Initial Environmental Examination

Document Stage: Updated
Project Number: 49423-006
October 2020

BAN: Bangladesh Power System Enhancement and Efficiency Improvement Project – Additional Financing

Prepared by Bangladesh Rural Electrification Board (BREB) for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 16 October 2020)

Currency unit	–	Bangladesh Taka (Tk)
Tk1.00	=	$0.012
$1.00	=	Tk84.80

ABBREVIATIONS

ADB	Asian Development Bank
BBS	Bangladesh Bureau of Statistics
BMD	Bangladesh Meteorological Department
DOE	Department of Environment
ECA	Environment Conservation Act
ECC	environmental clearance certificate
ECR	environmental conservation rules
EIA	environmental impact assessment
EMP	environmental management plan
FAO	Food and Agriculture Organization
GOB	Government of Bangladesh
GRC	grievance redress committees
IEE	initial environmental examination
IUCN	International Union for Conservation for Nature
MOEFCC	Ministry of Environment, Forest, and Climate Change
PBS	*palli bidyut samity*
PMU	project management unit
PPE	personal protection equipment
ROW	right of way
SRDI	Soil Resources Development Institute

WEIGHTS AND MEASURES

dB(A)	–	A-weighted decibel
ckm	–	circuit km
ha	–	hectare
km	–	kilometer
kV	–	kilovolt
kWh	–	kilowatt-hour
LV	–	low voltage
µg	–	microgram
m	–	meter
MT	–	metric tonnes
sqm	–	square meter
MVA	-	mega volt ampere

NOTE

(i) In this report, '$' refers to US dollars unless otherwise stated.

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Executive Summary

1. This initial environmental examination (IEE) including environmental management plan (EMP) for the proposed additional financing for the Bangladesh Power System Enhancement and Efficiency Improvement Project (the project) has been prepared in compliance with the Asian Development Bank's (ADB) Safeguard Policy Statement (2009), and national (Bangladesh) environmental, health and safety requirements.

2. Since 1978, Bangladesh Rural Electrification Board (BREB) is working to electrify rural areas of country. In consistence with these rigorous activities BREB has already provided electricity to 361 sub-divisional areas completely and remaining 100 sub-divisions are going to be enlightened by the year 2021.

3. ADB approved the Bangladesh Power System Enhancement and Efficiency Improvement Project on 29 March 2017 aims to improve electricity transmission and distribution in the country. The project is being under implementation. Implementing agencies of the ongoing project are (i) Bangladesh Rural Electrification Board; (ii) Dhaka Electricity Supply Company Limited; (iii) Power Division of Ministry of Power, Energy, and Mineral Resources; and (iv) Power Grid Company of Bangladesh Limited.

4. The parent project includes four components with four main outputs: (i) national transmission network in southern Bangladesh strengthened, (ii) distribution network improved, (iii) distribution network in rural areas improved, and (iv) capacity in power sector agencies enhanced.

5. An additional financing (AF) is programmed for component 3 for BREB to efficient and reliable electricity supply to the western zone (Khulna) of Bangladesh. The aim of the project is to contribute 100% access to power by 2021 and improved power sector sustainability in Bangladesh by 2030.

6. According to the Environment Conservation Act 1995 and Environment Conservation Rules 1997, electricity distribution line and substation related projects are regarded as a 'RED Category' project that require an IEE and environmental impact assessment (EIA) to get 'Site Clearance' and 'Environmental Clearance' from the Department of Environment (DOE). In this regard, BREB should conduct IEE and EIA studies domestically for the project with assistance from an organisation. According to ADB Safeguard Policy Statement (2009) the project falls under category B for environment and an IEE is required. This draft IEE is prepared for the activities proposed under AF following the Safeguards Policy Statement.

7. AF will construct 51 new 33/11 kilovolt (kV) substations, installation of 990 kilometers (km) of 33 kV distribution lines, and 3,000 km of 11 kV or below distribution lines. The assessment of 51 new substations have been completed during the months of July to October 2020.

8. The new 33/11 kV substations are to be located on land acquired by the BREB through willing-buyer and willing-seller mechanism. The new 33/11 kV lines will mostly be aligned along the right of way (ROW) of existing semi-urban and rural roads although some sections may need to pass thorough agricultural or plantation areas; alignments will be determined following detailed line survey by contractors. The associated poles, conductors, and transformers will have a small footprint.

9. The site selection for new substations has been done based on systems analysis of BREB's existing network to ensure overall system stability of the network and that consumers in the districts will benefit from improved delivery of electricity. The principles that have been (and will be) adopted for selection of optimum sites and route alignments for the various project components are: (i) minimize disturbance of human settlements; (ii) avoid monuments of cultural or historical importance; (iii) do not create a threat to the survival of any community with special reference to ethnic minority communities; (iv) do not affect any public utility

services like water line, telephone lines, roads or community facilities like playgrounds, schools etc.; (v) do not pass through any wildlife sanctuaries, national parks, reserve forests etc.; (vi) minimize damage to existing trees/forest resources; and (vii) selection and design of new equipment to comply with national requirements as well as considering international good practice per the International Finance Corporation (IFC) Environmental, Health, and Safety (EHS) Guidelines particularly with respect to avoiding the use of polychlorinated biphenyl (PCB) oils in the purchase of new transformers and the use of all asbestos containing materials in new construction.

10. The project components will not encroach upon any legally protected areas or internationally or nationally important biodiversity areas or physical cultural resources. Integrated Biodiversity Assessment Tool (IBAT) screening carried out for the AF components confirmed that there are no protected areas or key biodiversity areas within 5 km buffer of the project components.

11. The project is unlikely to cause any significant irreversible, diverse, or unprecedented adverse environmental impacts. This is due to the following facts (i) project components are located in semi-urban and rural areas which do not support high biodiversity values and will be away from legally protected areas or internationally or nationally important biodiversity areas or physical cultural resources; and ii) there will be only minor civil works required for the project. Given the nature, scale, and location of the project components, potential direct, indirect, cumulative, and induced impacts are anticipated to be minor in magnitude, site-specific, and generally reversible. Potential impacts can be easily mitigated through the adoption of international good practices for environmental management as set out in the IFC EHS Guidelines including the General Guidelines and those on Electric Power Transmission and Distribution dated 30 April 2007.

12. Potential environmental impacts were identified in relation to design, location, construction, operation and maintenance of the project infrastructure and mitigation measures have been developed in respect of all potentially negative impacts identified. Potential construction impacts relate to disturbance to land and communities as project infrastructure is installed and pollution, health and safety risks to workers and the community in proximity to works if the construction activities are not well managed. Pollution, health and safety risks to workers and the community will remain during operation and maintenance works.

13. An EMP has been prepared for the project. The EMP includes (i) mitigation measures for potential environmental impacts during implementation, including ensuring detailed designs take into account high floods and climate change adaptation measures; adhering to electromagnetic field (EMF) exposure and noise guideline levels; approving contractor's pollution prevention, solid and hazardous waste management, and health and safety management plans prior to works; prohibiting PCB use in new transformers and asbestos containing materials in construction; and, community awareness raising activities on the health and safety risks of electrical equipment; (ii) an environmental monitoring program, including monitoring of health and safety incidents; and (iii) the responsible entities for mitigation, monitoring, and reporting. Mitigation measures will be assured by a program of environmental supervision and monitoring to be conducted during the construction and operation stages. Any unanticipated impacts or requirements for corrective action during implementation will be reported by BREB to ADB.

14. Project stakeholders and local communities were consulted during preparation of the IEE and invited to express any environmental and social concerns they had regarding the project. A total 54 public consultation meetings (involving 229 local participants) were conducted on the location of the substations during July to October 2020. The consultations covered the proposed project site which includes 37 upazilas of 10 districts under Khulna division. No significant environmental and social concerns were raised, and all stakeholders consulted strongly support the project and are looking forward to the benefits of improved electricity services. Some are pointed out that the project will provide benefit to students as

they will get assured power supply during the evening for studying. The IEE will be made available to public and will be disclosed to a wider audience locally (with executive summary translated into local language) and via the ADB website. The consultation process will be continued during project implementation (with Covid-19 precautions) to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation

15. This IEE including EMP are considered sufficient to meet the environmental assessment requirements of ADB for the project. However, following selection of final 33/11 kV line alignments, and, in case of any unanticipated scope or design change occurring during project implementation, this IEE and EMP will be updated and cleared by ADB.

Chapter 1

1. Introduction

1.1 Background

1. Bangladesh Rural Electrification Board (BREB), established in 1977, is Government of Bangladesh (GOB) owned and operated corporation in Bangladesh and is responsible for rural electrification. BREB operates under a license issued by Bangladesh Energy Regulatory Commission (BERC). Under the provisions of the ordinance, commencing from 1980, the BREB has established 80 Palli Bidyut Samitis (PBSs), rural electricity cooperatives, for implementation of the rural electrification program in Bangladesh.

2. Since 1978, BREB is working to electrify rural areas of country. In consistence with these rigorous activities BREB has already provided electricity to 361 sub-divisional areas completely and remaining 100 sub-divisions are going to be enlightened by the year 2021. To meet this milestone BREB has completed 94% of country's rural area. Up to December 2019 BREB distribution network consists of 4,82,002 km. lines (high tension and low tension), Connecting 27.90 million consumers through its 80 nos. PBSs.

3. The Asian Development Bank (ADB) approved the Bangladesh Power System Enhancement and Efficiency Improvement Project on 29 March 2017 aims to improve electricity transmission and distribution in the country. The project is being under implementation. Implementing agencies of the ongoing project are (i) Bangladesh Rural Electrification Board; (ii) Dhaka Electricity Supply Company Limited; (iii) Power Division of Ministry of Power, Energy, and Mineral Resources; and (iv) Power Grid Company of Bangladesh Limited.

4. The parent project includes four components with four main outputs: (i) national transmission network in southern Bangladesh strengthened, (ii) distribution network improved, (iii) distribution network in rural areas improved, and (iv) capacity in power sector agencies enhanced.

5. An additional financing (AF) is programmed for component three for BREB to efficient and reliable electricity supply to the western zone (Khulna) of Bangladesh. The aim of the project is to contribute 100% access to power by 2021 and improved power sector sustainability in Bangladesh by 2030.

6. The parent project meets the eligibility criteria for additional financing. The ongoing project is performing well as it meets all the criteria including: (i) the project is rated on track under the project performance system, (ii) each safeguard covenant item is complied with, (iii) delivery of expected outputs is rated successful, and (iv) management of risks is rated successful as all the risks included in the Risk Assessment and Risk Management Plan have been managed successfully.

7. The project requires an initial environmental examination (IEE) and environment impact assessment (EIA) according to GOB environmental regulations as it ranks as a red project under Department of Environment (DOE) Regulations. BREB will prepare IEE and EIA reports and obtain the necessary project approval from the DOE. According to ADB Safeguards Policy Statement (2009), the project falls under category B and an initial environmental examination (IEE) is required. This draft IEE is being prepared for the activities proposed under AF following the Safeguards Policy Statement.

1.2 Objectives of the Project

8. The objective of the additional financing project is to improve the quality of electricity supply to existing consumers, to allow capability for consumer growth and to minimize system losses in nine PBS authorities of Khulna region. This will be achieved with the construction of 51 new substation, installation of total 3990 km new distribution lines.

9. The broad objective of AF is, therefore, to provide more access to electricity, and thereby boost economic development and reduce poverty in the rural areas. This will also result in improving the financial soundness of the concerned PBS with increased income generation from new consumer connections. The project should contribute to the national economy through added production in the agriculture and industry sectors, with the expansion of industries and business, and by the creation of additional employment.

1.3 Project Activity

10. Additional financing will construct 51 new substations, installation of 990 km of 33 kV distribution lines, and 3,000 km of 11 kV or below distribution lines.

11. BREB has already identified all 51 new substation locations. The assessment is completed for 51 substations during the months of July to October 2020. Among the 51 new substations, BREB has already completed negotiations for 37 locations, preliminary negotiations completed for six locations, completed land acquisition process for two locations, and preliminary negotiations are ongoing for six locations. Among the 51 substation locations, one location (substation: EB-1, Kushtia) is owned by Islamic University, Kushtia, Bangladesh. This land will be taken by BREB through mutual memorandum of understanding (MOU). Table 1.1 present the status of land acquisition of 51 new substations.

Table 2.1: Status of land Purchased and Acquisition for Substation

SL	Name of PBS	No of Substations	Status of Land purchase			
			Acquisition completed	Negotiation completed	Primary Negotiation completed	Preliminary negotiation ongoing
1	Bagerhat	3	0	3	0	0
2	Jashore -1	8	2	6	0	0
3	Jashore-2	7	0	5	2	0
4	Jhenaidah	6	0	6	0	0
5	Khulna	7	0	5	0	2
6	Kushtia	7	0	5	2	0
7	Magura	1	0	0	0	1
8	Meherpur	5	0	4	0	1
9	Satkhira	7	0	3	2	2
TOTAL		**51**	**2**	**37**	**6**	**6**

Source: BREB field Study

1.4 Scope of Work

12. The scope of work for this IEE study involves environmental assessment of the activities involved in the nine PBS authorities under Khulna Divisions. The work involved several small activities spread across 9 PBSs.

13. 100% site visit and assessment on the proposed identified 51 new substation locations have been completed. The site visits were conducted along with the respected PBS project engineers during the months of July October 2020 with due considerations to Covid-19 travel restrictions. Sample walkover surveys were also conducted along the tentative associated distribution 33 kV and 11 KV line alignment connected with the new substations between July-October 2020.

14. The IEE study also provides information on the baseline environmental condition (physical, biological, and social environment) of the project area.

15. The IEE identifies environmental components likely to be affected by the project and defines potential impacts. Public consultations were conducted to obtain the perception of locally affected people in area. An environmental management plan (EMP) including environmental monitoring plan and institutional arrangements for future monitoring are included in the IEE.

1.5 Objectives of the IEE Study

16. According to the Environment Conservation Act 1995 and Environment Conservation Rules 1997, electricity distribution line and substation related projects are regarded as a 'RED Category' project that require IEE and EIA reports to get 'Site Clearance' and 'Environmental Clearance' from the Department of Environment (DOE). In this regard, BREB should conduct IEE and EIA studies domestically for the Project with the assistance from an organisation.

17. Regardless of GOB regulations, the proposed AF project falls under Category B for environment according to the ADB Safeguards Policy Statement (2009) which need an IEE.

18. The environmental assessment of the proposed project identifies the potential adverse environmental impacts and risks to be considered in the detailed design and pre-construction, construction and operation and maintenance phases. The IEE addresses, as far as required, the environmental management, health, and safety requirements of Bangladesh as well as those of the ADB's Safeguards Policy Statement.

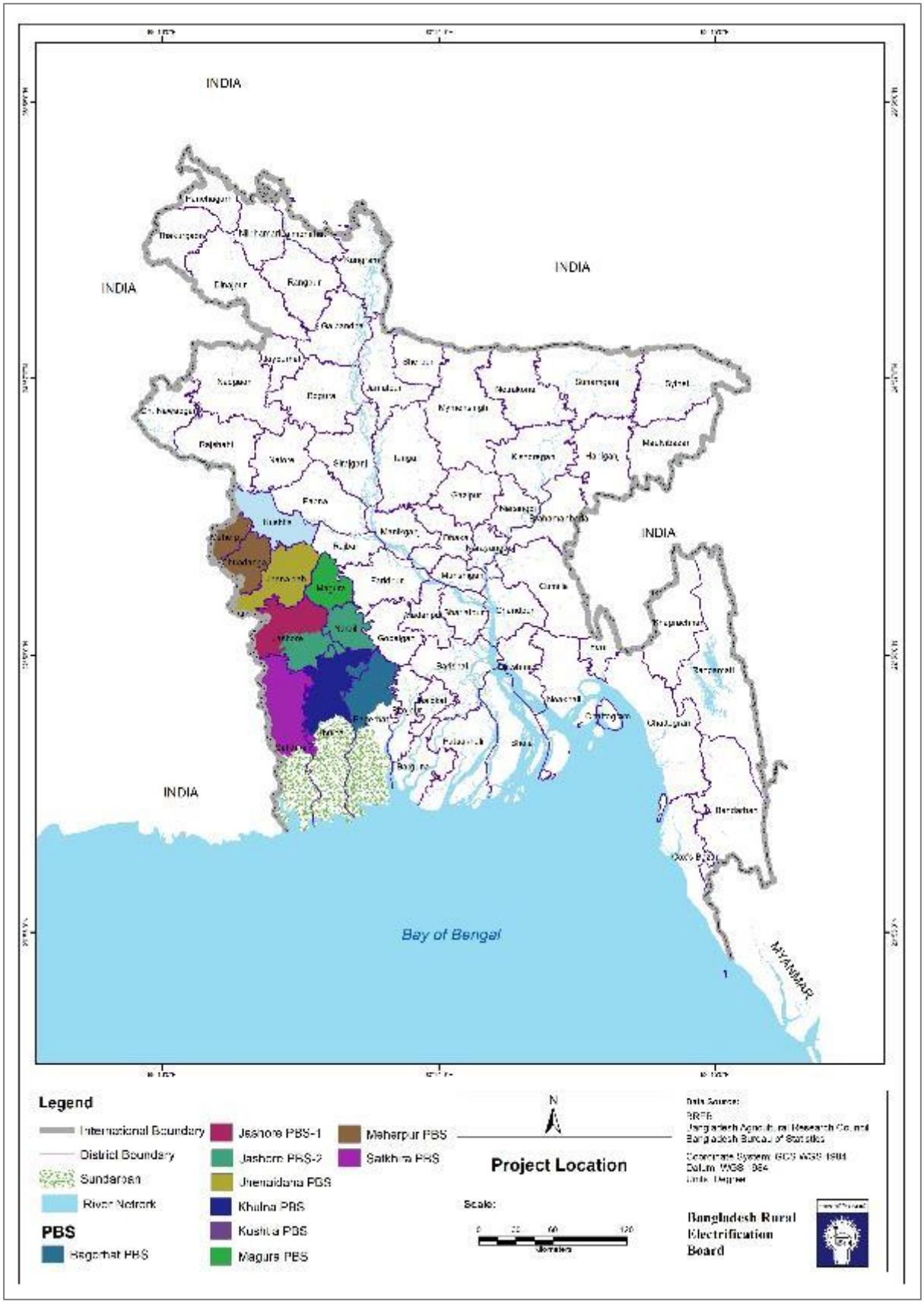
19. The objectives of the IEE are to:

(i) identify any legislative and approval requirements under which proposed project activities must occur;
(ii) assess the existing environmental conditions and receptors in the project area of influence including the identification of environmentally sensitive areas such as national protected areas network;
(iii) assess the direct, indirect, cumulative, and induced environmental impacts of the project on and risks to physical, biological, socioeconomic, and physical cultural resources; and
(iv) set out in an environmental management plan (EMP) with the mitigation and monitoring measures that will guide environmental management during detailed design and pre-construction, construction, operation, and maintenance phases of the project.

1.6 Project Location

20. The proposed AF activities are location in the nine PBSs covering 37 administrative upazilas of 10 districts in Khulna division of Bangladesh. The location of the project area is shown in **Figure 2.1**.

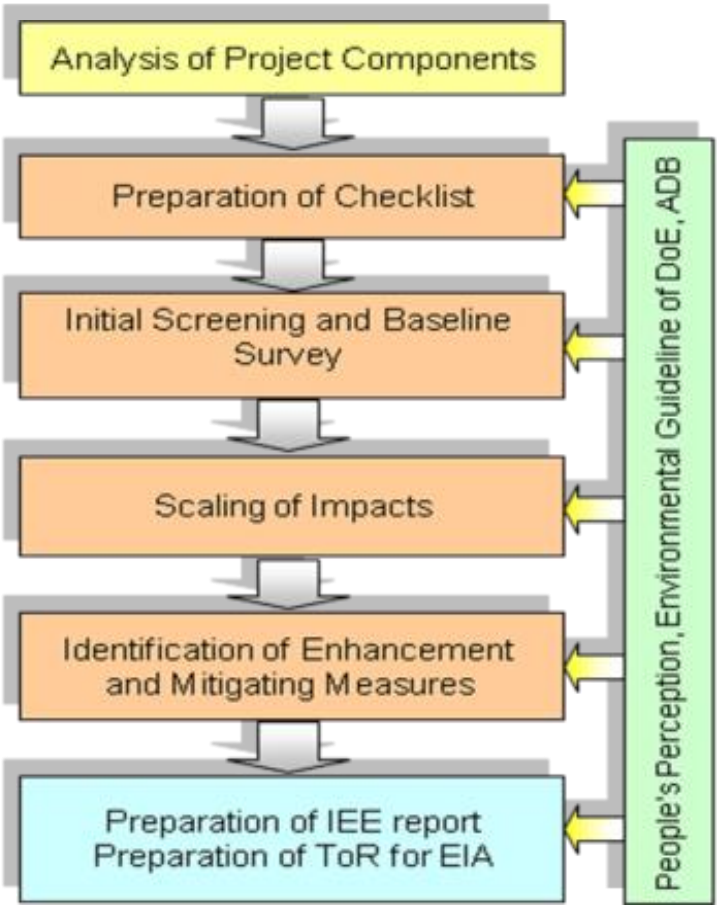
Figure 2.1: Project Location Map



1.7 Methodology

21. IEE is an initial examination for the likely potential environmental impacts of a proposed project. As the first step, project screening and scoping exercise was undertaken to identify the parameters needed to be considered for the study and to outline the activities for collecting data on each parameter. Data pertaining to all facets of environment and social aspects viz. physical, ecological, and socioeconomic environment were collected through secondary sources and by site surveys and consultations. The stepwise activities are detailed in the following subsections and shown in figure 1.2.

Figure 2.2: Steps of Initial Environmental Examination (IEE)



i. Analysis of the Project Components

22. All aspects of distribution line and substation construction works, and activities were examined prior to developing a checklist for further analysis.

ii. Preparation of Checklist

23. A checklist of potential environmental parameters was prepared based on various guidelines of different agencies such as DOE, World Bank, ADB and Japan International Corporation Agency. The checklist was used to identify potential impacts.

iii. Initial Screening and Baseline Survey

24. Existing available data of the project and secondary information available in public domain with regard to the project, the proposed project location and its surroundings have been reviewed. Environment and social specialists undertook site visit in substation locations to understand the site setting, environmental and social sensitivities. Consultation with the local community was also conducted to understand the local environmental and social issues in the area.

25. Establishing baseline helps in understanding the prevailing environmental and socio-economic status of the study area. It provides the background environmental and social conditions for prediction of the future environmental and social characteristics of the area due to the operation of the proposed project during its life cycle.

26. The list of parameters identified was shortened to focus on significant effects. Also, data was collected from all possible secondary sources. Environmental and socio-economic data from different sources (e.g. Bangladesh Bureau of Statistics (BBS), DOE, Bangladesh Meteorological Department (BMD), Bangladesh Water Development Board (BWDB), Agro-climatic survey of Bangladesh and other IEE/EIA reports) were collected to prepare the baseline environmental and socioeconomic profile of the study area.

iv. Scaling of Impacts

27. Higher level prediction of environment and social risks was undertaken as an objective exercise to determine what could potentially happen to the environmental and social receptors as a consequence of the project and its associated activities and took into account baseline conditions at site and expert judgement.

v. Identification of Enhancement and Mitigating Measures

28. An EMP has been prepared for the design and pre-construction, construction, and operation phases of the project. The EMP would act as a guidance document for BREB to ensure that they can implement the project in an environmentally sound manner where project planners and design agencies, contractors, relevant government departments and stakeholders understand the potential impacts arising out of the proposed Project and take appropriate actions to properly manage them.

vi. Preparation of IEE Report

29. Finally, an IEE report was prepared following standard chapter outlines.

1.8 Structure of the Report

30. In compliance with ADB's Safeguard Policy Statement (2009) requirements, this IEE has been structured and consists of following chapters.

- ***Chapter 1: Introduction:*** The introduction chapter presents a brief overview of the assignment along with its background, objectives, scope of work, methodology etc.
- ***Chapter 2: Policy, Legal and Administrative Framework:*** Outlines the policy and legislation with respect to environmental issues.
- ***Chapter 3: Project Description:*** Describes the proposed project interventions including any alternative options suggested for the project, background, project category, need for the Project, location, size, and magnitude of operation.
- ***Chapter 4: Description of the Environment:*** Presents a description of the environmental baseline condition (socio-economic, physical, and biological) of the project area.
- ***Chapter-5: Anticipated Environmental Impacts and Mitigation Measures***: Deals with the environmental impacts of the proposed project and possible mitigation measures.
- ***Chapter 6: Information Disclosure, Consultations and Participation:*** Mainly describes public opinion of the project as well as major problems, impacts and any solutions recommended as well as information disclosure for the project.
- ***Chapter 7: Grievance Redress Mechanism:*** Describes the mechanism for addressing complaints from public.
- ***Chapter 8: Environmental Management Plan:*** Defines the EMP and formulates the monitoring program of the project and institutional arrangements.

- ***Chapter 9: Conclusion and Recommendations:*** This chapter presents the findings, conclusion, and recommendations of the report.

31. The executive summary is also provided in the beginning of the report. The report is supported by appendices which include substation details, baseline profile of surveyed substations, photolog and details of field conditions and consultations, and template format of environmental monitoring report.

Chapter 2

2. Policy, Legal and Administrative Framework Overview

32. The implementation and construction of this project by the BREB requires strict compliance with laws, rules, and regulations pertinent to the environment. In Bangladesh, the DOE is responsible for ensuring the application of environmental laws and issuance of necessary clearances.

33. The procedures and requirements for environmental assessment under the power sector are dictated by the Environment Conservation Act of 1995, which introduced a requirement for any proposed "industrial unit or project" to obtain prior approval from the DOE.

34. In accordance with the Environment Conservation Rules (ECR) 1997, DOE has classified development interventions based on their potential adverse environmental impacts for the purpose of issuing the environmental clearance certificate (ECC.) The categories are (i) green, (ii) orange A, (iii) orange B, and (iv) red. For industrial units and projects falling in the orange – A, orange – B and red categories, firstly a location clearance certificate and thereafter an environmental clearance certificate shall be issued. Provided that the director general may, without issuing a location clearance certificate at the first instance, directly issue environmental clearance certificate if he, on the application of an industrial unit or project, considers it appropriate to issue such certificate to the industrial unit or project. The application for ECC from the DOE has two steps: (i) site clearance certificate is obtained at the initial stage and (ii) the ECC at the advanced stage. ECC is required for all the categories (i.e., green, orange A, orange B, and red). A site clearance and ECC are required environmental baseline condition for industries and/or projects in the categories: orange A, orange B, and red. According to ECR 1997, electricity distribution lines and substations are categorized as RED. Hence, the project is required location clearance certificate and thereafter an environmental clearance certificate. The issuance of the site clearance by the DOE for RED category projects will be within 60 days upon receipt of application. Once the site clearance is obtained along with approved terms of reference (TOR) for conducting Environmental Impact Assessment (EIA) of RED category projects, the ECC can be applied after completion of EIA study. DOE will issue or disapprove the ECC for RED projects within 30 day. The ECC is valid for one year depending on the compliance of the conditions and must be renewed 30 days prior to the expiry date.

35. The BREB, as project proponent, is responsible for carrying out IEE and EIA studies of the proposed AF project. BREB has the responsibility to administer the environment assessment process, review the findings of consultants, and submit the documents to the DOE for their review.

36. A key requirement of the EIA for projects classified in the red categories is an EMP. The function of the EMP is to enable the project proponent (BREB) to show the DOE how it will deliver the environmental performance assessed in the IEE (for which DOE approval is sought). The EMP must describe in detail organization and management responsibilities, give details of how mitigation measures identified in the IEE will be implemented and explain how monitoring will be carried out.

37. Possession of a "clearance" from the DOE does not relieve the developer of a project from the requirement to comply with other environmental regulations. In particular, the Bangladesh National Environment Quality Standards (EQS) for industrial effluent have been set and compliance is mandatory. In addition, there are statutory instruments applicable to power sector development projects, which are not primarily environmental in nature, but which influence environmental impacts. Compliance with such statutory instruments is mandatory.

2.2 Procedure for Obtaining Site/Environmental Clearance

2.2.1 Requirement for IEE and EIA Reports

38. All industries and projects in the red category must conduct IEE and EIA studies, which help in understanding the potential extent of environmental changes of the project. The EIA process helps in determining ways to mitigate negative impacts by considering available information, past experiences, and standard operating practices. The steps for conducting IEE/EIA studies are as follows:

- Collection of baseline information in respect of a project and the environmental setting of the project and its site.
- Setting of boundaries of an EIA by identifying the significant issues.
- Impact assessment suggesting mitigation measures, development of an EMP, and discussion of alternative sites for the project or other project modifications.
- Preparing an environmental monitoring program.

2.2.2 Procedure

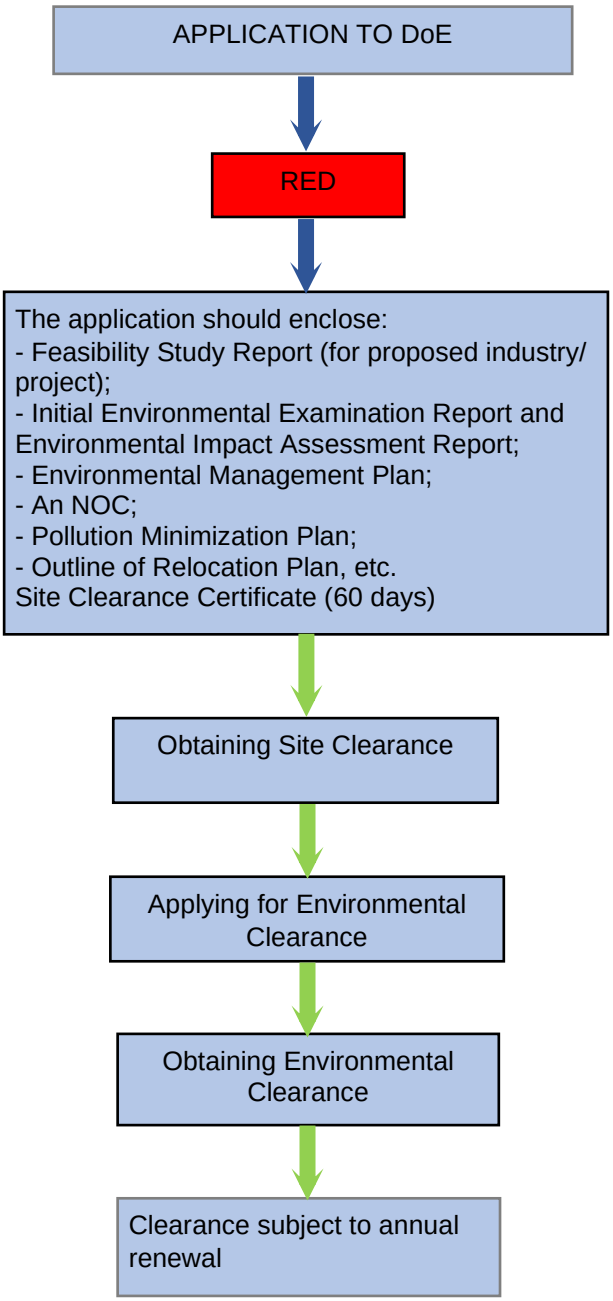
39. The project proponent applies to the DOE in the prescribed format for site clearance after completing the IEE and environmental clearance after completing the EIA report. The application for environmental clearance for the project classified in the red category should be accompanied by the following documents:

- Application through prescribed form-3 under ECR 1997;
- Prescribed fees under schedule-13 under ECR 1997 (Amendment 2002);
- Feasibility study report of the industrial unit or project (applicable only for proposed industrial unit or project);
- Report on the Initial Environmental Examination (IEE) relating to the industrial unit or project, and also the terms of reference (TOR) for the Environmental Impact Assessment (EIA) of the unit or the project and its Process Flow Diagram; or Environmental Impact Assessment (EIA) report prepared on the basis of terms of reference previously approved by the Department of Environment, along with the Layout Plan (showing location of Effluent Treatment Plant), Process Flow Diagram, design and time schedule of the Effluent Treatment Plant of the unit or project, (these are applicable only for a proposed industrial unit or project);
- A no objection certificate from the local authorities concerned;
- Emergency plan relating adverse environmental impact and plan for mitigation of the effect of pollution;
- Outline of relocation plans (where applicable);
- Other necessary information (where applicable).

40. The Environment Conservation Rules give the director general of DOE the discretion to issue environmental clearance directly without issuing any site clearance to any industry or project if he (the Director General) finds appropriate reason for doing so.

41. As the proposed construction of the project falls under the "Red" category, all necessary requirements mentioned above should be adopted by BREB for the project. **Figure 2.1** shows the activities involved in obtaining environmental clearance from the DOE.

Figure 2.1: DOE Environmental Clearance Procedures



NOC = No objection certificate, usually obtained from local government.
Note: 1. These requirements vary from those of the DOE (1997) in requiring EMPs for proposed, as well as current, projects.
2. Procedure of obtaining environmental clearance: Orange red category projects at first location clearance and thereafter environmental clearance will be granted. The gestation period for location clearance is within 60 days for red category projects.
Source: Adapted from the Environmental Guidelines for Industry (DOE, 1997)

2.3 Organizations Related with Enforcement of Environmental Standards

42. The roles and responsibilities of various ministries and departments involved in the enforcement of environmental requirements are described below:

2.3.1 Ministry of Environment, Forest, and Climate Change (MOEFCC)

43. 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. Previously the ministry name was Ministry of Environment and Forest. On May 14, 2018 cabinet changed the name to Ministry of Environment, Forest, and Climate Change. Realizing the ever-increasing importance of environmental issues, the MOEFCC was created by replacing 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 group 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/implementing agencies:

- Department of Environment (DOE)
- Forest Department (FD)
- Forest Industries Development Corporation (FIDC)

2.3.2 Department of Environment (DOE)

44. In order to expand the scope of environmental management and to strengthen implementation powers, the Government of Bangladesh adopted the Environmental Pollution Control Ordinance in 1977. The ordinance provided 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 Pollution Control Board was renamed as the Department of Environmental Pollution Control. Six divisional offices were established in Dhaka, Chittagong, Khulna, Barisal, Sylhet and Rajshahi.

45. A special presidential order renamed the Department of Environment Pollution Control as the Department of Environment (DOE) and placed it under the then newly formed MOEF in 1989.

46. The DOE is headed by a director general (DG). The DG has complete control over the DOE. The power of the DG, as given under the Act, is outlined as follows:

- The DG has the power to close down 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 appeal.
- The DG has the power to declare an area affected by pollution as an ecologically critical area. The 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 an Environmental Clearance from the DOE. The procedures to take such clearance are in place.
- Failure to comply with any part of the Environment Conservation Act (ECA) 1995 may result in punishment by a maximum of five years imprisonment or a maximum fine of Tk. 100,000, or both.

2.3.3 Forest Department

47. 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 agro forestry programs and its officers are also responsible for the protection of wildlife in the forests.

2.3.4 Related Other Organizations

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

- Ministry of Land: Land Reform and Land Acquisition Directorate
- Ministry of Water Resources: Bangladesh Water Development Board (BWDB)
- Ministry of Fisheries and Livestock: Directorate of Fisheries

2.4 National Policies and Legislation Relevant to Environment and Social

2.4.1 Environment Conservation Act, 1995 (Amended in 2010)

49. The Bangladesh Environment Conservation Act of 1995 (ECA '95) is currently the main legislation in relation to environmental protection in Bangladesh. This act is promulgated for environment conservation, environmental standards development and environment pollution control and abatement. It has repealed the Environment Pollution Control Ordinance of 1977.

50. The main objectives of ECA '95 are:

- conservation and improvement of the environment and
- control and mitigation of pollution of the environment.

51. The main strategies of the act can be summarized as:

- Declaration of ecologically critical areas and restriction on the operations and processes, which can or cannot be carried/initiated in the ecologically critical areas;
- Regulations in respect of vehicles emitting smoke harmful to the environment;
- Environmental clearance;
- Regulation of the industries and other development activities' discharge permits;
- Promulgation of standards for quality of air, water, noise, and soil for different areas for different purposes;
- Promulgation of a standard limit for discharging and emitting waste; and
- Formulation and declaration of environmental guidelines

52. Before any new project can go ahead, as stipulated under the rules, the project promoter must obtain environmental clearance from the director general of Department of Environment (DOE). An appeal procedure does exist for those promoters who fail to obtain clearance. Failure to comply with any part of this act may result in punishment to a maximum of three years imprisonment or a maximum fine of Tk300,000 or both. The Department of Environment (DOE) executes the act under the leadership of the Director General (DG).

53. The amendment of the act in 2010 introduces new rules & restriction on a) Ensure proper management of hazardous wastes to prevent environmental pollution and health risk; b) remarked water body could not be filled up/changed, in case of national interest, it can be done after getting clearance from the respective department; and c) restriction on hill cutting d) Emitter of any activities/incident will be bound to control the emission of environmental pollutants that exceed the existing emission standards.

2.4.2 Environment Conservation Rules (ECR), 1997 (as amended in in 2002 & 2003)

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

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

2.4.3 The Environment Court Act, 2010

55. The Environment Court Act, 2010 provides for the establishment of environment courts and matters incidental thereto. This act also provides the establishment of special magistrate's court, trial procedure in special magistrate's court, jurisdictions of environment court, the penalty for violating court's order, judgement of offence by special magistrate's court, procedure of judgement of special magistrate's court, the power of entry and arrest, the procedure for search, impose case and investigation, procedure and power of environment court, power of impose penalty, procedure for collection of penalty, power for inspection of environment court, appeal procedure and formation of environment appeal court.

2.4.4 National Environmental Policy 2018

56. The national environmental policy has been updated in 2018. The environmental policy is a comprehensive framework environmental action, together with a set of broad sectoral action guidelines. The objectives of the updated environmental policy as follows:

- Natural equilibrium provision and overall development of the country through environmental protection and sustainable management
- The spread of adaptation programs to reduce the adverse effects of climate change in the country
- Encourage collection and promotion of low carbon emission technology in the country
- Identifying and controlling all types of environmental pollution and degradation activities
- Ensure environmental development in all fields
- Ensure sustainable, long term and environmentally friendly use of all-natural resources
- Exploring and expanding the areas of mutual cooperation in regional and international arenas for the development of global environment
- Built up the environment education, capacity building, public awareness, and public opinion to protect the environment
- To take public private partnership for the development of the environment
- Maintain and streamline the environmental policies and strategies among other policy strategies in the interest of sustainable development
- Creating a population capable of dealing with all kinds of environmental and environmental issues, including climate change
- Ensure the Environmental Impact Assessment and Strategic Environmental Assessment in all necessary sectors
- To discourage the introduce of foreign and invasive species of animals and plants, if necessary, make decisions through adequate research
- Actively involved as possible with all international environmental initiatives and to take necessary actions at local and national levels
- Take action to reduce poverty through environmental protection
- Strengthen observations on proper compliance with environmental laws and regulations

57. The updated environmental policy includes total twenty-four sectors and areas. The policy includes outline of organizational set-up and national environmental policy compliance for different sectors.

2.4.5 The Acquisition and Requisition of Immovable Property Act, 2017

58. The Government of Bangladesh have enacted a new land acquisition law titled The Acquisition and Requisition of Immovable Property Act (ARIPA), 2017 replacing the 1982 Ordinance depending on the need and requirements of the day. The ARIPA 2017 requires that compensation be paid for: (i) land and assets permanently acquired (including standing crops, trees, houses); and (ii) any other damages caused by such acquisition. The act also

provides for the acquisition of properties belonging to religious organizations like mosques, temples, pagodas, and graveyards if they are acquired for public interest. The act stipulates certain safeguards for the landowners and provides for payment of “fair value” for the properties acquired.

