public highway having adequate sight lines for all drivers and warning signs of entrance as well as adequate parking for cars.						

Workshops								
Project Activity	Impact	Mitigation/Contingency/Enhancement Measures	Compensation/Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
					NESCO	PIAC	Contractor	
		- Final plinth level for workshops will in accordance to Bangladesh Building Codes and a safe height above the highest flood level including an allowance for climate change based on the findings of the climate change assessment prepared for the Project (whichever is higher) - Foundations to be constructed in such a way as to be adequately drained to prevent washouts and flooding impacts to adjacent land.						
	Impacts from dust generated by earthworks	- Detailed design of Workshops to minimize cut and fill of earthworks and thus dust generation during construction, also maximize reuse of spoil to minimize the need for disposal off site. - During detailed design, contractors will quantify extent of earthworks required, amount of spoil to be generated and location for disposal of excavated spoil through landscaping within the site boundary – generation of excess spoil to be avoided.	Detailed Design cleared and approved reflects EMP requirements	Prior to detailed design and approval for implementation during construction	√	√	√	NESCO and Contract Cost
	Impacts due to workshop machinery noise	- Detailed design to ensure maximum sound power level of equipment at 1 m is 85 dBA through use of sound attenuation, in areas where these noise levels will be exceeded OHS noise warning signage identifying that ear protection to be worn must be installed as part of detailed design. - Detailed design of workshop	- Detailed Design cleared and approved reflects EMP requirements Compliance with noise standards	Prior to detailed design and approval for implementation during construction	√	√	√	NESCO and Contract Cost

Workshops									
Project Activity	Impact	Mitigation/Contingency/Enhancement Measures	Compensation/Enhancement Measures	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
						NESCO	PIAC	Contractor	
		machinery and other noise sources to be located as far as practical from the workshop inside walls since noise diminishes with distance. Design engineers will incorporate noise attenuating features in wall and surfaces for the workshop design. – Contractors will be required to measure and confirm the distance from their detailed design and construction work to sensitive receptors to confirm if the noise standards can be met. If any properties are within 100m of the site boundary ⁵⁰ then baseline measurements must be carried out during detailed design (refer to EMoP Annex 2) by the contractor who will also undertake quantitative noise assessment using internationally recognized noise modelling software of (i) the detailed design considering low frequencies associated with workshop machinery and (ii) construction methods to confirm that noise standards per Annex 3 can be achieved without additional noise mitigation – industrial levels must be achieved at the site boundary with		applicable to the substation location per Annex 3					

⁵⁰ Per the IEE, general construction impacts and operational noise exceedance in silent zone might be possible up to 100m. However, if the louder types of piling (impact or vibratory hammers) that generate over 85 dBA are intended to be used by the contractor baseline measurements must be carried out at sites with any properties present in 500m due to the increased impact area that will result.

Workshops								
Project Activity	Impact	Mitigation/ Contingency/ Compensation/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/ Source
					NESCO	PIAC	Contractor	
		residential levels at the nearest properties with silent levels achieved when schools or other silent zone receptors are present. If residential properties or other sensitive receptors are near the boundary, then measurements must be carried out during detailed design and baseline noise calculations (modelling) considering low frequencies associated with machinery will be undertaken by the Contractor to demonstrate that the noise standards/guidelines can be met. If background noise levels already exceed the standards/guidelines the design must ensure that noise levels result in a <3dBA increase in background. – Contractor will ensure that the quietest available workshop equipment with manufacturer-supplied noise mitigation will be installed. If noise levels cannot be met through siting and design alone detailed design to incorporate acoustic barrier designed to international good practice around either the noise source and/or boundary to attenuate noise to level such that noise levels at the receptors will be met. As operational noise is permanent the acoustic noise barrier will need to be a permanent installation as part of the detailed						

Workshops									
Project Activity	Impact	Mitigation/ Contingency/	Compensation/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/ Source
						NESCO	PIAC	Contractor	
		design. – Contractor to avoid soil compaction, piling and other vibration inducing activities as much as possible. The quietest equipment available will be used, noise attenuation measures will include, (i) fitting of high efficiency mufflers to the noise generating equipment; and (ii) keeping acoustic enclosures around piling/drilling equipment. For piling it will not be possible to use the louder types of piling (impact or vibratory hammers) that generate over 85 dBA without resulting in a significant impact because noise from piling equipment of 120 dBA at 1m would exceed 85dBA, the level at which hearing damage is caused at adjacent properties if found within 100m. If noise levels are still exceeded a temporary acoustic noise barrier will be provided or alternatively temporary relocation of occupants during work to a rented property. In locations where soil compaction, piling, blasting and other vibration inducing activities are unavoidable Contractor to identify properties within the zone of influence and undertake pre-construction structural surveys to identify level of risk with reference to the guideline vibration levels per Annex 3. If there is a risk of structural damage to properties due to their current condition, consider alternative							

Workshops									
Project Activity	Impact	Mitigation/ Contingency/	Compensation/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/ Source
						NESCO	PIAC	Contractor	
			construction methods or temporary relocation of occupants during works if at risk to a rented property. Consider the need to install monitors to monitor structural movement. Structural or cosmetic damage to be repaired by Contractor to at least pre-project condition at their own cost.						
	Impacts on surface and groundwater resources	- Construction activities must be planned not to limit the availability of or restrict access to water sources (e.g., groundwater wells) used by local communities; natural flow of any surface water or drains must not be obstructed or if not possible diverted through a drainage system to another direction. - Any piling or excavation works within 500m of groundwater wells used as a drinking water source by local communities will require pre-construction and post construction water quality monitoring against drinking water standards to ensure there is no contamination of the water supply. - Construction water to be sourced from an existing licensed commercial supplier (preferred option especially for potable water supplies), where available, or rainwater harvesting. If using an existing surface water or an existing borewell for construction water, permissions to be obtained from the relevant authorities together	- Monitoring data demonstrates compliance with national standards - No unresolved grievances regarding water resources	Prior to mobilization and site establishment and for implementation during construction	√	√	√	Contract cost	

Workshops								
Project Activity	Impact	Mitigation/ Contingency/ Compensation/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/ Source
					NESCO	PIAC	Contractor	
		with the agreement of local communities. - Prior agreement is required by local community users to use any existing surface water/borewell or local piped water either temporarily during construction or permanently for substations; in cases where use of local water source is not agreed, contractors to import tanked water to the project area. - Contractors will only use groundwater after it has been confirmed through assessment and confirmed by competent authorities and community that there will be no additional stress on groundwater resources as a result. - Permissions of any new borewell (in accordance with Groundwater Management Ordinance 1985) installation (for construction or permanent supply to substation) to be obtained together with agreement of local communities before abstraction, include water meter for monitoring of water abstracted. - Contractor to avoid piling activities as much as possible. If needed a management plan will be prepared for approval. Oil will not be used for drilling or piling fluid. The piling management plan will include measures to avoid water pollution from the use of any bentonite clay slurry - adequate bunding must be provided						

Workshops									
Project Activity	Impact	Mitigation/ Contingency/	Compensation/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/ Source
						NESCO	PIAC	Contractor	
		around piling activities to contain piling mud and decanting ponds will need to be fully enclosed to avoid spills or leaks to adjacent land. Piling fluid must not be intentionally or unintentionally disposed of to surface water untreated or be allowed to damage adjacent land. Sediment laden surface water runoff and discharges must be disposed of to open ground for percolation or passed through a sedimentation tank having adequate settlement tank, to obtain at least 50 mg/l TSS, before being allowed to enter surface water. Use of piling mud treatment equipment to be considered where space is limited.							
	Removal of Trees.	– Avoid the siting of structures in locations that would require permanent loss of trees. Implement tree replantation or transplantation as the case may be for each site.		Statutory approvals for tree trimming/removal from competent authority.	Consultation with local authorities and design engineers in consonance with PMU.	PIU/PMU	Part of detailed location survey and design.		Included in construction contract
CONSTRUCTION									
Construction site clearance Surplus earthwork/soil	Removal of topsoil and loose soil storage at site may lead to dust emission. Runoff to cause water pollution, solid waste disposal	– Sprinkle water at site and cover soil dump against air pollution – Storage of excess soil near drainage and stored in restricted areas and construction work should be carefully designed to minimize obstruction or destruction to natural drainage.		– EMP/CSEMP requirements successfully implemented as determined through regular site checks.	Throughout construction	√	√	√	Contract cost

Workshops								
Project Activity	Impact	Mitigation/Contingency/Enhancement Measures	Compensation/Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
					NESCO	PIAC	Contractor	
			photographic record etc – Air and water pollution					
Trimming/cutting of trees within Workshops boundary.	Vegetation, re-vegetation of disturbed areas; greening. Loss of vegetation and removal of trees.	– Marking of vegetation (if any) to be removed prior to clearance, and strict control on clearing activities to ensure minimal clearance. – Trees that can survive pruning to comply should be pruned instead of cleared. If any trees are felled or pruned vegetation to be disposed of as authorized by the statutory bodies. Contractor will replant or transplant trees to be cut as per Tree Plantation Plan approved by PIU.	– Species-specific tree retention as approved by statutory authorities (average and maximum tree height at maturity, in meters).	Presence of target species Clearance strictly limited to target vegetation	√	√	√	Included in construction contract
Provision of facilities for construction workers at work site	Contamination of receptors (land, water, air).	– Construction workforce facilities to include proper sanitation, water supply and waste disposal facilities at work site. Discharge construction wastewater and domestic wastewater to provide on-site treatment facilities.	Amenities for Workforce facilities.	Presence of proper sanitation, water supply and waste disposal facilities	√	√	√	Included in construction contract
	Impacts due to dust from earthworks	– Plan the construction site layout so that machinery and dust-causing activities are located away from receptors, as far as is possible. – Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site to fully enclose operations. – Contractors to undertake quantitative air quality monitoring as per the EMoP (Annex 2). In addition to	– EMP/CSEMP requirements successfully implemented as determined through regular site checks, photographic record etc.	Throughout construction	√	√	√	Contract cost

Workshops									
Project Activity	Impact	Mitigation/ Contingency/	Compensation/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/ Source
						NESCO	PIAC	Contractor	
		quantitative monitoring (as per EMoP) contractors will undertake weekly dust soiling checks of surfaces of adjacent properties during earthworks and help with cleaning of external surfaces of property if dust is evident. - If air quality levels are exceeded, an increase in existing background air pollution is recorded where they were already exceeded, or complaints are received contractors will be required to implement additional dust mitigation e.g., barricading/isolating sources of dust, use of wheel wash, adjusting working methods, to ensure the levels are met.	- No exceedance of air quality levels (Annex 3) or increase in baseline air pollution levels where they are already exceeded. - No outstanding grievances related to impacts from dust and air pollution.						
Construction schedules for Workshops-Mechanized construction	Noise, vibration equipment wears and tears and operator safety, efficient operation. Noise nuisance to neighbouring properties.	- Construction equipment to be well maintained. Construction techniques and Machinery selection to minimize ground disturbance. Proper maintenance and turning off plants are not in use. Noise barriers will be installed to reduce the incidence of noise to local residents. During night (6am to 10pm) no work will be permitted at any worksites. - Contractor's maximum working hours (including the movement of heavy vehicles for construction on off-site access roads) will be 7 am – 7 pm. - Residents within 500m will be informed well in advance of the	- Construction techniques and equipment - estimated noise emissions and operating schedules. - Timing of construction (noise emissions in decibels	Technical specifications, safety regulations Noise control regulations Construction as per Scheduled timings only.	√	√	√		Contract cost

Workshops								
Project Activity	Impact	Mitigation/Contingency/Enhancement Measures	Compensation/Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
					NESCO	PIAC	Contractor	
		construction schedule for noisy activities taking place on-site. Noisy construction activity at substations (especially demolition and piling works) will only take place between the hours of 10 am - 4 pm. No noisy work and heavy vehicle movements will take place on Fridays and during school/college/university exam periods. No work on Saturday, holidays and festival days. Sensitive receptors to be consulted with any other special days when they would wish noise levels to be minimized. - For Workshopswith properties in 50m distance, loud construction noise must be limited to only very short periods of activity to minimize disturbance. - Layout design to ensure the nosiest construction works the furthest distance possible from adjacent receptors and adopt construction methods that ensure noise generated from construction is minimized. If the noise levels at the site boundary or receptors will exceed the required noise levels, are more than 3dBA above background when already exceeded, or there are complaints then a temporary acoustically designed noise barrier will need to be installed around the substation perimeter to be able to meet required	(dBA) ⁵¹ . EMP/CSEMP requirements successfully implemented as determined through regular site checks, photographic record etc. - No exceedance of noise levels (Annex 3) or increase in baseline noise levels where they are already exceeded. - No outstanding grievances related to impacts from noise and vibration.					

⁵¹ Noise norms of 55dB daytime 45dB night-time.

Workshops								
Project Activity	Impact	Mitigation/Contingency/Enhancement Measures	Compensation/Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
					NESCO	PIAC	Contractor	
		noise level. – Sound levels received by workers must not be over 85 dB(A) during continuation of 8 working hours without wearing PPE. – Contractors to undertake quantitative noise monitoring as per the EMoP (Annex 2). If noise levels are exceeded, an increase in existing or noise levels >3dBA recorded where they were already exceeded, or complaints are received contractor will be required to implement additional noise mitigation e.g., adjusting working methods, or placing of temporary acoustically designed noise barriers to ensure met.						
Electrical/fire safety Equipment layout and installation	Sparks and fire hazard during construction	– Record of all Workshops electric fittings and fire safety devices located within secure casings	– Electrical casings at Workshops	As per International standards Once in year	√	√	√	Included in construction contract
Use of Volatile organic compounds	Toxicity and air contamination	– Use of low or no volatile organic compounds – water based nontoxic etc. – If toxic solid waste is found during construction, construction activities should be suspended and the DOE consulted to define appropriate actions. – Store chemicals/hazardous products and waste on impermeable surfaces in secure, covered areas; Provide spill cleanup measures and equipment at	Air quality – measure volatility as per Mongolian standards – four times a year	four times a year	√	√	√	Included in construction contract

Workshops								
Project Activity	Impact	Mitigation/Contingency/Enhancement Measures	Compensation/Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
					NESCO	PIAC	Contractor	
		each construction site.						
Oil spillage.	Contamination of land/nearby water bodies.	Record of all oil spillage during construction from construction machinery etc.	Workshops bounding ("as-built" diagrams), construction machinery.	Guideline on Transportation, storage, use and disposal of toxic and hazardous chemicals (2009)	√	√	√	Included in construction contract
Construction waste generated on construction sites	Indiscriminate disposal of waste on site and off site by construction company	- Provide appropriate waste storage containers for worker's construction and hazardous wastes. - Install confined storage points of solid wastes away from sensitive receptors, regularly haul to an approved disposal facility. - Use licensed contractors to remove wastes from the construction sites. - Prohibit burning of waste.	Contract clauses	PMU and ADB Health and safety standards.	√	√	√	Included in construction contract
	Hazardous waste management	- The guidelines of UN Industrial Development Organization (UNIDO) must be followed in handling all transformers since due to recycling of oil none can be guaranteed PCB free; and the contractor should test all transformers removed by the project. - For workshops, waste disposal is a concern, except for waste oil which is taken by a contractor all solid and hazardous waste is disposed of to the municipalities who do not have a sanitary landfill meaning it is open dumped. - Removal of soil off-site for incineration at a cement plant approved by DOE to take hazardous	- EMP/CSEM P requirements successfully implemented as determined through regular site checks, photographic record etc. - No exceedance of air, water, soil levels (Annex 3) or increase in	On the completion of construction works prior to handover to NESCO	√	√	√	Contract cost

Workshops									
Project Activity	Impact	Mitigation/ Contingency/	Compensation/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/ Source
						NESCO	PIAC	Contractor	
		material or encapsulation if required. – Contractor to manage Asbestos containing materials (ACMs) if encountered at any project site or in the demolished buildings during the construction phase.		baseline contamination levels where they are already exceeded. – No outstanding grievances related to impacts from hazardous waste management .					
Construction of access road for ingress into premises. Temporary Traffic Management.	Increased land for requirement temporary accessibility.	– Existing separate gates used for construction and maintenance access to the site wherever possible. – Prepare traffic and access plan within and around workshop, substations, during construction, as needed.		Access gates, road, locations (length and width of access roads).	Blueprint design for access restricted to from normal Workshop entrances	√	√	√	Included in construction contract
Site restoration	Surplus earthwork/soil	– Rehabilitate any disturbed areas beyond the infrastructure footprint to through revegetation and landscaping using native species. – All spoils, construction waste and material scrap after construction must be removed. The boundaries to be cleared of construction waste, footpaths and surrounding to be cleared and restored satisfactorily to the community staying near the facilities.		– EMP/CSEMP requirements successfully implemented as determined through regular site checks, photographic record etc. – Storage of	On the completion of construction works prior to handover to NESCO	√	√	√	Contract cost

Workshops								
Project Activity	Impact	Mitigation/Contingency/Enhancement Measures	Compensation/Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
					NESCO	PIAC	Contractor	
		Runoff to cause water pollution, solid waste disposal	excess soil near drainage and stored in restricted area and construction work should be carefully designed to minimize obstruction or destruction to natural drainage.					
Temporary use of land.	Losses to neighbouring land uses/ values.	- Contract clauses specifying careful construction practices. - Workshop Land will be reinstated following completion of construction.	- Contract clauses - Design basis and layout. - Reinstatement of land status (area affected, m2).	Incorporating good construction management and design engineering practices.	√	√	√	Included in construction contract
Occupational Health and safety	Injury and sickness of workers and members of the public.	- Contract provisions specifying minimum requirements for construction camps. - Contractor to prepare and implement a health and safety plan and provide workers with required PPE (attached separately below table). - Contractor to arrange health and safety awareness programmes	Contract clauses (number of incidents and total lost-work days caused by injuries and sickness).	PMU and ADB Health and safety standards - Monthly.	√	√	√	Included in construction contract

Workshops								
Project Activity	Impact	Mitigation/Contingency/Enhancement Measures	Compensation/Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
					NESCO	PIAC	Contractor	
		including AIDS and sexually transmitted diseases (STD). – Develop an emergency response plan to take actions on accidents and emergencies. – Document and report on occupational accidents, diseases, and incidents. – Emergency contact numbers for local fire, medical and police services shall be kept in prominent place.						
Community Health and Safety	Injury and accidents caused by residents in the area	– Installation of proper warning signage, installation of sheet barriers to avoid people, workers stray animals falling into trenches, or projectile material hitting the neighbouring residents or damaging property	– Contract clauses (number of incidents caused by injuries and accidents in neighbourhood).	EHS guidelines, Health and safety standards.	√	√	√	Included in construction contract
Capacity Building	Improve standards of implementation and monitoring.	– Training of PIU, Workshop managements.	– Training schedules.	Number of training programs.	√	√	√	Contractor through contract provisions under supervision of PMU.
OPERATION								
Operation and maintenance activities	EHS impacts and risks in general	– Update operational SOP for substations covering pollution control, solid and hazardous waste management, health and safety risk assessments and management plans addressing both occupational and	– Compliance with GOB regulations – No fatalities or lost time incidents,	Throughout the O&M Phase	√			NESCO

Workshops									
Project Activity	Impact	Mitigation/ Contingency/	Compensation/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/ Source
						NESCO	PIAC	Contractor	
		community risks and including permitting a working system of critical activities such as electrical or work at height and emergency preparedness and response provisions (content will be similar to those of construction phase but tailored to reflect operational aspects) - Substation workers will need to be trained in update SOP/ OR (Annex 4, ECP 16 & 18) and good housekeeping practices including how to clean up oil/fuel spills and dispose of contaminated sorbent material which would be treated as hazardous waste etc. - During maintenance activities mitigation measures applicable to the construction phase are also applicable to NESCO maintenance workers or contractors and are to be followed - Material Safety Data Sheets for all fuel/oil/chemical kept on site to be posted - Records volumes of all types of wastes generated and keep transfer records at the substation with copies of the waste management company's licenses on file. - Defunct batteries (e.g., lead acid) installed at the substations at their end-of-life will need to be disposed of as hazardous waste. - During O&M, internal audits will be		100% of H&S incidents including near miss recorded, immediately investigated, and corrective action taken to prevent repeat. - Compliance with noise levels: 1-hour LAeq 70 dB(A) at the site boundary, 60dB(A) within commercial zones, 45 dB(A) at the nearest residential properties including those in commercial zones and 40dB(A) within 100m of silent zones					

Workshops								
Project Activity	Impact	Mitigation/Contingency/Enhancement Measures	Compensation/Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
					NESCO	PIAC	Contractor	
		undertaken by the NESCO ESS WING Environment Officer and Health and Safety Officer	- Compliance with ICNRP occupational/ community EMF exposure levels (reference and peak values) at substations - EMP/CSEMP requirements successfully implemented as determined through regular site checks, photographic record etc. No outstanding grievances from local communities or other interested stakeholders					
	Occupational health safety of maintenance staff - accident risk	- Maintain incident logbook and medical tests / health check-up of staff - Keep vents/windows unblocked and replace defunct bulbs/lights immediately						

Workshops									
Project Activity	Impact	Mitigation/ Contingency/	Compensation/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/ Source
						NESCO	PIAC	Contractor	
		– Ensure all Workshop engineers/technicians receive basic first aid and firefighting training with annual refreshers – Ensure that at least one member of staff at workshop is fully trained as a first aider and fire marshal – Maintain fully stocked, in-date first aid kit, keep first aid posters and emergency contact lists that are posted up to date – Maintain firefighting systems including in-date fire extinguishers and full sand buckets and keep fire safety posters up. Carry out regular inspections and periodic maintenance to ensure electrical standards are being implemented. – Keep emergency exits clear at all times and maintain emergency exit signs – Maintain written warning signages including the ISO 7010 Hazard Type: Electrical Symbol warning of the risk of electrocution. – Collect, segregate, and store in the designated and labelled storage areas all wastes including food wastes for onward disposal as per construction. – Undertake regular pest control using integrated pest management approach – O&M to be performed only by suitably qualified and experienced workers							

Workshops								
Project Activity	Impact	Mitigation/Contingency/Enhancement Measures	Compensation/Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
					NESCO	PIAC	Contractor	
		who are regularly trained staff of NESCO or a contractor under supervision of a Health and Safety Officer following the SOP for H&S. O&M workers to be given required PPE and other requisite safety equipment, provide sufficient PPE spares available on site for visitors etc.						
	Wastewater discharge and sanitation	- Maintenance and regular upkeep of septic tanks and holding tanks by Workshop to avoid surface discharge. include O&M of the sewage collection facility and sewage tanks. - Sanitation and welfare facilities as per construction will also be required for O&M workers. - Continue to provide potable drinking water supply meeting GoB drinking water standards (regular testing of drinking water is included in EMoP scope) - Cleaning of toilets on daily basis, use of disinfectants and floor cleaners; keep toilets/septic tank/soakaway maintained.	Water discharge parameters as specified in EMoP	Waste water standards	√	√	√	Operations Budget
	Community H&S risks – impact on surrounding community, noise, accidents etc.	Maintain security and prevent entry by the local community by maintaining adequate boundary fencing or walls, always keeping control room doors and gates shut, and having security persons present 24x7 to prevent unauthorized public access and trespass.						

Workshops								
Project Activity	Impact	Mitigation/Contingency/Compensation/Enhancement Measures	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
					NESCO	PIAC	Contractor	
		– Maintain written warning signages including the ISO 7010 Hazard Type: Electrical Symbol warning of the risk of electrocution.						
	Use of mineral oil for transformers repairs— accidental spillage contaminating both land and water	– Maintain inventory of transformers on site, make, model, risk of PCBs (if any) and other details including transformer test report, details any maintenance works undertaken, dates oil changes, leakage incidents etc. – For Transformers containing suspected PCB carry out regular inspections and periodic preventive maintenance to minimize oil leakages; ensure valves, nuts and bolts are fully functional and tightly secured, ensure rubber seals of radiators are intact – The acceptance of new mineral oil at the workshop be accompanied by Material Safety Data Sheet and certification that it is PCB free. – Waste oil to be disposed of as hazardous waste using appropriately licensed waste management company with environmentally safe and sound storage, transport, and disposal – Maintain spill management materials (sorbent pads, loose sorbent material, sand, etc.) next to storage areas for immediately soaking up any leaks or spills that do accidentally occur. – Workshops to ensure that waste oil effluent and sludge is collected and disposed of to the authorised oil	Workshops bounding (“as-built” diagrams).	Guideline on Transportation, storage, use and disposal of toxic and hazardous chemicals (2009)	√	√	√	Operations Budget

Workshops								
Project Activity	Impact	Mitigation/Contingency/Enhancement Measures	Compensation/Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
					NESCO	PIAC	Contractor	
		recyclers and waste collectors						
Segregation of Solid waste	Nuisance to local community	Training of Workshop personnel n proper segregation and storage and waste at Workshop	Training by PIU	Number of training programs.	√	√	√	Operations Budget
Training on Health and safety and emergency response	Lack of awareness for health and safety procedure.	Training of Workshop personnel on safety and emergency response	Training schedules.	Number of training programs.	√	√	√	Operations Budget
O&M of equipment building and generators etc.	High operational costs		Energy efficiency parameters	Energy conservation norms of buildings – Once/year	√	√	√	Operations Budget
Operation of Electrical safety systems, fire safety systems.	Electric sparks, fire and explosion	Record of all Workshops electrical switchbox located within secure casings.	Workshops electricity distribution boards Monthly.	Fire safety standard	√	√	√	Operations Budget
Electric shock or accidents	Death or injury to the staff and public.	Security warnings around fittings. Careful design using appropriate technologies to minimize hazards.	Proper maintenance of distribution boxes and sign boards. Usage of appropriate technologies (lost workdays due to injuries).	Periodic maintenance. The number of programmes and percentage of staff/workers covered.	√	√	√	Operations Budget
Replanted Trees	Replanted trees die	Proper upkeep, water etc. for ensuring tree regenerate	Number of trees		√	√	√	Operations Budget
Indoor Pollution	Indoor health and	Ensure compliance with relevant health	workshops	Air quality standards	√	√	√	Operations

Workshops									
Project Activity	Impact	Mitigation/Contingency/Enhancement Measures	Compensation/Enhancement Measures	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
						NESCO	PIAC	Contractor	
	safety	and safety regulations pertaining to ventilation, indoor air quality, lighting, noise, fire							Budget

Table 11-6: Environmental Management Plan (EMP) for installation of Solar Rooftop

Rooftop Solar									
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement Measures	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
						NESCO	PIAC	Contractor	
Detailed Design and Pre-Construction Preparatory Works									
EHS impacts and risk in general	EMP in Bidding and Contract Document	PMU to ensure the contractor's requirement to comply with the EMP and any updates to it following national environment clearance, detailed designs, or in response to any unanticipated impacts. The contractor will be responsible for implementing and budgeting all the mitigation measures required in the EMP to which the implementing leads and third parties must comply is that disclosed on ADB's/NESCO website. Contractor will preferably have its own corporate environment, health and safety policies and corporate environment, health, and safety management system certifications for health and safety, or equivalents.		Definitive EMP cleared by ADB and related provisions included in the signed contract document No breaches of EMP by contractor, subcontractor or other third parties with prompt corrective action taken if required	PMU prior to issue of bidding documents and contract award. Contract award for contractor	PMU	H&S Officer with support of PIAC	Contractor to comply for duration of contract relation to Solar Rooftop installations	NESCO counterpart funds; contractor to reflect in contact costs

Rooftop Solar									
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
						NESCO	PIAC	Contractor	
		Contractor will ensure all their subcontractor and third parties, irrespective of being formally or informally employed by them, also comply with the final EMP and any updates to it, as well as their own CSEMP. Contractor will not engage in any activities described on the ADB Prohibited Investment Activities List in Appendix 5 of ADB's SPS (2009). Contractor will put in place appropriate incentives and/or penalties for (non-) compliance by workers related to use of PPE, prohibition on firewood and fishing, hunting, or poaching by workers.							
EHS impacts and risk in general	Safeguard Staffing and Capacity Development Labor management, employment, and micro level socio economic development opportunities	PIAC to appoint a suitably qualified and experienced, H&S Officer upon loan effectiveness who will hold monthly EHS meetings including a site walkover with third parties as well as “spot check” site visits to the Solar Rooftop works Contractor to ensure that each active rooftop installation site has adequate H&S supervision to ensure the H&S of all workers and local communities; the H&S officer will be supported by full-time on-site H&S steward(s).	PIAC's environment safeguard staff are on board to oversee EMP implementation Detailed training plan reflecting EMP requirement	Throughout pre-construction and construction period Upon loan effectiveness for PMU Contract award for contractor	PMU List of safeguard staff and copies of CVs to be submitted in first ESMR, updates/changes in safeguard	H&S Officer with support from PIAC H&S Officer to oversee EMP and providing guidance and corrective actions as required, and recording activities and EHS conditions on-site through photos etc. PIAC staff to be involved in monthly	Contractor to comply for duration of contract, CVs for approval of environment safeguard team submitted as part of bid or subsequently for approval of PMU before mobilization,	NESCO counterpart off-funds; contractor costs including Contractor's EHS staff as BOQ line	

Rooftop Solar									
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
						NESCO	PIAC	Contractor	
		Contractor to conduct regular emergency preparedness and response drills involving all workers irrespective of them being formally or informally employed by contractor, subcontractor or third-party to prepare them in case of an environmental or health and safety incident including spillage, fire, natural disaster, disease outbreak, drowning etc. Contractor to conduct their own trainings for their construction management and provide all workers irrespective of them being formally or informally employed by the contractor, subcontractor or third party with an EHS induction before being allowed on site including dos and don'ts in relation to the construction site, temporary workers camps/overnight accommodation, code of conduct and interaction with local communities, forest areas, protected areas etc. Training for construction management will include modules on first aid and fire safety including include training on how to use first aid and firefighting equipment provided on-site.		s developed upon loan effectiveness and training records maintained Trainings and awareness raising delivered in accordance with the training plan Contractor and construction workers fully aware of their responsibilities under EMP through training		d staffing specified in subsequent ESMRs along with records of trainings provided	EHS meetings and in trainings in advance of handover	keep records of all trainings etc.	

