

Final Addendum to Initial Environmental Examination

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February 2024

Bangladesh: Dhaka and Western Zone Transmission Grid Expansion Project

Addendum- 4 (Package 3 and 7)

Prepared by Power Grid Company of Bangladesh Ltd. (PGCB), Government of Bangladesh for the Asian Development Bank (ADB).

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ADDENDUM TO INITIAL ENVIRONMENTAL EXAMINATION

BANGLADESH: DHAKA AND WESTERN ZONE TRANSMISSION GRID EXPANSION PROJECT

**KALIGANJ- MAHESHPUR 132 KV DOUBLE CIRCUIT TRANSMISSION LINE
230/132/33 KV GIS SUBSTATION AT RUPSHA
132/33 KV GIS SUBSTATION MEHERPUR
132/33 KV GIS SUBSTATION MANIRAMPUR
132/33 KV GIS SUBSTATION MAHESHPUR AND
132/33 KV GIS SUBSTATION PHULTOLA**



DRAFT FINAL REPORT

**PREPARED BY
POWER GRID COMPANY OF BANGLADESH (PGCB)**

February 2024

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ACRONYMS AND ABBREVIATIONS

ADB	Asian Development Bank
AIS	Air-Insulated Switchgear
AP	Affected Persons
ASL	Above Sea Level
BMD	Bangladesh Meteorological Department
CAP	Corrective Action Plan
CHT	Chattogram Hill Tracts
DoE	Department of Environment
DPP	Development Project Proposal
DPs	Displaced Persons
DSC	Design and Supervision Consultants
DWZTGEP	Dhaka and Western Zone Transmission Grid Expansion Project
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
EMoP	Environmental Monitoring Plan
EMP	Environmental Management Plan
EQS	Environment Quality Standards
ESMS	Environmental and Social Management System
FGD	Focus Group Discussion
GIS	Gas Insulated Switchgear
GoB	Government Of Bangladesh
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
GSS	Grid Substation
HES	Health Environment and Safety

IEC	Important Environmental Component
IEE	Initial Environmental Examination
ISC	Important Social Component
IUCN	International Union for Conservation for Nature
LGI	Local Government Institutions
LGRC	Local Grievance Redress Committee
LILO	Line-In Line-Out
MoEFCC	Ministry of Environment, Forest and Climate Change
NGO	Non-Governmental Organization
PAI	Project's Area of Influence
PAP	Project Affected Persons
PCB	Polychlorinated Biphenyl
PCRs	Physical Cultural Resources
PDB	Power Development Board
PGCB	Power Grid Company of Bangladesh
PMU	Project Management Unit
PPE	Personal Protective Equipment
PSMP	Power System Master Plan
RCC	Reinforced Cement Concrete
RMA	Resource Management Associates (Pvt) Ltd.
RoW	Right of Way
RP	Resettlement Plan
SF6	Sulfur Hexafluoride
SPS	Safeguard Policy Statement
SWTGEP	Southwest Transmission Grid Expansion Project
TL	Transmission Line

UPI	Union Parishad Institutions
WEIGHTS AND MEASURES	
cm	- centimeter
ha	- hectare
km	- kilometer (1,000 meters)
kV	- kilovolt (1,000 volts)
kW	- kilowatt (1,000 watts)
m	- meter
mm	- millimeter
MVA	- mega-volt ampere
MW	- megawatt

EXECUTIVE SUMMARY

1. INTRODUCTION

- i. This report is addendum to the original IEE report that was approved by ADB in July 2019. The addendum is only in respect of one line; Kaliganj-Maheshpur 132 kV double circuit transmission line (package 3) and five substations under Package 7 (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur). The report is based on the final alignment of the EPC Contractor and considers the risks and impacts in order to formalize the management plan. The original IEE depicted a detailed project description, baseline data, impact assessment and management plans and remains applicable for the project. As per PGCB, the construction activities (pilling and soil tests) in the Kaliganj-Maheshpur 132 kV double circuit transmission line started in May 2023.

1.2 Objectives of the Initial Environmental Examination

- ii. The implementation of the project could have both negative and positive impacts on the surrounding environment, depending on environmental sensitivities and the design of responsive mitigation measures. Environmental impacts include physical, ecological and socio-economic impacts.

1.3 Scope of Work

The broad scope of the IEE is:

- To conduct field visits to collect data relevant to the study area and also collect secondary data so as to establish the baseline environmental status of the study area.
- To assess the impacts on environmental attributes due to the location, design, construction, and operation of the proposed project.
- To identify critical environmental parameters required to be monitored after the implementation of the proposed project.
- To carry out consultation with local people to identify public perception regarding the project.
- To prepare an EMP and an Environment Monitoring Plan (EMoP) including cost estimates for PGCB to comply with during the project implementation; and
- To prepare an IEE report in accordance with the ADB's SPS 2009 and the national regulations of the government.

1.4 Methodology

- iii. The field survey team used a combination of desk studies, field investigations, census data, structured interviews, focus group discussions (FGDs), google maps, and reports to generate the data required to describe the existing environment and assess the potential impacts due to the construction and operation of the project. Local knowledge about the ecosystem and problems associated with the project activities were carefully recorded through public consultations and used in the impact assessment and to develop the mitigation plan. Formal public consultations, as well as informal ones, involving local villagers and Affected Persons (APs) were carried out from March to November 2023.

2. ADMINISTRATIVE AND LEGAL FRAMEWORK

A. Environment related policies in Bangladesh

- National Environment Policy, 2018
- National Environment Management Action Plan, 1995
- The National Biodiversity Strategy and Action Plan, 2004

B. Environment and Social Related Legislations in Bangladesh

- The Environment Conservation Act, 1995 and Subsequent Amendments
- The Environment Conservation Rules, 2023
- Noise Pollution (Control) Rules, 2006

- EIA Guidelines for Industry, 2021
- Air Pollution (Control) Rules 2022

C. Relevant National Environmental Regulations

- Environment Court Act 2000 (amended in 2002 and 2010)
- Bangladesh Water Act 2013
- Vehicle Act 1927, the Motor Vehicles Ordinance 1983
- Factories Act 1965 and Bangladesh Labour 2006, Bangladesh Labor Act 2013
- The Forest Act 1927 (amended in 1982 and 1989)
- Telegraph Act 1885
- Electricity Act 2018
- The Antiquities Act 1968 (amended 1976)
- Natural Water Bodies Protection Act 2000
- Wildlife (Protection and Safety) Act 2012
- National River Protection Act 2013
- The Protection and
- Conservation of Fish Act 1950 (amended 1973, 1982, 1995, 2002)
- Acquisition and Requisition of Immovable property Act, 2017
- Environment Conservation Rules 2023
- Grid Code 2019
- Hazardous Waste (e-waste) Management Rules, 2021
- Solid Waste Management Regulations 2021

3. PROJECT DESCRIPTION

- iv. This addendum is only in respect of one transmission line; (i) Kaliganj-Maheshpur 132 kV double circuit transmission line (Package 3), and five substations (Package 7); (i) 230/132/33 kV GIS Substation at Rupsha, (ii) 132/33 kV GIS Substation Phultola, (iii) 132/33 kV GIS Substation Maheshpur, (iv) 132/33 kV GIS Substation Meherpur and (v) 132/33 kV GIS Substation Manirampur.

4. ENVIRONMENTAL AND SOCIAL BASELINE

- v. This section describes the existing environmental and social baseline status of proposed overhead transmission lines; Kaliganj-Maheshpur 132 kV double circuit transmission line (package 3) and five substations under Package 7 (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur).

4.1 Methodology

- vi. The analysis was completed through on-ground reconnaissance and surveys to establish an understanding of the environmental and socio-economic baseline. Data for this chapter were collected from:
- Primary Sources: This included gathering information from field surveys, laboratory analysis and consultations/FGDs in the project area.
 - Secondary Sources: This included data from literature reviews, maps and monitoring reports.
- vii. The baseline condition of environmental quality in the locality of project study area serves as the basis for identification, prediction, and evaluation of impacts. The baseline environmental quality is assessed through field studies within the impact zone for various components of the environment such as air, noise, water, land and socio-economic etc.

4.2 Physical Environment

4.2.1 Climate

- viii. Three distinct seasons can be recognized in Bangladesh: the post-monsoon season from November to February; the pre-monsoon hot season from March to May, and the rainy monsoon season which lasts from June through to October. The month of March may also be considered as the spring season, and the period from mid-October to mid-November may be called the autumn season.

4.2.2 Water Quality

4.2.2.1 Surface Water

- ix. Water quality assessment for the Kaliganj-Maheshpur transmission line and associated substations indicates favorable conditions. Parameters such as BOD5 (0.8-3.0 mg/L), COD (9-28 mg/L), DO (>5 mg/L, except for a few locations), EC (217-379 $\mu\text{S}/\text{cm}$), pH (within national standards, except SW8), salinity (0.17-0.93 ppt), temperature (23.9-26.5°C), hardness (54-69 mg/L), TDS (108-685 mg/L), ammonia (low values), phosphate (low values), TPH (0.7-2.6 mg/L), total coliform (108-189 per 100ml), nitrogen (23.9-26.5 mg/L), TSS (2.3-4.6 mg/L), ammonium (0.21-0.43 mg/L), turbidity (4.54-9.87 mg/L), and oil and grease (1.0-1.9 mg/L) were within acceptable ranges based on national standards. Overall, the data suggests minimal impact of the Kaliganj-Maheshpur transmission line project on water quality in the assessed areas.

4.2.2.2 Ground Water

- x. Groundwater quality monitoring for the Kaliganj-Maheshpur transmission line and associated substations indicates compliance with Bangladesh standard values. No groundwater degradation was observed during the baseline monitoring, and no chemical or hazardous elements were found leaching into the ground. Parameters such as BOD, COD, DO (6.0-6.2 mg/L), EC (1431-2026 $\mu\text{S}/\text{cm}$), pH (6.96-7.52), salinity (0.07-0.10 ppt), temperature (within ECR 2023 standard), hardness (302-519 mg/L, except GW1), TDS (712-1014 mg/L, except GW1), manganese (below 4.6 mg/L, except GW6), iron (within ECR 2023 value), arsenic (below 0.097 mg/L, except GW6), total coliform (absence in drinking water), fecal coliform (absence in drinking water), TPH (below detection limit), turbidity (within ECR 2023 value), and chloride (within ECR 2023 value) were within acceptable ranges

4.2.3 Air Quality

- xi. Air quality monitoring for the Kaliganj-Maheshpur transmission line and associated substations indicates that particulate matter (PM_{2.5} and PM₁₀) levels, while below the Air Pollution (Control) Rules, 2022 standard, exceed the IFC/WHO standards due to vehicle movement on local roads during dry conditions. Sulphur Dioxide (SO₂) concentrations in the range of 9.8 to 23.3 $\mu\text{g}/\text{m}^3$ along the transmission line are below both IFC/WHO and Bangladesh Standard levels. Oxides of Nitrogen (NO_x) concentrations for all locations range from 15.7 to 87.5 $\mu\text{g}/\text{m}^3$. Suspended Particulate Matter (SPM) concentrations in five substation locations and the transmission line vary from 85.8 to 184.4 $\mu\text{g}/\text{m}^3$. Carbon Monoxide (CO) levels are generally below the Air Pollution (Control) Rules, 2022 standard, except for AQ17 (Manirampur 132/33 kV GIS Substation). Ozone (O₃) concentrations along the Kaliganj-Maheshpur line are below both IFC/WHO and Bangladesh Standard levels. Overall, while some parameters surpass international standards, the majority remain within acceptable limits, with vehicle emissions identified as a key contributing factor to elevated particulate matter levels.

4.2.4 Noise Level Monitoring Methods

- xii. According to Bangladesh Environmental Quality Standard ECR'23 categorizations, the current monitoring location falls into Mixed area (NL2, NL5, NL6, NL9-14, NL16, NL20-21, NL23-25 and NL27-28), Commercial area (NL4, NL7-8, NL15, NL18-19 and NL22), Silent zone (NL3), Industrial zone (NL17 and NL26) and Residential Area (NL1, NL29 and NL30). The daytime and nighttime noise levels at most of the locations are found within the national standards.

4.2.5 Physiographic Features

- The physiography of 5km buffer of Kaliganj- Maheshpur route and Five substations fall in Ganges River Floodplain.

4.2.6 Topography

- xiii. The average elevation of Kaliganj- Maheshpur alignment is 11.93- 18.92m. The average elevation of Five substations ranges from 0-16.

4.2.7 Geology

- xiv. As per the geological category map of Bangladesh, the majority of the 5 km buffer of Kaliganj- Maheshpur route falls under deltaic sand and deltaic silt category. Rupsha substation falls into Tidal Deltaic Deposits. The other four substations fall into Deltaic Silt category.

4.2.8 Soil

- xv. The general soil types of Kaliganj- Maheshpur route and Five substations (SS) fall into mixed highland and shallow flooded and deeply flooded phases.

4.2.9 Flood prone areas

- xvi. As per the flood category map, Kaliganj- Maheshpur alignments falls under low river flooding zone and partially in moderate tidal surge zone. Meherpur, Manirampur, and Maheshpur SS fall under low river flooding zone. Rupsha and Phultola substation fall under Moderate Tidal Surge and Not Flood Prone Zone respectively.

4.2.10 Cyclones

- xvii. As per the cyclone affected zone map, majority of the Kaliganj- Maheshpur route, Meherpur, Manirampur, and Maheshpur SS fall under no risk area. Rupsha and Phultola substation fall under the High Wind Area.

4.2.11 River Erosion

- xviii. As per the river erosion map, river erosion hazard is absent in majority of the Kaliganj- Maheshpur route and Five substation locations.

4.2.12 Agro-ecological zones of Bangladesh

- xix. Kaliganj- Maheshpur transmission line alignment, Meherpur, Manirampur, and Maheshpur falls in the High Ganges Floodplain zone. Rupsha and Phultola substation fall under Ganges Tidal Floodplain and Gopalganj- Khulna Beels respectively.

4.2.13 Seismic zones of Bangladesh

- xx. As per Bangladesh National Building Code (BNBC) seismic zoning map, Kaliganj- Maheshpur TL and five substations fall into Zone-1 having the coefficient of 0.12.

4.2.14 Land Use Interpretation of the Study Area

- xxi. The land use and cover analysis for the Kaliganj-Maheshpur transmission line and five substations reveal predominant categories within the 500 m buffer zones. For the transmission line, the primary land uses include agriculture land (47.61%) and settlement areas with homestead vegetation (42.25%). Similarly, the substations exhibit varying land use patterns. For example, the Rupsha 230/132/33 kV GIS Substation buffer comprises agriculture land (55.47%) and settlement areas (33.61%). Meherpur 132/33 kV GIS Substation is characterized by agriculture land (70.39%) and settlement areas (26.69%). Manirampur 132/33 kV GIS Substation has agriculture land (48.97%) and settlement areas (41.02%). Maheshpur 132/33 kV GIS Substation exhibits agriculture land (62.99%) and settlement areas (26.48%). Phultola 132/33 kV GIS Substation buffer includes agriculture land (65.31%) and settlement areas with homestead vegetation (26.69%). Throughout

the surveys, no settlements were identified beneath the proposed transmission line or substations, and these infrastructures are anticipated to pose no risks to seasonal habitats, wetlands, or birds in their respective locations.

4.3 Bio-Ecological Zones

- xxii. In 2002, the International Union for Conservation of Nature (IUCN) classified the country into 12 bio-ecological zones (25 sub-bio-ecological zones) according to factors such as fauna and flora, geographical characteristics, annual average rainfall, administrative regions, soil types, water level in Bangladesh.

4.3.1 Diversity of Floral and Faunal Species

- xxiii. As per EQMS Survey 2022, In Kaliganj- Maheshpur transmission line, the number of trees estimated in the 12 m clearing width of the line was 674 (>5 m in height). The number of trees in the clearing width which are less than 5 m in height was 478. Additionally, during the field visit and the survey, it was observed that, about 143 bamboo yard will be affected at different points of Kushtia-Meherpur transmission line. Different size of bamboo must be cleared in the ROW as it is considered the fastest growing species. No significant tree species were found in five substation locations.
- xxiv. No IUCN Red listed threatened species were recorded during site visit walkover. Major waterbodies covered in the alignments are rivers and gher. The proposed transmission line will not pose any risk to seasonal habitats/wetlands and birds.

4.3.2 Ecologically Critical Area (ECA)

- xxv. The nearest ECA from the Kaliganj- Maheshpur alignment is Marjat Baor which is 9.7 km away and 14 km away from Maheshpur Substation.

4.3.3 Protected Areas

- xxvi. The nearest protected areas that are situated in the North-East corner from Kaliganj- Maheshpur transmission line are: Silanda- Nagdemra Dolphin Sanctuary (88.8 km), Nagarbari- Mohonganj Dolphin Sanctuary (77.1 km) and Nazirgang Wildlife Sanctuary (60.9 km). The nearest protected area from Rupsha, Manirampur and Phultala substation is Pankhali Wildlife (Dolphin) Sanctuary (30.51, 48 and 31 km respectively).

4.3.4 Important Bird Areas

- xxvii. Bangladesh's Important Bird Areas (IBAs) cover less than 4% of the total land area of the country, reflecting the great reduction and fragmentation of natural habitats. However, additional sites are likely to be added to this preliminary list of IBAs in the future. Of the 20 IBAs in Bangladesh, 11 support globally threatened species, 10 have biome-restricted species and nine qualify as IBAs because they hold large congregations of water birds. Ten IBAs (53%) contain examples of terrestrial forest ecosystems, which together cover all significant areas of forest known to remain in Bangladesh. They include the Indo- Malayan tropical dry forests in Madhupur National Park (IBA 1) to the north of Dhaka, three IBAs in north-eastern Bangladesh where Indochinese tropical moist forest is the dominant biome, and six IBAs in the Chattogram hill tracts in the south-east of the country, where Indochinese tropical moist forest and Sino-Himalayan subtropical forest are the main habitats.

4.4 Socio- economic Information and Profile

The socio-economic assessment for the Kaliganj-Maheshpur transmission line and the associated substations reveals important details. The transmission line, spanning three upazilas (Kaliganj, Kotchandpur, and Maheshpur), comprises 76 approved towers over a length of 28 km. A social survey targeted 68 households, affecting 278 individuals, with an average household size slightly exceeding the national average. For each of the five substations (Rupsha, Meherpur, Manirampur, Maheshpur,

and Phultola), the socio-economic baseline is established using secondary data from the 2011 Population and Housing Census. This data covers administrative details, demographics, household characteristics, education, occupation, housing, employment opportunities, and access to water and sanitation. The information gathered will serve as a reference to assess potential socio-economic impacts and compare changes brought about by the project interventions.

5. IMPACT ASSESSMENT AND EVALUATION

- xxviii. This section evaluates additional potential impacts based on activities that will be involved in construction and operation phase of the one proposed transmission line: ; (i) Kaliganj-Maheshpur 132 kV double circuit transmission line (Package 3), and five substations (Package 7); (i) 230/132/33 kV GIS Substation at Rupsha, (ii) 132/33 kV GIS Substation Phultola, (iii) 132/33 kV GIS Substation Maheshpur, (iv) 132/33 kV GIS Substation Meherpur and (v) 132/33 kV GIS Substation Manirampur.
- xxix. Throughout the project stages (pre-construction, construction, and operation), various environmental and socio-economic factors have been assessed for both the Kaliganj-Maheshpur transmission line and the five associated substations. In the pre-construction stage, potential impacts on ambient air quality, noise, surface and groundwater quality, soil, land use, crop production, fisheries resources, and socio-economic aspects were considered. The construction stage brings concerns about air and noise quality, surface and groundwater, soil erosion, land use changes, crop production, fisheries, and socio-economic factors. The operation stage, while generally showing minimal adverse impacts on air and noise quality, surface and groundwater, land use, crop production, and fisheries, raises concerns about the potential impact on human health and safety due to electromagnetic fields. Throughout these stages, measures have been implemented to mitigate adverse effects, such as proper chance find procedures, compensation for crop damage, and employment opportunities. The overall assessment indicates a balance between adverse and beneficial impacts, with ongoing monitoring and mitigation strategies in place to address potential issues.