59. The following are the key features:

- The act spell out that whenever it appears to the deputy commissioner that any property in any locality is needed or is likely to be needed for any public purpose or in the public interest, he shall cause a notice to be published (under section 4 of the act) at convenient places on or near the property in the prescribed form and manner stating that the property is proposed to be acquired.
- In case of acquisition of immovable property for any non-governmental person or organization, whatever be the amount of the immovable property, sanction of the government must be taken before the initiation of acquisition proceeding.
- The deputy commissioner, before the publication of notice, in the prescribed manner and form, shall record the real nature, condition and infrastructures built therein, crops and trees of the proposed immovable property in video or still picture or any other technology and thereafter prepare a report accordingly.
- The act also says that religious places, graves, or crematoriums can be taken into acquisition. Provided that, if it essential in public purpose or public interest, by relocation and rebuilding, in the own money of the requiring persons or organizations, it may be taken into acquisition.
- In case property exceeds 50 standard bighas (or 16.5 acre) of land, the deputy commissioner should submit the record of the proceedings held by him, together with his opinion, for the decision of the Ministry of Land; and if the property does not exceed 50 standard bighas (or 16.5 acre) of land, submit the record of the proceedings held by him, together with his opinion, for the decision of the commissioner
- Deputy commissioner once decided for acquisition of any property shall cause public notice (under section 7 of the act) to be given in the prescribed manner at convenient places on or near such property stating that the deputy commissioner, has decided to acquire the property and intends to take possession thereof.
- The amount of compensation to be awarded for any property the deputy commissioner will take into consideration: (a) the market value of the property at the date of publication of the notice; (b) the damage that may be sustained by the person interested, by reason of the taking of any standing crops or trees which may be on the property at the time of the making of the joint list; (c) the damage that may be sustained by the person interested by reason of severing such property from his other property; (d) the damage that may be sustained by the person interested by reason of the acquisition injuriously affecting his other properties, movable or immovable, in any other manner, or his earnings; and (e) if in consequence of the acquisition of the property, the person interested is likely to be compelled to change his residence or place of business, the reasonable expenses, if any, incidental to such change.
- The most important feature of the act is that, if the government is acquiring land, it shall provide the persons interested with compensation of 200 per centum of the market price as defined in sub-section 1 (a), and if the government acquires the land for any non-government person then the amount of compensation shall be 300 per centum.
- In cases of injuries during the acquisition period, an additional 100 per centum compensation shall be provided.
- The Act says in spite of any compensation provided under the law; necessary steps may be taken to rehabilitate evicted persons due to acquisition.
- The act also provides for an appointment of arbitrator. The affected landowners have a provision of filing arbitration case and a right to be heard by the arbitrator if any entitled person is not agreeable with the calculation of the cost of compensation.

- The act recognizes the Bargadars[1] and pays compensations for the loss of standing crops being cultivated at the time of land acquisition.

2.5 Other Relevant Acts related to Environment

2.5.1 The Bangladesh Wildlife Preservation Order (1973; amended to Act in 1974)

60. The Bangladesh Wildlife (Preservation) Order 1973 and amended to Act 1974 provides for the preservation, conservation, and management of wildlife in Bangladesh. The earlier legislations on wildlife preservation, namely, the Elephant Preservation Act, 1879, the Wild Bird and Animals Protection Act, 1912, and the Rhinoceros Preservation Act, 1932 have been repealed and their provisions have been suitably incorporated in this law.

2.5.2 The National Forest Policy (1994)

61. The National Forest Policy of 1994 is the amended and revised version of the National Forest Policy of 1977 in the light of the National Forestry Master Plan. The major target of the policy is to conserve the existing forest areas and bring about 20% of the country's land area under the forestation program and increase the reserve forest land by 10% by the year 2015 through coordinated efforts of government organizations, non-government organizations and active participation of the people.

2.5.3 Wildlife (Conservation and Security) Act 2012

62. The Wildlife (protection and safety) Act 2012 passed in Parliament on 8th July 2012. Under this act, the hunting, trapping, killing of wildlife are strictly prohibited. After the establishment of this act, a board will be formed with the concerned members recommended by the government. There are certain provisions kept in this act, e.g. entrance, management, rules, and regulation of the protected area etc. If any person without license performs any kind of trade, he will be jailed for at least a year.

2.6 Policy Related with Energy Development

2.6.1 The Electricity Act, 2018 and Electricity Rules 1937

63. The Electricity Act enacted on 12th February 2018 repealed the former Electricity Act of 1910 with amendments to develop and reform the sectors of power generation, transmission, supply and distribution and for better service delivery to consumers and to meet the increasing demand for electricity. The act specifies the role of licensees in the supply of energy and construction of lines for energy transmission. The key features of the act are:

Table 2.1: Key issues of Electricity Act 2018

Chapter	Issues	Provisions in the Electricity Act, 2018
Chapter 3, section 6	Civil works	If any licensee is permitted to lay power supply lines within the area of supply or, subject to the terms of his license, beyond the area of supply, the licensee may, as soon as may be, do necessary civil works, with intimation to the concerned person or the local authority, as the case may be, for supplying electricity to that area. Licensee must take consent from all affected parties. However, if any power supply line or civil works creates any obstacle to proper execution of legitimate authority of any person, the licensee may shift the site for power supply line or civil works.

[1] "Bargadar" means a person who under the system generally known as adhi, barga, or bhag cultivates the land of another person on condition of delivering a share of produce of such land to that person. [See, section 2 (a), the Land Reforms Ordinance, 1984 (Ordinance No. X of 1984)].

Chapter 3, section 9	Damages	If any road, railway, underground drain, sewer or tunnel is damaged in consequence of civil works, the part excavated shall have to be filled up by soil, the part damaged shall have to be repaired and the garbage shall have to be removed immediately after such works.
Chapter 3, section 12	Compensation	If any damage, harm or inconvenience is caused while doing civil works under this act, the licensee shall, in such manner as may be prescribed by rules, pay compensation to the person affected or the owner of the land affected for acquiring land for construction of electricity towers.
Chapter 3, section 13	Right of Way	For the purpose of laying power supply lines or doing civil works under this act, the licensee shall reserve the right of way over the land and the space above or underground there of: Provided that the licensee shall inform the land owner in writing before laying of power supply lines and doing civil works within a reasonable time.
Chapter 3, section 14	Acquisition of land	If acquisition of land is required for establishment of power generation plant or sub-station, it shall be deemed to have been necessary for public interest and the existing laws and regulations on acquisition of land shall have to be followed. If any private company holding license requires any land for constructing any connection line with power station, sub-station or grid substation the licensee may purchase or acquire such land from the concerned landowner in accordance with the existing laws and regulations regarding land acquisition.
Chapter 5, section 29	Accidents and investigation	If any accident occurs or any risk arises due to power generation, transmission, supply or distribution or due to power supply line or any other work, the person affected or the person having knowledge of it, as the case may be, may give notice in writing to the authority of such incidence or damage.

2.6.2 The Telegraph Act (1885)

64. Under sections 10-19, Part III (Power to Place Telegraph Lines and Posts), the government can build poles and towers on public land without giving any land compensation.

2.6.3 The Power Policy, 1995

65. As with the Petroleum Policy, this is presently an integral part of the National Energy Policy 1996. It has different policy statements on a whole range of issues including demand forecast, long- term planning and project implementation, investment and lending terms, fuels and technologies, electricity supply to the west zone, isolated and remote load centers, tariff, captive and stand by generation, system loss reduction, load management and conservation, reliability of supply, system stability, load dispatching, institutional issues, private sector participation, human resource development, regional/international cooperation, technology transfer and research program, environment policy and legal issues.

2.6.4 The Energy Policy (1996 updated 2004)

66. The first National Energy Policy (NEP) of Bangladesh was formulated in 1996 by the Ministry of Power, Energy and Mineral Resources to ensure proper exploration, production, distribution and the rational use of energy resources to meet the growing energy demands of different zones, consuming sectors and consumers groups on a sustainable basis. With rapid change of the global as well as the domestic situation, the policy was updated in 2004. The updated policy includes additional objectives namely to ensure environmentally sound sustainable energy development programs causing minimum damage to the environment, to encourage public and private sector participation in the development and management of the

energy sector and to bring the entire country under electrification. The policy highlights the importance of protecting the environment by requiring an EIA for any new energy development project, or introduction of economically viable and environment friendly technology.

2.6.5 The Industrial Policy (1999)

67. The National Industrial Policy, 1999 aims to ensure a high rate of investment by the public and private sectors, a strong productive sector, direct foreign investment, development of labor-intensive industries, introduction of new appropriate technology, women's participation, development of small and cottage industries, entrepreneurship development, high growth of export, infrastructure development and environmentally sound industrial development. The World Trade organization (WTO) guidelines have been proposed to be followed in the industrial policy.

2.7 Other Relevant National Legal Instruments for the Project

68. **Table 2.2** presents an outline of other national legal instruments that will have relevance to the proposed Project with respect to the social and environmental considerations.

Table 2.2: Summary of National Legal Instruments relevant to the Project

Act/Rule/Law/Ordinance	Responsible Agency-Ministry/Authority	Key Features	Applicability to the Project
The Environment Conservation Act, 1995 and subsequent amendments in 2000 and 2002	Department of Environment, Ministry of Environment, Forest, and Climate Change	- Define applicability of environmental clearance; - Regulation of development activities from environmental perspective; - Framing applicable limits for emissions and effluents; - Framing of standards for air, water, and noise quality; - Formulation of guidelines relating to control and mitigation of environmental pollution, conservation, and improvement of environment - Declaration of ECAs	Applicable
Environmental Conservation Rules, 1997 and subsequent amendments in 2002 and 2003	Department of Environment, Ministry of Environment, Forest, and Climate Change	- Requirement of ECC for various categories of projects; - Requirement of IEE/ESIA as per category; - Renewal of the environmental clearance certificate within 30 days after the expiry; - Provides standards for quality of air, water and sound and acceptable limits for emissions/discharges from vehicles and other sources	Applicable as the Project falls under Red Category and require environmental clearance
Environment Court Act, 2010	Department of Environment, Ministry of Environment, Forest, and Climate Change	- Highest priority accorded to environment pollution; - Completion of environment related legal proceedings effectively.	Applicable for completing environmental legal requirements effectively
The Vehicle Act, 1927; The Motor Vehicles Ordinance, 1983; and The Bengal Motor Vehicle Rules, 1940	Bangladesh Road Transport Authority	- Exhaust emissions; - Vehicular air and noise pollution; - Road/traffic safety; - Vehicle Licensing and Registration; - Fitness of Motor Vehicles; - Parking by-laws	Applicable

Act/Rule/Law/Ordinance	Responsible Agency-Ministry/Authority	Key Features	Applicability to the Project
Water Supply and Sanitation Act, 1996	Ministry of Local Government, Rural Development and Cooperatives	- Management and Control of water supply and sanitation in urban areas	Not directly applicable, however, indirectly applicable when considering water usage management and sanitation facilities
The Ground Water Management Ordinance, 1985	Upazila Parishad	- Management of ground water resources; - Installation of tube-wells at any place after license from Upazila Parishad only	Water required for construction work (e.g., foundation, cement curing, etc.) can be sourced from tube wells. In case of non-availability of water source (tube wells), contractor will procure water from nearby sources. In case of construction of ground water abstraction units (tube wells) at Project site, then licenses will need to be obtained prior to installation of any tube-wells.
The Forest Act, 1927 and subsequent amendments in 1982 and 1989	Ministry of Environment, Forest and Climate Change	- Categorization of forests as reserve, protected and village forests - Permission is required for use of forest land for any non-forest purposes	Not directly applicable as proposed Project is not on forest land. However, in case of distribution network traversing through forest area, proposed project will necessitate tree felling/lopping of tree brunches, pruning triggering approval from Forest Department.
Bangladesh Wildlife (Preservation) Act, 1974	Ministry of Environment, Forest and Climate Change, Bangladesh Wildlife Advisory Board	- Preservation of Wildlife Sanctuaries, Parks, and Reserves	Applicable, in case, proximity of the project site to Wildlife Sanctuaries, Parks, and Reserves.
The Bangladesh Wildlife (Conservation & Security) Act, 2012	Department of Forest, Ministry of	- To conserve and protect wildlife in Bangladesh including designation of protected areas. Protection of wildlife is provided with lists of species with four schedules: first,	Applicable if the project will pass through the wildlife sanctuaries and other protected areas.

Act/Rule/Law/Ordinance	Responsible Agency-Ministry/Authority	Key Features	Applicability to the Project
	Environment, Forest, and Climate Change	second, third and fourth schedule. The fourth schedule species have the highest level of protection.	
National Biodiversity Strategy and Action Plan (2004)	Ministry of Environment, Forest, and Climate Change	- Conserve, and restore the biodiversity of the country for well-being of the present and future generations - Maintain and improve environmental stability for ecosystems - Ensure preservation of the unique biological heritage of the nation for the benefit of the present and future generations - Guarantee the safe passage and conservation of globally endangered migratory species, especially birds and mammals in the country - Stop introduction of invasive alien species, genetically modified organisms and living modified organisms	Applicable for conservation of bio-diversity in the study area
The Protection and Conservation of Fish Act 1950 subsequent amendments in 1982	Ministry of Fisheries and Livestock	- Protection and conservation of fish in Government owned water bodies	Applicable
The Embankment and Drainage Act 1952	Ministry of Water Resources	- An Act to consolidate the laws relating to embankment and drainage and to make better provision for the construction, maintenance, management, removal and control of embankments and water courses for the better drainage of lands and for their protection from floods, erosion and other damage by water	Applicable
Antiquities Act, 1968	Ministry of Cultural Affairs	- This legislation governs preservation of the national cultural heritage, protects and controls ancient monuments, regulates antiquities as well as the maintenance, conservation and restoration of protected sites and monuments, controls planning, exploration and excavation of archaeological sites	Not applicable as the study area does not have any likely cultural heritage or ancient monuments of national or international significance. However, in case, any such evidence of archaeological

Act/Rule/Law/Ordinance	Responsible Agency-Ministry/Authority	Key Features	Applicability to the Project
			findings arises, the Project will act in consonance to the Act
The Acquisition and Requisition of Immovable Property Act, 2017	Ministry of Land	- Current GOB Act and Guidelines, relating to acquisition and requisition of land	Applicable as two substation lands have been acquired
The Factories Act, 1965 Bangladesh Labor Law, 2006, Bangladesh Labor Rules 2015	Ministry of Labor	- This Act pertains to the occupational rights and safety of factory workers and the provision of a comfortable work environment and reasonable working conditions	Applicable
Noise Pollution (Control) Rules 2006	Ministry of Environment, Forest, and Climate Change	- Prevention of Noise pollution; - Standards for noise levels.	Applicable
Ozone Depleting Substances (Control) Rules, 2004	Ministry of Environment, Forest, and Climate Change	- Ban on the use of Ozone depleting substances - Phasing out of Ozone depleting substances	Applicable

2.8 Compliance with International Requirements

69. Bangladesh has acceded to, ratified, or signed a number of major international treaties, conventions and protocols related to environment protection and conservation of natural resources.

2.8.1 Rio Declaration

70. United Nations Conference on Environment and Development (UNCED) in 1992 adopted the global action Program for sustainable development called 'Rio Declaration' and 'Agenda 21'. Principle 4 of The Rio Declaration, 1992, to which Bangladesh is a signatory along with a total of 178 countries, states, "In order to achieve sustainable development, environmental protection should constitute an integral part of the development process and cannot be considered in isolation from it".

2.8.2 Convention on Biological Diversity, (1992)

71. The Convention on Biological Diversity, Rio de Janeiro, 1992 was adopted on 5th June 1992 and entered into force on 29 December 1993. Bangladesh ratified the convention on 20thMarch, 1994. This is the overarching framework for biodiversity and the signatories are required to develop a National Bio-diversity Strategy and Action Plan that incorporates the articles of the convention into national law and statutes.

72. Obligation has been placed on state parties to provide for environmental impact assessments of projects that are likely to have significant adverse effects on biological diversity.

2.8.3 Wetlands of International Importance as Waterfowl Habitat, (1971)

73. Convention of wetlands of international importance as waterfowl habitat (1971) is a convention that is also known as the Ramsar Convention. It was adopted on 02 February 1971 and entered into force on 21 December 1975. Bangladesh ratified the convention on 20 April 2002. This provides a framework for national action and international cooperation for the conservation and wise use of wetlands and their resource. There are 127 parties with 1,085 wetland sites designated as 'Wetlands of International Importance'.

74. This is an intergovernmental treaty, which provides the framework for international cooperation for the conservation of wetland habitats. Obligations for contracting parties include the designation of wetlands to the "List of Wetlands of International Importance', the provision of wetland considerations within their national land use planning, and the creation of natural reserves.

75. Bangladesh has two Ramsar sites-parts of the Sundarbans reserved forest (southwest of Bangladesh) and Tanguar Haor (Northeast of Bangladesh). The proposed project will not have any effect on these two Ramsar sites.

2.8.4 UN Convention on the Law of the Sea, Montego Bay, (1982)

76. This convention was adopted on 10 December 1982 at Montego Bay, Jamaica and Bangladesh has ratified this convention.

2.8.5 Others (Conventions and Agreements)

77. The following conventions and agreements include provisions which may be relevant for environmental management, nature protection, and biodiversity conservation:

- Convention relative to the Preservation of Fauna and Flora in their Natural State 1933; International Convention for the Protection of Birds, Paris, 1950;
- International Plant Protection Convention, Rome, 1951;
- The Convention Concerning the Protection of the World Cultural and Natural Heritage, Paris, 1972 has been ratified by 175 states. This defines and conserves the world's heritage by drawing up a list of natural and cultural sites whose outstanding values

should be preserved for all humanity. Of the 730 total sites, there are currently 144 natural, 23 mixed and 563 cultural sites that have been inscribed on the World Heritage List (distributed in 125 State parties). These are the 'Jewels in the Crown' of conservation;

- Convention on International Trade in Endangered Species of Wild Fauna and Flora, Washington, 1973 (Popularly known as CITES): 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 species which are threatened by unsustainable use patterns;
- 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;
- Basel Convention - this convention came into force on 5 May 1992 and ratified by Bangladesh on 1 April 1993 and aims to reduce the amount of waste produced by signatories and regulates the international traffic in hazardous wastes including PCBs and asbestos;
- Stockholm Convention of Persistent Organic Pollutants (POPs) (1972) —ensures the environmentally sound management and the disposal of POPs including PCBs. Bangladesh singed 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; and
- International Labour Organization (ILO) conventions and protocol ratified by Bangladesh related to the core labor standards.

2.9 Compliance with IFC Environmental, Health and Safety (EHS) Guidelines

78. Section 4 on Construction and Decommissioning of the IFC EHS General Guidelines (April 30, 2007) will be applicable for this project. In addition, the IFC EHS Guidelines for Electric Power Transmission and Distribution (April 30, 2007) also needs to be considered while designing the substations and distribution line components and undertaking the environmental assessment. It requires 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. BREB shall follow the IFC EHS Guidelines for this project and shall also ensure that all appointed contractors and their subcontractors follow them.

2.10 Compliance with ADB Safeguard Policy Statement, 2009

79. ADB's environmental and social safeguards form the cornerstone of its support to 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 (2009) governing the environmental and social safeguards of ADB's operations. The objectives of the Safeguard Policy Statement are to avoid, or when avoidance is not possible, to minimize and mitigate adverse project impacts on the environment and affected people, and to help borrowers strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

80. ADB environmental safeguards emphasis development and implementation of a comprehensive EMP. Key elements of EMPs are mitigation measures, monitoring programs, cost estimates, budgets, and institutional arrangements for implementation. In addition, the environmental assessment process emphasizes public consultation, information disclosure, and consideration of alternatives.

81. The key safeguard areas which must be addressed are (i) environmental, (ii) involuntary resettlement, and (iii) indigenous peoples.

82. ADB adopts a set of specific safeguard requirements that borrowers/clients are required to meet in addressing environmental and social impacts and risks.

83. 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.

84. 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.

2.11 Environmental Categorization and Standards

2.11.1 Environmental Category: Bangladesh

85. For the purpose of issuance of environmental clearance certificate, the industrial units and projects shall, in consideration of their site and impact on the environment, be classified into the following four categories: (a) Green; (b) Orange – A; (c) Orange – B; and (d) Red. The Industries and projects included in the various categories are specified in sub-rule (1) have been described in Schedule – 1. The ECA indicates that all industrial units or projects must obtain a location clearance certificate (LCC) and environmental clearance certificate (ECC) from the Department of Environment (DOE). No industrial unit or project shall be established or undertaken without obtaining environmental clearance from DOE in the manner prescribed by the rules.

86. The environmental category of the substation is not listed in Schedule – 1 of ECR but the power distribution line is under red category (Item-64). The construction of distribution lines and related substations is classified as red category.

2.11.2 Environmental Category: ADB

87. The Safeguard Policy Statement (2009) of ADB provides guidance on the environment category of projects based on the degree of anticipated environmental impacts. ADB environmental safeguards objectives are: (i) to ensure the environmental soundness and sustainability of projects and (ii) to support the integration of environmental considerations into the project decision-making process. ADB environmental safeguards are triggered if a project is likely to have potential environmental risks and impacts. The initial process of categorization involves filling out a sectoral Rapid Environmental Assessment (REA) checklist. A project is classified as one of the four environmental categories (A, B, C, or FI) based on the most environmentally sensitive component. Categories are as follows:

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

88. The project has been evaluated considering the outcome of the ADB rapid environmental assessment (REA) checklist. The magnitude of potential impacts and the presence of environmentally sensitive areas near to substations and along the proposed alignment of new 33 kV/11 kV lines have been screened (IBAT tool used to screen) to determine likely significance.

89. The project is unlikely to cause any significant irreversible, diverse, or unprecedented adverse environmental impacts. This is due to the following facts (i) project components are located in semi-urban and rural areas which do not support high biodiversity values and will be away from legally protected areas or internationally or nationally important biodiversity areas or physical cultural resources; and (ii) there will be only minor civil works required for the project. Impacts are mostly site-specific with substations mostly being installed close to villages and distribution lines generally being installed along existing road alignments.

90. ADB's Safeguard Policy Statement (2009) sets out the requirements for environmental safeguard that applies to all ADB-financed projects. Under ADB's Safeguard Policy Statement, the project is classified as "B" on environment requiring the preparation of an IEE. Accordingly, this IEE has been prepared covering all components of this AF project.

2.12 Compliance with BREB Health Environment and Safety (HES) Requirements

91. The BREB has its own policy and requirements for compliance relating to environment, health, and safety issues for its operations. The company is committed to managing its operations in a safe, efficient, and environmentally responsible manner. The BREB's Health Environment and Safety (HES) manuals, guidelines, procedures, and plans are important tools of their commitment. HES manuals include:

- Environmental Impact Assessment Module,
- Guideline on Integrated Impact Assessment,
- Health Impact Assessment Module, and
- Social Impact Assessment Module.

92. In addition, requirement for impact assessment is affirmed in the BREB's Statement of General Business Principles. The BREB is committed to:

- Pursuing the goal of no harm to people,
- Protecting the environment, and
- Managing HES as any other critical business activity.

Chapter 3

3. Project Description

3.1 Background of the Project

93. The Asian Development Bank (ADB) approved the Bangladesh Power System Enhancement and Efficiency Improvement Project on 29 March 2017 aims to improve electricity transmission and distribution in the country. The project is being under implementation. Implementing agencies of the ongoing project are: (i) Bangladesh Rural Electrification Board (BREB); (ii) Dhaka Electricity Supply Company Limited; (iii) Power Division of Ministry of Power, Energy, and Mineral Resources; and (iv) Power Grid Company of Bangladesh Limited.

94. The parent project includes four main outputs (i) national transmission network in southern Bangladesh strengthened, (ii) distribution network improved, (iii) distribution network in rural areas improved, and (iv) capacity in power sector agencies enhanced.

95. An additional financing (AF) is programmed for component 3 for BREB to efficient and reliable electricity supply to the western zone (Khulna) of Bangladesh. The aim of the project is to contribute 100% access to power by 2021 and improved power sector sustainability in Bangladesh by 2030.

3.2 Project Location

96. The project is located in Khulna Division of Bangladesh. The proposed project site covers 37 upzilas of 10 districts under Khulna division. The project activity will be carried out under nine PBSs. The administrative location of the 51 identified substations is shown in Table 3.1 and depicted in **Figure 2.1**.

Table 3.1: Administrative Location of Project Activities

PBS Name	Name of Substation	District	Upazila	Union	Mauza	Village	GPS Coordinate
Bagerhat	Bagerhat-3	Bagerhat	Bagerhat Sadar	Dema	Kashempur	Kashempur	22.597728°N 89.757624°E
	Chitalmari-2	Bagerhat	Chitalmari	Chitalmari	Khoria	Khoria	22.808734°N 89.777686°E
	Rupsha-2	Khulna	Rupsha	Ghatbug	Doba	Doba	22.847681°N 89.654444°E
Jashore-1	Bagharpara-4	Jashore	Bagharpara	Narkel Baria	Uttar Srirampur	Uttar Srirampur	23.263687°N 89.347350°E
	Chaugacha-3	Jashore	Chaugacha	Fulsara	Afra	Afra	23.241282°N 89.091343°E
	Jashore-7	Jashore	Jashore Sadar	Fatepur	Fatepur	Daitola	23.166768°N 89.277163°E
	Jashore-8	Jashore	Jashore Sadar	Deyara	Alamnagar	Alamnagar	23.166359°N 89.140258°E
	Jashore-9	Jashore	Jashore Sadar	Deyara	Teghoria	Teghoria	23.128617°N 89.149665°E
	Jikorgacha-5	Jashore	Jikorgacha	Godkhali	Patuapara	Patuapara	23.073691°N 89.061410°E
	Sharsha-5	Jashore	Sharsha	Ulashi	Ulashi	Tushipara	23.01700°N

PBS Name	Name of Substation	District	Upazila	Union	Mauza	Village	GPS Coordinate
							88.99400°E
	Sharsha-6	Jashore	Sharsha	Dihi	Nouhati	Nouhati	23.153600°N 88.968344°E
Jashore-2	Abhaynagar-4	Jashore	Abhaynagar	Godkhali	Vogilhat	Paikpara	23.117268°N 89.265130°E
	Abhaynagar-5	Jashore	Abhaynagar	Sundoli	Arpara	Arpara	23.05969°N 89.33705°E
	Kalia-3	Narail	Kalia	Kolabaria	Kolabaria	Kolabaria	23.00322°N 89.69539°E
	Kalia-4	Narail	Kalia	Purulia	Purulia	Lokkhipur	23.071182°N 89.550023°E
	Lohagara-3	Narail	Lohagara	Dighulia	Dighulia	Chardighulia	23.104733°N 89.646848°E
	Narail-3	Narail	Narail Sadar	Shahabad	Doljitpur	Doljitpur	23.208962°N 89.492911°E
	Narail-4	Narail	Narail Sadar	Tularampur	Durbajhuri	Durbajhuri	23.163592°N 89.449254°E
Jhenaidha	Harinakundu-2	Jehnaidah	Harinakundu	Joradaha	Ramnagar	Horishpur	23.688021°N 89.059744°E
	Jhenaidah-4	Jehnaidah	Jehnaidah Sadar	Noldanda Rajbari	Kajoli	Kajoli	23.450102°N 89.184377°E
	Kaliganj -4	Jehnaidah	Kaliganj	Maliyat	Pachkahonia	Pachkahonia	23.336117°N 89.204351°E
	Moheshpur-4	Jehnaidah	Moheshpur	Shamkur	Gurdha	Gurdha	23.340908°N 88.792177°E
	Moheshpur-5	Jehnaidah	Moheshpur	Pantapara	Ghugri Kagmari	Ghugri	23.337115°N 88.854131°E
	Shailkupa-3	Jehnaidah	Shailkupa	Dignarar	Shiddhi	Shiddhi	23.715661°N 89.206150°E
Khulna	Batiaghata-4	Khulna	Batiaghata	Batiaghata	Hetalbonia	Hetalbonia	22.734910°N 89.501123°E
	Batiaghata-5	Khulna	Batiaghata	Gongarampur	Khejurtola	Andaria	22.681759°N 89.527336°E
	Dacope-3	Khulna	Dacope	Tildanga	Tildanga	Khona	22.595160°N 89.480876°E
	Digalia-1	Khulna	Dighalia	Gazirhat	Ketla	Ketla	22.937997°N 89.577928°E
	Dumuria-4	Khulna	Dumuria	Sorabpur	Gulbaria	Gulbaria	22.698924°N 89.433210°E
	Dumuria-5	Khulna	Dumuria	Sobna	Mother	Baramother	22.746552°N 89.365906°E
	Koyra-2	Khulna	Koyra	Amdi	Naksha	Naksha	22.48548°N 89.27546°E

PBS Name	Name of Substation	District	Upazila	Union	Mauza	Village	GPS Coordinate
Kushtia	Daulatpur-5	Kushtia	Daulatpur	Rifatpur	Shitlaichonoi	Ghoramara	23.97736°N 88.88124°E
	Khoksha-2	Kushtia	Khoksha	Janipur	Ektarpur	Ektarpur	23.77083°N 89.29168°E
	Khoksha-3	Kushtia	Khoksha	Jointihajra	Uthali	Vobaniganj	23.86821°N 89.34121°E
	Kushtia-4	Kushtia	Kushtia Sadar	Jogoti	Dkaka Jhalupara	Dkaka Jhalupara	23.895038°N 89.086991°E
	Kushtia-5	Kushtia	Kushtia Sadar	Gushami Durgapur	Bamongram	Bamongram Arpara	23.77044°N 89.02309°E
	Kushtia-6	Kushtia	Kushtia Sadar	Horinarayanpur	Santidanga	Santidanga	23.72671°N 89.14925°E
	Mirpur-3	Kushtia	Mirpur	Bahalbaria	Khadimpur	Noudakhadimpur	23.97719°N 89.02438°E
Magura	Sripur-2	Magura	Sripur	Nakol	Nakol	Gobindopur	23.53798°N 89.49202°E
Meherpur	Chuadanga-3	Chuadanga	Chuadanga Sadar	Titudhada	Kalopole	Kalopole	23.568180°N 88.925917°E
	Damurhuda-2	Chuadanga	Damurhuda	Kalfadanga	Komorpur	Komorpur	23.587974°N 88.716972°E
	Gangni-4	Meherpur	Gangni	Kazipur	Kazipur	Noudapara	23.939337°N 88.783508°E
	Jibonnagar-3	Chuadanga	Jibonnagar	Raypur	Raypur	Balihuda	23.436630°N 88.904732°E
	Meherpur-3	Meherpur	Gangni	Katoli	Sohogolpur	Gharabaria	23.844712°N 88.658039°E
Satkhira	Asasuni-3	Satkhira	Asasuni	Anulia	Bollavpur	Bollavpur	22.423522°N 89.217904°E
	Debhata-2	Satkhira	Debhata	Shahabad	Parulia	Parulia	22.592187°N 89.036322°E
	Kalaroa-3	Satkhira	Kalaroa	Sonabaria	Beli	Beli	22.88318°N 88.97488°E
	Kaliganj-2	Satkhira	Kaliganj	Shahabad	Pania	Pania	22.486671°N 89.051752°E
	Satkhira-3	Satkhira	Satkhira Sadar	Kuskhali	Vadra	Vadra	22.76962°N 88.96726°E
	Satkhira-4	Satkhira	Satkhira Sadar	Dhulihor	Dhulihor	Dhulihor	22.664510°N 89.111118°E
	Tala-3	Satkhira	Tala	Kholishkhali	Asarnagar	Tikarampur	22.69613°N 89.18052°E

3.3 Project Components

97. AF will construct 51 new substations, installation of 990 km of 33 kV distribution lines, and 3,000 km of 11 kV or below distribution lines. Project activities of additional financing project are shown in Table 3.2. Details of the 51 new substations are provided in Appendix 1.

Table 3.2: Summary of Project Activities

Name of PBS	Construction of 33/11kV Substations (unit)	Installation of 33 kV line (km)	Installation of 11 kV and below line (km)
Bagerhat	3	60	156
Jashore -1	8	132	450
Jashore-2	7	55	579
Jhenaidah	6	143	720
Khulna	7	140	182
Kushtia	7	170	150
Magura	1	13	350
Meherpur	5	185	300
Satkhira	7	92	113
Total	**51**	**990**	**3,000**

Note: km = kilometers, kV = kilo volt.
Source: Bangladesh Rural Development Board

3.4 Construction and Installation Work

98. The power distribution system of the country is based on the power generation and transmission through the national grid, which eventually is fed into substations capable of converting 33kV supply into 11kV and feeding the distribution system with the same.

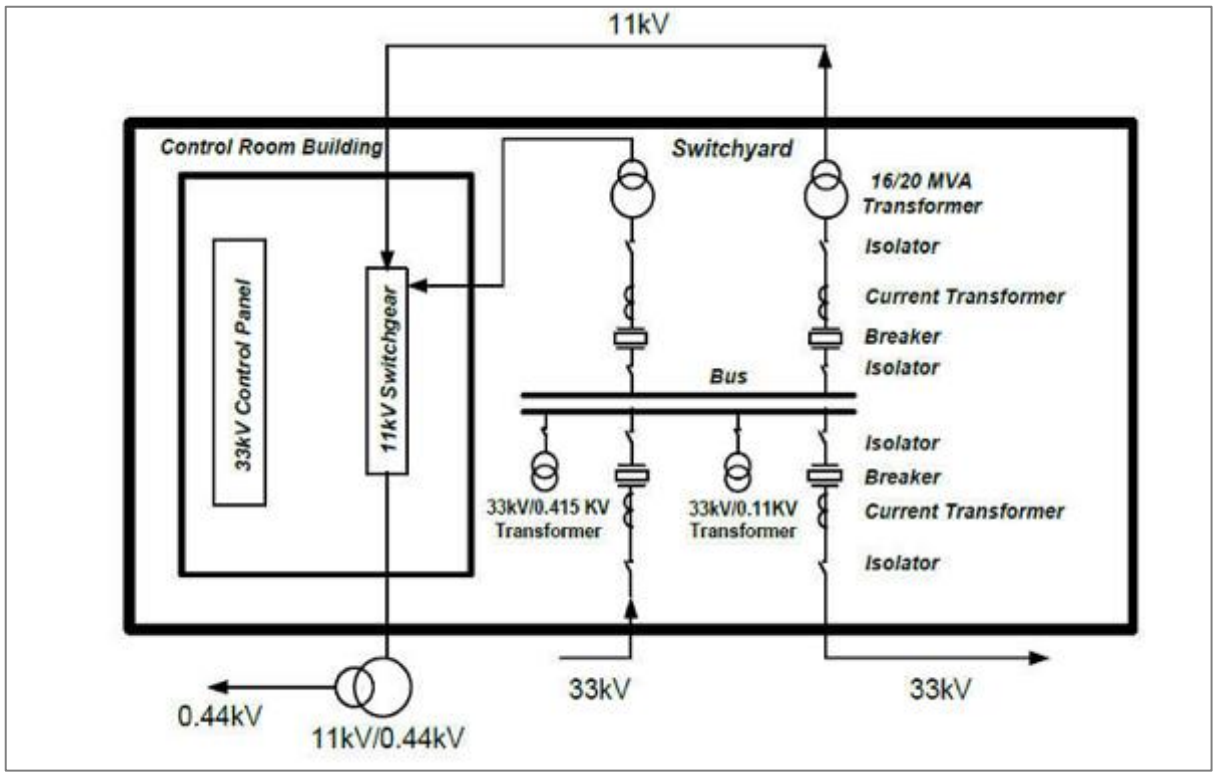
99. **New Substations**: Under the project, there are 51 new 33/11 kV substations to be installed with modern equipment and technology. Most of the new substations will be of outdoor type, which typically requires about 0.40–0.50 acres land. A typical 33/11 kV substation involves installation of 2.5/10 MVA transformers, installation of 33kV bays, a control room, and installation of associated 33/11 kV feeders. A line diagram of the different units in a 33/11kV substation is shown in Figure 3.1

100. Once the selection and purchase of land for the substation are done, subsoil investigations have to be carried out to assess the suitability of the soil for construction of the substation and other infrastructure. The civil construction works include the construction of the control room (building) along with the construction of the foundations for different equipment, followed by the construction of the boundary wall and the guard room.

101. After procurement of the 33kV auto reclosers, 11kV auto reclosers and the 33/1.732/11/1.732kV single phase transformers, these are installed in the switchyard within the substation complex. It should be noted that the weight of such a transformer may exceed 15 tons. Connectivity with the incoming line and the switchgears and between the switchgears and the transformers and the outgoing lines is achieved by laying 33kV, 11kV and 0.415kV cables along with the control cables both inside and outside the control building. Lightening arrestors as well as earthing cable need to be installed to prevent damage of equipment due to lightening during a storm event. The “terminal structures” for the 33kV and 11kV lines need

to be constructed within the premises of the Substation for final connectivity with the distribution system.

Figure 3.1: Typical 33/11kV Outdoor sub-station



102. In summary, the following specific activities need to be considered for assessing environmental impacts during construction phase of a 33/11kV substation:

- Acquisition/purchase of land for substation;
- Mobilization of material and equipment;
- Land development;
- Civil works, including design and construction of foundation for structures, boundary walls, guard room, etc.;
- Installation of electrical equipment, including 33kV and 11kV Auto reclosers, 33/1.732/11/1.732kV transformers, construction of terminal structures for 33 and 11kV lines; and
- Testing and commissioning of substation.

103. **New Distribution Lines**: The project will involve erection of 990 km of 33 KV distribution lines, and 3,000 km of 11 KV or below distribution lines. The 33 kV new lines will connect new substations from existing substations, whereas 11kV new lines will be erected to connect new villages. The distribution line requires erection of poles, cables, and other accessories. The new 33 kV and 11 kV lines will be mostly aligned along the ROW of existing rural roads although some sections may need to pass thorough agricultural or plantation areas; alignments will be determined following detailed line survey by contractors.

104. New distribution line works will involve staging and transportation of equipment, installation of poles for new lines, unrolling of cables, and installation. The new distribution line work will start with detailed route surveys to identify and locate poles and transformers along the route alignment adhering to the national electricity rules and EHS Guidelines on Transmission and Distribution e.g. installation above or adjacent to residential properties or

other locations intended for highly frequent human occupancy (e.g. schools or offices) will be avoided. This will be followed by surveys to ascertain the need to clear the ROW that may have vegetation to be trimmed etc.

105. Temporary labor camps will be setup and equipment (distribution poles, lines, and transformers) will be transported to the project construction site and temporary traffic diversions put in place. Digging of any foundation pits is done manually using auguring tools, concrete mixture for foundation is cast, and poles are unloaded for erection which is done using chain and pulley blocks. Then the pin insulators are mounted and stringing of new wires is done with correct sag to maintain prescribed ROW. Finally, for new lines the transformers are installed on single, double or four pole structures or ground mounted, for which earth works are required. The construction works for new distribution lines will involve minimal excavation and soil removal, to install new poles and any ground level transformers; new transformers and switchgear will however usually be pole mounted. There will be limited use of powered mechanical equipment other than cranes and trucks for equipment transportation. Much of the work will involve manual erection of equipment. The size of construction crew depends upon site conditions, the volume of works and techniques. Typically, a crew of 15 to 20 people will be employed, around 2-3 weeks of work will then be needed for the construction of a 1 km section of 33kV or 11kV line.

3.5 Resource Requirement

3.5.1 Water

106. Water will be required for construction work and the same will be sourced from existing tube-well during construction work, wherever available. In case of non-availability of tube well, contractor will procure water from nearby source. During the construction of new substation, contractor will install tube-well for procuring water.

3.5.2 Land

107. Total 0.40 acres land will be required for each new substation construction. Out of 51 new substations, only two substations land has been acquired through land acquisition process whereas rest 49 substations land will be purchased through willing buy and sell process.

3.5.3 Power requirement

108. Power for construction work will be sourced from existing substation. Diesel generator set may also be used as backup power supply during construction phase of the project.

3.5.4 Material Requirement

109. The main materials specified for the project are as follows:

- Conductor & wire (Underground cable)- 190 km
- Conductor & Guy Accessories
- Distribution Transformer- 2500 nos.
- Sectionalizing devices
- Fuse Links
- Connector
- Guy & grounding wire- 4096 km
- Power Transformer- 20 nos.
- 33kV/11 kV ACR- 68 nos.
- 33 KV VCB with CT/PT & control Cable- 50 nos.
- SPC Poles- 242990 nos.
- Wooden Pole- 6150 nos.

3.6 Pollution Source and Characterization

110. The project development might involve following potential effects on the environment:

- Air emissions;
- Water discharges;
- Waste generation; and

- Noise emission

111. During construction phase of the project i.e. construction of substation and distribution line, pollution is expected. This would include water pollution form labour camp, fugitive, and exhaust air pollution from the movement of vehicle carrying construction material, machinery used during site clearance and levelling of site for substation, material stockpile area etc. The labour camps would be setup for the construction of the substation and distribution lines. These camps would generate solid and liquid waste. These wastes have potential to contaminate the soil and the water bodies around the site if it is not properly handled.

112. The operation of earth moving machineries during construction phase of the project has potential to generate high noise levels. These machineries produce noise level of more than 70 dB (A). This can cause disturbance to the settlement, if located adjacent to substation sites.

3.7 Analysis of Alternatives

113. Alternatives analysis included consideration of the no project alternative. The no project alternative would have no direct negative environmental impacts since no construction works would be involved. However, it will result in further deterioration of the financial state of BREB caused by high aggregate technical and commercial (AT&C) losses from the distribution network as well as aged distribution assets and subsidized tariffs for poor and agricultural consumers. Indirectly this could increase demand for wood and other non-renewable fuels due to poor supply of electricity to meet the power demands of the population. The project will strengthen the country's rural distribution network, reduce AT&C losses, improve the power quality, and reduce outages in the Khulna Region of Western Bangladesh. Therefore, the with project alternative was preferred over the no project alternative.