Rooftop Solar									
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
						NESCO	PIAC	Contractor	
		No child will be employed, and no under 18 years will be engaged on the Solar Rooftop works (hazardous work). GRM will be available to workers for receiving and handling complaints about unfair treatment or unsafe living or working conditions, ensuring no coercion nor reprisal. Contractor to provide medical/accident insurance for all workers (formal and informal) for the duration of their contract							
	EHS impacts and risk of construction and operation in general, detailed design Visual impact from the introduction of solar rooftop installations, glint and glare	Contractor to ensure that detailed designs reflect the requirements of this EMP and international engineering best practice/good EHS practices. Selection of an environmentally safe and sound solar photovoltaic panel ideally from a manufacturer who offers a facility for return of end-of-life equipment. Solar panels installed must not contain hazardous materials e.g., cadmium, lead, or selenium. Equipment purchased for use on the project is to be accompanied by letter from the manufacturer stating its composition and the leaching		Approved detailed designs minimize impacts and risks on approval of subsequent stages of the project	Detailed design stage; compliance prior to approval of detailed designs	PMU supported by PIAC will review detailed designs to confirm all measures required by the EMP have been adequately	PIU E&S Officer with support from PIAC PIAC to be involved in detailed design review	Contractor to comply during detailed design stage	Contractor to reflect in contact costs

Rooftop Solar									
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
						NESCO	PIAC	Contractor	
		potential of any heavy metal content to determine if it is acceptable and how it is to be disposed on at end-of-life. Solar panels to have an anti-reflective coating to minimize glint and glare and maximize light absorption, tables/racks to be anti-reflective made of galvanized steel or aluminum. Detailed design to minimize visual impact and clutter. Design proper orientation for solar photovoltaic panels to prevent glint and glare at adjacent properties – if glint or glare becomes an issue provide vegetative screen around the property boundary during O&M. Include in the design a secure fence with lockable entry featuring written (Bangla) and visual warning signs to include the ISO 7010 "Hazard Type: Electrical Symbol" warning of risk of electrocution around the Solar Rooftop works. All individual items of electrical equipment provide written (Bangla) and visual warning signs to include the ISO 7010 "Hazard Type: Electrical Symbol" warning of risk of				incorporated			

Rooftop Solar									
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
						NESCO	PIAC	Contractor	
		electrocution with an internal fence for high-risk equipment. Detailed design to include lightening protection and fire safety measures including detector, alarm, suppression system in electrical equipment installed in the substations, and workshops and firefighting equipment including sufficient fire extinguishers.							
	H&S Provisions Additional water resources required including potable water supply for project workers	Contractor to provide installation workers with a source of drinking water that meets Bangladesh/WHO drinking water standards; minimum treatment is disinfection. Informed by the H&S risk assessment the HSMP will include occupational and community, H&S management sub-plans as well as a labor management sub-plan addressing migrant workers and sanitation and welfare etc. Contractor will ensure all workers are covered by insurance to pay out in the event of a disability or fatality. Contractor will provide adequate sanitation and welfare facilities including hand washing and clean							

Rooftop Solar								
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)		
						NESCO	PIAC	Contractor
		PPE in sufficient quantity are provided on-site and at temporary worker camps/overnight accommodation.						
	EHS impacts and risks of the project during RFT installations in general, planning for on-site EHS management and preparation of CSEMP	Contractor to develop a Construction Site specific Environmental Management Plan (CSEMP) and Construction H&S Management Plan (HSMP) reflecting the EMP requirements including the ECP and international engineering best practice/good EHS practices for their contract and submit to for approval prior to any works commencing on site. These will be living documents, to be updated as required and re-approved by PMU if the construction methods or site conditions change, in response to an accident, incident, near miss etc.	Approved CSEMP and HSMP minimize impacts and risks on subsequent stages of the project	Pre-construction stage; compliance prior to any works commencing on site including site establishment	PIU supported by PIAC will review CSEMP and HSMP to confirm all measures required by the EMP have been adequately incorporated	PIU's E&S Officer with support from PIAC PMU to be involved in H&S risk assessment since they will be responsible for O&M	Contractor to comply prior to any works commencing on site	Contractor to reflect in contact costs
	EHS impacts and risk in general, meaningful consultations and information disclosure as well as awareness in safety community relation to construction site and electrical safety	PMU/PIU to prepare detailed communication/consultation plan upon loan effectiveness to be followed by them and third parties. Contractor to undertake electrical safety community awareness raising activities.	Communication/consultation plan developed reflected ongoing consultation requirement upon loan	Throughout project implementation period Upon loan effectiveness for PMU	PMU followed by PIU during operation Consultation and awareness raising	H&S Officer with support from PIAC/PMU H&S Officer	Contractor to comply for duration of contract, contractor to remain actively involved with local communities	NESCO counterpart funds; contractor to reflect in contact costs

Rooftop Solar									
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
						NESCO	PIAC	Contractor	
		Basic training in first aid and firefighting to all personnel deployed for Erection, Operation Phases will be included in solar rooftop CSEMP for that site.		effectiveness Local communities and other concerned stakeholder s kept informed throughout project implementation.	Prior to the commencement of works for contractor, and then ongoing throughout construction Upon handover of the Solar Rooftop works	undertaken will be documented and reported in ESMRs including photos and records of participation (including the gender breakdown)		through ongoing consultations	
Construction Phase (Site Establishment and Erection)									
Site preparation	Prepare technical details about all sites	Detailed review of present condition of existing building's roof required for solar rooftop mounted installation: o structural safety o leakages and/or cracks o adequacy of roof drainage, and o condition and adequacy of parapet wall (to address safety concerns) Structural or cosmetic damage is to be repaired by contractor to roof or any structures to the pre-project condition at their own cost.		EMP/ECP/CSEMP requirements successfully implemented through regular site checks, photographi c record etc.	Prepare during pre-construction and comply throughout construction stage	PMU	H&S Officer with support from PIAC	Contractor to comply with construction	Contractor to reflect in contact costs

Rooftop Solar									
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
						NESCO	PIAC	Contractor	
		Determine the availability of water for periodic washing solar panels, without affecting other users either on sharing or through dedicated arrangements (approx. 10 liters/cleaning cycle per kW)							
Dust Management	Generation of dust during site development, loading and unloading of raw materials and other civil works	Comply with the ECPs as well as the CSEMP including pollution prevention sub-plan and the IFC and EHS General Guidelines in relation to air quality and dust generation incidents. Contractor to ensure the most stringent of the ambient air quality Bangladesh standards and WHO guidelines 2021 for PM10 and PM2.5 are complied with at the adjacent properties; If contractor uses any stationary emission sources such as diesel generator sets for installations, they need to ensure that they are implemented regularly serviced and maintained as in good working order in accordance with manufacturer's instructions and have passed applicable emission tests; keep log of maintenance work undertaken. Locate stores/stockpiles of loose material at least 50m from the adjacent properties and enclose	Compliance with most stringent of the government ambient air quality standards and WHO guidelines 2021 EMP/ECP/CSEMP requirement successfully implemented as determined through regular site checks, photographic record etc. No outstanding	Prepare during pre-construction and comply throughout construction stage	PMU	H&S Officer with support from PIAC	Contractor to comply duration of construction	Contractor to reflect in contact costs	

Rooftop Solar								
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)		
						NESCO	PIAC	Contractor
		them by a solid fence to reduce windblown dust.		dust related grievances from local communities				
Noise management	Generation of noise during roof preparation	Comply with the ECP as well as the CSEMP including pollution prevention sub-plan and the IFC EHS General Guidelines in relation to noise and avoid noise disturbance to community and staff/students. Construction methods to ensure that construction noise will be limited to 1-hour LAeq 55 (day) from 7am to 10pm and 45 (night) dB(A) from 10pm to 7am at the nearest adjacent residential properties, or levels will not increase by more than 3dB(A) above the background levels -- if these levels are exceeded contractor will be required to implement additional noise mitigation to ensure they are met. Strictly limit the working hours to weekdays and avoid all erection works at night, on weekends, and during holidays and festivals. No Community within 50m will be informed well in advance of the		Compliance with most stringent of government noise standards and WHO guidelines at adjacent residential properties EMP/ECP/CSEMP requirement successfully implemented as determined through regular site checks, photographic record etc. No outstanding noise	Prepare pre-construction and comply throughout construction stage	PMU	PIU E&S Officer with support from PIAC	Contractor to comply duration of construction Contractor to reflect in contact costs

Rooftop Solar									
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
						NESCO	PIAC	Contractor	
		construction schedule for noisy activities		related grievances from local communities					
Storage and spills	Inadequate storage and spills	Comply with the ECP as well as the CSEMP including pollution prevention sub-plan avoiding occurrence of pollution relating incidents. Conduct regular training of workers on pollution prevention sub-plan and construction waste management sub-plan including good housekeeping, the environmentally sound and safe storage and use of all battery, chemicals used on site and their management.		EMP/ECP/CSEMP requirement successfully implemented as determined through regular site checks, photographs, record etc.	Prepare during pre-construction and comply throughout construction stage	PMU	PIU E&S Officer with support from PIAC	Contractor to comply duration of construction	Contractor to reflect in contact costs
	HR policies of the contractor	All workforces are adequately trained and experienced in solar rooftop installation and maintenance labor license and workmen insurance has been obtained by the Contractor. All personnel deployed for Installation / O&M are adequately covered under workers compensation insurance policy							

Rooftop Solar									
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
						NESCO	PIAC	Contractor	
		Equal wages are ensured for both men and women workforce (unskilled, semi-skilled and skilled) deployed for Installation / O&M are paid.							
Materials Management	Use of raw materials for construction (cement, aggregate, sand, steel racks etc.)	Construction materials (especially sand and gravel) although small quantities required for erection of solar panels; will be sourced from existing approved sources with operating licenses, and records kept of all the materials used and their source. Contractor to provide adequate facilities for handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements. Ensure good housekeeping at construction site, storage areas, temporary workers overnight accommodation (if required), etc. -- to be kept neat and tidy, no trip hazards e.g., no materials, equipment, trash laying around.	EMP/ECP/CSEMP requirement successfully implemented as determined through regular site checks, photographical record etc. No outstanding waste related grievances from local communities	Prepare during pre-construction and comply throughout construction as stage	PMU	PIU E&S Officer with support from PIAC	Contractor to comply for duration of construction	Contractor to reflect in contact costs	
	Inappropriate disposal of solid wastes generated from project site and/or any worker	CSEMP will include a Solid and Hazardous Waste Management sub-plan dealing with all solid and hazardous waste generated (broken panels, damaged battery							

Rooftop Solar									
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
						NESCO	PIAC	Contractor	
	camp, including packaging materials from equipment, left over/unused/damaged/end of life parts, etc.	etc.) in an environmentally sound and safe manner, per national regulations and the IFC EHS General Guidelines section on Waste Management. Contractor to provide adequate facilities for the collection, separation, and storage of construction waste. Disposal of project worker generated waste (e.g., plastic bottles) on-site is prohibited and adequate waste storage areas to be incorporated into the detailed design. Garbage bins for the disposal of waste generated by O&M workers to be provided, garbage bins are to be enclosed with lids. On completion of the detailed design, will consult ADB regarding the need to update the IEE, if deemed necessary it will be updated, reviewed, and cleared by ADB prior to construction works. Prior to the start of works the contractor will ensure an appropriate waste management collection, storage and disposal system for domestic solid waste and construction waste is established at the construction site and temporary accommodation that is provided by the contractor.							

Rooftop Solar									
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
						NESCO	PIAC	Contractor	
		Separate waste containers (drums, bins, skips or bags) will be provided for different types of waste. Sensitize workers on good housekeeping and the environmentally sound storage and disposal of construction and wastes, and importantly not to leave garbage lying around. Collect and segregate construction wastes including scrap metal, and solid waste. Store all the waste produced in an environmentally sound manner in designated, labelled area with separate waste containers (drums, bins, skips or bags) for each distinct type of waste. e.g., solid waste within enclosed bins to contain leachate and avoid vermin. Prohibit open burning of any wastes generated during erection. Prohibit use of waste (e.g., empty cement bags and containers, plastic, wooden planks). Document all wastes removed off site by licensed waste contractor who should reuse/recycle or dispose of the waste according to type to suitably licensed and							

Rooftop Solar								
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)		
						NESCO	PIAC	Contractor
		engineered waste management facilities. Leaving or disposing of construction wastes by burying them on-site or disposing of them at unlicensed waste management facilities is strictly prohibited.						
OHS Risks	OHS risks related to dust and noise, operation substation etc. Risks due to accidents from community access to solar project site and electrical infrastructure	Comply with the ECP as well as the CHSMP in relation to OHS taking a zero-tolerance approach. Ensure health and safety supervision is on site at all times (if staff are on leave or off sick to provide an alternate). Contractor to comply with the national labor rules and regulations for the protection of workers, contractor is responsible for, and ensuring H&S of everyone on construction site including visitors and sub-contractor workers regardless they have been formally or informally employed. Only allow suitably trained and qualified workers to be allowed to work on electrical equipment and at height, these workers must have training record of attending suitable training course on electrical safety		No fatalities or lost time incidents 100% of H&S incidents including near miss recorded, immediately investigated and corrective action taken to prevent repeat Compliance with national labor rules and regulations	Prepare during pre-construction and comply throughout construction stage	PMU	H&S Officer with support of PIAC	Contractor to comply duration of construction to reflect in contact costs

Rooftop Solar								
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)		
						NESCO	PIAC	Contractor
		and working at height and be provided with and wear the appropriate PPE for their role. Untrained workers must not be permitted to work with live electricity or at height. Provide recommended Personal Protective Equipment to workers (regardless formal and informal, directly contracted or subcontracted). Provide fully equipped first aid kits at key locations in clearly labelled containers. Provide spill prevention kits (sorbent pads, loose sorbent material, etc.) at storage areas and other at-risk locations within clearly labelled containers. NESCO to provide all safety provisions like provision of rubber mats, electric shock chart, first aid box, fire extinguishers to handle all types of fire (ABC type of required capacity), sand buckets etc. are provided/installed at appropriate locations at solar rooftop installations site. Measures reflected in the H&S sub-plans will be in accordance with the IFC EHS General Guidelines sections on Occupational and Community Health and Safety. It		EMP/ECP/CHSMP requirement successfully implemented as determined through regular site checks, photographs record etc. No outstanding OHS related grievances from workers or community health and safety related grievances from local communities				

Rooftop Solar								
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)		
						NESCO	PIAC	Contractor
		will include a Construction Emergency Preparedness and Response Plan including communication systems and protocols to report an emergency e.g., health emergency, work-related accident, traffic accident, accident involving the community, natural disaster including landslide, flooding, virus outbreak, communicable viral diseases etc.						
	OHS risks related to sanitation and welfare of employees including STD/HIV/AIDS and other communicable diseases spread – at project site and accommodation, etc. Spread of STD/HIV/AIDS, and other communicable diseases to local community through unsanitary conditions or presence of project workers Community conflict with project workers	Toilet facilities to be provided at sites with adequate supplies of running water, soap, and hand drying devices. For workers not local to the area, suitable overnight accommodation (refer to ILO guidance on workers' accommodation) must be provided by the contractor, ideally use should be made of existing accommodation facilities but if a temporary worker camp is provided, it must be adequately equipped with sufficient toilets, hand washing facilities, showers or baths, food preparation and clean eating area, drinking water meeting drinking water standards etc. Check health condition of workers on daily basis, for example, use of		No fatalities or lost time incidents 100% of H&S incidents including near miss recorded, immediately investigated and corrective action taken to prevent repeat Compliance with national labor rules	Prepare during pre-construction and comply throughout construction stage	PMU	H&S Officer with support from PIAC	Contractor to comply with construction duration Contractor to reflect in contact costs

Rooftop Solar									
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
						NESCO	PIAC	Contractor	
	including sexual exploitation, abuse, and harassment	Self-certification forms before being allowed on the construction site with more thorough monthly health checks by qualified medical professional Contractor staff and local communities within 50m will be given awareness raising in STD/HIV/AIDS, other communicable diseases, local culture and heritage, and sexual exploitation, abuse, and harassment with workers having strict penalties (e.g., immediate removal from site) for any non-compliance of workers to an agreed code of conduct including setting limitations on worker movement from the construction site and temporary worker camps/overnight accommodation		and regulations EMP/ECP/CHSMP requirement successfully implemented as determined through regular site checks, photographi c record etc. No outstanding OHS related grievances from workers or community health and safety related grievances from local communities					
	Inappropriate disposal of solid wastes generated	Ensure stored wastes are regularly removed from site and not allowed to build up in excess quantities.		EMP/ECP/CSEMP requirement	Prepare during pre-construction	PMU	PIU E&S Officer with support from PIAC	Contractor to comply for	

Rooftop Solar									
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
						NESCO	PIAC	Contractor	
	from project site and worker camps, including packaging materials from equipment, left over/unused/damaged/end of life parts, etc. Inappropriate disposal of hazardous wastes generated from project site and worker camps e.g., left over/used e-wastes etc. Removal of scrap for solar panel erection.	Document all wastes generated taken by licensed waste contractor who should reuse/recycle or dispose of the waste to suitably licensed and engineered waste management facilities according to type to suitably licensed and engineered waste management facilities. Any solar photovoltaic panels that are rejected during installation and commissioning due to damage or failure shall immediately be removed from the site and returned to the supplier. Contractor to ensure proper disposal of batteries and solar panels damaged during erection back to the manufacturer and scrap to approved recyclers.		s successfully implemented as determined through regular site checks, photographic record etc. No outstanding waste related grievances from local communities	and comply throughout construction stage			duration of construction NESCO and its contractors to comply	
	Safety from electric shocks and electrocution	Carry out periodic safety related awareness raising for staff in case of any electrocution risks. Conduct tests to check earthing of all plant and equipment has been made and tested by an approved agency		EMP/ECP/CSEMP requirements successfully implemented as determined through regular site	Prepare during pre-construction and comply throughout construction stage	PMU	PIU E&S Officer with support from PIAC	Contractor to comply for duration of construction NESCO and its contractors to comply	

Rooftop Solar									
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
						NESCO	PIAC	Contractor	
				checks, photographic record etc.					
Operation and Maintenance									
EHS Risks	EHS impacts and risks of O&M works on rooftops that have installed Solar panels	During maintenance activities, mitigation measures applicable to the construction stage are also applicable maintenance workers and are to be followed, including strict prohibitions on workers Only water is to be used to clean solar photovoltaic panels, no detergent or other chemicals are to be utilized. Consider use of “dry” cleaning methods to reduce water consumption. Maintain a logbook of water used and abstracted from ground water Regular visual and technical inspection of condition and maintenance as required to be carried out, keep photographic records and log of all inspections, including register of faulty equipment found, and actions taken in response. Invertors/Batteries to be routinely inspected and maintained to avoid any battery water spills and leakage		Compliance with national laws and regulations. EMP successfully implemented by PMU as determined through regular site checks, photographic record etc. No outstanding O&M related grievances, Project infrastructure maintained in working order and good	Provide adequate facilities for O&M during design handover of the Solar Rooftop works to PMU and then throughout the O&M period	PIU E&S Officer	Not applicable	Not applicable	PMU Internal Cost

Rooftop Solar								
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)		
						NESCO	PIAC	Contractor
		- maintenance to be carried out only by trained workers using appropriate PPE. Keep track of any maintenance activities carried out with regards to invertors/batteries (e.g., each time batteries are changed) in maintenance logbook kept on the premises. Develop an O&M Plan for the solar rooftop plant setting out the schedule of inspections and EHS measures to be followed during any maintenance works Electrical equipment and electric wiring to be checked for safe current and voltage ratings at regular intervals.		condition at all times				
Storage and O&M wastes	Inadequate storage and spills of battery water etc.	Ensure battery or any chemicals are stored in an undercover area with impermeable floor with spill containment bund of 110% capacity under lock and key. Display material data sheets for batteries or battery water used on site. Always keep spill prevention equipment available on site.		Compliance with national laws and regulations. EMP successfully implemented by PMU as determined through regular site	Provide adequate facilities for O&M during detailed design Upon handover of the Solar Rooftop works to PMU	PIU E&S Officer	Not applicable	Not applicable
								PMU Internal Cost

Rooftop Solar									
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
						NESCO	PIAC	Contractor	
				checks, photographs, c record etc. No outstanding O&M related grievances	and then throughout the O&M period				
	Accumulation of dead batteries and damaged solar panels during O&M	Collect and segregate O&M wastes including scrap metal, solid waste; ensure all workers are familiar with this segregation. Leaving or disposing of O&M wastes by burying them on-site or disposing of them at unlicensed waste management facilities is strictly prohibited. Store end-of-life or unused equipment in designated areas on site, ensure these are not left lying around. Dead batteries and solar panels to be disposed only to certified recyclers or disposal entities that would deposit damaged solar panel at designated e-waste processing site in accordance with Hazardous (E waste) Management Rules 2021. Store all the wastes produced in an environmentally sound manner in		Compliance with national laws and regulations. EMP successfully implemented by PMU as determined through regular site checks, photographs, c record etc. No outstanding O&M related grievances	Provide adequate facilities for O&M during detailed design. Upon handover of the Solar Rooftop works to PMU and then throughout the O&M period	PIU E&S Officer	Not applicable	Not applicable	PMU Internal Cost

Rooftop Solar									
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
						NESCO	PIAC	Contractor	
		designated, labelled area with separate waste containers (drums, bins, skips or bags) for each distinct type of waste. Store solid waste in enclosed bins to contain leachate and avoid vermin. Waste shall be managed according to the waste management hierarchy of reduce waste generated, reuse waste materials where possible, recycle materials and finally safely and soundly dispose of residual waste material. Encourage recovery of recyclable wastes that could be reused or sold to recyclers, rather than disposing of it at locations available to the local community provided it is safe to do so and they will accept and can make use of it.							
	Risks related to electrical and fire hazards operating in remote location. Risks due to electrical and fire hazards	Ensure all O&M staff have received appropriate OHS trainings for their role. Always keep the solar rooftop installation neat and tidy. Store equipment in a dedicated, covered, labelled storage area		Compliance with national laws and regulations. EMP successfully implemented by PMU as determined	Upon handover of Solar Rooftop works to PMU and then throughout the O&M period	PIU E&S Officer	Not applicable	Not applicable	PMU Internal Cost

Rooftop Solar									
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
						NESCO	PIAC	Contractor	
	Risks due to accidents due to access to solar rooftop and electrical wiring by unauthorized persons/students/staff/community	(materials, tools, equipment, and any spare parts). Remove any trip hazards on the ground, e.g., open channels, materials, equipment, trash laying around. Carry out regular pest control where pests are a risk, apply natural pest control measures when possible. Provide first aid and firefighting training to select, volunteer staff; at least one staff having recently carried out first aid and firefighting training must be always present on site. Hang posters showing first aid procedures especially for electrocution, and fire procedures, as well as listing all emergency contacts.		through regular site checks, photographs, record etc.					
Rooftop battery storage	Battery storage Risks	Ensure the integrity of battery backup is always maintained with warning/advisory signage kept in good and visible condition. Ensure all O&M staff have received appropriate OHS training for their role.		Compliance with national laws and regulations. EMP successfully implemented by NESCO as determined	Throughout O&M period	PIU E&S Officer	Not applicable	Not applicable	NESCO Internal Cost

Rooftop Solar									
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
						NESCO	PIAC	Contractor	
				through regular site checks, photographic record etc. No outstanding O&M related grievances					
Decommissioning									
	EHS impacts and risks of decommissioning works in general	During decommissioning activities, mitigation measures applicable to the erection stage are also applicable to decommissioning workers or contractor and are to be followed, including strict prohibitions on workers. Develop a Decommissioning Plan for works covering the same items as per CSEMP for the rooftop solar panels erection stage. RTP Infrastructure decommissioning will include the disconnecting and removal of all electrical equipment, removal of the solar photovoltaic panels and their mounting frames, dismantling of concrete foundation pads and structures and finally the removal of any fencing surrounding the solar rooftop works.		Compliance with national laws and regulations. EMP successfully implemented by PMU as determined through regular site checks, photographic record etc. No outstanding decommissioning related grievances	Upon decision to decommission Solar Rooftop works	PIU E&S Officer	Not applicable	Not applicable	PMU Internal Cost

Rooftop Solar								
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)		
						NESCO	PIAC	Contractor
		During decommissioning process, all decommissioned equipment and other wastes will be stored on site prior to disposal. On completion of infrastructure decommissioning, restore the roof site which involves cleaning site of any debris or wastes.						
	Inappropriate disposal of solid wastes generated from project site including packaging materials from equipment, left over/unused/damaged/end of life parts, etc. Inappropriate disposal of hazardous wastes generated from project site	Define an environmentally safe and sound solar photovoltaic panel handling arrangement, with appropriate handling, storage, and recycling or disposal process for end-of-life equipment. Disposal will be in accordance with the manufacturer's instructions and in the first instance should be returned to the manufacturer if still in operation after 25 years. If not, disposal must be by a certified industrial waste management company who will need to remove the panels to suitably licensed waste management facilities based on composition – they must not be disposed of to a non-sanitary landfill or to a sanitary waste landfill if classed as hazardous waste. Dead batteries to be disposed only to certified recyclers or disposal entities that would deposit damaged solar panel at designated		Compliance with national laws and regulations. EMP successfully implemented by PMU as determined through regular site checks, photographical record etc. No outstanding decommissioning related grievances	Upon decision to decommission Solar Rooftop works or at the end-of-life of solar photovoltaic panels	PIU E&S Officer	Not applicable	Not applicable
								PMU Internal Cost

Rooftop Solar									
Project Activity	Impact	Mitigation/Contingency/Measures	Compensation/Enhancement	Performance Indicator	Timing	Responsibilities (including implementation, supervision and monitoring)			Budget/Source
						NESCO	PIAC	Contractor	
		e-waste processing site in accordance with Hazardous (E-waste) Management Rules 2021. Given current waste management capacity in Bangladesh it is likely that the above activities may involve transboundary transfer of waste which will need to be in accordance with the Basel Convention.							

Table 11-7: Environmental Management Plan for installation of Distribution Line

Overhead Distribution Line (Source Line)									
Project Activity	Impact or Risk	Mitigation/ Compensation/ Contingency/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (implementation, supervision and monitoring)			Budget Source	
					NESCO ⁵²	PIAC ⁵³	Contractor ⁵⁴		
Detailed Design and Pre-Construction Phase									
Routing of distribution lines	Impacts on community properties, utility services and trees	- Survey the route during detailed design [using survey form in IEE] and confirm sensitive areas (e.g., schools, mosques) to be considered in power line route and undertake consultations [recording using form in IEE] with the community 50m either side of the alignment to inform the final alignment. For existing lines enumerate any structures within the	Detailed Design cleared and approved reflects EMP requirement	Prior to detailed design approval and for implementation during	√	√	√	Contract Cost	

⁵² NESCO to implement EMP requirements as well as supervising and monitoring the contractor's implementation of measures delegated to them, including reviewing and approving detailed designs, CSEMPs/H&S Plans and subplans, and other documentation, reporting compliance in EMRs for submission to ADB.

⁵³ PIAC to support NESCO in EMP implementation, supervision, and monitoring of the contractors, the reviewing and approving of documentation, and reporting.

⁵⁴ Contractor to implement the measures delegated to them for the duration of their contract period, pre-construction measures are to be completed before the commencement of works and then to implement requirements throughout construction works reporting to NESCO monthly on the status of EMP implementation

Overhead Distribution Line (Source Line)								
Project Activity	Impact or Risk	Mitigation/ Compensation/ Contingency/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (implementation, supervision and monitoring)			Budget Source
					NESCO ⁵²	PIAC ⁵³	Contractor ⁵⁴	
		ROW and if safety clearances are being met. Submit survey and consultation report alongside detailed design - NESCO to confirm no change from the impacts and risks described and assessed in the IEE, or undertake site-specific assessment and develop the site specific EMP if required, seeking ADB clearance of any updated IEE before works start - Contractor to select the location for poles replacement in a way that minimum impact on existing structures/property, physical cultural resources, utilities, street lighting and trees from the poles and stringing of the conductors; poles to be placed so they do block the footpath/road or sites used by access to shops/hotels/business/street vendors etc. - Distribution line alignment to be designed to be within existing power line and road ROWs, having minimal impact on private land, avoid impacting on rivers/ponds and groundwater sources especially water sources including springs/wells/pumps used by communities - Contractor must not locate poles or undertake any work that would (i) result in damage to public or private structures/property or physical cultural resources, or (ii) require physical cultural resources to be removed from their current location, in such cases the distribution line must be rerouted. - In accordance with Resettlement Plan assessment of	s	construction				

Overhead Distribution Line (Source Line)								
Project Activity	Impact or Risk	Mitigation/ Compensation/ Contingency/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (implementation, supervision and monitoring)			Budget Source
					NESCO ⁵²	PIAC ⁵³	Contractor ⁵⁴	
		livelihood damages (if any) due to pole replacement and line stringing e.g. street vendors requiring temporary relocation. – Contractor must ensure all horizontal and vertical safety clearances per GoB requirements are met by new and upgraded distribution lines. In addition, no overhead lines must pass directly above any residential property or other building or location that is occupied by people at high frequency e.g. offices. If these conditions are not met for conversion of existing lines they will only be permitted if minor rerouting takes place to avoid them, or the resettlement requirements are triggered. – No new overhead lines will be constructed across school compounds or buildings or other high-risk locations for vulnerable groups e.g., playgrounds; conversion of the existing lines will only be permitted if school compounds or high-risk locations are not crossed, or minor rerouting takes place to avoid them. – New lines and minor deviations to be sited to minimize visual impact and the amount of visual clutter in consultation with affected communities – Contractors to consult individual households/property owners where a new pole location is within or directly adjacent to private property or where the line passes directly over private property (not regularly occupied buildings) prior to finalizing detailed design						
	Interruption to	– Contractor to check with relevant local authorities	–					

Overhead Distribution Line (Source Line)								
Project Activity	Impact or Risk	Mitigation/ Compensation/ Contingency/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (implementation, supervision and monitoring)			Budget Source
					NESCO ⁵²	PIAC ⁵³	Contractor ⁵⁴	
	existing services/risk of damage to properties	(gas, electric, water, telecoms) whether there are known pipes, cables, or other utility lines and carry out a scan using Cable Avoidance Tool (CAT) to identify any unknown underground utilities prior to pole foundations excavation. – Contractor to obtain necessary approvals from the municipalities and other utility providers prior to the start of works. – Contractors to identify in consultation with service providers appropriate measures to minimize period of disruption to utilities and reduce health and safety risks during installation – Contractor must liaise with other utilities utilizing any existing distribution poles (e.g., lighting, telecoms) to ensure there will be no disruption to their services. – For private property including physical cultural resources or public utilities that may be damaged during construction, including from potential damage (buildings, hotels/shops roads, drains etc.) photographic and/or structural precondition surveys are to be completed by the contractors prior to any works, including site establishment. These must be documented in a pre-project condition report, which will serve as baseline in case any inadvertent damage or vibration impact to property occurs. – Contractors will be required to restore any structural or cosmetic property (like damage to front porch of buildings) damage that is caused by their works to at least pre-project condition at their own cost.						