6. ENVIRONMENTAL MANAGEMENT PLAN

The environmental considerations for the Kaliganj-Maheshpur 132 kV double circuit transmission line project involve multiple aspects. In the pre-construction and construction stages, mitigation measures are outlined for tree cutting, occupational health and safety, pollution prevention, community health and safety, and gender-based violence risks. The proposed measures include compensatory tree plantation, safety plans, waste management, and emergency procedures. The implementation and supervision agencies responsible for overseeing these measures include the contractor, DSC, and PGCB. These efforts are aimed at addressing and minimizing the potential adverse impacts on the environment, community health, and worker safety associated with the transmission line project.

The construction and operation of five substations involve several environmental considerations and mitigation measures. These substations, situated on paddy fields and waterbodies, require measures such as proper land acquisition processes, topsoil preservation, and compensation for potential tree cutting and vegetation clearing. The project emphasizes the importance of a Construction Management Plan (CMP) to address wildlife disturbance, particularly during nighttime construction activities. Additionally, the mitigation measures include effective construction waste management, drainage control to prevent flooding, noise and air pollution reduction strategies, soil quality preservation, and careful siting of construction camps to minimize environmental impact on nearby settlements. Traffic management, waste disposal, community and occupational health and safety, and the protection of physical and cultural resources are essential aspects incorporated into the project plan. The ongoing operation stage focuses on tree replantation, drainage maintenance, community health and safety awareness, security measures, and reliable power supply, all under the supervision of PGCB to ensure the substations' responsible and sustainable impact.

6.1 Environmental Monitoring

- xxx. The Environmental Monitoring Plan for the Kaliganj-Maheshpur Transmission Line during Addendum 4 outlines comprehensive monitoring parameters, standards, and means for the pre-construction/construction and operation stages. The plan focuses on various environmental aspects, including land use, trimming of trees, ambient air and noise pollution, waste management, surface and groundwater quality, traffic congestion, cultural sites, occupational health and safety, community health and safety, tree replantation, electromagnetic field (EMF) clearance, and power supply reliability. Monitoring activities involve inspections, laboratory analyses, and regular assessments to ensure compliance with environmental standards and guidelines. The plan emphasizes the implementation and supervision by relevant agencies, such as the Department of Environment (DoE), Forest Department (FD), Bangladesh Road Traffic Authority (BRTA), and the project implementing agency PGCB, ensuring the ongoing environmental integrity and sustainability of the Kaliganj-Maheshpur Transmission Line project.
- xxxi. The Environmental Monitoring Plan for the five substation subprojects during Addendum 4 outlines a comprehensive strategy to address various environmental issues throughout the pre-construction/construction and operation stages. The plan focuses on monitoring parameters such as clearing of vegetation, wildlife disturbance, drainage congestion, noise and dust pollution, surface and groundwater quality, waste management, traffic congestion, occupational and community health and safety, as well as the protection of physical cultural resources. Inspection, sampling, laboratory analysis, and regular assessments are employed as means of monitoring, ensuring compliance with standards and guidelines set by the Department of Environment (DoE), Forest Department (FD), and other regulatory bodies. The implementation agency includes the contractor and FD, with supervision by the Dhaka Power Distribution Company (DSC) and the Power Grid Company of Bangladesh (PGCB). The plan aims to mitigate environmental impacts and safeguard the health, safety, and cultural integrity of the project sites, emphasizing ongoing monitoring and corrective actions as necessary.

6.2 Tree Plantation Plan

- xxxii. As per the original IEE, 2019, a significant number of big trees were estimated to be cleared in Kaliganj- Maheshpur transmission line, where no trees were felled during the land development of five substations. However, as per the primary survey during this addendum, the total number of trees to be cut was tentatively 16.

6.3 Budget For EMP

- xxxiii. Budget for EMP implementation for Kaliganj- Maheshpur TL and five substation is 269,940 BDT. and 510,000 BDT.

7. GRIEVANCE REDRESS MECHANISM

- xxxiv. A Grievance Redress Mechanism (GRM), consistent with the requirements of ADB's SPS 2009 has been established by PGCB to prevent and address community concerns, reduce risks, and assist the project to maximize environmental and social benefits. A three-tire GRM has been established to deal with and resolve complaints and grievances faster and thus enhance project performance standards in terms of environmental and social management. The detailed grievance mechanism and resolution procedure has been incorporated in the original IEE, 2019.

8. PUBLIC CONSULTATION AND DISCLOSURE

- xxxv. The public consultations were conducted in Kaliganj- Maheshpur TL and Maheshpur Substation in March 2023 and consultations for other four substation carried out in 2022 and 2023 through stakeholder consultations, and individual meetings during the environmental study of the proposed project.

8.1 Focus Group Discussions

- xxxvi. Focus group Discussion (FGD) is a small, but demographically diverse group of people whose reactions are studied about a proposed project or something else to determine the reactions that can be expected from a larger population. It is a form of qualitative study consisting of interviews in which groups of people are asked about their perceptions, opinions, beliefs, and attitudes towards the project, service, concept, advertisement, idea, or packaging. Questions are asked in an interactive group setting where participants are free to talk with other group members. During the study, eleven FGDs with various groups including women and affected people were conducted using local language (Bengali) for easy understanding of the opinions for both the transmission lines.

9. CONCLUSION AND RECOMMENDATIONS

- xxxvii. In five substation locations during the field surveys, it was observed that the locations have some deviations considering less impacts e.g., damage to community structures, tree cutting etc. to the substation locations. There are no settlements, structures, springs or deep wells/tubewell other common and individual properties situated underneath these locations. There are no protected areas, ecologically critical areas, reserve forests and other wildlife reserves are found within the RoW. There are no springs or deep wells/tubewell other common and individual properties situated underneath these locations. During the consultation and site visit of the consultants, it was revealed that there were no physical cultural resources situated within 10-15 km radius.
- xxxviii. A detailed birds survey/migratory birds survey for Kaliganj- Maheshpur alignments and five substation locations are suggested to be conducted in order to eliminate any potential threat to their route and staging.
- xxxix. In conclusion, there will be some minor negative impacts caused by the project during implementation. Compensation will be paid for the loss of land, trees, and crops. The impacts identified in the original IEE and this addendum can be mitigated with implementation of the EMP and monitoring measures.

1. INTRODUCTION

1. This report is addendum to the original IEE report¹ that was approved by ADB in July 2019. The addendum is only in respect of one line; Kaliganj-Maheshpur 132 kV double circuit transmission line (package 3) and five substations under Package 7 (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur). The report is based on the final alignment of the EPC Contractor and considers the risks and impacts in order to formalize the management plan. The original IEE depicted a detailed project description, baseline data, impact assessment and management plans and remains applicable for the project. As per PGCB, the construction activities (piling and soil tests) in the Kaliganj-Maheshpur 132 kV double circuit transmission line started in May 2023.

2. In order to prepare this addendum 4, EQMS performed desk-based study (which included data from literature reviews, maps, original IEE report and monitoring reports) supported by on-ground reconnaissance visits, surveys and consultations to establish an understanding of the environmental and socio-economic baseline. The identified impacts have been compared with the original routes as predicted in the original IEE and additional mitigation measures have been proposed along with the upgradation of the EMP in accordance with the requirements of ADB SPS 2009 for unanticipated environmental impacts. The additional risks and mitigation measures under this addendum Kaliganj-Maheshpur 132 kV double circuit transmission line (package 3) and Substations under Package 7 (Rupsha, Phultola, Manirampur, and Maheshpur). are described in this report.

1.1 Background

3. The Power Division, under the Ministry of Power, Energy and Mineral Resources (MPEMR) leads the power sector while the Bangladesh Energy Regulatory Commission (BERC) is the regulatory agency which regulates electricity, gas, and petroleum sectors. The electricity sector is unbundled into generation, transmission, and distribution segments. Backbone transmission lines and substation network in the country are operated by the Power Grid Company of Bangladesh Limited (PGCB). As of December 2018,² PGCB network comprised, transmission lines operated at 400 kV, 230 kV and 132 kV voltage levels with a total length of 11,396 circuit km and 125 132/33 kV substations with a cumulative capacity of 20,211 MVA. Development of transmission and distribution network in line with generation has been identified as a key element of the power sector strategy in the 'Bangladesh Seventh Five Year Plan FY2016 - FY2020'. Development of an inter-region transmission network is required due to the unbalance in concertation of generation and demand, while local network expansions are required to cater to the increasing demand at new load centers. Due to the growing electricity demand, a considerable number of grid substations and transmission lines have already been overloaded. Therefore, urgent upgrades and expansions are required by PGCB to supply power to the key economic corridors in the southern and western regions including greater Dhaka area.

4. The Dhaka and Western Zone Transmission Grid Expansion Project (DWZTGEP) focuses on expanding the local transmission network to deliver electricity to new and expanding load centers while meeting the network operating criteria. PGCB has appointed EQMS Consulting Limited for Conducting Social Value Assessment Surveys, Preparation, Upgradation, and Implementation of Resettlement Action Plans and Environmental and Social Safeguard Supervision and Monitoring for the Proposed Grid Substations and Transmission Lines.

5. The concept paper for the project was approved by ADB on 6 March 2019, comprising three main investment components. The loan was made effective on 16 July 2020.

¹<https://www.adb.org/projects/documents/ban-51137-003-iee>.

²Power Grid Company of Bangladesh Ltd. PGCB at a glance.

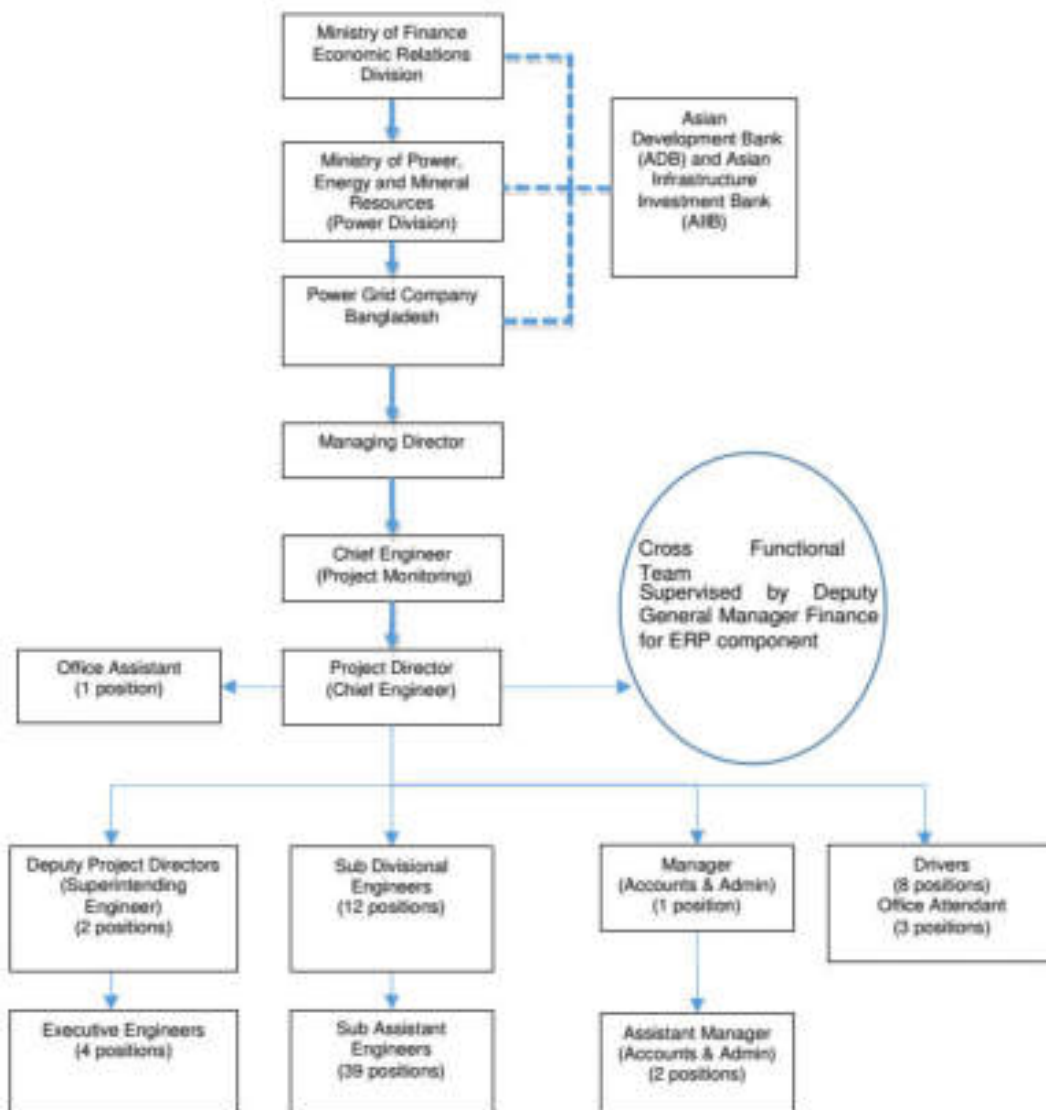
Component 1: Transmission system in Greater Dhaka expanded. The project will construct and commission substations with a total capacity of 4,450 MVA and 40 km of transmission lines in Greater Dhaka.

Component 2: Transmission system in Western Zone expanded. The project will construct and commission substations with a total capacity of 3,070 MVA and 368 km of transmission lines in western zone.

Component 3: Institutional Capacity of PGCB strengthened. The project will enhance capacity by (a) supporting installation and operation of an enterprise resource planning (ERP) system to assist PGCB in optimally managing its capital-intensive assets; (b) establishing a Drone Inspection Center within the operation and maintenance department of PGCB with some gender equality element.

6. On behalf of the government, overall coordination of the project will be managed by MPEMR. PGCB will be the Executing Agency (EA) for Component 1, 2 and 3. The project preparation, implementation, monitoring, and reporting to ADB and the government will be handled by the Project Management Unit (PMU) established by PGCB. EPC Contractors with separate environmental officer and Health & Safety Officer for each package will implement Environment Management Plan (EMP). Designated PMU engineers will be trained and supervised by the PGCB safeguards unit to work together with contractors for EMP implementation. Figure 1-1 shows the institutional framework for DWZTGEP.

Figure 1-1: Institutional Framework for Dhaka and Western Zone Transmission Grid Expansion Project



Source: PGCB.

Note: ERP component implementation will be supervised by a deputy general manager (project finance) with support from PGCB's Cross Functional Team which comprises 7 members.

ADB = Asian Development Bank, AIIB = Asian Infrastructure Investment Bank, ERP = Enterprise Resources Planning, PGCB = Power Grid Company of Bangladesh Limited., P&D = planning and design.

1.2 Objectives of the Initial Environmental Examination

7. The implementation of the project could have both negative and positive impacts on the surrounding environment, depending on environmental sensitivities and the design of responsive mitigation measures. Environmental impacts include physical, ecological and socio-economic impacts. This project is categorized as an Environmental B project, based on the rapid environmental assessment and the ADB's Safeguard Policy Statement (SPS) 2009. For Category B projects, the environmental impacts are site-specific, few if any of them are irreversible. An Initial Environmental Examination (IEE) is required to address the anticipated impacts and to suggest appropriate mitigation

measures in the Environmental Management Plan (EMP). This IEE report was prepared following the requirements of the ADB's SPS 2009. PGCB will ensure that safeguard plans in IEE/EMP are updated if any changes are identified in detailed engineering designs and changes in project scope.

1.3 Scope of Work

8. This IEE requires identification of potential environmental issues associated with the project and appropriate mitigation measures to minimize the environmental impacts. The broad scope of the IEE is:

- i. To conduct field visits to collect data relevant to the study area and also collect secondary data so as to establish the baseline environmental status of the study area;
- ii. To assess the impacts on environmental attributes due to the location, design, construction and operation of the proposed project;
- iii. To identify critical environmental parameters required to be monitored subsequent to the implementation of the proposed project;
- iv. To carry out consultation with local people to identify public perception regarding the project;
- v. To prepare an EMP and an Environment Monitoring Plan (EMoP) including cost estimates for PGCB to comply with during the project implementation; and
- vi. To prepare an IEE report in accordance with the ADB's SPS 2009 and the national regulations of the government.

9. The DWZTGEP subprojects are located in five administrative divisions and twenty districts of Bangladesh; one in Rajshahi division (Naogaon), six in Dhaka division (Dhaka, Narayanganj, Gopalganj, Madaripur, Gazipur and Faridpur), seven in Khulna division (Jhenaidah, Bagerhat, Kushtia, Meherpur, Jessore, Satkhira, and Khulna), three in Barishal division (Bhola, Jhalokathi, and Pirojpur), and three districts in Rangpur division (Dinajpur, Lalmonirhat and Nilphamari) (Figure 1-2).

1.4 Methodology

10. The IEE is usually used to estimate the potential environmental impacts of a proposed project, based on available preliminary information and information readily acquired through rapid environmental surveys. This study has been conducted in accordance with the ADB's SPS 2009 and other relevant national/international laws and treaties applicable to the proposed project.

11. The field survey team used a combination of desk studies, field investigations, census data, structured interviews, focus group discussions (FGDs), google maps, and reports to generate the data required to describe the existing environment and assess the potential impacts due to the construction and operation of the project. Local knowledge about the ecosystem and problems associated with the project activities were carefully recorded through public consultations and used in the impact assessment and to develop the mitigation plan. Formal public consultations, as well as informal ones, involving local villagers and Affected Persons (APs) were carried out from January 2022 to January 2024.

1.4.1 Secondary Data Collection

12. The review of secondary sources and informal initial field investigations were undertaken to prepare a preliminary assessment of the physical and social environment, biodiversity, and conservation significance of the identified project area. The preliminary literature reviews also assisted in identifying data gaps which could be addressed with collection of additional primary information through field surveys.

13. Relevant data/information was collected from various government and non-governmental organizations, especially related to site aspects, climate (weather), topography, geology, waterbodies, surface/groundwater quality, ecology/biology, socioeconomics, and other aspects. Previous environmental site studies, where available, were reviewed, as well as relevant articles and web sites.

1.4.2 Primary Data Collection

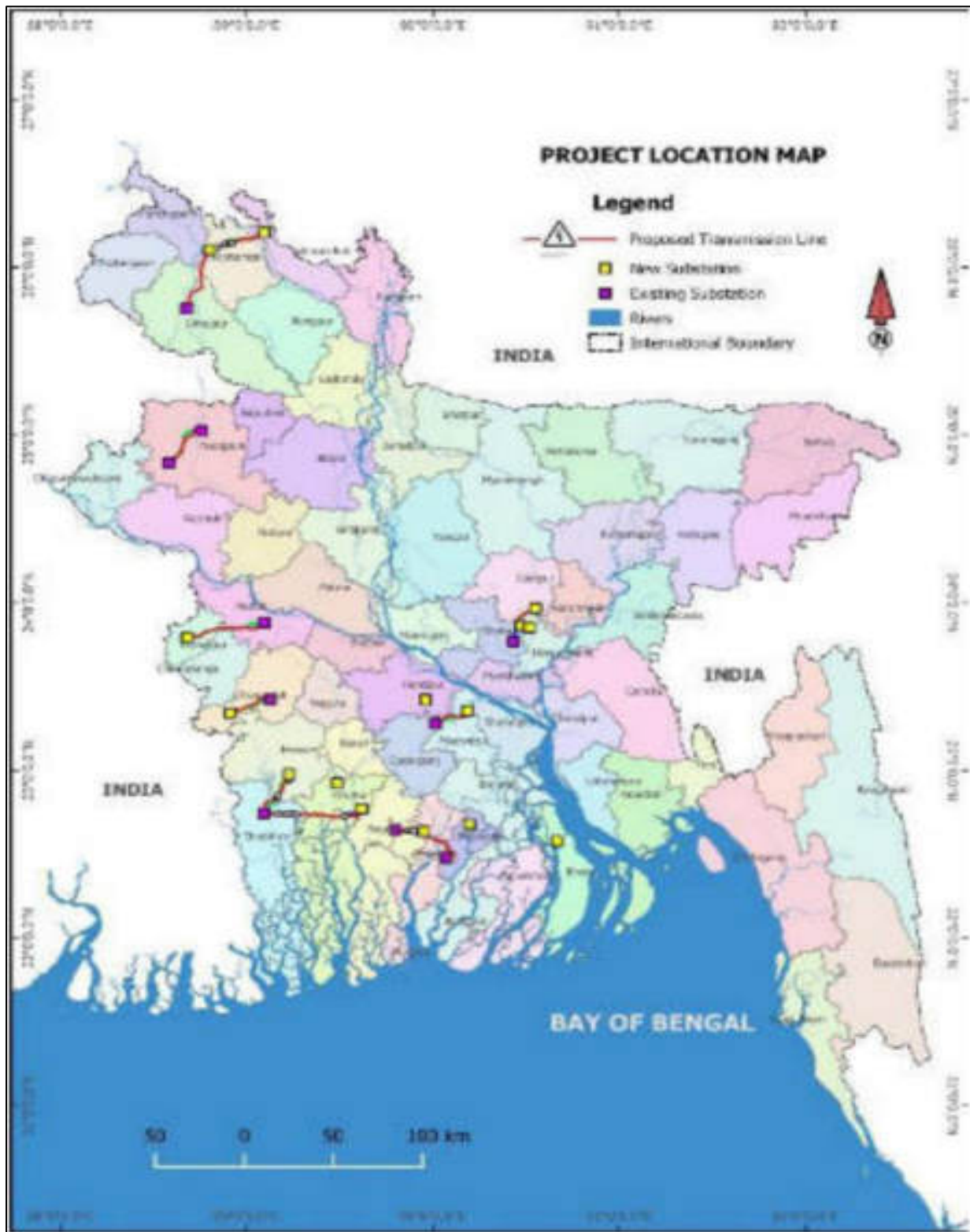
14. Primary data/information included data collected during the field surveys and observations, and discussions with stakeholders, such as community representatives and APs at key project locations and in the project influence area. The main purpose of this approach was to obtain a clear impression on the people's perceptions of the project and its environmental impacts and possible mitigation measures.