114. Location alternatives were analyzed by BREB as part of their selection of sites for the new substations. There is little scope for the consideration of alternatives in a project which is linking an existing distribution service to individual household and commercial users. However, during the planning stage and preliminary design, alternatives were considered in the selection of new line routes mainly to maximize the number of consumer connections. Long distribution lines were avoided with specification for short extensions of about one hundred meters only. Availability of a suitable ROW and access to site by overhead distribution lines was preferred to lines crossing open farmland. Short distances to all weather roads were preferred with adequate accessibility for PBS and sub-contractor equipment. Sites with no private land ownership were preferred as were sites away from flood plains, wetlands, and other environmentally sensitive areas. For distribution line alignments, for the sake of public safety, places such as schools, hospitals and places of worship were avoided as where all public utilities wherever possible.

115. The principle that has (and will be) adopted for the selection and design of new equipment is to comply with national requirements as well as considering international good practice per the IFC EHS Guidelines particularly with respect to avoiding the use of PCB oils in purchase of transformers and the use of all asbestos containing materials in new construction.

3.8 Project Cost and Implementation Schedule

116. The project is estimated to cost $313.5 million, including physical and price contingencies and financial charges during construction. The government has requested (i) a regular loan of $70.0 million and (ii) a concessional loan of $130.0 million from ADB's ordinary capital resources to help finance the project.

117. The project will be implemented over a period of five years. The bid document preparation will be started from the fourth quarter of 2020 and the project will be ended in fourth quarter of 2025 (estimated). The project implementation plan is shown in Table 3.3.

Table 3.3: Project Implementation Plan

Year	2020	2021				2022				2023				2024				2025			
Description	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Bid documents preparation																					
Tendering and award																					
Preparatory works (survey, setting up of site store and etc.,) and mobilization																					
Supply and erection of equipment including civil works																					
Testing and commissioning																					

Sources: Bangladesh Rural Electrification Board and Asian Development Bank estimates.

Chapter 4

4. Description of the Environment

4.1 Introduction

118. This section establishes the baseline environmental and socio-economic status of the study area to provide a context within which the impacts of the project are to be assessed.

119. Establishing baseline helps in understanding the prevailing environmental and socio-economic status of the study area. It provides the background environmental and social conditions for prediction of the future environmental characteristics of the area based on the operation of the new/ expansion activity of the project during its life cycle. It also helps in environmental and social management planning and strategy to minimize any potential impact due to the project activities on surrounding environment.

120. In order to establish the baseline settings of the project areas, field surveys and investigations have been carried out at project sites (new substations locations and alignment of distribution lines) and in the project area of influence.

121. Field assessment have been completed for 51 new substations. The field surveys were carried out by a team of consultants appointed by BREB along with the respected PBS project engineers between July–October 2020. Sample walkover surveys were also conducted of the tentative associated distribution 33kV and 11KV line alignment connected with the new substation during July–October 2020. Field assessments and consultations were carried out with due considerations to covid-19 travel restrictions.

122. The environmental studies and surveys have been confined to the project area of influence as defined in ADB's Safeguard Policy Statement (2009). Assessment is carried out on various environment components including terrestrial and aquatic ecology, soil, water, air, noise, socio-economic aspects including occupational and community health and safety, and physical cultural resources.

123. In this chapter, the environmental setting of the project components is discussed first followed by the description of the environment (physical, biological, and socio-economic and physical cultural) in the project area of influence. As the project activities are spread over entire Khulna region (covering 10 districts and nine PSBs in Western Bangladesh) of the country, the general environmental setting of the affected region is presented with specific details focused on key components mainly new substations and distribution lines.

4.2 Study Area

124. Considering the project activity described in Chapter 3, it is anticipated that scale and magnitude of project related impacts are likely to be perceived in an area within 500 m both side of the alignment for distribution lines and within 1 km from boundary of substations site and has been considered to be the study area for the IEE. However, the potential impact zone is considered up to 5 km radius of substations and distribution line alignments in respect of indirect impacts on environmentally sensitive areas such as national protected areas networks.

125. Baseline data collection involved collection of primary and secondary data through identifying and collecting available published material and documents on relevant environmental and social aspects (like soil quality, hydrogeology, hydrology, drainage pattern, ecology, meteorology and socio-economic conditions) from veritable sources including government departments, research papers, etc.

Table 4.1: List of Substations and Study Area

PBS Name	District	Upazila/ sub-district
Bagerhat	Bagerhat	Bagerhat Sadar, Chitalmari
	Khulna	Rupsha
Jessore 1	Jashore	Jashore Sadar, Jhikargachha, Sharsha, Chaugachha, Bagherpara
Jessore 2	Jashore	Abhaynagar
	Narail	Kalia, Lohagara, Narail Sadar
Jhenaidah	Jhenaidah	Harinakunda, Jhenaidah Sadar, Kaliganj, Moheshpur, Shailkupa
Khulna	Khulna	Batiaghata, Dumuria, Dacope, Dighalia, Koyra
Kushtia	Kushtia	Daulatpur, Khoksha. Kushtia Sadar, Mirpur
Magura	Magura	Sreepur
Meherpur	Chuadanga	Chuadanga Sadar, Damurhuda, Jibonnagar
	Meherpur	Gangni,
Satkhira	Satkhira	Assasuni, Debhata, Kalaroa, Kaliganj, Satkhira Sadar, Tala

4.3 Environmental Setting of the New Substation Sites

126. As part of the environmental assessment, field visits were undertaken to the selected locations of the proposed 51 new 33/11 kV substations. The objectives of the site surveys are to identify the typical physical, biological, and socio-economic conditions in and around the proposed sites of 33/11 kV substations. The field surveys along with consultations were undertaken in the months of July–October 2020.

127. Key environmental features (along with site conditions) of the 51 new substation sites are summarized in Table 4.2. Baseline profile along with site photographs of each surveyed substation is provided in Appendix 2.

Table 4.2: Summary Environmental Features of New Substation Sites

S. No.	Substation Name	District/Upazila/Union/Mauza/Village	Access	Land ownership	Land use type	Terrain	Trees & Vegetation	Forest	Habitat Type	Water body	Protected areas	Cultural and religious	Sensitive receptor	Habitation
1.	Bagerhat-3 under Bagerhat PBS	Bagerhat/ Bagerhat Sadar / Dema/ Kashempur/ Kashempur	Yes	Private land	Agricultural land	Flat	Paddy	No Forest	Modified	Canal about 74m to the east	Nil	No	Dema Union Health Complex about 322m to the north	Residential house present 60m to the south
2.	Chitalmari-2 under Bagerhat PBS	Bagerhat/ Chitalmari / Chitalmari / Khaarai/ Doba	Yes	Private land	Agricultural and water body	Low	Partially Paddy	No Forest	Modified	Canal to the south	Nil	No	Proposed sub-station land is near to the residential house	Residential house present 16m to the west
3.	Rupsha-2 under Bagerhat PBS	Bagerhat/ Rupsha / Ghatbog/ Doba/ Doba	Yes	Private land	Agricultural land	Flat	Paddy	No Forest	Modified	Atharobaki River about 430m to the west	Nil	No	Ghatbog Union Health Complex about 1 km from the land	Residential house present 10m to the south
4.	Bagharpara-4 under Jashore PBS-1	Jashore/ Bagharpara /Narikel Baria/Uttar Srirampur/ Uttar Srirampur	Yes	Private land	Agricultural land	Flat	Coconut and Mehogoni	No Forest	Modified	Pond about 60m to west	Nil	No	Bagherpara Upazila Health Complex is about 5km to the south	Residential house at 200m distance to the southwest
5.	Chaugacha-3 under Jashore PBS-1	Jashore/Chaugacha/Fulsara/Afra/ Afra	Yes	Private land	Orchard	Flat	Orchard	No Forest	Modified	Canal appr. 1.2 km to East	Nil	No	Proposed sub-station land is near to the residential house	Residential house at 7m distance
6.	Jashore-7 under Jashore PBS-1	Jashore/Jashore Sadar/Fatepur/Fatepur/Daitola	Yes	Jeshore PBS-1	Agricultural land	Flat	Paddy	No Forest	Modified	Canal about 300m to North and North-East and Bhairab river at	Nil	No	Residential house at 40m distance to the east	Residential house at 40m distance to the east

S. No.	Substation Name	District/Upazila/Union/Mauza/Village	Access	Land ownership	Land use type	Terrain	Trees & Vegetation	Forest	Habitat Type	Water body	Protected areas	Cultural and religious	Sensitive receptor	Habitation
										distance of 470m to the south-east				
7.	Jashore-8 under Jashore PBS-1	Jashore/ Jashore Sadar /Deyara Alamnagar/ Alamnagar	Yes	Private land	Agricultural land	Flat	Paddy	No Forest	Modified	Canal about 640m to east	Nil	No	Amdabad Govt. Primary school about 206m to the west	Residential house at 10m distance to the south
8.	Jashore-9 under Jashore PBS-1	Jashore/Jashore Sadar/Deyara/Fatepur/Daitola	Yes	Private land	Agricultural land	Flat	Paddy	No Forest	Modified	Pond adjacent to substation site at the west	Nil	No	Natunhat public college is about 415 m to the west	Residential house at 600m distance to the southwest
9.	Jhikargacha -5 under Jashore PBS-1	Jashore/ Jhikargacha /Godkhali Patuapara/ Patuapara	Yes	Private land	Orchard and Nursery	Flat	Nursery, Fruit, medicinal and wood trees	No Forest	Modified	Canal about 760m to west	Nil	No	Taora Azizur Rahman Secondary School about 356m to the north	Residential house at 20m distance to the south
10.	Sharsha-5 under Jashore PBS-1	Jashore/Sharsha /Tushipara/Ulashi/Ulashi	Yes	Jeshore PBS-1	Only banana cultivation	Flat	Perennial crop Banana	No Forest	Modified	No waterbody nearby	Nil	No	Nil	Habitation within 500 to north
11.	Sharsha-6 under Jashore PBS-1	Jashore/Sharsha /Dihi/Nouhati/Nouhati	Yes	Private land	Agricultural land	Flat	Paddy	No Forest	Modified	Betna river, 570m to south	Nil	No	Proposed sub-station land is in the village	Village with residential house at 30m

S. No.	Substation Name	District/Upazila/Union/Mauza/Village	Access	Land ownership	Land use type	Terrain	Trees & Vegetation	Forest	Habitat Type	Water body	Protected areas	Cultural and religious	Sensitive receptor	Habitation
12.	Abhaynagar-4 under Jashore PBS-2	Jashore/ Abhaynagar / Godkhali / Vogilhat/ Paikpara	Yes	Private land	Agricultural land	Flat	Paddy	No Forest	Modified	Bhairab river about 1.4km to south	Nil	No	Proposed sub-station land is near to the residential house	Residential house at 250m distance to the north
13.	Abhaynagar-5 under Jashore PBS-2	Jashore / Abhaynagar/ Sundoli/ Arpara/ Arpara	Yes	Private land	Agricultural and fish farm	Low land	Non-Irrigated	No Forest	Modified	Pond about 20m to west	Nil	No	No sensitive receptor presents near to the site	No Residential house present near to the site
14.	Kalia-3 under Jashore PBS-2	Narail/ Kalia/ Kolabaria/ Kolabaria/ Kolabaria	Yes	Private land	Fallow land	Flat	Non-Irrigated	No Forest	Modified	No water body near to the site	Nil	No	Proposed sub-station land is near to the residential house	Residential house at 45m distance to the south west
15.	Kalia-4 under Jashore PBS-2	Narail/ Kalia/ Purulia/ Purulia/ Lokkhipur	Yes	Private land	Agricultural land	Flat	Irrigated	No Forest	Modified	Pond about 23m to north	Nil	No	Proposed sub-station land is near to the residential house	Residential house at 75m distance to the west
16.	Lohagara-3 under Jashore PBS-2	Narail/ Lohagara / Dighulia / Dighulia / Chardighulia	Yes	Private land	Fallow and mango tree	Flat	Non-Irrigated	No Forest	Modified	No water body near to the site	Nil	No	Proposed sub-station land is near to the residential house	Residential house at 50m distance to the east
17.	Narail-3 under Jashore PBS-2	Narail/ Narail sadar / Shahbad/ Doljitpur/ Doljitpur	Yes	Private land	Agricultural land	Flat	Paddy	No Forest	Modified	Canal about 615m to North and Bhairab river at distance of	Nil	No	Shahabad Mazidia Kamil Madrasah about 125 m to the southeast	Residential house at 50m distance to the south

S. No.	Substation Name	District/Upazila/Union/Mauza/Village	Access	Land ownership	Land use type	Terrain	Trees & Vegetation	Forest	Habitat Type	Water body	Protected areas	Cultural and religious	Sensitive receptor	Habitation
										1.6m to the east				
18.	Narail-4 under Jashore PBS-2	Narail/ Narail sadar / Tularampur / Durbajhuri / Durbajhuri	Yes	Private land	Agricultural land	Flat	Irrigated	No Forest	Modified	Branch of Bhairab river about 743 m to the west	Nil	No	Tularampur High school about 895 m to the north west	Residential house present adjacent to the site
19.	Harinakundu-2 under Jhenaidha PBS	Jehnaidah/ Harinakundu/ Joradaha/ Ramnagar/ Horishpur	Yes	Private land	Agricultural land	Flat	Irrigated	No Forest	Modified	Canal about 70 m to the west	Nil	No	Satbridge Bazar Jame Mosque about 220 m to the south west	Residential house present adjacent to the site
20.	Jhenaidah-4 under Jhenaidha PBS	Jehnaidah/ Jehnaidah Sadar/ Noldanda Rajbari / Kajoli / Kajoli	Yes	Private land	Agricultural land	Flat	Irrigated	No Forest	Modified	Pond about 40 m to the west	Nil	No	Proposed sub-station land is near to the residential house	Residential house present about 45 m to the east
21.	Kaliganj-4 under Jhenaidha PBS	Jehnaidah/ Kaliganj / Maliyat / Pachkahonia / Pachkahonia	Yes	Private land	Agricultural land	Flat	Irrigated	No Forest	Modified	Chitra River about 460 m to the south	Nil	No	No sensitive receptor presents nearby	Residential house present about 110 m to the east
22.	Moheshpur-4 under Jhenaidha PBS	Jehnaidah/ Moheshpur / Shamkur / Gurdha / Gurdha	Yes	Private land	Guava garden	Flat	Non-Irrigated	No Forest	Modified	No water body present nearby	Nil	No	Proposed sub-station land is near to the residential house	Residential house present about 32 m to the north
23.	Moheshpur-5 under Jhenaidha PBS	Jehnaidah/ Moheshpur / Pantapara / Ghugri Kagmari / Ghugri	Yes	Private land	Agricultural land	Flat	Irrigated	No Forest	Modified	Canal about 140 m to the west	Nil	No	No sensitive receptor presents nearby	Residential house present about 40 m to the north

S. No.	Substation Name	District/Upazila/Union/Mauza /Village	Access	Land ownership	Land use type	Terrain	Trees & Vegetation	Forest	Habitat Type	Water body	Protected areas	Cultural and religious	Sensitive receptor	Habitation
24.	Shailkupa-3 under Jhenaidha PBS	Jehnaidah/ Shailkupa / Dignarar / Shiddhi / Shiddhi	Yes	Private land	Agricultural land	Flat	Irrigated	No Forest	Modified	No water body present nearby	Nil	No	Proposed sub-station land is near to the residential house	Residential house present about 15 m to the east
25.	Batiaghata-4 under Khulna PBS	Khulna/ Batiaghata / Batiaghata / Hetulbunia/ Hetulbunia	Yes	Private land	Agricultural land	Flat low land	Paddy	No Forest	Modified	Canal about 47m to the north	Nil	No	Batiaghata Upazila Health Complex about 2km from the site	Residential house present 30m to the northwest
26.	Batiaghata-5 under Khulna PBS	Khulna/ Batiaghata / Gonogrampur / Andharia/ Andharia	Yes	Private land	Agricultural land	Flat	Paddy	No Forest	Modified	Kazibacha River about 195 to the east	Nil	No	No sensitive receptor presents nearby	Residential house present 212m to the north
27.	Dacope-3 under Khulna PBS	Khulna/ Dacope / Tildanga / Tildanga / Khona	Yes	Private land	Agricultural land	Flat	Paddy	No Forest	Modified	Canal adjacent to the project site at west	Nil	No	Proposed sub-station land is near to the residential house	Residential house present 60m to the north
28.	Dighalia-1 under Khulna PBS	Khulna/ Dighalia / Gazirhat / Ketla/ Ketla	Yes	Private land	Agricultural land	Flat	Paddy	No Forest	Modified	Atai River about 180m to the east	Nil	No	Proposed sub-station land is near to the residential house	Residential house present adjacent to the land
29.	Dumuria-4 under Khulna PBS	Khulna/ Dumuria / Sarafpur / Bulbaria/ Bulbaria	Yes	Private land	Agricultural and water body	Low	Partially Paddy	No Forest	Modified	Canal about 590m to the north	Nil	No	Proposed sub-station land is near to the residential house	Residential house present adjacent to the land
30.	Dumuria-5 under Khulna PBS	Khulna/ Dumuria / Shovon /	Yes	Private land	Agricultural land	Flat	Paddy	No Forest	Modified	River about 60m to the east	Nil	No	Proposed sub-station land is near to the	Residential house

S. No.	Substation Name	District/Upazila/Union/Mauza/Village	Access	Land ownership	Land use type	Terrain	Trees & Vegetation	Forest	Habitat Type	Water body	Protected areas	Cultural and religious	Sensitive receptor	Habitation
		Madartola/ Madartola											residential house	present 35m to the north
31.	Koyra-2 under Khulna PBS	Khulna/ Koyra / Amdi / Naksha/ Naksha	Yes	Private land	Agricultural land	Flat	Paddy	No Forest	Modified	Pond about 92m to the north-west	Nil	No	Proposed sub-station land is near to the residential house	Residential house present 40m to the west
32.	Daulatpur-5 under Kushtia PBS	Kushtia/ Daulatpur / Rifatpur / Shitlaichonoi / Ghoramara	Yes	Private land	Agricultural land	Flat	Corn and seasonal crops	No Forest	Modified	Pond adjacent to the project site	Nil	No	Proposed sub-station land is near to the residential house	Residential house present 40m to the north
33.	Khoksha-2 under Kushtia PBS	Kushtia/ Khoksha / Janipur / Ektarpur/ Ektarpur	Yes	Private land	Orchard	Flat	Non-irrigated	No Forest	Modified	No water body nearby	Nil	No	Proposed sub-station land is near to the residential house	Residential house present 50m to the east
34.	Khoksha-3 under Kushtia PBS	Kushtia/ Khoksha / Jointihajra / Uthali / Vobaniganj	Yes	Private land	Agricultural land	Flat	Irrigated	No Forest	Modified	No water body nearby	Nil	No	Proposed sub-station land is near to the residential house	Residential house present 22m to the south-west
35.	Kushtia-4 under Kushtia PBS	Kushtia/ Kushtia Sadar / Jogoti / Dkaka Jhalupara / Dkaka Jhalupara	Yes	Private land	Agricultural land	Flat	Irrigated	No Forest	Modified	Pond adjacent to the project site at north	Nil	No	Kushtia Sugar Mills Primary School 320 m at the south	Residential house present 52m to the south-west
36.	Kushtia-5 under Kushtia PBS	Kushtia/ Kushtia Sadar / Gushami Durgapur / Bamongram / Bamongram Arpara	Yes	Private land	Agricultural land	Flat	Irrigated	No Forest	Modified	No water body nearby	Nil	No	No Sensitive receptor nearby	Residential house present 75m to the south

S. No.	Substation Name	District/Upazila/Union/Mauza/Village	Access	Land ownership	Land use type	Terrain	Trees & Vegetation	Forest	Habitat Type	Water body	Protected areas	Cultural and religious	Sensitive receptor	Habitation
37.	Kushtia-6 under Kushtia PBS	Kushtia/ Kushtia Sadar / Horinarayanpur / Santidanga / Santidanga	Yes	Private land	Fallow land	Flat	Non-Irrigated	No Forest	Modified	No water body nearby	Nil	No	Teachers dormitory of Islami University	Teachers dormitory present 82 m to the south
38.	Mirpur-3 under Kushtia PBS	Kushtia/ Mirpur / Bahalbaria / Khadimpur / Noudakhadimpur	Yes	Private land	Low land	Flat	Mehegony tree garden	No Forest	Modified	Seasonal water body adjacent to the project site	Nil	No	Proposed sub-station land is near to the residential house	Residential house adjacent to the site at east
39.	Asasuni-3 under Satkhira PBS	Satkhira/ Asasuni / Anulia/ Bollaypur/ Bollaypur	Yes	Private land	Fallow land	Flat	Non-Irrigated	No Forest	Modified	Pond is located 53 m to the west	Nil	No	Proposed sub-station land is near to the residential house	Residential house present about 34 m to the south
40.	Debhata-2 under Satkhira PBS	Satkhira/ Debhata / Parulia/ Parulia/ Polghada	Yes	Private land	Pond	Low land	Non-Irrigated	No Forest	Modified	Pond adjacent to the land at west	Nil	No	Debhata Upazila Health Complex about 7 km to the west	Residential house at 7m distance to the west
41.	Kalaroa-3 under Satkhira PBS	Satkhira/ Kalaroa / Sonabaria / Beli / Beli	Yes	Private land	Fallow land	Flat	Non-Irrigated	No Forest	Modified	Canal is about 273 m to the south	Nil	No	Madra Primary school is about 555m to the south	No Residential house present near to the site
42.	Kaliganj-2 under Satkhira PBS	Satkhira/ Kaliganj / Mautola/ Pania/ Pania	Yes	Private land	Agricultural land	Flat	Paddy	No Forest	Modified	Canal about 37m to south	Nil	No	Duloli Madhapara Hebran Jame Mosque about 260m to the west	Residential house present adjacent to the land

S. No.	Substation Name	District/Upazila/Union/Mauza/Village	Access	Land ownership	Land use type	Terrain	Trees & Vegetation	Forest	Habitat Type	Water body	Protected areas	Cultural and religious	Sensitive receptor	Habitation
43.	Satkhira-3 under Satkhira PBS	Satkhira/ Satkhira Sadar / Kuskhali / Vadra / Vadra	Yes	Private land	Land is using for brick field	Flat	Non-Irrigated	No Forest	Modified	No water body present in and around the site	Nil	No	Chakura Mosque about 1.07km to the west	No Residential house present near to the site
44.	Satkhira-4 under Satkhira PBS	Satkhira/ Satkhira Sadar / Dhulihor / Dhulihor / Dhulihor	Yes	Private land	Mango Garden	Flat	Mango trees	No Forest	Modified	Marshy land adjacent to the site at west side	Nil	No	Berbari Jame Mosque about 503m to the north-east	Residential house present about 67 m to the north
45.	Tala-3 under Satkhira PBS	Satkhira/ Tala / Kholishkhali / Asarnagar / Tikarampur	Yes	Private land	Agricultural land	Flat	Irrigated	No Forest	Modified	Canal is about 20 m to the north	Nil	No	Shaheed Ziaur Rahman Degree about 250m to the east	No Residential house present near to the site
46.	Sripur-2 under Magura PBS	Magura/ Sripur / Nakol / Nakol / Gobindopur	Yes	Private land	Agricultural land	Flat	Irrigated	No Forest	Modified	No water body nearby	Nil	No	Proposed sub-station land is near to the residential house	Residential house present about 60 m to the north
47.	Chuadanga-3 under Meherpur PBS	Chuadanga/ Chuadanga sadar/ Tetudah / Kalupol/ Kalupol	Yes	Private land	Agricultural land	Flat	Paddy	No Forest	Modified	Canal 760 m to the south	Nil	No	None	Residential house present 400m to the north
48.	Damurhuda -2 under Meherpur PBS	Chuadanga/ Damurhuda/ Karpasdanga / Kumorpur/ Kumorpur	Yes	Private land	Agriculture and perennial Crops field	Flat	Paddy and perennial Crops	No Forest	Modified	Canal 277 m to the south	Nil	No	Proposed sub-station land is near to the residential house	Residential house present 100m to the southwest
49.	Gangni -4 under	Meherpur/ Gangni / Kazipur	Yes	Private land	Agriculture land	Flat	Paddy	No Forest	Modified	No water body nearby	Nil	No	No sensitive receptor	Residential house present

S. No.	Substation Name	District/Upazila/Union/Mauza/Village	Access	Land ownership	Land use type	Terrain	Trees & Vegetation	Forest	Habitat Type	Water body	Protected areas	Cultural and religious	Sensitive receptor	Habitation
	Meherpur PBS	/ Kazipur / Noudapara											presents nearby	130m to the southeast
50.	Jibonagar-3 under Meherpur PBS	Chuadanga/ Jibonagar / Raipur / Raipur / Dalihuda	Yes	Private land	Agriculture land	Flat	Vegetable	No Forest	Modified	No water body nearby	Nil	No	Proposed sub-station land is near to the residential house	Residential house present 20m to the west
51.	Meherpur-3 under Meherpur PBS	Meherpur/ Gangni / Katholi / Sohogolpur Gharabaria	Yes	Private land	Agricultural land	Flat	Paddy	No Forest	Modified	Bhairab-Kabadak River 990 m to the west	Nil	No	Proposed sub-station land is near to the residential house	Residential house present 90m to the northeast

4.4 Physical Environment

4.4.1 Meteorology

128. Although less than half of Bangladesh lies within the tropics, the presence of the Himalaya mountain range has created a tropical macroclimate across most of the east Bengal land mass (Rashid, 1991).[2] Brammer (1996)[3] has identified four distinct seasons resulting from this weather pattern, namely:

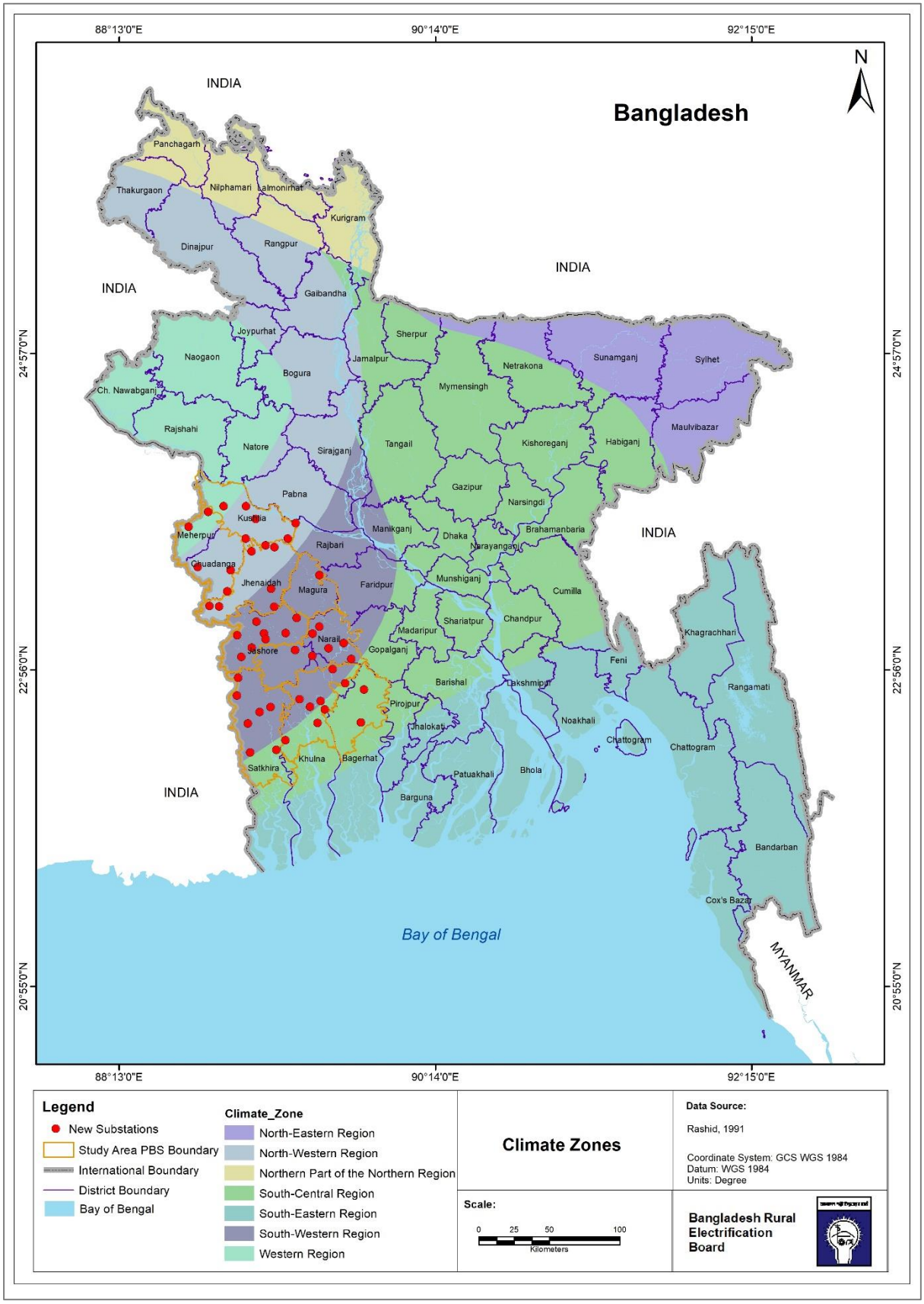
- Pre-Monsoon Season (March to May): Characterized by the highest temperatures of the year – up to 36°C. Some rainfall may occur, with tropical cyclones occasionally affecting coastal areas;
- Monsoon Season (June to September): Period of highest rainfall (up to 80% of the annual rainfall), humidity and cloud cover. Increased rain and cloud cover generally cause a small reduction in mean daily temperatures;
- Post-Monsoon Season (October to November): Temperature remains hot and humid, though cloud cover decreases in this season. Limited tropical thunderstorms may still, particularly in coastal areas; and
- Dry Winter Season (December to February): Coolest time of the year with mean minimum temperatures falling below 10°C in some areas. Reduced humidity and cloud cover. Rainfall is scarce.

129. Despite the general predictability of the seasons in Bangladesh, local conditions may still vary widely across the country. As such, Bangladesh can be divided into seven climactic zones based on differences in a range of factors including rainfall, temperature, evapotranspiration, and local seasonality (Rashid, 1991). According to the climatic zones of Bangladesh, the project area is located in South-western zone, North-western zone, and South-central zone. The substation locations in different climatic zone is presented in **Figure 4.1**.

[2] Rashid, H. E. (1991). University Press Limited. "*Geography of Bangladesh*". Dhaka.

[3] Brammer, H. (1996). University Press Limited. "*The Geography of the Soils of Bangladesh*". Dhaka·

Figure 4.1: Climatic Zones of Bangladesh



4.4.1.1 Temperature

130. Data for normal temperature from the Bangladesh Meteorological Department (BMD) stations in the project area are given in **Table 4.3** and **Table 4.4**. Normal minimum and maximum temperatures in the summer and the winter months are fairly consistent across the stations in the project area. Temperature remain well above freezing point in the coldest months and although summers are warm, extremes of heat are rare. In all stations the lowest normal minimum temperatures are experienced in January. The highest normal maximum temperatures are in April and May, pre-monsoon.

Table 4.3 : Normal Minimum Temperature

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Khulna	12.4	15.4	20.5	23.9	25.2	26.1	26.0	26.2	25.8	24.1	19.6	13.9
Mongla	14.0	17.5	21.9	24.7	25.9	26.5	26.3	26.3	24.9	24.5	20.6	15.6
Satkhira	12.2	15.6	20.6	24.3	25.3	26.3	26.0	26.0	25.6	23.6	18.5	13.2
Jashore	11.2	14.4	19.5	23.6	24.9	25.9	25.9	25.9	25.4	23.2	18.0	12.4
Chuadanga	10.6	14.1	18.8	23.4	25.2	26.1	26.2	26.2	25.6	23.5	18.1	12.5

Source: Bangladesh Meteorological Station (BMD)

Table 4.4 : Normal Maximum Temperature

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Khulna	25.6	28.5	33.1	34.6	34.3	32.9	31.8	31.8	32.1	32.1	29.9	26.5
Mongla	25.2	28.4	32.4	34.4	34.2	32.9	31.7	31.6	31.7	31.4	29.4	26.5
Satkhira	26.0	28.8	33.2	35.2	34.9	33.4	32.0	32.0	32.2	32.3	30.2	27.0
Jashore	25.6	28.5	33.3	35.6	34.9	33.3	32.0	32.1	32.5	32.3	30.0	26.5
Chuadanga	24.6	28.1	33.2	36.3	35.8	34.1	32.7	33.0	32.8	32.4	30.1	26.4

Source: Bangladesh Meteorological Station (BMD)

4.4.1.2 Rainfall

131. Rainfall shows significant variation across the year in the project area and May, June, July, August, and September generally show the highest monthly average rainfall. The monthly rainfall figures are provided in **Table 4.5**.

132. There is also variation across the geographical area of the project itself. Chuadanga and Jashore inland on the Indian border have only 1496.5 mm and 1615.0 mm respectively and have the lowest total annual rainfall in the project area; Mongla, experiences the highest rainfall at 1887.6 mm.

Table 4.5: Average Monthly Rainfall of the Study Area

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Khulna	13.3	44.4	52.1	87.5	200.0	335.6	329.8	323.5	254.7	129.8	32.1	6.6	1809.4
Mongla	16.9	35.9	58.1	72.4	180.9	323.8	342.7	344.4	313.0	149.9	48.0	1.6	1887.6
Satkhira	13.7	40.1	37.6	86.5	152.4	296.6	375.4	297.3	280.1	120.6	31.2	11.4	1742.9
Jashore	14.8	26.1	44.6	75.4	169.9	298.7	304.1	291.8	236.9	107.9	29.0	15.8	1615.0
Chuadanga	14.8	26.6	20.2	39.8	142.8	235.4	351.7	232.8	297.1	101.3	21.0	13.0	1496.5

Source: Bangladesh Meteorological Station (BMD)

133. The number of rainy days experienced in the project area has a similar pattern in the different BMD stations as shown in **Table 4.6**. From October to April there are few days when rain is recorded and in December no station has more than 1 rainy day. During the period just before the monsoon breaks and during the monsoon itself, rainfall increases and in June, July, August, and September about half the days experience rain. Chuadanga has fewest rainy days and Jashore has the highest rainy days.

Table 4.6: Number of Normal Rainy Days in the Project Area

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Khulna	2	3	3	6	11	14	17	16	13	7	2	1	95
Mongla	3	4	3	7	12	16	19	17	15	7	2	1	106
Satkhira	2	3	3	6	11	14	19	16	14	6	3	1	98
Jashore	2	3	4	6	11	17	21	21	16	6	2	1	110
Chuadanga	3	3	2	4	10	13	17	13	14	5	2	1	87

Source: Bangladesh Meteorological Station (BMD)

4.4.1.3 Humidity

134. Humidity across the general project area shows similar variation during the year with highest readings between June and September (Table 4.7) in the height of the monsoon rains. Humidity is highest at Mongla experience 88% humidity in July, August, and September. The lowest recorded average monthly humidity 65 % in March at Chuadanga.

Table 4.7: Monthly Normal Humidity (%) in the Project Area

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Khulna	78	74	73	76	79	85	87	86	87	84	80	79
Mongla	75	73	73	77	80	86	88	88	88	85	80	77
Satkhira	74	71	69	72	75	82	85	85	86	82	77	75
Jashore	77	72	69	72	77	84	87	86	86	83	79	78
Chuadanga	78	72	65	68	74	83	86	86	86	83	78	78

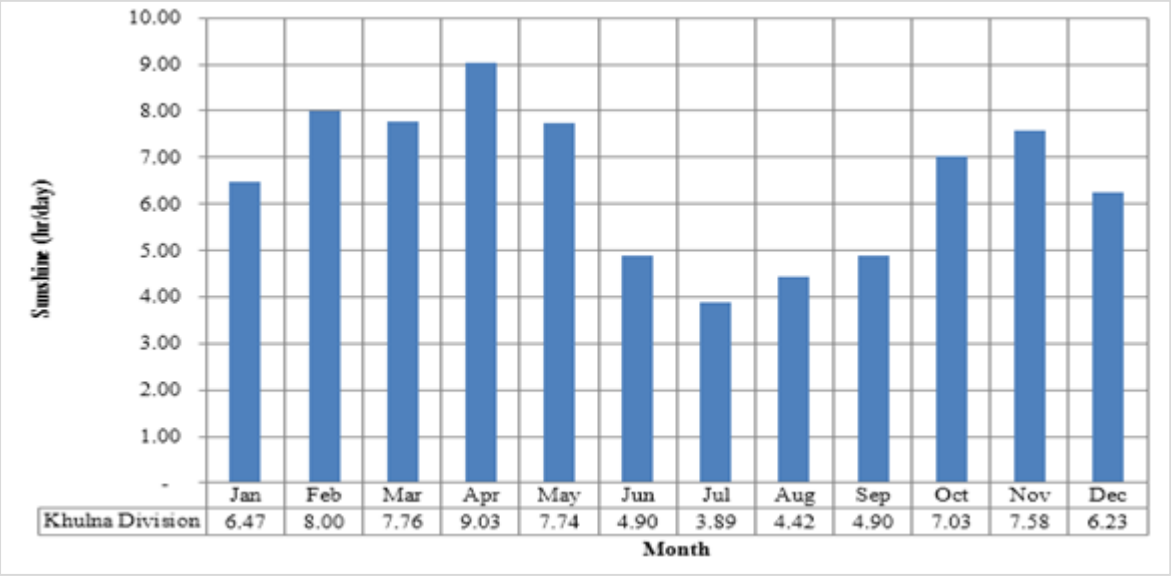
Source: Bangladesh Meteorological Station (BMD)

4.4.1.4 Sunshine

135. Monthly sunshine hour data are available for various BMD stations. The monsoon period has comparatively fewer sunshine hours due to increased cloud cover and June, July, August, and September show reduced sunshine throughout the project area. See data below in Figure 4.2 for Khulna division.

136. Khulna has 9 hours sunshine in April and has more than 6 hours sunshine daily for the 8 months October to May. The other rainy months have less than 5 hours with under 4 hours in July.

Figure 4.2: Average Daily Sunshine Hours at Khulna



Source: Bangladesh Meteorological Station (BMD)

4.4.1.5 Windspeed

137. Wind speed data across the project area show significant differences. Wind speed varies from location to location and is also dependent on the time of year. The windiest months of the year tend to be during the pre-monsoon period. Wind speeds stay high during the summer monsoon but gradually decrease until November which is usually the calmest month in the project area.

Table 4.8: Normal Wind Speeds (m/s) in the Project Area

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Khulna	1.34	1.61	2.48	3.72	3.74	3.34	3.20	3.25	2.23	1.27	0.97	1.07	2.38
Mongla	1.86	2.05	2.71	3.96	4.17	3.98	3.70	3.46	2.71	1.87	1.45	1.50	2.78
Satkhira	1.54	1.81	2.50	3.75	3.72	3.16	2.83	2.56	2.05	1.51	1.40	1.47	2.36
Jessore	1.38	1.85	3.42	6.00	6.25	5.41	4.84	4.29	3.37	1.71	1.19	1.11	3.42
Chuadanga	0.82	0.95	1.57	2.47	2.44	2.31	1.99	1.71	1.55	0.94	0.62	0.66	1.50

Source: Bangladesh Meteorological Station (BMD)

4.4.2 Land Resources

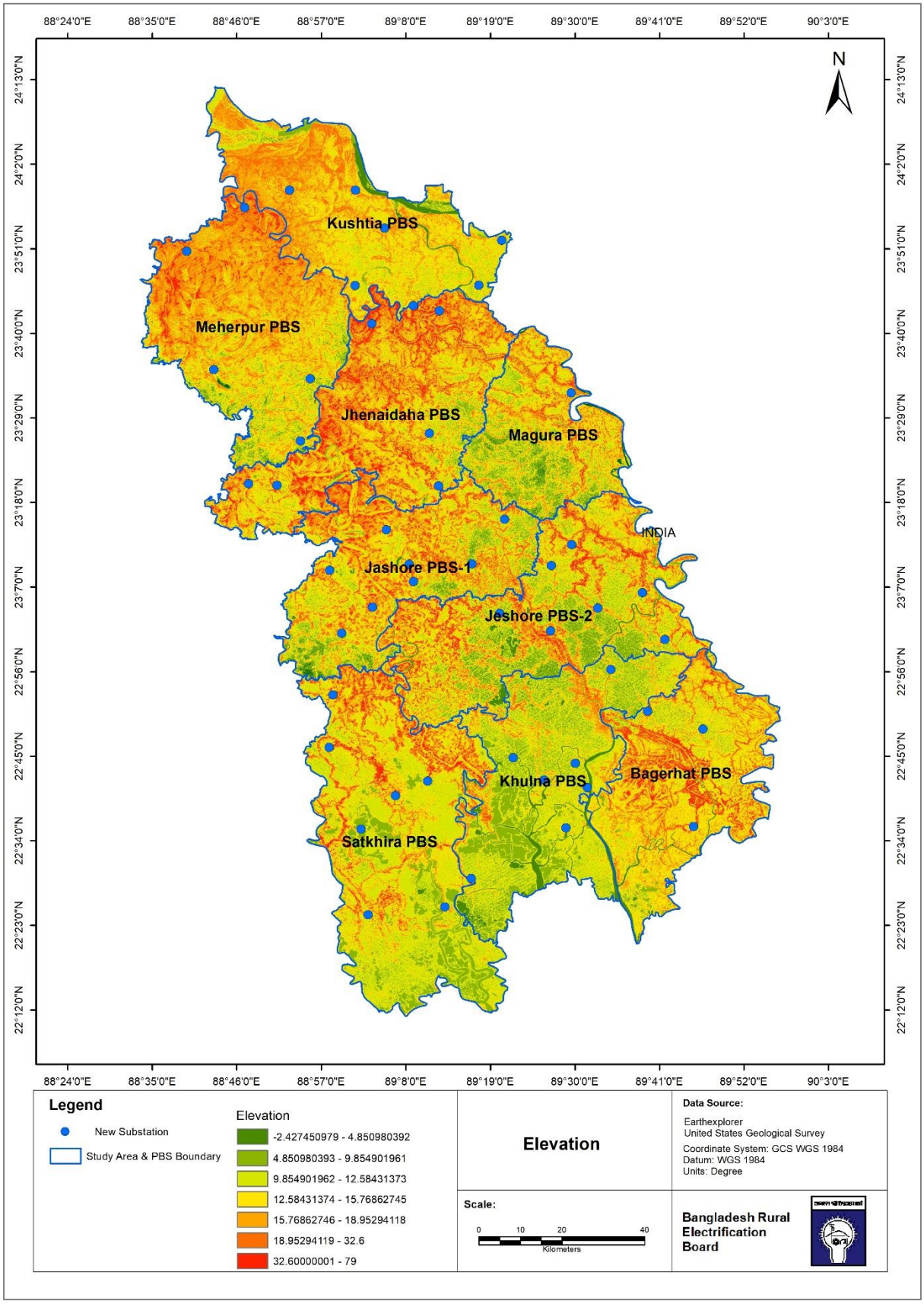
4.4.2.1 Topography

138. Topographically Bangladesh can be divided into alluvial plains and hilly areas. More than 90 percent of the total area of Bangladesh is low land, an alluvial plain formed by the sediments of the several great rivers and their tributaries and distributaries which traverse the country. However, some local variations in the nature and extent of the plain land. Low hills are found in the north-eastern extremities of Bangladesh.