Overhead Distribution Line (Source Line)								
Project Activity	Impact or Risk	Mitigation/ Compensation/ Contingency/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (implementation, supervision and monitoring)			Budget Source
					NESCO ⁵²	PIAC ⁵³	Contractor ⁵⁴	
		– If risk of structural damage to adjacent properties from vibration identified due to setting or current condition, consider alternative construction methods or temporary relocation of occupants during works if at risk.						
	Traffic Safety and Community Disturbance	– Contractor must ensure the safety of pedestrian and road users in undertaking the works with traffic management controls adopted, signage and flagmen must be provided at the start and end of each section of public road with works to ensure safety is maintained. – Road safety and warning signs must be posted at 500m, 100m, and immediately in advance of the distribution line works at least two weeks prior to the works commencing – Traffic management plan to be developed in consultation with relevant local authorities to ensure proper execution of traffic controls including where temporary blockage of one lane of the road or footpath is needed for installation – Traffic management will need to be done in consultation with the affected communities to ensure they are aware of likely disruption. – Scaffolds and safety nets will be used to protect pedestrians and vehicles (and the conductor itself) from potential injury/damage during conductor removal and stringing – this will be used wherever stringing of OHL conductor (or removal of old OHL conductors) crosses over roads, presenting a	–					

Overhead Distribution Line (Source Line)								
Project Activity	Impact or Risk	Mitigation/ Compensation/ Contingency/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (implementation, supervision and monitoring)			Budget Source
					NESCO ⁵²	PIAC ⁵³	Contractor ⁵⁴	
		possible risk to traffic, or is in settlement presenting a possible risk to local communities – Contractors will be required to ensure that safe access ways to public and private amenities (including schools, hospitals, public health centres, clinics, mosques, etc.) are maintained – In relation to cumulative impact contractors to liaise with other utilities regarding the timing and extent of other construction works in the same road ROW and ensure plans for construction works are coordinated so emissions/disruption/ disturbance are minimized						
	Safety implications of bare conductors	– No bare conductors will be installed where there is a risk of electrocution to (i) humans, and (ii) birds, bats and other wildlife unless site-specific community health and safety or biodiversity study as applicable has been undertaken to confirm significant adverse impacts and risk can be avoided by virtue of location. – At the poles, equipment will be adequately spaced or fully insulated e.g., using covered jumpers for taps and equipment, covering all primary voltage bushings with insulating wildlife caps etc. – On all distribution poles provide written and visual warning signs to include the ISO 7010 "Hazard Type: Electrical Symbol" warning of risk of electrocution. – Install lightning arrestors along all distribution lines. – Install suitable means of ensuring security of the cable to avoid vandalism – Horizontal and vertical safety clearances will be maintained by raising conductor height above the	–					

Overhead Distribution Line (Source Line)								
Project Activity	Impact or Risk	Mitigation/ Compensation/ Contingency/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (implementation, supervision and monitoring)			Budget Source
					NESCO ⁵²	PIAC ⁵³	Contractor ⁵⁴	
		ground, typically by increasing pole height, and using extenders and reducing conductor spacing to gain the horizontal clearances - Contractors will also ensure that ICNRP occupational/community EMF exposure levels (reference and peak values) will be achieved - Contractor to ensure structural safety of poles, especially in the event of high winds/cyclones (allowing for climate change) or an earthquake by designing for maximum loadings; select an appropriate foundation design considering both climatic and seismic risks present. - Design to include adequate pole foundation in order that all poles remain vertical during operation, and that the lines are tensioned - If during the route survey contractors identify existing distribution transformers (DTR) not maintained in good condition and to which the distribution lines must connect and report to NESCO. NESCO will need to either remove/replace or maintain/repair the DTR, so it is left in good condition. Health and safety risk assessment for exposure to PCBs to be undertaken before removal/maintenance/repair/connection work is undertaken on any existing transformers.						
	Impacts on standing trees	– No trees will be cut for installation of the distribution lines	Tree enumeration	Prior to detailed	√	√	√	Contract Cost

Overhead Distribution Line (Source Line)								
Project Activity	Impact or Risk	Mitigation/ Compensation/ Contingency/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (implementation, supervision and monitoring)			Budget Source
					NESCO ⁵²	PIAC ⁵³	Contractor ⁵⁴	
	under non-forest and private trees category	- Trees in non-forest area may require trimming and lopping to maintain the minimum safety clearance 2.6 m from conductor - Trimming of trees will only be planned when required to meet safety clearance requirements	n throughout the distribution line section with pole replacement shows no direct impact for felling of standing trees	design approval and for implementation during construction				
Construction stage								
	Impacts on standing trees under non-forest and private trees category	Before cutting/trimming trees, ecologist to check for presence of the nesting birds or roosting bats and – if found – delay trimming.	EMP/CESMP requirement successfully implemented as determined through regular site checks, photographic record etc.	Throughout construction	√	√	√	Contract cost
	Interruption of existing services/risk to	Local communities must be informed of any power or similar shut downs at least 48 hours before they occur to minimize disruption	EMP/CESMP requirement	Throughout construction	√	√	√	Contract cost

Overhead Distribution Line (Source Line)								
Project Activity	Impact or Risk	Mitigation/ Compensation/ Contingency/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (implementation, supervision and monitoring)			Budget Source
					NESCO ⁵²	PIAC ⁵³	Contractor ⁵⁴	
	damage to properties	– On completion restore or rehabilitate any shut off or damaged utilities to at least their original condition in conjunction with the relevant utilities. All unanticipated damage to existing public utilities shall be restored immediately to pre-project condition at the cost of the contractor – Provide a central covered warehouse for storage of construction materials; only volumes of material required for the day's work will be stored on-site while construction vehicles transporting stone, sand, and other dust generating materials will be covered with a canvas or tarpaulin – Soil scattered on pavements/footpath and roads shall be immediately swept up to avoid windblown dust – Remove existing poles no longer needed by pulling the complete pole from the ground; poles will not be cut off at ground level. Poles will then be cleaned, and any material attached to the pole (including concrete) removed. Unused pits will then be backfilled and compacted completely with enough backfill piled above grade to prevent depressions being created by natural compaction, and the disturbed ground surfaced or vegetated per the surroundings. – Existing poles may be used for other utilities – e.g., street lighting – in which case some poles may need to be retained or utilities shifted in conjunction with poles.	s successfully implemented as determined through regular site checks, photographic record etc.					

Overhead Distribution Line (Source Line)								
Project Activity	Impact or Risk	Mitigation/ Compensation/ Contingency/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (implementation, supervision and monitoring)			Budget Source
					NESCO ⁵²	PIAC ⁵³	Contractor ⁵⁴	
		- Demarcate the working area by the contractor and avoidance of encroachment outside this working area. - Follow chance find procedure if physical cultural resources are found during construction works						
	Traffic Safety and Community Disturbance	- Provide at least one-month advance notice to local community about the schedule of and details of planned construction works including hotels, shops, and, informal street vendors and specifically notify them about the commencement of work etc. - Distribution line works shall be taken up during daytime unless otherwise agreed with the local community - During night no works will be permitted, contractors working hours will be 7 am – 7 pm, unless in commercial zones with dense urban areas where for reasons of road safety and avoiding traffic congestion it is otherwise agreed in writing with the municipal authorities and following consultation with all adjacent residents/occupants of buildings to avoid noise nuisance - In dense urban areas or on busy roads installation works affecting footpaths and roads to avoid rush hours i.e., 8am to 10am, 4pm to 10pm	EMP/CESMP requirements successfully implemented as determined through regular site checks, photographic record etc.	Throughout construction	√	√	√	Contract cost
	Occupational and Community Health and Safety	- Contractor must ensure all workers at height are fit to work and have been trained specifically in working at height with correct PPE provided. - Each transient work gang will have with them on site at all times canned drinking water, first aid kit	- EMP/CE SMP requirements successful	Throughout construction	√	√	√	Contract cost

Overhead Distribution Line (Source Line)								
Project Activity	Impact or Risk	Mitigation/ Compensation/ Contingency/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (implementation, supervision and monitoring)			Budget Source
					NESCO ⁵²	PIAC ⁵³	Contractor ⁵⁴	
		– Unless DTRs have been certified PCB free workers interacting with them must wear suitable chemical and/or oil resistant gloves, goggles, and protective clothing whilst taking samples and/or working with transformers – Workers to observe guidelines to minimum approach distances for excavations, tools, vehicles, pruning, and other activities when working around power lines. – Testing of structural integrity prior to proceeding with the work and the use of fall protection measures such as harnesses, tool bags, ropes etc. – Proper grounding and deactivation of live power lines when working on or near the lines.	ully implemented as determined through regular site checks, photographic record etc.					
	Community health and safety	– If works are not completed within the day the contractor must not leave any hazardous conditions (e.g., unsigned, unfenced, and unlit open excavations without means of escape and emergency contacts in case an accident occurs) overnight unless absolutely no access by public can be ensured – Stockpiling of old poles, spoil, and any new equipment (cable reels etc.) only in designated areas where no access or road use will be blocked. – Temporary pedestrian and traffic diversions are to be put in place per the approved traffic management plan. Diversion works to be immediately dismantled on completion of works and the footpath and roads restored to their original condition.	EMP/CESMP requirements successfully implemented as determined through regular site checks, photographic record etc.	Throughout construction	√	√	√	Contract cost

Overhead Distribution Line (Source Line)								
Project Activity	Impact or Risk	Mitigation/ Compensation/ Contingency/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (implementation, supervision and monitoring)			Budget Source
					NESCO ⁵²	PIAC ⁵³	Contractor ⁵⁴	
		- Ensure that safe access ways to public and private amenities (including schools) are maintained, safe alternative routes provided and clearly signed where there are temporary diversions or blockages. - Safety guides should be provided where works are on footpaths or in locations of pedestrian crossings to help guide pedestrians, especially vulnerable persons, safely around the working area.						
	Pollution risks, soil erosion due to the construction activities of poles erection, stringing of conductors.	- If transformers are temporarily disturbed during pole replacement, they must be handled carefully and stored (ideally undercover) on drip trays to provide secondary containment of 110% of the liquid contents should they spill or leak - Timetable prepared in consideration with the climatic conditions of each area for pole replacement activities; because the area can be subject to unseasonal heavy rain during construction considering the climatic conditions - Excavation and other earthworks will be conducted during the dry season to minimize soil erosion and sedimentation of watercourses although this has potential to exacerbate dust impact. - Back-fill to be compacted properly and graded to original contours where possible - New pole dug-up areas to be treated against flow acceleration with drainage around the pole foundation - Protect all areas susceptible to erosion during the pole erection period. Minimize removal of existing	EMP/CESMP requirements successfully implemented as determined through regular site checks, photographic record etc.	Throughout construction	√	√	√	Contract cost

Overhead Distribution Line (Source Line)								
Project Activity	Impact or Risk	Mitigation/ Compensation/ Contingency/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (implementation, supervision and monitoring)			Budget Source
					NESCO ⁵²	PIAC ⁵³	Contractor ⁵⁴	
		vegetation and topsoil, exposed surfaces will be promptly revegetated - Use of pit latrines will be prohibited as will be open defecation and urination and uncivil use of roads or private premises by construction workers. For the transient works provision of adequate on-site temporary sanitation facilities (one toilet per six workers) that do not allow untreated disposal of sewage to adjacent water bodies e.g., portable toilets where the wastewater generated is enclosed in a container and will later be taken offsite for wastewater treatment and disposal. In urban areas arrangements for access to alternative sanitary facilities (e.g., existing public toilets) that do not allow untreated disposal of sewage to adjacent water bodies may be provided - Removed electrical and mechanical equipment, old bare conductor lines and poles will be handed over to NESCO who will reuse or recycle as per the condition of the equipment, if fit for use they will be stored for reuse by NESCO or they will be auctioned off as scrap material.						
	Loss of trees and vegetation cover, site restoration	- The contractor's staff and labor will be strictly directed to avoid damages to any vegetation such as trees or bushes. - Clearing of trees and other important vegetation during construction to be minimized. - Topsoil disturbed will be separately stored and used	EMP/CES MP requirements successfully	Throughout construction	√	√	√	Contract Cost

Overhead Distribution Line (Source Line)								
Project Activity	Impact or Risk	Mitigation/ Compensation/ Contingency/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (implementation, supervision and monitoring)			Budget Source
					NESCO ⁵²	PIAC ⁵³	Contractor ⁵⁴	
		to restore the surface of the excavated areas. Infertile and rocky material will where possible be reused as fill material, if it needs to be taken off site it will be disposed by licensed waste management operator at designated disposal area suitable for inert waste – Landscaping and road verges to be re-installed on completion. – At completion all temporary structures including stores, toilets and all debris and waste shall be removed – On completion of construction works roads must be left by the contractors in no poorer condition than when construction started.	implemented as determined through regular site checks, photographic record etc.					
Operations and Maintenance								
EHS impacts and risks of the project during O&M in general	Occupational and community health and safety risks	– Carry out regular inspections (at least monthly) on the distribution lines and periodic maintenance to ensure that integrity of the poles and line is in good condition including possible conductor snapping and de-energizing of the line within three cycles to avoid the potential for electrocution from a breakage, the clearances are maintained, and electrical standards are being upheld. – Inspection protocol should confirm electrical safety warning signs and lighting arrestors in place and identify any missing or corroded parts for immediate replacement – If property is found to be encroaching into the safety clearances notification is to be immediately issued to	– Compliance with GOB regulations – No fatalities or lost time incidents 100% of H&S incidents	Throughout the O&M Phase	√			NESCO

Overhead Distribution Line (Source Line)								
Project Activity	Impact or Risk	Mitigation/ Compensation/ Contingency/ Enhancement Measures	Performance Indicator	Timing	Responsibilities (implementation, supervision and monitoring)			Budget Source
					NESCO ⁵²	PIAC ⁵³	Contractor ⁵⁴	
		the owner/occupier by NESCO along with awareness raising materials with respect to the importance of maintaining the horizontal and vertical clearance from buildings and the matter will be taken up further in consultation with the appropriate authorities – For all maintenance works undertake risk assessment and prepare H&S plan in accordance with EHS Guidelines, considering occupational and community H&S and including adherence to electrical safety standards and emergency preparedness and response plan with communication systems and protocols to report an emergency. – O&M to be performed only by suitably qualified and experienced workers who are regularly trained staff of NESCO or a contractor under supervision of a Health and Safety Officer with an appropriately equipped first aid kit and appropriate fire extinguishers immediately available for use – Restricting working at height and with electricity only by workers who are trained and certified to do so. – O&M workers to be given required PPE and other requisite safety equipment	including near miss recorded , immediately investigated, and corrective action taken to prevent repeat.					
	Vegetation management and electrocution of birds	– Track growth of large trees under the conductors – Regular patrolling of lines to ensure there are no bird nests etc.	Maintaining tree clearance under lines	Throughout the O&M Phase	√			NESCO

Table 11-8: Environmental Monitoring Plan for All works (for 06 new substation, 10 existing substation upgradation, 36 nos. Bay

Extension in 14 locations, 07 switching stations, 4 workshops, 33.73 km overhead distribution lines and solar rooftop.

General (All works)								
Environm ental Paramete rs to be Monitored	Location	Time/Frequency/ Duration	Method of Measurements	Performance Standard / Quantitative Targets	Responsibilities			Equipment and Monitoring Cost (Million BDT)
					PIU	PIAC	Contract or	
Detailed Design and Pre-Construction Phase								
Ecology	Substation/workshops/stor e sites and OD line areas used	Once prior to construction – baseline monitoring prior to the start of any activity onsite (if more than 100 trees are cut)	Ecological survey of substations/workshops/ store sites/overhead distribution line areas used to include presence flora and fauna and tree enumeration (numbers, species, size etc.)	No net loss of biodiversity following construction. Only types of habitats and number of trees documented in IEE are lost, any trees lost are compensated for, 1:3 replacement with native tree species in suitable alternative location, 100% survival rate. No damage to other habitats/trees/ vegetation outside the substation.	PIU to ensure survey undertaken by contractor report in EMR to ADB	PIAC to supervise survey in the field and support PIU in checking complian ce	Contracto r to undertake survey and report to PIU	- Ecologi cal survey by qualified and experie nced ecologis ts - Part of contract cost, include costs if implem enting EMP as BOQ line.
Air Quality: PM ₁₀ , PM _{2.5} , SO _x and NO _x O ₃ CO and	Nearest sensitive receptor within 50 m of substations/workshop/stor e on each boundary and ROW of OD line.	Once prior to construction – baseline monitoring prior to	To be measured as 1-hour, 8-hour and 24- hour averages along with	Compliance with ambient air quality standards to be applied to the project (see Annex 3–	PIU to ensure monitoring undertaken by	PIAC to support PIU in recruitme nt	Contracto r to undertake measure ments	- Professi onal, calibrat ed, portable

General (All works)								
Environmental Parameters to be Monitored	Location	Time/Frequency/Duration	Method of Measurements	Performance Standard / Quantitative Targets	Responsibilities			Equipment and Monitoring Cost (Million BDT)
					PIU	PIAC	Contractor	
Pb per the National Air Pollution (Control) Rules 2022 (5 locations).		the start of any activity onsite	meteorological data-temperature humidity, wind speed, and wind direction-during the dry season as per National Air Pollution (Control) Rules 2022. - Record details as required by the National Air Pollution (Control) Rules 2022,	Applicable Standards for EMP) or no increase above baseline if already exceeded	contractor report in EMR to ADB	ensuring that air quality monitoring is carried out	and report to PIU	outdoor air quality monitoring sensors to be used. - Part of contract cost, include costs of implementing EMoP as BOQ line
Noise level: dB(A) (5 locations).	Site boundary and nearest sensitive receptor within 50m of Substations/workshops/store on each boundary.and OD line ROW	Once prior to construction – baseline monitoring prior to the start of any activity onsite	1hr LAeq and Lday and Lnight over a 48-hour period including workday and weekend using professional, calibrated portable monitoring devices. Noise levels to be	Compliance with ambient noise standards to be applied to the project (see Annex 3– Applicable Standards for EMP) or <3dBA increase	PIU to ensure monitoring undertaken by contractor and report in EMR to ADB	PIAC to supervise measurements in the field and support PIU in checking	Contractor to undertake measurements and report to PIU	- Portable, professional, real-time calibrated Type

General (All works)								
Environmental Parameters to be Monitored	Location	Time/Frequency/Duration	Method of Measurements	Performance Standard / Quantitative Targets	Responsibilities			Equipment and Monitoring Cost (Million BDT)
					PIU	PIAC	Contractor	
			measured outdoors in free field conditions. Record details as required by the ECR 2023 .	above baseline if already exceeded		compliance		1 or 2 sound level meter meeting all appropriate IEC standards to be used with a tripod. - Part of contract cost, include costs of implementing EMoP as BOQ line
Water quality: Surface water (pH, DO, BOD ₅ ,	Nearest surface and groundwater sources (wells) unless >50m distant from the	Once prior to construction – baseline monitoring prior to	- Water sample is to be taken in a, non-contaminated, well-sealed container	No pollution incident affecting surface or groundwater quality and compliance with ambient water	- ensure monitoring undertaking	PIAC to supervise measurements in the field	Contractor to undertake measurements	- Water quality tests by accredited

General (All works)								
Environmental Parameters to be Monitored	Location	Time/Frequency/Duration	Method of Measurements	Performance Standard / Quantitative Targets	Responsibilities			Equipment and Monitoring Cost (Million BDT)
					PIU	PIAC	Contractor	
COD, TDS, TSS, NH ₃ -N, PO ₄ , Turbidity, Chloride, Total Coliform (TC), Faecal Coliform (FC), Oil & Grease, PCBs (if , Groundwater Quality (pH, Pb, Mn, Fe, As, EC, Cl, Total Coliform (TC), Faecal Coliform (FC), turbidity, odor, PCBs If used by community	substations/workshops/stores:	the start of any activity onsite	and tested in-situ or within the next 48h for those that do not degrade or suit rapid testing. Water quality tests by accredited laboratory (physical, chemical, and bacteriological tests) –Record details as required by the ECR, 2023	quality standards to be applied to the project (see Annex 3– Applicable Standards for EMP) or no increase above baseline if already exceeded.	n by contractor and to report in EMR to ADB	and support PIU in checking compliance	and report to PIU	ed laboratory. - Part of contract cost, include costs of implementing EMoP as BOQ line

General (All works)								
Environmental Parameters to be Monitored	Location	Time/Frequency/Duration	Method of Measurements	Performance Standard / Quantitative Targets	Responsibilities			Equipment and Monitoring Cost (Million BDT)
					PIU	PIAC	Contractor	
as source of drinking water also test against GOB drinking water parameters (full suite)								
Asbestos	A total of 7 old residential/buildings and other equipment to be demolished by NESCO at substations/work shops/store	One time for baseline establishment prior to the start of any demolition works.	Licensed entity to survey and test for the presence of ACMs in electrical equipment and buildings to be demolished.	No asbestos was present prior to demolition work. If present this is to be treated as an unanticipated impact and asbestos remedial action plan developed and implemented by the PIU or third parties prior to demolition.	ensure monitoring undertaken by contractor and testing at substation sites prior to their demolition, obtain and report results of	PIAC to support PIU in supervision of contractors ensuring that asbestos survey and testing is carried out	Contractor to undertake measurements and report to PIU	Part of contract cost, includes costs of implementing EMoP as BOQ line

General (All works)								
Environmental Parameters to be Monitored	Location	Time/Frequency/Duration	Method of Measurements	Performance Standard / Quantitative Targets	Responsibilities			Equipment and Monitoring Cost (Million BDT)
					PIU	PIAC	Contractor	
				- Demolition of any electrical equipment and buildings containing ACMs follow national laws and regulations, and international good practice such as ADB's Good Practice Guidance on the Use of Asbestos. - No workers and communities affected by exposure to ACMs.	surveys in EMR to ADB			
Health and Safety: operational drinking water supplies	All sources that will be developed by contractor for use as an operational drinking water supply	One time for baseline establishment prior to the start of any activity onsite	Water sample is to be taken in a non-contaminated, well-sealed container and tested within the next 48h. Drinking water	Drinking water provided for operational substations meets national drinking water standards or	PIU to ensure monitoring undertaken by contractor	PIAC to supervise measurements in the field and	Contractor to undertake measurements and	Water quality tests by accredited

General (All works)								
Environmental Parameters to be Monitored	Location	Time/Frequency/Duration	Method of Measurements	Performance Standard / Quantitative Targets	Responsibilities			Equipment and Monitoring Cost (Million BDT)
					PIU	PIAC	Contractor	
			quality tests against Bangladesh drinking water standards [physical, bacteriological, chemical including arsenic] by accredited laboratory, per Annex 3.	appropriate level of water treatment is incorporated into the project design	and to report in EMR to ADB	support PIU in checking compliance	report to PIU	laboratory. Part of contract cost, include costs of implementing EMoP as BOQ line
Health and safety/physical cultural resources: condition surveys in relation to property damage from construction	All substations/workshops/store/OD line; include surveys of all properties located immediately adjacent all boundaries (including informal settlements) at substations/Workshops/store for which demolition and/or piling works are being required or pole foundation drilling required	One time for baseline establishment prior to the start of any activity onsite	Photographic and/or structural precondition surveys of existing property condition including utilities, structures, drains etc. Risk assessment of potential damage to structures and additional recommendations for structural and	Damages to property avoided but if caused, to be paid for by the contractor. National Building Code to be referred to in relation to ensuring structural safety of property during works.	PIU to ensure surveys undertaken by contractor and to report in EMR to ADB	PIAC to supervise surveys in the field and support PIU in checking compliance	Contractor to undertake surveys and report to PIU	Part of construction cost, include costs of implementing EMP as BOQ line.

General (All works)								
Environmental Parameters to be Monitored	Location	Time/Frequency/Duration	Method of Measurements	Performance Standard / Quantitative Targets	Responsibilities			Equipment and Monitoring Cost (Million BDT)
					PIU	PIAC	Contractor	
			vibration monitoring condition where there is a risk of property damage					
Construction Phase								
Ecology	Substation/workshops/store sites and OD line areas used	Ongoing throughout construction, monthly reporting of records kept by the contractor. Ecological survey once on commissioning and prior to handover of substation to NESCO	Ecological survey of substation/workshop s/store/OD line areas used to include presence flora and fauna and tree enumeration (numbers, species, size etc.) Keep records of all compensatory tree plantation undertaken (numbers, species, size etc.) including survival and replacement of trees	No net loss of biodiversity following construction. Only types of habitats and number of trees documented in IEE are lost, including minimum number of trees, any trees lost are compensated for, 1:3 replacement with native tree species in suitable alternative location, 55 100% survival rate. No damage to other habitats/trees/vegetation outside the substation.	PIU to ensure record keeping by contractor and to report in EMR to ADB	PIAC to supervise contractor and support PIU in checking compliance	Contractor to undertake surveys, keep records and report to PIU in monthly progress reports	Ecological survey by qualified and experienced ecologists Part of contract cost, include costs of implementing EMoP as BOQ line

General (All works)								
Environmental Parameters to be Monitored	Location	Time/Frequency/Duration	Method of Measurements	Performance Standard / Quantitative Targets	Responsibilities			Equipment and Monitoring Cost (Million BDT)
					PIU	PIAC	Contractor	
			during defect liability period					
Air Quality: PM ₁₀ , PM _{2.5} , NO ₂ , SO ₂ , O ₃ CO and Pb per the National Air Pollution (Control) Rules 2022. A total of 16 sample locations.	Nearest sensitive receptor within 50 m of Substations/workshop s/store sites on each boundary and OD line areas Additional locations at request of PIU/PIAC in the event of visible dust pollution or grievance received during construction.	Quarterly during active construction involving demolition and earthworks, and then as requested by PIU/PIAC in event of visible dust pollution or grievance received during construction.	To be measured as 1-hour, 8 hour and 24- hour averages along with meteorological data- temperature humidity, wind speed, and wind direction-during the dry season as per National Air Pollution (Control) Rules 2022. Record details as required by the National Air Pollution (Control) Rules 2022 and ECR, 2023	No exceedance of ambient air quality standards (see Annex 3– Applicable Standards for EMP) or no worsening if already exceeded (as per the baseline)	PIU to ensure monitoring undertaking by contractor and to report in EMR to ADB	PIAC to supervise measurements in the field and support PIU in checking compliance	Contractor to undertake measurements and report to PIU	Professional, calibrated, portable outdoor air quality monitoring sensors to be used. Part of contract cost, include costs of implementing EMoP as BOQ line

General (All works)								
Environmental Parameters to be Monitored	Location	Time/Frequency/Duration	Method of Measurements	Performance Standard / Quantitative Targets	Responsibilities			Equipment and Monitoring Cost (Million BDT)
					PIU	PIAC	Contractor	
Noise level: dB(A) – 16 samples from different sites.	Site boundary and nearest sensitive receptor within 50 m of Substations/workshops/store sites on each boundary and OD line areas. Additional locations at request of PIU/PIAC in the event of noise pollution concerns or grievance received during construction	Monthly during active demolition and construction involving noisy activities, and then as requested by PIU/PIAC in event of noise pollution concerns or grievance received during construction. Once on commissioning and prior to handover of substation to NESCO to confirm operational substation	1hr LAeq and Lday and Lnight over a 48-hour period including workday and weekend using professional, calibrated portable monitoring devices. Noise levels to be measured outdoors in free field conditions. Record details as required by the National Noise Pollution (Control) Rules 2006,	No exceedance of ambient noise standards (see Annex 3– Applicable Standards for EMP) or <3dBA increase if already exceeded (as per the baseline)	PIU to ensure monitoring undertaken by contractor and to report in EMR to ADB	PIAC to supervise measurements in the field and support PIU in checking compliance	Contractor to undertake measurements and report to PIU	Portable, professional, real-time calibrated Type 1 or 2 sound level meter meeting all appropriate IEC standards to be used with a tripod. Part of contract cost, include costs of impleme

General (All works)								
Environmental Parameters to be Monitored	Location	Time/Frequency/Duration	Method of Measurements	Performance Standard / Quantitative Targets	Responsibilities			Equipment and Monitoring Cost (Million BDT)
					PIU	PIAC	Contractor	
		meets noise standards.						nting EMoP as BOQ line
Water quality: Surface Water Quality: pH, DO, BOD ₅ , COD, TDS, TSS, NH ₃ -N, PO ₄ , Turbidity, Chloride, Fecal Coliform (FC), Total Coliform (TC), Oil and Grease, PCBs Ground Water/Drinking Water Quality: pH, Pb,	Nearest surface waterbodies and groundwater sources (wells) unless > 50m distant from the substation. Additional locations at request of PIU/PIAC in the event of water pollution concerns or grievance received during construction:	Quarterly during active construction involving earthworks, and then only required if requested by PIU/PIAC in event of water pollution concerns or grievance received during construction. During land development/infill and piling works adjacent to waterbodies using handheld meter for pH, turbidity, TDS, TSS and DO	Water sample is to be taken in a non-contaminated, well-sealed container and tested in-situ or within the next 48h for those that do not degrade or suit rapid testing. Water quality tests by accredited laboratory (physical, chemical, and bacteriological tests). If used as source of drinking water to also test against Bangladesh drinking water standards per Annex 3. Record details as required by the ECR, 2023	No pollution incident affecting surface or groundwater quality and compliance with ambient water quality standards to be applied to the project (see Annex 3– Applicable Standards for EMP) or no increase above baseline if already exceeded.	PIU to ensure monitoring undertaken by contractor and to report in EMR to ADB	PIAC to supervise measurements in the field and support PIU in checking compliance	Contractor to undertake measurements and report to PIU	Water quality tests by accredited laboratory. Part of contract cost, include costs of implementing EMoP as BOQ line

General (All works)								
Environmental Parameters to be Monitored	Location	Time/Frequency/Duration	Method of Measurements	Performance Standard / Quantitative Targets	Responsibilities			Equipment and Monitoring Cost (Million BDT)
					PIU	PIAC	Contractor	
Mn, Fe, As, EC, Cl, Total Coliform (TC), Fecal Coliform (FC), Turbidity, Odor, PCBs								
Effluent	All substation/workshops/storage sites including construction camp	Monthly testing of all effluent streams from SS	Monitor all effluent discharges from septic tank/soakaway as per GoB effluent standards or the general IFC EHS effluent guidelines whichever is more stringent.	Effluent standards met and no grievance received during construction or operation regarding water pollution	PIU to ensure record keeping by contractor and to report in EMR to ADB	PIAC to supervise contractor and support PIU in checking compliance	Contractor to keep records and report to PIU in monthly progress reports	Part of contract cost, include costs of implementing EMoP as BOQ line
Health and Safety: operational drinking water supplies	All sources that will be developed for use as an operational drinking water supply as part of substation construction	Once commissioning and prior to handover of substations/workshop/store to	Water sample is to be taken in a non-contaminated, well-sealed container and tested within the next 48h. Drinking water	Drinking water provided for operational substations meets national drinking water standards or	PIU to ensure monitoring undertaken by contractor	PIAC to supervise measurements in the field and	Contractor to undertake measurements and	Water quality tests by accredited