15. The primary data on environmental and socioeconomic aspects of the project area were collected from March to November 2023 by the safeguards survey team to comprehensively evaluate the existing project area environmental baseline conditions.

16. Status of flora and fauna within the project area was determined by reviewing the literature relevant to the area, as well as observations and surveys at the project sites. Tree counting at the project sites within the RoW was also carried out by the safeguard survey team. Identification of tree species in different habitats, such as home gardens, plantations, and agricultural lands, and assessment of stage of growth (whether mature tree or sapling) were also carried out.

17. A discussion with PGCB officials revealed that trees or saplings below five meters in height will not be cleared within the RoW. Trees taller than five meters in height and within 12 meters from the centre of the RoW will be cleared to make space for the tower footings and conductors. Tree branches outside 12 meters of the RoW will be cut at a 45° angle to the tower. Cutting branches that grow horizontally towards the conductors and towers will be carried out every three months to prevent the in-growth. The value of the trees was determined according to the information provided by the Bangladesh Forest Department and Department of Agriculture

Figure 1-2: Diagrammatic Representation of the Proposed Subprojects in Dhaka and Western Zone Transmission Grid Expansion Project



2. ADMINISTRATIVE AND LEGAL FRAMEWORK

18. This chapter provides legal and regulatory framework, covering national requirements as well as guidelines and standards to address environmental and social risks of any proposed project and its associated components and to protect and conserve the environment from any adverse impacts. The intent of this chapter is to discuss the regulatory context, which is directly related to environmental compliance, which must be adhered to by all parties involved in the project throughout the planning, construction, and operation.

19. Several new policies and guidelines have been introduced since the original IEE was produced and taken into account this addendum for assessment. The newly introduced policies/laws/guidelines are: National Environment Policy, 2018, EIA Guidelines for Industry, 2021, Hazardous Waste (e-waste) Management Rules, 2021, Solid Waste Management Regulations 2021 and Grid Code, 2019.

2.1 Environment related policies in Bangladesh

Table 2-1: Related policies in Bangladesh

Policies	Description/ Applicability of Acts
National Environment Policy, 2018	- Ensuring sustainable development through reducing human pressure on nature and natural resources. - Considering environmental protection as an integral part of the development programs planned to meet the need of the present and future generations. - Making natural resources extraction, use, environmental conservation, etc. to be based on science. - Considering environmental impacts and risks in extracting and using natural resources. - Evaluating the economic contribution of ecosystem services simultaneously to that of natural resources. - Giving priority to poor and underprivileged groups of people to ensure their participation, equity, justice, accessibility to the use of natural resources, and getting ecosystem services on which, they are dependent. - Taking initiatives to prevent misuse and ensure optimum water, land, natural gas, and other natural resources in the production process as well as day-to-day purposes. - Encouraging sustainable use of new and renewable resources. - Enhancing long-term poverty alleviation and food security through conserving biological diversity. - Realizing compensation from persons and institutes those who are liable to environmental pollution through applying polluter pay principle. - Including environmental conservation and preservation in all national policies and ensuring implementation of the environment policy at both government and nongovernment levels. - Giving priority to preventive measures over curative measures in environmental conservation. - Including adaptation and mitigation programs in all development projects to address adverse impacts of climate change. - Ensure sustainable utilization of ecosystem goods and services. - Implementation of the 3R principle in the utilization of resources.

Policies	Description/ Applicability of Acts
	- Strengthening the institutional and legal capacity of the institution (Government, local, private, and technical) relevant to the enforcing and implementation of rules and regulations relating to environmental policy and environment conservation. - Ensuring considerations of climate change and challenges of calamities in all kinds of infrastructure projects. - Reducing all SLCP (Short-Lived climate pollutants) that are harmful to health and the environment. - Taking development programs considering sustainable production and consumption as an integral part of environmental conservation to meet the need of present and future generations. - Allocating necessary funds to all areas of environmental conservation, preservation, and control. - Taking up programs in favor of a flourishing environment-friendly economy
National Environment Management Action Plan, 1995	- Identification of key environmental issues affecting Bangladesh; - Identification of actions necessary to halt or reduce the rate of environmental degradation; - Improvement of the natural environment; - Conservation of habitats and biodiversity; - Promotion of sustainable development; and - Improvement of the quality of life of the people.
The National Biodiversity Strategy and Action Plan, 2004	- Conserve and restore the biodiversity of the country for the wellbeing of the present and future generations; - Ensure that long-term food, water, health, and nutritional securities of the people are met through conservation of biological diversity; - Maintain and improve environmental stability of 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; and - Stop introduction of invasive alien species, genetically modified organisms, and living modified organisms.
Environment and Social Related Legislations in Bangladesh	
The Environment Conservation Act, 1995 and Subsequent Amendments	- Declaration of Ecologically Critical Areas (ECAs); - Obtaining an Environmental Clearance Certificate (ECC); - Regulation with respect to vehicles emitting smoke harmful to the environment; - Regulation of development activities from an environmental perspective; - Promulgation of standards for quality of air, water, noise, and soils in different areas and for different purposes; - Promulgation of acceptable limits for discharging and emitting waste; and - Formulation of environmental guidelines relating to control and mitigation of environmental pollution, conservation, and improvement of the environment.

Policies	Description/ Applicability of Acts
The Environment Conservation Rules, 2023	• The NEQS 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 ECC; • Requirements for undertaking IEE and EIA's 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.
Noise Pollution (Control) Rules, 2006	• According to the Rules, motor honking within a 100-meter radius of a hospital, school, and office is prohibited. • The rules also do not allow the use of brick crushers and cement mixers within a 500-meter radius of a residential area. Besides, prior permission is mandatory for using loudspeakers or megaphones. • The rules stipulate safety and precautionary measures in workplaces, designated authorities for allowing noise-generating appliances.
EIA Guidelines for Industry, 2021	The EIA Guidelines for Industry, 2021, introduced by the Department of Environment, Bangladesh, is the only guideline for conducting an Environmental Impact Assessment in Bangladesh. It is not only for industries but also for all types of development works.
Air Pollution (Control) Rules 2022	The Rules are regarded as subordinate regulations of the Bangladesh Environment Conservation Act, 1995 and its main provisions are as follows. • The Rules stipulate environmental air quality standards (general standards), emission standards for vehicles, emission standards applicable to industries or projects, and odor standards • After the promulgation of the Rules, the Department of Environment (DoE) shall prepare a National Air Quality Management Plan that includes an organizational working framework and efficient management of indoor air quality. When preparing the National Air Quality Management Plan, the standards and methods specified in the Rules shall be followed. • The DoE shall prepare and publish a list of industries, projects, and activities that are harmful to the environment and human health. For the industries and activities included in the list, the DoE shall establish emission standards and conditions for management as appropriate. • In order to control air pollution from motor vehicles, the regulatory authority for motor vehicles (http://www.brta.gov.bd/) shall comply with the standards and control methods specified in the Rules and follow the work procedures recommended in the National Air Quality Management Plan. • The DoE may inspect the emissions of motor vehicles and restrict the movement of old motor vehicles that give off emissions exceeding the standards. The DoE may also regulate and prohibit certain engines in order to enforce the standards and control methods specified in the Rules. • Local government organizations, construction management authorities, and other relevant organizations shall comply with the standards and

Policies	Description/ Applicability of Acts
	control methods specified in the Rules and follow the work procedures recommended in the National Air Quality Management Plan. The Rules also provide for the prevention of air pollution from hazardous waste, excessive emissions of air pollutants, air quality monitoring and warning, data management, establishment of a national executive committee for air pollution control, measures to prevent damage to ecosystems caused by air pollution, awards for contributions to air pollution control, and penalties for violations.

Table 2-2: Relevant National Environmental Regulations

Regulation	Brief Description	Remarks
Environment Court Act 2000 (amended in 2002 and 2010)	This Act is under the Judiciary and MoEFCC to ensure the resolution of disputes on environmental and social damages resulting from any development activities. This Act also allows for the completion of environment-related legal proceedings effectively	PGCB will ensure that all potential environmental complaints will be dealt with effectively at the project level through the PMU. SPS 2009 requires setting up of a grievance redress mechanism for projects known to cause potential environmental impacts
Bangladesh Water Act 2013	Makes provisions for integrated development, management, abstraction, distribution, use, protection, and conservation of water resources	Transmission line will cross rivers: Kapotaksha river, Betna river, Buri Bhadra River, Harihar river, Kumar River, Arialkha river and PGCB will ensure compliance with this Act.
Vehicle Act 1927, the Motor Vehicles Ordinance 1983	These are under the Bangladesh Road Transport Authority (BRTA) which regulates vehicular emissions and noise including road safety.	This regulation will be complied with by vehicles that may be used during the construction and operation of Transmission line.
Factories Act 1965 and Bangladesh Labour 2006, Bangladesh Labor Act 2013	Regulations that aim to protect the interests and rights of the workers and to ensure their safety.	Workers recruited under Transmission line will be provided with PPE (if needed) and will comply with these regulations. No worker under 18 years old will be recruited
The Forest Act 1927 (amended in 1982 and 1989)	This Act under the MoEFCC aims to protect forest resources.	Transmission line will not traverse protected forest areas or other forest types.
Telegraph Act 1885	Under the Ministry of Posts and Telecommunications, this provides power to the Telegraph Authority to alter the position of gas or water pipes or drain (Sect. 14; a and b).	The route for Transmission line was selected considering this Act.

Regulation	Brief Description	Remarks
Electricity Act 2018	Relates to the supply and use of electrical energy, allows any person to secure a license to supply energy and to put down or place electrical supply lines for the transmission of energy. The Act provides that the licensee, in the exercise of any of the powers conferred by or under this Act, will cause as little damage, detriment, and inconvenience as may be, and will make full compensation for any damage, detriment or inconvenience caused by the licensee or by anyone employed by the licensee.	Transmission line referred to the applicable provisions in this Act.
The Antiquities Act 1968 (amended 1976)	Regulation on the preservation and protection of antiquities.	Not Applicable
Natural Water Bodies Protection Act 2000	According to this Act, the character of water bodies i.e., rivers, canals, tanks, or floodplains identified as water bodies in the master plans or in the master plans formulated under the laws establishing the municipalities in division and district towns shall not be changed without approval of the concerned ministry. This Act is under the Rajdhani Unnayan Kartipakkha/Town Development Authority/Municipalities.	Any part of Transmission line that will cross rivers, ponds, canals, and drainage channels will refer to this Act and will secure the required approval and clearances.
Wildlife (Protection and Safety) Act 2012	Provides for the conservation and safety of biodiversity, forest, and wildlife of the country by repealing the existing law relating to the conservation and management of wildlife of Bangladesh. Under this Act, hunting, trapping, the killing of wildlife is strictly prohibited.	Transmission line will not affect areas of habitats known to host wildlife. The route is along with urban areas.
National River Protection Act 2013	Creation of National River Protection Commission to manage and control water and environmental pollution, etc., and ensure socio-economic development of a multi-use and rational use of natural resources	Transmission line will ensure compliance with relevant provisions of this Act
The Protection and Conservation of Fish Act 1950 (amended 1973, 1982, 1995, 2002)	Provides for the requirements for the protection and conservation of fish. This Act defines fish as “all cartilaginous, bony fishes, prawn, shrimp, amphibians, tortoise, turtles, crustacean animals, mollusks, echinoderms and frogs at all stages in their life history.”	Transmission lines will cross Kapotaksha river, Betna river, Buri Bhadra River, Harihar river, Kumar River, Arialkha river and will ensure that no protected fish species under this Act will be destroyed or affected. Any potential impact will be mitigated.
Acquisition and Requisition of	The 2017 Act requires that compensation be paid for (i) land and assets permanently	-

Regulation	Brief Description	Remarks
Immovable property Act, 2017	acquired (including houses, trees, and standing crops,); and (ii) any other impacts caused by such acquisition.	
Environment Conservation Rules 2023	has promulgated the Environment Conservation Rules 2023 under the ECA 1995 to evaluate, review the Environmental Impact Assessment (EIA) of various projects and activities, and procedures are established for approval.	Transmission line will comply with this rule. There is no category for substation
Grid Code 2019	The Grid Code specifies criteria, guidelines, basic rules, procedures, responsibilities, standards, and obligations for the operation, maintenance, and development of the Electricity Transmission System of Bangladesh to ensure transparent, non-discriminatory, and economic access and use of the Grid, whilst maintaining a safe, reliable and efficient operation of the same to provide a quality and secure electricity supply as reasonably as practicable.	Transmission line will ensure the compliance of this grid code.
Hazardous Waste (e-waste) Management Rules, 2021	On June 10, 2021, Bangladesh's Department of Environment (DOE) published the Hazardous Waste (e-waste) Management Rules, 2021 under the Bangladesh Environmental Protection Act, 1995. The E-waste rule covers the products listed in the Schedule (home appliances, monitoring and control equipment, medical equipment, automatic machines, IT and communication equipment), and establishes obligations for manufacturers, assemblers, collectors, sellers, and consumers of the products. The rule also sets provisions to limit the use of the 10 substances covered by the EU RoHS Directive. This regulation entered in force upon publication. The main provisions of this regulation are as follows. - Manufacturers, traders, sellers, transporters, repairers, collection centers, recyclers, dismantlers, etc. of the subject products are required to register with a prescribed form to the DOE. When applying for registration, they shall also submit the Waste Electrical and Electronic Equipment (WEEE) management plan. - Registered manufacturers, recyclers, etc. shall obtain environmental clearance in accordance with the Bangladesh Environmental Protection Rules, 2023.	Transmission line will ensure compliance with relevant provisions of this rules.

Regulation	Brief Description	Remarks
	- Manufacturers have to establish individual or joint collection centers and set aside funds for the management of the Waste Electrical and Electronic Equipment (WEEE). - For fluorescent lamps and mercury incandescent lamps, if they cannot be recycled, they need to be handed over to collection centers for storage and disposal. - Manufacturers, importers, etc. shall meet the collection targets for the Waste Electrical and Electronic Equipment (WEEE) as specified in the Schedule (10% in the first year of the implementation, 20% in the second year, 30% in the third year, 40% in the 4th year, and 50% in the fifth year and thereafter). - In order to facilitate the proper management of the Waste Electrical and Electronic Equipment (WEEE), the name, address and contact information of the trader or seller as well as the information on the registered collection center shall be displayed on the product or on the product label, or this information shall be provided to consumers or large consumers. - Traders, sellers and collectors of the Waste Electrical and Electronic Equipment (WEEE) shall receive them from consumers at designated points and transport them to collection centers.	
Solid Waste Management Regulations 2021	The Solid Waste Management Regulations 2021 were published in Bangladesh on December 23, 2021, under the Bangladesh Environmental Protection Act, 1995. The Regulations define the responsibilities of businesses involved in solid waste management and impose collection, recycling, and disposal obligations according to Extended Producer Responsibility (EPR) on manufacturers of non-biodegradable products such as glass, plastic, and bottles. The Regulations also include provisions for the treatment of solid waste such as composting and energy recovery. The main provisions of the Regulations are as follows. When recovering resources from waste, the principles of management that consider the	Transmission line will ensure compliance with relevant provisions of this regulations.

Regulation	Brief Description	Remarks
	waste hierarchy, such as the 3Rs, segregation, and reduction, must be followed at all stages from waste generation to final disposal. • Responsibilities of waste generators, consumers, and users: — Dispose of waste in accordance with the regulations of authorities including local government. — Dispose of waste separately. — Do not dump, store, or burn waste outdoors. • Responsibilities of manufacturers and importers of products — Collect non-biodegradable products such as glass, plastic, polyethylene, multi-layered packaging, bottles, and cans from consumers and recycle or dispose of them if appropriate. — Determine work plans and implementation procedures for recycling and disposal. — Ensure that EPR is properly implemented. — Submit an annual report to the Department of Environment (DOE) on the amount of plastic recycled. — Raise public awareness of proper waste management.	

3. PROJECT DESCRIPTION

20. This addendum is only in respect of one transmission line; (i) Kaliganj-Maheshpur 132 kV double circuit transmission line (Package 3), and five substations (Package 7); (i) 230/132/33 kV GIS Substation at Rupsha, (ii) 132/33 kV GIS Substation Phultola, (iii) 132/33 kV GIS Substation Maheshpur, (iv) 132/33 kV GIS Substation Meherpur and (v) 132/33 kV GIS Substation Manirampur.

21. Kaliganj-Maheshpur was finalized during original IEE (ref: Table 6.1 of the original IEE, <https://www.adb.org/projects/documents/ban-51137-003-iee>). The final alignments were done considering less impacts e.g., damage to community structures, tree cutting etc. and avoided all types of settlements beneath the RoW from start to end. Lesser number of trees to be cut for final alignments than the original routes (see Table 5-2). The summary and comparisons of both the final routes and original routes are given in Table 3-1.