139. Nevertheless, elevation of the project area was also determined by Digital Elevation Model (DEM).[4] The result showed that, highest elevation was recorded as 79m from Mean Sea Level (MSL) in Kushtia. Whereas the lowest elevation was reported in Satkhira as -2m from MSL. Elevation of the project area is shown in **Figure 4.3**.

[4] https://earthexplorer.usgs.gov.

Figure 4.3: Elevation of the Project Area



4.4.2.2 Land Use/Land Cover

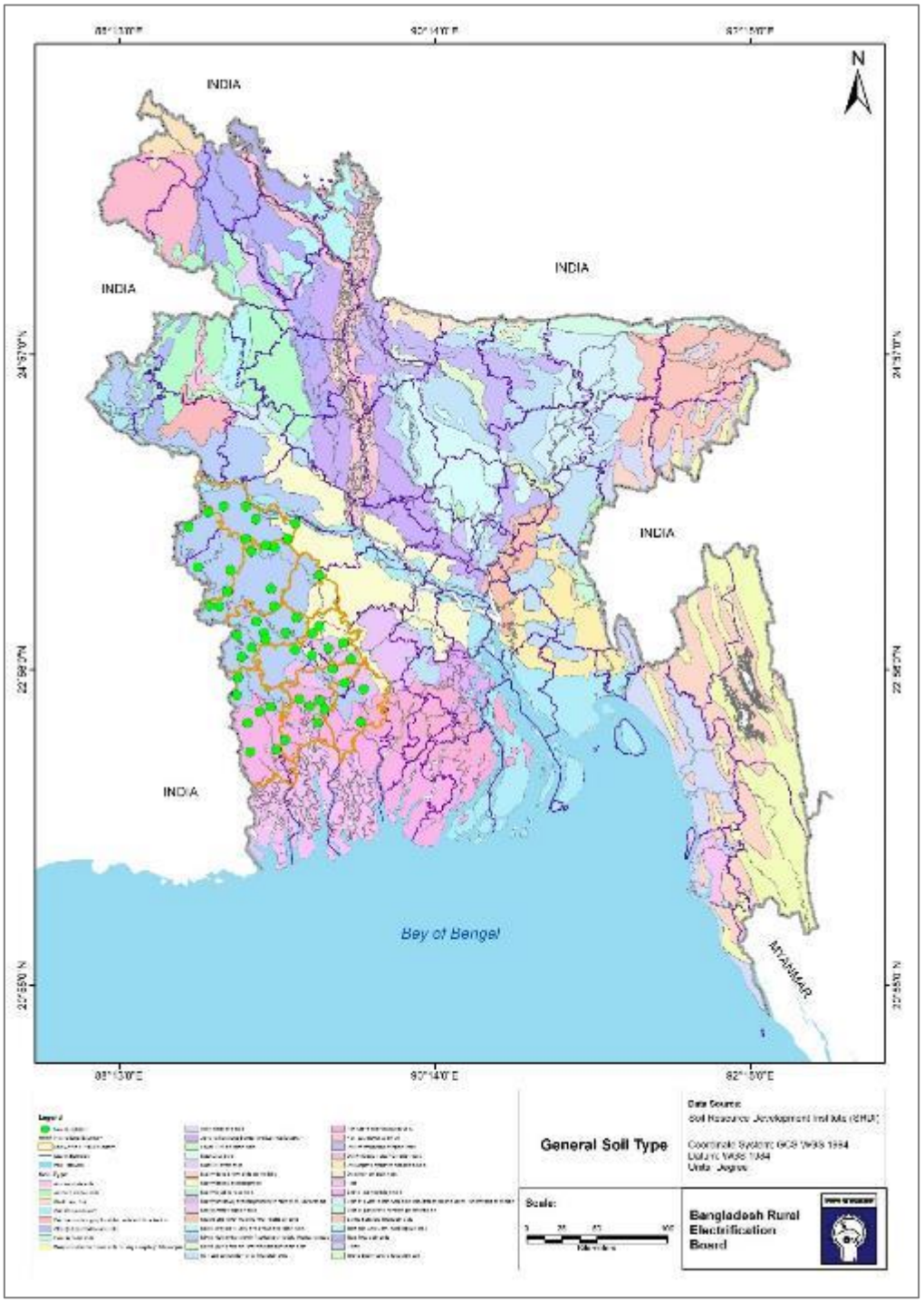
140. Land use in the project area and much of Bangladesh is dominated by human activity. According to the World Bank, only 11.1% of Bangladesh has forest cover but only 30.2 % is primary forest and a great majority of this in the Sundarban mangrove forests in the south west and in the Chittagong Hill Tract regions in the east (see Land Use Map 4.3). Neither of these areas is included in the Project. Much of the land particularly in the south area of the project in Khulna is low lying and subject to flooding in the monsoon season. The land, although low lying is used intensively for agriculture. The basic land use map for Bangladesh is depicted in Figure 4.4.

Figure 4.4: Land Use Zones of Bangladesh

4.4.2.3 Soil Quality

141. The Soil Resource Development Institute (SRDI) has identified about 500 soil series in Bangladesh which is further classified into 23 broad types.[5] Project area falls under four soil types such as Calcareous Dark Grey Floodplain Soils & Calcareous Brown Floodplain Soils, Peat and Grey Floodplain soils.

Figure 4.5: General Soil Map of Bangladesh



[5] Food and Agriculture Organization (FAO), Land resources appraisal of Bangladesh for agricultural development, Vol 2, Rome, 1988; FAO/ UNDP, Classification of the soils of Bangladesh, 1986; H Brammer, The Geography of the Soils of Bangladesh, UPL, Dhaka, 1996.

142. Calcareous Dark Grey Floodplain Soils: Occur extensively on the Ganges floodplain and locally on the soils that comprise cambic B-horizon and lime in part or throughout the solum and with a dark grey topsoil and/or upper subsoil. Calcareous Dark Grey Floodplain soil occurs extensively in the Ganges Meander Floodplain and locally in the Ganges Tidal Floodplain. These are seasonally flooded soils, contain lime in some layers within 125 cm from the surface. It is mainly dark grey or brown clays with dark grey flood coatings. However, brown calcareous loamy soils are found on highest ridges and near riverbanks. It is widely distributed soil in Bangladesh and are found in Dhaka, Mymensingh, Faridpur, Rajshahi, Pabna and few other districts as well.

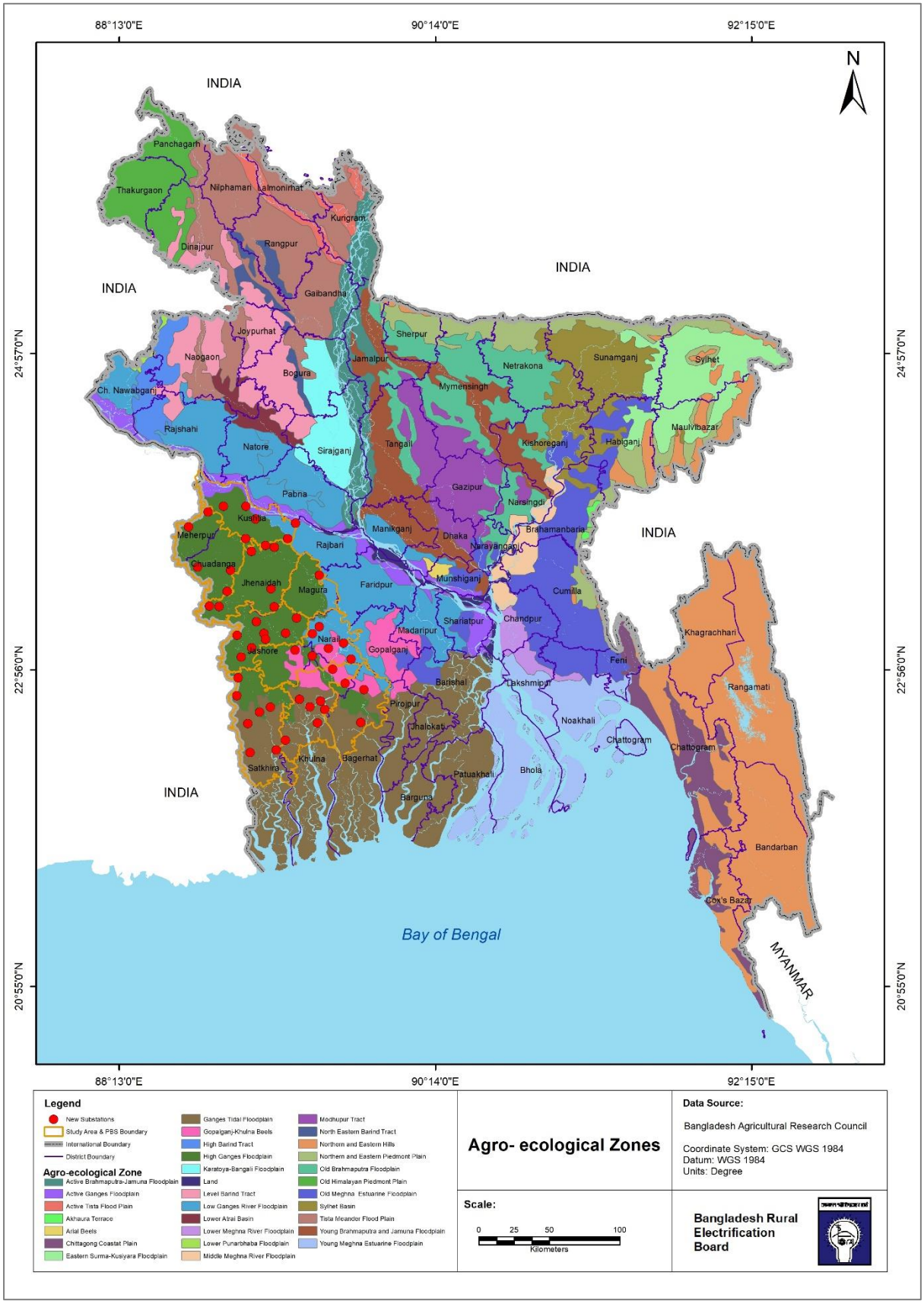
143. Peat: Occurs extensively in the Gopalganj-Khulna Beels and locally in some haors of the Sylhet Basin. The soils contain organic matter at the surface or buried under a mineral soil layer below at a depth of up to 40 cm. The organic material that forms the Histic horizon varies from dark brown, fibrous peat to semi-liquid black muck. They have been included as Histosols.

4.4.2.4 Agro-ecological Zone

144. Agro-ecological zones (AEZ) define by the soil composition, landform, and climatic condition. The parameters of AEZs are the basic climatic and edaphic requirements of crops. According to the Bangladesh Agricultural Research Council (BARC), there are 30 agro-ecological zones in Bangladesh.[6] The project area falls under four agro-ecological zones namely: Ganges Tidal Floodplain, Gopalganj-Khulna Beels, High Ganges Floodplain, Low Ganges River Floodplain. Agro- ecological zones of the project site is shown in Figure 4.6.

[6] FAO/UNDP, Land Resources Appraisal of Bangladesh for Agricultural Development Report 2: Agroecological Regions of Bangladesh, FAO/UNDP, 1988; Bangladesh Bureau of Statistics, 1998 Yearbook of Agricultural Statistics, BBS, Dhaka, 1999.

Figure 4.6: Substations Location in Agro-ecological Zone



145. Ganges Tidal Floodplain: This region occupies an extensive area of tidal floodplain land in the southwest of the country. The greater part of this region has smooth relief having large areas of salinity. Riverbanks generally stand about a meter or less above the level of adjoining basins. Non-calcareous grey floodplain soil is the major component of general soil types. Acid sulphate soil also occupies a significant part of the area, where it is extremely acidic during the dry season. Most of the topsoil are acidic and subsoils are neutral to mildly alkaline. Soils of the Sundarbans area are alkaline. General fertility level is high, with medium to high organic matter content.

146. Gopalganj-Khulna Beels: Gopalganj-Khulna Beel region occupies extensive low-lying areas between the Ganges river floodplain and the Ganges tidal floodplain. Soils of the area are grey, and dark grey, acidic, heavy clays overlay peat or muck at 25-100 cm. General soil types include mainly peat and non-calcareous dark grey floodplain soils. Organic matter content is medium to high. Fertility level is medium.

147. High Ganges Floodplain: This region includes the western part of the Ganges River Floodplain which is predominantly highland and medium highland. Most areas have a complex relief of broad and narrow ridges and inter-ridge depressions, separated by areas with smooth broad ridges and basins. 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.

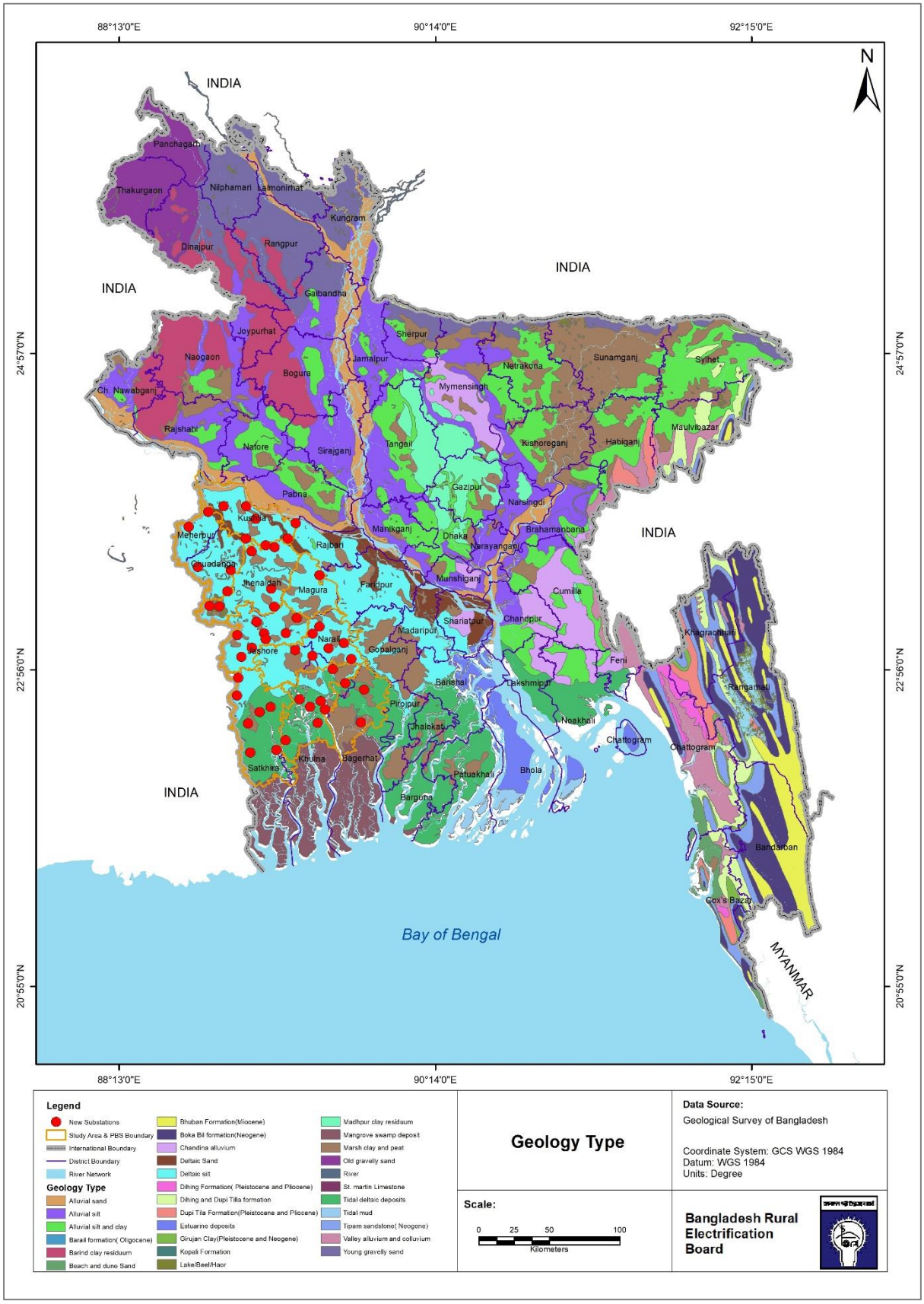
148. Low Ganges River Floodplain: The region comprises the eastern half of the Ganges River Floodplain which is low-lying. The region has a typical meander floodplain landscape of broad ridges and basins. Soils of the region are silt loams and silty clay loams on the ridges and silty clay loams to heavy clays on lower sites. General soil types predominantly include Calcareous Dark Grey and Calcareous Brown Floodplain soils. Organic matter content is low in ridges and moderate in the basins. Soils are calcareous in nature having neutral to slightly alkaline reaction. General fertility level is medium.

4.4.2.5 Geology

149. The Geology of Bangladesh is affected by the country's location, as Bangladesh is mainly a riverine country. It is the eastern two-thirds of the Ganges and Brahmaputra river delta plain stretching to the north from the Bay of Bengal. According to the Geological Survey of Bangladesh (GSB) map, project area falls under four geological zones such as Deltaic silt, Mangrove swamp deposit, Marsh clay and peat and Tidal deltaic deposits.[7] Geology of the project site is given in **Figure 4.7**.

[7] Geological Survey of Bangladesh (GSB), 1990, Geological map of Bangladesh. Ministry of Energy and Mineral Resources, Government of the Peoples Republic of Bangladesh.

Figure 4.7: Geology of the Project Area



150. Deltaic Silt: Light grey to grey, fine sandy silt to clayey silt. Fine overbank sediments deposited by distributaries in flood basins.

151. Mangrove swamp deposit: Dark-grey to black silt and clay deposited in the active tidal zone, which is dominated by woody, organic rich, mangrove swamps. Areas between tidal channels covered with as much as 1 m of brackish and saline water during high tide. Area uncultivated and covered by natural mangrove forest. Unit includes thin scattered deposits of beach sand at the seaward edge.

152. Marsh Clay and Peat: Grey or bluish-grey clay, black herbaceous peat, and yellowish-grey silt. Alternating beds of peat and peaty clay common in bils and large structurally controlled & pressions; peat is thickest in deeper parts. Thin beds of peat and clay are interbedded with alluvial silt in the north central Sylhet depression. Chains of linear lakes north of the river and south of the Shillong Plateau in the Sylhet depression suggest these areas are subsiding.

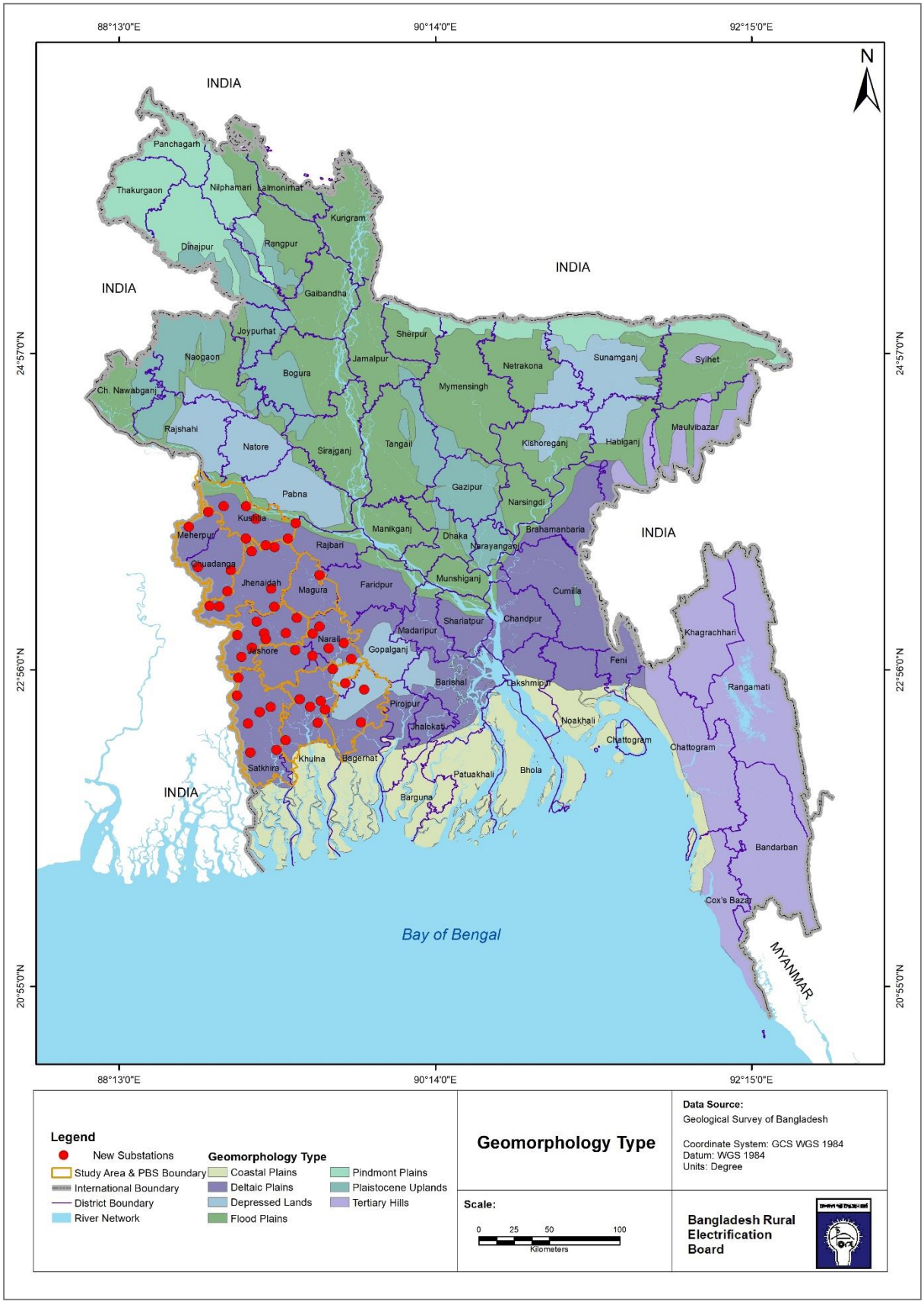
153. Tidal Deltaic Deposits: Light- to greenish-grey, weathering to yellowish grey, silt to clayey silt with lenses of very fine to fine sand along active and abandoned stream channels, including crevasse splays. Contains some brackish-water deposits. Numerous tidal creeks crisscross the area; large tracts are during spring tides.

4.4.2.6 Geomorphology

154. There are three geomorphological division of Bangladesh named as: i) Tertiary Hills, ii) Pleistocene Uplands, and iii) Holocene plains. Holocene plains also subdivided into Coastal Plains, Deltaic Plain, Depressed Lands, Flood Plains, Piedmont Plains[8]. The project area belongs to Coastal Plains, Deltaic Plain, Depressed Lands geomorphological units of Bangladesh. Geomorphology of the project site is shown in **Figure 4.8**.

[8] Ahmed, K. Matin, Prosun Bhattacharya, M. Aziz. Hasan, S. Humayun Akhter, S.M. Mahbub Alam, M.A. Hossain Bhuyian, M. Badrul Imam, Aftab A. Khan, Ondra Sracek 2004. Arsenic contamination in groundwater of alluvial aquifers in Bangladesh: An overview. Applied Geochemistry, 1 9(2): 181–200.

Figure 4.8: Geomorphology of Project Area



155. Coastal Plains - This is the southern part of the Delta plain. This area is tide dominated and is considered as the active part of the delta. The landforms are characterized by tidal low land with weakly developed natural levees distributed in an irregular pattern. Numerous rivers, channels, tidal creeks have crisscrossed the area. Swamps and depressions are also present in the area. Estuarine deposits of silt, silty clay dominates in this area. Mangrove swamps of the Sundarbans and many salt fields and shrimp culture farms have developed in the area. The landforms in the area are temporal as they are changing due to the cyclones and other natural calamities.

156. Deltaic Plain - The Delta Complex covers about 32% of Bangladesh. The area south of a line drawn from Ganges-Padma as far as the lower course of the Feni River in the southeast belongs to the delta of the Ganges, Brahmaputra and Meghna River. The Ganges is the greatest builder of the delta (70-80%). The Ganges delta located in the south of the Barind and Madhupur Tract also includes part of West Bengal. The Bangladesh portion of the delta occupies about 46,620 sq. km. In the southwest, a part of the delta has been classified as the inactive delta but the major part in the south and southeast is very active. The elevation of the delta is about 15 to 20 m from the sea level in the northwest and 1 to 2 m in the south. The elevation increases within the upper reaches of the delta. Many swamps (depressions) have developed in the substantial part of the delta. Clay, silty clay and occasionally peat are the major constituent of the delta plain.

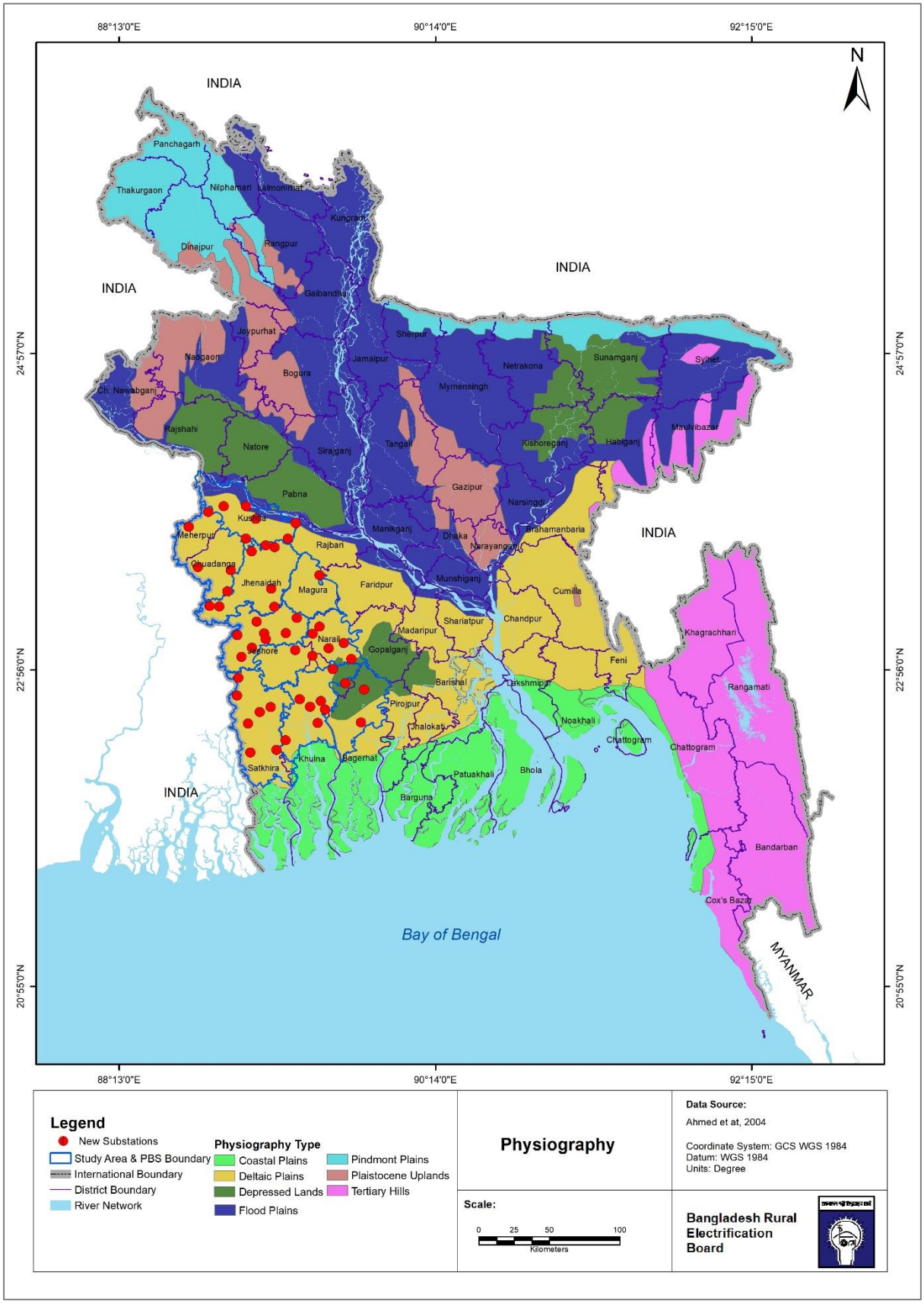
157. The present Delta is a combination of three deltas, namely the Ganges delta, the Old Brahmaputra-Meghna delta and the Ganges-Jamuna (the present Brahmaputra)-Meghna Delta. In some recent literature the name, "Ganges-Brahmaputra-Meghna Delta Complex" has been used. Also, in the summer monsoon season when about 3 million cusecs of water pass through the delta, it behaves as a fluvial delta whereas in the winter when the volume of water passing through the delta drops to 250,000 to 300,000 cusecs it behaves as a tide dominated delta. These unusual features make this delta one the most complex in the world. Holocene or recent sediments from a few hundred to thousands of meters cover the Flood plains and the Delta.

158. Depressed Lands - The Sylhet Depression is a tectonic basin subsiding at a very fast rate and is bounded by the hills of frontier strip of Sylhet and Netrokona Districts in the north and the north-eastern Sylhet Hills in the east. Numerous lakes (beels) and large swamps (haors) cover the saucer shaped area of about 7,250 sq. km. The elevation of the central part of the depression is about 3 m above the sea level. The inland marshes are found scattered all over the country. Most of them are back swamps, oxbow lakes and abandoned channels formed due to the changes in the courses of the rivers.

4.4.2.7 Physiography

159. The physiography of the country has been divided into 24 sub-regions and 54 units. The project area falls under fifteen physiographic units of Bangladesh. Physiography of the project area is presented in **Figure** 4.9.

Figure 4.9: Physiography of Bangladesh



160. Ganges Tidal Floodplain: The boundary between this unit and the Ganges floodplain is traditional. The tidal landscape has a low ridge and a basin relief crossed by innumerable tidal rivers and creeks. Local differences in elevation generally are less than 1m compared with 2-3m on the Ganges floodplain. The sediments are mainly non-calcareous clays, but they are silty and slightly calcareous on riverbanks and in a transitional zone in the east adjoining the lower Meghna. This unit covers most of Satkhira, Khulna, Bagerhat, Pirojpur, Barisal, Patuakhali, Bhola and the entire Jhalokati and Barguna districts but excludes the Sundarbans in the southwest.

161. Gopalganj-Khulna Beels: Gopalganj-Khulna Beel region occupies extensive low-lying areas between the Ganges river floodplain and the Ganges tidal floodplain. Soils of the area are grey, and dark grey, acidic, heavy clays overlay peat or muck at 25–100 cm. General soil types include mainly peat and non-calcareous dark grey floodplain soils. Organic matter content is medium to high. Fertility level is medium.

4.4.3 Agricultural Resources

162. Most agricultural land in the project area tends to be intensively used with double or triple cropping pattern being common with rice as the main crop. Single T. Aman cropping pattern is the most dominant cropping pattern in Khulna region. Boro-Fallow-T. Aman cropping pattern ranked the second position whereas Boro-Fish is the third cropping pattern. Single Boro rice is recorded as the fourth cropping pattern with the higher share in waterlogged area of Dumuria, Mollahat, Tala, Bagerhat sadar, Fakirhat and Rampal. The highest number of cropping patterns was recorded in Kalaroa (26) followed by Tala (24) and the lowest was reported in Mongla (5). The overall crop diversity index (CDI) for the region was 0.93. The highest CDI was in Tala (0.95) and the lowest in Dacope (0.42). The average cropping intensity (CI) of the Khulna region was 171% with the lowest in Mongla (101%) and the highest in Kalaroa (224%)[9].

4.4.4 Water Resources

163. Several rivers govern the overall hydrology of the project area. There are also many lakes/ water bodies in the project area which in many places is very low lying. Khulna area has Betna, Bhairab, Bhodra, Chitra, Gorai-Madhumati, Hariabhanga, Haringhata, Ichamati, Kajibacha, Kakshuyali, Kaliganga, Kalindi, Kapotaksha, Kholpetua, Kumar, Mathabhanga, Mayur, Mukteshwari, Nabaganga, Pasur, Raimangal, Rupsa, Shibsa, and Shoilmari River. Proposed Substations are not located close to the river. The Project has little or no impact on water systems in the area with infrastructure.

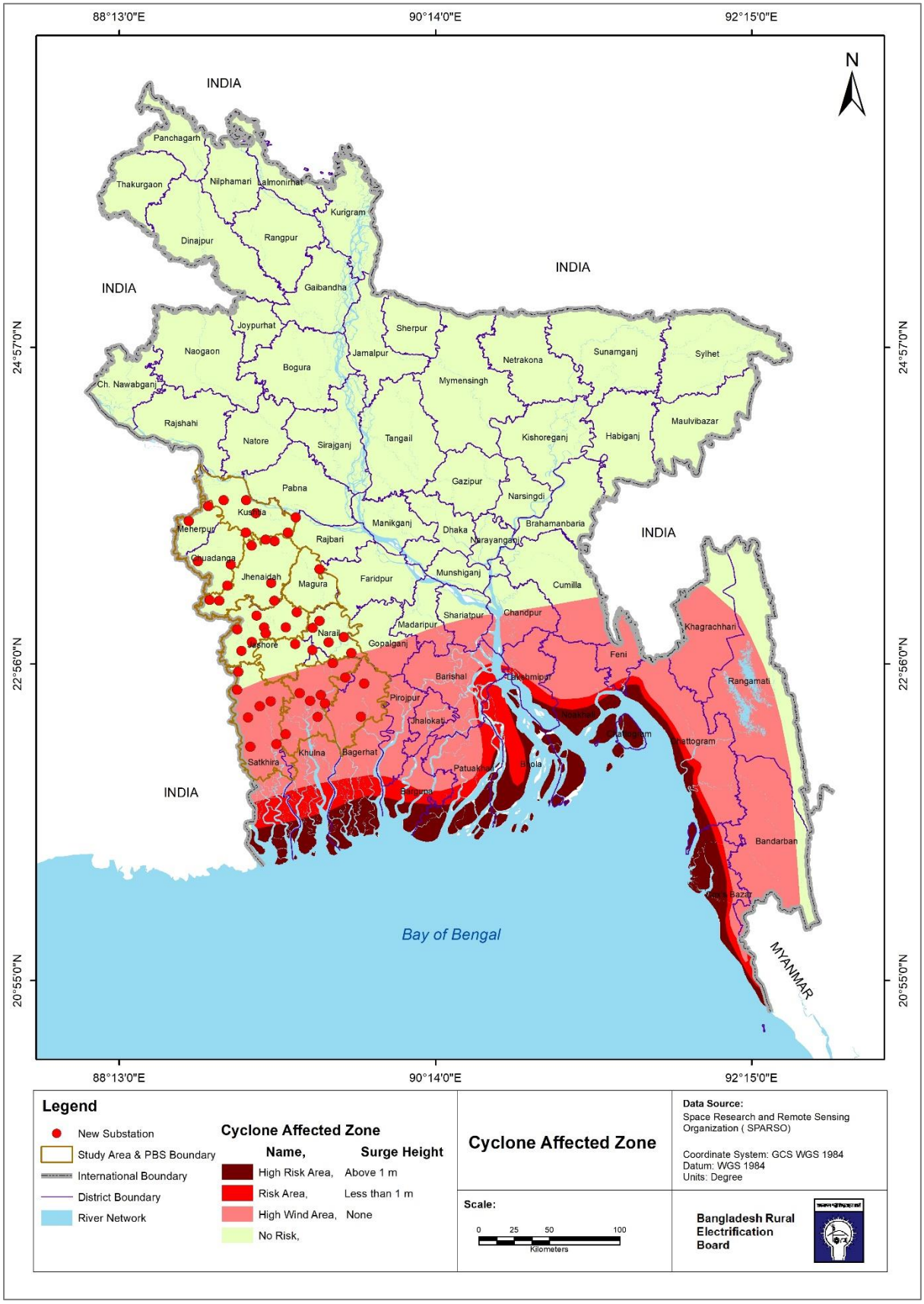
4.4.5 Natural Hazard

4.4.5.1 Cyclone

164. The funnel-shaped northern portion of the Bay of Bengal amplifies the storm surge of landfalling tropical cyclones, affecting thousands of people. Some of the most devastating natural disasters in recorded history with high casualties were tropical cyclones that hit the region now comprising present-day Bangladesh. Historically, cyclone have killed around 1.54 million of people. The Bangladesh Space Research and Remote Sensing Organization (SPARRSO) has divided Bangladesh into four cyclone affected zones. These are high risk area, risk area, high wind area and no risk area. According to the risk of cyclone vulnerability map, the project area located no risk area and high wind area. Project area in cyclone affected zone is given in **Figure 4.10**.

[9] M Harunur Rashid, B J Shirzy, M Ibrahim, S M Shahidullah 2017. Cropping Systems and their Diversity in Khulna Region: Bangladesh Rice J. 21(2): 203–215.