General (All works)								
Environmental Parameters to be Monitored	Location	Time/Frequency/Duration	Method of Measurements	Performance Standard / Quantitative Targets	Responsibilities			Equipment and Monitoring Cost (Million BDT)
					PIU	PIAC	Contractor	
	(pre- and post-treatment samples are to be taken)	NESCO to confirm operational substation meets drinking water quality standards	quality tests against Bangladesh drinking water standards by accredited laboratory (physical, bacteriological and chemical), per Annex 3. Record details as required by the ECR, 2023	appropriate level of water treatment is incorporated into the project design	and to report in EMR to ADB	support PIU in checking compliance	report to PIU	laboratory. Part of contract cost, include costs of implementing EMoP as BOQ line
Health and safety: electromagnetic field (EMF)	All substation sites	Substation boundary and adjacent to electrical equipment Once on commissioning and prior to handover of substation to NESCO to confirm operational	EMF levels to be monitored using professional, calibrated portable monitoring devices	No exceedance of ICNIRP reference levels	PIU to ensure monitoring undertaken by contractor and to report in EMR to ADB	PIAC to supervise measurements in the field and support PIU in checking compliance	Contractor to undertake measurements and report to PIU	Portable but professional, calibrated EMF detector Part of contract cost, include costs of impleme

General (All works)								
Environmental Parameters to be Monitored	Location	Time/Frequency/Duration	Method of Measurements	Performance Standard / Quantitative Targets	Responsibilities			Equipment and Monitoring Cost (Million BDT)
					PIU	PIAC	Contractor	
		substation meets EMF reference levels						nting EMoP as BOQ line
Health and safety/physical cultural resources: condition surveys in relation to property damage	Substations/workshops/st ore with adjacent properties at risk (ongoing survey of properties flagged at risk during pre-construction)	Ongoing throughout construction, daily site checks and additional monitoring of condition as per the recommendation of the pre-construction surveys Once on commissioning and prior to handover of substation to NESCO to confirm no	Ongoing photographic and/or structural condition surveys of existing property condition including utilities, structures, drains etc. Structural condition monitoring of properties at risk as recommended during the pre-construction surveys	Damages to property avoided but if caused, to be paid for by the contractor. National Building Code to be referred to in relation to ensuring structural safety of property during works.	PIU to ensure monitoring undertaken by contractor and to report in EMR to ADB	PIAC to supervise measurements in the field and support PIU in checking compliance	Contractor to undertake measurements and report to PIU	Part of contract cost, include costs of implementing EMoP as BOQ line

General (All works)								
Environmental Parameters to be Monitored	Location	Time/Frequency/Duration	Method of Measurements	Performance Standard / Quantitative Targets	Responsibilities			Equipment and Monitoring Cost (Million BDT)
					PIU	PIAC	Contractor	
		residual damage occurred						
Operation and Maintenance								
GHG emissions: SF6 leakage	All GIS substations	Daily checks and record keeping during O&M	Record of all SF6 leakage and any SF-6 related maintenance activities in substations	Leakage <0.1% and records of undertaking a regular maintenance	NESCO substation manager (supported by third party if needed) to undertake monitoring and report monthly to the NESCO ESSU	NA	Supply monitoring equipment	Portable but professional, calibrated SF6 leakage detector, to be provided by the contractor one per SF6 containing substation / include for

General (All works)								
Environmental Parameters to be Monitored	Location	Time/Frequency/Duration	Method of Measurements	Performance Standard / Quantitative Targets	Responsibilities			Equipment and Monitoring Cost (Million BDT)
					PIU	PIAC	Contractor	
								equipment provision as a BOQ line NESCO O&M budget
Noise in dB(A)	Site boundary and nearest receptor to the substation/workshop	Semi-annually or as may be required by DOE during O&M (monitoring can cease if compliance demonstrated at end of first year)	1hr LAq over a 48-hour period including workday and weekend using professional, calibrated portable monitoring devices. Record details as required by the ECR, 2023	No exceedance of noise standards specified in Annex 3 (or less than 3dBA increase if already exceeded) at site boundary and sensitive receptors	NESCO ESSU (supported by third party if needed) to undertake monitoring and report to ADB.	NA	Contractor to supply monitoring equipment for use by NESCO ESSU during O&M	1no. portable, professional, real-time calibrated Type 1 or 2 sound level meter meeting all appropriate IEC standard

General (All works)								
Environmental Parameters to be Monitored	Location	Time/Frequency/Duration	Method of Measurements	Performance Standard / Quantitative Targets	Responsibilities			Equipment and Monitoring Cost (Million BDT)
					PIU	PIAC	Contractor	
								s to be used with a tripod to be provided for ESSU by the contractor / include for equipment provision as a BOQ line NESCO O&M budget
Wastewater discharge; pH, BOD5, COD,	All substations/workshops/stores not connected to sewerage system e.g.	Semi-annually or as may be required by DOE during O&M	Treated water sample is to be taken in a non-contaminated, well-	No pollution incident affecting surface or groundwater quality and compliance with effluent discharge	NESCO ESSU to appoint third-party laboratory to	NA	NA	Water quality tests by accredit

General (All works)								
Environmental Parameters to be Monitored	Location	Time/Frequency/Duration	Method of Measurements	Performance Standard / Quantitative Targets	Responsibilities			Equipment and Monitoring Cost (Million BDT)
					PIU	PIAC	Contract or	
TDS, TSS, DO, NH3-N, PO4, Turbidity, Odor, Chloride, Total Coliform (TC), Ammonia-Nitrogen, Oil & Grease, Polychlorinated Biphenyls (PCBs)	having septic tank with soak away		sealed container and tested within the next 48h. Water quality tests against Bangladesh surface water quality standards by accredited laboratory (physical, chemical, and bacteriological tests) - Record details as required by the ECR, 2023	standards to be applied to the project (see Annex 3–Applicable Standards for EMP) or no increase above baseline if already exceeded.	undertake monthly testing and report the results to ADB.			d laboratory. NESCO O&M budget
Health and safety: drinking water supplies	All substations-	Monthly testing or reporting records kept	Water sample is to be taken in a non-contaminated, well-sealed container and tested within the next 48h. Drinking water quality tests against Bangladesh	Drinking water provided for operational substations meets national drinking water standards or appropriate level of water treatment is being maintained	Substation manager to keep records and report to ESSU in monthly progress reports NESCO ESSU to	NA	NA	Water quality tests by accredited laboratory.

General (All works)								
Environmental Parameters to be Monitored	Location	Time/Frequency/Duration	Method of Measurements	Performance Standard / Quantitative Targets	Responsibilities			Equipment and Monitoring Cost (Million BDT)
					PIU	PIAC	Contract or	
			drinking water standards by accredited laboratory (physical, chemical, and bacteriological tests including arsenic levels) where a surface or groundwater drinking water supply was provided by the contractor or sources where supplier is unable to provide water quality test results. Alternatively, documentary evidence that drinking water meeting national standards is being imported for O&M		appoint third-party laboratory to undertake monthly testing and report the results to ADB.			NESCO O&M budget

General (All works)								
Environmental Parameters to be Monitored	Location	Time/Frequency/Duration	Method of Measurements	Performance Standard / Quantitative Targets	Responsibilities			Equipment and Monitoring Cost (Million BDT)
					PIU	PIAC	Contractor	
			workers consumption. Record details as required by the ECR, 2023					
Health and safety: Electromagnetic field (EMF)	All substation sites	Semi-annually Routine checks and record keeping during O&M for workers in close contact with EMF	EMF levels to be monitored using professional, calibrated portable monitoring devices Continuous checks for substation workers in close contact with EMF through use of personal EMF monitor carried by workers at all times while working on or near live electrical equipment	No exceedance of ICNIRP reference levels and records of EMF checking	NESCO substation manager (supported by third party if needed) to undertake monitoring and report monthly to the ESSU NESCO ESSU to report to ADB.	NA	Contractor to supply monitoring equipment for use by NESCO substation manager and staff during O&M	Portable but professional, calibrated EMF detector, to be provided by the contractor one per substation along with personal EMF radiation exposure

General (All works)								
Environmental Parameters to be Monitored	Location	Time/Frequency/Duration	Method of Measurements	Performance Standard / Quantitative Targets	Responsibilities			Equipment and Monitoring Cost (Million BDT)
					PIU	PIAC	Contract or	
								monitoring equipment for substation workers / include for equipment provision as a BOQ line - NESCO O&M budget
Hazardous materials–incidents	All substations/workshops	Daily checks for pollution incidents and record keeping during O&M	- Records of pollution incidents (e.g., type of material spilled, amount in kg or m3 and action taken to clean up)	- No pollution incident affecting soil of water quality - zero major incidents occurred.	- Substation manager to keep records and report to ESSU in	NA	NA	NESCO O&M budget

General (All works)								
Environmental Parameters to be Monitored	Location	Time/Frequency/Duration	Method of Measurements	Performance Standard / Quantitative Targets	Responsibilities			Equipment and Monitoring Cost (Million BDT)
					PIU	PIAC	Contract or	
			- Carry out visual inspection and interviews with workers and the community to identify if any unrecorded incidents occurred	- Minor incidents responded to in accordance with O&M response plan procedures with lessons learnt for future if they occur.	monthly progress reports - Any pollution incident to be reported within 24 hours to ESSU by substation/line manager - NESCO ESSU to report to ADB			
Health and safety: incident records	All substations/workshops/store sites and OD line areas	Daily checks and record keeping during O&M	Keep records of health and safety incidents, compile records from substations and carry out interviews with workers and the community to identify if any	- Zero lost time incidents or fatalities (among workers and community) - All near miss, minor, lost time, and fatal incidents as well	- Substation/line manager to keep records and report to ESSU in monthly	NA	NA	NESCO O&M budget

General (All works)								
Environm ental Paramete rs to be Monitored	Location	Time/Frequency/ Duration	Method of Measurements	Performance Standard / Quantitative Targets	Responsibilities			Equipment and Monitoring Cost (Million BDT)
					PIU	PIAC	Contract or	
			unrecorded incidents occurred	as suspected/confirmed STD/AIDS/communicable disease instances having adequate response plan, with lessons learnt for future if they occur.	progress reports - Any lost time incident or fatality to be reported within 24 hours to ESSU by substation/line manager - NESCO ESSU to report to ADB - Any lost time incident or fatality to be reported within 24 hours to ADB			

Table 11-9: EMP Implementation Budget for the Project

Item	P-3	P-4	P-5	P-6	P-7	P-8	P-9	Others and Contingency	Total Cost per Period (BDT)	Paid by whom
	3 GIS Switching Stations	3 GIS/AIS new + 1 upgrade GIS SS	2 New AIS	9 AIS upgrade	4 Workshops	4 AIS Switching Stations	Bay Extensions			
Environment Mitigation Cost (quarterly estimate)										
Waste Management (SWM, Hazardous, PCB, Asbestos (if any), sewage, drainage)	30,000	50,000	20,000	90,000	40,000	40,000	100,000	50,000	420,000	Contractor through BOQ
Labor PPE and Camp Cost (including costs for drinking water, sanitation, and community liaison to prevent disputes, worker PPE)	200,000	300,000	100,000	450,000	250,000	250,000	300,000	200,000	20,50,000	Contractor through BOQ
Noise Management	75,000	100,000	50,000	450,000	200,000	200,000	250,000	100,000	14,25,000	Contractor through BOQ
Dust Management	15000	60,000	30,000	135,000	60,000	60,000	200,000	100,000	660,000	Contractor through BOQ
Drainage Congestion	50,000	75,000	50,000	90,000	100,000	100,000	200,000	100,000	765,000	Contractor through BOQ
STD/AID/Communicable Diseases Protection	30,000	40,000	20,000	90,000	40,000	40,000	100,000	50,000	410,000	Contractor through BOQ
Drinking Water	15000	60,000	30,000	135,000	60,000	60,000	100,000	50,000	510,000	Contractor through BOQ
Tree Plantation & Maintenance	90,000	150,000	60,000	270,000	120,000	120,000	200,000	200,000	12,10,000	Contractor through BOQ
Stakeholder Engagement Plan	30,000	40,000	20,000	90,000	40,000	40,000	100,000	50,000	410,000	Contractor through BOQ
EHS Training	150,000	200,000	100,000	225,000	200,000	200,000	200,000	100,000	13,75,000	Contractor through BOQ
PPE and monitoring/safety tools/kits provision for O&M	200,000	300,000	100,000	450,000	250,000	250,000	300,000	200,000	20,50,000	Contractor through BOQ

Item	P-3 3 GIS Switching Stations	P-4 3 GIS/AIS new + 1 upgrade GIS SS	P-5 2 New AIS	P-6 9 AIS upgrade	P-7 4 Workshop s	P-8 4 AIS Switching Stations	P-9 Bay Extensions	Others and Contingenc y	Total Cost per Period (BDT)	Paid by whom
Sign Board	30,000	50,000	60,000	90,000	120,000	120,000	200,000	100,000	770,000	Contractor through BOQ
Fire Safety	30,000	50,000	60,000	90,000	120,000	120,000	200,000	100,000	770,000	Contractor through BOQ
Safety and Security	30,000	50,000	60,000	90,000	120,000	120,000	200,000	100,000	770,000	Contractor through BOQ
Natural Disaster Management	30,000	50,000	60,000	90,000	120,000	120,000	200,000	100,000	770,000	Contractor through BOQ
Miscellaneous Traffic Management Plan etc.	30,000	50,000	60,000	90,000	120,000	120,000	200,000	100,000	770,000	Contractor through BOQ
Ecology Study	150,000	200,000	50,000	300,000	200,000	200,000	200,000	200,000	15,00,000	Contractor through BOQ
Soil Remediation	30,000	50,000	60,000	90,000	120,000	120,000	200,000	100,000	770,000	Contractor through BOQ
Sub-Total									77,95,000	
Environment Monitoring Cost (annual estimate)										
Laboratory Analysis for Environmental Quality Monitoring (Ambient Air Quality Parameters, Vibration level monitoring, Surface Water Quality Monitoring, Ground Water Quality, Soil Pollution including Detailed Soil Investigation, Electro Magnetic Field etc.)	1200000	3000000	800000	2000000	2000000	2000000	2000000	500000	135,00,000	Contractor through BOQ
Grand Total (Two crore Twelve Lac and Ninety Five thousand BDT)									2,12,95,000	

Note: It is the estimated budget which will be altered based on ground conditions or as per requirements of the project.

12 CONCLUSIONS AND RECOMMENDATIONS

12.1 Conclusions

663. This IEE has established that, except for the residual impacts mentioned below, there are no significant environmental issues that cannot be either totally prevented or adequately mitigated to levels acceptable to the national standards and international guidelines for Project activities.

664. The key identified significant residual impacts are as follows:

- Construction Phase: Community Safety - a range of mitigation measures have been provided to help manage the risk of accidents occurring and affecting the local community. However, despite these measures it is still possible that accidents could occur due to unforeseen circumstances.
- Construction Phase: Dust and Emissions - as with any project involving excavations, dust impacts cannot be eliminated. Generic mitigation measures will, however, ensure residual impacts will be reduced to low significance.
- Construction and Operational Phase: Soil Contamination – good practice mitigation measures will ensure that residual impacts are low during construction. Construction of containment measures according to GIIP will ensure that leaks and spills at substations do not result in highly significant impacts. Regarding existing soil contamination, the measures outlined in the IEE will ensure that any potentially significant soil contamination is identified and removed from the site to authorized disposal locations before work. No highly significant residual impacts are identified if these procedures are followed.
- Construction Phase: Disruption to Water Supply - during the design phase the EPC Contractor will identify all borewells, water supply systems and water pumps and ensure that alignments avoid any interference with these areas. However, it is possible that temporary disruptions could occur.
- Construction Phase: Impacts to Sidewalks/Roads and Access - the high-level committee coordination activities and agreements with Municipal corporation should ensure that sidewalk impacts, and access issues are not highly significant, but a 15-day period after work are completed may still result in low level residual impacts.
- Construction Phase: Noise - some short-term elevated noise impacts may occur during the daytime. Keeping work to short durations and the use of temporary mobile noise barriers should reduce the noise levels to acceptable levels during the working day. Residual impacts will be low.
- Construction / Operational Phase: Physical Damage - awareness training for workers in the most sensitive locations (community, hospitals, schools etc.) due to their proximity to the proposed substation works.
- Operational Phase: Geohazards – floods are a potential issue which, despite adoption of good practice mitigation measures, may continue to occur and affect project infrastructure in the future mainly due to climate change, e.g., increased temperatures, drought and extreme rainfall events.

12.2 Recommendations

665. Mitigation and monitoring measures have been included in the Project Environmental Management Plan (EMP) incorporated into the IEE. NESCO will implement the EMP measures ensuring adequate budget and human resources are allocated to this. NESCO will also complete the activities outlined in the Corrective Action Plan (CAP) for existing substations, according to the timetable included in the CAP.

666. The EMP, its mitigation and monitoring programs, contained herewith, will be included within the Bidding documents for project works for all Project components. The Bid documents

will state that the EPC Contractor will be responsible for the implementation of the requirements of the EMP allocated to them (including specific design phase actions) through their own CEMP which will adopt all the conditions of the EMP and add site specific elements that are not currently known, such as the EPC Contractor's storage and camp locations. This will ensure that all potential bidders are aware of the environmental requirements of the Project and its associated environmental costs. The EMP and all its requirements will then be added to the EPC Contractor's Contract, thereby making implementation of the EMP a legal requirement according to the Contract.

667. The EPC contractors will then prepare their detailed designs and CEMP which will be approved and monitored by NESCO. Before the detailed designs are approved the IEE will need to be updated to reflect the final detailed designs which are reviewed and cleared by ADB for disclosure on the ADB website and locally. Should they note any non-conformance with the EMP (and CSEMP) the EPC Contractor can be held liable for breach of the contractual obligations of the EMP. To ensure compliance with the CEMP the EPC Contractor is required to employ an Environmental and Social Officer and a team of experts to monitor and report Project activities throughout the Project Construction phase. Project implementation supervision consultants will also include environment, health and safety experts to support supervision and monitoring of Project EMP implementation and to build the capacity of NESCO.

13 Annexure-1: NO Objection Certificate of Department of Environment (DOE)

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
পরিবেশ অধিদপ্তর
পরিবেশ ভবন, ই-১৬, আগারগাঁও
শেরে বাংলা নগর, ঢাকা-১২০৭
www.doe.gov.bd

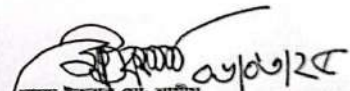
২১/১১/১৪৩১ বঙ্গাব্দ
তারিখ:
০৬/০৩/২০২৫ খ্রিষ্টাব্দ

নং-২২.০২.০০০০.০১৮.৫২.০০১.২৫. 

বিষয়: Network Infrastructure Development and Modernization of Distribution System in NESCO Area
এর ছাড়পত্রের আবেদন।
সূত্র: উদ্যোক্তার ০৫.০২.২০২৫ তারিখের আবেদন।

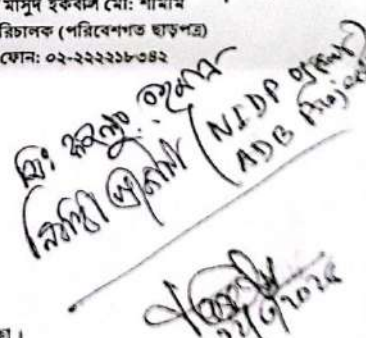
উপর্যুক্ত বিষয়ে সূত্রোক্ত আবেদনটি পরিবেশ অধিদপ্তরের প্রধান কার্যালয়ের পরিবেশগত ছাড়পত্র কমিটির ৫২৪ তম সভায় পর্যালোচনা করা হয়। পর্যালোচনাতে পরিলক্ষিত হয় যে, আলোচ্য প্রকল্পের আওতায় দেশের বিভিন্ন স্থানে ডাটা সেন্টার, ডিজিটাল রিকভারি সেন্টার, ফল্ট ডিটেক্টর সিস্টেম স্থাপন, জিআইএস সুইচিং সাবস্টেশন, এআইএস সুইচিং সাবস্টেশন, বে-এক্সটেনশন/সুইচিং সেন্টার স্থাপন, জিআইএস সাবস্টেশন আপগ্রেডেশন, ট্রান্সফরমার রিপেয়ারিং ওয়ার্কসপ এবং বহুতল ভবন নির্মাণ করা হবে। বর্ণিত কার্যক্রমের মধ্যে ডাটা সেন্টার, ডিজিটাল রিকভারি সেন্টার, ফল্ট ডিটেক্টর সিস্টেম স্থাপন, জিআইএস সুইচিং সাবস্টেশন, এআইএস সুইচিং সাবস্টেশন, বে-এক্সটেনশন/সুইচিং সেন্টার স্থাপন, জিআইএস সাবস্টেশন আপগ্রেডেশন, ট্রান্সফরমার রিপেয়ারিং ওয়ার্কসপ নির্মাণ পরিবেশ সংরক্ষণ বিধিমালা, ২০২৩ এ ছাড়পত্র প্রদানের উদ্দেশ্যে তফসিল-১ এ উল্লিখিত শিল্প প্রতিষ্ঠান ও প্রকল্পের তালিকা বহির্ভূত এবং তফসিল-১৪ এ ক্ষেত্রে প্রযোজ্য নয়। এক্ষেত্রে উক্ত কার্যক্রমের জন্য ছাড়পত্র প্রদানের কোন অবকাশ নেই। তবে বহুতল ভবন নির্মাণের ক্ষেত্রে আবাসিক ও বাণিজ্যিক ভবন (৫,০০০ থেকে ২০,০০০ বর্গমিটার পর্যন্ত বিল্ডআপ এরিয়া) হলে পরিবেশ সংরক্ষণ বিধিমালা, ২০২৩ অনুযায়ী “কমলা” ক্রমিক নম্বর: ২৫) শ্রেণি হিসেবে সংশ্লিষ্ট জেলা কার্যালয় হতে বিধিমোতাবেক ছাড়পত্র গ্রহণ করতে হবে।

বিষয়টি সদয় অবগতি ও পরবর্তী কার্যার্থে প্রেরণ করা হলো।


মাসুদ ইকবাল মো: শামীম
পরিচালক (পরিবেশগত ছাড়পত্র)
ফোন: ০২-২২২২১৮৩৪২

জনাব মো: হাসিবুর রহমান
প্রজেক্ট কো-অর্ডিনেটর (তত্ত্বাবধায়ক প্রকৌশলী)
বিদ্যুৎ ভবন, নেসকো, হেভেম খাঁ, রাজশাহী-৬৭০০।

অনুলিপি:
১. পরিচালক, পরিবেশ অধিদপ্তর, রাজশাহী বিভাগীয় কার্যালয়, বগুড়া।
২. পরিচালক, পরিবেশ অধিদপ্তর, রংপুর বিভাগীয় কার্যালয়, রংপুর।
৩. সহকারী পরিচালক, পরিবেশ অধিদপ্তর, রাজশাহী জেলা কার্যালয়, রাজশাহী।
৪. সহকারী পরিচালক, মহাপরিচালক মহোদয়ের দপ্তর, পরিবেশ অধিদপ্তর, সদর দপ্তর, ঢাকা।


নিমিত্ত প্রকৌশলী (NIDP প্রকৌশলী)
১৫/৩/২০২৫

14 Annexure-2: Attendance of Public Consultation Meetings (PCMs)

Northern Electricity Supply PLC (NESCO)
Northwest Distribution Network Modernization Project
Funded by the Government of Bangladesh and Asian Development Bank (ADB)
Stakeholder Consultation Meeting (SCM)

Date: 26.11.2024

Place: NESCO Conference Room, Rajshahi

Sl. No.	Name of the participant	Organization Name	Designation	E-mail/Phone no.	Signature
1	মোহাম্মদ মজিদ হাফিজ	নেসকো	ফিল্ড ইঞ্জিনিয়ার (ইলেক্ট্রিক্যাল)	01704109060	
2	কবি: ফাহিমুল হক	নেসকো	P&D	01704109061	
3	Md. Ziaul Islam	NESCO	CE (Engineering)	01709996744	
4	Md. Moklesur Rahman	NESCO	SE	se.danish@nesco.gov.bd	
5	Md. Abu Muttalib	NESCO	DGM	dgmbudget@nesco.gov.bd	
6	Md. Abdun Rashid	NESCO	SE	se1.rajshahi@nesco.gov.bd	
7	Fouzia Nusrat	ADB	Environmental Specialist	fushimul@gmail.com 01611286615	
8	কবি: ফাহিমুল হক	NESCO	SE	01709996752	
9	কবি: ফাহিমুল হক	NESCO	SE	01709996751	
10	Gobindo Ghosh	NESCO	SE	01255582334	
11	কবি: ফাহিমুল হক	NESCO	XEN	01710-023437	
	Anisur Rahman Anen	NESCO	XEN	01637556023	

Northern Electricity Supply PLC (NESCO)
Northwest Distribution Network Modernization Project
Funded by the Government of Bangladesh and Asian Development Bank (ADB)
Stakeholder Consultation Meeting (SCM)

12	RISKY KHATUN	NESCO	AE	01778890640	
13	PAPIA RAHMAN MOURY	DAE	Metropolitan Agriculture Officer	01723077676	
14	Abul Kalam Hossain	Chairman No. 1, Halabaganj	Kashidanga	01719723074	
15	md. AKTARUZZAMAN	AE, SDO-5 Raj	Kadavuli	01767159574	
16	Md. Shohrab Hossain	Chairman	Katakali	01733257226	
17	ফাহিমুল হক	Chairman	NESCO-5	01711055986	
18	MD: Ibrahim Hossain	Chairman	Katakali	01710695607	
19	MD: Liton	Chairman		01758926533	
20	Mo Rason Ali	DBO		01303966535	
21	Uday Rozario	DoF	Fisheries Extension Officer	01716320767	
22	Ferdoy Zaman	মহাপরামর্শক		01758036187	
23	Md. Enamul Hossain	নেসকো গ্রাহক		01892144973	
24	Md. Sabbir Hossain	Nesco consumer Division-3		01714-837585	

Northern Electricity Supply PLC (NESCO)
Northwest Distribution Network Modernization Project
Funded by the Government of Bangladesh and Asian Development Bank (ADB)
Stakeholder Consultation Meeting (SCM)

25	Mr. Amjad Hossain	Sonail Forest Division Rajshahi	Offices in charge	01716121558	
26	MD. Rafiqul Islam (Babu)	NESCO	Business	01720407848	
27	রাফিক ইসলাম	কোম্পানি		01738673453	
28	এম. মোস্তাফিজ হোসেন			01798508066	
29	এম. মোস্তাফিজ			01320574038	
30	এম. রাসেল			01714955200	
31	MD. Tariq Hossain			01728-035349	
32	এম. মোস্তাফিজ			01791129900	
33	এম. মোস্তাফিজ হোসেন	এম. মোস্তাফিজ হোসেন		01727666372	
34	এম. মোস্তাফিজ হোসেন	এম. মোস্তাফিজ		01738-245158	
35		Snd 1, NESCO	AE	01754-002086	
36	এম. মোস্তাফিজ হোসেন	District Social Service Office	Deputy Director	01716093216	

Northern Electricity Supply PLC (NESCO)
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37	Tauhique Ahmad Faroque	S&D-1 Rajshahi	AE	01861613540	
38	Sadrul Islam	Director R C C I	chamber of commerce	0171111669	
39	MD Shohidul Kabir	Executive Engg. in Design & Construction	Pro.	01770666661	
40	MD. MOZAFFOR HOSSAIN	Consumer of NESCO	U. No. 27	01712076854	
41	এম. মোস্তাফিজ হোসেন	কোম্পানি	মো	02980966800	
42	MD. ABU MUTALIB	DGM Budget, NESCO	DGM	01755-582304	
43	MD. Kamal Uddin	M/S Kamal M&A Rice mill Khasani	Pro	01713720902	
44	MD KHALED ALAM	AE, Office of M. NESCO		01773368831	
45	Tapas Kumar Paul	Ex En (add. charge) Project Planning	Ex En.	01744-911144	
46	MD. Rezaul Rahman Skipton	Office of SD (Enr) NESCO	AE	01785342191	
47	MD. Tanvir Alam	SD-2, NESCO Rajshahi	AE	01732-174134	
48	MD. Walid Husan	SD-Kasliadanga NESCO, Rajshahi	Ex. Engg (Asst. Engg)	01321-124483	
49	MD. Mostafizur Rahman Khan	S&D-3, NESCO Rajshahi	AE	01768850540	

Northern Electricity Supply PLC (NESCO)
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49	Md. Taniul Islam	BBB Bimanbandan SAE	01676093266	Taniul
50	মুহাম্মদ হুমায়ুন কবীর		0176505091	
51	জাহান্নাওয়ার আলী		0520244088	Ug
52	MD. Sanowar Jahan Sima	সফটওয়্যার	029064889188	Pij
53	MD. Javed Hasan Abdullah	Snd - 2 Raj	01779-374806	Abdullah
54	MD. Abdul Wahid al Razzan	Snd - 2 Raj	01790366196	Razzan
55	MD. Atik Hossien	Snd - 2 Raj	01650066287	Atik
56	ডাঃ জাহাঙ্গীর আলী	সফটওয়্যার	01930698089	Sam
57	MD. Kamrul Hasan Bhuiyan	Environmental Consultant - NESCO	01941086695	Hasan
58				
59				
60				

Northern Electricity Supply Company PLC (NESCO)
Northwest Distribution Network Modernization Project
Funded by the Government of Bangladesh and Asian Development Bank (ADB)
Stakeholder Consultation Meeting (SCM)

Date: 27-11-2024

Place: Conference Room, Bidget Vhaban, Lalbag, Rangpur

Sl. No.	Name of the participant	Organization Name	Designation	E-mail/Phone no.	Signature
1	Md. Mizanur Rahman	NESCO	CE, PRD	01701407061	Rahman
2	Md. Ziaul Islam	NESCO	CE, Engineering	01709996744	Ziaul
3	MR. ASU Hena	NESCO	PD, Rangpur	01713850751	Hena
4	MR. Harun Razzan	NESCO	SE-1, Rangpur	01755589889	Razzan
5					
6	Ma. Hasibul Rahman	Project Coordinator NESCO	SE	01709996752	Hasibul
7	Md. Yeaser Arafat	Project Planning NESCO	SE	01713850752	Arafat
8	MD. SHARIFUL ISLAM	Circle-2, Rangpur NESCO	SE	01709996749	Shariful
9	Mst. Fizee Rahman Bhuiyan	NESCO	SE	01709996754	Fizee
10	Fouzia Nusrat	Environmental ADB	Environment Safeguard spri	01819286613	Nusrat
11	MR.				