Table 3-1: The summary and comparisons of Final and Original Alignments

Subproject	Final Alignment				Original Routes
	Size/Length	Upazilla	District	Division	Size/Length
Kaliganj-Maheshpur 132 kV double circuit transmission line	28 km; 17 angle towers and 74 are suspension towers	Kaliganj Kotchandpur Maheshpur	Jhenaidah	Khulna	28 km; 14 angle towers and 72 are suspension towers
Rupsha 230/132 kV, 3x 250/350 MVA and 132/33 kV, 3x 80/120 MVA indoor GIS substation	5.35 acres, Lat: 22.77076, Lon: 89.61685; 4.045m land filling	Fakirhat	Bagerhat	Khulna	Land filling, 1.5-3 m (1 acre waterbody)
Meherpur 132/33 kV GIS Substation	3 acres, Lat: 23.79119 Lon: 88.6796798; 2.424m land filling	Meherpur Sadar	Meherpur	Khulna	Land filling, 1-1.5m, Sensitive receptors (houses, markets, mosques) in 500 m radius
Manirampur 132/33 kV indoor GIS substation	3 acres, Lat: 22.97617 Lon: 89.22928; 2.611m land filling	Manirampur	Jashore	Khulna	Land filling, 1-1.5 m
Maheshpur 132/33 kV indoor GIS substation	3.03 acres, Lat: 23.344773, Lon: 88.924450;	Maheshpur	Jhenaidah	Khulna	Land filling, 1.5 -2 m, Sensitive receptors (houses, markets, mosques) in 500 m radius, tube well to be relocated
Phultala 132/33 kV indoor GIS substation	2 acres Lat: 22.92388, Lon: 89.48595; 4m land filling	Phultola	Khulna	Khulna	Land filling, 1-3 m, (2 acres waterbody)

3.1 Site Details

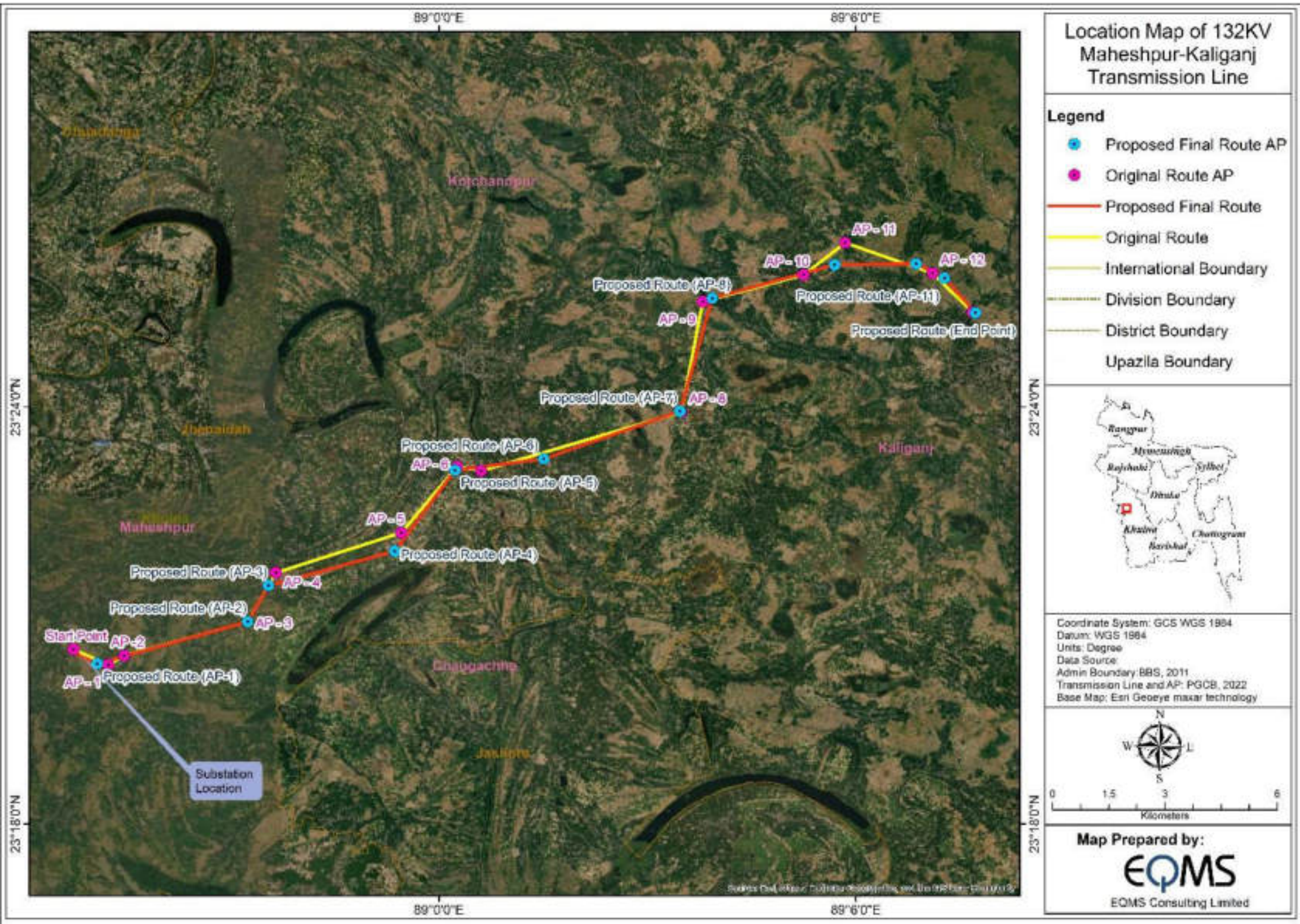
3.1.1 Location of the Project Site

22. This addendum is only in respect of one line and five substations; (i) Kaliganj-Maheshpur 132 kV double circuit transmission line (Package 3), and five substations (Package 7); (i) 230/132/33 kV GIS Substation at Rupsha, (ii) 132/33 kV GIS Substation Meherpur, (iii) 132/33 kV GIS Substation Manirampur, (iv) 132/33 kV GIS Substation Maheshpur and (v) 132/33 kV GIS Substation Phultola. These alignments and substations comprise of two administrative divisions and five districts of Bangladesh: one TL (Transmission Line) and five substations located in Khulna division (Kaliganj-Maheshpur TL, Rupsha, Phultola, Maheshpur, Meherpur and Manirampur). As per the Table 3.1 of the original IEE, <https://www.adb.org/projects/documents/ban-51137-003-iee>, and current site visits, the Kaliganj- Maheshpur 132 kV alignment covers Kaliganj, Kotchandpur and Maheshpur Upazilla under Jhenaidah districts. Rupsha, Phultola, Maheshpur, Meherpur and Manirampur substations covers under Khulna, Jessore, Kushtia and Jhenaidah districts. The final alignments have deviated minimally from the original IEE. As per the EMP requirement, PGCB avoids housing or school structures directly underneath the line. As per the confirmation from PGCB and on ground site visits, there are no housing or school structures directly underneath these final routes of the contractor. The major waterbodies covered in the final routes are rivers and Gher, however, the transmission line will not pose any risk to these wetlands as well as seasonal habitats of wildlife and birds.

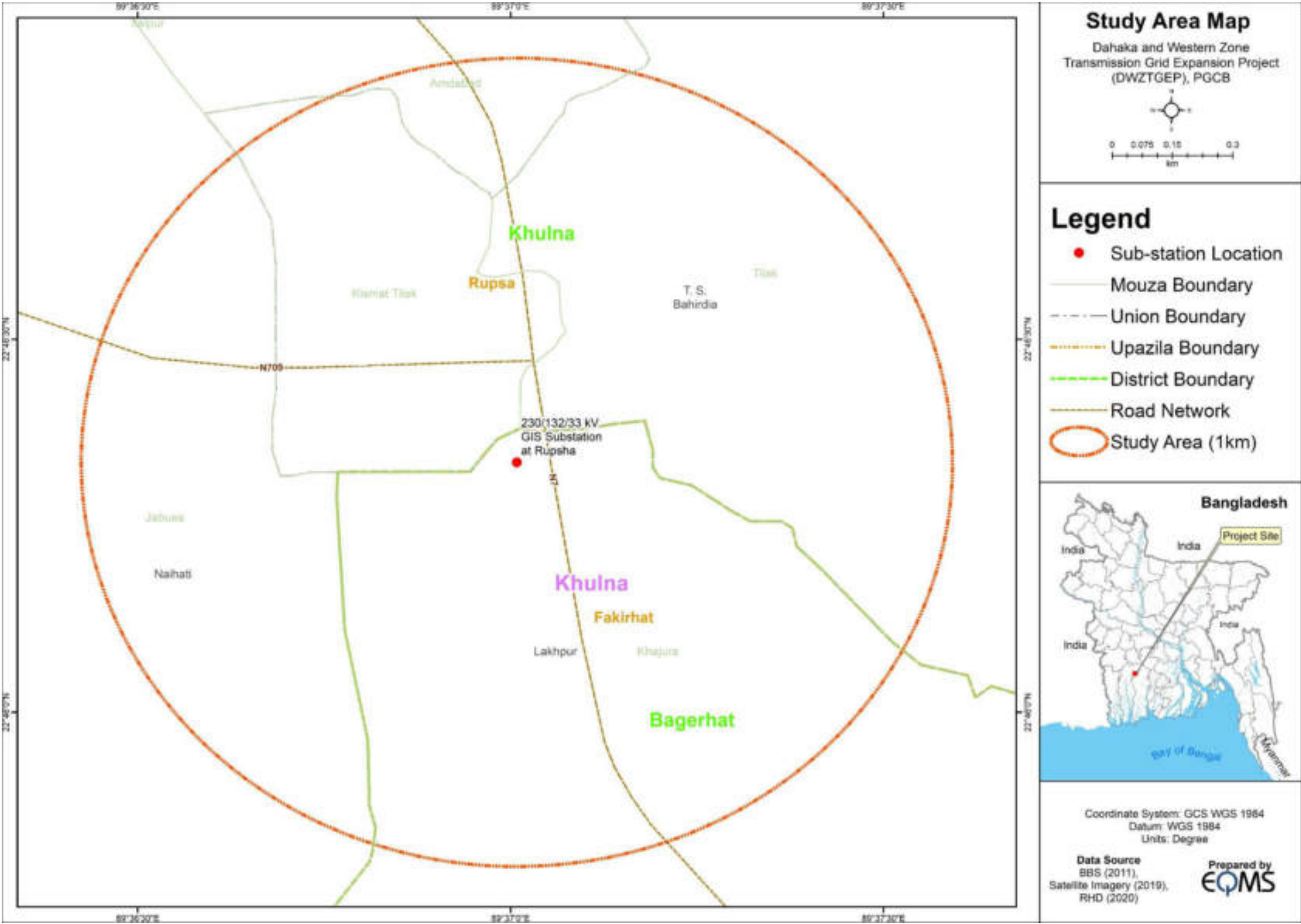
23. In all five substation locations were similarly merged to the original IEE and there were no housing or school structures, water bodies, archeological site found near all five substation locations.

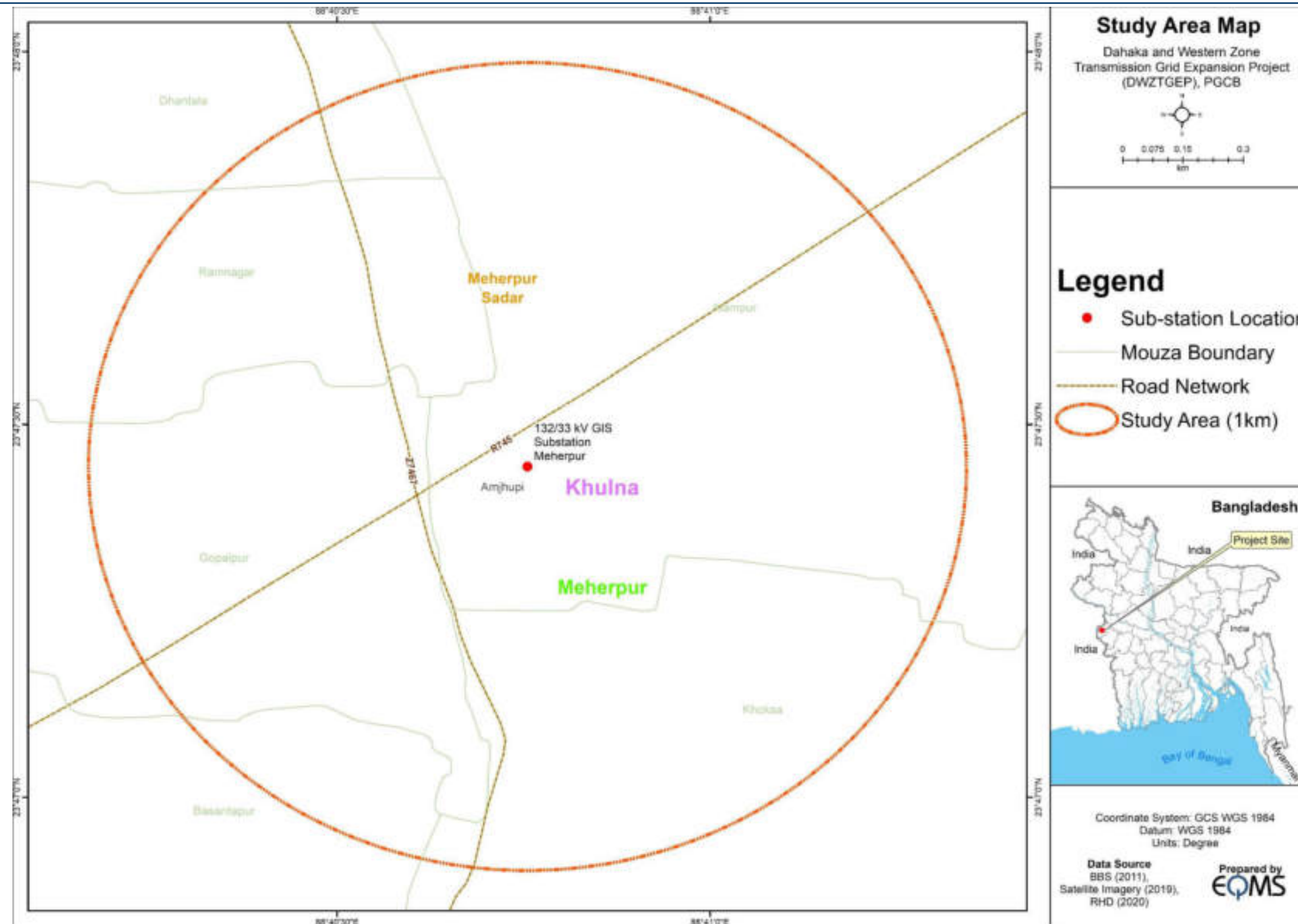
24. The coordinates of the final alignments and elevation of Kaliganj and Maheshpur TL (Transmission Line) details are given in **Annex A**.

Figure 3-1: Proposed Route of the Transmission Lines and Five Substation Locations