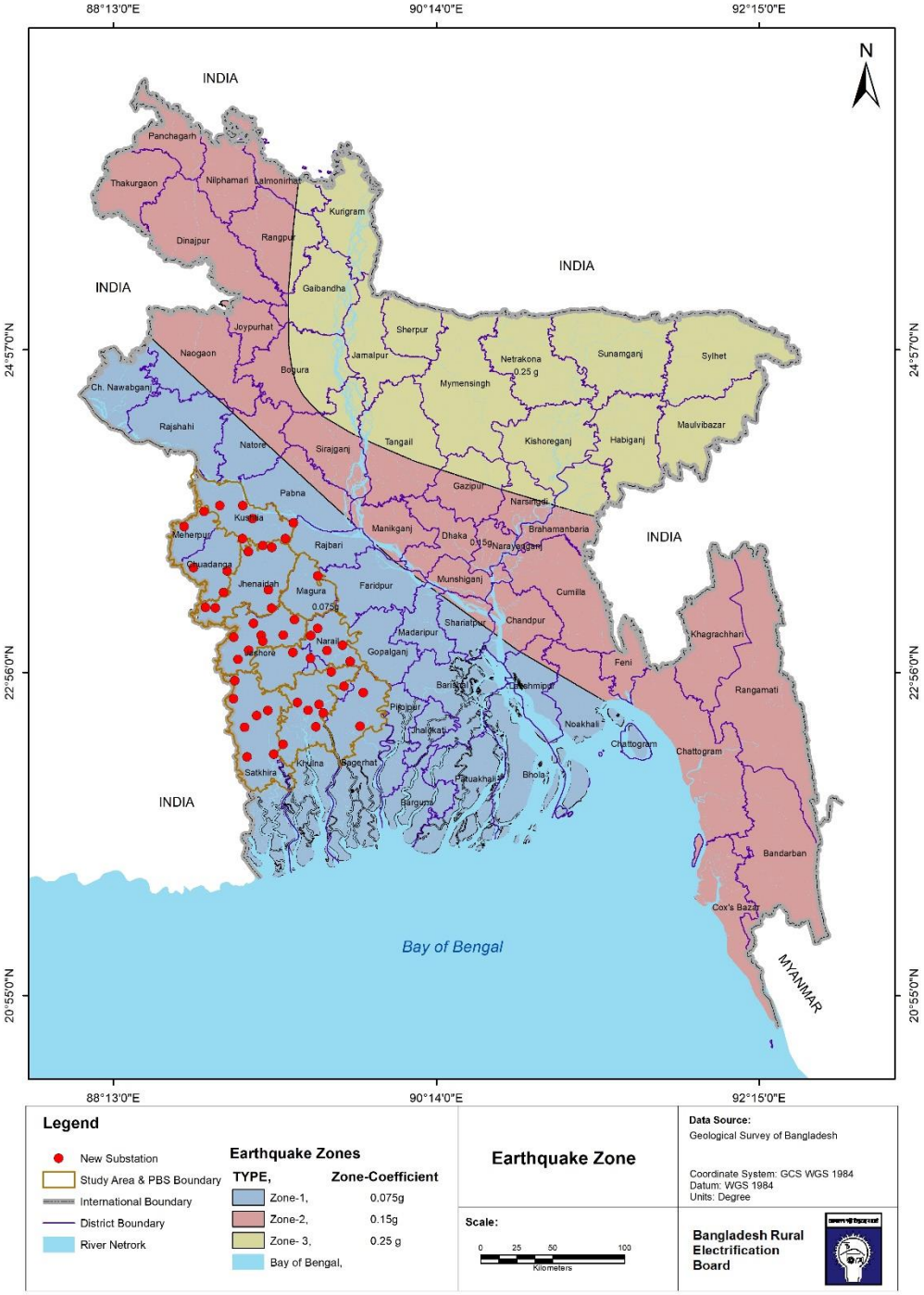
Figure 4.10: Cyclone Affected Zone of Bangladesh



4.4.5.2 Earthquake

165. Bangladesh National Building Code (BNBC, 1993) has provided seismic zoning map of Bangladesh. According to the BNBC, Bangladesh has been divided into three seismic zones, with zone coefficients [10] of 0.25 (Zone-3 in the north and north-east), 0.15 (Zone-2 in the middle, north-west and south-east) and 0.075 (Zone-1 in the south west), as shown in following **Figure 4.11**. This zoning map is based on peak ground accelerations estimated by Hattori (1979) for a return period of 200 years. The project areas are located in zone 1.

Figure 4.11: Seismic Zone of Bangladesh



[10] Zone coefficient (Z) represents the peak ground acceleration (PGA) in units of g (acceleration due to gravity).

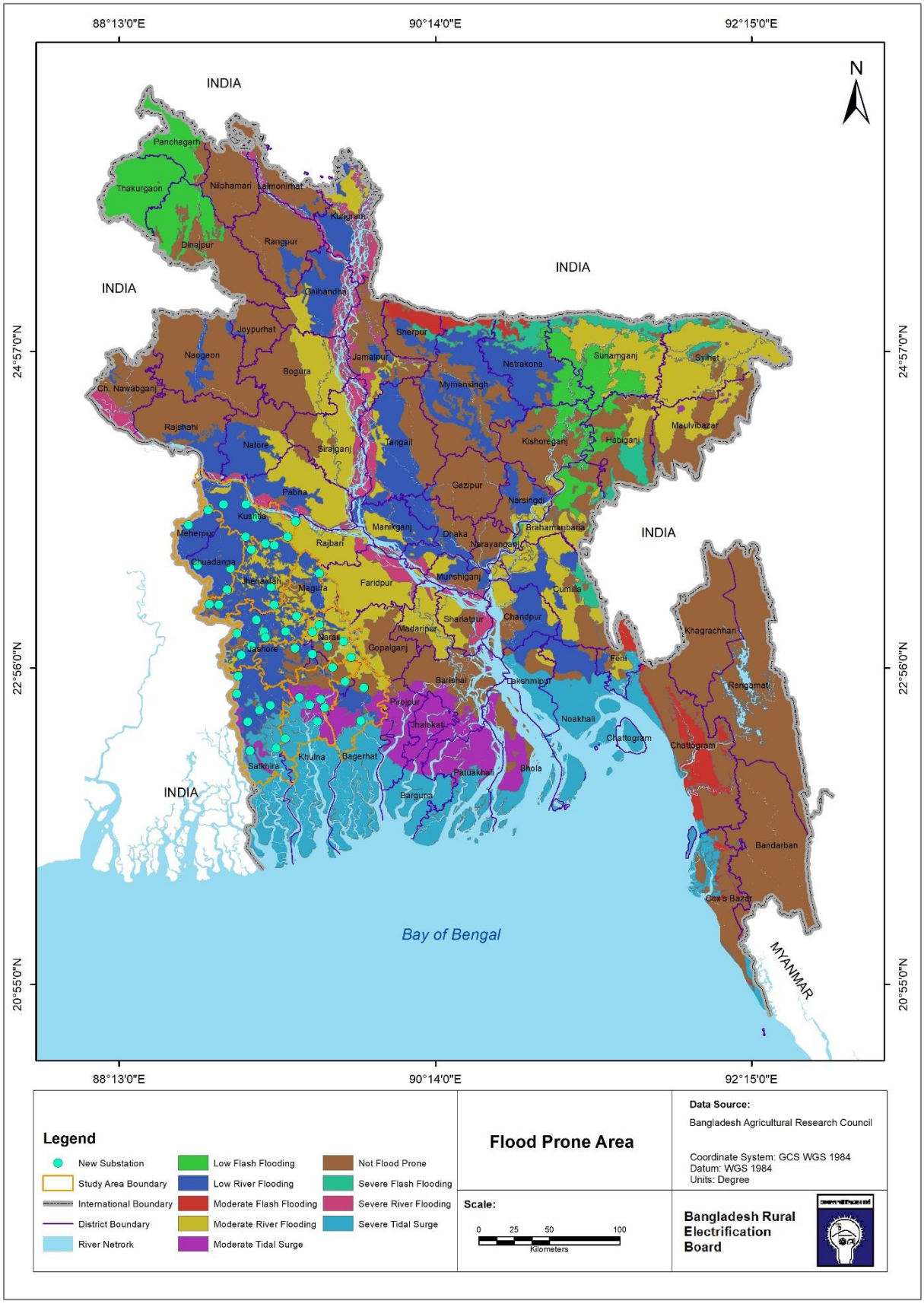
4.4.5.3 Flood

166. Flood is a recurrent phenomenon in Bangladesh. Every year near about one-fifth of Bangladesh undergoes flood during the monsoon season. A flood season in Bangladesh may start as early as May and can continue until November. Floods of Bangladesh can be divided into below three categories:

- Monsoon Flood - seasonal, increases slowly and decreases slowly, inundate vast areas, and causes huge loss to the life and property;
- Flash Flood - from sudden torrential flows, following a brief intense rainstorm or the bursting of a natural or manmade dam or levee; and
- Tidal Flood - short duration, height is generally 3–6m, prevents inland flood drainage. Floods are annual phenomena in Bangladesh. Normally the most severe floods occur during the months of July and August. Regular river floods (during monsoon season) affect 20% of the country which may increase up to 67% in extreme years like the 1998 flood.

167. The project areas are located in low river flooding, moderate river flooding, moderate tidal surge, severe tidal surge and not flood prone areas. The project area and their risk of flood is showing in **Figure 4.12**.

Figure 4.12: Flood Prone Areas of Bangladesh



4.5 Environmental Quality

4.5.1 Ambient Air Quality

168. The study area can be characterized as a rural area comprising of several small habitations, farmlands. Existing sources of generation of particulate matter and gaseous air pollutants is primarily limited to brick kilns, vehicular transportation on adjacent road and from burning of fossil fuels for domestic purposes. Considering this context, the ambient air quality is expected to be representative of a predominantly rural area, with moderate to good air quality.

4.5.2 Acoustic Environment

169. The ambient noise quality of the study area is also representative of ambient noise quality typically expected in rural residential areas. The main source of noise near project sites is noise emitted from vehicles plying on the adjoining roads. Primarily, light utility vehicles were observed, and no significant noise levels were reported by local people during consultations.

4.6 Biological Environment

4.6.1 Biological Environment

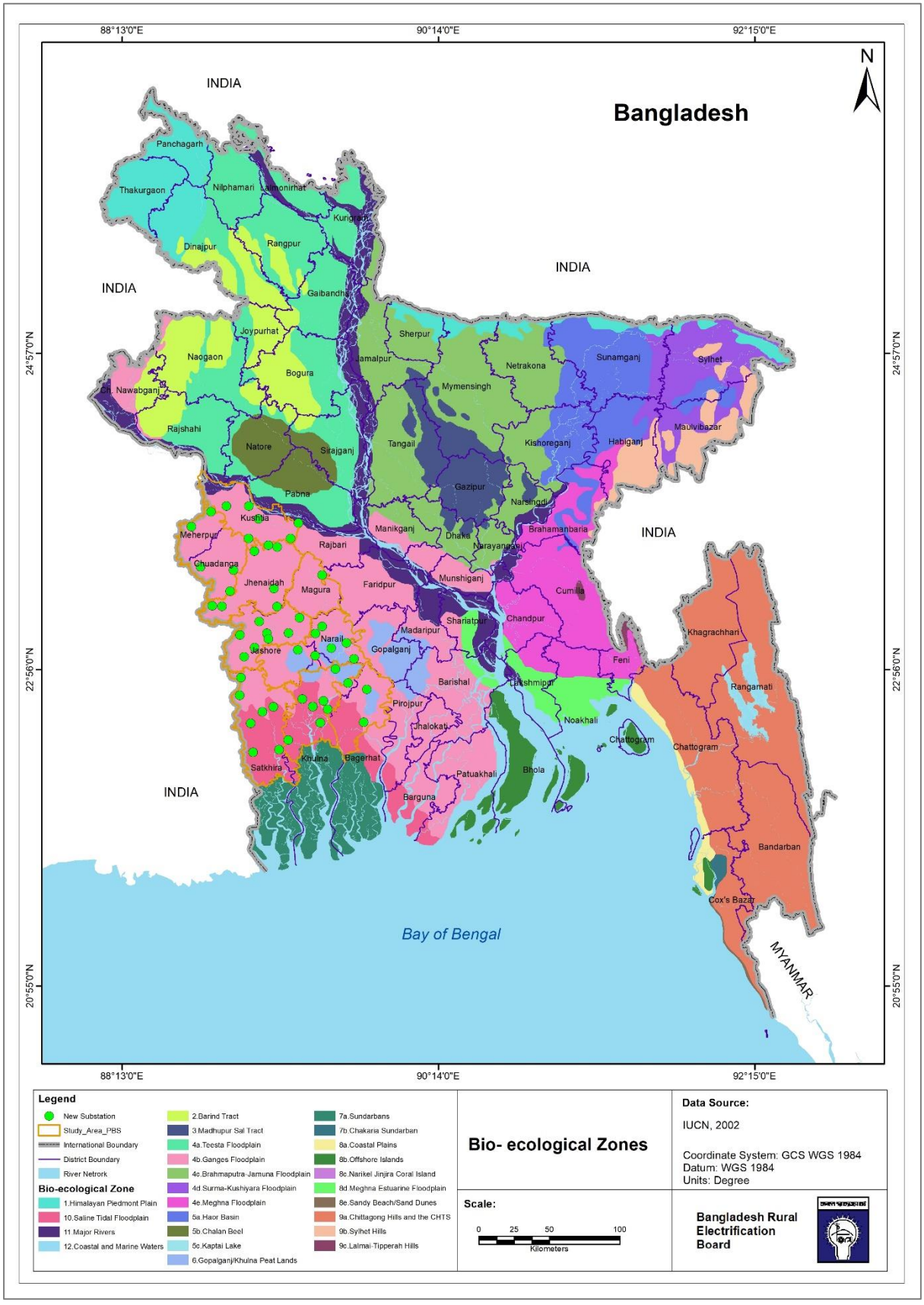
170. The project area falls in various terrestrial and aquatic ecosystems consisting of mainly floodplain lands, peat lands and river terrain. With a variation of landforms, the area once supported a natural abundance of wildlife and vegetation. The project area is much changed with homesteads and intensive agriculture, but many rivers, beels, ponds, ditches and floodplain still support various species of flora and fauna.

4.6.2 Bio-ecological Zones

171. The International Union for Conservation of Nature (IUCN) has classified Bangladesh into twenty-five (25) Bio-ecological Zones (Nishat et al., 2002) (11) in the context of physiographic and biological diversity. The project areas fall under three bio-ecological zones of Bangladesh as Ganges floodplain (4b), Gopalganj/Khulna Peat land (6) and Saline tidal floodplain (10). The following **Figure 4.13** shows the bio-ecological zones of Bangladesh.

[11] Nishat, A., Huq, S.M. Imamul, Barua, Shuvashis P., Reza, Ali A.H.M., Khan, & Moniruzzaman A.S. (eds). (2002). “Bio-ecological Zones of Bangladesh”. IUCN Bangladesh Country Office, Dhaka, Bangladesh.

Figure 4.13: Project Area in Bio-ecological Zones of Bangladesh



172. Project areas bio-ecological zones are described in following sections:

Ganges Floodplain

173. The Ganges floodplain is basically consisted of the active floodplain of the Ganges river and the adjoining meandering floodplains and is mostly situated in the administrative districts of greater Jessore, Kushtia, Faridpur and Barisal. The adjoining meander floodplains mainly comprise a smooth landscape of ridges, basins, and old channels. Noteworthy aspect here is that the Gangetic alluvium is readily distinguishable from the Old Brahmaputra, Jamuna and Meghna sediments by its high lime content. Besides, 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 lands in each flooding season, but it is less braided than that of the Brahmaputra-Jamuna. Interestingly enough, both plants and animals move and adapt with the pattern of flooding (Brammer, 1996).

Floral diversity

Trees near water: Eliial (*Barringtonia acutangula*), Barun (Crataeva nurvala), Jiban (*Trema orientalis*), Mandar (*Erythrina indica*)

Shrubs: Chakunda (*Cassia tora*), Assam lata (*Mikania scandens*), Ban croton (*Croton bonplandianum*)

Planted trees: Khejur (*Phoenix sylvestris*), Narikel (*Cocus nucifera*), Amra (*Spondias pinnata*), Supari (*Areca catechu*)

Aquatic plants: Shado shapla (*Nymphaea nouchali*), Singara (*Trapn bispinosa*), Kachuripana (*Eicllhornia crassipes*), Panchuli (*Nymphoides indicum*), Hogla (*Typha elephantina*)

Faunal diversity

Mammals: Hanuman langur (*Semnopithccus entellus*), Five-striped palm squirrel (*Funambulus Fnnanti*), Smooth-coated otter (*Iutra perspicillata*), Rufous-tailed hare (*Ivpus nigricollis*).

Birds: Water cock (*Gallicrex cinerea*), Bank myna (*Acridotheres ginginianus*), Asian paradise-flycatcher (*terpsiphone paradisi*), Brahminy kite (*llaliastur indus*), River tern (*Sterna aurantia*).

Reptiles: Yellow monitor (*Varanus flavescens*), Common vine snake (*Ahaetulla nasutus*), Binocellate cobra (*Naja naja*), Painted roofed turtle (*Kachuga kachuga*).

Amphibians: Boulenger's frog (*Rana alticola*), Balloon frog (*Uperodon globulosus*).

Gopalganj/Khulna Peat Lands

174. This zone occupies a number of low-lying areas between the Ganges river floodplain and the Ganges tidal floodplain in the south of Faridpur region and the adjoining parts of Khulna and Jessore districts. Thick deposits of peat occupy perennially wet basins, but they are covered by clay around the edges and by calcareous silty sediments along the Ganges distributaries crossing the zone. Most of the layers harden irreversibly into coal-like lumps when dry. The soil, in this zone, is potentially strongly acidic and low in essential plant nutrients. The basins are deeply flooded by rainwater during the monsoon season. However, in the basin close to Khulna, the floodwater is somewhat brackish (Brammer, 2000).

Floral diversity

Trees near water Bakful (*Sesbania grandiflora*), Hijal (*Barringtonia acutangula*), Barun (*Crataeva nurvala*), Rendi koroi/Rain tree (*Samanea saman*), Safeda (*Manilkara zapota*)

Aquatic plants: Kaoatukri (*Sagittaria guaynensis*), Padda (*Nelumbo nucifera*), Kolmi (*Ipomoea aquatica*), Hogla (*Typha angustata*), Chechra (*Schenoplectus articulatus*)

Faunal diversity

Mammals: Smooth-coated otter *(Lutra perspicillata)*, Five-striped palm squirrel *(Funambulus pennanti),* Fishing cat *(Prionailurus viverrinus)*

Birds: Scaly-breasted munia *(Lonchura punctulata),* Asian openbill *(Anastomus oscitans),* Bank myna *(Acridotheres ginginianus)*

Reptiles: Common krait *(Bungarus caeruleus),* Common wolf snake *(Lycodon aulicus),* Copper head trinket snake *(Elaphe radiata),* Spotted pond turtle *(Geoclemys hamiltonii)*

Amphibians: Maculated tree frog *(Polypedates maculatus),* Cricket frog *(Limnonectes limnocharis)*

Saline Tidal Floodplain

175. The Saline tidal floodplain has a transitional physiography, which is located in the administrative districts of Satkhira, Khulna, Bagerhat, Jhalakathi and Borguna. It has a low ridge and basin relief, crossed by innumerable tidal rivers and creeks. Local differences in elevation are less than 1 m. The sediments are mainly composed of non-calcareous clays, although in the riverbanks, they are silty and slightly calcareous. The soils are non-saline throughout the year over substantial amount of areas in the north and east, but they become saline to varying degrees in the dry season in the southwest and are saline for much of the year in the Sundarban. The rivers carry fresh water throughout the year to the east and northeast, but saline water penetrates increasingly further inland towards the west mainly in the dry season, and for most or all the monsoon season in the southwest. In the northeast, there is moderately deep flooding during the monsoon season, mainly due to accumulation of rainwater on the land when the Ganges distributaries and the lower Meghna are at high flood levels. Elsewhere, there is mainly shallow flooding at high tide, either throughout the year or only in the monsoon season, except where tidal flooding is prevented by embankments. Within embankments, seasonal flooding only occurs through accumulation of rainwater (Brammer, 1996).

Floral diversity

Trees

Hargoza *(Acanthus illicifolius),* Narikel *(Cocos nucifera)*, Khejur *(Phoenix sylvestris),* Bhadi *(Lannea coromandelica*)

Faunal diversity

Mammals: Jackal *(Canis aureus),* Smooth-coated otter *(Lutra perspicillata),* Gray mask shrew *(Suncus murinus),* Small Indian civet *(Viverricula indica)*

Birds: Sarus crane *(Grus antigone),* Black-winged stilt *(Himantopus himantopus),* Little grebe *(Tachybaptus ruficollis)*, Red-wattled lapwing *(Vanellus indicus)*

Reptiles: Ring lizard *(Varanus salvator),* Banded sea snake *(Hydrophis fasciatus)*, Estuarine sea snake *(Hydrophis obscura)*

Amphibians: Maculated tree frog *(Polypedates maculatus),* Tree frog *(Polypedates leucomystax),* Cricket frog *(Limnonectes limnocharis)*

4.6.3 Environmentally Sensitive Areas

4.6.3.1 Protected Areas

176. The protected area refers to an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity and of natural and associated cultural resources and managed through legal or other effective means i.e. 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 (18),

Wildlife Sanctuary (23), Eco-park (10), Safari park (2), Marine Protected Area (2), Special Biodiversity Conservation Areas (2), Botanical Garden, Community Conservation Area, Kunjaban etc.

177. According to the Bangladesh Forest Department, the closest protected area is Dangmari wildlife Sanctuary which is about 18.7 km from proposed Dacope-3 substation. The map of the protected areas is shown in **Figure 4.14**.

4.6.3.2 Ecologically Critical Area

178. In 1995 after the enactment of the Ecological Critical Area (ECA), 1995 the government is empowered to declare an area which is enriched with unique biodiversity and environmentally significant and shall need protection or conservation from destructive activities as ECA. In this regard, the GOB after considering the human habitat, ancient monument, archaeological 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 till now declared 13 areas as ECA.

179. None of the project components are located in these ecological critical areas. The ECA area of Bangladesh is shown in **Figure 4.15**.

Figure 4.14: Protected Areas of Bangladesh

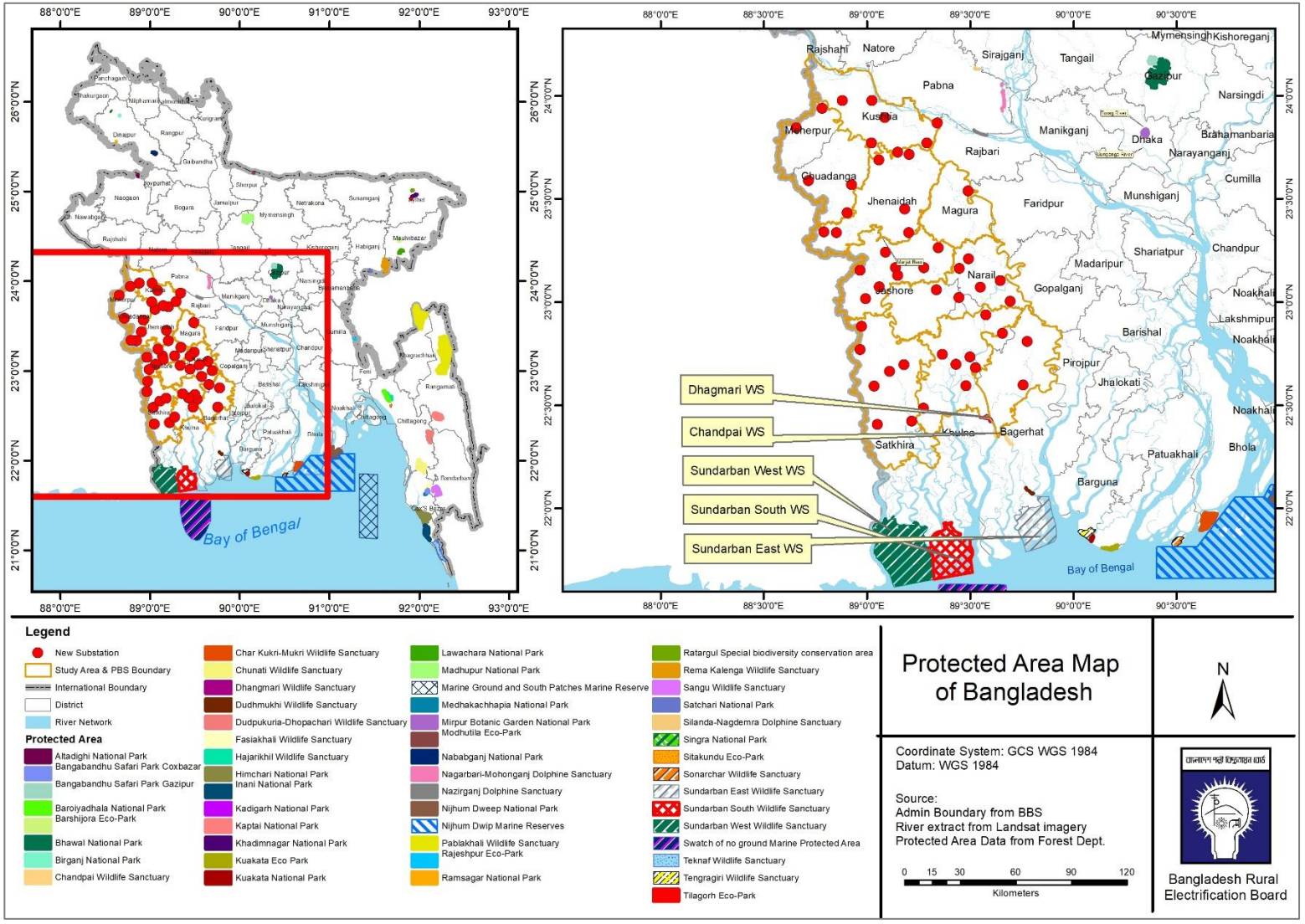
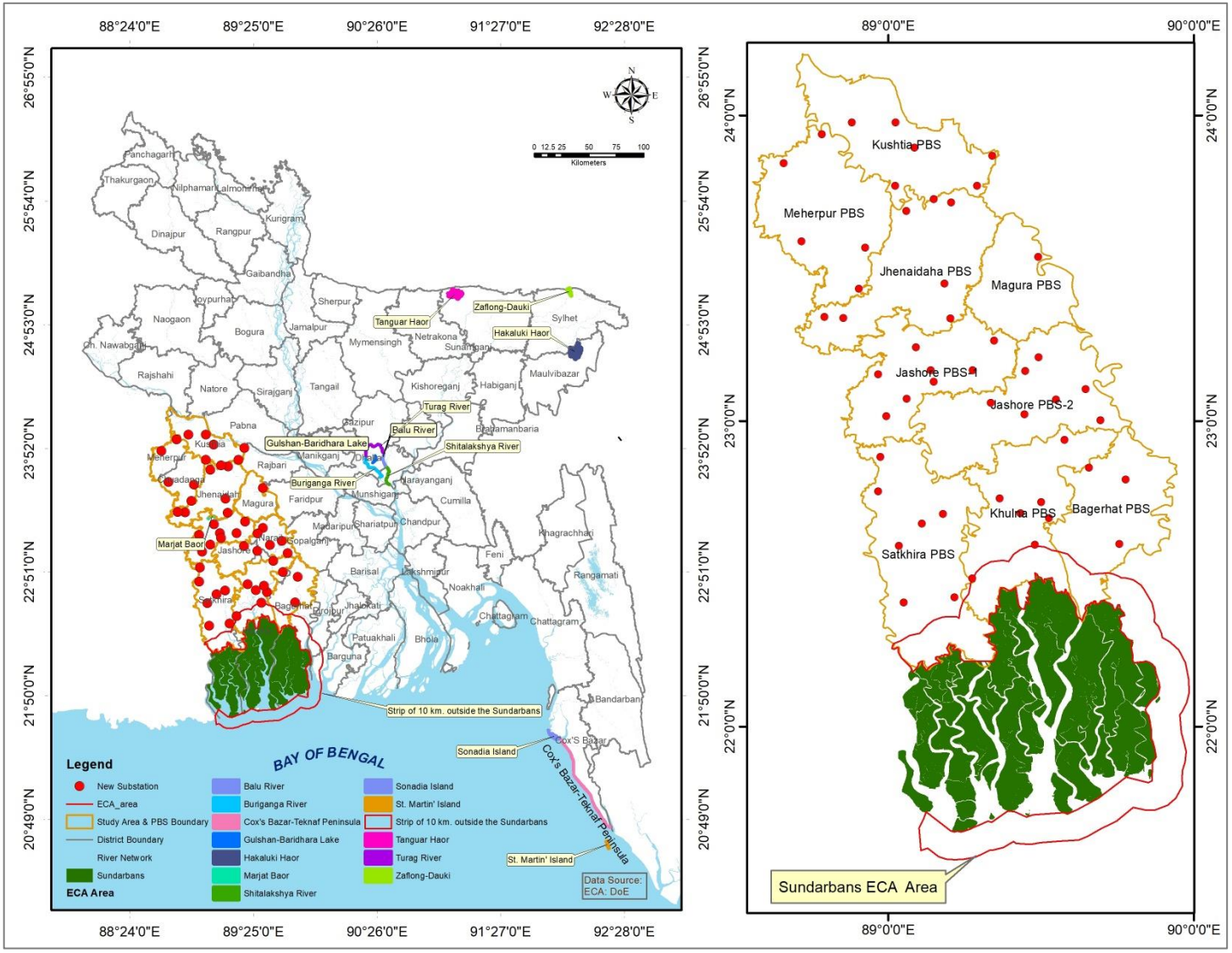


Figure 4.15: Ecologically Critical Area of Bangladesh



4.6.3.3 IBAT Screening of Key Biodiversity Areas

180. The eight districts in Khulna region of the Western Bangladesh in which construction works will take place plus a buffer zone have been screened to determine presence of key biodiversity areas (KBAs) using the Integrated Biodiversity Assessment Tool (IBAT).[12]

181. Screening using IBAT shows that there are no protected areas or key biodiversity areas within 5 km buffer zone of the project components.

182. The new substations are located in rural areas mostly on the open land available on the outskirts of villages; and the alignments of the 33kV and 11 kV distribution lines mostly follow the alignment of existing roads. None of the new substations are located within any national park, protected forest, game reserve, wildlife sanctuary and environmental critical area.

183. During site visits no threatened species were observed in the project area, and consultations with local communities did not identify the presence of any species of concern.

4.7 Social Environment

4.7.1 Introduction

184. Information on the baseline condition of social and economic resources of the project area is provided below. A number of socio-economic indicators are analyzed based on data available from the 2011 census for the Khulna division in which the project falls.

4.7.2 Administrative Area

185. The project consists of several components under nine PBSs of ten district within Khulna division of Bangladesh. The study area covers 37 upazilas and 380 unions as presented in **Table 4.9**.

Table 4.9: Administrative Areas Inside 9 PBSs

District	Upazila/ Thana/ City Corporation/ Pourosava	Union
Bagerhat	Bagerhat Sadar	10
	Chitalmari	7
Subtotal	**2**	**17**
Jashore	Abhaynagar	8
	Jashore Sadar	15
	Jhikargachha	11
	Sharsha	11
	Chaugachha	11
	Bagherpara	9
Subtotal	**6**	**66**
Jhenaidah	Harinakunda	8
	Jhenaidah Sadar	17
	Kaliganj	11

[12] IBAT is a multi-institutional programme of work involving BirdLife International, Conservation International, IUCN and UNEP-WCMC. IBAT provides a basic risk screening on biodiversity. It draws together information on globally recognised biodiversity information drawn from a number of IUCN's Knowledge Products: IUCN Red List of Threatened Species, Key Biodiversity Areas (priority sites for conservation) and Protected Planet/The World Database on Protected Areas (covering nationally and internationally recognised sites, including IUCN management categories I–VI, Ramsar Wetlands of International Importance and World Heritage sites).

District	Upazila/ Thana/ City Corporation/ Pourosava	Union
	Maheshpur	12
	Shailkupa	14
Subtotal	**5**	**62**
Khulna	Rupsha	5
	Batiaghata	7
	Dumuria	14
	Dacope	10
	Dighalia	4
	Koyra	7
Subtotal	**6**	**47**
Kushtia	Daulatpur	14
	Khoksha	9
	Kushtia Sadar	14
	Mirpur	12
Subtotal	**4**	**49**
Narail	Kalia	13
	Lohagara	12
	Narail Sadar	13
Subtotal	**3**	**38**
Magura	Sreepur	8
Subtotal	**1**	**8**
Meherpur	Gangni	9
Subtotal	**1**	**9**
Chuadanga	Chuadanga Sadar	7
	Damurhuda	7
	Jibonnagar	4
Subtotal	**3**	**18**
Satkhira	Tala	12
	Kalaroa	12
	Satkhira Sadar	14
	Assasuni	11
	Debhata	5
	Kaliganj	12
Subtotal	**6**	**66**
Total	**37**	**380**

Source: Population and Housing Census, Bangladesh Bureau of Statistics, 2011

4.7.3 Population and Households

186. The 9 PBSs cover south-west area of Bangladesh. The average sex ratio among all districts is 100. Population densities in Bangladesh are relatively high throughout the country.

Narail district has the lowest population density in the project area and Khulna district has the highest with more than 1,000 persons per km^2. The demographic characteristics of the study area is shown in **Table 4.10**.

Table 4.10: Demographic Characteristics of the Study Area

District	Household	Population	Male	Female	Sex Ratio	Area (km^2)	Persons/ km^2
Chuadanga	277464	1129015	564819	564196	100	290127	962
Bagerhat	354223	1476090	740138	735952	101	978317	1027
Jashore	656413	2764547	1386293	1378254	101	644190	1060
Jhenaidah	422332	1771304	886402	884902	100	485506	902
Khulna	547347	2318527	1175686	1142841	103	1085893	1046
Kushtia	477289	1946838	973518	973320	100	397544	1210
Magura	205902	918419	454739	463680	98	256767	884
Meherpur	166312	655392	324634	330758	98	185731	872
Narail	162607	721668	353527	368141	96	239196	746
Satkhira	469890	1985959	982777	1003182	98	943272	1044
Project Area	3739779	15687759	7842533	7845226	100	5506543	975

Source: Population and Housing Census, Bangladesh Bureau of Statistics, 2011

4.7.4 Religion

187. According to the population and housing census (2011), the population of the project areas is dominated by the Muslim community constituting almost 87.4% of the total population. The remaining 12.6% is primarily constituted by Hindus with Christians, Buddhists and others comprising an insignificant percentage. The following **Table 4.11** indicates the various religious profiles of the project areas.

Table 4.11: Religious Profile of the Study Area

District	Total Population	Muslim	Hindu	Christian	Budhist	Others
Chuadanga	1129015	97.5	2.3	0.14	0.002	0.05
Bagerhat	1476090	81.2	18.4	0.41	0.003	0.03
Jashore	2764547	88.5	11.2	0.20	0.004	0.09
Jhenaidah	1771304	90.4	9.5	0.06	0.002	0.08
Khulna	2318527	76.6	22.7	0.66	0.004	0.03
Kushtia	1946838	97.0	2.9	0.01	0.004	0.05
Magura	918419	82.0	17.9	0.04	0.001	0.03
Meherpur	655392	97.8	1.2	1.01	0.002	0.02
Narail	721668	81.3	18.7	0.04	0.001	0.03
Satkhira	1985959	81.9	17.7	0.31	0.001	0.12
Project Area	15687759	87.4	12.2	0.29	0.002	0.053

Source: Population and Housing Census, Bangladesh Bureau of Statistics, 2011

4.7.5 Household size

188. The 2011 Census shows that 64% of households (HH) in the project area comprise four or more family members as depicted in **Table 4.12**. The average household size in the project area is 4.2 members which is lower than the national average of 4.44 members.

Table 4.12: Household Size of the Study Area

District	No. of HH	No of Persons in Household and Percentage in Each Group								Ave. HH Size
		1	2	3	4	5	6	7	8+	
Chuadanga	276910	2.8	11.6	23.5	29.6	17.8	8.1	3.5	3.2	4.1
Bagerhat	350537	3.9	12.0	21.6	26.1	18.2	9.6	4.5	4.0	4.1
Jashore	653423	2.4	10.5	22.6	29.2	18.4	8.9	4.0	3.9	4.2
Jhenaidah	421300	2.4	10.8	22.0	29.2	18.8	8.9	3.9	3.9	4.2
Khulna	540504	3.4	11.0	22.1	27.2	17.9	9.4	4.4	4.6	4.2
Kushtia	475989	3.1	11.9	23.1	29.0	17.9	8.2	3.5	3.4	4.1
Magura	205492	2.4	9.2	18.9	27.1	20.3	11.0	5.3	5.9	4.4
Meherpur	166312	3.3	13	24.9	29.6	16.1	7.3	3	2.8	3.9
Narail	162607	3.1	9.8	19.1	25.5	19.4	11.5	5.7	6	4.4
Satkhira	468853	2.7	10.6	22.1	28.3	18.3	9.3	4.3	4.4	4.2
Project Area	3445017	3.0	11.0	21.8	27.9	18.4	9.3	4.3	4.3	4.2

Source: Population and Housing Census, Bangladesh Bureau of Statistics, 2011

4.7.6 Age Structure in the Project Area

189. Population and housing census (2011) shows that age structure in the project area covers 31.5 % of total population are children (ages up to 14 years), 60% are of working age i.e. between 15 to 59 years, which is considered as the active workforce. **Table 4.13** Shows the population distribution by different age groups in the project area.

Table 4.13: Population Distributions by Different Age Groups

District	Percentage of Population in Each Age Group (%)									
	0-4	5–9	10-14	15-19	20-24	25-29	30-49	50-59	60-64	65+
Chuadanga	8.9	10.7	11.1	8.3	8.8	9.9	27.8	6.8	2.8	5
Bagerhat	9	11.5	11.8	8.1	8	8.6	26.2	7.3	3.3	6.3
Jashore	8.9	10.7	11.0	8.7	9.2	9.6	26.9	6.9	2.8	5.3
Jhenaidah	9.0	11.0	11.1	8.3	8.8	9.7	26.8	6.9	2.9	5.4
Khulna	8.5	10.4	10.9	8.9	9.7	9.6	26.9	7.0	2.8	5.3
Kushtia	9.1	11.1	10.8	8.2	8.9	9.7	26.9	7.1	3.1	5.1
Magura	9.8	12.3	11.9	8.1	8.1	8.8	25.3	7.0	2.9	5.6
Meherpur	9.8	12.3	11.9	8.1	8.1	8.8	25.3	7	2.9	5.6
Narail	8.6	10.1	10.7	8.1	8.7	9.7	28.8	7.2	2.9	5.3
Satkhira	8.6	10.9	11	9	9.2	9.3	26.5	7	2.9	5.7
Project Area	9.1	11.2	11.2	8.4	8.7	9.3	26.6	7.0	3.0	5.5

Source: Population and Housing Census, Bangladesh Bureau of Statistics, 2011

4.7.7 Literacy

190. The literacy rate for the population 7 years and above in the project area is 52.7 % which is higher than the national literacy rate of 51.7 %. Similarly, male literacy rate in the project area is higher than national literacy rate whereas female literacy rate in the project area is lower than that of the country as a whole. Khulna district shows the highest literacy rates at 64.3 % for males and 59.3 % for females in Narail, while Chuadanga has the lowest rates at 46.9 % for male and 44.8 % for females in Kushtia. Literacy rates by each district in the project area is shown in **Table 4.14**.

Table 4.14: Literacy Rates by Each District in the Project Area

District	Total Literacy		Male Literacy		Female Literacy	
	Total Population	% of Total Literate	Total Male Population	% of Males Literate	Total Female Population	% of Females Literate
Chuadanga	980609	45.9	489330	46.9	491279	44.9
Bagerhat	1276591	59	638145	60	638446	58.0
Jessore	2400016	56.5	1200411	59.4	1199605	53.7
Jhenaidah	1532981	48.4	765563	50.5	767418	46.3
Khulna	2027717	60.1	1027115	64.3	1000602	55.9
Kushtia	1681149	46.3	838656	47.9	842493	44.8
Magura	783544	50.6	385745	52.9	397799	48.5
Meherpur	572499	46.3	282786	46.9	289713	45.7
Narail	610377	61.3	296657	63.3	313720	59.3
Satkhira	1730080	52.1	852067	56.1	878013	48.2
Project Area	13595563	52.7	6776475	54.8	6819088	50.5

Source: Population and Housing Census, Bangladesh Bureau of Statistics, 2011

4.7.8 Disability

191. Rates of disability provide an indication of social condition and wellbeing. **Table 4.15** shows that the overall disability rate in the project area is 1.56%. Six categories are defined in the census i.e. disability in speech, vision, hearing, physical, mental and autism. Among these categories physical disability is the most significant with 103,922 persons, which is 0.67% of the total population.

Table 4.15: Distribution of Population by Type of Disability

District	Total Population	Type of Disability (%)						
		Total	Speech	Vision	Hearing	Physical	Mental	Autism
Chuadanga	1129015	19193	2258	3387	2258	7903	2258	1129
		1.7	0.2	0.3	0.2	0.7	0.2	0.1
Bagerhat	1476090	25094	2952	4428	2952	10333	2952	1476
		1.7	0.2	0.3	0.2	0.7	0.2	0.1
Jessore	2764547	35939	5529	5529	2765	16587	5529	2765
		1.3	0.2	0.2	0.1	0.6	0.2	0.1
Jhenaidah	1771304	28341	3543	5314	1771	12399	3543	1771
		1.6	0.2	0.3	0.1	0.7	0.2	0.1
Khulna	2318527	39415	4637	9274	4637	16230	4637	2319
		1.7	0.2	0.4	0.2	0.7	0.2	0.1
Kushtia	1946838	27256	3894	3894	1947	11681	3894	1947
		1.4	0.2	0.2	0.1	0.6	0.2	0.1
Magura	918419	11021	1837	1837	918	4592	1837	918
		1.2	0.2	0.2	0.1	0.5	0.2	0.1
Meherpur	655392	11142	1311	1966	1311	5243	1311	655
		1.7	0.2	0.3	0.2	0.8	0.2	0.1
Narail	721668	11547	1443	2165	1443	5052	1443	722
		1.6	0.2	0.3	0.2	0.7	0.2	0.1

District	Total Population	Type of Disability (%)						
		Total	Speech	Vision	Hearing	Physical	Mental	Autism
Satkhira	1985959	33761	3972	5958	3972	13902	3972	1986
		1.7	0.2	0.3	0.2	0.7	0.2	0.1
Project Area	15687759	242708	31376	43752	23974	103922	31376	15688
		1.56	0.20	0.28	0.16	0.67	0.20	0.10

Source: Population and Housing Census, Bangladesh Bureau of Statistics, 2011

4.7.9 Occupations and Livelihoods

192. According to the Population and Housing Census of Bangladesh (2011), approximately 10% males aged 7 years old and above of total population in the study area are employed whereas 1.6% males have no work. Almost 11.3% females are involved in household work.