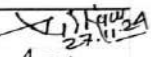
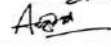
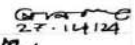
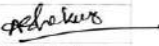
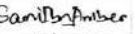
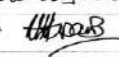
Northern Electricity Supply Company PLC (NESCO)
Northwest Distribution Network Modernization Project
Funded by the Government of Bangladesh and Asian Development Bank (ADB)
Stakeholder Consultation Meeting (SCM)

Sl. No.	Name of the participant	Organization Name	Designation	E-mail/Phone no.	Signature
12	মি. আরশাদ আলী	NESCO	XEN, SED-1 Rangpur	017555-24982	[Signature]
13	Anisur Rahman Anisur	NESCO	XEN, COMHEAT PHU Team Member ADB Project	01637556023	[Signature]
14	Md. Abul Kalam Azad	Headmaster, Rangpur Zila School	Headmaster	01716386096	[Signature]
15	MD. Rafiqul Islam Miah	Instructor, Rangpur Textile M.	Instructor (Tech)	01712407628	[Signature]
16	MD. Rokomajjaran	NESCO	Assistant Engineer	01773576933	[Signature]
17	MD. TAREQ RAHMAN	Customer, Three Phase	Customer	01711005174	[Signature]
18	MD. Monjurul	residence	Customer	01769025725	[Signature]
19	NUR MOHAMMAD	NESCO	XEN, SED-4, Rang	01702409044	[Signature]
20	Md. Masudul Rahman	NESCO	Inspector	01216985156	[Signature]
21	Md. Fakikul Hasan Roki	NESCO	Assistant Engineer	01719400855	[Signature]
22	Nuruzzaman Nurun	Imam And Teacher, Rangpur Govt. Begum Rokun College, Rangpur	Senior Teacher, Lecturer	01770944426	[Signature]
23	Md. Arzaf Hossain			01717-678744	[Signature]

Northern Electricity Supply Company PLC (NESCO)
Northwest Distribution Network Modernization Project
Funded by the Government of Bangladesh and Asian Development Bank (ADB)
Stakeholder Consultation Meeting (SCM)

Sl. No.	Name of the participant	Organization Name	Designation	E-mail/Phone no.	Signature
24	মি. হাবিবুর রহমান	DAE, Rangpur	ADD (Horticulture)	01710279350	[Signature]
25	Md. Habibur Rahman	DAE, Rangpur	ADD (Horticulture)	01734128411	[Signature]
26	Md. Zafireul Islam	DAE, Rangpur	Electrical Engineer	01738216834	[Signature]
27	Mst. Kamiz Fatema	NESCO	Manager	01755584900	[Signature]
28	Sonithi Singh Roy	Social Forest Division, Rangpur	Wildlife and Biodiversity Conservation Officer	01719312230	[Signature]
29	Jonathan Russell Toppo	B.A.D.C Rangpur	Manager	01724122143	[Signature]
30	মি. আরশাদ আলী	NESCO	XEN, SED-4, Rang	01714606059	[Signature]
31	Mosdul Alam Shoun	NSI	AD	01893995861	[Signature]
32	Mykel Arunendu Sarkar	Inpathani Agro Limited	Manager, Procuring	01313479181	[Signature]
33	Md. Splam Hossain	NESCO	Executive Engineer, Rang.	01755584891	[Signature]
34	Md. Nizam Rener	MNRELECTRIC RANGPUR	Owner	01750646468	[Signature]

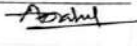
Northern Electricity Supply Company PLC (NESCO)
Northwest Distribution Network Modernization Project
Funded by the Government of Bangladesh and Asian Development Bank (ADB)
Stakeholder Consultation Meeting (SCM)

Sl. No.	Name of the participant	Organization Name	Designation	E-mail/Phone no.	Signature
35	Md. Abu Baker Siddique	Islamic Foundation	Deputy Director	ddi@rang@gmail.com	
36	Shapaz Chowdhury	The Daily Somakal	3 years old Chief Engineer	shapm65@gmail.com	
37	Md. Abdul Matin	SNDI, NESCO, Rangpur	Executive Engineer	xen.sndi2.rangpur@nesco.gov.bd	
38	Hd. Nasimul Haque	Manager, MRPM	Manager	engn.nasimul00@gmail.com	
39	Md. Ashique Rahman	NESCO	SDE	ashik031067@gmail.com	
40	Sami Bin Amber	Development Studies B. University of Dhaka	Student	samiinamber@gmail.com	
41	Md. Kamrul Hasan Bhuiyan	Environment Consultant NESCO (part)		hkgedlogist@gmail.com	
42					
43					
44					
45					

Northern Electrical Supply Company PLC (NESCO)
Northwest Distribution Network Modernization Project
Funded by the Government of Bangladesh and Asian Development Bank (ADB)
Stakeholder Consultation Meeting (SCM)

Date: 28-11-2024

Place: ESDO, Head office, Gobi ndanagar, Thakurga

Sl. No.	Name of the participant	Organization Name	Designation	E-mail/Phone no.	Signature
1	Md. Arshad Islam Mondul	NESCO	CE	01715041240	
2	Md. Hasibul Rahman	NESCO	SE	01709996752	
3	Md. Mosaddak Kabir	NESCO	SE	01755584890	
4	মোঃ মোস্তাফিজুল ইসলাম	NESCO	XEN	01715023437	
5	Arifur Rahman Arif	NESCO	XEN	01637556023	
6	মোঃ বিজয় দত্ত	NESCO	XEN	01755584899	
7	মোঃ মোস্তাফিজুল ইসলাম	NESCO	SDE	01717434416	
8	মোস্তাফিজুল ইসলাম	NESCO	AE	01775165593	
9	মোস্তাফিজুল ইসলাম	ESDO	SCO	01713143369	
10	Md. Kamrul Hasan	NESCO (part)	Env. Consultant	01941086695	
11					

Stakeholder Consultation Meeting (SCM)

SL No.	Name of the participant	Organization Name	Designation	E-mail/Phone no.	Signature
12	Dr. Skirini abater	MOCS	MOCC		Skirini
13	Most. Nayma parvin.	College	Lac.		Nayma
14	Tahmina Khadun	Forest Department	ACF (w. st.)	tahminaf@gmail.com	Tahmina
15	Muhamm pinky	Environment Department	Sample collector	01737067857	Muhamm
16	Kafi Uddin Shommed	Bangladesh Jamateishon	Asst. Sec. Thakurgaon	07323266311	Kafi Uddin
17	ডাঃ মিন (১৭) সিকান্দার	বাংলাদেশ জামাতে ইসলামী	সহ সেক্রেটারী প্রশিক্ষণ	01712220644	Dr. Min
18	Alamgir Kabir	DAE, Thakurgaon	ADD (Crop)	adderuphathakurgaon@gmail.com	Alamgir
19	সিকান্দার (১২) ন	দাখিল (LBP) ন	বিশ্ববিদ্যালয়	bishwabidyalay@gmail.com	Sikandar
20	ডাঃ আমিনুল হক - আমিন	ডাঃ আমিনুল হক	প্রশ. প্রচলক	02970-263209	Amir
21	ডাঃ আমিনুল হক - আমিন	ডাঃ আমিনুল হক	প্রশ. প্রচলক	02922208490	Amir
22	ডাঃ আমিনুল হক - আমিন	ডাঃ আমিনুল হক	AIC	01928085766	Amir

Stakeholder Consultation Meeting (SCM)

Sl. No.	Name of the participant	Organization Name	Designation	E-mail/Phone no.	Signature
23	MD. Mahiuz Rahman	DSS	Registration Officer	mahiuraz7d@gmail.com	[Signature]
24	মোঃ জুয়েল আলম	স্বাস্থ্য সেবা পরিদপ্তর আলাউল্লাহ হাসপাতাল	ফিলিয়াস নিয়ন্ত্রক	jumaloh598@gmail.com	[Signature]
25	মোঃ মাহমুদ হাবিব(বাবু)	৯২০০৫৭১৩৬৪৮৮০৭৭	চেয়ারম্যান	01713863748	[Signature]
26	শ্রী: সত্যজিৎ কুমার	জিএমইপিআইআইসি	অধ্যক্ষ	02920462352	[Signature]
27	মামুনুল হক	আইডিও কনটাক্ট	আইডিও কন্টাক্ট	017366293283	[Signature]
28	ডাঃ মুক্তার হোসেন	চিকিৎসা পরিদপ্তর		02920462352	[Signature]
29	Emdadul Islam Bhuiya	GTV,	Dist Commis- sioner	01719836019	[Signature]
30	MZ মজিদ	মজিদ	অতিরিক্ত সহকারী প্রোগ্রামার	01736478847	[Signature]
31	PrO (প্রোগ্রামার)	মজিদ	অতিরিক্ত সহকারী প্রোগ্রামার	01736478847	[Signature]
32	শ্রী: জুবায়ের হোসেন	জুবায়ের হোসেন	MZ অধ্যক্ষ	01717814204	[Signature]
33	সংগঠন ও প্রশিক্ষণ	উচ্চমাধ্যমিক শিক্ষা সংস্থা, গাজীপুর, গি.	ED	09912200002	[Signature]

Northern Electrical Supply Company PLC (NESCO)
Northwest Distribution Network Modernization Project
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Sl. No.	Name of the participant	Organization Name	Designation	E-mail/Phone no.	Signature
34	ডায়েরী সেক্টর	ডায়েরী সেক্টর	ডায়েরী সেক্টর	0296488525	
35	ইমদা মির্জা	ইমদা মির্জা	ইমদা মির্জা	01309676799	
36	ডাঃ জাঃ মাহিদ	ডাঃ জাঃ মাহিদ	ডাঃ জাঃ মাহিদ	02988200200	
37	Engr. Md. Roshidul Islam	Karigan (Home priming)	Director	01753613483	
38	মোহাম্মদ হান্নান	ESDO	Asst	01746975793	
39	মোহাম্মদ হুসেইন	আইআইসি সিস্টেমিক	সিস্টেমিক	01705452701	
40	মোহাম্মদ হুসেইন	আইআইসি সিস্টেমিক	সিস্টেমিক	01973322038	
41	ফাহিম হুসেইন	আইআইসি সিস্টেমিক	সিস্টেমিক	01758206750	
42	মোহাম্মদ হুসেইন	আইআইসি সিস্টেমিক	সিস্টেমিক	01745080666	
43	মোহাম্মদ হুসেইন	আইআইসি সিস্টেমিক	সিস্টেমিক	01715412122	
44	মোহাম্মদ হুসেইন	আইআইসি সিস্টেমিক	সিস্টেমিক	01703617789	
45	Md Asaduzzaman Asad	Thakurgaon Reporter's unity	General Secretary	01762816271 01819865788	

Northern Electrical Supply Company PLC (NESCO)
Northwest Distribution Network Modernization Project
Funded by the Government of Bangladesh and Asian Development Bank (ADB)
Stakeholder Consultation Meeting (SCM)

Sl. No.	Name of the participant	Organization Name	Designation	E-mail/Phone no.	Signature
46	ডাঃ জাঃ মাহিদ	ডাঃ জাঃ মাহিদ	ডাঃ জাঃ মাহিদ	01712519517	
47	ডাঃ জাঃ মাহিদ	ডাঃ জাঃ মাহিদ	ডাঃ জাঃ মাহিদ	01722468578	
48	ডাঃ জাঃ মাহিদ	ডাঃ জাঃ মাহিদ	ডাঃ জাঃ মাহিদ	01734901099	
49	Md. Nadeem	NESCO	Project manager	01308163638	
50	মোহাম্মদ হুসেইন	আইআইসি সিস্টেমিক	সিস্টেমিক	01722441000	
51	মোহাম্মদ হুসেইন	আইআইসি সিস্টেমিক	সিস্টেমিক	01755164470	
52	ডাঃ জাঃ মাহিদ	ডাঃ জাঃ মাহিদ	ডাঃ জাঃ মাহিদ	01716415735	
53	ডাঃ জাঃ মাহিদ	ডাঃ জাঃ মাহিদ	ডাঃ জাঃ মাহিদ		
54	ডাঃ জাঃ মাহিদ	ডাঃ জাঃ মাহিদ	ডাঃ জাঃ মাহিদ	01930700270	
55	ডাঃ জাঃ মাহিদ	ডাঃ জাঃ মাহিদ	ডাঃ জাঃ মাহিদ	01715249142	
56	ডাঃ জাঃ মাহিদ	ডাঃ জাঃ মাহিদ	ডাঃ জাঃ মাহিদ		

15 Annexure-3: Environmental Monitoring Test Results

Air Quality:



TEST REPORT NO.: I&E (ENV)-2024070178

DATE: 28 July, 2024

Page: 2 of 3

Job No: SGS-I&E(ENV)/240609

DESCRIPTION OF MONITORING RESULT:

Sampling Location	Test Name	Method	Unit	LOR	Result	Bangladesh (DoE) Ambient Air Quality Standards
POINT: Ambient Air Quality (AAQ-1B), (Solar Power Plant Area, Thakurgaon, 26°2'16.21"N; 88°25'37.54"E)	Particulate matter (PM ₁₀)	In House Based On IS 5182 (Part 23) 2006	µg/m ³	5.0	13.15	150 ^a 50 ^b
	Particulate matter (PM _{2.5})	In House Gravimetric Method	µg/m ³	5.0	8.70	85 ^a 35 ^b
	SO ₂ -Sulphur Dioxide (SO ₂)	In House Based On IS 5182 (Part 2) 2001	µg/m ³	2.5	<2.5	250 ^a 80 ^b
	NO _x -Oxides of Nitrogen (NO _x)	In House Based On IS 5182 (Part 6) 2006	µg/m ³	5.0	<5.0	80 ^a 40 ^b
	Carbon Mono-Oxide (CO)	Real-Time Electrochemical Sensor (In House, in-situ)	mg/m ³	0.0	1.6	20 ^c 05 ^d
	Ozone (O ₃)	Real-Time Electrochemical Sensor (In House, in-situ)	µg/m ³	0.0	<0.1	180 ^c 100 ^d

Meteorological information:

Date	Temperature (°C) Max Min	Humidity (% RH)	Wind Speed (m/s)	Wind Direction	Rainfall (mm)
05.07.2024	28.8°C 25.8°C	92.3%	5.36 m/s	North West Side	36.9
06.07.2024	29.5°C 26.2°C	83.7%	4.47 m/s	North West Side	29.2

Abbreviation: DoE - Department of Environment, a = standard for 24 hours exposure, b = standard for yearly exposure, c = standard for 1 hours exposure, d = standard for 8 hours exposure, LOR= Limit of Reporting, meter per second (m/s), Microgram per cubic meter (µg/m³), milligram per cubic meter (mg/m³), Ambient Air Quality (AAQ), SO_x-Sulphur Dioxide (SO₂) measurement resolution is 2.5 µg/m³, NO_x- Oxides of Nitrogen (NO_x) measurement resolution is 5.0 µg/m³ & Ozone (O₃) measurement resolution is 0.1 µg/m³.

Sampler Details & ID Number: Respirable Dust Sampler (Model: RDS, ENV-EQ-01/04), Ambient Fine Dust Sampler (Model: FEM_ADS 2.5/10, ENV-EQ-38/39), Digital Anemometer (Model: AR826, ENV-EQ-33), ES20 portable gas detector (Model: XLA-BX-03, ENV-EQ-35), Air Quality Meter (Model: AQ-9001SD, ENV-EQ-41).

Comments: Ambient Air Quality has been found within the standard limit according to Air Pollution Control Rules, 2022.

Monitoring Conducted By: Md. Shamin Reza and Md. Emraddul Haque.

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Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and each sample(s) are retained for maximum 15 days depending on the sample characteristics and conditions.

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TEST REPORT NO.:

I&E (ENV)-2024070180

DATE: 28 July, 2024

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Job No.: SGS-I&E(ENV)/240609

INSPECTION AND MONITORED BY SGS BANGLADESH LIMITED

Fouzia Nusrat
National Environment Safeguard Specialist,
Asian Development Bank (ADB),
Plot E-31, Sher-e-Bangla Nagar, Dhaka 1207, Bangladesh.

DESCRIPTION : Ambient Air Quality
Project Name : Network Infrastructure Development and Modernization of Power Distribution System in Northwest Area
Project Location : New Substation Area, Pabna.
GPS Co-Ordinate : 23°59'30.49"N; 89°15'32.64"E
INSPECTION DATE : 07 July 2024 to 08 July 2024.
REPORT ISSUE DATE : 28 July 2024

Sign for and on behalf of

Md. Masroor Abedin
Manager-I&E (Environment)

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TEST REPORT NO.:

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DESCRIPTION OF MONITORING RESULT:

Sampling Location	Test Name	Method	Unit	LOR	Result	Bangladesh (DoE) Ambient Air Quality Standards
POINT: Ambient Air Quality (AAQ-17), (New Substation Area, Pabna. 23°59'30.49"N; 89°15'32.64"E)	Particulate matter (PM ₁₀)	In House Based On IS 5182 (Part 23):2006	µg/m ³	5.0	24.57	150 ^a 50 ^b
	Particulate matter (PM _{2.5})	In House Gravimetric Method	µg/m ³	5.0	6.20	65 ^a 35 ^b
	SO _x -Sulphur Dioxide (SO ₂)	In House Based On IS 5182 (Part 2):2001	µg/m ³	2.5	<2.5	250 ^c 80 ^a
	NO _x -Oxides of Nitrogen (NO ₂)	In House Based On IS 5182 (Part 6):2006	µg/m ³	5.0	<5.0	80 ^a 40 ^b
	Carbon Mono-Oxide (CO)	Real-Time Electrochemical Sensor (In House, in-situ)	mg/m ³	0.0	1.4	20 ^c 05 ^d
	Ozone (O ₃)	Real-Time Electrochemical Sensor (In House, in-situ)	µg/m ³	0.0	<0.1	180 ^c 100 ^d

Meteorological information:

Date	Temperature (°C)		Humidity (% RH)	Wind Speed (m/s)	Wind Direction	Rainfall (mm)
	Max	Min				
07.07.2024	34.7°C	27.6°C	61.6%	3.12 m/s	South East Side.	0.0
08.07.2024	35.2°C	28.3°C	59.3%	4.47 m/s	South East Side.	0.0

Abbreviation: DoE - Department of Environment, a = standard for 24 hours exposure, b = standard for yearly exposure, c = standard for 1 hours exposure, d = standard for 8 hours exposure, LOR= Limit of Reporting, meter per second (m/s), Microgram per cubic meter (µg/m³), milligram per cubic meter (mg/m³), Ambient Air Quality (AAQ), SO_x-Sulphur Dioxide (SO₂) measurement resolution is 2.5 µg/m³, NO_x- Oxides of Nitrogen (NO₂) measurement resolution is 5.0 µg/m³ & Ozone (O₃) measurement resolution is 0.1 µg/m³.

Sampler Details & ID Number: Respirable Dust Sampler (Model: RDS, ENV-EQ-01,04), Ambient Fine Dust Sampler (Model: PEM_ADS 2.5/10, ENV-EQ-38,39), Digital Anemometer (Model: AR826, ENV-EQ-33), ES20 portable gas detector (Model: XLA-BX-03, ENV-EQ-35), Air Quality Meter (Model: AQ-9901SD, ENV-EQ-41).

Comments: Ambient Air Quality has been found within the standard limit according to Air Pollution Control Rules, 2022

Monitoring Conducted By: Md. Shamim Reza and Md. Emdadul Haque.

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TEST REPORT NO.:

I&E (ENV)-2024070154

DATE: 28 July, 2024

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DESCRIPTION OF MONITORING RESULT:

Sampling Location	Test Name	Method	Unit	LOR	Result	Bangladesh (DoE) Ambient Air Quality Standards
POINT: Ambient Air Quality (AAQ-4), (Miapur-City Central (Alt-2 Under Line), Rajshahi, 24°22'13.89"N; 88°34'0.52"E)	Particulate matter (PM ₁₀)	In House Based On IS 5182 (Part 23):2006	µg/m ³	5.0	78.76	150 ^a 50 ^b
	Particulate matter (PM _{2.5})	In House Gravimetric Method	µg/m ³	5.0	7.96	65 ^a 35 ^b
	SO _x -Sulphur Dioxide (SO ₂)	In House Based On IS 5182 (Part 2):2001	µg/m ³	2.5	<2.5	250 ^c 80 ^a
	NO _x -Oxides of Nitrogen (NO ₂)	In House Based On IS 5182 (Part 6):2006	µg/m ³	5.0	<5.0	80 ^a 40 ^b
	Carbon Mono-Oxide (CO)	Real-Time Electrochemical Sensor (In House, in-situ)	mg/m ³	0.0	1.7	20 ^c 05 ^d
	Ozone (O ₃)	Real-Time Electrochemical Sensor (In House, in-situ)	µg/m ³	0.0	<0.1	180 ^c 100 ^d

Meteorological information:

Date	Temperature (°C)		Humidity (% RH)	Wind Speed (m/s)	Wind Direction	Rainfall (mm)
	Max	Min				
26.06.2024	37.8°C	29.9°C	43.9%	2.68 m/s	North West side.	0.0
27.06.2024	36.8°C	29.7°C	52.3%	4.02 m/s	North West side.	0.0

Abbreviation: DoE - Department of Environment, a = standard for 24 hours exposure, b = standard for yearly exposure, c = standard for 1 hours exposure, d = standard for 8 hours exposure, LOR= Limit of Reporting, meter per second (m/s), Microgram per cubic meter (µg/m³), milligram per cubic meter (mg/m³), Ambient Air Quality (AAQ), SO_x-Sulphur Dioxide (SO₂) measurement resolution is 2.5 µg/m³, NO_x- Oxides of Nitrogen (NO₂) measurement resolution is 5.0 µg/m³ & Ozone (O₃) measurement resolution is 0.1 µg/m³.

Sampler Details & ID Number: Respirable Dust Sampler (Model: RDS, ENV-EQ-01,04), Ambient Fine Dust Sampler (Model: PEM_ADS 2.5/10, ENV-EQ-38,39), Digital Anemometer (Model: AR826, ENV-EQ-33), ES20 portable gas detector (Model: XLA-BX-O3, ENV-EQ-35), Air Quality Meter (Model: AQ-9901SD, ENV-EQ-41).

Comments: Ambient Air Quality has been found within the standard limit according to Air Pollution Control Rules, 2022

Monitoring Conducted By: Md. Shamim Reza and Md. Enidatul Haque.

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TEST REPORT NO.:

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INSPECTION AND MONITORED BY SGS BANGLADESH LIMITED

Fouzia Nusrat
National Environment Safeguard Specialist,
Asian Development Bank (ADB),
Plot E-31, Sher-e-Bangla Nagar, Dhaka 1207, Bangladesh.

DESCRIPTION : Ambient Air Quality
Project Name : Network Infrastructure Development and Modernization of Power Distribution System in Northwest Area
Project Location : Mapur-City Central (Alt-2 Underground Line), Rajshahi.
GPS Co-Ordinate : 24°22'13.89"N; 88°34'0.52"E
INSPECTION DATE : 26 June 2024 to 27 June 2024.
REPORT ISSUE DATE : 28 July 2024

Sign for and on behalf of

Md. Masroor Abedin
Manager-I&E (Environment)

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TEST REPORT NO.:

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DATE: 28 July, 2024

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DESCRIPTION OF MONITORING RESULT:

Sampling Location	Test Name	Method	Unit	LOR	Result	Bangladesh (DoE) Ambient Air Quality Standards
POINT: Ambient Air Quality (AAQ-5), (Goshpara Mor, (Shadharon Bima Feeder), Rajshahi, 24°22'10.73"N; 88°35'22.20"E)	Particulate matter (PM ₁₀)	In House Based On IS 5182 (Part 23):2006	µg/m ³	5.0	40.23	150 ^a 50 ^b
	Particulate matter (PM _{2.5})	In House Gravimetric Method	µg/m ³	5.0	11.81	65 ^a 35 ^b
	SO _x -Sulphur Dioxide (SO ₂)	In House Based On IS 5182 (Part 2):2001	µg/m ³	2.5	<2.5	250 ^c 80 ^a
	NO _x -Oxides of Nitrogen (NO ₂)	In House Based On IS 5182 (Part 6):2006	µg/m ³	5.0	<5.0	80 ^a 40 ^b
	Carbon Mono-Oxide (CO)	Real-Time Electrochemical Sensor (In House, in-situ)	mg/m ³	0.0	2.1	20 ^c 05 ^d
	Ozone (O ₃)	Real-Time Electrochemical Sensor (In House, in-situ)	µg/m ³	0.0	<0.1	180 ^c 100 ^d

Meteorological information:

Date	Temperature (°C)		Humidity (% RH)	Wind Speed (m/s)	Wind Direction	Rainfall (mm)
	Max	Min				
27.06.2024	36.8°C	28.4°C	53.2%	5.81 m/s	North South side.	0.0
28.06.2024	36.9°C	28.2°C	48.7%	5.36 m/s	North South side..	0.0

Abbreviation: DoE - Department of Environment, a = standard for 24 hours exposure, b = standard for yearly exposure, c = standard for 1 hours exposure, d = standard for 8 hours exposure, LOR= Limit of Reporting, meter per second (m/s), Microgram per cubic meter (µg/m³), milligram per cubic meter (mg/m³), Ambient Air Quality (AAQ), SO_x-Sulphur Dioxide (SO₂) measurement resolution is 2.5 µg/m³, NO_x- Oxides of Nitrogen (NO₂) measurement resolution is 5.0 µg/m³ & Ozone (O₃) measurement resolution is 0.1 µg/m³.

Sampler Details & ID Number: Respirable Dust Sampler (Model: RDS, ENV-EQ-01,04), Ambient Fine Dust Sampler (Model: PEM_ADS 2.5/10, ENV-EQ-38,39), Digital Anemometer (Model: AR826, ENV-EQ-33), ES20 portable gas detector (Model: XLA-BX-O3, ENV-EQ-35), Air Quality Meter (Model: AQ-9901SD, ENV-EQ-41).

Comments: Ambient Air Quality has been found within the standard limit according to Air Pollution Control Rules, 2022

Monitoring Conducted By: Md. Shamim Reza and Md. Emdadul Haque.

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TEST REPORT NO.:

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INSPECTION AND MONITORED BY SGS BANGLADESH LIMITED

Fouzia Nusrat
National Environment Safeguard Specialist,
Asian Development Bank (ADB),
Plot E-31, Sher-e-Bangla Nagar, Dhaka 1207, Bangladesh.

DESCRIPTION : Ambient Air Quality
Project Name : Network Infrastructure Development and Modernization of Power Distribution System in Northwest Area
Project Location : Goshpara Mor, (Shadharon Bima Feeder), Rajshahi.
GPS Co-Ordinate : 24°22'10.73"N; 88°35'22.20"E
INSPECTION DATE : 27 June 2024 to 28 June 2024.
REPORT ISSUE DATE : 28 July 2024

Sign for and on behalf of

Md. Masroor Abedin
Manager-I&E (Environment)

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DESCRIPTION OF MONITORING RESULT:

Sampling Location	Test Name	Method	Unit	LOR	Result	Bangladesh (DoE) Ambient Air Quality Standards
POINT: Ambient Air Quality (AAQ-6). (Near New Govt. Degree College, (Medical Feeder), Rajshahi, 24°22'11.77"N; 88°34'58.54"E)	Particulate matter (PM ₁₀)	In House Based On IS 5182 (Part 23):2006	µg/m ³	5.0	35.49	150 ^a 50 ^b
	Particulate matter (PM _{2.5})	In House Gravimetric Method	µg/m ³	5.0	5.65	65 ^a 35 ^b
	SO _x -Sulphur Dioxide (SO ₂)	In House Based On IS 5182 (Part 2):2001	µg/m ³	2.5	<2.5	250 ^c 80 ^a
	NO _x -Oxides of Nitrogen (NO ₂)	In House Based On IS 5182 (Part 6):2006	µg/m ³	5.0	<5.0	80 ^a 40 ^b
	Carbon Mono-Oxide (CO)	Real-Time Electrochemical Sensor (In House, in-situ)	mg/m ³	0.0	2.2	20 ^c 05 ^d
	Ozone (O ₃)	Real-Time Electrochemical Sensor (In House, in-situ)	µg/m ³	0.0	<0.1	180 ^c 100 ^d

Meteorological information:

Date	Temperature (°C)		Humidity (% RH)	Wind Speed (m/s)	Wind Direction	Rainfall (mm)
	Max	Min				
27.06.2024	36.8°C	28.4°C	53.2%	5.81 m/s	North South side.	0.0
28.06.2024	36.9°C	28.2°C	48.7%	5.36 m/s	North South side..	0.0

Abbreviation: DoE - Department of Environment, a = standard for 24 hours exposure, b= standard for yearly exposure, c = standard for 1 hours exposure, d = standard for 8 hours exposure, LOR= Limit of Reporting, meter per second (m/s), Microgram per cubic meter (µg/m³), milligram per cubic meter (mg/m³), Ambient Air Quality (AAQ), SO_x-Sulphur Dioxide (SO₂) measurement resolution is 2.5 µg/m³, NO_x- Oxides of Nitrogen (NO₂) measurement resolution is 5.0 µg/m³ & Ozone (O₃) measurement resolution is 0.1 µg/m³.

Sampler Details & ID Number: Respirable Dust Sampler (Model: RDS, ENV-EQ-01,04), Ambient Fine Dust Sampler (Model: PEM_ADS 2.5/10, ENV-EQ-38,39), Digital Anemometer (Model: AR826, ENV-EQ-33), ES20 portable gas detector (Model: XLA-BX-O3, ENV-EQ-35), Air Quality Meter (Model: AQ-9901SD, ENV-EQ-41).

Comments: Ambient Air Quality has been found within the standard limit according to Air Pollution Control Rules, 2022

Monitoring Conducted By: Md. Shamim Reza and Md. Emdadul Haque.

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TEST REPORT NO.:

I&E (ENV)-2024070158

DATE: 28 July, 2024

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Job No.: SGS-I&E(ENV)/240609

INSPECTION AND MONITORED BY SGS BANGLADESH LIMITED

Fouzia Nusrat
National Environment Safeguard Specialist,
Asian Development Bank (ADB),
Plot E-31, Sher-e-Bangla Nagar, Dhaka 1207, Bangladesh.