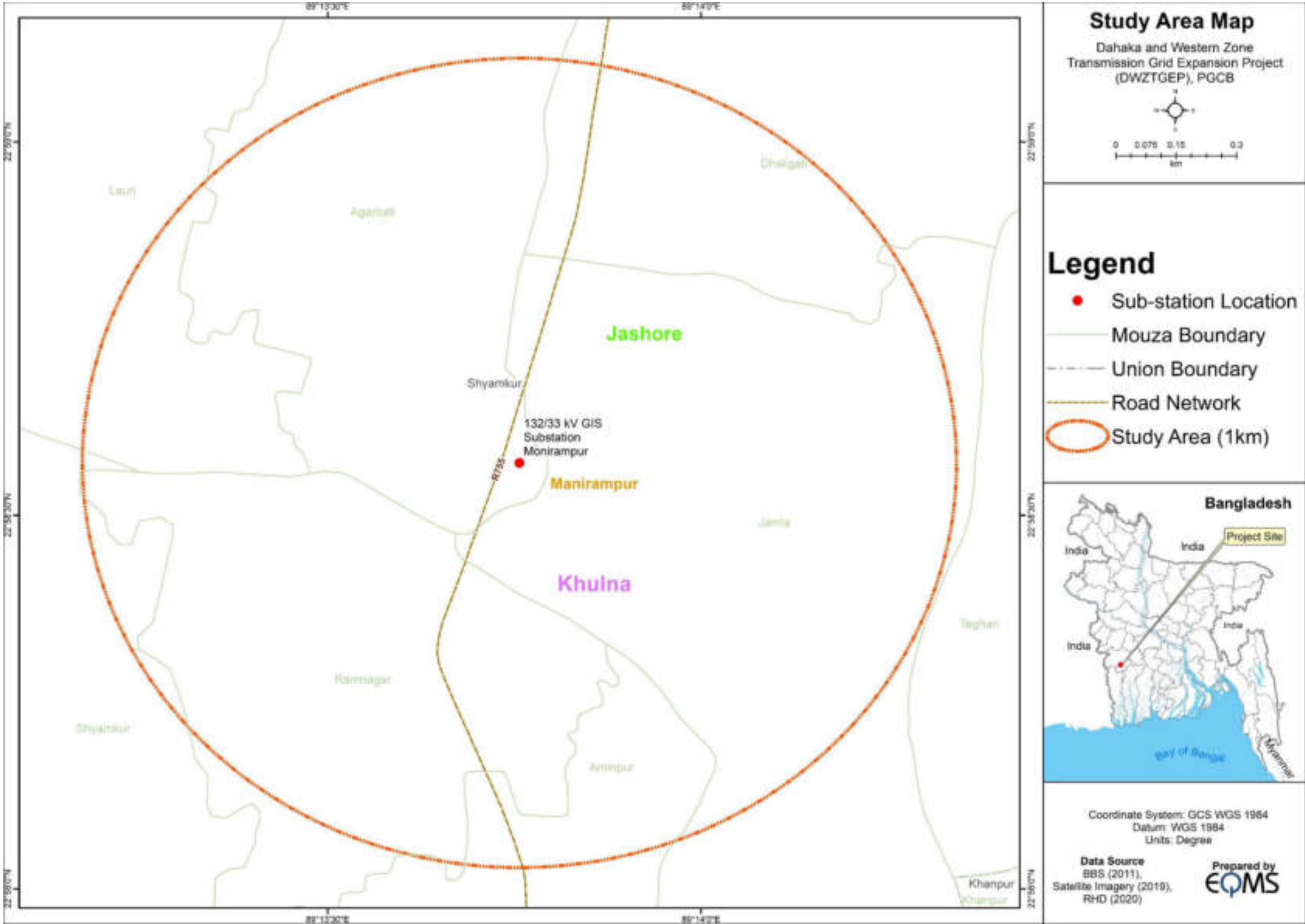


Kaliganj- Maheshpur

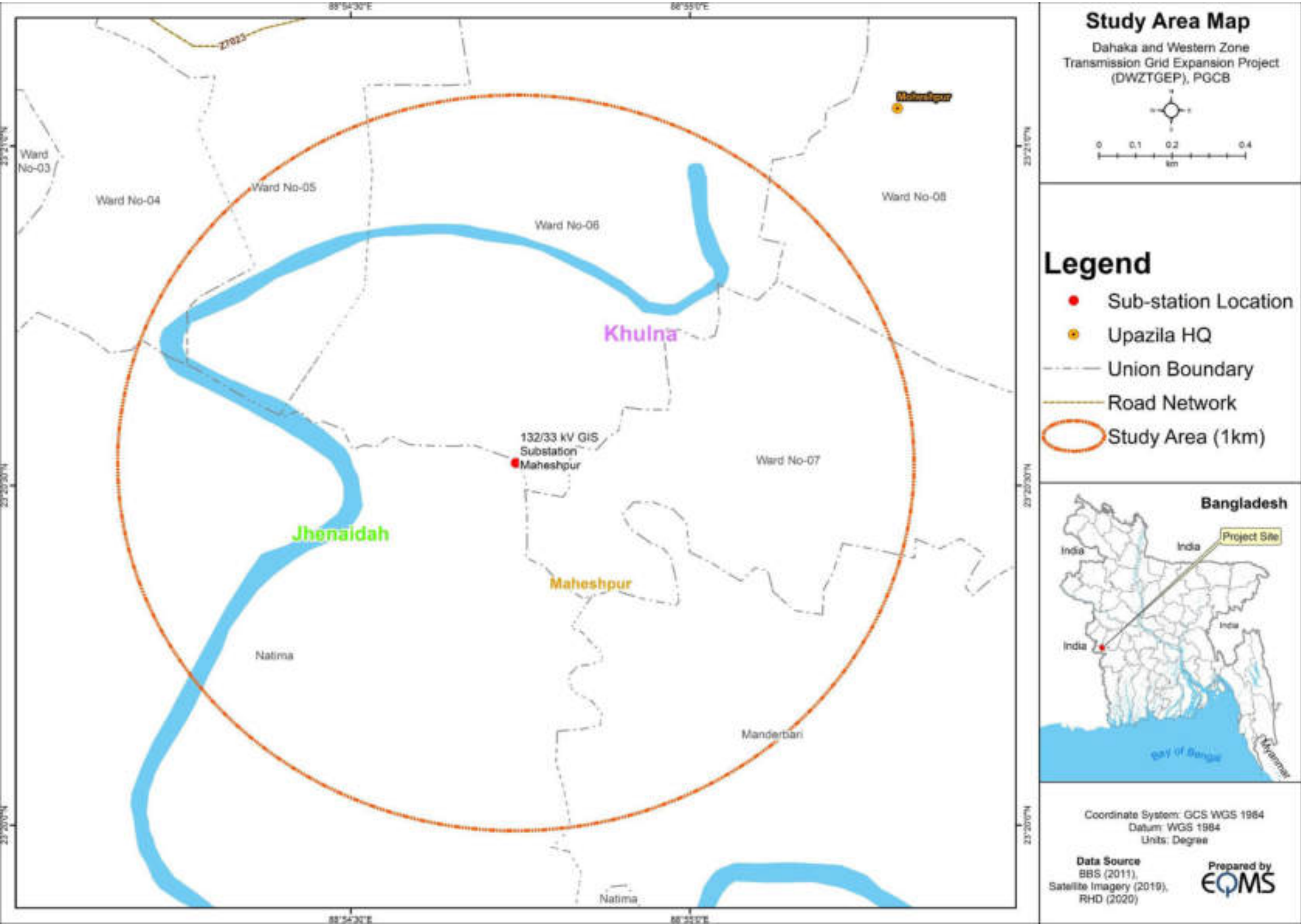




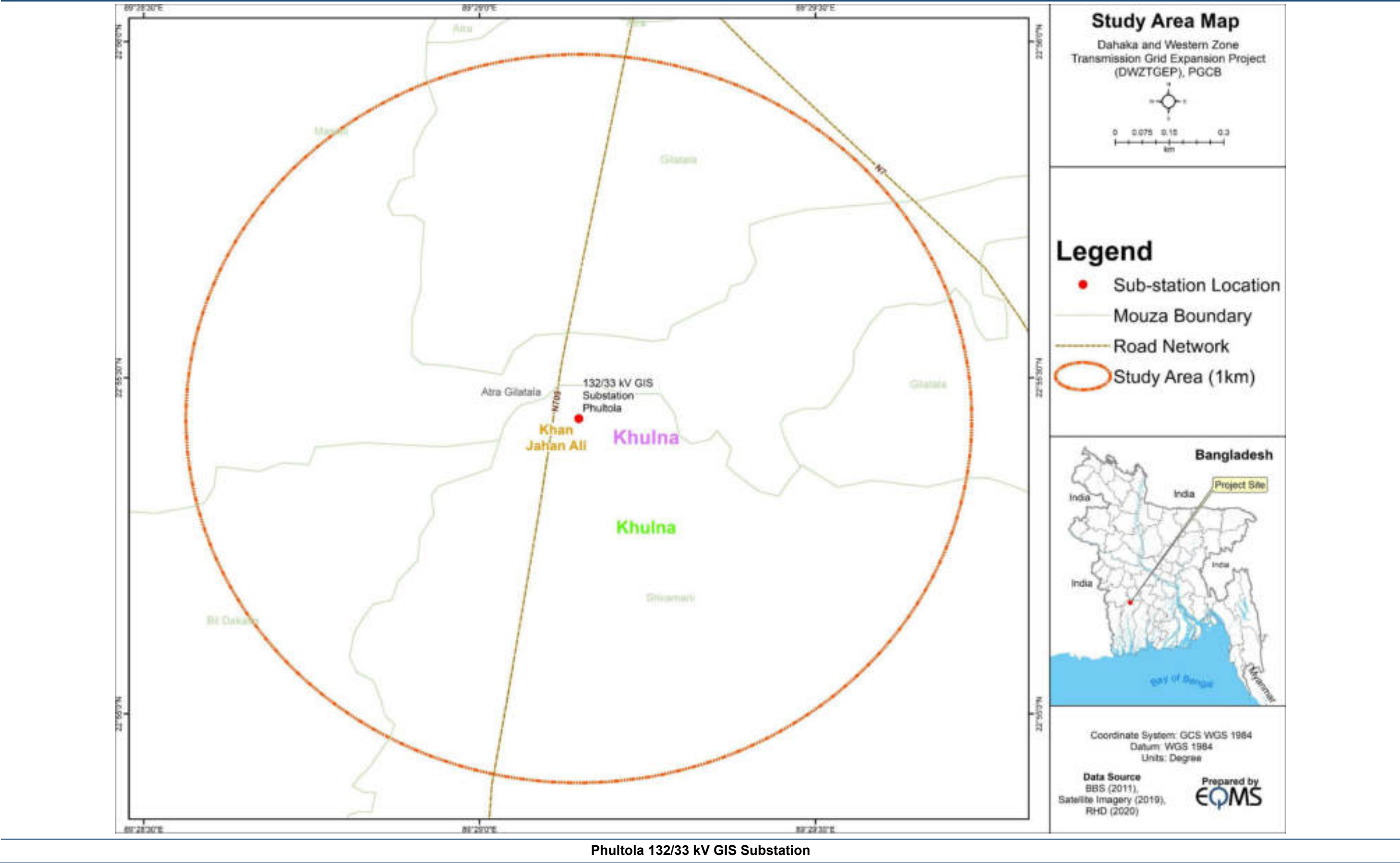
Meherpur 132/33 kV GIS Substation



Manirampur 132/33 kV GIS Substation



Maheshpur 132/33 kV GIS Substation



Source: Final routes of Kaliganj- Maheshpur TL and Substation locations provided by PGCB, 2023

4. ENVIRONMENTAL AND SOCIAL BASELINE

25. This section describes the existing environmental and social baseline status of proposed overhead transmission lines; Kaliganj-Maheshpur 132 kV double circuit transmission line (package 3) and five substations under Package 7 (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur).

4.1 Methodology

26. The analysis was completed through on-ground reconnaissance and surveys to establish an understanding of the environmental and socio-economic baseline. Data for this chapter were collected from:

- **Primary Sources:** This included gathering information from field surveys, laboratory analysis and consultations/FGDs in the project area.
- **Secondary Sources:** This included data from literature reviews, maps and monitoring reports.

27. The baseline condition of environmental quality in the locality of project study area serves as the basis for identification, prediction, and evaluation of impacts. The baseline environmental quality is assessed through field studies within the impact zone for various components of the environment such as air, noise, water, land and socio-economic etc.

28. Data was collected from secondary sources for the macro-environmental setting like climate (temperature, rainfall, wind speed & direction and humidity), physiography, geology etc. Primary environmental baseline information was collected from the project site and surrounding area to know the current environmental and socio-economic condition of the project study area. Data on ambient air, noise quality, surface water and ground/drinking water quality were gathered from onsite environmental quality monitoring. FGDs were also carried out to investigate local environmental conditions, issues, and possible impacts.

29. The baseline environment is discussed in three broad categories: (i) Physical Environment which includes factors such as topography, geology, earthquake risk, climate, hydrology/drainage, and environmental pollution related elements; (ii) Biological Environment, which includes flora, fauna, Protected Areas, wildlife sanctuaries, forest reserves, and the general ecosystem; and; (iii) Socio-economic Environment, which includes anthropological factors like demography, income, land use, land requirements and infrastructure.

4.2 Physical Environment

4.2.1 Climate

30. Although less than half of Bangladesh lies within the tropics, the presence of the Himalaya Mountain range has created a tropical macro-climate across most of the east Bengal land mass. Bangladesh is divided into seven climatic zones and the sub projects are located in five climatic zones.

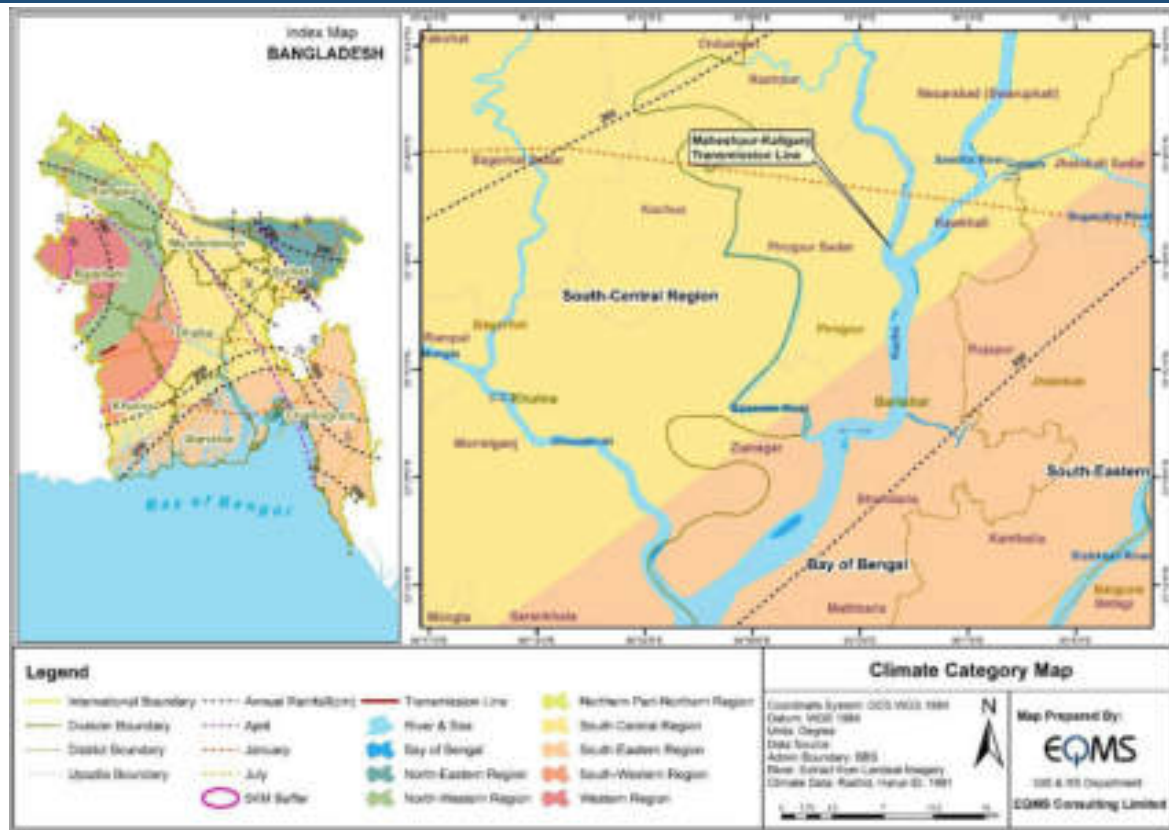
31. Three distinct seasons can be recognized in Bangladesh: the post-monsoon season from November to February; the pre-monsoon hot season from March to May, and the rainy monsoon season which lasts from June through to October. The month of March may also be considered as the spring season, and the period from mid-October to mid-November may be called the autumn season.

32. The post-monsoon season (November-February) begins first in the west-central part of the country, where its duration is about four months, and it advances toward the east and south, reaching the eastern and southern margins of the country by mid-March, where its duration is about one month.

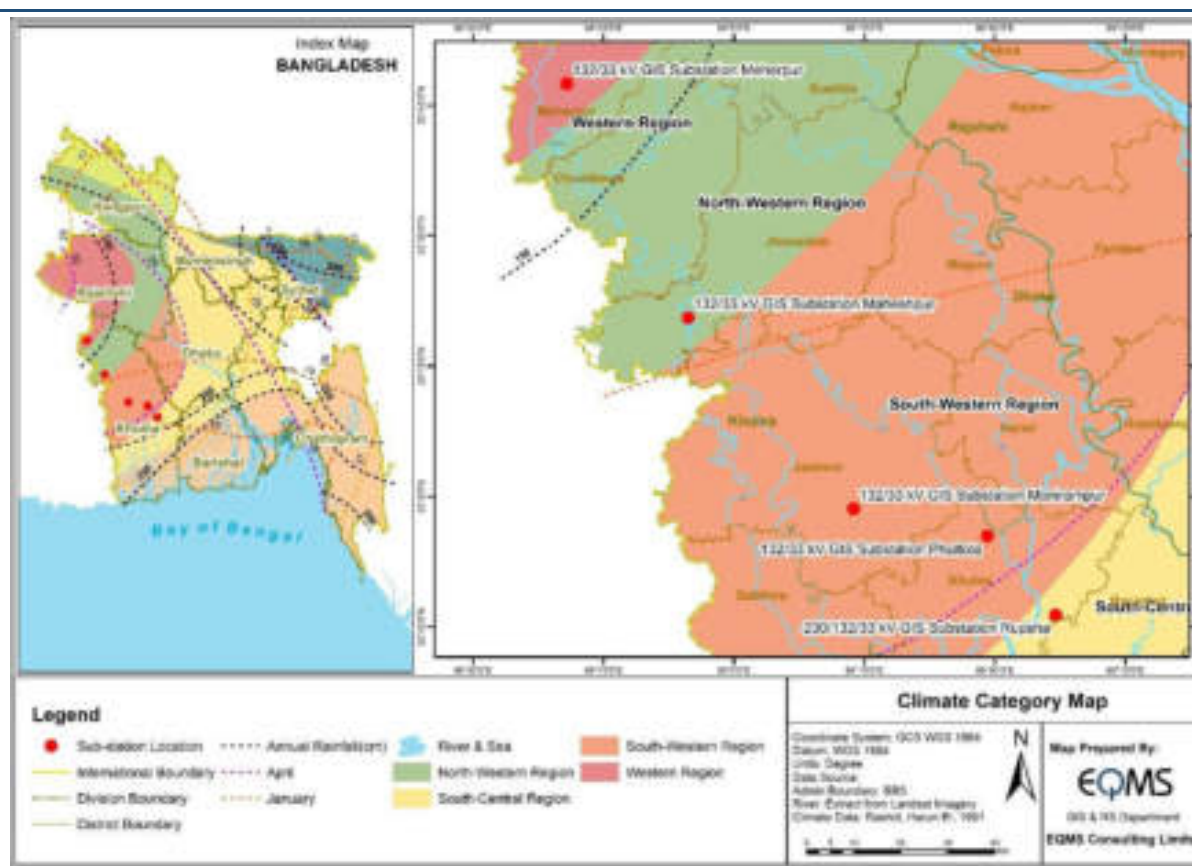
33. The pre-monsoon hot season (March-May) is characterized by high temperatures and the occurrence of thunderstorms. April is the hottest month when mean temperatures range from 27°C in the east and south to 31°C in the west-central part of the country. In the western part, summer temperatures sometimes reach up to 40°C. After the month of April, the temperature dampens due to increased cloud cover. The pre-monsoon season is the transition period when the northerly or north-

westerly winds of the winter season gradually change to the southerly or south-westerly winds of the summer monsoon or rainy season (June-September). During the early part of this season, the winds are neither strong nor persistent. However, with the progression of this season, wind speed increases, and the wind direction becomes more persistent. Figure 4-1 represents different climatic zones in Kaliganj- Maheshpur transmission line route and five substation locations.

Figure 4-1: Climatic Zones of Kaliganj- Maheshpur and five substation locations



Climate Category of Kaliganj Maheshpur TL



Climatic Category of five substation Locations

Source: Rashid, Haroun Er, 1991.

4.2.1.1 Climate at Kaliganj- Maheshpur Transmission Line (TL) and Maheshpur, Meherpur and Manirampur Substation Location

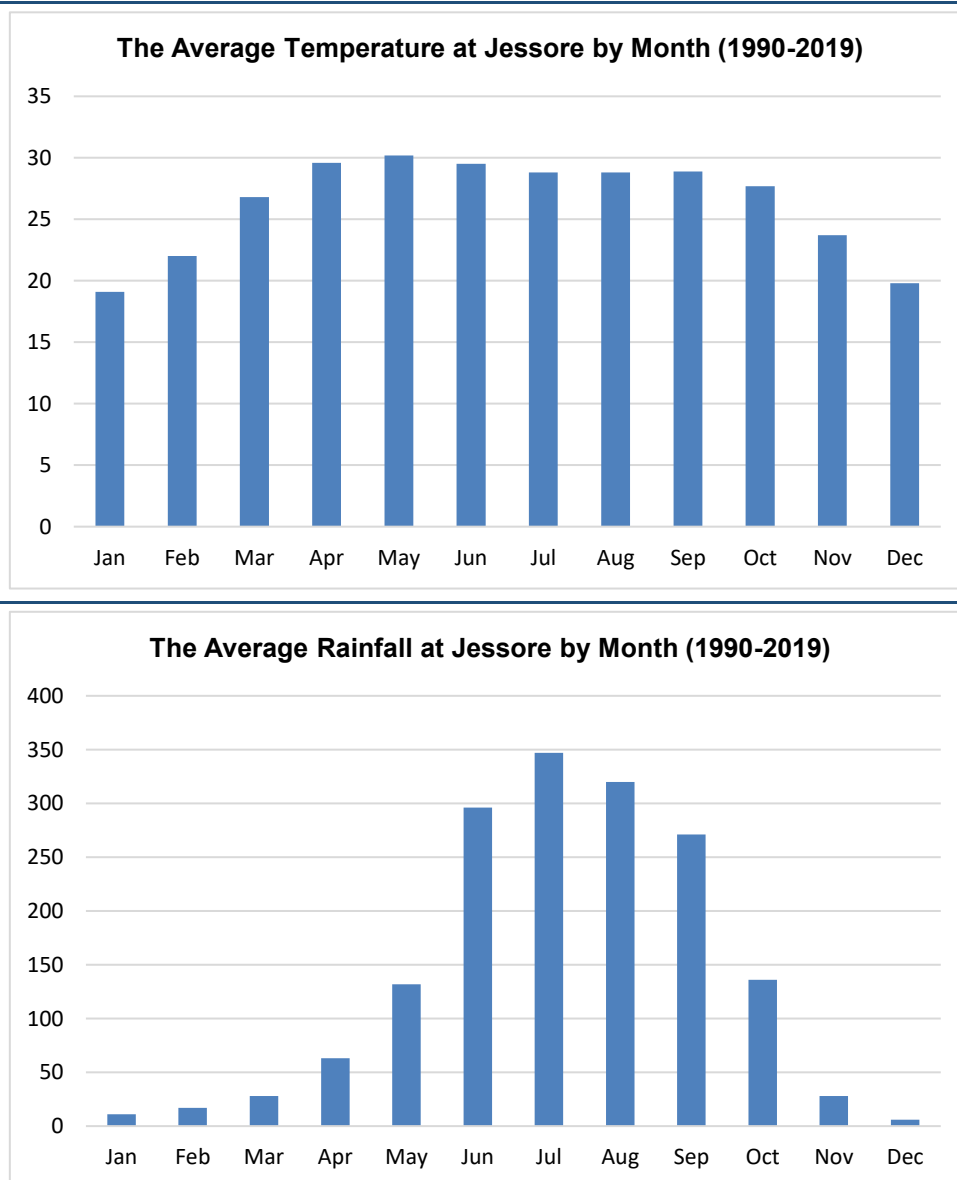
34. The source of climate data is Bangladesh Meteorological Department (BMD). The climate data was collected from nearby BMD station. For Kaliganj and Maheshpur TL and Maheshpur, Meherpur and Manirampur Substation Location, data was collected from Jessore BMD station, which has the coverage for all the districts crossed within this TL route and substation locations. The average annual temperature is 26.2 °C in this region. About 1655 mm of precipitation falls annually. The least amount of rainfall occurs in December. The average this month is 6 mm. With an average of 347 mm, the most precipitation falls in July. The temperatures are highest on average in May, at around 30.2°C. January has the lowest average temperature of the year. It is 19.1°C. The variation in the precipitation between the driest and wettest months is 341 mm. During the year, the average temperatures vary by 11.1 °C.