193. **Table 4.16** shows census data of occupation and livelihood for administrative divisions in which the project will be implemented under four very broad categories.

Table 4.16: Occupation and Livelihood in the Project Area

District	Total Population	Employed		Looking for work		Household work		Do not work	
		Male	Female	Male	Female	Male	Female	Male	Female
Chuadanga	1129015	149556	6690	565	273	987	151926	20799	27533
Bagerhat	1476090	95840	6883	1268	357	2815	94938	22276	32307
Jashore	2764547	240322	19532	799	598	2630	278371	39523	64135
Jhenaidah	1771304	224118	9020	690	468	2044	244598	28815	41681
Khulna	2318527	154335	24582	1288	685	2181	185021	38802	61115
Kushtia	1946838	281898	13663	1286	731	2871	295495	33942	43870
Magura	918419	102156	3887	356	230	1266	119381	15255	22006
Meherpur	655392	98340	3162	383	222	692	102455	11284	13583
Narail	721668	67183	3241	443	185	910	78524	13749	19291
Satkhira	1985959	173638	17796	960	603	2777	224415	30887	54038
Project Area	15687759	1587386	108456	8038	4352	19173	1775124	255332	379559

Source: Population and Housing Census, Bangladesh Bureau of Statistics, 2011

4.7.10 Housing Condition

194. According to population and housing census (2011), predominant structure of project areas is Kutcha[13] (58.3%) followed by Semi-Pucca[14] (26.9%), Pucca[15] (12.1%) and Jhupri[16] (2.7%).

195. In the project areas, about 35.3% households use no water sealed sanitary latrine including 30.8% non-sanitary and 29.8% water sealed sanitary latrine. On contrary, 4.2% households have no access to latrine facility and defecate in open places. **Table 4.17** shows housing structure and sanitary facility in the project area.

[13] "Kutcha is defined by the structures whose walls are made of clay, wood, bamboo, straw or raw bricks and roofs are made of tin, bamboo and straw", BBS (2015).
[14] "Pucca is structures whose floor, wall and roof are made of cement, brick and stones", BBS (2015).
[15] "Semi-pucca is defined by the structures whose walls are made of cement and bricks and roof is made of tin, asbestos, wood or bamboo", BBS (2015).
[16] "Jhupri is very smaller and lower than a general house and made of straw/leaf, polythene, bamboo or tin", BBS (2015).

Table 4.17: Type of Housing Structure and Sanitary Facility in the Project Area

No. of HH	Percentage of Type of Structure				Percentage of Toilet Facility			
	Pucca	Semi pucca	Kutcha	Jhupri	Sanitary (With Water Seal)	Sanitary (No Water Seal)	Non-Sanitary	None
276910	22.1	27.7	46.5	3.7	18.9	26.4	47.8	6.9
350537	5.1	11.8	78.3	4.8	35.4	43.3	19.5	1.8
653423	16.4	33.6	44.9	5.2	28.6	31.7	35.2	4.5
421300	14.9	29.4	51.5	4.2	24	33.3	37.3	5.4
540504	18.3	23	56.6	2	41.4	36.6	18.4	3.6
475989	7.8	31.8	59.4	1	25.9	33.3	36.3	4.5
205492	5.4	26.2	66.9	1.5	42.4	35	19.4	3.2
166312	20	33.4	43.4	3.1	20.2	25.4	46.5	7.9
162607	6.4	24.3	68.3	1	29.9	41.2	26.1	2.9
468853	14.3	28.5	55.8	1.4	20.6	37.6	38.1	3.7
3445017	**12.1**	**26.9**	**58.3**	**2.7**	**29.8**	**35.3**	**30.8**	**4.2**

Source: Population and Housing Census, Bangladesh Bureau of Statistics, 2011

4.7.11 Housing Tenancy

196. Population and housing census (2011) show that in the project areas about 91.5% household have own house followed by 5.7% rented house and 2.8% rent free house. Following **Table 4.18** shows the housing tenancy in the project areas.

Table 4.18: Water & Electricity Access within the Project Areas

District	No. of HH	Housing Tenancy (%)		
		Owned	Rented	Rent free
Chuadanga	276910	94.5	2.9	2.6
Bagerhat	350537	92.6	5.2	2.3
Jashore	653423	86.6	8.3	5.1
Jhenaidah	421300	94.4	3.5	2.1
Khulna	540504	72.6	22.9	4.5
Kushtia	475989	94.4	3.7	2
Magura	205492	95.1	3.1	1.8
Meherpur	166312	94.7	1.8	3.4
Narail	162607	94.8	3	2.2
Satkhira	468853	95.5	2.8	1.7
Project Area	**3721927**	**91.5**	**5.7**	**2.8**

Source: Population and Housing Census, Bangladesh Bureau of Statistics, 2011

4.7.12 Water and Electricity Supply

197. Within the project areas, the major source of drinking water is tube-well where about 87.8% populations use tube-well water. On the other hand, only 3.0% people have access to tap water. Other 9.3% people have access neither tube-well nor tap water and consequently have to rely on nearest surface water sources i.e. river, pond or canal.

198. Electricity is an important indicator for measuring the quality of life. In these project areas, only 54.0% of the households have electricity connections. **Table 4.19** shows the water and electricity access of the project areas.

Table 4.19: Water & Electricity Access within the Project Areas

District	No. of HH	Source of Drinking Water (%)			Electricity Connection (%)
		Tap	Tube-well	Other	
Chuadanga	276910	3	94.8	2.2	60.6
Bagerhat	350537	6.4	59.9	33.7	40.8
Jashore	653423	1.2	97	1.8	61.1
Jhenaidah	421300	2.4	95.2	2.4	58.6
Khulna	540504	2	83.7	14.3	64.1
Kushtia	475989	1.5	95.9	2.6	64.1
Magura	205492	1.3	96.5	2.2	40.8
Meherpur	166312	3	93.8	3.3	61.2
Narail	162607	1.2	96.6	2.2	45.7
Satkhira	468853	5.9	79.1	15	41.8
Project Area	**3721927**	**3.0**	**87.8**	**9.3**	**54.0**

Source: Population and Housing Census, Bangladesh Bureau of Statistics, 2011

Chapter 5

5. Anticipated Environmental Impacts and Mitigation Measures

199. This chapter presents the potential environmental impacts of the project and the recommended mitigation measures to address adverse environmental impacts. The environmental impacts are structured into three phases as: (i) detailed design and pre-construction phase, (ii) construction phase, and (iii) operational phase of the project. It is based on assessment of the locations earmarked for the 51 new substation sites and provisional routing alignments for 33/11 kV distribution line connecting the new substations with existing substations. For new distribution lines, alignments will be determined following detailed route surveys. Considering the ongoing covid-19 pandemic, the due diligence has been carried out within the procedural framework developed for the safeguards due diligence (Appendix 5).

200. Considering the nature and footprint of the project activities, the project area of influence is considered as a 1km radius around the substations and 500 m along the distribution line alignments. The right of way of the distribution lines is considered as the direct impact zone along the alignment. However, the potential impact zone is considered up to a 5 km radius of substations and distribution line alignments in respect of indirect impacts on environmentally sensitive areas such as national protected areas networks. The potential impacts and risks from the project were assessed based on these considerations and the available design information. Major permanent physical impacts of the project will take place by construction of proposed new substations and installation of 33kV and 11kV new distribution lines.

201. The assessment was carried out through site surveys, public consultations and interviews with stakeholders and assessment of the environmental setting of the project areas. The maps for locations such as protected areas, culturally sensitive areas, geology, land use, and secondary data on environmental and socio-economic settings in the project region (Khulna region in Western Bangladesh) were generated to determine the extent of the impacts of the project to the environment and communities. Primary baseline data was collected to supplement gaps in the secondary data.

202. The following sections present the potential environmental impacts and mitigation measures of the project during various phases of project implementation.

5.1 Impacts and Mitigation Measures Due to Project Design and Pre-construction Phase

203. The project component involves construction of new 33/11kV substations and laying the new 33kV and 11kV and lower voltage distribution lines. The potential impacts are mostly related to construction of the proposed new substations and installation of new distribution lines. The route of the new distribution lines will be aligned alongside existing lines and/or along the alignment of existing road corridors although some sections may need to pass thorough agricultural areas.

204. The principles that have been (and will be) adopted for selection of optimum sites and routings for the various project components are: (i) minimize disturbance of human settlements (minimum or no land acquisition or resettlement); (ii) avoid monuments and all resources of cultural or historical importance; (iii) do not create a threat to the survival of any community with special reference to ethnic minority communities; (iv) do not affect any public utility services or community facilities like playgrounds, schools etc.; (v) do not encroach or pass through any protected area i.e. wildlife sanctuaries, national parks, reserve forests etc. or key biodiversity areas; and (vi) minimize damage to existing trees/forest resources. In relation to the selection and design of new equipment this will be done to comply with national requirements as well as considering international good practice as per the IFC guidelines on Electric Power Transmission and Distribution dated 30 April 2007 particularly with respect to

avoiding the use of PCB oils in the purchase of transformers and use of asbestos containing materials in construction.

5.1.1 Encroachment into Areas of Cultural/Historical Significance, Protected Areas, Forests and Areas of Biodiversity Value

205. New substation sites are located in semi-urban/rural areas on land owned by government or private individuals. Mostly the locations of new 51 substations are on cultivated land with standing crops, few trees and vegetation growth of mainly shrubs and grasses. For new substations, 33kV feeder lines from existing 33/11kV substations require erection of new poles and conductors mostly along existing road corridors within the available right of way or potentially crossing agricultural or plantation land.

206. There are no sensitive cultural or biodiversity receptors of international, national, state or district importance including protected areas, key biodiversity areas, forest areas, sacred groves, or historical / cultural monuments around the identified substation sites or along the alignments of the 33kV distribution lines that will be impacted from the construction or operation of the substations and distribution lines.

207. The identified new substations are located in rural areas mostly on the open land available on the outskirts of villages; and the alignments of the 33kV and 11 kV distribution lines mostly follow the alignment of existing roads.

208. During site visits no threatened species were observed in the project area, and consultations with local communities did not identify the presence of any species of concern. Locally important receptors (e.g. trees and physical cultural resources) if any will be avoided to the extent possible during survey works for the distribution lines.

209. Once installed the main biodiversity impact from distribution lines is electrocution of animals. For example, elephants in forest areas have been electrocuted by distribution lines, electrocution of bats handing on wires, and birds of prey when coming into contact with live conductor cables either when perched at the top of poles or when perched on the steel crossarm.

210. No distribution lines will pass through reserve or protected forest areas. Also, there are no reported elephant corridors in the project. However, for any distribution lines crossing any reported elephant corridors the detailed design is to ensure that, even if no elephants have been recently recorded or seen by forest officials or the local communities, that the clearance above ground of the lower conductor is as per national regulations or above maximum trunk height of the elephant, which ever higher.

211. For electrocution of birds, studies have shown that for bird’s electrocution rates can be significantly lower, average reduction of 85%, by discouraging them from perching on top of the pole and providing a barrier to touching the live cables. Mitigation is relatively inexpensive to implement (approximately $12/pole for materials) with no additional maintenance requirement.

5.1.2 Loss of Trees and Vegetation

212. A total of 3721 trees are expected to be affected by the 51 new substations. Trees are categorized based on their character and then size.[17] All trees are perennial except banana.

213. Most of the affected trees are small trees. PSB wise details of total trees affected by the project are presented in Table 5.1.

Table 5.1: Total Number of Trees Affected by the project

Type of Trees	Name of the PBS							Total
	Jashore-1	Jashore-2	Jhenaidah	Khulna	Kushtia	Meherpur	Satkhira	
Timber								
Large	3	13	8	3	0	0	6	33
Medium	37	8	5	7	0	6	5	68
Small	174	12	0	8	600	18	4	816
Sub-Total	**214**	**33**	**13**	**18**	**600**	**24**	**15**	**917**
Fruit								
Large	16	11	0	6	0	66	0	99
Medium	30	72	400	11	30	44	35	622
Small	342	29	0	11	25	32	30	469
Sub-Total	**388**	**112**	**400**	**28**	**55**	**142**	**65**	**1190**
Medicinal								
Large	0	0	0	0	0	0	0	0
Medium	2	0	0	0	0	0	0	2
Small	19	0	0	1	0	0	0	20
Sub-Total	**21**	**0**	**0**	**1**	**0**	**0**	**0**	**22**
Banana	192	0	0	0	600	0	0	792
Nursery	800	0	0	0	0	0	0	800
Sub-Total	**992**	**0**	**0**	**0**	**600**	**0**	**0**	**1592**
Total	**1615**	**145**	**413**	**47**	**1255**	**166**	**80**	**3721**

Source: Resettlement Action Plan Report, 2020

214. Some trees along the alignment of the 33/11kV transmission lines may also be affected and would need to be cut or trimmed in order to achieve the standard safety clearances for distribution power lines. The number of trees to be cut or trimmed will be identified as part of the detailed route alignment surveys. During finalization of the position of the line route the position of the concrete poles can be easily adjusted within the road reserve to minimize impacts on trees.

215. BREB and their contractors should identify and conduct an inventory of trees to be cut prior to the start of land clearing work at substation sites and along distribution lines. Public trees will be compensated by compensatory afforestation as per forest department requirements and the requisite forest department approvals for any tree cutting will be sought

[17] **Large Tree:** A commonly found tree (except some particular species such as palm, dates, coconut, betel nut, guava, lemon, sharifa/sofeda, etc) with more than 4 feet of girth at the chest position has been classified as big tree. In case of fruit bearing trees (Mango, Jackfruit, Litchi, Black Berry, etc.) the girth size 3.5 feet and above are also considered as big category. In case of Palm, dates, coconut, betel nut, etc. 20 feet or above height is considered big. In case of guava, lemon, sharifa/sofeda, etc the age of the trees and judgment of the surveyor and trees owners has been imposed to classify the size. More than 10 years of age of such species of trees has been categorized as large.
Medium Tree: Trees having 2–4 feet girth is classified as medium. In case of palm, dates, coconut, betel nut species, the height between 10–20 feet is medium and for guava, lemon, sharifa/sofeda, etc the age of the trees between 5–10 years are classified as medium.
Small Tree: Three having less than 2 feet girth is classified as small,In case of palm, dates, coconut, betel nut species, the height between 5–10 feet is small and for guava, lemon, sharifa/sofeda, etc the age of the trees between 2–5 years are classified as small.
Sapling/plant: Tree planted for gardening or growing up is classified as sapling. The plant still in nursery or eligible for shifting is classified as seedling.

pre-construction. BREB will provide funds to the forest department rather than undertaking the compensatory afforestation themselves. However, BREB will monitor the progress of the compensatory afforestation process it has funded to ensure that planting takes place such that no net loss of biodiversity is obtained. Compensation for the loss of any private trees would be based on their replacement cost, as defined in the resettlement plan.

5.1.3 Interference with other utilities and traffic

216. BREB to seek requisite clearance prior to construction from agencies like forest department, departments of railways, roads, telecommunication, and wherever necessary, from aviation authorities that could be affected by the construction of power distribution infrastructure. Given that all new substations will be constructed on land secured by BREB, no significant interference with other utilities and traffic is expected, but requisite clearances will be obtained for distribution lines. Based on existing routings practices no reserve forest land will be traversed, so forest clearance may not be required. In the event the alignment of the distribution lines passes through reserve forest land, forest clearance would need to be obtained prior to commencement of the work in forest areas.

217. To minimize risks from interference with existing roads at the construction sites and used for haulage a Contractor's traffic management plan is to be developed in accordance with the project EMP will be approved by BREB prior to works. The traffic management plan will be prepared by the contractor in consultation with relevant local authorities for approval prior to any works.

5.1.4 Interference with water drainage patterns

218. Construction of new substation infrastructure at new sites will include provision of effective drainage design to attenuate storm water runoff leaving the site to greenfield runoff rates (allowing for climate change and considering addition of impermeable surfaces) such that there will be minimal changes to the natural flow rates and paths of storm water runoff across adjacent land. Drainage will be designed to route storm water runoff from the substation to existing watercourses or to infiltrate to ground in order to avoid flooding of access roads and nearby areas. Storm water management shall conform to governmental agency requirements.

219. There will be no or insignificant impacts on water drainage patterns resulting from 33/11kV feeder line components of the project.

5.1.5 Construction of access roads

220. In relation to traffic existing access roads to substations will be used to the extent possible. Most of new substation locations are accessible from existing village roads or state highway paved roads at distance varying in the range of 50–100m. Some of the existing village roads are in poor condition and unpaved access roads used for construction traffic and operational access will be (re)surfaced using concrete or asphalt to connect the substations with existing paved roads.

221. In case there is need construction of new access, the new access roads will be of single lane configuration (approximately 3m wide carriageway with side drains) and will be of concrete or asphalt surface with adequate drainage. Detailed design of the new access roads will be done by contractors. Construction material for access road works will be sourced from existing approved sources with operating licenses.

222. No new access roads will be required for distribution lines since all lines will be connected with existing road within access distance of 50–100m.

5.1.6 Proximity of sensitive receptors including noise/vibration nuisance

223. Some of the substation locations are adjacent to the sensitive receptors such residential houses, schools and mosques are within 50m distance. Such proximity of less than 50m to nearby residences is acceptable when internationally recognized design and

environmental health and safety standards are applied as they will be in this project. This includes ensuring that noise levels generated from the substations do not exceed statutory limits for residential areas.

224. The maximum allowable WHO guidelines (1-hour LAeq) noise levels for residential areas is 55dBA during daytime (0600–2200hrs) and 45dBA during nighttime (2200–0600hrs). In order to ensure that noise generated from construction activities and during operation of the substations does not exceed these noise levels for both the day time and night time, the layout of the substations will need to be designed to keep construction works and the transformers at the furthest distance possible from the houses.

225. The equipment installed at substations is mostly static and will be as far as possible be laid out so that transformers are placed at least 10m from the site boundary to provide further noise attenuation, they will also need to be well maintained once substations are operational. Transformers with power levels of 2.5MVA and 10MVA, as will be installed respectively, would be required via the contract to generate sound pressure levels of between 45 and 55dBA at 1m distance. The Institute of Electronics and Electrical Engineers (IEEE) standard 1127 notes that sound pressure levels from transformers will drop at least 3dBA for every doubling of distance. In other words, if the noise level of the transformer is measured at a distance of 10m from the source, this gives attenuation in the noise level by at least 20dBA. Thus, the maximum estimated noise level generated from the transformers at 10m from the source (substation boundary) is expected to dissipate to a range between 25–35 dBA which is significantly below the permissible limits. During operation it should therefore be possible for the substations to remain within the WHO guideline noise levels or at least not result in an increase in noise levels of < 3dBA where nighttime guidelines are already exceeded by the baseline.

226. For the substations which has sensitive receptors within 50m a solid boundary wall of at least 3m in height will also be provided on the boundary nearest the receptors; this will be constructed first to also provide screening from construction noise or alternatively temporary acoustic fence will be provided. With further attenuation by the proposed substation wall provided, even though not acoustically designed, it can be said that the statutory levels and WHO noise guidelines will be complied with such that potential noise impacts on sensitive receptors will not be significant once operational.

227. For the 33/11kV feeder lines statutory horizontal clearance distances from buildings will be maintained. In addition, given greater vulnerability of children to health and safety risk, the crossing of playgrounds and schools will be avoided by routing new distribution lines outside the compounds of schools and other similar community facilities during survey work. For any 33/11 kV line within 5m of such facilities, the arrangement plan will be included in the updated IEE, following detailed route surveys having been completed during detailed design.

5.1.7 Escape of Polluting Materials

228. The main potential source of polluting materials arising from the project is oil spill/leakage from substation transformers entering the soil, surface water and groundwater either directly or indirectly through the substation drainage system. Whilst no PCB oils will be used in new transformers, as per international good practice and in compliance with the ban by the government, insulating oils used can still adversely affect soil and water quality if inadvertently released to the environment.

229. Oil filling of transformers occurs when the equipment is initially installed. Periodic reprocessing or replacement of the oil may be necessary to ensure that proper insulation qualities are maintained. Under normal operating conditions some very minor loss of oil may occur over time through leaking seals and gaskets if not well maintained. Otherwise electrical failure or accident/fire could result in a more catastrophic loss of oil to the surrounding environment. The detailed design will need to ensure that adequate oil containment systems comprising impermeable surface (e.g. concrete) with 110% capacity are included for

transformers or other oil filled equipment at the new and upgraded substations to ensure that any insulating oil that inadvertently leaks from them is contained and does not migrate from the site.

230. Replacement transformer oil, as well as lubricating oil, solvents, and fuel that may be used by the substations, should be stored in metal drums, and kept on an impermeable surface under lock and key and under cover. It is anticipated that no more than about 500 liters of transformer oil would be stored at a substation. The detailed design for new substations will need to ensure an adequate store is provided. A concrete berm in the entranceway to or a bund around the covered store should be integrated into the detailed design, so as to create a shallow holding tank (of 110% volume) in the event that any oil, solvent, or fuel products released from a drum or tank are contained. Space will also be provided for solid and hazardous waste garbage bins to be stored.

231. Oil spill clean-up materials (sorbent pads, loose sorbent material, etc.) should be stationed in/outside any oil/fuel/chemical storage building in clearly labelled containers. Substation operators will need to be trained in good housekeeping practices, including how to clean up oil/fuel spills and dispose of contaminated sorbent material which would be treated as a hazardous waste.

232. Liquid waste management systems will be included in the detailed design and installed in substations to ensure that there will be no unacceptable impacts on the surrounding land or water bodies. The substation surface water drainage system should be carefully designed to prevent possible flooding of the substation area and should be directed through an oil and grease separator before discharge outside the site. Sanitary wastewater should be either discharged to an existing sewerage system where this exists or to septic tank with a soak away installed within the grounds of the substation but located at least 50m from any spring or well used for drinking water and 25m from any drain, stream or river.

233. In addition, contractor's pollution prevention, solid and hazardous waste management plans to be developed in accordance with the project EMP will be approved by BREB prior to works.

234. Provided the above measures are implemented the potential impacts due to the escape of polluting materials from substations will not be significant.

5.1.8 Explosion/fire hazards

235. Modern transformers are oil-cooled devices equipped with fire control systems, including firewalls that separate one transformer from another. These measures help to ensure that transformers do not overheat and catch fire and, on the rare occasion that they do catch fire, the fire does not spread to adjacent transformers.

236. Sufficient fire extinguishers of the type suitable for fighting an oil or fuel fire and other firefighting equipment shall be positioned where oil-filled transformers or other oil-filled equipment is used as well as outside/within the store. Fire detection and alarm system is to be provided in the control buildings. A fire emergency action plan shall be prepared for the substations and training given to staff on how to use firefighting equipment and how to implement the action plan.

5.1.9 Disaster risk

237. To minimize disaster risk, particularly given that some substations and distribution lines are on floodplains, detailed design will include highest flood levels and climate change adaptation measures. The detailed design will consider climate change adaptation measures suggested which include raising the transformer platforms in substations up to 2m height above the highest flood level etc.

5.1.10 Occupational Health and Safety

238. There will be workers based at the new substations and therefore the detailed design must ensure adequate sanitation and welfare facilities are incorporated into the control buildings. Such facilities should meet the requirements of the IFC EHS General Guidelines and will include:

- Indoor toilets with hand washing facilities and private bathing area connected to sewerage system or septic tank with soak away,
- Indoor food preparation and clean eating area, provision of sufficient fuel supply for cooking other than wood,
- Garbage bins for disposal of waste generated by workers, as burning of waste will be prohibited,
- Drinking water supply for any BREB stationed at the substation (usually maximum 2–3 persons) that meets drinking water standards must be provided, if an authorized supplier of canned water is not used the source to be used must be regularly tested to confirm it meets these standards.

239. The construction of substations and 33 and 11kV distribution lines poses moderate risk to the health and safety of workers. To mitigate this risk, the installation contractor will be required to prepare and implement an occupational health and safety risk assessment and plan (including covid-19 risks) for approval prior to construction works. The risk assessment should be undertaken through facilitated risk assessment workshop involving the contractor, BREB, and project implementation agency. The occupational health and safety plan should follow the health and safety hierarchy including measures set out in the IFC EHS General Guidelines, Section 2 on Occupational Health and Safety and those on Electric Power Transmission and Distribution.

5.1.11 Community Health and Safety

240. To mitigate potential impacts to the health and safety of villagers, the contractor will be required to develop a community health and safety risk assessment and plan (specific attention will be given to covid-19 risks and mitigations) for approval prior to construction works that incorporates good international practices and recognized standards such as emergency response and preparedness procedures, communication systems and protocols to report any emergency, including interaction with commune and provincial emergency and health authorities. IFC EHS General Guidelines, section 3 on Community Health and Safety and those on Electric Power Transmission and Distribution will be followed in developing the community health and safety plan by contractor. The risk assessment should be undertaken through facilitated risk assessment workshop involving contractor, BREB, and PIU. Community health and safety measures e.g. fencing, and signage will be incorporated into the detailed design.

5.2 Impacts and Mitigation Measures Due to Construction Activities

5.2.1 Waste Management

241. Liquid petroleum fuels for vehicles and other equipment may be used and stored. Recommendations for prevention and control of hazards associated with spill prevention, emergency response, clean-up, and contaminated soil remediation will follow the general EHS guidelines.

242. Waste management will be in accordance with national regulations and the IFC EHS General Guidelines. Scrap metal and equipment can be taken to the BREB stores for reuse or recycling on reaching the stores BREB must ensure that old transformers are stored on drip trays; currently they are stored on open ground. As per BREB practices, the old conductors will be stored in regional stores and sold to the third-party authorized venders for further recycling. Other solid and hazardous waste generated during construction will be limited in

volume and should be temporarily stored on site in segregated, labeled, sealed, and covered garbage bins. It will be disposed of by the contractor using a licensed waste management operator to recycle or dispose of it to suitably designed and licensed waste management facility. Records of materials used, generated waste, and transfer records will be kept by the contractor, the BREB will undertake random audit of third-party transfer of waste from time to time.

5.2.2 Erosion and sedimentation hazards

243. For substations excavation and other earthworks will be required, generally confined to soil movement to create a level platform for transformers and substation structures/switchyards to be installed within the land area for substation sites for 51 green field 33/11kV substations but also for the surfacing of unpaved and installation of new access tracks where these are needed. Excavation and other earthworks will be conducted during the dry season of the year to minimize the potential impacts related to erosion and sedimentation of watercourses due to construction activities although this has potential to exacerbate dust impact.

244. For distribution lines, the project will involve only minimal excavation that could contribute to soil erosion and the potential for sedimentation of watercourses. Excavation will be mainly limited to the auguring a single hole in the impact corridor for all 33kV lines and 11kV lines.

245. Excavations for tower bases will be limited to the immediate area of the tower legs. At most the footprint of a 33kV tower would be about 2m, therefore, the area that would be exposed to the forces of erosion is limited. The alignment route of proposed 33kV lines from existing substations to new substations will be along the existing roads and in parallel to existing lines with a safe distance for operations. As much as possible existing line maintenance tracks will be used to access the tower/pole sites (33kV) for new lines. The work will be performed within existing roads or other utility corridors. Given the small-scale nature of the excavations required for tower/pole foundations and that works will be undertaken in dry season, the impacts associated with uncontrolled erosion and silt runoff will not be significant.

246. Measures to minimize erosion and sedimentation will be incorporated into contract documents. These will include minimizing removal of existing vegetation and topsoil, and, promptly revegetating with native species or surfacing any areas where excavation and other earthworks are done. Excavated soil will be covered with tarpaulin when spoil heaps are not active and stored at least 10m from watercourses. Topsoil disturbed during the development of sites will be used to restore the surface of the excavated area. 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 accepting inert wastes. Records of excavated soil, generated waste, and transfer records will be kept by the contractor.

5.2.3 Nuisance to nearby properties

247. Potential nuisance to nearby properties during construction includes:

- Noise and vibration from construction equipment and heavy vehicles transporting materials to the sites,
- Dust arising during excavation and transport of materials,
- Air pollution due to exhaust gases from vehicles and plant, and
- Gaseous emissions from welding.

248. The construction activities will involve temporary and periodic use of mechanical equipment over a short period with much of the work carried out using manual labor. The main noise and dust generating activities will be associated with excavation for construction platform

preparation of substations and periodic transport of materials and equipment to the sites. The potential impact of noise, dust nuisance and air pollution on nearby communities from these activities will be minor, and periodic in nature. However, good construction practice to minimize these temporary construction impacts shall be specified in the contract documents.

249. The maximum allowable noise levels in residential areas is 55dB (A) during daytime hours (0600–2200hrs) and 45dB (A) during night- time hours (2200–0600hrs) which are equivalent to the WHO noise guidelines as 1-hour LAeq. For the project works will be restricted to daytime so the limit is 55dBA which the contractor will be required to comply with.

250. Periodic noise monitoring (at least two times during the construction period) during noisy construction activities at substations such as excavation for platform preparation and delivery of equipment to sites, will be undertaken during the construction of the project. Monitoring points will be located at the facade of the nearest residence where the nearest residence is less than 100m from the construction site or access road. Noise levels greater than the allowable standard should be recorded during noise monitoring, the contractor will be required to implement additional noise mitigation measures such as adjusting the working methods or placing of temporary noise barriers/fences to ensure that the noise standard is met.

251. Mitigation measures for noise at substations and on distribution lines will be in accordance with national regulations and the IFC EHS General Guidelines and will include:

- Scheduling all activities only during daytime working hours (8am–6pm)—any works outside these hours to only be undertaken with the agreement of local community and residents within 100m.
- Avoiding noisy works on the weekends, public holidays, religious festivals, and for works in proximity to schools, during exam periods—any noisy works within these periods to only be undertaken with the agreement of local community and residents within 100m.
- Use of low noise generating equipment e.g. less than 55dBA sound pressure level at 1m.
- Maintenance of construction machinery and vehicles to keep noise at a minimum, and in accordance with any national requirements for noise levels.
- Where sensitive receptors are within 50m of construction works temporary acoustic noise fence to be used.
- Construction workers exposure to noise should not exceed the levels set out in the general EHS Guidelines on Occupational Health and Safety otherwise the hearing protection is to be provided.

252. Mitigation measures for dust/air pollution at substations and on distribution lines will be in accordance with national regulations and the IFC EHS General Guidelines and will include:

- Poorly condition or unpaved access roads to substations to be surfaced before any excavation or other earthworks at the substation commence.
- Minimizing removal of existing vegetation and topsoil, and, promptly revegetating with native species or surfacing any areas where excavation and other earthworks are done.
- Water to be sprayed to suppress dust during works are in the vicinity of communities; water should be sprayed at least twice a day at substations and on unpaved access roads to distribution lines but more often if needed during excavations, earthworks, and windy conditions that enable dust to be easily mobilized.
- Vehicles delivering construction materials shall be covered.
- Vehicles and construction equipment shall be regularly serviced and well maintained.

- Vehicles and construction equipment shall comply with statutory emission standards.
- Stockpiles of soil and other dust generating materials will be covered with tarpaulin.
- Providing workers with N95 dust masks to be worn when dust generating activities take place.
- Open burning of construction related waste will be strictly prohibited.

5.2.4 Water quality impacts

253. During construction wastewater will arise from the domestic sewage from site workers, and there is a risk of contamination due to spillage of oil and other lubricants, unsanitary disposal of construction wastes, and wastewater from washing of construction equipment and vehicles. Such wastewater if not properly controlled has the potential to pollute nearby waterbodies namely drainage channels and irrigation canals as well as groundwater sources.

254. The contractors will be required to implement measures to prevent wastewater produced during construction from entering directly into the adjacent drainage channels and irrigation canals or groundwater without adequate treatment. Such measures shall be in accordance with national regulations and the IFC EHS General Guidelines and will include:

- Provision of adequate on-site sanitation facilities including septic tanks and soak- away pits or alternative sanitary facilities that do not allow the untreated disposal of sewage to adjacent water bodies e.g. portable toilets (same requirement applies to any construction camps)—wastewater generated will be taken offsite for treatment and disposal.
- Provision of an appropriate domestic solid waste and construction waste collection and disposal system.
- Provision of designated hard standing areas for equipment servicing, refueling and wash down at least 50m from watercourses, springs, and wells, with drainage directed through oil and grease interceptors before being discharged into a settling pond prior to discharge offsite.
- Implementation of good operation and maintenance practices for construction equipment.
- Storage of oil, fuels and chemicals and mounting of plant containing oil and diesel on drip trays to catch leaks.
- Oil spill clean-up materials (sorbent pads, loose sorbent material, etc.) should be stationed at site.

255. Proper implementation of the above measures will ensure that the potential water quality impacts during construction will not be significant.

5.2.5 Interference with utilities, blockage of access ways

256. Most of new substation locations are accessible from existing village roads or national highway or feeder paved roads at distance varying in the range of 50–100m. in case of poor condition and unpaved access roads used for construction traffic and operational access will be surfaced using concrete or asphalt to connect the substations with existing paved roads. Construction traffic to and from the sites will be minor and periodic in nature although large vehicles will be required for plant and equipment transport.

257. The contractors will be required to post warning signs and manage traffic movements to protect the travelling public and its workers as necessary and ensure drivers obey road rules and travel at a safe speed given the nature of local roads and size of vehicles involved. Road safety and warning signs must be posted at 500m, 100m, and immediately in advance of the substation access road and distribution line works at least two weeks prior to the works

commencing to inform the public of turning vehicles and the temporary blockage of one lane of the road during pole installation works.

258. For distribution lines, the electric poles will be transported (to the site from outside) and installed along existing roads, which may cause temporary disruption of traffic along these roads. Village roads are relatively narrow and movement of large trucks along these roads carrying the electric poles and other materials might cause temporary blockage and nuisance to villagers. Some sections of the 33kV lines will traverse narrow, single/two-lane roads which can cause interference to the normal flow of traffic. This is primarily troublesome in residential areas where roads are being used by vehicles such as bicycles, motorbikes, cars, and vans. As the area has limited space for the temporary storage of the concrete poles and materials, the contractor may park trucks carrying these materials on streets. In such case, there is potential to cause traffic congestion and hazards to commuters using the said road and flagmen should be utilized to warn road users of the situation. All traffic management will need to be done in consultation with the affected communities to ensure they are well aware of likely disruption. In case there is a need for temporary storage, locations to be agreed and any impacts on private land and assets to be compensated in line with the resettlement plan.

259. In the event that stringing conductors presents a possible risk to traffic on roads or rivers, scaffolds will be constructed to protect pedestrians and vehicles (and the conductor itself) from potential injury /damage during conductor stringing. Contractors will be required to ensure that safe access ways to public and private amenities are maintained throughout the construction period.

260. In order to minimize adverse impacts of the project on traffic, the contractor will be required to properly plan and execute a traffic management plan in accordance with national regulations and the IFC General EHS Guidelines that is supported by good site supervision.

5.2.6 Loss of Biodiversity and Cultural Values

261. There are no cultural or ecological protected areas or protected forests within the project area of influence. Construction works and movement of construction vehicles may cause an impact on the local archaeological and cultural significance of the area. The following mitigation measures will be implemented during the construction phase:

- No temporary or permanent project facilities shall be established within protected areas/reserve forest areas. Such facilities include but are not limited to vehicle and maintenance areas, storage areas of poles, conductors, transformers, and pole installation equipment.
- Demarcation of the working area by contractor and avoidance of encroachment outside the agreed corridor of impact.
- Demarcation of mature trees to be avoided and retained.
- Avoidance of tree cutting or trimming during the bird breeding/nesting season.
- Avoidance of construction works from one hour after dawn to one hour before dusk in areas where there is no existing human disturbance and within known elephant corridors.
- Replanting (by forest department) of removed trees in accordance with national regulation and Forest Department approvals and prompt revegetation of disturbed areas with native plant species.
- Removal of invasive plant species during site clearance and routine vegetation maintenance.

5.2.7 Health and Safety

262. **Occupational Health and Safety**: The construction of substations and 33 and 11kV distribution lines poses moderate risk to the health and safety of workers. To mitigate this risk, the installation contractor will undertake works in accordance with the agreed health and safety plan (covering covid-19 risks) and using skilled workers with suitable training for the job in

hand. The provision of personal protective equipment (PPE) such as hard hats and safety gloves/boots for every worker (with use mandatory and subject to no work conditions if not compliant) should be made as a last resort where risks cannot be avoided. While working at heights personal safety measures such as harnesses, tool bags, ropes etc. will need to be provided. All workers will receive health and safety induction and those working with live electricity and at heights will attend specialist health and safety trainings and be certified to do so following medical check. Untrained workers will not be permitted to work with live electricity or at height.

263. Live lines will be deactivated and properly grounded before work is performed on, or in close proximity, to the lines and this will be checked and certified in writing by the contractor's EHS officer in advance.

264. Sufficient toilets and hand washing facilities, clean eating area, and shaded rest area to accommodate the number of workers on site must be accessible at all construction sites. Drinking water that meets drinking water standards must be provided, if an authorized supplier of canned water is not used the source must be regularly tested to confirm it meets these standards. Either use can be made of existing BREB facilities or, if adequate facilities meeting international good practice requirements i.e. connected to existing sewerage system or septic tank with soak away are not available, the contractor must provide portable facilities. Since workers will not be local to the area suitable accommodation must be provided by the contractor, ideally use should be made of existing accommodation facilities but if a construction camp is provided it must be adequately equipped with sufficient toilets, hand washing facilities, showers or baths, food preparation and clean eating area, etc.

265. The existing health services in the project areas are generally located in rural areas and may not be able to accommodate additional patients from the construction workforce during emergencies. Therefore, in the construction phase, the contractor will be required to provide readily available first aid for workers as well as an ambulance for more serious cases.

266. In undertaking H&S risk assessment and planning adequate attention is to be given to the risks associated with covid-19 pandemic and other communicable diseases. Containing the spread of covid-19 will require adequate sanitation and welfare facilities including for hand washing and personal protective equipment are provided on-site and at accommodation and to consider the ability of communities to comply with protective measures such as regular handwashing and for the local health care facilities capacity to deal with any surge in infections as consequence to influx of workers and any resulting community transmission. Particular attention must be paid to accommodation of workforce given the transient nature of work, to avoid spreading any virus among workers and between workers and communities. Given the specialist nature of responding to covid-19 public health officials/experts to be consulted in undertaking the risk assessment and management planning for covid-19.

267. **Community Health and Safety**: The project construction may potentially result in adverse impacts to community health and safety such as toppling of concrete poles, construction traffic and accidents, and emergency spill of liquid materials as well as covid-19 diseases. Standing water will need to be avoided due to potential to spread vector borne disease. To mitigate these potential impacts to the health and safety of villagers, the contractor will be required to follow the agreed community health and safety plan (including covid-19 measures), respond promptly to any grievances and undertake community awareness raising of potential risks involved. In case of any emergency or accident involving the project, the contractor will ensure that the affected communities are pre-informed of the emergency procedures to be included in the agreed community health and safety plan and if appropriate given proximity to works included in their mock drills etc.

268. Contractors staff will also be given awareness raising in infectious disease including covid-19 and code of conduct at work.

269. During construction, benefits to local people can be maximized if the contractor recruits construction workers locally. However, precedence must be given to ensuring that all workers are appropriately skilled given the hazardous nature of distribution works and so local workers will be limited to few unskilled positions. Wherever possible, the contractor should not discriminate and should proactively encourage the employment of suitably skilled women on the project.

5.3 Impacts and Mitigation Measures from Operation

270. The anticipated adverse impacts during the operational phase of substations and distribution lines are generally related to the occupational and community health and safety issues. These risks can be managed with proper engineering and management controls.

5.3.1 Risks to Worker Health and Safety

271. The main occupational health and safety issues inherent to the operation of substations and distribution lines include hazards due to exposure of workers to live power lines, working at heights, and potential exposure to electric and magnetic fields.

272. Accidents that may occur during and maintenance may involve electrocution, lightning, fires, and explosion.

273. Potential impacts related to operation and maintenance will be avoided by BREB through implementation of the following measures:

i. Operation and maintenance of all distribution lines and substations is performed only by adequately and regularly trained and experienced staff of BREB various field offices,
ii. The maintenance of all the substations is being performed by staff adequately and regularly trained by BREB.
iii. Training program for all workers on substation sites and responsible for maintenance of distribution lines will be provided.
iv. BREB should be guided by the “Environmental, Health, and Safety Guidelines – Electric Power Transmission and Distribution” (IFC) dated 30 April 2007 when working at the power line facilities.
v. Risk assessment and occupational health and safety plan for substation workers and for maintenance for the distribution lines will be developed and adhered to during operation.
vi. Adequate attention will be given to the risks associated with covid-19 pandemic and other communicable viral diseases. National restrictions for containing the spread of covid-19 must be complied with and Government of Bangladesh and ADB guidance (https://www.adb.org/publications/safety-well-being-workers-communities-covid-19) is to followed, as well as further guidance detailed in Appendix 7.