DESCRIPTION : Ambient Air Quality
Project Name : Network Infrastructure Development and Modernization of Power Distribution System in Northwest Area
Project Location : Near New Govt. Degree College, (Medical Feeder), Rajshahi.
GPS Co-Ordinate : 24°22'11.77"N; 88°34'58.54"E
INSPECTION DATE : 27 June 2024 to 28 June 2024.
REPORT ISSUE DATE : 28 July 2024

Sign for and on behalf of

Md. Masroor Abedin
Manager-I&E (Environment)

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TEST REPORT NO.:

I&E (ENV)-2024070160

DATE: 28 July, 2024

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Job No.: SGS-I&E(ENV)/240609

DESCRIPTION OF MONITORING RESULT:

Sampling Location	Test Name	Method	Unit	LOR	Result	Bangladesh (DoE) Ambient Air Quality Standards
POINT: Ambient Air Quality (AAQ-7), (Substation Area, S&D-1 Campus, Bogura, 24°50'55.59"N; 89°22'29.07"E)	Particulate matter (PM ₁₀)	In House Based On IS 5182 (Part 23):2006	µg/m ³	5.0	22.90	150 ^a 50 ^b
	Particulate matter (PM _{2.5})	In House Gravimetric Method	µg/m ³	5.0	6.67	65 ^a 35 ^b
	SO _x -Sulphur Dioxide (SO ₂)	In House Based On IS 5182 (Part 2):2001	µg/m ³	2.5	<2.5	250 ^c 80 ^a
	NO _x -Oxides of Nitrogen (NO ₂)	In House Based On IS 5182 (Part 6):2006	µg/m ³	5.0	<5.0	80 ^a 40 ^b
	Carbon Mono-Oxide (CO)	Real-Time Electrochemical Sensor (In House, in-situ)	mg/m ³	0.0	1.4	20 ^c 05 ^d
	Ozone (O ₃)	Real-Time Electrochemical Sensor (In House, in-situ)	µg/m ³	0.0	<0.1	180 ^c 100 ^d

Meteorological information:

Date	Temperature (°C)		Humidity (% RH)	Wind Speed (m/s)	Wind Direction	Rainfall (mm)
	Max	Min				
29.06.2024	33.5°C	27.6°C	76.3%	5.36 m/s	South West side.	34.5
30.06.2024	34.7°C	27.3°C	78.5%	5.81 m/s	South west side.	22.9

Abbreviation: DoE - Department of Environment, a = standard for 24 hours exposure, b = standard for yearly exposure, c = standard for 1 hours exposure, d = standard for 8 hours exposure, LOR= Limit of Reporting, meter per second (m/s), Microgram per cubic meter (µg/m³), milligram per cubic meter (mg/m³), Ambient Air Quality (AAQ), SO_x-Sulphur Dioxide (SO₂) measurement resolution is 2.5 µg/m³, NO_x- Oxides of Nitrogen (NO₂) measurement resolution is 5.0 µg/m³ & Ozone (O₃) measurement resolution is 0.1 µg/m³.

Sampler Details & ID Number: Respirable Dust Sampler (Model: RDS, ENV-EQ-01,04), Ambient Fine Dust Sampler (Model: PEM_ADS 2.5/10, ENV-EQ-38,39), Digital Anemometer (Model: AR826, ENV-EQ-33), ES20 portable gas detector (Model: XLA-BX-O3, ENV-EQ-35), Air Quality Meter (Model: AQ-9901SD, ENV-EQ-41).

Comments: Ambient Air Quality has been found within the standard limit according to Air Pollution Control Rules, 2022

Monitoring Conducted By: Md. Shamim Reza and Md. Emdadul Haque.

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TEST REPORT NO.:

I&E (ENV)-2024070160

DATE: 28 July, 2024

Page: 1 of 3

Job No.: SGS-I&E(ENV)/240609

INSPECTION AND MONITORED BY SGS BANGLADESH LIMITED

Fouzia Nusrat
National Environment Safeguard Specialist,
Asian Development Bank (ADB),
Plot E-31, Sher-e-Bangla Nagar, Dhaka 1207, Bangladesh.

DESCRIPTION : Ambient Air Quality
Project Name : Network Infrastructure Development and Modernization of Power Distribution System in Northwest Area
Project Location : Substation Area, S&D-1 Campus, Bogura.
GPS Co-Ordinate : 24°50'55.59"N; 89°22'29.07"E
INSPECTION DATE : 29 June 2024 to 30 June 2024.
REPORT ISSUE DATE : 28 July 2024

Sign for and on behalf of

Md. Masroor Abedin
Manager-I&E (Environment)

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TEST REPORT NO.:

I&E (ENV)-2024070162

DATE: 28 July, 2024

Page: 2 of 3

Job No.: SGS-I&E(ENV)/240609

DESCRIPTION OF MONITORING RESULT:

Sampling Location	Test Name	Method	Unit	LOR	Result	Bangladesh (DoE) Ambient Air Quality Standards
POINT: Ambient Air Quality (AAQ-8), (Substation Area, S&D-1 Campus, Rangpur, 25°43'43.24"N; 89°15'8.33"E)	Particulate matter (PM ₁₀)	In House Based On IS 5182 (Part 23):2006	µg/m ³	5.0	16.32	150 ^a 50 ^b
	Particulate matter (PM _{2.5})	In House Gravimetric Method	µg/m ³	5.0	5.37	65 ^a 35 ^b
	SO _x -Sulphur Dioxide (SO ₂)	In House Based On IS 5182 (Part 2):2001	µg/m ³	2.5	<2.5	250 ^c 80 ^a
	NO _x -Oxides of Nitrogen (NO ₂)	In House Based On IS 5182 (Part 6):2006	µg/m ³	5.0	<5.0	80 ^a 40 ^b
	Carbon Mono-Oxide (CO)	Real-Time Electrochemical Sensor (In House, in-situ)	mg/m ³	0.0	1.4	20 ^c 05 ^a
	Ozone (O ₃)	Real-Time Electrochemical Sensor (In House, in-situ)	µg/m ³	0.0	<0.1	180 ^c 100 ^d

Meteorological information:

Date	Temperature (°C)		Humidity (% RH)	Wind Speed (m/s)	Wind Direction	Rainfall (mm)
	Max	Min				
30.06.2024	31.6°C	26.8°C	76.6%	3.57 m/s	North West side.	24.8
01.07.2024	30.9°C	26.3°C	76.2%	3.12 m/s	North west side.	19.9

Abbreviation: DoE - Department of Environment, a = standard for 24 hours exposure, b = standard for yearly exposure, c = standard for 1 hours exposure, d = standard for 8 hours exposure, LOR= Limit of Reporting, meter per second (m/s), Microgram per cubic meter (µg/m³), milligram per cubic meter (mg/m³), Ambient Air Quality (AAQ), SO_x-Sulphur Dioxide (SO₂) measurement resolution is 2.5 µg/m³, NO_x- Oxides of Nitrogen (NO₂) measurement resolution is 5.0 µg/m³ & Ozone (O₃) measurement resolution is 0.1 µg/m³.

Sampler Details & ID Number: Respirable Dust Sampler (Model: RDS, ENV-EQ-01,04), Ambient Fine Dust Sampler (Model: PEM_ADS 2.5/10, ENV-EQ-38,39), Digital Anemometer (Model: AR826, ENV-EQ-33), ES20 portable gas detector (Model: XLA-BX-O3, ENV-EQ-35), Air Quality Meter (Model: AQ-9901SD, ENV-EQ-41).

Comments: Ambient Air Quality has been found within the standard limit according to Air Pollution Control Rules, 2022

Monitoring Conducted By: Md. Shamim Reza and Md. Emdadul Haque.

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TEST REPORT NO.:

I&E (ENV)-2024070162

DATE: 28 July, 2024

Page: 1 of 3

Job No.: SGS-I&E(ENV)/240609

INSPECTION AND MONITORED BY SGS BANGLADESH LIMITED

Fouzia Nusrat
National Environment Safeguard Specialist,
Asian Development Bank (ADB),
Plot E-31, Sher-e-Bangla Nagar, Dhaka 1207, Bangladesh.

DESCRIPTION : Ambient Air Quality
Project Name : Network Infrastructure Development and Modernization of Power Distribution System in Northwest Area
Project Location : Substation Area, S&D-1 Campus, Rangpur.
GPS Co-Ordinate : 25°43'43.24"N; 89°15'8.33"E
INSPECTION DATE : 30 June 2024 to 01 July 2024.
REPORT ISSUE DATE : 28 July 2024

Sign for and on behalf of

Md. Masroor Abedin
Manager-I&E (Environment)

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DESCRIPTION OF MONITORING RESULT:

Sampling Location	Test Name	Method	Unit	LOR	Result	Bangladesh (DoE) Ambient Air Quality Standards
POINT: Ambient Air Quality (AAQ-9), (Workshop Area, Lalbagh, Rangpur, 25°43'45.31"N; 89°15'7.66"E)	Particulate matter (PM ₁₀)	In House Based On IS 5182 (Part 23):2006	µg/m ³	5.0	28.11	150 ^a 50 ^b
	Particulate matter (PM _{2.5})	In House Gravimetric Method	µg/m ³	5.0	21.39	65 ^a 35 ^b
	SO _x -Sulphur Dioxide (SO ₂)	In House Based On IS 5182 (Part 2):2001	µg/m ³	2.5	<2.5	250 ^c 80 ^a
	NO _x -Oxides of Nitrogen (NO ₂)	In House Based On IS 5182 (Part 6):2006	µg/m ³	5.0	<5.0	80 ^a 40 ^b
	Carbon Mono-Oxide (CO)	Real-Time Electrochemical Sensor (In House, in-situ)	mg/m ³	0.0	1.4	20 ^c 05 ^a
	Ozone (O ₃)	Real-Time Electrochemical Sensor (In House, in-situ)	µg/m ³	0.0	<0.1	180 ^c 100 ^d

Meteorological information:

Date	Temperature (°C)		Humidity (% RH)	Wind Speed (m/s)	Wind Direction	Rainfall (mm)
	Max	Min				
30.06.2024	31.6°C	26.8°C	76.6%	3.57 m/s	North West side.	24.8
01.07.2024	30.9°C	26.3°C	76.2%	3.12 m/s	North west side.	19.9

Abbreviation: DoE - Department of Environment, a = standard for 24 hours exposure, b = standard for yearly exposure, c = standard for 1 hours exposure, d = standard for 8 hours exposure, LOR= Limit of Reporting, meter per second (m/s), Microgram per cubic meter (µg/m³), milligram per cubic meter (mg/m³), Ambient Air Quality (AAQ), SO_x-Sulphur Dioxide (SO₂) measurement resolution is 2.5 µg/m³, NO_x- Oxides of Nitrogen (NO₂) measurement resolution is 5.0 µg/m³ & Ozone (O₃) measurement resolution is 0.1 µg/m³.

Sampler Details & ID Number: Respirable Dust Sampler (Model: RDS, ENV-EQ-01,04), Ambient Fine Dust Sampler (Model: PEM_ADS 2.5/10, ENV-EQ-38,39), Digital Anemometer (Model: AR826, ENV-EQ-33), ES20 portable gas detector (Model: XLA-BX-O3, ENV-EQ-35), Air Quality Meter (Model: AQ-9901SD, ENV-EQ-41).

Comments: Ambient Air Quality has been found within the standard limit according to Air Pollution Control Rules, 2022

Monitoring Conducted By: Md. Shamim Reza and Md. Emdadul Haque.

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TEST REPORT NO.:

I&E (ENV)-2024070166

DATE: 28 July, 2024

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Job No.: SGS-I&E(ENV)/240609

INSPECTION AND MONITORED BY SGS BANGLADESH LIMITED

Fouzia Nusrat
National Environment Safeguard Specialist,
Asian Development Bank (ADB),
Plot E-31, Sher-e-Bangla Nagar, Dhaka 1207, Bangladesh.

DESCRIPTION : Ambient Air Quality
Project Name : Network Infrastructure Development and Modernization of Power Distribution System in Northwest Area
Project Location : Baharkasna, Rangpur.
GPS Co-Ordinate : 25°46'14.00"N; 89°18'1.62"E
INSPECTION DATE : 01 July 2024 to 02 July 2024.
REPORT ISSUE DATE : 28 July 2024

Sign for and on behalf of

Md. Masroor Abedin
Manager-I&E (Environment)

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TEST REPORT NO.:

I&E (ENV)-2024070166

DATE: 28 July, 2024

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Job No.: SGS-I&E(ENV)/240609

DESCRIPTION OF MONITORING RESULT:

Sampling Location	Test Name	Method	Unit	LOR	Result	Bangladesh (DoE) Ambient Air Quality Standards
POINT: Ambient Air Quality (AAQ-10), (Baharkasna, Rangpur, 25°48'14.00"N; 89°18'1.62"E)	Particulate matter (PM ₁₀)	In House Based On IS 5182 (Part 23):2006	µg/m ³	5.0	28.82	150 ^a 50 ^b
	Particulate matter (PM _{2.5})	In House Gravimetric Method	µg/m ³	5.0	5.23	65 ^a 35 ^b
	SO _x -Sulphur Dioxide (SO ₂)	In House Based On IS 5182 (Part 2):2001	µg/m ³	2.5	<2.5	250 ^c 80 ^a
	NO _x -Oxides of Nitrogen (NO ₂)	In House Based On IS 5182 (Part 6):2006	µg/m ³	5.0	<5.0	80 ^a 40 ^b
	Carbon Mono-Oxide (CO)	Real-Time Electrochemical Sensor (In House, in-situ)	mg/m ³	0.0	1.3	20 ^c 05 ^d
	Ozone (O ₃)	Real-Time Electrochemical Sensor (In House, in-situ)	µg/m ³	0.0	<0.1	180 ^c 100 ^d

Meteorological information:

Date	Temperature (°C)		Humidity (% RH)	Wind Speed (m/s)	Wind Direction	Rainfall (mm)
	Max	Min				
01.07.2024	30.7°C	26.4°C	84.3%	3.12 m/s	South East side.	27.8
02.07.2024	30.6°C	26.7°C	85.2%	4.47 m/s	North west side.	26.9

Abbreviation: DoE - Department of Environment, a = standard for 24 hours exposure, b = standard for yearly exposure, c = standard for 1 hours exposure, d = standard for 8 hours exposure, LOR= Limit of Reporting, meter per second (m/s), Microgram per cubic meter (µg/m³), milligram per cubic meter (mg/m³), Ambient Air Quality (AAQ), SO_x-Sulphur Dioxide (SO₂) measurement resolution is 2.5 µg/m³, NO_x- Oxides of Nitrogen (NO₂) measurement resolution is 5.0 µg/m³ & Ozone (O₃) measurement resolution is 0.1 µg/m³.

Sampler Details & ID Number: Respirable Dust Sampler (Model: RDS, ENV-EQ-01,04), Ambient Fine Dust Sampler (Model: PEM_ADS 2.5/10, ENV-EQ-38,39), Digital Anemometer (Model: AR826, ENV-EQ-33), ES20 portable gas detector (Model: XLA-BX-O3, ENV-EQ-35), Air Quality Meter (Model: AQ-9901SD, ENV-EQ-41).

Comments: Ambient Air Quality has been found within the standard limit according to Air Pollution Control Rules, 2022

Monitoring Conducted By: Md. Shamim Reza and Md. Emdadul Haque.

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TEST REPORT NO.:

I&E (ENV)-2024070168

DATE: 28 July, 2024

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Job No.: SGS-I&E(ENV)/240609

INSPECTION AND MONITORED BY SGS BANGLADESH LIMITED

Fouzia Nusrat
National Environment Safeguard Specialist,
Asian Development Bank (ADB),
Plot E-31, Sher-e-Bangla Nagar, Dhaka 1207, Bangladesh.

DESCRIPTION : Ambient Air Quality
Project Name : Network Infrastructure Development and Modernization of Power Distribution System in Northwest Area
Project Location : Tazhat, Lalbagh to Mahiganj (Underground Line), Rangpur.
GPS Co-Ordinate : 25°43'37.60"N; 89°16'41.85"E
INSPECTION DATE : 01 July 2024 to 02 July 2024.
REPORT ISSUE DATE : 28 July 2024

Sign for and on behalf of

Md. Masroor Abedin
Manager-I&E (Environment)

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TEST REPORT NO.:

I&E (ENV)-2024070168

DATE: 28 July, 2024

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Job No.: SGS-I&E(ENV)/240609

DESCRIPTION OF MONITORING RESULT:

Sampling Location	Test Name	Method	Unit	LOR	Result	Bangladesh (DoE) Ambient Air Quality Standards
POINT: Ambient Air Quality (AAQ-11), (Tazhat, Lalbagh to Mahigan) (Underground Line), Rangpur, 25°43'37.60"N; 89°16'41.85"E	Particulate matter (PM ₁₀)	In House Based On IS 5182 (Part 23):2006	µg/m ³	5.0	21.44	150 ^a 50 ^b
	Particulate matter (PM _{2.5})	In House Gravimetric Method	µg/m ³	5.0	8.01	65 ^a 35 ^b
	SO _x -Sulphur Dioxide (SO ₂)	In House Based On IS 5182 (Part 2):2001	µg/m ³	2.5	<2.5	250 ^c 80 ^a
	NO _x -Oxides of Nitrogen (NO ₂)	In House Based On IS 5182 (Part 6):2006	µg/m ³	5.0	<5.0	80 ^a 40 ^b
	Carbon Mono-Oxide (CO)	Real-Time Electrochemical Sensor (In House, in-situ)	mg/m ³	0.0	1.6	20 ^c 05 ^a
	Ozone (O ₃)	Real-Time Electrochemical Sensor (In House, in-situ)	µg/m ³	0.0	<0.1	180 ^c 100 ^d

Meteorological information:

Date	Temperature (°C)		Humidity (% RH)	Wind Speed (m/s)	Wind Direction	Rainfall (mm)
	Max	Min				
01.07.2024	30.7°C	26.4°C	84.3%	3.12 m/s	South East side.	27.8
02.07.2024	30.6°C	26.7°C	85.2%	4.47 m/s	North west side.	26.9

Abbreviation: DoE - Department of Environment, a = standard for 24 hours exposure, b = standard for yearly exposure, c = standard for 1 hours exposure, d = standard for 8 hours exposure, LOR= Limit of Reporting, meter per second (m/s), Microgram per cubic meter (µg/m³), milligram per cubic meter (mg/m³), Ambient Air Quality (AAQ), SO_x-Sulphur Dioxide (SO₂) measurement resolution is 2.5 µg/m³, NO_x- Oxides of Nitrogen (NO₂) measurement resolution is 5.0 µg/m³ & Ozone (O₃) measurement resolution is 0.1 µg/m³.

Sampler Details & ID Number: Respirable Dust Sampler (Model: RDS, ENV-EQ-01,04), Ambient Fine Dust Sampler (Model: PEM_ADS 2.5/10, ENV-EQ-38,39), Digital Anemometer (Model: AR826, ENV-EQ-33), ES20 portable gas detector (Model: XLA-BX-O3, ENV-EQ-35), Air Quality Meter (Model: AQ-9901SD, ENV-EQ-41).

Comments: Ambient Air Quality has been found within the standard limit according to Air Pollution Control Rules, 2022

Monitoring Conducted By: Md. Shamim Reza and Md. Emdadul Haque.

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TEST REPORT NO.:

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DATE: 28 July, 2024

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Job No.: SGS-I&E(ENV)/240609

INSPECTION AND MONITORED BY SGS BANGLADESH LIMITED

Fouzia Nusrat
National Environment Safeguard Specialist,
Asian Development Bank (ADB),
Plot E-31, Sher-e-Bangla Nagar, Dhaka 1207, Bangladesh.

DESCRIPTION : Ambient Air Quality
Project Name : Network Infrastructure Development and Modernization of Power Distribution System in Northwest Area
Project Location : Near NESCO S&D-3, Lalbagh-Shapla (Underground Line), Rangpur.
GPS Co-Ordinate : 25°43'47.74"N; 89°15'16.62"E
INSPECTION DATE : 02 July 2024 to 03 July 2024.
REPORT ISSUE DATE : 28 July 2024

Sign for and on behalf of

Md. Masroor Abedin
Manager-I&E (Environment)

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Noise level Measurements:



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Job No.: SGS-I&E(ENV)/240809

INSPECTION AND MONITORED BY SGS BANGLADESH LIMITED

Fouzia Nusrat
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Asian Development Bank (ADB),
Plot E-31, Sher-e-Bangla Nagar, Dhaka 1207, Bangladesh.

DESCRIPTION	: Ambient Noise Level Monitoring
Project Name	: Network Infrastructure Development and Modernization of Power Distribution System in Northwest Area
Project Location	: Workshop Area, Shalbagan, Rajshahi
GPS Co-Ordinate	: 24°23'1.59"N, 88°36'34.44"E
INSPECTION DATE	: 25 June 2024.
REPORT ISSUE DATE	: 18 July 2024

Sign for and on behalf of

Md. Masroor Abedin
Manager-I&E (Environment)

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Description of Analysis:

Sl No.	ID and Name of the Monitoring Location	Location Type	Measured Noise Level (dB A)		BD Sound Pollution (Control) Rules-2006	IFC Standard-2007
1.	Ambient Noise Level (ANL-01), (Workshop Area, Shalbagan, Rajshahi, 24°23'1.59"N, 88°36'34.44"E)	Mixed Area	Day (Leq)	60.0	60	55
			Night (Leq)	54.5	50	45
			L-Max	64.0	-	-
			L-Min	52.8	-	-

Comments: The Ambient noise level at day time has been found within the standard limit and the ambient noise level at Night time has been exceed the standard limit according to Sound Pollution (Control) Rules-2006.

Note: According Rules 2006- Day Time- 6.00 to 21.00 hrs, Night Time- 21.00 to 6.00 hrs

Sampler Details: Sound Level Meter (Model: SL-4022, ENV-EQ-37)

Monitoring Conducted By: Md. Shamim Reza and Md. Emdadul Haque

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TEST REPORT NO.: I&E (ENV)-2024070151

DATE: 18 JULY, 2024

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Job No.: SGS-I&E(ENV)/240609

INSPECTION AND MONITORED BY SGS BANGLADESH LIMITED

Fouzia Nusrat
National Environment Safeguard Specialist,
Asian Development Bank (ADB),
Plot E-31, Sher-e-Bangla Nagar, Dhaka 1207, Bangladesh.

DESCRIPTION	: Ambient Noise Level Monitoring
Project Name	: Network Infrastructure Development and Modernization of Power Distribution System in Northwest Area
Project Location	: Substation Area, Chandipur, Rajshahi.
GPS Co-Ordinate	: 24°22'11.17"N; 88°34'28.47"E
INSPECTION DATE	: 25 June 2024.
REPORT ISSUE DATE	: 18 July 2024

Sign for and on behalf of

Md. Masroor Abedin
Manager-I&E (Environment)

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Description of Analysis:

SI No.	ID and Name of the Monitoring Location	Location Type	Measured Noise Level (dB A)		BD Sound Pollution (Control) Rules-2006	IFC Standard-2007
1.	Ambient Noise Level (ANL-02), (Substation Area, Chandipur, Rajshahi, 24°22'11.17"N; 88°34'28.47"E)	Mixed Area	Day (Leq)	64.3	60	55
			Night (Leq)	62.4	50	45
			L-Max	73.4	-	-
			L-Min	59.1	-	-

Comments: The Ambient noise level has been exceed the standard limit according to Sound Pollution (Control) Rules-2006.

Note: According Rules 2006- Day Time- 6.00 to 21.00 hrs, Night Time- 21.00 to 6.00 hrs

Sampler Details: Sound Level Meter (Model: SL-4022, ENV-EQ-37)

Monitoring Conducted By: Md. Shamim Reza and Md. Emdadul Haque

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Fouzia Nusrat
National Environment Safeguard Specialist,
Asian Development Bank (ADB),
Plot E-31, Sher-e-Bangla Nagar, Dhaka 1207, Bangladesh.

DESCRIPTION	: Ambient Noise Level Monitoring
Project Name	: Network Infrastructure Development and Modernization of Power Distribution System in Northwest Area
Project Location	: Katakhal-Talaimari (Underground Line), Rajshahi.
GPS Co-Ordinate	: 24°21'54.91"N; 88°40'11.40"E
INSPECTION DATE	: 26 June 2024.
REPORT ISSUE DATE	: 18 July 2024

Sign for and on behalf of

Md. Masroor Abedin
Manager-I&E (Environment)

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Description of Analysis:

Sl No.	ID and Name of the Monitoring Location	Location Type	Measured Noise Level (dB A)		BD Sound Pollution (Control) Rules-2006	IFC Standard-2007
1.	Ambient Noise Level (ANL-03), (Katakhali-Talaimari (Underground Line), Rajshahi, 24°21'54.91"N; 88°40'11.40"E)	Mixed Area	Day (Leq)	76.6	60	55
			Night (Leq)	72.7	50	45
			L-Max	88.6	-	-
			L-Min	61.8	-	-

Comments: The Ambient noise level has been exceed the standard limit according to Sound Pollution (Control) Rules-2006.

Note: According Rules 2006- Day Time- 6.00 to 21.00 hrs, Night Time- 21.00 to 6.00 hrs

Sampler Details: Sound Level Meter (Model: SL-4022,ENV-EQ-37)

Monitoring Conducted By: Md. Shamim Reza and Md. Emdadul Haque

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INSPECTION AND MONITORED BY SGS BANGLADESH LIMITED

Fouzia Nusrat
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Plot E-31, Sher-e-Bangla Nagar, Dhaka 1207, Bangladesh.

DESCRIPTION	: Ambient Noise Level Monitoring
Project Name	: Network Infrastructure Development and Modernization of Power Distribution System in Northwest Area
Project Location	: Miapur-City Central (Alt-2 Underground Line), Rajshahi.
GPS Co-Ordinate	: 24°22'13.89"N; 88°34'0.52"E
INSPECTION DATE	: 26 June 2024.
REPORT ISSUE DATE	: 18 July 2024

Sign for and on behalf of

Md. Masroor Abedin
Manager-I&E (Environment)

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Description of Analysis:

Sl No.	ID and Name of the Monitoring Location	Location Type	Measured Noise Level (dB A)		BD Sound Pollution (Control) Rules-2006	IFC Standard-2007
1.	Ambient Noise Level (ANL-04), Miapur-City Central (Alt-2 Underground Line), Rajshahi, 24°22'13.89"N; 88°34'0.52"E)	Mixed Area	Day (Leq)	79.4	60	55
			Night (Leq)	74.1	50	45
			L-Max	88.5	-	-
			L-Min	66.1	-	-

Comments: The Ambient noise level has been exceed the standard limit according to Sound Pollution (Control) Rules-2006.

Note: According Rules 2006- Day Time- 6.00 to 21.00 hrs, Night Time- 21.00 to 6.00 hrs

Sampler Details: Sound Level Meter (Model: SL-4022,ENV-EQ-37)

Monitoring Conducted By: Md. Shamim Reza and Md. Emdadul Haque

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DATE: 18 JULY, 2024

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Job No.: SGS-I&E(ENV)/240609

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Fouzia Nusrat
National Environment Safeguard Specialist,
Asian Development Bank (ADB),
Plot E-31, Sher-e-Bangla Nagar, Dhaka 1207, Bangladesh.

DESCRIPTION	: Ambient Noise Level Monitoring
Project Name	: Network Infrastructure Development and Modernization of Power Distribution System in Northwest Area
Project Location	: Goshpara Mor, (Shadharon Bima Feeder), Rajshahi.
GPS Co-Ordinate	: 24°22'10.73"N; 88°35'22.20"E
INSPECTION DATE	: 27 June 2024.
REPORT ISSUE DATE	: 18 July 2024

Sign for and on behalf of

Md. Masroor Abedin
Manager-I&E (Environment)

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TEST REPORT NO.: I&E (ENV)-2024070157

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Description of Analysis:

SI No.	ID and Name of the Monitoring Location	Location Type	Measured Noise Level (dB A)		BD Sound Pollution (Control) Rules-2006	IFC Standard-2007
1.	Ambient Noise Level (ANL-05), Goshpara Mor, (Shadharon Bima Feeder), Rajshahi, 24°22'10.73"N; 88°35'22.20"E)	Mixed Area	Day (Leq)	80.3	60	55
			Night (Leq)	77.8	50	45
			L-Max	86.7	-	-
			L-Min	73.6	-	-

Comments: The Ambient noise level has been exceed the standard limit according to Sound Pollution (Control) Rules-2006.

Note: According Rules 2006- Day Time- 6.00 to 21.00 hrs, Night Time- 21.00 to 6.00 hrs

Sampler Details: Sound Level Meter (Model: SL-4022,ENV-EQ-37)

Monitoring Conducted By: Md. Shamim Reza and Md. Emdadul Haque

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TEST REPORT NO.: I&E (ENV)-2024070159

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INSPECTION AND MONITORED BY SGS BANGLADESH LIMITED

Fouzia Nusrat
National Environment Safeguard Specialist,
Asian Development Bank (ADB),
Plot E-31, Sher-e-Bangla Nagar, Dhaka 1207, Bangladesh.

DESCRIPTION	: Ambient Noise Level Monitoring
Project Name	: Network Infrastructure Development and Modernization of Power Distribution System in Northwest Area
Project Location	: Near New Govt. Degree College, (Medical Feeder), Rajshahi.
GPS Co-Ordinate	: 24°22'11.77"N; 88°34'58.54"E
INSPECTION DATE	: 27 June 2024.
REPORT ISSUE DATE	: 18 July 2024

Sign for and on behalf of

Md. Masroor Abedin
Manager-I&E (Environment)

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Description of Analysis:

Sl No.	ID and Name of the Monitoring Location	Location Type	Measured Noise Level (dB A)		BD Sound Pollution (Control) Rules-2006	IFC Standard-2007
1.	Ambient Noise Level (ANL-06), Near New Govt. Degree College, (Medical Feeder), Rajshahi. 24°22'11.77"N; 88°34'58.54"E)	Mixed Area	Day (Leq)	66.6	60	55
			Night (Leq)	63.2	50	45
			L-Max	75.7	-	-
			L-Min	56.0	-	-

Comments: The Ambient noise level has been exceed the standard limit according to Sound Pollution (Control) Rules-2006.

Note: According Rules 2006- Day Time- 6.00 to 21.00 hrs, Night Time- 21.00 to 6.00 hrs

Sampler Details: Sound Level Meter (Model: SL-4022,ENV-EQ-37)

Monitoring Conducted By: Md. Shamim Reza and Md. Emdadul Haque

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TEST REPORT NO.: I&E (ENV)-2024070161

DATE: 18 JULY, 2024

Page: 1 of 3

Job No.: SGS-I&E(ENV)/240609

INSPECTION AND MONITORED BY SGS BANGLADESH LIMITED

Fouzia Nusrat
National Environment Safeguard Specialist,
Asian Development Bank (ADB),
Plot E-31, Sher-e-Bangla Nagar, Dhaka 1207, Bangladesh.