Table 4-1: Average temperature and rainfall at Kaliganj- Maheshpur Transmission Line (TL) and Maheshpur, Meherpur and Manirampur Substation Location by month

Average	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Avg. Temperature (°C)	19.1	22	26.8	29.6	30.2	29.5	28.8	28.8	28.9	27.7	23.7	19.8
Avg. Rainfall (mm)	11	17	28	63	132	296	347	320	271	136	28	6

Source: Bangladesh Meteorological Department (BMD)

Figure 4-2: Distribution of Rainfall & Temperature at Kaliganj- Maheshpur Transmission Line (TL) and Maheshpur, Meherpur and Manirampur Substation Location



Source: Bangladesh Meteorological Department (BMD)

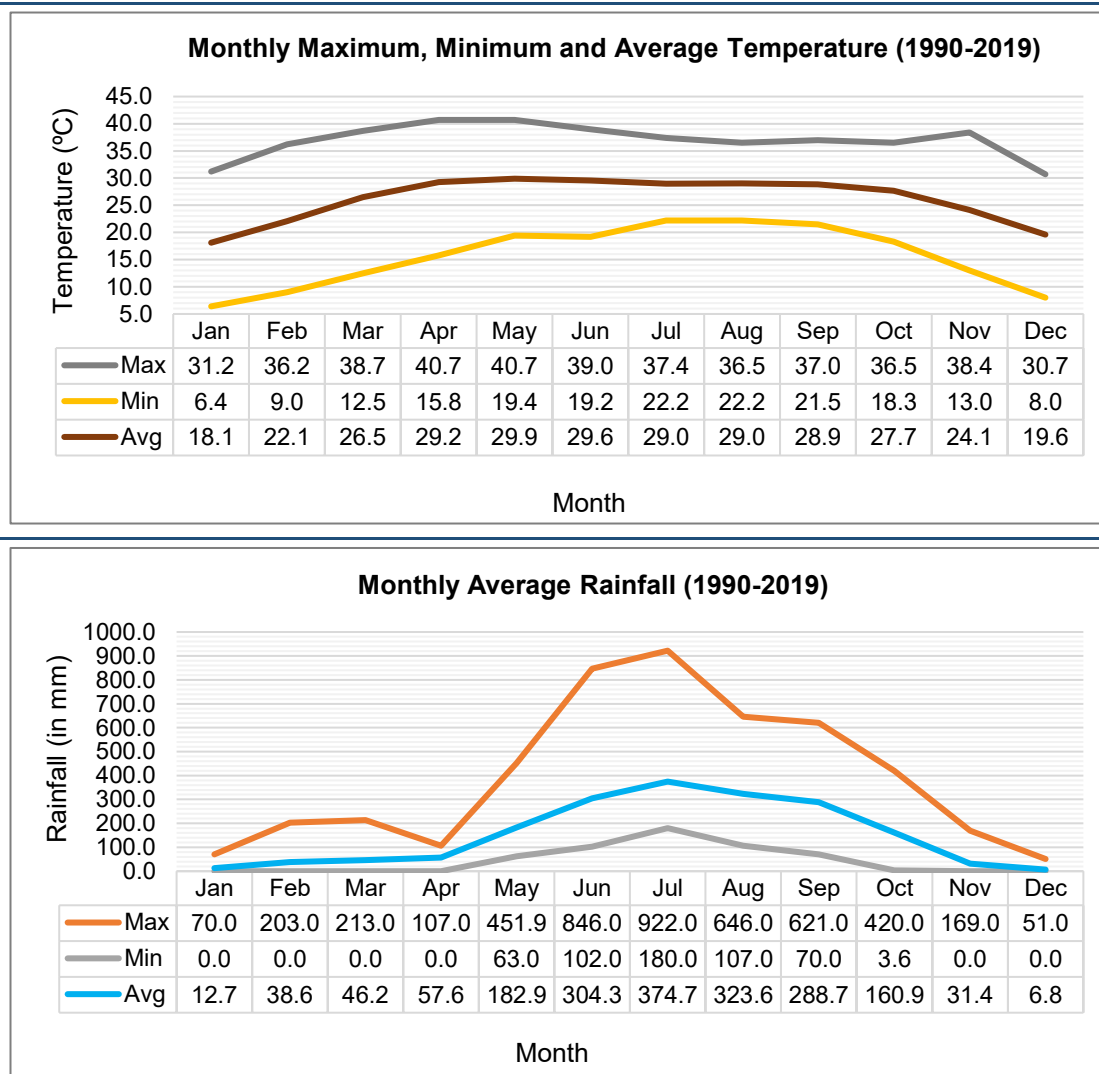
4.2.1.2 Climate at Rupsha and Phultola Substation Locations

35. The source of climate data is Bangladesh Meteorological Department (BMD). The climate data was collected from nearby BMD station. For Rupsha and Phultola Substation Locations, data was collected from Khulna BMD station, which has coverage for all the districts. In Khulna, the average annual temperature is 26 °C. About 1828 mm of precipitation falls annually. The least amount of rainfall occurs in December. The average this month is 6.8 mm. With an average of 374.7 mm, the most precipitation falls in July. The temperatures are highest on average in May, at around 29.9°C. January has the lowest average temperature of the year. It is 18.1°C. The variation in the precipitation between the driest and wettest months is 316.8 mm. During the year, the average temperatures vary by 11.8°C.

Table 4-2: Average temperature and rainfall at Rupsha and Phultola substation Locations by month

Average	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Avg. Temperature	18.1	22.1	26.5	29.2	29.9	29.6	29.0	29.0	28.9	27.7	24.1	19.6
Avg. Rainfall	12.7	38.6	46.2	57.6	182.9	304.3	374.7	323.6	288.7	160.9	31.4	6.8

Source: Bangladesh Meteorological Department (BMD)

Figure 4-3: Distribution of Rainfall & Temperature at Rupsha and Phultola Substation Locations

Source: Bangladesh Meteorological Department (BMD)

4.2.2 Water Quality

4.2.2.1 Surface Water

36. Overhead transmission lines in Dhaka and Western zone cross 31 rivers. Kaliganj-Maheshpur 132 kV double circuit transmission line crosses Kapotaksha river and Chitra River. The width of these rivers is ranging from 50-110 m (Table 4-3) during monsoon. Moreover, one river and 12 ponds were found in 500m radius of three substation (Rupsha, Maheshpur and Manirampur) locations whereas no significant surface water sources were found in other two substation (Phultola and Meherpur) locations.

Table 4-3: Name of rivers/ other surface water sources and transmission lines

No.	Overhead Transmission Line	Names and Widths of River
1.	Kaliganj-Maheshpur 132 kV double circuit transmission line	The line crosses two rivers and two canals, and a pond along the length of the line. Rivers are Kapotaksha river and Chitra River. ranging from 50-110 m.
2.	230/132/33 kV GIS Substation at Rupsha, and 132/33 kV GIS Substation Manirampur	Nine pond and one pond were found in 1km radius of substation locations respectively.
3.	132/33 kV GIS Substation Maheshpur	Two ponds and one river were found in 1 km radius of substation
4.	132/33 kV GIS Substation Phultola, 132/33 kV GIS Substation Meherpur	No significant surface water sources were found

4.2.2.1.1 Surface Water Sampling Methods

37. To determine the quality of surface water, a sample was collected from the nearest water body of the existing project site and analyzed in the lab for different parameters following the standard method. Change of any parameters of water due to construction can affect the crops, flora, and fauna.

38. The samples have been analyzed for parameters covering bacteriological and physio-chemical characteristics which include certain heavy metals and trace elements. Surface water samples have been collected as grab water sample in a standard sampling bottle and 250 ml sterilized clean PET bottle to complete physio-chemical and bacteriological tests respectively. The samples have been analyzed as per standard procedure/method given in Standard Method for Examination of Drinking Water Edition 20, published by APHA as well as using on site field test kit. Details of the sampling procedures are shown in **Table 4-4**.

Table 4-4: Analysis Method for Surface Water Samples

Sl. No.	Parameters	Unit	Analysis Method
1.	Biochemical Oxygen Demand (BOD)	mg/L	5 days Incubation
2.	Chemical Oxygen Demand (COD)	mg/L	Closed Reflux Method
3.	Dissolved Oxygen (DO)	mg/L	Hanna Combo Meter
4.	Electrical Conductivity (EC)	μS/cm	Hanna Combo Meter
5.	pH	--	Hanna Combo Meter

Sl. No.	Parameters	Unit	Analysis Method
6.	Salinity	ppt	Hanna Combo Meter
7.	Temperature (T)	°C	Hanna Combo Meter
8.	Hardness	mg/L	Colorimetric Method
9.	Total Dissolved Solid (TDS)	mg/L	Hanna Combo Meter
10.	NH ₃ -N	mg/L	Gravimetric method
11.	Phosphate (PO ₄ ³⁻)	mg/L	Photometric Method
12.	TPH	mg/L	Gravimetric method
13.	Total Coliform	n/100 ml	AFNOR approved method compared to ISO 4832 method

Sources: Information Taken from EQMS Wet Laboratory

39. The quality of surface water was compared with the standards for Inland Surface Water, Environment Conservation Rules (ECR) 2023-Schedule 2(A) whereas the groundwater was compared with the Drinking Water Standard ECR 2023 Schedule-2(B). The standards have been presented along with the monitoring results of surface water for comparison.

4.2.2.1.2 Surface Water Sampling Locations

40. The monitoring team has observed various source of water throughout the transmission line. The alignment will not traverse areas that are protected by the GoB but will cross some canals and ponds. There are some small canals, ponds, Gher were observed in the project sites. Five surface water samples were collected for surface water quality monitoring during the month of August 2023 for Kaliganj- Maheshpur TL alignments and 5 surface water samples were collected in January 2023 for five substation locations (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur). The samples were collected from nearby water bodies of the alignment and substation (**Table 4-5**). The analyzed results for surface water were compared to Bangladesh Standards (ECR, 2023) Guidelines. Results of inland surface water analysis are presented in **Table 4-7** and **Table 4-8**.

Table 4-5: Surface Water Sampling Location

Sl. No.	Code	Sampling Location	GPS Coordinate	Type of Source	Sampling Time	Sampling Date
Kaliganj-Maheshpur 132 kV double circuit transmission line						
1.	SW1	Alampur, Azampur, Maheshpur, Jhenaidah (Near AP 5/3)	23°22'58.78"N 89°0'40.28"E	Kapotaksha River	02:55 PM	28.08.2023
2.	SW2	Elangi, Kathalia, Kotchadpur (Near AP 7/7)	23°25'13.61"N 89°3'48.31"E	Local Gher	02:25 PM	28.08.2023
3.	SW3	Fajilpur, Kaliganj (Near AP 8/8)	23°25'50.47"N 89°4'56.62"E	Chitra River	03:20 PM	28.08.2023
4.	SW4	Near Singdah Primary School, Kaliganj,	23°25'50.95"N 89°5'55.42"E	Chitra River	03:20 PM	29.08.2023

Sl. No.	Code	Sampling Location	GPS Coordinate	Type of Source	Sampling Time	Sampling Date
		Jhenaidah (Near AP 9/5)				
5.	SW5	Near Sub-station, Shreerampur, Kaliganj.	23°25'15.09"N 89°7'39.01"E	Local Pond	09:55 AM	29.08.2023
Rupsha 230/132/33 kV GIS Substation						
6.	SW6	Cannel beside Khulna Mongla Road	22°46'14.55"N 89°37'2.96"E	Pond	-	04.01.2023
Meherpur 132/33 kV GIS Substation						
7.	SW7	Kajla River	23°46'56.10"N 88°41'9.88"E	River	-	18.01.2023
Manirampur 132/33 kV GIS Substation						
8.	SW8	Canal Near Lawra Madrasah Bazar	22°58'24.12"N 89°13'41.37"E	Canal		11.01.2023
Maheshpur 132/33 kV GIS Substation						
9.	SW9	Pond Near Kaji Bari	23°20'26.21"N 88°54'29.20"E	Pond	-	15.01.2023
Phultola 132/33 kV GIS Substation						
10.	SW10	Pond Near FR Jute Mills Ltd.	22°55'37.25"N 89°29'7.75"E	Pond	-	08.01.2023

Source: Environmental Monitoring Report- August 2023. (Kaliganj-Maheshpur 132 kV double circuit transmission line) and Environmental Monitoring Report- January 2023 five substations under Package 7 (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur).

**Monitoring dates and locations obtained from the Environmental Baseline Monitoring reports of the 3rd Party monitoring consultants appointed by EPC Contractors for the respective packages.

Table 4-6: Pictures of Sampling Location

Kaliganj-Maheshpur 132 kV double circuit transmission line	
	
SW1; Kapotaksha River, Alampur, Azampur, Maheshpur, Jhenaidah (Near AP 5/3)	



SW2; Elangi, Kathalia, Kotchandpur (Near AP 7/7)



SW3; Chitra River, Fajilpur, Kaliganj (Near AP 8/8)



SW4; Chitra River, Near Singdah Primary School, Kaliganj, Jhenaidah (Near AP 9/5)



SW5, Chitra River, Near Sub-station, Shreerampur, Kaliganj.

Rupsha 230/132/33 kV GIS Substation



SW6

Meherpur 132/33 kV GIS Substation



SW7

Manirampur 132/33 kV GIS Substation



SW8

Maheshpur 132/33 kV GIS Substation



SW9

Phultola 132/33 kV GIS Substation



SW10

Source: Environmental Monitoring Report- August 2023. (Kaliganj-Maheshpur 132 kV double circuit transmission line) and Environmental Monitoring Report- January 2023 five substations under Package 7 (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur).

4.2.2.1.3 Result Analysis

41. The analyzed results for surface water were compared to the Environment Conservation Rules (ECR) 2023, Schedule 2(A); Inland Surface Water Quality (Water Usable for Fisheries). Results of inland surface water analysis are presented in Table 4-7 and Table 4-8.

Table 4-7: Surface Water Analysis Result of Kaliganj- Maheshpur TL

Parameters		Concentration*												
		BOD	COD	DO	EC	pH	Salinity	T	Hardness	TDS	NH ₃ -N	PO ₄	TPH	Total Coliform
Unit		mg/L	mg/L	mg/L	µS/cm	--	ppt	°C	mg/L	mg/L	mg/L	mg/L	mg/L	n/100 ml
Kaliganj-Maheshpur 132 kV double circuit transmission line														
SW1	Baseline (Aug. 2023)	1.2	17	6.3	361	7.03	0.49	24.7	64	180	0.78	1.5	1.2	12
SW2	Baseline (Aug. 2023)	0.8	14	6.4	379	7.15	0.91	24.2	69	189	0.27	1.1	0.7	10
SW3	Baseline (Aug. 2023)	1.2	9	6.1	217	7.15	0.17	23.9	54	108	0.51	2.1	1.7	14
SW4	Baseline (Aug. 2023)	3.0	28	5.0	249	7.15	0.28	24.4	60	124	1.95	11	2.6	22
SW5	Baseline (Aug. 2023)	2.1	11	6.0	277	7.16	0.37	24.6	63	138	0.36	1.7	0.9	17
Bangladesh Standards ³		≤6	50	≥5	--	6-9	-	--	--	1000	-	-	-	≤5000

Source: Environmental Monitoring Report- August 2023

*Monitoring results obtained from the Environmental Baseline Monitoring reports of the 3rd Party monitoring consultants appointed by EPC Contractors of the respective packages.

Date of Monitoring: 28th and 29th August 2023

Date of Analysis: 11th September 2023

³ The Environment Conservation Rules (ECR) 2023, Schedule 2(A); Inland Surface Water Quality (Water Usable for Fisheries)

Table 4-8: Surface Water Analysis Result of Substations

Parameters		Concentration											
		pH	BOD	COD	DO	TDS	TSS	Nitrogen	Ammonium	Total Coliform	Turbidity	Temperature	Oil & Grease
Unit			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100ml	NTU	oC	mg/L
Rupsha 230/132/33 kV GIS Substation													
SW6	Baseline (Jan. 2023)	6.6	3.8	11	3.4	685	4.6	0.097	0.27	6.2×10 ²	9.87	25.5	1.9
Meherpur 132/33 kV GIS Substation													
SW7	Baseline (Jan. 2023)	6.7	4.9	12	1.6	368	2.3	0.066	0.28	5.1×10 ²	7.32	25	1.1
Manirampur 132/33 kV GIS Substation													
SW8	Baseline (Jan. 2023)	5.87	1.5	13	4.98	578	3.3	0.084	0.21	5.8×10 ²	7.34	25	1.1
Maheshpur 132/33 kV GIS Substation													
SW9	Baseline (Jan. 2023)	7.2	1.5	19	5.88	368	3.5	0.046	0.27	5.5×10 ²	4.54	26.5	1
Phultola 132/33 kV GIS Substation													
SW10	Baseline (Jan. 2023)	6.8	1.7	13	4.19	672	4.3	0.078	0.43	6.5×10 ²	7.92	25.4	1.5
ECR'23 Standard	b ⁴	6-9	≤6	50	≥5	1000	-	-	-	≤5000	-	-	-
	d ⁵	6.5-8.5	≤12	100	-	1000	-	-	-	≤50000	-	-	-

Source: Environmental Monitoring Report- January 2023

**Monitoring results obtained from the Environmental Baseline Monitoring reports of the 3rd Party monitoring consultants appointed by EPC Contractors of the respective packages.

⁴ The Environment Conservation Rules (ECR) 2023, Schedule 2(A); Inland Surface Water Quality (Water Usable for Fisheries)⁵ The Environment Conservation Rules (ECR) 2023, Schedule 2(A); Inland Surface Water Quality (Water Usable for Irrigation)

4.2.2.1.4 Discussion

42. The surface water samples have been taken from nearby surface water sources. According to tasted result the tested parameters remain under the Bangladesh standard.

- **Biological Oxygen Demand (BOD):** Biological Oxygen Demand is the quantity of oxygen required by bacteria and other microorganisms during the biochemical degradation and transformation of organic matter present in water under aerobic conditions. BOD₅ is an index of the biodegradable organics present. Biological oxygen demanding wastes consume the dissolved oxygen from water. In Kaliganj- Maheshpur transmission line, the average value of BOD₅ varied from 0.8 to 3.0 mg/L which is lower than the limit of standard. For five substation locations, the average value of BOD₅ varied from 1.5-4.9 mg/L. In all the locations, the average value of BOD₅ was found within the limits of national standards.
- **Chemical Oxygen Demand (COD):** The chemical oxygen demand is commonly used to indirectly measure the number of organic compounds in water. Most applications of COD determine the number of organic pollutants found in surface water (e.g., lakes and rivers) or wastewater, making COD a useful measure of water quality. In Kaliganj- Maheshpur transmission line, the average value of COD varied from 9- 28 mg/L, whereas, in five substation locations, the average value of COD varied from 8.5 to 12.3 mg/L and 11- 19 mg/L respectively.
- **Dissolved Oxygen (DO):** The presence of sufficient DO in water is a positive sign of a healthy water body but the deficiency of DO is a signal of pollution. DO for all the samples of surface water are remained above 5 except SW6, SW7, SW8 and SW10 which is recommended by DoE.
- **Electrical Conductivity (EC):** The electrical conductivity (EC) is usually used for indicating the total concentration of the ionized constituents of water. The values of EC of the surface water of the Kaliganj- Maheshpur varies from 217 to 379 $\mu\text{S}/\text{cm}$ which indicates the very lower amount of ionization.
- **pH:** The pH of surface water may continuously fluctuate depending on the seasonal variation. pH amount fluctuating between the range of neutral nature. It's also noticeable that all the samples of surface water remain between no construction waste thrown into the surface water body. In all the locations except SW8 (5.8), the value of pH was found within the limits of national standards.
- **Salinity:** The salinity level of surface water may continuously fluctuate depending on the seasonal variation. Salinity level in Kaliganj- Maheshpur fluctuating between the range of 0.17 to 0.93 ppt.
- **Temperature (T):** Temperature for all the surface water samples were ranging from 23.9-26.5.
- **Hardness:** Hardness is a measure of divalent salts, or positively charged ions, particularly calcium (Ca^{2+}) and magnesium (Mg^{2+}), in water. Total hardness is the sum of the concentrations of Ca^{2+} and Mg^{2+} , expressed in ppm calcium carbonate. The tested report shows the Hardness values in Kaliganj- Maheshpur were found to have ranges from 54 to 69 mg/L.
- **Total Dissolved Solid (TDS):** The high number of suspended dissolved solids in water increases the water density; it influences the osmoregulation of freshwater organisms and reduces the solubility of gases. TDS for all the surface water samples were ranging from 108- 685.
- **Ammoniacal nitrogen ($\text{NH}_3\text{-N}$):** $\text{NH}_3\text{-N}$ is a measure for ammonia, a toxic pollutant often found in surface water, landfill leachate and other liquid organic waste products. It can also be used as a measure of the health of water in natural bodies such as rivers or lakes, or in man-made water reservoirs. The term is used widely in waste treatment and water purification systems. Ammonia can directly poison humans and upset the equilibrium of water systems. All the surface water samples of Kaliganj- Maheshpur show very low values of ammonia.
- **Phosphate (PO_4^{3-}):** Phosphate is also called Phosphate ion or **Orthophosphate**. It is a trivalent inorganic anion and a conjugate base of hydrogen phosphate. All the surface water samples of Kaliganj- Maheshpur TL show very low values of Phosphate.
- **Total petroleum hydrocarbons (TPH):** TPH is a term used to describe a large family of several hundred chemical compounds that originally come from crude oil; the main and most specific part of these compounds are non-polar and slightly polar hydrocarbons. These compounds are harmful

to humans and animals. So, detection and control of TPH in water is essential. The tested results show that the sample from all locations of Kaliganj- Maheshpur ranges from 0.7 to 2.6 mg/L.