274. **Exposure to Live Power Lines**. Workers may come in contact with live power lines during the maintenance of the facilities and electrocution from direct contact with electricity is a hazard directly related to power lines and facilities.

275. Some of the prevention and control measures when working with live power lines are:

i. Restricting access to electrical equipment only by workers who are trained and certified to work on electrical equipment.
ii. Adherence to electrical safety standards.
iii. Proper grounding and deactivation of live power lines during maintenance work or if working in close proximity to the lines.
iv. Provision of PPE for workers, safety guidelines, personal safety devices such as harnesses, tool bags, ropes etc., and other precautions.

v. Workers will be required to observe guidelines to minimum approach distances for excavations, tools, vehicles, pruning, and other activities when working around power lines.

276. **Working at Heights.** Accidents may happen when working in heights. Some of the prevention and control measures when working with live power lines are: (i) restricting working at height only by workers who are trained and certified to do so and (ii) testing of structural integrity prior to proceeding with the work and the use of fall protection measures such as harnesses, tool bags, ropes etc.

5.3.2 Worker and Community Exposure to Electro Magnetic Fields (EMF)

277. There have been some concerns about possible increased risk of cancer from exposure to electromagnetic radiation from overhead transmission lines. Research has been undertaken into this matter throughout the world. A World Health Organization (WHO) review in 1996 of long term exposure to EMF from overhead transmission lines concluded that: “from the current scientific literature, there is no convincing evidence that exposure to radiation field shortens the life span of humans or induces or promotes cancer”. Further, EMF levels associated with distribution lines are significantly lower than those associated with overhead transmission lines. The EMF from distribution networks in communities can vary widely depending upon the number of phases and whether the circuit is overhead or underground. A typical 11kV overhead distribution line with 300amps current can result in magnetic field of 22mG immediately below the line dropping to 15mG at 7.5m from the line and 8mG at 14m distance. In addition, within inhabited communities the existing environment already includes EMF from a number of sources including the use of electrical appliances and equipment and ground current in residential water pipes.

278. For the project WHO recommended international guidelines per the IFC EHS Guidelines, namely those of the International Commission for Non-Ionizing Radiation Protection (ICNIRP) will be adapted. BREB to comply with these international norms for field strength limits. The ICNIRP guidelines recommends limiting exposure to EMF, although it adds that the levels quoted should not be interpreted as distinguishing ‘safe’ from ‘unsafe’ EMF levels. Biological effects reported as resulting from exposure to static and extremely low frequency electric and magnetic fields were reviewed to provide the scientific rationale for these guidelines for limiting exposure to time varying electric, magnetic, and electromagnetic fields.

279. The impact of EMF is dependent on the duration of exposure and therefore provided these ICNIRP guideline levels (Table 5.2) are complied with for worker exposure no significant adverse impacts are envisaged. The ICNIRP for workers is maximum exposure levels of 10kV m^{-1} for 50- Hz. The ICNIRP guideline for the general public (up to 24 hours a day) which would also apply to worker accommodation for workers based at full-time at the new substation sites, due to their longer period of exposure, is maximum exposure levels of 5kV m^{-1} for 50-Hz. The value of 10kV m-1 for 50-Hz occupational exposure includes a sufficient safety margin and half of this value was chosen for the general public reference levels i.e. 5kV m-1 for 50 Hz, to prevent indirect effects for more than 90% of exposed individuals.

280. The minimum electrical clearance, as required by the national electricity rules & regulations in Bangladesh, are also to be maintained with respect to the ground, roads, railway lines and habitations, to ensure safety of human beings and livestock moving, living or working in the vicinity.

Table 5.2: ICNIRP Limit Values Concerning Electric and Magnetic Fields (50 Hz) for the Public and at Working Places

Source	Electric Field Strength [kV/m]	Magnetic Flux density [µT]
Occupational exposure	10	500
General public exposure	5	100

5.3.3 Poly Chlorinated Biphenyls (PCBs), SF6, and Asbestos

281. Due to its high heat capacity, low flammability and low electrical conductivity, PCBs were extensively used as insulating material in capacitors and transformers prior to the mid-1990s. But after the finding that these PCBs are non-biodegradable and have carcinogenic tendencies, their use in electrical equipment as an insulating medium has been banned internationally. In compliance with the above, BREB has also banned purchase of equipment (transformers and capacitors as per international good practice) using PCBs. BREB also obtains confirmation from the supplier at the time of bid offer that the offered transformers are free from PCBs so there should be no ongoing risks of exposure to workers or the public related to new installation.

282. For maintenance workers, if any PCB containing transformers remain in-situ then measures set out in the construction section for work related to PCB containing transformers should be followed.

283. Emission of greenhouse gases from insulators, which use SF6 in high voltage equipment, is a major concern. SF6 has a global warming potential 23,900 times greater than CO2, which needs to be controlled. However, given that the project involves low to medium voltage components and substations are air insulated it is most unlikely that SF6 will be present in the project components. Use of SF6 in fire extinguishers provided at substations should also be avoided.

284. Use of all asbestos containing materials will be prohibited in new construction via the contract so there should be no ongoing risks of exposure to workers or the public related to new installation.

5.3.4 Other Risks to Community Health and Safety

285. People and animals can be electrocuted by coming in contact with live wires. Several persons are killed due to electricity-related accidents every year. Studies have shown that the key reasons are: contacting / touching live overhead power lines especially snapped conductors (70%); electric shocks due to defective pump motor starter wiring and lack of earthing (15%); attempts to replace fuses at transformers by villagers to restore power for pumping; and safety issues in Single Wire Earth Return Single Phase High Voltage transformers. In many places, bare live wires are hung at 5 ft above ground, no fencing or barricades are provided, and Regulations and Standards are not being followed. The project will therefore have health and safety benefits if properly implemented by BREB.

286. However, health and safety issues that may still be encountered by communities living near power distribution lines include electrocution, lightning strikes, explosion and fire, and exposure to magnetic field. The open burning of waste during operation and maintenance will be strictly prohibited. Standing water at substations will need to be avoided due to potential to spread vector borne disease.

287. **Electrocution and Lightning Strikes**. The results of the stakeholder consultations including BREB suggested that lightning strikes and electrocution risks are perceived as potential negative impacts of the project. The operation of the 33kV and 11kV distribution lines near community areas may expose the villagers to electrocution hazards as a result of direct contact with live conductors, flashover from the conductor to a pole and conductor breakage,

particularly if the person, tree or structure is near a live line where the safe horizontal or vertical clearances are compromised.

288. To prevent these hazards, concerned BREB staff needs to conduct regular inspections (at least monthly) on the lines to ensure that the minimum vertical clearance as well as protection is maintained. The inspection protocol should include possible conductor snapping and de- energizing of the line within three cycles to avoid the potential for electrocution from a breakage. The community should be educated with respect to the importance of maintaining horizontal clearance from buildings in order that they do not erect new buildings within this zone.

289. Lightning arresters will be provided along the line. There will also be provision for ensuring security of the cable to avoid vandalism. Regular inspections of the line and the facilities would help identify missing or corroded parts that need immediate replacement. Substations should be securely fenced with locked gates to prevent members of the community entering the site. Signs warning about safety hazards should be mounted at the entrance and on equipment within the substation compound using International Organization for Standardization (ISO) recognized standards. Each pole should also have installed a sign warning about the safety hazard from the power lines, for pole mounted transformers these should be fenced off with a locked gate. The community should be educated with respect to the hazards associated with coming into contact with electrical equipment.

290. **Explosion and Fire**. Potential fire events and explosion of equipment may occur in medium voltage (33kV and 11kV) distribution lines. In case of fire events, explosion, and other related situations, a fire management strategy should be developed. This should be included in the emergency preparedness and response plan of the project. Given BREB may not be available immediately in rural locations the community should be educated with respect to emergency response with 24/7 emergency contact numbers for BREB included on signs.

291. Workers should be trained on emergency preparedness and response procedures and a manual on safety and emergency procedures during operation should be prepared and disseminated to workers on, e.g. extinguishing oil fires from transformers. The procedure should outline identification of potential emergency situations and potential hazards that could result in accidents that can have an impact to the health and safety of workers and communities.

292. **Community Health and Safety Campaign**: There are potential risks to safety due to exposure to electrical equipment and conductors as discussed above. BREB as part of its regular health and safety practices will organize health and safety campaigns in project villages prior to energizing the lines. Awareness programs will use distribution of posters, leaflets, and safety booklets to all households within 50m of the substations and along the corridor distribution lines as well as face-to-face orientation at the village level. These posters and safety booklets are available with BREB as its internal health and safety measures. BREB will also ensure that disaster and emergency preparedness plans are developed and communicated not only to staff of BREB but also to the local communities living close to the substations and distribution lines. Communities living close by should also be included in mock drills in addition to information drives.

293. A public consultation process has been undertaken in the 24 project locations as part of the IEE. All participants of the consultations supported the project. The people living in all the project areas expect the different distribution components to facilitate improved power supply and thereby availing them of direct and indirect benefits related to socio-economic development.

294. The impact of the proposed power distribution project on the socio-economic environment will be beneficial. Improved access to uninterrupted electricity supply will help stimulate economic growth, particularly in rural areas of the 10 districts in Khulna region. During operation, benefits to local people can be maximized if BREB recruits local persons for

unskilled positions such as substation housekeeping for 51 new 33/11kV substations. The long-term effects of the proposed project in poverty reduction are expected to be significantly positive.

5.3.5 Trimming of Trees

295. One of the regular programs to maintain the integrity of the distribution lines is the trimming of tall trees and vegetation along the ROW. This is being done to maintain the necessary conductor clearance of the line.

296. Private and communal trees and plants about 3 m height within the ROW will be either removed or pruned to provide the necessary conductor clearance distance. In addition, large trees within 3 m of the base of the poles will be selectively removed or pruned during operation to reduce the potential to fall and strike these structures. Tree removal or pruning will also be undertaken immediately outside the ROW to prevent trees from falling and striking the lowest conductor.

297. The vegetation maintenance activities may cause minor disturbance to local people. This can be mitigated by limiting use to already existing roads or tracks to reach the distribution lines and informing the locals in advance through the village heads on the schedule of the maintenance works. Care should be observed to avoid encroachment into rice or cropland of villagers by workers who will undertake vegetation trimming. Cut vegetation will need to be stored away from habitation and any not handed over to the landowner immediately disposed using appropriately licensed waste management operator on the completion of cutting and trimming activities.

298. BREB will not allow the use of herbicides and pesticides to control vegetation growth.

299. Burning to control vegetation along the ROW is also prohibited.

Chapter 6

6. Information Disclosure, Consultation and Participation Stakeholder and Public Consultations

300. Public consultation is mandatory for the IEE study of any development project according to the IEE guidelines of the DOE. ADB also require disclosure, consultation, and participation (DCP) in project processing to ensure that adequate and timely information is made available to beneficiaries and affected people. Gender consultations were also carried during census among women to seek women's view on the project and to make them aware about the project. Due to covid-19 pandemic, BREB was unable to conduct mass level of consultation. All the consultations were conducted following the covid guidelines of WHO, ADB and government. It ensured that the affected people and other stakeholders are informed, consulted, and allowed to participate actively in the process of project preparation and aware about the positive and negative impact of the project. The process of consultation will be continued throughout project cycle with various stakeholders such as affected people, concerned line department such as revenue, horticulture, agriculture departments and local administration.

301. Public consultations were carried out with groups of people their community-based organizations in the project impact areas for the purpose of disclosing information about the proposed project and its various activities and eliciting their views and concerns. The consultations covered the proposed project site which covers 37 upazilas of 10 districts under Khulna division. The feedback received from consultations meeting will be used by the project executing agencies to carryout necessary revisions to the technical designs in order to minimize the resettlement impacts. The consultations were also held with several officials of the BREB as well as with the affected persons in the project areas during project preparation.

302. A total 54 public consultation meetings were conducted on the location of the substations during July to October 2020. Among the total 54 consultation meetings, 47 consultation meetings were conducted in different 9 PBS with affected households and community people and rest of the 07 consultation meetings were conducted with respective PBS officials. The key objectives of the consultation meetings were to disclose the positive and negative impacts of the project to the community and stakeholders as well as to ensure inclusion of views and opinions from project affected persons about its impacts on their livelihood and wellbeing.

6.1.1 Objective of Public Consultations

303. Following are the main objectives of the consultations:

- To seek the overall no objection from the local on the acceptability of the project.
- To seek communities' support toward the project.
- Make people aware about the project and its potential impacts with proposed mitigation measures.
- Understand the views of the people affected, with reference to loss of land, assets, and its due compensation.
- Develop a thorough coordination between all stakeholders for the successful implementation of the project.
- To incorporate stakeholder and community inputs into the project design.
- To make the aware about the next plan of action relating to project implementation.
- Make them aware about the project implementation schedule, compensation methods, grievance redress mechanism etc. and seeking their views on continued participation.

304. Due to covid-19 pandemic situation a large number of people were not participated in the consultation meetings. A total of around 229 local people and PBS officials were participated at consultation meetings where 201 were male and 28 were female. However, female participants are found in many consultation meetings despite being conservative

society as well as covid-19 pandemic situation. During the census survey, female members are also consulted separately. Consultation picture is shown in **Figure 6.1** and participant details is presented in **Table 6.1**. Records of consultations are provided in Appendix 3.

Figure 6.1: Consultation Pictures

Conducting consultation meetings with local peoples

Consultation meetings with BREB officials

Table 6.1: Locations and Number of Participants at Public Consultations

SL	Name of Sub-stations	Locations	Date	Participant	
				Male	Female
Bagerhat PBS					
1	Bagerhat-3	Kashimpur, Bagerhat Sadar, Khulna	19/08/2020	5	0
2	Rupsha-2	Doba, Rupsha, Bagerhat	19/08/2020	4	0
3	Chitalmari-2	Khoria, Chitalmari, Bagerhat	19/08/2020	4	0
Jashore-1 PBS					
1	Sharsha-5 (Ulashi)	Toshipara, Sharsha, Jashore	24/07/2020	5	0
2	Jessore-7(Daitola)	Daitola, Jashore Sadar	25/07/2020	6	0
3	Sharsha-6 (Saratola)	Nouhati, Sharsha, Jashore	24/07/2020	6	4
4	Chaugacha-3 (Solua)	Afra, Chaugacha, Jashore	25/07/2020	5	0
5	Jessore-8 (Faridpur)	Alamnagar, Jashore Sadar	20/08/2020	4	0
6	Bagharpara-4 (Narikel Baria)	Uttar Srirampur, Bagharpara, Jashore Sadar	25/07/2020	3	0
7	Jhikargacha-5 (Godkhali)	Patuapara, Jikorgacha, Jashore	24/07/2020	5	0
8	Jashore 9 (Notun Hat)	Teghoria, Jashore Sadar, Jashore	28/09/2020	0	5
Jashore-2 PBS					
1	Avoinagar-4	Paikpara, Avoinagar, Jashore	26/07/2020	2	0
2	Avoinagar-5	Arapara, Avoinagar, Jashore	29/09/2020	5	0
3	Narail-4	Durbajuri, Narail Sadar, Narail	29/09/2020	2	0
4	Kalia-3	Kolabaria, Kalia, Narail	29/09/2020	3	8
5	Kalia-4	Lokkhipur, Kalia, Narail	30/09/2020	3	0
6	Lohagara-3	Chaoiguliya, Lohagara, Narail	29/09/2020	3	0
Jhenaidah PBS					
1	Harinakundau-2	Horishpur, Harinakundau, Jhenaidah	02/10/2020	5	0
2	Jhenaidah-4	Kajoli, Jhenaidah Sadar, Jhenaidah	02/10/2020	4	0

SL	Name of Sub-stations	Locations	Date	Participant	
				Male	Female
3	Shailkupa-3	Shiddhl, Shailkupa, Jhenaidah	02/10/2020	4	0
4	Kaliganj-4	Paskahonia, Kaliganj, Jhenaidah	03/10/2020	6	0
5	Moheshpur-4	Guroha, Moheshpur, Jhenaidah	03/10/2020	3	0
6	Moheshpur-5	Ghugi, Moheshpur, Jhenaidah	03/10/2020	5	0
Khulna PBS					
1	Dumuria-4	Bulbaria, Dumuria, Khulna	17/08/2020	4	0
2	Dumuia-5	Badargacha, Dumuria, Khulna	17/08/2020	4	0
3	Batiaghata-4 (Hetulnia)	Hetulnia, Batiaghata, Khlna	18/08/2020	3	6
4	Koyra-2	Naksha, Koyra, Khulna	01/10/2020	4	0
5	Dacope-3	Khona Dakup, Khulna	01/10/2020	3	0
Kushtia PBS					
1	Kushtia-4	Dhaka Jhalupara, Kushtia Sadar, Kushtia	05/10/2020	3	0
2	Kushtia-5	Bamon Gram, Kushtia Sadar, Kushtia	05/10/2020	4	0
3	Khoksha-2	Ektarpur, Khoksha, Kushtia	06/10/2020	3	0
4	Khoksha-3	Vobaniganj, Khoksha, Kushtia	06/10/2020	4	0
5	Mirpur-3	Khadimpur, Mirpur, Kushtia	05/10/2020	5	0
6	Daulatpur-5	Ghuramara, Daulatpur, Kushtia	06/10/2020	4	0
Magura PBS					
1	Sripur-2	Gobindapur, Sripur, Magura	04/10/2020	3	0
Meherpur PBS					
1	Meherpur-3	Garabaria, Gangni, Meherpur	21/08/2020	3	0
2	Chudanga-3	Kalupole, Chuadanga Sadar	21/08/2020	4	0
3	Damurhuda-2	Komorpur, Damurhuda, Chuadanga	21/08/2020	3	0
4	Jibonagar-3	Raipur, Jibonnagar, Chuadanga	21/08/2020	4	0

SL	Name of Sub-stations	Locations	Date	Participant	
				Male	Female
5	Gangni-4	Noudapara, Gangni, Meherpur	07/10/2020	3	0
Satkhira PBS					
1	Debhata-2 (Parulia)	Parulia, Devhata, Satkhira	27/07/2020	5	0
2	Kaliganj-2 (Mautola)	Pania, Kaliganj, Satkhira	27/07/2020	4	0
3	Satkhira-3 (Vadra)	Vadra, Satkhira Sadar, Satkhira	28/09/2020	3	0
4	Satkhira-4 (Dhulihor)	Dhulihor, Shatkhira Sadar, Satkhira	27/09/2020	3	0
5	Kalarowa-3	Beli, Kalarowa, Satkhira	28/09/2020	5	0
6	Assasuni-3 (Bollavpur)	Bollabpur, Assasuni, Satkhira	27/09/2020	5	5
7	Tala-3	Tikrampur, Tala, Satkhira	28/09/2020	2	0

Table 6.2: Meeting with PBS Officials

SL	Locations	Date	Participant	
			Male	Female
1	Jashore PBS-1, Jashore Sadar, Jashore	24/07/2020	2	0
2	Jashore PBS-2, Monirampur, Jashore	26/07/2020	3	0
3	Satkhira PBS, Satkhira Sadar, Satkhira	27/07/2020	4	0
4	Khulna PBS, Khulna Sadar, Khulna	16/08/2020	2	0
5	Digulia Obijug Kendro, Digulia, Khulna	17/08/2020	3	0
6	Bagerhat PBS, Bagerhat Sadar, Bagerhat	19/08/2020	5	0
7	Meherpur PBS, Meherpur Sadar, Meherpur	21/08/2020	2	0

6.1.2 Summary of the Consultation Meetings

305. Summary of consultation meeting is presented in **Table 6.3**.

Table 6.3: Summary Findings of Public Consultations

Issues Discussed	People's Views and Perception
General perception about the project	Most the people opined that they were aware about the proposed project. People in general felt that the project is very necessary for the regular and sufficient power supply with proper voltage. Some are pointed out that the project will provide benefit to students as they will get assured power supply during the evening for studying.

Issues Discussed	People's Views and Perception
Support of local people for the proposed project	All the participants were 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 power supply is very poor there is 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.
Support and participation during project implementation	All the participants during the consultation expressed that they would extend unconditional support to the project and participate during the implementation of the project as and when required.
Critical issue and concern by the local people for the project	The local people during the consultation pointed out various issues pertaining to the project. One major issue highlighted was safety to the nearest residential population due to the construction of substation. In some locations they pointed out the issue of timely construction of proposed substation as during the construction there are lot of dust and sound pollution for the nearby population.
Criteria to be considered during project design, construction, and operation stage	Few of the participants during the consultation suggested that the proposed substation should be at least 2 to 3 kms away from the residential population. In some locations, people mentioned that for safety fencing around the project site is required and modern technique should be used to reduce the noise pollution. Some were suggested that for safety there should be a safety wall with guard facility. In a few substations the people during the consultation pointed out that proper approach road with streetlight facility to the proposed substation is needed to deal with emergency situations.
Environmental issue	During consultation participants were pointed out that there is no environmental sensitivity in and around the project site. They were concerned about the noise and air pollution during the construction period, but they were very much positive for the project as it will contribute socio-economic development of the area.
Willing buyer and willing seller process	Majority of the landowners during consultation expressed that they want cash compensation at market rate for loss of land due to substation construction. They requested adequate compensation for the loss of trees and crops. Some villagers were of the view that in addition to cash compensation a member of each affected family should be given work or job during the construction stage.
Status of current electricity supply	Majority of the participants during the consultation reported that electricity is available for 12 to 14 hrs. only. There are regular power cuts due to load shading, and they experience voltage fluctuations. The electricity supply is very less when there is strong wind and rain. In some substation areas, the participants pointed out that electricity is available for 6 to 7 hrs. in a day and during the rainy season the electricity supply is even less.
Perceived benefits from project	Almost all the participants during the consultation pointed out that the construction of new substations will ensure increased electricity supply to villages and will stabilize the voltage fluctuations. Some of the participants pointed out that the increased power supply will meet the power demand of small-scale industries in the future which in turn will create employment opportunities for people in the area. The availability of sufficient

Issues Discussed	People's Views and Perception
	power would be beneficial for the students for studying and undertaking other learning activities especially in the evening time.
Perceived loss	Almost all the villagers felt that there are no such negative impacts from this proposed project. Though there are some perceived losses these are very minimal in nature as they feel that there could be disruption of agricultural activities during stinging of feeder line or loss of crops if not avoided
Safety issues	Almost all the villagers raised the issue of safety due to the construction of substation. The participants mentioned that there will be always fear in the mind near the substation. For safety fencing around the project site is required and modern technique should be used to reduce the noise pollution. Some participants suggested that safety wall should be constructed around the substation with guard facility. This has been clarified that the substation boundary will be permanently fenced and there will be no influx of people inside the s/s boundary. Necessary safety measures will eb adopted for ensuring safety of local people.
Usefulness of consultation	All the villagers admitted that the consultations are very useful and helpful as they got an opportunity to share their views and concerns about the proposed project. Most of them pointed out that regular information sharing regarding the proposed project is needed for information about project status among local people.
Labor management during covid-19	Most of the participants are concerned about the migrant labors as they might spread covid virus during the construction period. They urged to engage local labors as much as possible. They have also suggested the following to avoid covid virus spread; (1)Controlling entry/exit to the site, securing the boundaries of the site, and establishing designating entry/exit points; (2)Training security staff on the (enhanced) system that has been put in place for securing the site and controlling entry and exit, the behaviors required of them in enforcing such system and any covid-19 specific consideration; (3) Confirming that workers are fit for work before they enter the site or start work. Special attention should be paid to workers with underlying health issues or who may be otherwise at risk; and (4) Checking and recording temperatures of workers and other people entering the site or requiring self-reporting prior to or on entering the site.

306. Overall, the people living in project impact areas did not raise any critical objections to the proposed projects as they believed that this project would yield benefits to the localities as well as the country as a whole in terms of power supply expansion and reliability improvement. The households who were not connected to electricity supply and lived within the impact areas of the proposed rural electrification schemes of BREB expressed their strong support for the project as they aspired to get electricity supply to their households which would eventually minimize their current costs of energy and improve their livelihood practices, living conditions and quality of life. Those communities were of the view that they would be able to use electricity for irrigation of their cultivations, poultry farming, aquaculture farming, tailoring work, and other cottage industries such as running rice grinding mills. They also believed that household electrification would enhance the convenience for their children to engage in studies. The households did not expect any compensation for loss of trees or crops in the event of their removal or clearance to pave the way for the installation of electricity poles and lines. They valued the electricity supply to their villages more than the compensation.

307. Overall, the communities did not have objections to the project provided it does not affect the environment badly as well as their properties and livelihoods. If project activities

caused any adverse impacts on individual properties, valuable tree species and cultivations, people requested that such losses irrespective of whether they are permanent or temporary should be compensated adequately and timely.

6.2 Information Disclosure

308. All environmental safeguards documents are subject to public disclosure, and therefore will be made available to the public. BREB and ADB agree that in disclosing environmental information for the project to the public that:

(i) BREB are responsible for ensuring that all environmental assessment documentation, including the IEE, updated/revised IEE required following detailed route surveys, and any further IEE update, as well as environmental monitoring reports, are properly and systematically kept as part of the BREB project specific record;

(ii) all environmental documents are subject to public disclosure, and therefore must be made available to public on request;

(iii) the IEE, updated/revised IEE, any further IEE update, and monitoring reports with corrective action plan (if required) have to be locally disclosed—the IEE (including executive summary in local language i.e. Bangla) will need to be disclosed locally to the public through local offices of BREB, and through notices/posters at construction sites with a hard copy to be made available to view on site free of charge on request;

(iv) the IEE, updated/revised IEE, and any further IEE update, and monitoring reports with corrective action plan (if required) to be disclosed on ADB's website upon receipt; and

(v) BREB will continue to ensure that meaningful public consultations, particularly with project affected persons, are undertaken throughout implementation of the project.

Chapter 7

7. Grievance Redress Mechanism

309. Grievance redress mechanisms (GRM) are important for infrastructure development projects where ongoing risks or adverse impacts are anticipated. They serve as a way to engage communities, reduce risks, and assist processes that create positive social change. GRM can be an effective tool for early identification, assessment, and resolution of complaints on projects. Under the project funded by the ADB, it is required that a GRM be established to assist affected persons to resolve queries and complaints if any, in a timely manner. A common GRM has been proposed for the project to deal with environmental and social related grievances.

310. The legal framework of Bangladesh does not provide any institutional mechanism, other than the court of law for resolving project-based grievances that may be raised by project affected parties. Furthermore, the rights of non-titled persons are not well recognized, there is no mechanism to hear and redress grievances of such affected persons. Therefore, it is necessary that a project specific Grievance Redress Mechanism (GRM) is established outside the courts of law which is easily accessible and cost-effective to the APs and immediately responsive to the grievances reported by the affected persons. This project based GRM will also serve to avoid lengthy and costly court actions that APs may recourse to thereby causing considerable delays in project implementation. It adopts a transparent and time-bound procedure in the grievance resolution process. The existing GRM does not impede access to the country's judicial or the other administrative remedies.

311. A two-tier project-specific Grievance Redress Mechanism (GRM) has been established. The first tier is the grass-roots level mechanism. At this level, the grievances are reported to field officers of the complainant centers at each service area of the nine PBSs in Khulna division. Any issues and grievances of technical, environment, health and safety, or involuntary resettlement nature such as compensation, land purchase-related issues, cutting down trees, distribution lines crossing over houses or home gardens, safety issues electricity breakdowns, public health and safety, power fluctuations, defects in meter readings, electricity-related thefts etc. can be raised to the field officers. .

312. If the issue/s cannot be resolved by the field officers within seven days, they will be brought to second tier which is grievance redress committee (GRC) at PBS. BREB established a committee for a potential resolution. On behalf of BREB, the committee consult properly with local people to ensure issues are managed in an amicable way. The GRC is comprised of 5 members including PBS director (convenor), members from the office of executive engineer, BREB, member from PBS, member from consulting firm (in case of safeguard issue, safeguard consultant will attend) and member from contractor. The GRC normally provide solution within 15 days of receiving the grievance from the field officers. The details of the GRC is presented in the table 7.1.

Table 7.1: Grievance Redress Committee at PBS

Sl. No.	Members	Designation	Responsibility
1	Elected Local PBS Director	Convener	Organize monthly or quarterly meeting
2	Member from Office of the Executive Engineer, BREB	Member secretary	Recorded all issues and circulated among the Interested people.
3	Member from PBS	Member	Summarized the grievances relating to environmental and social issues, construction related issues, OHS and community health and safety issues and Gender Based Violence, etc.

Sl. No.	Members	Designation	Responsibility
4	Member from Consultant	Member	Note discussions and decisions of the meeting and disseminate the information about GRM and taking follow up actions.
5	Member from Contractor	Member	Implementing the decision with the help of PBS, & BREB.

313. Still, if an amicable settlement could not be reached, such grievances can be forwarded to the general manager of the PBS for resolution and or PIU headed by PD for management discussion and decision.

314. The fundamental objectives of the Grievance Redress Mechanism are:

(i) To reach mutually agreed solutions satisfactory to both, the project and the affecter persons, and to resolve any project-related grievance locally, in consultation with the aggrieved party;
(ii) To facilitate the smooth implementation of the resettlement plan and prevent delay in project implementation;
(iii) To democratize the development process at the local level, while maintaining transparency as well as to establish accountability to the affected people;
(iv) To facilitate an effective dialogue and open communication between the project stakeholders; and
(v) To have clear definition of roles and responsibilities of the various parties involved in consideration and resolution of grievances.

315. The recording format of the grievances are presented below in Table 7.2.

Table 7.2: Grievance Registration Form

No	Title of complaint	Type of complaint	Date received	Name of plaintiff	Contact details of plaintiff	Summary of complaint	Action taken	Status of complaint / date	Notes/ comments

Chapter 8

8. Environmental Management Plan

8.1 Purpose of this EMP

316. The objective of this Environmental Management Plan (EMP) is to formulate measures, which will:

- Mitigate adverse impacts on various environmental components, which have been identified during observation;
- Protect environmental resources where possible; and
- Enhance the value of environmental and social components where possible.

317. The EMP also includes a monitoring plan to enable evaluation of the success or failure of environmental management measures, and to carry out reorientation of the plan if found necessary. It is emphasized that many of the protective and enhancement measures can be implemented by adopting suitable planning and design criteria for construction of the project. This EMP is also made site specific with guidelines for the contractors to be able to operate according to the Bangladesh Government and ADB requirements to comply with their relevant policies.

8.2 Environmental Management Plan (EMP)

318. The EMP is necessary on the grounds that it will manage the environment by off setting the negative impacts with possible mitigation measures and enhancing the positive impacts within the allocated fund from the project. Thus, the main objectives of the EMP for the proposed project are:

- Define the responsibilities of the project proponents in accordance with the three project phases (design, construction, and operation);
- Facilitate the implementation of the mitigation measures by providing the technical details of each project impact, and proposing an implementation schedule of the proposed mitigation measures;
- Define a monitoring mechanism and identify monitoring parameters to ensure that all proposed mitigation measures are completely and effectively implemented;
- Identify training requirements at various levels and provide a plan for the implementation of training sessions;
- Identify the resources required to implement the EMP and outline corresponding financing arrangements; and Providing a cost estimate for all proposed EMP actions

319. The Environmental Management Plan has been prepared for the construction and operation phase of the Project is presented in Table 8.1. The EMP would act as a guidance document for BREB to ensure that they can implement the project in an environmentally sound manner where project planners and design agencies, contractors, relevant government departments and stakeholders of concern understand the potential impacts arising out of the proposed Project and take appropriate actions to properly manage them.

Table 8.1: Environmental Management Plan for the Proposed Project

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
A. DETAILED DESIGN AND PRE-CONSTRUCTION PHASE						
Update and disclose IEE prior to contract award, update as required to reflect detailed designs	• BREB to update the IEE for ADB clearance and disclosure prior to contract award. • Considering the ongoing COVID-19 pandemic, further due diligence will be carried out within the procedural framework developed for the safeguards due diligence (Appendix 5). • BREB and Contractor to ensure, in the context of the COVID-19 pandemic, that all consultations and field activities are carried out following latest national COVID-19 requirements and WHO social distancing and hygiene guidelines as detailed in Appendix 7 of the IEE. • BREB to review the final IEE following the completion of the detailed designs and update it, as required, to reflect the detailed design for all project components, and obtain ADB's clearance before the commencement of any works, including enabling works. • If a change in project scope or design occurs during project implementation or if unanticipated impacts are identified at any point during project implementation BREB to inform ADB and, if deemed appropriate, BREB will update the IEE for clearance and disclosure by ADB. • BREB to locally disclose in a timely manner the final IEE, any subsequent updates to it, and other environmental safeguards	Updated IEE cleared and disclosed by ADB prior to contract award. IEE updated, as required, to reflect the detailed design for all project components prior to the start of any works. Final IEE, any subsequent updates to it, and other environmental safeguards documentation are locally disclosed.	BREB counterpart funds, including costs of printing Part of supervision budget Part of contract cost, include costs of implementing EMP as BOQ line	BREB to comply with requirements prior to issue of bidding documents and before the commencement of works. BREB to supervise and monitor contractor to ensure their compliance with delegated requirements.	Environment Consultant (EC) to supervise, monitor, and assist BREB in ensuring their own compliance. EC to support BREB in finalizing and updating IEE/EMP documentation.	Contractor to immediately inform BREB if any unanticipated impacts are identified at any point and make a copy of the latest IEE available at the project sites.

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	documentation by posting them on the BREB website and ensuring full copies of the latest IEE and its executive summary translated into Bangla are available at all local BREB offices and project substations.					
Release of toxic pollutants, chemicals and gases to receptors (air, water, land) from transformers and other project equipment	• PCBs will not be used in any transformers and any other project facilities or equipment. • Equipment purchased by BREB or contractor for use on the project to be accompanied by letter from the manufacturer that it is guaranteed PCB free and labelled as PCB free. • Surrounding soil exposed to oil leakage from equipment should be assessed by contractor, and appropriate removal and / or remediation measures should be implemented in accordance with the General EHS Guidelines. • BREB to ensure that asbestos containing material (ACMs) will not be used in new substations, equipment, or other project facilities. • BREB should develop and have a protocol in handling PCBs and other hazardous wastes like lead acid batteries (if any), lubricants, etc. in their operations.	100% of new transformers used in the project are confirmed to be PCB free No H&S incidents involving PCBs reported Compliance with national laws and regulations	Part of detailed design and pre-construction cost, include as BOQ line	Comply with mitigating measures Include mitigating measures for contractor as part of tender specifications Supervise and monitor contractor compliance Transport, storage, decontamination, and disposal of contaminated units	Check contract document to ensure compliance Train / support PIU and contractor re PCBs. Supervise and monitor PIU/contractor compliance	Comply with mitigating measures
Interference with land users, other utilities, and traffic due to design and layout of project equipment	• New 33/11kV substations to be located on purchased land. • New 33/11 kV lines ideally aligned along the right of way (ROW) of existing rural roads although some sections may need to pass thorough agricultural or plantation areas with	100% of clearances obtained and compensation paid in accordance with	Part of pre-construction cost, include as BOQ line	Comply with mitigating measures Include mitigating	Check contract document to ensure compliance	Comply with mitigating measures

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	compensation in accordance with the resettlement plan. • Since any damages to be paid by contractor photographic and structural pre-condition surveys of property including existing utilities, structures (e.g. buildings) and roads, crops, and drains, utilities, should be completed by the Contractor and agreed with BREB and the property owner prior to any works to provide a baseline for any claims. • Continue to follow criteria for site selection in the event of any design change; if required update the IEE and EMP to reflect changes. • Obtain necessary clearances consistent with the requirements of Government of Bangladesh from other utilities that could be affected by the project (electric, water, telecommunications etc.) • Contractor to prepare for BREB approval traffic management plan in consultation with relevant local authorities to ensure proper execution of traffic controls including where temporary blockage of one lane of the road during installation is required for health and safety purposes that highly visible guides, advance warning signs or flag persons are in place to direct pedestrian and vehicular traffic.	Resettlement plan before commencement of works Traffic management plan approved before commencement of works No unresolved grievances from local community Compliance with national laws and regulations		measures for contractor as part of tender specifications Review and approval of traffic management plan Supervise and monitor contractor compliance	Assist with review and approval of traffic management plan Supervise and monitor PIU/ contractor compliance	
Cutting or trimming of trees and clearing of vegetation	• As far as is practical, alignment to avoid the need to cut/trim trees by avoiding areas with a high concentration of trees. • Cutting or trimming of trees will only be planned when required to meet safety	100% of compensation paid prior to commencement	Part of detailed design and pre-construction	Comply with mitigating measures	Supervise and monitor PIU/ contractor compliance	Comply with mitigating measures

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	clearance requirements. • Where alignment results in loss of fruit-bearing trees that have economic value compensate in accordance with the entitlement matrix in the project resettlement plan. • Schedule works requiring tree cutting/trimming outside the bird breeding season. • Efforts to be taken to replant the species nearby where no disturbance due to project activity is envisaged; • The replant species number shall be 3 times of actual vegetation cutting; • The plant species varieties need to be selected in a way so that both the territorial flora and fauna's habitat can be restored there;	of works No unresolved grievances from local community Compliance with national laws and regulations	cost, include as BOQ line	Include mitigating measures for contractor as part of tender specifications Supervise and monitor contractor compliance		
Encroachment into ecologically sensitive areas	• Obtain approvals from forest department as per national regulatory framework, approvals are required for tree cutting/trimming outside protected or forest areas. • No works shall be undertaken, and no temporary or permanent project facilities established within a designated protected area, IBA, reserve forest area, or sacred grove etc. • New lines will be designed retrofitted to be ecologically sensitive for birds in accordance with international good practice e.g. maintaining 1.5 meter spacing between energized components and grounded	No impact on protected area, IBA, reserve forest area, or sacred grove etc. 100% of new lines designed to incorporate ecologically sensitive features Compliance with	Part of detailed design and pre-construction cost, include as BOQ line	Comply with mitigating measures Include mitigating measures for contractor as part of tender specifications Supervise and monitor contractor compliance	Supervise and monitor PIU/ contractor compliance	Comply with mitigating measures

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	hardware or, where spacing is not feasible, covering energized parts and retrofitting elevated perches, insulating jumper loops, placing obstructive perch deterrents, changing the location of conductors, and / or using raptor hood.	national laws and regulations				
Final IEE and EMP in bidding documents	• Prior to finalization of detailed design review the project scope and alignments to confirm no change from those described and assessed in this IEE, if there are any aspects that were not included or changed update the IEE and seek ADB clearance. • Continue to undertake consultation, ensure consultation with potentially affected residents within 100 meters of ROW prior to finalization of the route alignment. • Final IEE to be posted on the BREB website, substations, and also notices posted in the vicinity of works to inform of its availability—hard copy to be made available to view on site free of charge on request. • Ensure final EMP is included in the bidding documents and forms integral part of the contractor's agreement.	EMP included in bidding documents	N/A	Include mitigating measures for contractor as part of tender specifications	Check contract document to ensure compliance	N/A
Planning for construction environmental management	• Project to comply with national and international regulatory framework as set out in the IEE plus other applicable environment, health, and safety legislation. • Project to comply with the EHS General Guidelines (April 2007) and the EHS Guidelines for Electric Power Transmission and Distribution (April 2007) in addition to	Contractor appointed full contingency staff prior to mobilization EMP approved before	Part of detailed design and pre-construction cost, include as BOQ line	Comply with mitigating measures Include mitigating measures for contractor as	Check contract document to ensure compliance Train / support PIU and	Comply with mitigating measures

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	the mitigation set out in this table. • BREB to appoint an EHS Team comprising a suitably qualified and experienced dedicated Environment Specialist and Social Specialist. • Conduct training on EMP implementation for those with responsibilities under it. • Contractor to appoint a suitably qualified and experienced dedicated Environment, Health and Safety Officer. • Ensure GRM is operational by or before loan effectiveness and members of GRM is receiving training if necessary. • Conduct training on GRM for those with responsibilities under it and distribute verbally and through leaflets, brochures, notices with the GRM contacts. • Prior to mobilization the Contractor to update and submit environmental management plan (EMP) to BREB for approval, to provide details on how contractor plans to implement the construction mitigation measures specified in this EMP and relevant parts of the EHS Guidelines on Construction and Demolition. • Approved EMP will identify temporary construction facilities needed e.g. laydown and storage areas, concrete casting areas, workers facilities etc.	commencement of works No unresolved grievances from local community		part of tender specifications Review and approval of EMP Supervise and monitor contractor compliance	Contractor in meeting EMP requirements and GRM operation. Assist with review and approval of EMP Supervise and monitor PIU/contract or compliance	
Location of workers camp and materials storage areas could adversely affect	• Transformers to be required via the contract to generate sound pressure levels of between 45 and 55 dBA at 1m distance. • Install new transformers 10m from site	Related facilities located sufficient	Part of detailed design and pre-	Comply with mitigating measures	Supervise and monitor PIU/	Implement mitigating measures