DESCRIPTION	: Ambient Noise Level Monitoring
Project Name	: Network Infrastructure Development and Modernization of Power Distribution System in Northwest Area
Project Location	: Substation Area, S&D-1 Campus, Bogura.
GPS Co-Ordinate	: 24°50'55.59"N; 89°22'29.07"E
INSPECTION DATE	: 29 June 2024.
REPORT ISSUE DATE	: 18 July 2024

Sign for and on behalf of

Md. Masroor Abedin
Manager-I&E (Environment)

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Surface Water Quality:



TEST REPORT NO.:

DHK: FD: 2420000452

DATE: 09 Jul, 2024

Page: 2 of 2

Job No.: 2421000182

Test Results:

Test Parameters	Test Method	Unit	LOD	Result	Standards for drinking water E.C.R. '23 (BD) (Schedule - 2, Ka-4)
Temperature (in-situ)	Analog Thermometer	°C	--	31.2	20 - 30
pH Value (in-situ)	Electrometric Method by pH Meter	--	--	7.06	6 - 9
DO (in-situ)	Electrometric Method	mg/L	--	4.35	≥5
Biochemical Oxygen Demand, BOD	BOD Trak Instrument Manual of HACH/OxiTOP & APHA 23 rd Edition 2017 (5210 B)	mg/L	1.0	3	≤6
Chemical Oxygen Demand, COD	APHA 23 rd Edition 2017 (5220 B)	mg/L	4.0	11	50
Colour	APHA 23 rd Edition 2017 (2120 C)	Pt-Co	5.0	14.12	--
Total Suspended Solid, (TSS)	APHA 23 rd Edition 2017 (2540 D)	mg/L	1.0	2	--
Total Dissolved Solid, (TDS)	APHA 23 rd Edition 2017 (2540 C)	mg/L	1.0	102	1000
Fecal Coliform	APHA 23 rd Edition, 2017 (9221 E)	MPN/100 ml	--	110	≤5000

Note: ND = Not Detected & LOD = Lower Detection Limit



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 Laboratory of SGS Bangladesh Ltd.	TEST REPORT DHF240001037	Page 1 of 2

Analyses ordered by:	ASIAN DEVELOPMENT BANK PLOT E-31, SHER-E-BANGLA NAGAR, DHAKA, 1207 BANGLADESH	Date of sample receipt:	09.07.2024
		Date of analysis:	09.07.2024 - 26.07.2024

The following sample was collected by the SGS

Sample Description	Surface water, NESCO/Workshop (SW-Thakurgaon DPS)
Type of sample	Water
Sample Condition	Water in four plastic bottle
Sample Quantity	03 liter

Chemical tests

Parameter	Method of Analyses	Unit	RL	Test Result	Test Requirements
Colour	Visual Examination (APHA 2120 B, 23rd edn. 2017)	Pt-Co	5	27.6	-
Total Dissolved Solid (TDS)	APHA 2540 C, 23rd edn. 2017	mg/L	1	138.00	1000
Total suspended solid (TSS)	APHA 2540 D, 23rd edn. 2017	mg/L	1	10.00	-
Temperature (In-Situ)	APHA 2550 B, 23rd edn. 2017	°C	1	30.4	-
pH (In-Situ)	APHA 4500-H+ B, 23rd edn. 2017	-	-	6.50	6-9
Dissolved oxygen (DO) (In-Situ)	APHA 4500-O D, 23rd edn. 2017	mg/L	1	5.01	>=5
Biological Oxygen Demand (BOD)	APHA 5210 B, 23rd edn. 2017	mg/L	2	8.0	<=6
Chemical oxygen demand (COD)	APHA 5220 B & D, 23rd edn. 2017	mg/L	4	32.0	50

Microbiology tests

Parameter	Method of Analyses	Unit	RL	Test Result	Test Requirements
Fecal Coliform	APHA 9221E_23rd Edition 2017	MPN/100 ml	1.8	140.00	<=5000

Note:

RL = Reporting Limit

< = Less than

Less than reporting limit = Not detected

Remarks: Requirements have been followed as per BD ECR'23 Inland Surface water standard (schedule 2, Ka(1)-4).

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 Laboratory of SGS Bangladesh Ltd.	TEST REPORT DHF240001037	Page 2 of 2

Signed for and on behalf of:
SGS BANGLADESH LIMITED



Rafiqul Islam
Chemical Lab Manager



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Analyses ordered by:	ASIAN DEVELOPMENT BANK PLOT E-31, SHER-E-BANGLA NAGAR, DHAKA, 1207 BANGLADESH	Date of sample receipt:	09.07.2024
		Date of analysis:	09.07.2024 - 26.07.2024

The following sample was collected by the SGS

Sample Description	Surface water, NESCO Workshop (SW-New Substation Area, Pabna)
Type of sample	Water
Sample Condition	Water in four plastic bottle
Sample Quantity	03 liter

Chemical tests

Parameter	Method of Analyses	Unit	RL	Test Result	Test Requirements
Colour	Visual Examination (APHA 2120 B, 23rd edn. 2017)	Pt-Co	5	<5	-
Total Dissolved Solid (TDS)	APHA 2540 C, 23rd edn. 2017	mg/L	1	330.00	1000
Total suspended solid (TSS)	APHA 2540 D, 23rd edn. 2017	mg/L	1	10.00	-
Temperature (In-Situ)	APHA 2550 B, 23rd edn. 2017	°C	1	36.2	-
pH (In-Situ)	APHA 4500-H+ B, 23rd edn. 2017	-	-	7.24	6-9
Dissolved oxygen (DO) (In-Situ)	APHA 4500-O D, 23rd edn. 2017	mg/L	1	5.20	>=5
Biological Oxygen Demand (BOD)	APHA 5210 B, 23rd edn. 2017	mg/L	2	6.0	<=6
Chemical oxygen demand (COD)	APHA 5220 B & D, 23rd edn. 2017	mg/L	4	28.0	50

Microbiology tests

Parameter	Method of Analyses	Unit	RL	Test Result	Test Requirements
Fecal Coliform	APHA 9221E_23rd Edition 2017	MPN/100 ml	1.8	49.00	<=5000

Note:

RL = Reporting Limit

< = Less than

Less than reporting limit = Not detected

Remarks: Requirements have been followed as per BD ECR23 Inlet surface water standard (schedule 2, Ka (1) -4.)

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 Laboratory of SGS Bangladesh Ltd.	TEST REPORT DHF240001031	Page 2 of 2

Signed for and on behalf of:
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Rafiqul Islam
Chemical Lab Manager



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Groundwater Quality:



TEST REPORT NO.:

DHK: FD: 2420000449

DATE: 09 Jul, 2024

Page: 1 of 3

Job No.: 2421000160

SAMPLE DRAWN AND TESTED BY SGS BANGLADESH LTD.

Network Infrastructure Development and Modernization of Power Distribution System in Northwest Area.
Fouzia Nusrat,
International Environment Safeguard Specialist (Asian Development Bank).

THE FOLLOWING SAMPLE WAS COLLECTED BY THE SGS:

SAMPLE DESCRIPTION	:	GROUND WATER – NESCO/WORKSHOP (GW-ZRS, NESCO CAMPUS, BOGURA)
PRODUCT TYPE	:	GROUND WATER
SAMPLE CONDITION	:	WATER IN THREE PLASTIC BOTTLES
RECEIVED SAMPLE QUANTITY	:	2.5 LITRE
SAMPLE COLLECTION DATE	:	29 JUN, 2024
TEST START DATE	:	01 JUL, 2024
TEST COMPLETION DATE	:	09 JUL, 2024

Sign for and on behalf of
SGS Bangladesh Ltd

RAFIQUL ISLAM
Chemical Lab Manager

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Test Results:

Test Parameters	Test Method	Unit	LOD	Result	Standards for drinking water E.C.R. '23 (BD) (Schedule - 2, Kha)
Temperature (in-situ)	Analog Thermometer	°C	--	31.5	20 - 30
pH Value (in-situ)	Electrometric Method by pH Meter	--	--	7.12	6.5 - 8.5
DO (in-situ)	Electrometric Method	mg/L	--	4.25	--
Depth of Pump (in-situ)	--	ft	--	65	--
Chloride	APHA 23 rd Edition 2017 (4500-Cl B&D)	mg/L	0.5	13	250
Colour	APHA 23 rd Edition 2017 (2120 C)	Pt-Co	5.0	<5	15
Nitrate (NO ₃)	APHA 23 rd Edition 2017 (4500-NO ₃ B)	mg/L	0.05	0.45	45
Nitrite (NO ₂)	APHA 23 rd Edition 2017 (4500-NO ₂ B)	mg/L	0.02	ND	1.0
Oil & Grease	APHA 23 rd Edition 2017 (5520-B)	mg/L	1.0	ND	--
Sulfate	APHA 23 rd Edition 2017, (4500-SO ₄ , E)	mg/L	5.0	5.85	250
Total Dissolved Solid, (TDS)	APHA 23 rd Edition 2017 (2540 C)	mg/L	1.0	214	1000
Total Suspended Solid, (TSS)	APHA 23 rd Edition 2017 (2540 D)	mg/L	1.0	ND	10
Arsenic (as As)	APHA 23 rd Edition (2017) by ICP-OES/MS	ppm	0.01	ND	0.05
Calcium (as Ca)	APHA 23 rd Edition (2017) by ICP-OES/MS	ppm	0.05	2.28	75
Iron (as Fe)	APHA 23 rd Edition (2017) by ICP-OES/MS	ppm	0.05	ND	0.3 - 1.0
Potassium (as K)	APHA 23 rd Edition (2017) by ICP-OES/MS	ppm	0.05	1.14	12
Sodium (as Na)	APHA 23 rd Edition (2017) by ICP-OES/MS	ppm	0.05	12.01	200
Fecal Coliform	APHA 23 rd Edition, 2017 (9221 E)	MPN/100 ml	--	23	0

Note: ND = Not Detected & LOD = Lower Detection Limit.

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Test Report



TC-7047

SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001308.002
ULR No : TC704724100002038F
Report Control No : KER0000223140

Issue Date : 26/07/2024
JOE No : KE24-001308

Customer Provided Information

Sample Described by Customer as : GROUND WATER
Customer Name : ASIAN DEVELOPMENT BANK
Customer Address : PLOT E-31, SHER E BANGLA NAGAR
Postal Code : 1207
State :
Country : BANGLADESH
Sampling Location : GW, ZRS NESCO Campus, Bogura
Sample Qty. Recd. : 1LTR APPROX.
Sample Description : GROUND WATER
Sampling Date : June 29, 2024 12:10pm
Marks on Sample : GPS 24°50'25.99"N; 89°21'16.48"E

Lab Provided Information

Sample Type : GROUND WATER
Received : 18/07/2024
Test Start/End Date : 18/07/2024 / 25/07/2024

NABL Accredited Tests

Analysis	Method	Result	Unit
NABL Group : Water		Ground Water	
DISCIPLINE: CHEMICAL			
2-Chlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,3-Dichlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,4,5-Trichlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,2',4,4'-Tetrachlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,2',3',4',6'-Pentachlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,2',4,4',5,6'-Hexachlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,2',3,3',4,4',6'-Heptachlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
Polychlorinated biphenyls (PCB)	SO-IN-MUL-TE-022	<0.05	µg/L

Per pro SGS India Private Ltd


SATYA CHARAN MANNA

Authorized Signatory

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Test Report



TC-7047

SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001308.002

Issue Date : 26/07/2024

ULR No : TC704724100002038F

JOE No : KE24-001308

Report Control No : KER0000223140

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TEST REPORT NO.: DHK: FD: 2420000458 DATE: 12 Jul, 2024 Page: 1 of 3
Joe No.: 2421000166
SAMPLE DRAWN AND TESTED BY SGS BANGLADESH LTD.

Network Infrastructure Development and Modernization of Power Distribution System in Northwest Area.
Fouzia Nusrat,
International Environment Safegurd Specialist (Asian Development Bank).

THE FOLLOWING SAMPLE WAS COLLECTED BY THE SGS:

SAMPLE DESCRIPTION	:	GROUND WATER - NESCO/SUBSTATIONS (GW - CAMPUS S&D-1, RANGPUR)
PRODUCT TYPE	:	GROUND WATER
SAMPLE CONDITION	:	WATER IN FOUR PLASTIC BOTTLES
RECEIVED SAMPLE QUANTITY	:	3.0 LITRE
SAMPLE COLLECTION DATE	:	01 JUL, 2024
TEST START DATE	:	04 JUL, 2024
TEST COMPLETION DATE	:	12 JUL, 2024

Sign for and on behalf of
SGS Bangladesh Ltd

RAFIQUL ISLAM
Chemical Lab Manager

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Test Results:

Test Parameters	Test Method	Unit	LOD	Result	Standards for drinking water E.C.R. '23 (BD) (Schedule – 2, Kha)
Temperature (in-situ)	Analog Thermometer	°C	--	30.9	20 – 30
pH Value (in-situ)	Electrometric Method by pH Meter	--	--	7.02	6.5 – 8.5
DO (in-situ)	Electrometric Method	mg/L	--	4.52	--
Depth of Pump (in-situ)	--	ft	--	70	--
Chloride	APHA 23 rd Edition 2017 (4500-Cl B& D)	mg/L	0.5	48	250
Colour	APHA 23 rd Edition 2017 (2120 C)	Pl-Co	5.0	<5	15
Nitrate (NO ₃)	APHA 23 rd Edition 2017 (4500-NO ₃ B)	mg/L	0.05	12.70	45
Nitrite (NO ₂)	APHA 23 rd Edition 2017 (4500-NO ₂ B)	mg/L	0.02	ND	1.0
Sulfate	APHA 23 rd Edition 2017, (4500-SO ₄ ²⁻ E)	mg/L	5.0	34.47	250
Total Dissolved Solid, (TDS)	APHA 23 rd Edition 2017 (2540 C)	mg/L	1.0	478	1000
Total Suspended Solid, (TSS)	APHA 23 rd Edition 2017 (2540 D)	mg/L	1.0	ND	10
Arsenic (as As)	APHA 23 rd Edition (2017) by ICP-OES/MS	ppm	0.01	ND	0.05
Calcium (as Ca)	APHA 23 rd Edition (2017) by ICP-OES/MS	ppm	0.05	20.72	75
Iron (as Fe)	APHA 23 rd Edition (2017) by ICP-OES/MS	ppm	0.05	ND	0.3 - 1.0
Potassium (as K)	APHA 23 rd Edition (2017) by ICP-OES/MS	ppm	0.05	11.41	12
Sodium (as Na)	APHA 23 rd Edition (2017) by ICP-OES/MS	ppm	0.05	36.40	200
Fecal Coliform	APHA 23 rd Edition, 2017 (9221 E)	MPN/100 ml	--	<1.8	0

Note: 1) ND = Not Detected & LOD = Lower Detection Limit.

2) If no evidence of Fecal Coliform observed in the tested sample, as per 5 tube MPN table result expressed as <1.8 MPN/100ml.

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TEST REPORT NO.: DHK: FD: 2420000459 DATE: 12 Jul, 2024 Page: 1 of 3
Joe No.: 2421000167
SAMPLE DRAWN AND TESTED BY SGS BANGLADESH LTD.

Network Infrastructure Development and Modernization of Power Distribution System in Northwest Area.
Fouzia Nusrat,
International Environment Safegurd Specialist (Asian Development Bank).

THE FOLLOWING SAMPLE WAS COLLECTED BY THE SGS:

SAMPLE DESCRIPTION	: GROUND WATER - NESCO/WORKSHOP (GW - LALBAG, RANGPUR)
PRODUCT TYPE	: GROUND WATER
SAMPLE CONDITION	: WATER IN THREE PLASTIC BOTTLES
RECEIVED SAMPLE QUANTITY	: 2.5 LITRE
SAMPLE COLLECTION DATE	: 01 JUL, 2024
TEST START DATE	: 04 JUL, 2024
TEST COMPLETION DATE	: 12 JUL, 2024

Sign for and on behalf of
SGS Bangladesh Ltd

RAFIQUL ISLAM
Chemical Lab Manager

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Test Results:

Test Parameters	Test Method	Unit	LOD	Result	Standards for drinking water E.C.R. '23 (BD) (Schedule – 2, Kha)
Temperature (in-situ)	Analog Thermometer	°C	--	29.8	20 – 30
pH Value (in-situ)	Electrometric Method by pH Meter	--	--	6.73	6.5 – 8.5
DO (in-situ)	Electrometric Method	mg/L	--	4.89	--
Depth of Pump (in-situ)	--	ft	--	60	--
Chloride	APHA 23 rd Edition 2017 (4500-Cl B& D)	mg/L	0.5	10	250
Colour	APHA 23 rd Edition 2017 (2120 C)	Pt-Co	5.0	8.51	15
Nitrate (NO ₃)	APHA 23 rd Edition 2017 (4500-NO ₃ B)	mg/L	0.05	ND	45
Nitrite (NO ₂)	APHA 23 rd Edition 2017 (4500-NO ₂ B)	mg/L	0.02	ND	1.0
Sulfate	APHA 23 rd Edition 2017, (4500-SO ₄ ²⁻ E)	mg/L	5.0	ND	250
Total Dissolved Solid, (TDS)	APHA 23 rd Edition 2017 (2540 C)	mg/L	1.0	144	1000
Total Suspended Solid, (TSS)	APHA 23 rd Edition 2017 (2540 D)	mg/L	1.0	12	10
Oil & Grease	APHA 23 rd Edition 2017 (5520-B)	mg/L	1.0	ND	--
Arsenic (as As)	APHA 23 rd Edition (2017) by ICP-OES/MS	ppm	0.01	ND	0.05
Calcium (as Ca)	APHA 23 rd Edition (2017) by ICP-OES/MS	ppm	0.05	18.85	75
Iron (as Fe)	APHA 23 rd Edition (2017) by ICP-OES/MS	ppm	0.05	2.82	0.3 – 1.0
Potassium (as K)	APHA 23 rd Edition (2017) by ICP-OES/MS	ppm	0.05	4.28	12
Sodium (as Na)	APHA 23 rd Edition (2017) by ICP-OES/MS	ppm	0.05	18.51	200
Fecal Coliform	APHA 23 rd Edition, 2017 (9221 E)	MPN/100 ml	--	<1.8	0

Note: 1) ND = Not Detected & LOD = Lower Detection Limit.

2) If no evidence of Fecal Coliform observed in the tested sample, as per 5 tube MPN table result expressed as <1.8 MPN/100ml.

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Test Report



TC-7047

SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001308.003
ULR No : TC704724100002039F
Report Control No : KER0000223140

Issue Date : 26/07/2024
JOE No : KE24-001308

Customer Provided Information

Sample Described by Customer as : GROUND WATER
Customer Name : ASIAN DEVELOPMENT BANK
Customer Address : PLOT E-31, SHER E BANGLA NAGAR
Postal Code : 1207
State :
Country : BANGLADESH
Sampling Location : GW, Lalbagh Workshop Area, Rangpur
Sample Qty. Recd. : 1LTR APPROX.
Sample Description : GROUND WATER
Sampling Date : July 01, 2024 11:30AM
Marks on Sample : GPS 25°43'45.31"N; 89°15'7.66"E

Lab Provided Information

Sample Type : GROUND WATER
Received : 18/07/2024
Test Start/End Date : 18/07/2024 / 25/07/2024

NABL Accredited Tests

Analysis	Method	Result	Unit
NABL Group : Water		Ground Water	
DISCIPLINE: CHEMICAL			
2-Chlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,3-Dichlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,4,5-Trichlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,2',4,4'-Tetrachlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,2',3',4',6'-Pentachlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,2',4,4',5,6'-Hexachlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,2',3,3',4,4',6'-Heptachlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
Polychlorinated biphenyls (PCB)	SO-IN-MUL-TE-022	<0.05	µg/L

Per pro SGS India Private Ltd


SATYA CHARAN MANNA

Authorized Signatory

Page 1 of 2

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SGS India Pvt. Ltd.

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Test Report



TC-7047

SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001308.003

Issue Date : 26/07/2024

ULR No : TC704724100002039F

JOE No : KE24-001308

Report Control No : KER0000223140

****End of Report****

Page 2 of 2

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TEST REPORT NO.:

DHK: FD: 2420000457

DATE: 12 Jul, 2024

Page: 1 of 3

Job No.: 2421000165

SAMPLE DRAWN AND TESTED BY SGS BANGLADESH LTD.

Network Infrastructure Development and Modernization of Power Distribution System in Northwest Area.
Fouzia Nusrat,
International Environment Safegurd Specialist (Asian Development Bank).

THE FOLLOWING SAMPLE WAS COLLECTED BY THE SGS:

SAMPLE DESCRIPTION	:	GROUND WATER - NESCO/SUBSTATIONS (GW-BAHARKASNA, RANGPUR)
PRODUCT TYPE	:	GROUND WATER
SAMPLE CONDITION	:	WATER IN THREE PLASTIC BOTTLES
RECEIVED SAMPLE QUANTITY	:	2.5 LITRE
SAMPLE COLLECTION DATE	:	01 JUL, 2024
TEST START DATE	:	04 JUL, 2024
TEST COMPLETION DATE	:	12 JUL, 2024

Sign for and on behalf of
SGS Bangladesh Ltd

RAFIQUL ISLAM
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TEST REPORT NO.:

DHK: FD: 2420000457

DATE: 12 Jul, 2024

Page: 2 of 3

Job No.: 2421000165

Test Results:

Test Parameters	Test Method	Unit	LOD	Result	Standards for drinking water E.C.R. '23 (BD) (Schedule – 2, Kha)
Temperature (in-situ)	Analog Thermometer	°C	--	29.7	20 – 30
pH Value (in-situ)	Electrometric Method by pH Meter	--	--	6.92	6.5 – 8.5
DO (in-situ)	Electrometric Method	mg/L	--	5.10	--
Depth of Pump (in-situ)	--	ft	--	72	--
Chloride	APHA 23 rd Edition 2017 (4500-Cl B& D)	mg/L	0.5	26	250
Colour	APHA 23 rd Edition 2017 (2120 C)	Pl-Co	5.0	<5	15
Nitrate (NO ₃)	APHA 23 rd Edition 2017 (4500-NO ₃ B)	mg/L	0.05	0.86	45
Nitrite (NO ₂)	APHA 23 rd Edition 2017 (4500-NO ₂ B)	mg/L	0.02	ND	1.0
Sulfate	APHA 23 rd Edition 2017, (4500-SO ₄ ²⁻ E)	mg/L	5.0	6.48	250
Total Dissolved Solid, (TDS)	APHA 23 rd Edition 2017 (2540 C)	mg/L	1.0	202	1000
Total Suspended Solid, (TSS)	APHA 23 rd Edition 2017 (2540 D)	mg/L	1.0	ND	10
Arsenic (as As)	APHA 23 rd Edition (2017) by ICP-OES/MS	ppm	0.01	ND	0.05
Calcium (as Ca)	APHA 23 rd Edition (2017) by ICP-OES/MS	ppm	0.05	2.70	75
Iron (as Fe)	APHA 23 rd Edition (2017) by ICP-OES/MS	ppm	0.05	ND	0.3 - 1.0
Potassium (as K)	APHA 23 rd Edition (2017) by ICP-OES/MS	ppm	0.05	1.63	12
Sodium (as Na)	APHA 23 rd Edition (2017) by ICP-OES/MS	ppm	0.05	13.67	200
Fecal Coliform	APHA 23 rd Edition, 2017 (9221 E)	MPN/100 ml	--	4.5	0

Note: ND = Not Detected & LOD = Lower Detection Limit.

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 Laboratory of SGS Bangladesh Ltd.	TEST REPORT DHF240001033	Page 1 of 3

Analyses ordered by:	ASIAN DEVELOPMENT BANK PLOT E-31, SHER-E-BANGLA NAGAR DHAKA, 1207 BANGLADESH	Date of sample receipt:	09.07.2024
		Date of analysis:	09.07.2024 - 26.07.2024

The following sample was collected by the SGS

Sample Description	Ground water, NESCO/Substations (GW-S&D-1 Campus, Dinajpur)
Type of sample	Water
Sample Condition	Water in three plastic bottle
Sample Quantity	2.5 liter

Chemical tests

Parameter	Method of Analyses	Unit	RL	Test Result	Test Requirements
Arsenic (As)	APHA 3030 & 3120, 23rd edn., 2017	mg/L	0.01	0.00	0.05
Calcium (Ca)	APHA 3030 & 3120, 23rd edn., 2017	mg/L	0.05	6.77	75
Iron (Fe)	APHA 3030 & 3120, 23rd edn., 2017	mg/L	0.05	0.00	0.3-1.0
Potassium (K)	APHA 3030 & 3120, 23rd edn., 2017	mg/L	0.05	1.79	12
Sodium (Na)	APHA 3030 & 3120, 23rd edn., 2017	mg/L	0.05	8.93	200
Colour	Visual Examination (APHA 2120 B, 23rd edn., 2017)	Pt-Co	5	7.17	15
Total Dissolved Solid (TDS)	APHA 2540 C, 23rd edn., 2017	mg/L	1	140.00	1000
Total suspended solid (TSS)	APHA 2540 D, 23rd edn., 2017	mg/L	1	< 1.00	10
Temperature (In-Situ)	APHA 2550 B, 23rd edn., 2017	°C	1	30.9	-
Chloride	APHA 4500-Cl- B & D, 23rd edn., 2017	mg/L	0.5	12.00	250
pH (In-Situ)	APHA 4500-H+ B, 23rd edn., 2017	-	-	6.78	6.5-8.5
Nitrite	APHA 4500-NO2 B, 23rd edn., 2017	mg/L	0.02	< 0.02	1.0
Nitrate	APHA 4500-NO3 B, 23rd edn., 2017	mg/L	0.05	2.96	45
Dissolved oxygen (DO) (In-Situ)	APHA 4500-O C, 23rd edn., 2017	mg/L	1	4.78	-
Sulfate	APHA 4500-SO4 2- E, 23rd edn., 2017	mg/L	5	33.14	250

Microbiology tests

Folder Number : DHF24-0000373

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 Laboratory of SGS Bangladesh Ltd.	TEST REPORT DHF240001033	Page 2 of 3

Parameter	Method of Analyses	Unit	RL	Test Result	Test Requirements
Fecal Coliform	APHA 9221E_23rd Edition 2017	MPN/100 mL	1.8	<1.80	0

Note:

RL = Reporting Limit

< = Less than

Less than reporting limit = Not detected

Remarks: (1) If no evidence of Fecal Coliform observed in the tested sample, as per 5 tube MPN table result expressed as <1.8 MPN/100 mL. Requirements have been followed as per BD ECR23 standard (schedule 2, Kha)

Depth of Pump (In-Situ) : 50 Feet

Signed for and on behalf of:

SGS BANGLADESH LIMITED



Rafiqul Islam

Chemical Lab Manager

Folder Number : DHF24-0000373

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 Laboratory of SGS Bangladesh Ltd.	TEST REPORT DHF240001035	Page 1 of 3

Analyses ordered by:	ASIAN DEVELOPMENT BANK PLOT E-31, SHER-E-BANGLA NAGAR DHAKA, 1207 BANGLADESH	Date of sample receipt:	09.07.2024
		Date of analysis:	09.07.2024 - 26.07.2024

The following sample was collected by the SGS

Sample Description	Ground water, NESCO/Workshop (GW-S&D-2, Dinaipur)
Type of sample	Water
Sample Condition	Water in three plastic bottle
Sample Quantity	2.5 liter

Chemical tests

Parameter	Method of Analyses	Unit	RL	Test Result	Test Requirements
Arsenic (As)	APHA 3030 & 3120, 23rd edn. 2017	mg/L	0.01	0.00	0.05
Calcium (Ca)	APHA 3030 & 3120, 23rd edn. 2017	mg/L	0.05	1.93	75
Iron (Fe)	APHA 3030 & 3120, 23rd edn. 2017	mg/L	0.05	0.00	0.3-1.0
Potassium (K)	APHA 3030 & 3120, 23rd edn. 2017	mg/L	0.05	9.56	12
Sodium (Na)	APHA 3030 & 3120, 23rd edn. 2017	mg/L	0.05	19.66	200
Oil & Grease	APHA 5520 B, 23rd edn. 2017	mg/L	1	< 1.0	-
Colour	Visual Examination (APHA 2120 B, 23rd edn. 2017)	Pl Co	5	< 5	15
Total Dissolved Solid (TDS)	APHA 2540 C, 23rd edn. 2017	mg/L	1	348.00	1000
Total suspended solid (TSS)	APHA 2540 D, 23rd edn. 2017	mg/L	1	< 1.00	10
Temperature (In-Situ)	APHA 2550 B, 23rd edn. 2017	°C	1	32.5	-
Chloride	APHA 4500 Cl B & D, 23rd edn. 2017	mg/L	0.5	33.99	250
pH (In-Situ)	APHA 4500-H+ B, 23rd edn. 2017	-	-	6.35	6.5-8.5
Nitrite	APHA 4500-NO2 B, 23rd edn. 2017	mg/L	0.02	< 0.02	1.0
Nitrate	APHA 4500-NO3 B, 23rd edn. 2017	mg/L	0.05	< 0.05	45
Dissolved oxygen (DO) (In-Situ)	APHA 4500 O G, 23rd edn. 2017	mg/L	1	5.01	-
Sulfate	APHA 4500-SO4 2- F, 23rd edn. 2017	mg/L	5	32.98	250

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 Laboratory of SGS Bangladesh Ltd.	TEST REPORT DHF240001035	Page 2 of 3

Microbiology tests

Parameter	Method of Analyses	Unit	RL	Test Result	Test Requirements
Fecal Coliform	APHA 9221E_23rd Edition 2017	MPN/100 mL	1.8	<1.80	0

Note:

RL = Reporting Limit

< = Less than

Less than reporting limit = Not detected

Remarks: (1) If no evidence of Fecal Coliform observed in the tested sample, as per 5 tube MPN table result expressed as <1.8 MPN/100 mL. Requirements have been followed as per BD ECR'23 standard (schedule 2, Kha).