- **Total coliform:** In Kaliganj- Maheshpur a double circuit transmission line, the average value of total coliform varied from 108- 189 per 100ml, 79-108 per 100ml and in five substation locations it ranges from 5.1×10^2 - 6.5×10^2 per 100 ml water.
- **Nitrogen (N):** In five substation locations, Nitrogen for all the surface water samples were ranging from 23.9-26.5 mg/L.
- **TSS:** In five substation locations, Nitrogen for all the surface water samples were ranging from 2.3- 4.6 mg/L.
- **Ammonium:** In five substation locations, Nitrogen for all the surface water samples were ranging from 0.21- 0.43 mg/L.
- **Turbidity:** In five substation locations, Nitrogen for all the surface water samples were ranging from 4.54- 9.87 mg/L.
- **Oil and grease:** In five substation locations, Nitrogen for all the surface water samples were ranging from 1.0- 1.9 mg/L.

4.2.2.2 Ground Water

4.2.2.2.1 Ground Water Sampling Methods

43. To determine the quality of ground water, a sample was collected from the deep tube well of the existing project site and analyzed in the lab for different parameters following the standard method. Change of any parameters of water due to construction can affect the crops, flora, and fauna.

44. Ground water samples has been collected from the Ground water supply point or deep tube well or shallow tube well set up in the construction area. Ground water samples has been collected in a standard sampling bottle and 250 ml sterilized clean PET bottle for complete physio-chemical and bacteriological tests respectively. The samples have been analysed as per standard procedure/method given in Standard Method for Examination of Water and Wastewater Edition 20, published by APHA as well as using a site field test kit. Details of the analysis method and protocol are presented in **Table 4-9**.

Table 4-9: Analysis Method for Ground Water Samples

Sl. No.	Parameter	Unit	Analysis Method
1.	Biochemical Oxygen Demand (BOD)	mg/L	5 days Incubation
2.	Chemical Oxygen Demand (COD)	mg/L	Closed Reflux
3.	Dissolved Oxygen (DO)	mg/L	Ion electrode
4.	Electrical Conductivity (EC)	$\mu\text{S/cm}$	Ion electrode
5.	pH	--	Ion electrode
6.	Salinity	ppt	Ion electrode
7.	Temperature (T)	$^{\circ}\text{C}$	Ion electrode
8.	Hardness	mg/L	Colorimetric
9.	TDS	mg/L	Ion electrode
10.	Manganese (Mn)	mg/L	Photometric method
11.	Iron (Fe)	mg/L	Photometric method
12.	Arsenic (As)	mg/L	Photometric method

Sl. No.	Parameter	Unit	Analysis Method
13.	Total Coliform	n/100 ml	AFNOR approved method compared to ISO 4832 method
14.	Fecal Coliform	n/100 ml	AFNOR approved method compared to NF V08-017 method.
15.	TPH	mg/L	Gravimetric method

Sources: Information Taken from EQMS Laboratory

4.2.2.2.2 Ground-Water Sampling Locations

45. Ground water samples were collected for determining the quality of existing sources. Ground water in the project area was selected as the source of groundwater. During the site visit, no springs or deep wells/tubewell were found within the ROW of these lines. Detail of the sampling location is provided in Table 4-10.

Table 4-10: Locations and Descriptions of Ground-Water Sampling

Sl. No.	Code	Sampling Location	GPS Coordinate	Type of Source	Sampling Time	Sampling Date
Kaliganj-Maheshpur 132 kV double circuit transmission line						
1.	GW1	Kashipur, Azampur, Maheshpur, Jhenaidah (Near AP 3/1)	23°21'25.80"N 88°57'44.73"E	Tube-Well	02:55 PM	27.08.2023
2.	GW2	Alampur primary school, Azampur, Maheshpur, Jhenaidah (Near AP 5/2)	23°22'57.92"N 89°0'35.28"E	Tube-Well	09:25 AM	28.08.2023
3.	GW3	Kadirkol, Fajilpur, Kaliganj, Jhenaidah (Near AP 8/8)	23°25'58.63"N 89°5'9.45"E	Tube-Well	03:18 PM	28.08.2023
4.	GW4	Amtola Bazar, Ganna Road, Kaliganj, Jhenaidah (Near AP 9/5)	23°26'0.33"N 89°6'36.41"E	Tube-Well	02:58 PM	29.08.2023
5.	GW5	Shreerampur primary school, Near Sub-station, Shreerampur, Kaliganj.	23°25'19.60"N 89°7'35.47"E	Tube-Well	09:54 AM	29.08.2023
Rupsha 230/132/33 kV GIS Substation						
6.	GW6	Residential Area near the Joy Petroleum	22°46'14.66"N 89°37'4.94"E	Tube-Well	-	04.01.2023
Meherpur 132/33 kV GIS Substation						
7.	GW7	Selfie Feeling Station	23°47'30.24"N 88°40'48.14"E	Tube-Well	-	18.01.2023
Manirampur 132/33 kV GIS Substation						
8.	GW8	Baitullah Jame Mosque	22°58'42.75"N 89°13'47.31"E	Tube-Well	-	11.01.2023

Sl. No.	Code	Sampling Location	GPS Coordinate	Type of Source	Sampling Time	Sampling Date
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Maheshpur 132/33 kV GIS Substation

9.	GW9	Near Residential Area 2	23°20'32.62"N 88°54'39.59"E	Tube-Well	-	15.01.2023
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Phultola 132/33 kV GIS Substation

10.	GW10	Md. Afiful Islam House near the Road	22°55'11.04"N 89°29'6.68"E	Tube-Well	-	08.01.2023
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Source: Environmental Monitoring Report- August 2023. (Kaliganj-Maheshpur 132 kV double circuit transmission line) and Environmental Monitoring Report- January 2023 five substations under Package 7 (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur).

**Monitoring dates and locations obtained from the Environmental Baseline Monitoring reports of the 3rd Party monitoring consultants appointed by EPC Contractors for the respective packages.

4.2.2.2.3 Sampling Photographs

Kaliganj-Maheshpur 132 kV double circuit transmission line



GW1; Kashipur, Azampur, Maheshpur, Jhenaidah (Near AP 3/1)



GW2; Alampur primary school, Azampur, Maheshpur, Jhenaidah (Near AP 5/2)



GW3; Kadirkol, Fajilpur, Kaliganj, Jhenaidah (Near AP 8/8)



GW4; Amtola Bazar, Ganna Road, Kaliganj, Jhenaidah (Near AP 9/5)



GW5; Shreerampur primary school, Near Sub-station, Shreerampur, Kaliganj.

Rupsha 230/132/33 kV GIS Substation



GW6

Meherpur 132/33 kV GIS Substation



GW7

Manirampur 132/33 kV GIS Substation



GW8

Maheshpur 132/33 kV GIS Substation



GW9

Phultola 132/33 kV GIS Substation



GW10

Source: Environmental Monitoring Report- August 2023. (Kaliganj-Maheshpur 132 kV double circuit transmission line) and Environmental Monitoring Report- January 2023 five substations under Package 7 (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur).

4.2.2.2.4 Ground-Water Quality Analysis Results

46. Analysis results of the Ground water are represented in Table 4-11 and Table 4-12 where the values are compared with the standard limit.

Table 4-11: Ground Water Quality Analysis Results of Kaliganj-Maheshpur TL.

Parameters		Concentration														
		BOD	COD	DO	EC	pH	Salinity	T	Hardness	TDS	Mn	Fe	As	TC	FC	TPH
		mg/L	mg/L	mg/L	µS/cm	--	ppt	°C	mg/L	mg/L	mg/L	mg/L	mg/L	n/100 ml	n/100 ml	mg/L
Kaliganj-Maheshpur 132 kV double circuit transmission line																
GW1	Baseline (Aug. 2023)	BDL**	<0.1	6.1	2026	7.06	0.10	23.1	519	1014	0.05	0.021	<0.01	0	0	BDL
GW2	Baseline (Aug. 2023)	BDL**	<0.1	6.2	1688	7.22	0.08	22.7	411	820	0.04	0.049	<0.01	0	0	BDL
GW3	Baseline (Aug. 2023)	BDL**	<0.1	6.0	1511	7.52	0.07	23.3	339	752	0.05	0.15	<0.01	0	0	BDL
GW4	Baseline (Aug. 2023)	BDL**	<0.1	6.2	1443	7.25	0.07	22.8	309	718	0.06	0.25	<0.01	0	0	BDL
GW5	Baseline (Aug. 2023)	BDL**	<0.1	6.1	1431	7.25	0.07	23.5	302	712	0.02	0.32	<0.01	0	0	BDL
Bangladesh Standards ⁶		NF	NF	NF	NF	6.5-8.5	NF	20-30	500	1000	0.4	0.3 – 1.0	0.05	0	0	NF

Source: Environmental Monitoring Report-August 2023.

NF: Not Found. BDL: Below Detection Limit

Date of Sampling: 27th– 29th August 2023

Monitoring results obtained from the Environmental Baseline Monitoring reports of the 3rd Party monitoring consultants appointed by EPC Contractors of the respective packages.

⁶ The Environment Conservation Rules (ECR), 2023, Schedule 2(B): Standards for Drinking Water

Table 4-12: Ground Water Quality Analysis Results of Substations

Parameters		Concentration							
		pH	Turbidity	EC	Chloride	Fe	Mn	As	TC
			NTU	mS/cm	mg/L	mg/L	mg/L	mg/L	CFU/100ml
Unit									
Rupsha 230/132/33 kV GIS Substation									
GW6	Baseline (Jan 2023)	6.6	3.8	11	3.4	0.685	4.6	0.097	0.27
Meherpur 132/33 kV GIS Substation									
GW7	Baseline (Aug. 2023)	6.96	1.41	218.68	21	0.167	0.085	<0.01	0
Manirampur 132/33 kV GIS Substation									
GW8	Baseline (Jan 2023)	6.84	1.51	332.22	19	0.091	0.098	<0.01	0
Maheshpur 132/33 kV GIS Substation									
GW9	Baseline (Jan 2023)	6.9	0.98	283.71	16	0.076	0.068	<0.01	0
Phultola 132/33 kV GIS Substation									
GW10	Baseline (Jan 2023)	6.84	0.81	395.31	24	0.244	0.148	<0.01	0
Bangladesh ECR-2023 ⁷		6.5-8.5	5	NF	150-600	0.3-1.0	0.1	0.05	0
Analysis Method		Electrometric	Nephelometric method	Electrometric	Argentometric	AAS	AAS	AS-test kit	Membrane Filtration

Source: Environmental Monitoring Report-January 2023.

NF: Not Found. BDL: Below Detection Limit

Date of Sampling: 4th – 15th January 2023

Monitoring results obtained from the Environmental Baseline Monitoring reports of the 3rd Party monitoring consultants appointed by EPC Contractors of the respective packages.

⁷ The Environment Conservation Rules (ECR), 2023, Schedule 2(B): Standards for Water (Drinking Water Quality).

4.2.2.2.5 Discussion

47. According to the ground, water quality parameters monitoring most of them are under BD standard values. There has not been any groundwater degradation observed during this baseline monitoring period. There were no chemical and hazardous elements found leaching into the ground. Regular groundwater sampling will be conducted during the construction period. If any impact is observed in the future, the proper initiative will be taken immediately.

- **Biological Oxygen Demand (BOD):** BOD level of 1-2 ppm is very good. implies that not much organic waste is present in the water supply. The tested result shows the value of BOD for all the locations of Kaliganj- Maheshpur are less than 0.1 mg/L, which indicated the good condition of the tested samples.
- **Chemical Oxygen Demand (COD):** Chemical oxygen demand is commonly used to indirectly measure the number of organic compounds in water. The tested values of ground water samples of all locations of Kaliganj- Maheshpur found less than 0.1 mg/L which indicated the good condition of the tested samples.
- **Dissolved Oxygen (DO):** Dissolved oxygen is necessary for many forms of life including fish, invertebrates, bacteria, and plants. In Kaliganj- Maheshpur DO for almost all the samples of ground water ranges from 6.0 to 6.2 mg/L.
- **Electrical Conductivity (EC):** The electrical conductivity (EC) is usually used for indicating the total concentration of the ionized constituents of water. In Kaliganj- Maheshpur transmission line, the EC of the ground water varied from 1431 to 2026 $\mu\text{S}/\text{cm}$.
- **pH:** pH for all locations varied from 6.96 to 7.52 and the water quality shows the basic or neutral state which can be no harm to consume. Besides, the change of pH in every location may occur for different sources.
- **Salinity:** In the southwestern coastal region of Bangladesh, options for drinking water are limited by groundwater salinity. Recently, aquaculture ponds in areas with a thin surface clay layer have increased the salinity in the underlying shallow aquifers. The tested samples salinity in Kaliganj- Maheshpur TL locations fluctuating between the range of 0.07 to 0.10 ppt. It's also noticeable that all the samples of ground water contained a moderate amount of salinity.
- **Temperature (T):** Temperature for all the ground water samples of Kaliganj- Maheshpur were found within the ECR 2023 standard. Seasonal variation is completely responsible for decreasing the temperatures.
- **Hardness:** Hardness is a measure of divalent salts, or positively charged ions, particularly calcium (Ca^{2+}) and magnesium (Mg^{2+}), in water. Total hardness is the sum of the concentrations of Ca^{2+} and Mg^{2+} , expressed in ppm calcium carbonate. The tested report shows the Hardness value in Kaliganj- Maheshpur were found ranges from 302 to 519 mg/L, Except GW1 (519 mg/L), concentration of hardness of other samples are below the ECR 2023 Standard for all locations.
- **Total Dissolved Solid (TDS):** Total Dissolved Solids (TDS) data can be used to identify the presence of currently undeveloped fresh or brackish groundwater at depths that may require protection. TDS of the ground water of Kaliganj- Maheshpur ranges from 712 to 1014 mg/L Except GW1 (1014 mg/L), concentration of TDS of other samples are below the ECR 2023 Standard for all locations of Kaliganj- Maheshpur TL.
- **Manganese (Mn):** Manganese occurs naturally in rocks and soil layers. The human body needs some manganese to stay healthy, but too much can be harmful. Manganese is an element essential to the proper functioning of both humans and other animals, as it is required for the functioning of many cellular enzymes. Except GW6 (4.6 mg/L), concentration of Mn of other samples are below the ECR 2023 Standard for all locations.
- **Iron (Fe):** Iron (Fe) is usually very much available on any bank side of a river or lowland area. The project site is situated not only on the bankside but also in a low land area. Iron level at all tested samples were found within the ECR 2023 value.

- **Arsenic (As):** Arsenic in ground water is recorded in compliance with the ECR 2023 standard of 0.05 mg/L in all water samples of the project site. Except GW6 (0.097mg/L), concentration of As of other samples are below the ECR 2023 Standard for all locations.
- **Total Coliform (TC):** There have been no bacteriological activities shown in the drinking water sources during the baseline study. So, the water is safe to drink depending on the biological parameters.
- **Fecal Coliform (FC):** The presence of fecal coliform bacteria in aquatic environments indicates that the water has been contaminated with the fecal material of humans or other animals. At the time this occurred, the source water may have been contaminated by pathogens or disease-producing bacteria or viruses which can also exist in fecal material. The drinking water results for all locations show zero fecal coliform values in water samples. Hence, the water is free from any pathogenic contamination and is safe to drink.
- **Total petroleum hydrocarbons (TPH):** TPH is a term used to describe a large family of several hundred chemical compounds that originally come from crude oil; the main and most specific part of these compounds are non-polar and slightly polar hydrocarbons. These compounds are harmful to humans and animals. So, detection and control of TPH in water is essential. In Kaliganj-Maheshpur TL locations tested results of all ground water sample were below detection limit (<0.05mg/L).
- **Turbidity:** Turbidity of all tested samples (GW6-GW10) were found within the ECR 2023 value.
- **Chloride:** Chloride concentrations at all tested samples (GW6-GW10) were found within the ECR 2023 value.

4.2.3 Air Quality

48. The subprojects are located in rural areas of Bangladesh. This section identifies the status of the ambient air quality in the alignments: Kaliganj- Maheshpur 132 kV double circuit transmission line, and five substation locations (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur). In these areas, ambient air quality is dependent on many factors like air movement, traffic volume, congestion, emissions from motor vehicles, and suspended dust particles. A continuous monitoring scheme is essential to evaluate air quality and for the development of any plan for mitigation of health risks caused by polluted air. The "criteria pollutants," particulate matter (PM₁₀, PM_{2.5}), CO, SO_x and NO_x must be monitored. Hence, to establish the baseline air quality, as per the monitoring plan, a primary analysis of air quality is proposed, before commencing the construction activities of subprojects.

4.2.3.1 Air Quality Monitoring Methods

49. The existing ambient air quality of the both the alignments have been monitored during the construction period of the project. The ambient status of major air pollutants viz. Particulate Matter (SPM, PM₁₀, and PM_{2.5}), Gaseous substances (NO_x, SO₂, O₃ and CO) and Lead has been assessed.

50. Haz-Scanner™ (HIM 6000)/Lata Envirotech APM 250 has been used to monitor the ambient air quality. The particulate and gaseous samples have been monitored and analysed as per the procedures specified in Table 4-13.

Table 4-13: Methodology for the Analysis of Ambient Air Quality.

Sl. No.	Parameters	Analysis Procedure
1.	SPM	Particulates Sensor Light Scattering Nephometer/ Gravimetric
2.	PM ₁₀	Particulates Sensor Light Scattering Nephometer/ Gravimetric
3.	PM _{2.5}	Particulates Sensor Light Scattering Nephometer/ Gravimetric
4.	SO ₂	High Sensitivity Electrochemical/ West-Geake
5.	NO _x	High Sensitivity Electrochemical/ Jacob & Hochheiser
6.	O ₃	High Sensitivity Electrochemical/ Ozone meter

Sl. No.	Parameters	Analysis Procedure
7.	Pb	AAS

Sources: Information Taken from EQMS Laboratory

Table 4-14: Air Sample Collection Time and Data Converted Time

Sl. No.	Parameters	Sample Collection time (Hr.)	Conversion Time (Hr.)
1.	SPM	8	-
2.	PM ₁₀	24	24
3.	PM _{2.5}	24	24
4.	SO ₂	24	24
5.	NO _x	24	24
6.	CO	8	-
7.	O ₃	8	8
8.	Pb	8	24

Sources: Information Taken from EQMS Laboratory

4.2.3.2 Air Quality Monitoring Locations

51. The objective of the surrounding air quality observing system was to set up the standard encompassing air quality in the study area. The profile of the Project is mainly rural and urban mixed with two major river confluences. The major sources of air pollution noted within the study area include vehicular movement and domestic emissions apart from the existing infrastructure. Ambient air quality has been monitored in the project activities. The location details are as follows Table 4-15. Besides, the monitoring locations map is attached in the annex section for more clarification.

52. Air quality monitoring samples has been monitored for a defined time interval and from different sampling points within project areas (Table 4-15) of Kaliganj- Maheshpur, and five substation locations. Air quality analysis results are shown in Table 4-17. Monitoring photos are shown in Table 4-16.