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
residential areas and sensitive receptors (schools, hospitals/clinics)	boundary of substations/30m from sensitive receptors; if this is not possible undertake noise calculations to demonstrate noise standards will be met given distance involved, if necessary, providing an enclosure to provide a sound barrier. • If required, laydown and storage areas, concrete casting areas, workers facilities etc. to be located at least 200m away residential areas, waterbodies, groundwater wells, and sensitive receptors (houses, schools, clinics, temples, etc.). • Local communities to be consulted when selecting sites for project facilities prior to finalization.	distance from nearest receptors No unresolved grievances from local community Compliance with national laws and regulations	construction cost, include as BOQ line	Include mitigating measures for contractor as part of tender specifications Supervise and monitor contractor compliance	Contractor compliance	
Pollution prevention and generation of construction wastes	• Detailed design to ensure sanitation to be connected existing sewerage system or to septic tank with soak away located at least 50m from any spring or well used for drinking water and 10m from any drain, stream or river. Pit latrines prohibited, no untreated sanitary wastewater is to be disposed of to surface or groundwater. • Detailed designs of substations to ensure all drainage prevents flooding and is fitted with oil and grease interceptors to catch oil spill. • For all transformers and related fuel, oil chemical, and waste storage areas the design is to incorporate bunded area to 110% volume of impermeable concrete surface which is not connected to the drainage system in order to capture any leaks or spills; the storage for fuel, oil and	PPP and CWMP approved before commencement of works Compliance with national laws and regulations No unresolved grievances from local community	Part of detailed design and pre-construction cost, include as BOQ line	Include mitigating measures for contractor as part of tender specifications Review and approval of PPP and CWMP Supervise and monitor contractor compliance	Supervise and monitor PIU/ contractor compliance Assist with review and approvals of PPP and CWMP	Implement mitigating measures

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	chemicals is to also be under lock and key and covered to protect it from rain with space also provided for solid and hazardous waste garbage bins to be stored. • Design to include for oil spill clean-up materials (sorbent pads, loose sorbent material, etc.) to be stationed in/outside any oil/fuel storage building in clearly labelled containers. • Garbage bins for disposal of waste generated by workers, burning of waste prohibited. • Prepare pollution prevention plan (PPP) and construction waste management plan (CWMP) for solid and hazardous waste management in accordance with national regulations and EHS Guidelines.					
Health and safety	• For all construction works comply with GOB rules and regulations for the protection of workers. • For all construction works undertake risk assessment and prepare H&S plan in accordance with EHS Guidelines, considering occupational and community H&S and including adherence emergency preparedness and response plan with communication systems and protocols to report an emergency situation. • In undertaking H&S risk assessment and preparing Emergency Preparedness and Response Plan adequate attention will be given to the risks associated with COVID-19 pandemic and other communicable viral	H&S Plan approved before commencement of works Compliance with national laws and regulations No unresolved grievances from workers of the local community	Part of detailed design and pre-construction cost, include as BOQ line	Comply with mitigating measures Include mitigating measures for contractor as part of tender specifications Review and approval of H&S Plans	Supervise and monitor PIU/ contractor compliance Assist with review and approvals of H&S Plans	Implement mitigating measures

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	diseases. National restrictions for containing the spread of COVID-19 must be complied with and Government of Bangladesh and ADB guidance (https://www.adb.org/publications/safety-well-being-workers-communities-covid-19) is to followed, as well as further guidance detailed in Appendix 7. Contractor will provide adequate sanitation and welfare facilities including hand washing and clean PPE in sufficient quantity are provided on-site and at accommodation; Contractor will also consider the ability of communities to comply with protective measures such as regular handwashing and the local health care facilities' capacity to deal with any infections agreeing with the with nearest Health Center and/or Hospital for emergency cares of workers. Particular attention must be paid to accommodation of workforce given the transient nature of work on transmission and distribution lines, to avoid spreading any virus between communities. EPRP must include response flow chart and contact details to deal with any construction worker or community member being diagnosed with COVID-19 during the course of the works. To limit contacts and hence contamination risk, the same workers should be grouped in accommodation, transport, and work teams. Medical insurance will be provided by contractor for all workers with sick leave allowance to ensure symptomatic workers do not attend site; Contractor will avoid no-work-no-pay policies, whereby by fear of	Supply of water meets drinking water standards (test results)		Supervise and monitor contractor compliance		

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	not getting paid workers would be tempted to report to work and hide any symptoms, creating more risk for the wider workforce and community. Given the unprecedented nature of responding to COVID-19, public health officials/experts must be consulted in undertaking the risk assessment and management planning for COVID-19. • Conduct training on occupational health and safety related to project (including Covid-19) for all construction workers including regular refreshers. To include training for PIU and all contractor management and construction workers including subcontractors before commencement of works. • Conduct training of workers on emergency preparedness and response procedures related to project (including Covid-19 related emergencies) in case of an occupational or community health and safety incident during construction works. To include training for PIU and all contractor management and construction workers including subcontractors before commencement of works. This is to include fire plan for the substations with training given to staff on how to use the firefighting equipment. • Detailed designs of substations to ensure infrastructure is located above maximum flood level (allowing for climate change) and incorporate adequate drainage design to attenuate storm water runoff leaving the site to greenfield runoff rates (allowing for					

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	climate change and considering addition of impermeable surfaces) such that there will be minimal changes to the natural flow rates and paths of storm water runoff across adjacent land. Drainage will be designed to route storm water runoff from the substation to existing watercourses or to infiltrate to ground in order to avoid flooding of access roads and nearby areas. Storm water management shall conform to governmental agency requirements. • Unpaved access roads used for construction traffic and operational access will be surfaced using concrete or asphalt. • New access roads will also be concrete, or asphalt surfaced with adequate drainage. • For all substations provide secure fence with locked gates and warning signs to include the ISO 7010 Hazard Type: Electrical Symbol warning of the risk of electrocution. • Design to include adequate pole foundation in order that all poles remain vertical during operation, and that the lines are tensioned, for reconductoring old poles or poles previously incorrectly installed may need to be replaced. • Design to provide on all substation boundaries/equipment and poles visual and written warning signages to the public to include the ISO 7010 Hazard Type: Electrical Symbol warning of the risk of electrocution. • Design to provide lighting arrestors along					

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	all lines. • Design to provide around the base of all pole mounted transformers a fence or similar deterrent to prevent climbing with suitable warning signs. • Detailed design of substations and lines to ensure EMF levels are within international good practice International Commission on Non-Ionizing Radiation Protection (ICNIRP) reference levels (average and peak exposure) and to meet national vertical and horizontal safety distances • Detailed design of lines to ensure their installation of above or adjacent to locations intended for highly frequent human occupancy (e.g. schools) avoided. • If safety distances found not to be complied with during reconductoring reroute to facilitate compliance; also reroute to avoid distribution lines passing over any school compounds or similar community facilities. • Detailed design to include for sufficient fire extinguishers of the type suitable for fighting an oil or fuel fire and for other firefighting equipment positioned where oil-filled transformers or other oil-filled equipment is used as well as outside/within the store. • Detailed design to ensure fire detection and alarm system is to be provided in the control buildings. • Detailed design of substations to include adequate sanitation and welfare facilities					

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	for permanent workers, including indoor kitchen facilities and eating area with provision of sufficient fuel supply for cooking other than wood, and adequate number of indoor toilets/washrooms for bathing with a hot and cold running water supply connected to either • Source of drinking water that meets drinking water standards to be identified, if an authorized supplied of canned water is not used this may require drinking water filter to be included in the detailed design. Such water must be regularly tested to confirm if meets drinking water standards.					
B. CONSTRUCTION PHASE						
Unanticipated impacts on property including land and structures. Loss of agricultural land that causes temporary disruption of farming activities, damage to crops, bunds, canals, and drains.	• Follow design drawings and implement careful construction practices to avoid damage to existing structures (e.g. buildings) and roads, crops, bunds, canals, and drains. • Demarcation of the working area and avoid encroachment outside the agreed corridor of impact. • All unanticipated damage to existing structures (e.g. buildings) and roads, crops, bunds, canals and drains outside the assessed corridor of impact shall be restored to pre-project condition and/or compensated at cost of contractor.	100% of structures (e.g. buildings) and roads, crops, bunds, canals, and drains left in same condition as prior to construction No unresolved grievances from local community	Part of construction cost, include as BOQ line	Check with contractor regarding need for pole replacement on private land and initiate necessary engagement with landowner Supervise and monitor contractor compliance	Supervise and monitor PIU/ contractor compliance Undertake site visits and review documentation to audit implementation of measures at all construction sites	Implement mitigation measures To advise PIU and SC of need for pole replacement on private land

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
				Undertake site visits using checklist to confirm implementation of measures by Contactor		
Cutting or trimming of trees and clearing of vegetation.	• No works shall be undertaken, and no temporary or permanent project facilities established within a protected area, IBA, reserve forest area, or sacred grove etc. • Follow design drawings and implement careful construction practices to avoid damage to trees. • Demarcation of mature trees to be avoided and retained. • Demarcation of the working area and avoid encroachment outside the agreed corridor of impact. • Cutting or trimming of trees prohibited unless in accordance with design drawings in order to meet safety clearance requirements. • Cut/trimmed trees and other vegetation trimmings will be temporarily stored at designated places outside of built up area to avoid blocking of accesses or dumping on agriculture fields. • Cut/trimmed trees and other vegetation	No impact on protected area, IBA, reserve forest area, or sacred grove etc. Works in accordance with EMP measures, approved EMP and compensatory afforestation plan Compliance with national laws and regulations No unresolved grievances from	Part of construction cost, include as BOQ line	Supervise and monitor contractor compliance Undertake site visits using checklist to confirm implementation of measures by contactor	Supervise and monitor PIU/ contractor compliance Undertake site visits and review documentation to audit implementation of measures at all construction sites	Implement mitigation measures

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	trimmings will be removed off-site as soon as line is completed. Unless sold for reuse, to be disposed of to a suitably licensed waste management facility with all waste transfer records retained. • Unanticipated loss of fruit-bearing trees that have economic value shall be compensated at cost of contractor in accordance with resettlement plan. • For all public trees removed replacement by native tree species in consultation with forest department. • Before cutting/trimming trees contractor's EHS Officer to check for presence of nesting birds or roosting bats. • Undertake works requiring tree cutting/trimming outside the bird nesting/breeding season. • Avoidance of construction works from one hour after dawn to one hour before dusk in areas where there is no existing human disturbance. • Removal and disposal of identified invasive plant species in an ecologically sound manner.	local community				
Interference with traffic and accessways	• Implement agreed traffic management plan. • Safe access to property and roads should be maintained and alternative routes and access provided where there are temporary diversions or blockages. • Stockpiling of poles, spoil and cable reels shall be away from properties and only in designated areas where no access will be	Works in accordance with EMP measures and approved traffic management plan	Part of construction cost, include as BOQ line	Supervise and monitor contractor compliance Undertake site visits	Supervise and monitor PIU/ contractor compliance Undertake site visits and	Implement mitigation measures

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	blocked. • Implement traffic management controls during construction works with advance warning signs or flag persons to ensure health and safety of construction workers and road users. • Road safety and warning signs must be posted at 500m, 100m, and immediately in advance of the works at least two weeks prior to the works commencing to inform the public of the temporary blockage of one lane of the road. • Scaffolds will be constructed to protect pedestrians and vehicles (and the conductor itself) from potential injury /damage during conductor stringing.	Compliance with national laws and regulations No unresolved grievances from local community		using checklist to confirm implementation of measures	review documentation to audit implementation of measures at all construction sites	
Soil erosion during substation construction and auguring/ excavation of pole foundation.	• Excavation for substations will be limited to within the substation footprint. • Minimize removal of existing vegetation and topsoil to that which is absolutely necessary. • Once earthworks are complete immediately revegetate areas of substation not utilized for infrastructure using native species etc. • Undertake earthworks for substations only during the dry season to minimize sediment laden surface water runoff. • Excavated soil will be covered with tarpaulin when spoil heaps are not active and stored at least 10m from watercourses. • Topsoil disturbed during the development of sites will be used to restore the surface	Works in accordance with EMP measures and approved EMP provisions Compliance with national laws and regulations No unresolved grievances from local community	Part of construction cost, include as BOQ line	Supervise and monitor contractor compliance Undertake site visits using checklist to confirm implementation of measures	Supervise and monitor PIU/ contractor compliance Undertake site visits and review documentation to audit implementation of measures at all construction	Implement mitigation measures

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	of the excavated area. • 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 accepting inert wastes. • Records of excavated soil, generated waste, and transfer records will be kept by the contractor. • Excavation for poles will be limited to within the agreed corridor of impact, ideally road reserve. • Rehabilitate any disturbed areas beyond footprint of pole foundation to at least original condition immediately through revegetation using native species etc. • Use of auguring to limit the area to be disturbed for pole foundation. • Undertake installation of poles during the dry season to minimize exposed areas subject to erosion by surface water runoff.				sites	
Risks of damages to sub-surface utilities and chance find of physical cultural resources during construction.	• Check with relevant local authorities (electric, water, telecoms) whether there are known pipes, cables, or other utility lines to identify any unknown underground utilities prior to excavation • Rehabilitate any damaged utilities to at least original condition in conjunction with relevant local authorities at cost to the contractor. • Follow chance find procedure if physical cultural resources are found during	Works in accordance with EMP measures and approved chance find procedure provisions Compliance with national laws and	Part of construction cost, include as BOQ line	Supervise and monitor contractor compliance Undertake site visits using checklist to confirm	Supervise and monitor PIU/ contractor compliance Undertake site visits and review documentatio	Implement mitigation measures

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	construction works; if physical cultural resources are encountered, all works at the find site should be immediately halted.	regulations No unresolved grievances from local community		implementation of measures	n to audit implementation of measures at all construction sites	
Dust, noise and general disturbance to local community	• Provide at least one-month advance notice to local community through the village heads about the schedule of, location plan, and details of planned construction works. • Carry out construction works only during daytime hours (8am-6pm) and on weekdays unless otherwise agreed with the village heads and all residents within 100m to avoid noise nuisance. • Construction to be conducted using manual and no heavy equipment. • Noise generating construction-related activities will be avoided during evenings, school hours, prayer times, religious or cultural events in close proximity to the sensitive receptors. • Construction noise in the vicinity of houses and other sensitive receptors must be limited to 55dB(A) as 1hour LAeq—if nighttime work is permitted it must be limited to 45dB(A) as 1hour LAeq. • If these levels are exceeded the contractor will be required to implement additional noise mitigation measures such as adjusting his working methods or placing of	Comply with national air and noise standards, or WHO noise guidelines where stricter than the national Works in accordance with EMP measures and approved EMP Compliance with national laws and regulations No unresolved grievances from local community	Part of construction cost, include as BOQ line	Supervise and monitor contractor compliance Undertake site visits using checklist to confirm implementation of measures If required undertake quantitative dust and noise monitoring to confirm compliance with performance	Supervise and monitor PIU/ contractor compliance Undertake site visits and review documentation to audit implementation of measures at all construction sites	Implement mitigation measures

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	temporary noise barriers to ensure the noise standard is met. • Use of low noise generating equipment e.g. less than 55dBA sound pressure level at 1m • Equipment (e.g. generators) to meet applicable national air and noise emission requirements. • Ensure all construction machinery and vehicles are maintained in good working order and have passed emissions test for noise and air emissions as applicable to them • Prohibit the use of horns in areas where sensitive receptors are located (houses, schools, clinics, temples, etc.) • Construction workers exposure to noise should not exceed the levels set out in the General EHS Guidelines on Occupational Health and Safety otherwise the hearing protection is to be provided • Unpaved access roads to substations to be surfaced before any excavation or other earthworks at the substation commence • Limit engine idling to maximum 5 minutes • Impose speed limits on construction vehicles to minimize dust emission along areas where sensitive receptors are located (houses, schools, clinics, temples, etc.) • During the dry season or in windy conditions undertake water sprinkling at least twice a day in exposed areas prone to dust generation where sensitive receptors			standards at any given location		

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	are located (houses, schools, clinics, temples, etc.) and at substations and on unpaved access roads to distribution lines but more often if needed during excavations, earthworks, and windy conditions that enable dust to be easily mobilized • Stockpiles of soil and other dust generating materials will be covered with tarpaulin • Providing workers with N95 dust masks to be worn when dust generating activities take place • Vehicles delivering construction materials shall be covered • Burning of wastes generated by project-related activities to be strictly prohibited • Ensure all stationary emission sources are maintained in good working order in accordance with manufacturer instructions • Position any stationary emission sources (e.g. diesel generators, compressors, etc.) as far as practical from sensitive receptors (houses, schools, clinics, temples, etc.) • Follow General EHS Guidelines for the use and storage of fuel, oil, and chemical including prevention and control of hazards associated with spill prevention, emergency response, clean up and contaminated soil remediation • Fuel, oil, and chemicals used to be kept under lock and key and stored in labelled, sealed containers on drip trays to provide secondary containment, ideally these will					

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	be located on an impermeable surface • Mounting of plant containing oil and diesel on drip trays to catch leaks. • Refueling operations, equipment servicing and washdown to take place on an impermeable surface at least 50m from watercourses, springs, and wells, with drainage directed through oil and grease interceptors before being discharged into a settling pond prior to discharge offsite • Provide sufficient absorbent materials (e.g. sorbents, dry sand, sandbags) on-site for soaking up fuel, oil or chemical leaks/spills.					
Pollution prevention and generation of construction wastes	• Provision of adequate on-site sanitation facilities including septic tanks and soak-away pits or alternative sanitary facilities that do not allow the untreated disposal of sewage to adjacent water bodies e.g. portable toilets (same requirement applies to any construction camps). • Provision of an appropriate domestic solid waste and construction waste collection and disposal system. • Provision of designated hard standing areas for equipment servicing, refueling and wash down at least 50m from watercourses, springs, and wells, with drainage directed through oil and grease interceptors before being discharged into a settling pond prior to discharge offsite. • Implement agreed waste management plan and avoid or minimize the generation of waste materials, as far as is practicable.	Works in accordance with EMP measures and approved PPP and CWMP Compliance with national laws and regulations No unresolved grievances from local community	Part of construction cost, include as BOQ line	Supervise and monitor contractor compliance Undertake site visits using checklist to confirm implementation of measures	Supervise and monitor PIU/ contractor compliance Undertake site visits and review documentation to audit implementation of measures at all construction sites	Implement mitigation measures

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	• Collect and segregate construction wastes including scrap metal, oils, and solid waste. • Store all wastes in designated, labelled area in an environmentally sound manner e.g. oils to be stored in sealed drums on drip trays, solid wastes to be stored in an enclosed bin. • Recover recyclable wastes that could be reused or sold to recyclers. • Prohibit burning of construction wastes. • Prohibit dumping of construction wastes into canals, rivers, agricultural fields etc. • Scrap metal and similar waste to be immediately removed off-site to the BREB stores for appropriate reuse or disposal with all waste transfer records retained. • Unless reused or sold, other construction waste to be disposed of to a suitably licensed waste management facility (depending on if hazardous or non-hazardous) with all waste transfer records retained.					
Occupational health and safety	• Require workers to confirm they have seen and understood the requirements of the OHS plan before proceeding with the work. • 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 and working at height. • Untrained workers will not be permitted to	No fatalities or lost time incidents 100% of H&S incidents including near miss recorded, immediately	Part of construction cost, include as BOQ item	Supervise and monitor contractor compliance Undertake site visits using checklist to confirm	Supervise and monitor PIU/ contractor compliance Undertake site visits and review documentatio	Implement mitigation measures

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	work with live electricity or at height. • Provide PPE for workers in accordance with Table 2.7.1. Summary of Recommended Personal Protective Equipment According to Hazard in EHS Guidelines on OHS. • Enforce disciplinary system (e.g. immediate removal from site) for non-compliance with PPE requirements • During the COVID-19 pandemic, temperature checks to be carried out at entrance of the work site at start of shift, and records of all suspected and confirmed cases to be kept. • Require workers to observe the EHS Guideline on Construction and Demolition • Require workers to observe EHS Guideline on T&D requirements for working with live power lines • Ensure proper grounding and deactivation of live power lines during construction work or before any work in close proximity to the lines and this will be checked and certified by Health and Safety Officer in advance. • Only suitably trained workers that meet the requirements set out in EHS Guidelines on Transmission and Distribution (T&D) to be allowed to work on live power lines with strict adherence to safety and insulation standards including those listed in the EHS Guidelines • Require other workers to observe the minimum approach distances for	investigated, and corrective action taken to prevent repeat Works in accordance with EMP measures and approved H&S Plans Compliance with national laws and regulations No unresolved grievances from workers or the local community		implementation of measures	n to audit implementation of measures at all construction sites	

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	excavations, tools, vehicles, pruning, and other activities when working around power lines • Require workers to observe EHS Guideline on T&D requirements for working at height • Require workers to test the structural integrity of poles prior to proceeding with the work. • Use fall protection measures when working on poles, i.e. mobile elevated working platform, all workers are required to wear body harness. • Unless transformers have been certified PCB free workers must wear suitable chemical and/or oil resistant gloves, goggles, and protective clothing whilst working with transformers. Eye wash station and water supply to shower to be provided during works due to risk of PCB coming into contact with skin. • During construction works ensure qualified first aider and trained fire marshal is available on-site at all times with an appropriately equipped first aid kit and appropriate fire extinguisher and other firefighting equipment immediately available for use • Provide an ambulance for more serious cases. • Arrange with nearest Health Center and/or Hospital for emergency cares of workers • Provide workers with access to an existing functional toilet facility (toilets and hand					

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	washing area) or provide a self-contained portable toilet with hand washing facilities (use of pit latrines to be prohibited)—generated wastewater to be disposed of to existing local facilities. • Sufficient toilet facilities should be provided for the number of workers, and there should be an indication of whether the toilet facility is “in use” or “vacant” if not segregated. • Toilet facilities to be provided with adequate supplies of hot and cold running water, soap, and hand drying device. • Provide workers with access to clean eating area with supply of drinking water. • Adequate supplies of potable drinking water meeting national standards should be provided to workers. • Since workers will not be local to the area suitable accommodation must be provided by the contractor, ideally use should be made of existing accommodation facilities but if a construction camp is provided it must be adequately equipped with sufficient toilets, hand washing facilities, showers or baths, food preparation and clean eating area, etc.					
Community health and safety such as toppling of concrete poles, traffic and accidents, emergency spill of materials, and access of villagers	• Install on all substation fences/equipment and poles visual and written warning signages to the public to include the ISO 7010 Hazard Type: Electrical symbol warning of the risk of electrocution. • Install lighting arrestors along all lines. • Provision for ensuring security of the cable	No fatalities or lost time incidents 100% of H&S incidents	Part of construction cost, include as BOQ item	Supervise and monitor contractor compliance Undertake	Supervise and monitor PIU/ contractor compliance Undertake	Implement mitigation measures

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
to dangerous working areas.	to avoid vandalism. • Install around the base of all pole mounted transformers a fence with locked gate or similar deterrent with suitable warning signs. • Fence and sign immediate working area to prevent public access during construction works • Do not leave hazardous conditions (e.g. unlit open excavations without means of escape) overnight unless no access by public can be ensured • Prevent standing water as it may become a breeding habitat for mosquitoes etc. • During construction works provide signage detailing site and office contacts in case of grievance. • Before handover, all poles to be confirmed to have adequate foundation that they will remain vertical during operation, and that all the feeder lines are correctly tensioned. • Contractors staff will also be given awareness raising in infectious disease including COVID-19, and code of conduct at work • Wherever possible, the contractor should not discriminate and should proactively encourage the employment of suitably skilled women on the project.	including near miss recorded, immediately investigated, and corrective action taken to prevent repeat Works in accordance with EMP measures and approved H&S Plans Compliance with national laws and regulations No unresolved grievances from local community		site visits using checklist to confirm implementation of measures	site visits and review documentation to audit implementation of measures at all construction sites	
C. OPERATIONAL AND MAINTENANCE PHASE						
Impacts on occupational health	• BREB Team to appoint suitably qualified and experienced staff on a full time basis to			PBS District Units;	NA	NA

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
and safety due to exposure to live power lines, working at heights, and risks of accidents (electrocution, lightning, fires, and explosion)	oversee implementation of environment, health and safety matters across the organization, to provide staff regular trainings, and continually improve compliance with national requirements and good international practice for EHS • 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 emergency preparedness and response plan with communication systems and protocols to report an emergency situation. • Require workers to confirm they have seen and understood the requirements of the OHS plan before proceeding with the work. • Conduct training on occupational health and safety for all operations and maintenance workers including refreshers. • Conduct training of workers on emergency preparedness and response procedures in case of an occupational health and safety incident during operation and maintenance. • 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 and working at height. • Provide PPE for workers in accordance with Table 2.7.1. Summary of Recommended Personal Protective Equipment According to Hazard in EHS	No fatalities or lost time incidents 100% of H&S incidents including near miss recorded, immediately investigated, and corrective action taken to prevent repeat Works in accordance with EMP measures and approved H&S Plans Compliance with national laws and regulations No unresolved grievances from local community	PBS O&M Budget	supervision and monitoring by BREB HQ Team		

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	Guidelines on OHS. • Enforce disciplinary system (e.g. immediate removal from site) for non-compliance with PPE requirements • Ensure proper grounding and deactivation of live power lines during maintenance work or before any work in close proximity to the lines • Require workers to test the structural integrity of poles prior to proceeding with the work • Use fall protection measures when working on poles, i.e. mobile elevated working platform, all workers are required to wear body harness • Require workers to observe the minimum approach distances for excavations, tools, vehicles, pruning, and other activities when working around power lines • During maintenance works ensure qualified first aider and trained fire marshal is available on-site at all times with an appropriately equipped first aid kit and appropriate fire extinguisher and other firefighting equipment immediately available for use • Arrange with nearest Health Center and/or Hospital for emergency cares of workers • Provide workers with access to an existing functional toilet facility or provide a self-contained portable toilet with hand washing facilities (use of pit latrines to be prohibited)					

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	• Occupational EMF exposure should be prevented or minimized through the preparation and implementation of an EMF safety program in accordance with the "Environmental, Health, and Safety Guidelines—Electric Power Transmission and Distribution" (IFC) dated 30 April 2007					
Impacts to community health and safety such as electrocution and lightning strikes, explosion and fire, and exposure to magnetic field.	• 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 emergency preparedness and response plan with communication systems and protocols to report an emergency situation. • Conduct training of workers on emergency preparedness and response procedures in case of a community health and safety incident during operation and maintenance. • Undertake public information/awareness campaign covering all project villages using distribution of posters, leaflets and safety booklets as well as orientation at village level on health and safety risks related to substations and live electric lines and how to avoid or respond to incidents. • Regularly inspect (at least monthly) the condition of substations, poles, lines and transformers to check minimum vertical clearance and protection is maintained; integrity of the poles and line is in good condition; electrical safety warning signs and lighting arrestors in place; missing or corroded parts are immediately identified	No fatalities or lost time incidents 100% of H&S incidents including near miss recorded, immediately investigated, and corrective action taken to prevent repeat Works in accordance with EMP measures and approved H&S Plans Compliance with national laws and regulations	PBS O&M Budget	PBS District Units; supervision and monitoring by BREB HQ Team	NA	NA

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	and replaced; that any leaking oil from transformers is immediately addressed; and, the status of any vegetation growth that may damage or threaten the integrity of the lines. • Inspection protocol should include possible conductor snapping and de-energizing of the line within three cycles to avoid the potential for electrocution from a breakage • Keep photographic records and log of all inspections and actions taken in response.	No unresolved grievances from local community				
Disturbance to local community due to maintenance works.	• Provide at least one-month advance notice to local community through the village heads about the schedule of, location plan, and details of planned maintenance works. • Carry out maintenance works only during daytime hours and on weekdays unless otherwise agreed with the village heads. • During maintenance works provide signage detailing site and office contacts in case of grievance. • Implement traffic management controls during maintenance works with advance warning signs or flag persons to ensure health and safety of maintenance workers and road users. • Prohibit the use of herbicides, pesticides or burning to control any vegetation growth or to manage vegetation waste. • Removal and disposal of identified invasive plant species in an ecologically sound manner. • Scrap metal and similar waste to be	Works in accordance with EMP measures and approved H&S Plans Compliance with national laws and regulations No unresolved grievances from local community	PBS O&M Budget	PBS District Units; supervision and monitoring by BREB HQ Team	NA	NA

Environmental Impact	Mitigating Measures	Performance Standard	Budget/ Source	Responsibilities		
				BREB	PIU/BES/EC	Contractor
	immediately removed off-site to the DISCOM stores for appropriate reuse or disposal with all waste transfer records retained. • Vegetation and other solid waste to be immediately removed off-site and disposed of to a suitably licensed waste management facility with all waste transfer records retained.					

8.3 Monitoring and Reporting Plan

320. The BREB will be overall responsible for implementation of the EMP and preparation of semi-annual environmental monitoring reports to ADB in the format acceptable to ADB (template provided in Appendix 6). This should be done with support of the PBS supervising consultants and a monitoring consultant. The monitoring plan below (Table 8.2) shows activities and institutional responsibilities for overall implementation of the EMP. The environmental monitoring reports will be submitted semi-annually during construction and annually during operation. The monitoring reports should be provided to ADB within 30 days from the end of the reporting period as per the frequency indicated above until the submission of the project completion report. The monitoring reports will be disclosed on ADB's website.

Table 8.2: Environmental Monitoring Plan for the Project

Measure/Indicator	Locations	Frequency	Methods of Monitoring	Responsibility
Pre-Construction Phase				
About 2,129 trees[18] cutting within the substation area	• Plantation of 6,387 trees at a ratio of 1:3 • Confirm that this planting plan is being followed during the construction period also	During pre-construction phase	Tree replanting plan and record of compensation	Implementation: BREB Supervision: PD & PIU
EMP Implementation Training for Better understanding of environmental safeguards and how they are to be implemented is needed. BREB needs to provide this briefing to the contractor	At BREB office	Prior to contractor mobilization	Obtain record of presentation	Implementation: BREB Supervision: PD & PIU
Construction Phase				
Loss or damage to crops, trees etc. Notify farmers, owners, provide compensation for crop loss/trees	New pole locations at new sites, and stringing sites	Initial one-off compensation as required	Field visits. PBS consultant Engineers and DC's staff as necessary	Implementation: PD, DC office Supervision: PIU
Interference with traffic and road crossings	Roads where distribution lines work are taking place	Every week during project construction	Field observation. Informal interview. PBS	Implementation: PD, DC office Supervision: PIU

[18] A total of 3,721 trees are expected to be affected of which 917 are timber trees, 1,190 are fruit-bearing tree, 22 are medicinal and rest 1,592 are banana and nursery. In this number the timber, fruit-bearing and medicinal trees are counted for replantation since Department of Environment does not recommend replantation of Banana trees. The number of trees eligible for replantation is 2,129. Thus, the total number of replantation trees are 6,387 at a ratio of 1:3.

			Consultant Engineers	
Air Quality • Dust resulting from construction work • Exhaust gas from construction machinery and vehicles used for mobilization of equipment	Substation site and along the distribution line alignment	Daily	Visual inspection is suggested since no sensitive areas nearby	Implementation: contractor Supervision: PD & PIU
Wastes • Construction waste from construction work • Domestic waste from workers	Substation site, workers camp	Daily	Record of kinds and quantity of waste, and the disposal method	Implementation: contractor Supervision: PD & PIU
Infectious Diseases such as Covid-19 Temporary influx of migrant labor during construction may increase risk of infection	Camp site	Twice a year	Labor health record	Implementation: contractor Supervision: Social safeguard expert
Worker condition including work safety	Working site	Record of accidents	Continuous record	Implementation: contractor Supervision: Social safeguard expert
Loss of electricity to businesses/ interruptions to be kept to a minimum and loss of income to be minimized	Work along bazaars and commercial areas	Every week during construction activity	PBS Consultant Engineers	PD & PIU
Safety of workers and general public during implementation	All substation sites and at distribution line sites in commercial area	Every week during construction activity	PBS Consultant Engineers	PD & PIU
Waste from substation construction site and new distribution line work sites and proper disposal at central locations at PBS warehouses and yards	Substation construction site	Once at each	Field observation	Implementation: Contractor(s). PBS Supervision: PD & PIU
Post-Construction/Operation Phase				

Oil waste from transformers maintenance Recycle, reuse, safe storage and disposal at PBS sites recognized agencies	PBS operations at warehouses and stores	Half yearly at each PBS	Visits to PBS stores depots, and check records	PD, PIU and Monitoring Consultant

PIU–project implementation unit, DC Office–Deputy Commissioner's Office, PBS–Palli Biddyut Samities, PD–Project Director

8.4 Institutional Arrangement and Responsibilities

8.4.1 Introduction

321. The Ministry of Power, Energy and Mineral Resources (MPEMR) will take overall responsibility for ensuring the project implementation on behalf of Government of Bangladesh. Bangladesh Rural Electrification Board (BREB) is executing agency for the additional financing. The project implementation units (PIUs) within the executing agency headed by a project director will implement the project.

8.4.2 Institutional Arrangements of BREB

322. BREB already has experience working on international donor funded projects where construction of new substations and distribution lines have been supported. To institutionalize the environment and social safeguards, BREB has already setup a formal Environment and Social Management Unit/Cell with qualified staff under the project management unit (PMU).

323. The BREB has already established a PIU with a full time Project Director. The same PIU will be responsible for all aspects of the EMP implementation including procurement and financial management.

324. The monitoring and supervision of the construction work at field level will be entrusted to the respective PBSs. The General Manager and the Consultant Engineer of the PBSs will also be responsible for the implementation of the EMP, resolution of project related grievances at field level, payment of compensation for any losses caused by the project.

8.4.3 Current Implementation Status and Capacity Building Requirement for AF

325. The Asian Development Bank (ADB) approved the Bangladesh Power System Enhancement and Efficiency Improvement Project on 29 March 2017 aims to improve electricity transmission and distribution in the country. The parent project includes four components and BREB is currently implementing component 3 which is the distribution system rehabilitation, augmentation, and rural electrification in BREB service areas. Up to June 2020, the total progress status of upgradation, rehabilitation, and intensification of distribution system (URIDS) in Dhaka, Mymensingh, Chittagong and Sylhet divisions (DMCS) is 16,139 Km considering the line upgradation, rehabilitation and extensions which is 59.77% against the total target of 27,000 Km. On the other hand, under URIDS in Rangpur, Rajshahi, Khulna and Barishal divisions (RRKB), the total progress of line construction (upgradation/ rehabilitation and extension) is 16,510 Km which is 70.26% of the total target of 23,500 Km.

326. There is no dedicated safeguard person in the PIU. However, SMEC International Pty. Ltd. which is the monitoring and supervision consulting firm has retained one national safeguard specialist and one international environmental specialist along with other engineering experts. BREB has submitted semi-annual social monitoring reports for the period of (1) June to December 2019 and (2) January to June 2020. The reports are prepared by PIU, BREB with the support of monitoring and supervision consulting firm. The safeguards specialist (National) in supervision and monitoring firm along with other specialists (power distribution engineering specialist, power distribution specialist and site engineers) have

visited the project sites during preparation of the monitoring reports. Supervision and monitoring firm has also provided recommendation/ advice to the contractors/ subcontractors to fulfill the social requirements.

327. During the field visits, team has also disclosed projects grievance mechanism, safeguard compliances, resettlement plan, IEE and EMP to the community people and interested stakeholders. All safeguard related provisions are incorporated in bidding document of works and works contract. In order to address these issues, BREB established a committee for a potential resolution of grievances and GRM is well functional. During the period of June to December 2019. BREB has conducted 05 consultation meetings with different stakeholders. During the period of 1 January 2020 to 12 March 2020, PIU and monitoring firm has conducted 18 consultation meetings with different stakeholders.

328. At the construction sites, full PPE was not used by the laborers, and workers; even, in many instances, contractors do not provide the full set of PPEs at the sites, creating opportunities for incidents during working hours.

8.4.4 Capacity Building Requirement for AF

329. There is no dedicated environmental and social safeguard specialist at the PIU, thus there should be one environmental consultant and one social consultant who will support PIU for the additional financing. The TOR for the environment consultant is in the Appendix 4. Also, at each PBS level, there should be one officer who is the focal for the environmental and social safeguards. Lastly, each contractor should assign the environmental and social safeguard work to one of the engineers and the persons should look after field level safeguard matters.

330. Further, before stating of any filed work, there should be environmental and social safeguard training delivered by the environmental and social consultants and in which the focals at PBSs and officers in charge for safeguard of contractors are participating.

8.5 Budget for the Environmental Management Plan (EMP)

331. The monitoring costs for the project is to be included in annual budgets of BREB and the PBS. The breakdown of budget for the EMP is given in **Table 8.3**. Funding will be made available for external monitoring of the project.

Table 8.3: Budget for the Environmental Management Plan

Item	Qty	Rate/Ref.	Total Tk (Million)	USD (1USD=85 BDT)
Monitoring Plan	**From revenue budget**			
Monitoring, and reporting		Lump sum	2	23,529
Tree Plantation	6,387 trees	Tk 1,000 per tree	6.3	74,117
Dust suppression measures as stipulated in EMP		Lump sump	3	35,294
Debris disposal and waste management on site		Lump sump	2	23,529
Updating IEE/EMP and admin cost including yearly DOE license renewal		Lump sum	3	35,294
Sub Total			**16.3**	**191,764**
Contingencies (10%)			1.6	18,823
Total Cost			**17.9**	**210,588**

Chapter 9

9. Conclusion and Recommendations

332. The additional financing project for Bangladesh Power System Enhancement and Efficiency Improvement Project will construct 51 new substations, installation of 990 km of 33 KV distribution lines, and 3,000 km of 11 KV or below distribution lines in 9 PBS under Khulna division. On successful completion of the project, facilities for connected 3,452,751 nos. of consumers of different categories will be created. It is also expected that the financial soundness of the concerned PBSs will improve through income generation with these new consumers.

333. According to the Environmental Conservation Rules of Bangladesh 1997, the proposed project falls under the Red category. In line with the rules, BREB has to prepare an IEE report to obtain site clearance and EIA report for environmental clearance certificate from the Department of Environment (DOE) prior to commencement of the construction work of the project.

334. The environmental impacts and risks of the project have been assessed as described in the previous sections of this IEE report. Potential negative impacts were identified in relation to the detailed design and pre-construction, construction and operation and maintenance of the improved distribution infrastructure. Mitigation measures have been developed and are included in the EMP to address all negative impacts identified.

335. Potential construction impacts relate to disturbance to land and communities as project infrastructure is installed and pollution, health and safety risks to workers and the community in proximity to works if the construction activities are not well managed. Pollution, health and safety risks to workers and the community will remain during operation and maintenance works.

336. Overall construction, operation and maintenance of the project facilities is likely to give rise to direct, indirect, cumulative, and induced environmental impacts that are mostly minor in magnitude, site-specific, generally reversible, temporary and of short duration primarily during construction works. Potential impacts can be easily mitigated through the adoption of international good practices for environmental management as set out in the IFC EHS Guidelines including those on Electric Power Transmission and Distribution dated 30 April 2007. This is due to the following findings:

- All of the proposed new 33/11kV substations are located on land acquired by the BREB through willing-buyer and willing-seller mechanism.
- The new 33 and 11 kV lines will mostly be aligned along the ROW of existing rural roads although some sections may need to pass through agricultural or plantation areas; the associated poles, conductors, and transformers have a small footprint ─ the IEE will be updated following detailed route surveys for these components of the project.
- Project components are located in semi-urban and rural areas which do not support high biodiversity values and will be away from legally protected areas or internationally or nationally important biodiversity areas or physical cultural resources.
- There will be only minor civil works required for the project.
- An EMP has been prepared for the project. The EMP includes (i) mitigation measures for potential environmental impacts during implementation, including ensuring detailed designs take into account high floods, and climate change adaptation measures; adhering to EMF exposure and noise guideline levels; approving contractor's pollution prevention, solid and hazardous waste management, and health and safety management plans prior to works; prohibiting PCB use in new transformers and the use of all asbestos containing materials in new construction; and, community awareness raising activities on the health and safety risks of electrical equipment; (ii)

an environmental monitoring program, including monitoring of health and safety incidents; and (iii) the responsible entities for mitigation, monitoring, and reporting.

337. Mitigation measures will be assured by a program of environmental supervision and monitoring to be conducted during the construction and operation stages. All planning and design, construction, and operation and maintenance activities will be supervised, monitored, and reported by BREB and the respective BES in accordance with the EMP.

338. This IEE including EMP are considered sufficient to meet the environmental assessment requirements of ADB for the project. However, following selection of final 33 and 11 kV line alignments, and, in case of any unanticipated scope or design change occurring during project implementation, this IEE and EMP will be updated and cleared by ADB.