Depth of Pump (In-Situ) : 65 Feet

Signed for and on behalf of:

SGS BANGLADESH LIMITED



Rafiqul Islam

Chemical Lab Manager

Folder Number : DHF24-0000375

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Test Report



TC-7047

SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001308.004
ULR No : TC704724100002040F
Report Control No : KER0000223140

Issue Date : 26/07/2024
JOE No : KE24-001308

Customer Provided Information

Sample Described by Customer as : GROUND WATER
Customer Name : ASIAN DEVELOPMENT BANK
Customer Address : PLOT E-31, SHER E BANGLA NAGAR
Postal Code : 1207
State :
Country : BANGLADESH
Sampling Location : GW, S&D-2, Workshop Area, Dinapur
Sample Qty. Recd. : 1LTR APPROX.
Sample Description : GROUND WATER
Sampling Date : July 04, 2024 1:20pm
Marks on Sample : GPS 25°37'26.52"N; 88°38'19.34"E

Lab Provided Information

Sample Type : GROUND WATER
Received : 18/07/2024
Test Start/End Date : 18/07/2024 / 25/07/2024

NABL Accredited Tests

Analysis	Method	Result	Unit
NABL Group : Water		Ground Water	
DISCIPLINE: CHEMICAL			
2-Chlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,3-Dichlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,4,5-Trichlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,2',4,4'-Tetrachlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,2',3',4',6'-Pentachlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,2',4,4',5,6'-Hexachlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,2',3',3',4,4',6'-Heptachlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
Polychlorinated biphenyls (PCB)	SO-IN-MUL-TE-022	<0.05	µg/L

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Test Report



TC-7047

SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001308.004

Issue Date : 26/07/2024

ULR No : TC704724100002040F

JOE No : KE24-001308

Report Control No : KER0000223140

****End of Report****

Page 2 of 2

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 Laboratory of SGS Bangladesh Ltd.	TEST REPORT DHF240001034	Page 1 of 3

Analyses ordered by:	ASIAN DEVELOPMENT BANK PLOT E-31, SHER-E-BANGLA NAGAR DHAKA, 1207 BANGLADESH	Date of sample receipt: 09.07.2024 Date of analysis: 09.07.2024 - 26.07.2024	

The following sample was collected by the SGS

Sample Description Type of sample Sample Condition Sample Quantity	Ground water, NESCO/Substations (GW-Thakuragaon DPS, Thakuragaon) Water Water in three plastic bottle 2.5 liter

Chemical tests

Parameter	Method of Analyses	Unit	RL	Test Result	Test Requirements
Arsenic (As)	APHA 3030 & 3120, 23rd edn. 2017	mg/L	0.01	0.00	0.05
Calcium (Ca)	APHA 3030 & 3120, 23rd edn. 2017	mg/L	0.05	24.25	75
Iron (Fe)	APHA 3030 & 3120, 23rd edn. 2017	mg/L	0.05	13.36	0.3-1.0
Potassium (K)	APHA 3030 & 3120, 23rd edn. 2017	mg/L	0.05	27.55	12
Sodium (Na)	APHA 3030 & 3120, 23rd edn. 2017	mg/L	0.05	18.33	200
Colour	Visual Examination (APHA 2120 B, 23rd edn. 2017)	Pt-Co	5	<5	15
Total Dissolved Solid (TDS)	APHA 2540 C, 23rd edn. 2017	mg/L	1	274.00	1000
Total suspended solid (TSS)	APHA 2540 D, 23rd edn. 2017	mg/L	1	16.00	10
Temperature (In-Situ)	APHA 2550 B, 23rd edn. 2017	°C	1	28.7	-
Chloride	APHA 4500-Cl- B & D, 23rd edn. 2017	mg/L	0.5	37.99	250
pH (In-Situ)	APHA 4500-H+ B, 23rd edn. 2017	-	-	6.72	6.5-8.5
Nitrite	APHA 4500-NO2 B, 23rd edn. 2017	mg/L	0.02	<0.02	1.0
Nitrate	APHA 4500-NO3 B, 23rd edn. 2017	mg/L	0.05	<0.05	45
Dissolved oxygen (DO) (In-Situ)	APHA 4500-O G, 23rd edn. 2017	mg/L	1	4.61	-
Sulfate	APHA 4500-SO4 2- E, 23rd edn. 2017	mg/L	5	20.93	250

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 Laboratory of SGS Bangladesh Ltd.	TEST REPORT DHF240001034	Page 2 of 3

Microbiology tests

Parameter	Method of Analyses	Unit	RL	Test Result	Test Requirements
Fecal Coliform	APHA 9221E_23rd Edition 2017	MPN/100 mL	1.8	<1.80	0

Note:

RL = Reporting Limit

< = Less than

Less than reporting limit = Not detected

Remarks: (1) If no evidence of Fecal Coliform observed in the tested sample, as per 5 tube MPN table result expressed as <1.8 MPN/100 mL. Requirements have been followed as per BD ECR'23 standard (schedule 2, Kha)

Depth of Pump (In-Situ) : 47 Feet

Signed for and on behalf of:

SGS BANGLADESH LIMITED



Rafiqul Islam

Chemical Lab Manager

Folder Number : DHF24-0000374

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Analyses ordered by:	ASIAN DEVELOPMENT BANK PLOT E-31, SHER-E-BANGLA NAGAR DHAKA, 1207 BANGLADESH	Date of sample receipt:	09.07.2024 Date of analysis:	09.07.2024 - 26.07.2024

The following sample was collected by the SGS

Sample Description Type of sample Sample Condition Sample Quantity	Ground water, NESCO/Workshop (GW-New Workshop Area, Pabna) Water Water in three plastic bottle 2.5 liter

Chemical tests

Parameter	Method of Analyses	Unit	RL	Test Result	Test Requirements
Arsenic (As)	APHA 3030 & 3120, 23rd edn. 2017	mg/L	0.01	0.00	0.05
Calcium (Ca)	APHA 3030 & 3120, 23rd edn. 2017	mg/L	0.05	0.15	75
Iron (Fe)	APHA 3030 & 3120, 23rd edn. 2017	mg/L	0.05	0.00	0.3-1.0
Potassium (K)	APHA 3030 & 3120, 23rd edn. 2017	mg/L	0.05	1.19	12
Sodium (Na)	APHA 3030 & 3120, 23rd edn. 2017	mg/L	0.05	24.25	200
Oil & Grease	APHA 5520 B, 23rd edn. 2017	mg/L	1	< 1.0	-
Colour	Visual Examination (APHA 2120 B, 23rd edn. 2017)	Pt-Co	5	< 5	15
Total Dissolved Solid (TDS)	APHA 2540 C, 23rd edn. 2017	mg/L	1	572.00	1000
Total suspended solid (TSS)	APHA 2540 D, 23rd edn. 2017	mg/L	1	< 1.00	10
Temperature (In-Situ)	APHA 2550 B, 23rd edn. 2017	°C	1	32.2	-
Chloride	APHA 4500 Cl B & D, 23rd edn. 2017	mg/L	0.5	8.00	250
pH (In-Situ)	APHA 4500-H+ B, 23rd edn. 2017	-	-	6.94	6.5-8.5
Nitrite	APHA 4500-NO2 B, 23rd edn. 2017	mg/L	0.02	< 0.02	1.0
Nitrate	APHA 4500-NO3 B, 23rd edn. 2017	mg/L	0.05	< 0.05	45
Dissolved oxygen (DO) (In-Situ)	APHA 4500 O G, 23rd edn. 2017	mg/L	1	4.78	-
Sulfate	APHA 4500-SO4 2- F, 23rd edn. 2017	mg/L	5	< 5.00	250

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 Laboratory of SGS Bangladesh Ltd.	TEST REPORT DHF240001036	Page 2 of 3

Microbiology tests

Parameter	Method of Analyses	Unit	RL	Test Result	Test Requirements
Fecal Coliform	APHA 9221E, 23rd Edition 2017	MPN/100 mL	1.8	<1.80	0

Note:

RL = Reporting Limit

< = Less than

Less than reporting limit = Not detected

Remarks: (1) If no evidence of Fecal Coliform observed in the tested sample, as per 5 tube MPN table result expressed as <1.8 MPN/100 mL. Requirements have been followed as per BD ECR'23 standard (schedule 2, Kha).

Depth of Pump (In-Situ) : 162 Feet.

Signed for and on behalf of:

SGS BANGLADESH LIMITED



Rafiqul Islam
Chemical Lab Manager

Folder Number : DHF24-0000376

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Test Report



TC-7047

SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001308.005
ULR No : TC704724100002041F
Report Control No : KER0000223140

Issue Date : 26/07/2024
JOE No : KE24-001308

Customer Provided Information

Sample Described by Customer as : GROUND WATER
Customer Name : ASIAN DEVELOPMENT BANK
Customer Address : PLOT E-31, SHER E BANGLA NAGAR
Postal Code : 1207
State :
Country : BANGLADESH
Sampling Location : GW, New Workshop Area, Pabna
Sample Qty. Recd. : 1LTR APPROX.
Sample Description : GROUND WATER
Sampling Date : July 07, 2024 6:30pm
Marks on Sample : GPS: 24°1'18.50"N; 89°14'53.1"E

Lab Provided Information

Sample Type : GROUND WATER
Received : 18/07/2024
Test Start/End Date : 18/07/2024 / 25/07/2024

NABL Accredited Tests

Analysis	Method	Result	Unit
NABL Group : Water		Ground Water	
DISCIPLINE: CHEMICAL			
2-Chlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,3-Dichlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,4,5-Trichlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,2',4,4'-Tetrachlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,2',3',4',6'-Pentachlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,2',4,4',5,6'-Hexachlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,2',3',3',4,4',6'-Heptachlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	SO-IN-MUL-TE-022	<0.05	µg/L
Polychlorinated biphenyls (PCB)	SO-IN-MUL-TE-022	<0.05	µg/L

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Test Report



TC-7047

SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001308.005

Issue Date : 26/07/2024

ULR No : TC704724100002041F

JOE No : KE24-001308

Report Control No : KER0000223140

****End of Report****

Page 2 of 2

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Member of the SGS Group (SGS SA)

Soil Quality:

	Test Report		
TC-7047			
SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.			
Report No	: KE24-001309.001-A	Issue Date	: 31/07/2024
ULR No	: TC704724100002192F	JOE No	: KE24-001309
Report Control No	: KER0000223514		
Customer Provided Information			
Sample Described by Customer as : SOIL			
Customer Name	: ASIAN DEVELOPMENT BANK		
Customer Address	: PLOT E-31, SHIER E BANGLA NAGAR		
Postal Code	: 1207		
State	:		
Country	: BANGLADESH		
Sample Description	: SOIL		
Sampling Date	: JULY 07, 2024 10:20AM		
Sampling Location	: Shelbagan Workshop Area, Rajshahi		
Marks on Sample	: GPS: 24°23'15"N; 88°36'34.44"E		
Sample Qty. Recd.	: 500G APPROX		
Lab Provided Information			
Sample Type	: SOIL		
Received	: 18/07/2024		
Test Start/End Date	: 18/07/2024 - 31/07/2024		
NABL Accredited Tests			
Analysis	Method	Result	Unit
NABL Group : Pollution & Environment	Soil/Sediments		
% Sand	FAO U.N 2005	58.4	%
DISCIPLINE: CHEMICAL			
pH(1:2.5)	IS 2720 (Part 26) : 1987	8.44	—
Total Organic Carbon	IS 2720 (Part 22) : 1972	0.42	%
Chromium (as Cr)	USEPA 3050B/3052	29.35	mg/kg
Lead (as Pb)	USEPA 3050B/3052	14.01	mg/kg
Cadmium (as Cd)	USEPA 3050B/3052	8.90	mg/kg
Arsenic (as As)	USEPA 3050B/3052	4.13	mg/kg
Mercury (as Hg)	USEPA 3050B/3052	<0.50	mg/kg
Polychlorinated biphenyls	USEPA 3540C & 8082A	<0.1	mg/kg
2-Chlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,3-Dichlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,4,5-Trichlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',4,4'-Tetrachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',3',4,6'-Pentachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',4,4',5,6'-Hexachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',3',3',4,4',6'-Heptachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',3',3',4,4',5,6'-Octachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
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Test Report



TC-7047

SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001309.001-A

Issue Date : 31/07/2024

ULR No : TC704724100002192F

JOE No : KE24-001309

Report Control No : KER0000223514

NABL Accredited Tests

Analysis	Method	Result	Unit
NABL Group : Pollution & Environment	Soil/Sediments		
Moisture content	IS 2720 (Part 02) : 1873	14.8	%

Per pro SGS India Private Ltd



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****End of Report****

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Test Report

SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001309.001-B

Issue Date : 31/07/2024

JOE No : KE24-001309

Report Control No : KER0000223514

Customer Provided Information

Sample Described by Customer as : SOIL
Customer Name : ASIAN DEVELOPMENT BANK
Customer Address : PLOT E-31, SHER E BANGLA NAGAR
Postal Code : 1207
State :
Country : BANGLADESH
Sample Description : SOIL
Sampling Date : JULY 07, 2024 10:20AM
Sampling Location : Shelbagan Workshop Area, Rajshahi
Marks on Sample : GPS: 24°23'15.8"N; 88°36'34.44"E
Sample Qty. Recd. : 500G APPROX

Lab Provided Information

Sample Type : SOIL
Received : 18/07/2024
Test Start/End Date : 18/07/2024 - 31/07/2024

Non-Accredited tests

Analysis	Method	Result	Unit
% Silt	FAO.U.N 2005	10.0	%
% Clay	FAO.U.N 2005	31.7	%
Colour	Visual Examination	Grey	
Oil & Grease(HEM)	USEPA Method 9071 B	8.0	mg/kg
Total nitrogen as N	IS 14884 - 1999	0.06	%
Phosphorus as P	ASTM D6349 - 13 (by ICP OES)	6.03	mg/kg
Potassium as K ₂ O (Potash)	ASTM D6349 - 13 (by ICP OES)	0.02	% (w/w)

Per pro SGS India Private Ltd


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Test Report



TC-7047

SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001309.002-A
ULR No : TC704724100002193F
Report Control No : KER0000223514

Issue Date : 31/07/2024
JOE No : KE24-001309

Customer Provided Information

Sample Described by Customer as : SOIL
Customer Name : ASIAN DEVELOPMENT BANK
Customer Address : PLOT E-31, SHER E BANGLA NAGAR
Postal Code : 1207
State :
Country : BANGLADESH
Sample Description : SOIL
Sampling Date : JUNE 20, 2024 11:40AM
Sampling Location : ZRS NESCO Campus, Bogura
Marks on Sample : GPS: 24°50'25.99"N; 89°21'16.48"E
Sample Qty. Recd. : 500G APPROX

Lab Provided Information

Sample Type : SOIL
Received : 18/07/2024
Test Start/End Date : 18/07/2024 - 31/07/2024

NABL Accredited Tests

Analysis	Method	Result	Unit
NABL Group : Pollution & Environment	Soil/Sediments		
% Sand	FAO U.N 2005	68.9	%
DISCIPLINE: CHEMICAL			
pH(1:2.5)	IS 2720 (Part 26) : 1987	8.25	-
Total Organic Carbon	IS 2720 (Part 22) 1972	0.46	%
Chromium (as Cr)	USEPA 3050B/3052	29.05	mg/kg
Lead (as Pb)	USEPA 3050B/3052	19.18	mg/kg
Cadmium (as Cd)	USEPA 3050B/3052	<1.00	mg/kg
Arsenic (as As)	USEPA 3050B/3052	2.23	mg/kg
Mercury (as Hg)	USEPA 3050B/3052	<0.50	mg/kg
Polychlorinated biphenyls	USEPA 3540C & 8082A	<0.1	mg/kg
2-Chlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,3-Dichlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,4,5-Trichlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',4,4'-Tetrachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',3',4,6'-Pentachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',4,4',6,6'-Hexachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',3',5',4,4',6'-Heptachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',3',3',4,5',6,6'-Octachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg

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Test Report

SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001309.002-B

Issue Date : 31/07/2024

JOE No : KE24-001309

Report Control No : KER0000223514

Customer Provided Information

Sample Described by Customer as : SOIL
Customer Name : ASIAN DEVELOPMENT BANK
Customer Address : PLOT E-31, SHER E BANGLA NAGAR
Postal Code : 1207
State :
Country : BANGLADESH
Sample Description : SOIL
Sampling Date : JUNE 20, 2024 11:40AM
Sampling Location : ZRS NESCO Campus, Bogura
Marks on Sample : GPS: 24°50'25.99"N; 89°21'16.48"E
Sample Qty. Recd. : 500G APPROX

Lab Provided Information

Sample Type : SOIL
Received : 18/07/2024
Test Start/End Date : 18/07/2024 - 31/07/2024

Non-Accredited tests

Analysis	Method	Result	Unit
% Silt	FAO.U.N 2005	9.8	%
% Clay	FAO.U.N 2005	31.3	%
Colour	Visual Examination	Grey	
Oil & Grease(HEM)	USEPA Method 9071 B	7.5	mg/kg
Total nitrogen as N	IS 14884 - 1999	0.06	%
Phosphorus as P	ASTM D6349 - 13 (by ICP OES)	5.30	mg/kg
Potassium as K ₂ O (Potash)	ASTM D6349 - 13 (by ICP OES)	<0.01	% (w/w)

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Test Report



TC-7047

SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001309.003-A

Issue Date : 31/07/2024

ULR No : TC704724100002194F

JOE No : KE24-001309

Report Control No : KER0000223514

NABL Accredited Tests

Analysis	Method	Result	Unit
NABL Group : Pollution & Environment	Soil/Sediments		
Moisture content	IS 2720 (Part 02) : 1873	18.8	%

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Test Report

SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001309.003-B

Issue Date : 31/07/2024

JOE No : KE24-001309

Report Control No : KER0000223514

Customer Provided Information

Sample Described by Customer as : SOIL
Customer Name : ASIAN DEVELOPMENT BANK
Customer Address : PLOT E-31, SHER E BANGLA NAGAR
Postal Code : 1207
State :
Country : BANGLADESH
Sample Description : SOIL
Sampling Date : JULY 01, 2024 02:40AM
Sampling Location : Lalbagh Workshop Area, Rangpur
Marks on Sample : GPS: 25°43'45.31"N; 89°15'7.66"E
Sample Qty. Recd. : 500G APPROX

Lab Provided Information

Sample Type : SOIL
Received : 18/07/2024
Test Start/End Date : 18/07/2024 - 31/07/2024

Non-Accredited tests

Analysis	Method	Result	Unit
% Silt	FAO.U.N 2005	7.9	%
% Clay	FAO.U.N 2005	35.5	%
Colour	Visual Examination	Blackish Grey	
Oil & Grease(HEM)	USEPA Method 9071 B	12.3	mg/kg
Total nitrogen as N	IS 14884 - 1999	0.06	%
Phosphorus as P	ASTM D6349 - 13 (by ICP OES)	2.56	mg/kg
Potassium as K ₂ O (Potash)	ASTM D6349 - 13 (by ICP OES)	0.03	% (w/w)

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Test Report



TC-7047

SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001309.004-A
ULR No : TC704724100002195F
Report Control No : KER0000223514

Issue Date : 31/07/2024
JOE No : KE24-001309

Customer Provided Information

Sample Described by Customer as : SOIL
Customer Name : ASIAN DEVELOPMENT BANK
Customer Address : PLOT E-31, SHER E BANGLA NAGAR
Postal Code : 1207
State :
Country : BANGLADESH
Sample Description : SOIL
Sampling Date : JULY 04, 2024 12:25PM
Sampling Location : S&D-2, Workshop Area, Dinajpur
Marks on Sample : GPS: 25°37'26.52"N; 88°38'19.34"E
Sample Qty. Recd. : 500G APPROX

Lab Provided Information

Sample Type : SOIL
Received : 18/07/2024
Test Start/End Date : 18/07/2024 - 31/07/2024

NABL Accredited Tests

Analysis	Method	Result	Unit
NABL Group : Pollution & Environment	Soil/Sediments		
% Sand	FAO U.N 2005	66.6	%
DISCIPLINE: CHEMICAL			
pH(1:2.5)	IS 2720 (Part 26) : 1987	8.34	—
Total Organic Carbon	IS 2720 (Part 22) : 1972	0.51	%
Chromium (as Cr)	USEPA 3050B/3052	30.42	mg/kg
Lead (as Pb)	USEPA 3050B/3052	12.14	mg/kg
Cadmium (as Cd)	USEPA 3050B/3052	1.20	mg/kg
Arsenic (as As)	USEPA 3050B/3052	1.96	mg/kg
Mercury (as Hg)	USEPA 3050B/3052	<0.50	mg/kg
Polychlorinated biphenyls	USEPA 3540C & 8082A	<0.1	mg/kg
2-Chlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,3-Dichlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,4,5-Trichlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',4,4'-Tetrachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',3',4,6'-Pentachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',4,4',6,6'-Hexachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',3',5',4,4',6'-Heptachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',3',3',4,5',6,6'-Octachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg

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Test Report



SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001309.006-A Issue Date : 31/07/2024
ULR No : TC704724100002197F JOE No : KE24-001309
Report Control No : KER0000223514

Customer Provided Information

Sample Described by Customer as : SOIL
Customer Name : ASIAN DEVELOPMENT BANK
Customer Address : PLOT E-31, SHER-E-BANGLA NAGAR
Postal Code : 1207
State :
Country : BANGLADESH
Sample Description : SOIL
Sampling Date : JULY 06, 2024 : 10 : 30 AM
Sampling Location : Thakurgaon Solar Plant, Thakurgaon
Marks on Sample : GPS: 26°2'16.21"N, 88°25'37.54"E
Sample Qty. Recd. : 500G APPROX.

Lab Provided Information

Sample Type : SOIL
Received : 18/07/2024
Test Start/End Date : 18/07/2024 - 31/07/2024

NABL Accredited Tests

Analysis	Method	Result	Unit
NABL Group : Pollution & Environment	Soil/Sediments		
% Sand	F.A.O.U.N 2005	55.4	%
DISCIPLINE: CHEMICAL			
pH(1:2.5)	IS 2720 (Part 26) : 1987	6.39	-
Total Organic Carbon	IS 2720 (Part-22) 1972	0.42	%
Chromium (as Cr)	USEPA 3050B/3052	31.36	mg/kg
Lead (as Pb)	USEPA 3050B/3052	12.73	mg/kg
Cadmium (as Cd)	USEPA 3050B/3052	<1.00	mg/kg
Arsenic (as As)	USEPA 3050B/3052	2.72	mg/kg
Mercury (as Hg)	USEPA 3050B/3052	<0.50	mg/kg

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Test Report



TC-7047

SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001309.006-A
ULR No : TC704724100002197F
Report Control No : KFR0000223614

Issue Date : 31/07/2024
JOE No : KE24-001309

NABL Accredited Tests

Analysis	Method	Result	Unit
NABL Group : Pollution & Environment	Soil/Sediments		
Moisture content	IS 2720 (Part 02) : 1973	16.8	%

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****End of Report****

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Test Report



SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001309.006-B

Issue Date : 31/07/2024

JOE No : KE24-001309

Report Control No : KER0000223514

Customer Provided Information

Sample Described by Customer as : SOIL
Customer Name : ASIAN DEVELOPMENT BANK
Customer Address : PLOT E-31, SHER-E-HANGLA NAGAR
Postal Code : 1207
State :
Country : BANGLADESH
Sample Description : SOIL
Sampling Date : JULY 06, 2024 - 10:30 AM
Sampling Location : Thakurgaon Solar Plant, Thakurgaon
Marks on Sample : GPS: 26°2'16.21"N; 88°25'37.54"E
Sample Qty. Recd. : 500G APPROX.

Lab Provided Information

Sample Type : SOIL
Received : 18/07/2024
Test Start/End Date : 18/07/2024 - 31/07/2024

Non-Accredited tests

Analysis	Method	Result	Unit
% Silt	F.A.O.U.N 2005	9.9	%
% Clay	F.A.O.U.N 2005	39.7	%
Colour	Visual Examination	Grey	—
Total nitrogen as N	IS 14664 - 1999	0.05	%
Phosphorus as P	ASTM D6349 - 13 (by ICP OES)	4.42	mg/kg
Potassium as K ₂ O (Potash)	ASTM D6349 - 13 (by ICP OES)	<0.01	% (w/w)

Per pro SGS India Private Ltd


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****End of Report****

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Test Report



TC-7047

SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001309.005-A
ULR No : TC704724100002196F
Report Control No : KER0000223514

Issue Date : 31/07/2024
JOE No : KE24-001309

Customer Provided Information

Sample Described by Customer as : SOIL
Customer Name : ASIAN DEVELOPMENT BANK
Customer Address : PLOT E-31, SHER E BANGLA NAGAR
Postal Code : 1207
State :
Country : BANGLADESH
Sample Description : SOIL
Sampling Date : JULY 07, 2024 07:00PM
Sampling Location : New Workshop Area, Palina
Marks on Sample : GPS: 24°1'18.50"N; 89°14'5.31"E
Sample Qty. Recd. : 500G APPROX

Lab Provided Information

Sample Type : SOIL
Received : 18/07/2024
Test Start/End Date : 18/07/2024 - 31/07/2024

NABL Accredited Tests

Analysis	Method	Result	Unit
NABL Group : Pollution & Environment	Soil/Sediments		
% Sand	FAO U.N 2005	66.6	%
DISCIPLINE: CHEMICAL			
pH(1:2.5)	IS 2720 (Part 26) : 1987	8.30	-
Total Organic Carbon	IS 2720 (Part 22) 1972	0.47	%
Chromium (as Cr)	USEPA 3050B/3052	32.32	mg/kg
Lead (as Pb)	USEPA 3050B/3052	11.85	mg/kg
Cadmium (as Cd)	USEPA 3050B/3052	<1.00	mg/kg
Arsenic (as As)	USEPA 3050B/3052	5.75	mg/kg
Mercury (as Hg)	USEPA 3050B/3052	<0.50	mg/kg
Polychlorinated biphenyls	USEPA 3540C & 8082A	<0.1	mg/kg
2-Chlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,3-Dichlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,4,5-Trichlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',4,4'-Tetrachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',3',4,6'-Pentachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',4,4',6,6'-Hexachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',3',5',4,4',6'-Heptachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',3',3',4,5',6,6'-Octachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg

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Test Report

SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001309.005-B

Issue Date : 31/07/2024

JOE No : KE24-001309

Report Control No : KER0000223514

Customer Provided Information

Sample Described by Customer as : SOIL
Customer Name : ASIAN DEVELOPMENT BANK
Customer Address : PLOT E-31, SHIER E BANGLA NAGAR
Postal Code : 1207
State :
Country : BANGLADESH
Sample Description : SOIL
Sampling Date : JULY 07, 2024 07:00PM
Sampling Location : New Workshop Area, Palana
Marks on Sample : GPS: 24°1'18.50"N; 86°14.5'31"E
Sample Qty. Recd. : 500G APPROX

Lab Provided Information

Sample Type : SOIL
Received : 18/07/2024
Test Start/End Date : 18/07/2024 - 31/07/2024

Non-Accredited tests

Analysis	Method	Result	Unit
% Silt	FAO.U.N 2005	11.9	%
% Clay	FAO.U.N 2005	43.5	%
Colour	Visual Examination	Grey	
Oil & Grease(HEM)	USEPA Method 9071 B	5.7	mg/kg
Total nitrogen as N	IS 14884 - 1999	0.06	%
Phosphorus as P	ASTM D6349 - 13 (by ICP OES)	5.82	mg/kg
Potassium as K ₂ O (Potash)	ASTM D6349 - 13 (by ICP OES)	<0.01	% (w/w)

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****End of Report****

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Test Report



TC-7047

SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001309.002-A

Issue Date : 31/07/2024

ULR No : TC704724100002193F

JOE No : KE24-001309

Report Control No : KER0000223514

NABL Accredited Tests

Analysis	Method	Result	Unit
NABL Group : Pollution & Environment	Soil/Sediments		
Moisture content	IS 2720 (Part 02) : 1873	12.5	%

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Test Report



TC-7047

SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001309.003-A
ULR No : TC704724100002194F
Report Control No : KER0000223514

Issue Date : 31/07/2024
JOE No : KE24-001309

Customer Provided Information

Sample Described by Customer as : SOIL
Customer Name : ASIAN DEVELOPMENT BANK
Customer Address : PLOT E-31, SHER E BANGLA NAGAR
Postal Code : 1207
State :
Country : BANGLADESH
Sample Description : SOIL
Sampling Date : JULY 01, 2024 02:40AM
Sampling Location : Lalbagh Workshop Area, Rangpur
Marks on Sample : GPS: 25°43'45.31"N; 89°15'7.66"E
Sample Qty. Recd. : 500G APPROX

Lab Provided Information

Sample Type : SOIL
Received : 18/07/2024
Test Start/End Date : 18/07/2024 - 31/07/2024

NABL Accredited Tests

Analysis	Method	Result	Unit
NABL Group : Pollution & Environment	Soil/Sediments		
% Sand	FAO U.N 2005	66.6	%
DISCIPLINE: CHEMICAL			
pH(1:2.5)	IS 2720 (Part 26) : 1987	8.16	—
Total Organic Carbon	IS 2720 (Part 22) 1972	0.37	%
Chromium (as Cr)	USEPA 3050B/3052	32.71	mg/kg
Lead (as Pb)	USEPA 3050B/3052	10.74	mg/kg
Cadmium (as Cd)	USEPA 3050B/3052	<1.00	mg/kg
Arsenic (as As)	USEPA 3050B/3052	<0.50	mg/kg
Mercury (as Hg)	USEPA 3050B/3052	<0.50	mg/kg
Polychlorinated biphenyls	USEPA 3540C & 8082A	<0.1	mg/kg
2-Chlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,3-Dichlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,4,5-Trichlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',4,4'-Tetrachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',3',4,6'-Pentachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',4,4',6,6'-Hexachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',3,3',4,4',6'-Heptachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	USEPA 3540C & 8082A	BDL(DL0.1)	mg/kg

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SGS India Pvt. Ltd., C-5 Plot-5(23) Midc, Harnapur, Diamond Harbour Rd PO-Joka, South 24 Parganas Kolkata - 700114 (Phone: 91 6262 153334)
Head Office: 605 House 49, A.S. Nano Vihar, West, Mumbai-400093, Tel: 1021 257901/21 to 25 www.sgs.com

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Test Report



TC-7047

SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001309.004-A
ULR No : TC704724100002195F
Report Control No : KER0000223514

Issue Date : 31/07/2024
JOE No : KE24-001309

NABL Accredited Tests

Analysis	Method	Result	Unit
NABL Group : Pollution & Environment	Soil/Sediments		
Moisture content	IS 2720 (Part 02) : 1873	18.1	%

Per pro SGS India Private Ltd


SATYA CHARAN MANNA

Authorized Signatory
****End of Report****

Page 2 of 2

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Test Report

SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001309.004-B

Issue Date : 31/07/2024

JOE No : KE24-001309

Report Control No : KER0000223514

Customer Provided Information

Sample Described by Customer as : SOIL
Customer Name : ASIAN DEVELOPMENT BANK
Customer Address : PLOT E-31, SHIER E BANGLA NAGAR
Postal Code : 1207
State :
Country : BANGLADESH
Sample Description : SOIL
Sampling Date : JULY 04, 2024 12:25PM
Sampling Location : S&D-2, Workshop Area, Dinajpur
Marks on Sample : GPS: 25°37'26.52"N; 88°38'19.34"E
Sample Qty. Recd. : 500G APPROX

Lab Provided Information

Sample Type : SOIL
Received : 18/07/2024
Test Start/End Date : 18/07/2024 - 31/07/2024

Non-Accredited tests

Analysis	Method	Result	Unit
% Silt	FAO.U.N 2005	7.9	%
% Clay	FAO.U.N 2005	35.6	%
Colour	Visual Examination	Blackish Grey	
Oil & Grease(H&M)	USEPA Method 9071 B	13.7	mg/kg
Total nitrogen as N	IS 14884 - 1999	0.06	%
Phosphorus as P	ASTM D6349 - 13 (by ICP OES)	6.06	mg/kg
Potassium as K ₂ O (Potash)	ASTM D6349 - 13 (by ICP OES)	0.03	% (w/w)

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****End of Report****

Page 1 of 1

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Test Report



TC-7047

SAMPLE NOT DRAWN BY SGS INDIA PVT. LTD.

Report No : KE24-001309.005-A

Issue Date : 31/07/2024

ULR No : TC704724100002196F

JOE No : KE24-001309

Report Control No : KER0000223514

NABL Accredited Tests

Analysis	Method	Result	Unit
NABL Group : Pollution & Environment	Soil/Sediments		
Moisture content	IS 2720 (Part 02) : 1873	23.3	%

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****End of Report****

Page 2 of 2

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