Table 4-15: Air Quality Measurement Locations and Descriptions

SL No	Sample ID	GPS Coordinate	Location Details	Date & Time	Location Setting
Kaliganj-Maheshpur 132 kV double circuit transmission line					
1.	AQ1	23°21'26.03"N 88°57'44.07"E	Kashipur, Azampur, Maheshpur, Jhenaidah (Near AP 3/1)	27.08.2023 02:21 PM	Agricultural and Residential Area
2.	AQ2	23°22'56.54"N 89°0'35.97"E	Alampur, Azampur, Maheshpur, Jhenaidah (Near AP 5/2)	28.08.2023 08:45 AM	Residential, Commercial and Institutional Area
3.	AQ3	23°25'57.59"N 89°5'10.13"E	Kadirkol, Fajilpur, Kaliganj, Jhenaidah (Near AP 8/8)	28.08.2023 02:44 PM	Agricultural and Institutional Area
4.	AQ4	23°26'1.79"N 89°6'36.36"E	Amtola Bazar, Ganna Road, Kaliganj, Jhenaidah (Near AP 9/5)	29.08.2023 02:32 PM	Commercial and Agricultural Area
5.	AQ5	23°25'18.90"N 89°7'35.80"E	Near Sub-station, Shreerampur, Kaliganj.	29.08.2023 09:12 AM	Commercial and Institutional Area

SL No	Sample ID	GPS Coordinate	Location Details	Date & Time	Location Setting
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Rupsha 230/132/33 kV GIS Substation

6.	AQ6	22°46'23.87"N 89°36'41.46"E	Near Friendship Church	02.01.2023	-
7.	AQ7	22°46'14.24"N 89°37'4.47"E	Residential Area near the Joy Petroleum	02.01.2023	-
8.	AQ8	22°46'26.70"N 89°36'58.31"E	Near the police box area beside Khulna Mongla Road	03.01.2023	-
9.	AQ9	22°46'14.58"N 89°36'56.56"E	Bare Land	03.01.2023	-
10.	AQ10	22°46'19.73"N 89°37'0.50"E	Near 230/132/33 kV GIS Substation at Rupsha	04.01.2023	-

Meherpur 132/33 kV GIS Substation

11.	AQ11	23°47'30.39"N 88°40'48.08"E	Selfie Feeling Station	16.01.2023	-
12.	AQ12	23°47'36.26"N 88°40'54.21"E	Residential Area	16.01.2023	-
13.	AQ13	23°47'32.12"N 88°40'45.93"E	Bare Land	17.01.2023	-
14.	AQ14	23°47'28.07"N 88°40'46.51"E	Near 132/33 kV GIS Substation Meherpur	17.01.2023	-
15.	AQ15	23°47'25.97"N 88°40'40.53"E	Near Nutun Modna Vanga Bazar	18.01.2023	-

Manirampur 132/33 kV GIS Substation

16.	AQ16	22°58'34.73"N 89°13'44.69"E	Near 132/33 kV GIS Substation Manirampur	09.01.2023	
17.	AQ17	22°58'43.47"N 89°13'47.66"E	Baitullah Jame Mosque	09.01.2023	
18.	AQ18	22°58'13.97"N 89°13'42.00"E	Near Ranagar Secondary School	10.01.2023	
19.	AQ19	22°58'26.84"N 89°13'41.27"E	Lauri Madrasha Bazar	10.01.2023	
20.	AQ20-	22°58'36.81"N 89°13'44.17"E	Nearest Residential Area	11.01.2023	

Maheshpur 132/33 kV GIS Substation

21.	AQ21	23°20'33.18"N 88°54'43.78"E	Near 132/33 kV GIS Substation Maheshpur	12.01.2023	
22.	AQ22	23°20'20.98"N 88°54'31.37"E	Near Residential Area near Boga Jame Mosque	12.01.2023	

SL No	Sample ID	GPS Coordinate	Location Details	Date & Time	Location Setting
23.	AQ23	23°20'23.60"N 88°54'51.82"E	Bare Land	14.01.2023	
24.	AQ24	23°20'41.27"N 88°54'44.55"E	Near Chou-Rasta (Al Amin Confectionery)	14.01.2023	
25.	AQ25	23°20'32.69"N 88°54'39.29"E	Near Residential Area	15.01.2023	
Phultola 132/33 kV GIS Substation					
26.	AQ26	22°55'24.53"N 89°29'8.10"E	Near 132/33 kV GIS Substation Phultola	05.01.2023	
27.	AQ27	22°55'12.26"N 89°29'5.72"E	Md. Afiful Islam House near the Road	05.01.2023	
28.	AQ28	22°55'43.57"N 89°29'8.43"E	Near BKSP Khulna	07.01.2023	
29.	AQ29	22°55'20.21"N 89°29'18.79"E	Local Residential Area	07.01.2023	
30.	AQ30	22°55'37.55"N 89°29'19.89"E	Housing area opposite side of the FR Jute Mills Ltd.	08.01.2023	

Source: Environmental Monitoring Report- August 2023. (Kaliganj-Maheshpur 132 kV double circuit transmission line) and Environmental Monitoring Report- January 2023 five substations under Package 7 (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur).

**Monitoring dates and locations obtained from the Environmental Baseline Monitoring reports of the 3rd Party monitoring consultants appointed by EPC Contractors for the respective packages.

Table 4-16 Air Quality Monitoring Pictures

Kaliganj-Maheshpur 132 kV double circuit transmission line	
	
AQ1, Kashipur, Azampur, Maheshpur, Jhenaidah (Near AP 3/1)	



AQ2, Alampur, Azampur, Maheshpur, Jhenaidah (Near AP 5/2)



AQ3, Kadirkol, Fajilpur, Kaliganj, Jhenaidah (Near AP 8/8)



AQ4, Amtola Bazar, Ganna Road, Kaliganj, Jhenaidah (Near AP 9/5)



AQ5, Near Sub-station, Shreerampur, Kaliganj.

Rupsha 230/132/33 kV GIS Substation



Meherpur 132/33 kV GIS Substation



Manirampur 132/33 kV GIS Substation



Maheshpur 132/33 kV GIS Substation



Phultola 132/33 kV GIS Substation



Source: Environmental Monitoring Report- August 2023. (Kaliganj-Maheshpur 132 kV double circuit transmission line) and Environmental Monitoring Report- January 2023 five substations under Package 7 (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur).

4.2.3.3 Analysis Results

53. Among all the parameters of ambient air, SPM, CO, Pb and O₃ had been taken for 8 hours and the rest of the parameters were taken on a 24-hourly basis. O₃ has been measured for Kaliganj-Maheshpur alignment and five substations under Package 7 (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur). Analysis results of every location are briefly mentioned in the following Table 4-17 and Table 4-18.

Table 4-17: Air Quality Analysis Results Kaliganj-Maheshpur TL

Sl. No.	Code	Period	Ambient Air Pollution Concentration in µg/m3							CO (mg/m3)
			PM _{2.5}	PM ₁₀	SO ₂	NO _x	SPM	O ₃	Pb	
			(µg/m3)	(µg/m3)	(µg/m3)	(µg/m3)	(µg/m3)	(mg/m3)	(µg/m3)	
Kaliganj-Maheshpur 132 kV double circuit transmission line										
1.	AQ1	Baseline (Aug. 2023)	35.7	51.2	12.5	15.7	92.8	14.1	BDL	0.051
2.	AQ2	Baseline (Aug. 2023)	44.8	67.5	23.3	32.4	122.1	18.6	BDL	0.213
3.	AQ3	Baseline (Aug. 2023)	31.6	48.3	9.8	17.5	85.8	11.7	BDL	0.021
4.	AQ4	Baseline (Aug. 2023)	38.2	56.7	14.7	27.2	98.7	15.1	BDL	0.125
5.	AQ5	Baseline (Aug. 2023)	41.1	58.5	20.4	35.5	106.2	19.7	BDL	0.098
Duration (hours)			24	24	24	24	8	8	24	8
Bangladesh Standard ⁸			65	150	80	-	-	100	0.50	5
**IFC/WHO Standard ⁹			15	45	40	-	-	100	-	4

Source: Environmental Monitoring Report- August 2023. (Kaliganj-Maheshpur 132 kV double circuit transmission line)

Note: BDL= Below Detection Limit

⁸ Air Pollution (Control) Rules, 2022, Schedule 1: Ambient Air Quality Standards⁹ WHO Ambient Air Quality Guideline Values (2005 and 2000), which are also being referred in the World Bank and IFC's General EHS Guidelines (2007). BDL-Below Detection level

Table 4-18: Air Quality Analysis Results of Substations

Sl. No.	Code	Period	Ambient Air Pollution Concentration in µg/m3						
			PM _{2.5}	PM ₁₀	SPM	SO _x	NO _x	CO	Lead
			(µg/m3)	(µg/m3)	(µg/m3)	(µg/m3)	(µg/m3)	(mg/m3)	(µg/m3)
Rupsha 230/132/33 kV GIS Substation									
1.	AQ6	January 2023	48.3	74.4	175.3	19.8	28.1	0.22	0.01
2.	AQ7	January 2023	50.7	72.7	180.5	20.6	31.4	0.34	0.03
3.	AQ8	January 2023	47.1	70.5	168.4	21.1	29.8	0.25	0.02
4.	AQ9	January 2023	40.5	61.6	153.2	15.1	26.1	0.19	0.01
5.	AQ10	January 2023	57.2	73.5	178.6	21.4	38.8	0.41	0.04
Meherpur 132/33 kV GIS Substation									
6.	AQ11	January 2023	55.8	78.4	171.4	21.5	35.6	0.34	0.04
7.	AQ12	January 2023	48.7	74.7	164.5	16.6	25.2	0.19	0.01
8.	AQ13	January 2023	44.1	70.6	160.3	19.7	31.7	0.21	0.02
9.	AQ14	January 2023	58.8	79.3	178.2	24.2	34.5	0.38	0.04
10.	AQ15	January 2023	46.7	59.5	158.5	18.6	27.9	0.18	0.01
Manirampur 132/33 kV GIS Substation									
11.	AQ16	January 2023	52.5	77.4	165.9	23.3	34.4	0.27	0.02
12.	AQ17	January 2023	51.9	98.9	184.4	127.8	87.5	2.13	0.04
13.	AQ18	January 2023	49.2	72.7	158.6	21.6	30.1	0.26	0.02

Sl. No.	Code	Period	Ambient Air Pollution Concentration in µg/m ³						
			PM _{2.5}	PM ₁₀	SPM	SO _x	NO _x	CO	Lead
			(µg/m ³)	(µg/m ³)	(µg/m ³)	(µg/m ³)	(µg/m ³)	(mg/m ³)	(µg/m ³)
14.	AQ19	January 2023	50.6	76.1	162.8	19.2	29.5	0.19	0.02
15.	AQ20	January 2023	47.7	63.3	160.6	19.3	28.8	0.21	0.01
Maheshpur 132/33 kV GIS Substation									
16.	AQ21	January 2023	51.7	73.3	178.8	28.4	33.4	0.37	0.04
17.	AQ22	January 2023	49.4	71.9	168.4	19.5	26.5	0.16	0.01
18.	AQ23	January 2023	46.6	68.4	162.3	17.9	27.8	0.25	0.01
19.	AQ24	January 2023	52.9	65.5	168.2	26.5	28.7	0.18	0.03
20.	AQ25	January 2023	50.2	61.4	171.9	18.2	25.9	0.14	0.02
Phultola 132/33 kV GIS Substation									
21.	AQ26	January 2023	50.5	71.5	170.7	24.7	33.6	0.48	0.03
22.	AQ27	January 2023	48.9	69.9	176.3	21.2	30.0	0.32	0.02
23.	AQ28	January 2023	53.0	70.8	180.2	20.0	31.5	0.41	0.04
24.	AQ29	January 2023	45.9	60.5	153.1	17.1	21.1	0.19	0.01
25.	AQ30	January 2023	48.6	70.7	172.5	22.3	24.9	0.31	0.01
Duration (hours)			24	24	8	24	24	8	24
Bangladesh Standard ¹⁰			65	150	-	-	-	5	0.50

¹⁰ Air Pollution (Control) Rules, 2022, Schedule 1: Ambient Air Quality Standards

Sl. No.	Code	Period	Ambient Air Pollution Concentration in µg/m3						
			PM _{2.5}	PM ₁₀	SPM	SO _x	NO _x	CO	Lead
			(µg/m3)	(µg/m3)	(µg/m3)	(µg/m3)	(µg/m3)	(mg/m3)	(µg/m3)
IFC/WHO Standard ¹¹			15	45	-	40	-	4	-

Source: Environmental Monitoring Report- January 2023 five substations under Package 7 (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur).

Monitoring results obtained from the Environmental Baseline Monitoring reports of the 3rd Party monitoring consultants appointed by EPC Contractors for the respective packages.

¹¹ WHO Ambient Air Quality Guideline Values (2005 and 2000), which are also being referred in the World Bank and IFC's General EHS Guidelines (2007). BDL-Below Detection level

4.2.3.4 Discussion

Particulate Matter (PM_{2.5}): The result of particulate matter under 2.5 micron has been lower than the standard value of Air Pollution (Control) Rules, 2022, but cross IFC/WHO standard. Vehicle movement on local Road in dry season and dry surface is the main reason to cross the standard (IFC/WHO).

Particulate Matter (PM₁₀): The result of particulate matter under 10 micron has been lower than the standard value of Air Pollution (Control) Rules, 2022, but cross IFC/WHO standard. Vehicle movement on local Road in dry season and dry surface is the main reason to cross the standard (IFC/WHO).

Sulphur Dioxide (SO₂): In Kaliganj- Maheshpur line, SO₂ concentration has been recorded in the range of 9.8 to 23.3 µg/m³. During the monitoring period, the maximum SO₂ concentration has been reported at AQ2 as 23.3 µg/m³ in August 2023. SO₂ concentrations at Kaliganj- Maheshpur line are lower than the IFC/WHO standard level and Bangladesh Standard.

Oxides of Nitrogen (NO_x): NO_x concentration for all location of Kaliganj- Maheshpur and five substation locations have been recorded in the range of 15.7- 87.5 µg/m³.

Suspended Particulate Matter (SPM): The ambient air quality has been monitored in January and August 2022 in five substation locations and Kaliganj- Maheshpur alignments respectively. SPM concentration for all locations has found ranging 85.8- 184.4 µg/m³.

Carbon Monoxide (CO): CO concentration for all location except AQ17 (Manirampur 132/33 kV GIS Substation) have been found to be lower than the standard value of Air Pollution (Control) Rules, 2022.

Oxone (O₃): O₃ concentrations at Kaliganj- Maheshpur line are lower than the IFC/WHO standard level and Bangladesh Standard³. O₃ concentration for all locations have been found lower than the standard value of Air Pollution (Control) Rules, 2022 and IFC/WHO standard for air quality.

4.2.4 Noise Level Monitoring Methods

54. This section identifies the status of the ambient noise level in one alignment: Kaliganj- Maheshpur 132 kV double circuit transmission line and five substation locations (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur). The ambient noise level has been measured within the project area for 24 hour in every location. One Noise data logger sound level meter (Techoplus, Model: SLM25K) has been used to collect the ambient noise levels. After getting all the noise data it has been downloaded to a computer. The noise meter has been settled in a tripod and kept 2-3 m away from the sources. The only sensitive areas have been covered. The noise level has been analyzed according to the methodology and compared with the Noise Pollution (Control) Rules, 2006- Schedule 1. The SLM (sound level meter) has been oriented towards the facility of interest for each measurement taken. The SLM was calibrated before the noise monitoring survey was carried out. The sound level has been recorded in form of A-weighted equivalent continuous sound pressure level (L_{Aeq}) values with the use of A-weighting filters in the noise measuring instrument.

Table 4-19: Noise Level Standards/ Guidelines

Sl. No.	Category of Area/Receptor	Bangladesh Standard ¹²		IFC-WHO ¹³	
		Day [dB(A)] 6 AM – 9 PM	Night [dB(A)] 9 PM – 6 AM	Day [dB(A)] 7 AM – 10 PM	Night [dB(A)] 10 PM – 7 AM
1.	Silent Zone	50	40	55	45
2.	Residential Area	55	45	55	45
3.	Mixed Area	60	50	-	-

¹² Noise Pollution (Control) Rules, 2006- Schedule 1

¹³ Guidelines for Community Noise, World Health Organization (WHO), 1999; As per IFC EHS noise level guidelines,

4.	Commercial Area	70	60	70	70
5.	Industrial Area	75	70	70	70

Note: The day time is considered from 6 a.m. to 9 p.m. and the night time is from 9 p.m. to 6 a.m.

55. Area within 100 meters of hospital or education institution or government designated / to be designated/ specific institution/ establishment are considered Silent Zone. Use of motor vehicle horn or other signals and loudspeakers are forbidden in Silent Zone.

4.2.4.1 Noise Level Monitoring Locations

56. Noise levels were recorded at five locations in Kaliganj-Maheshpur 132 kV double circuit transmission line and for each substation. Noise levels were recorded in the form of sound pressure levels using a digital sound level meter. Detail list of noise level sampling location is given in **Table 4-20**.

57. **Table 4-20**. Noise level was measured at every location at different time. The sound level is recorded in form of A-weighted equivalent continuous sound pressure level (Leq) values with the use of A-weighting filters in the noise measuring instrument.

Table 4-20: Sensitive Noise Locations and Descriptions of Kaliganj- Maheshpur and Five Substations

Sl. No.	Code	Location	GPS Coordinates	Sampling Date	Category
Kaliganj-Maheshpur 132 kV double circuit transmission line					
1.	NL-1	Kashipur, Azampur, Maheshpur, Jhenaidah (Near AP 3/1)	23°47'51.28"N 88°44'41.88"E	27.08.2023	Residential Area
2.	NL-2	Alampur, Azampur, Maheshpur, Jhenaidah (Near AP 5/2)	23°49'44.50"N 88°46'40.81"E	28.08.2023	Mixed Area
3.	NL-3	Kadirkol, Fajilpur, Kaliganj, Jhenaidah (Near AP 8/8)	23°50'8.75"N 88°54'12.71"E	28.08.2023	Silent Area
4.	NL-4	Amtola Bazar, Ganna Road, Kaliganj, Jhenaidah (Near AP 9/5)	23°50'27.29"N 89° 2'10.86"E	29.08.2023	Commercial Area
5.	NL-5	Near Sub- station, Shreerampur, Kaliganj.	23°51'50.06"N 89° 4'42.54"E	29.08.2023	Mixed Area

Rupsha 230/132/33 kV GIS Substation

Sl. No.	Code	Location	GPS Coordinates	Sampling Date	Category
6.	NL-6	Near Friendship Church	22°46'24.72"N 89°36'43.06"E	02.01.2023	Mixed
7.	NL-7	Residential Area near the Joy Petroleum	22°46'13.90"N 89°37'4.44"E	02.01.2023	Commercial
8.	NL-8	Near the police box area beside Khulna Mongla Road	22°46'26.28"N 89°36'59.06"E	03.01.2023	Commercial
9.	NL-9	Bare Land	22°46'14.59"N 89°36'59.30"E	03.01.2023	Mixed
10.	NL-10	Near 230/132/33 kV GIS Substation at Rupsha	22°46'20.05"N 89°36'59.92"E	04.01.2023	Mixed

Meherpur 132/33 kV GIS Substation

11.	NL-11	Selfie Feeling Station	23°47'30.48"N 88°40'48.05"E	16.01.2023	Mixed
12.	NL-12	Residential Area	23°47'36.49"N 88°40'54.13"E	16.01.2023	Mixed
13.	NL-13	Bare Land	23°47'32.40"N 88°40'46.04"E	17.01.2023	Mixed
14.	NL-14	Near 132/33 kV GIS Substation Meherpur	23°47'27.75"N 88°40'46.76"E	17.01.2023	Mixed
15.	NL-15	Near Nutun Modna Vanga Bazar	23°47'25.05"N 88°40'41.58"E	18.01.2023	Commercial

Manirampur 132/33 kV GIS Substation

16.	NL-16	Near 132/33 kV GIS Substation Monirampur	22°58'34.60"N 89°13'44.95"E	09.01.2023	Mixed
17.	NL-17	Baitullah Jame Mosque	22°58'43.42"N 89°13'47.77"E	09.01.2023	Industrial
18.	NL-18	Near Ranagar Secondary School	22°58'13.83"N 89°13'41.91"E	10.01.2023	Commercial

Sl. No.	Code	Location	GPS Coordinates	Sampling Date	Category
19.	NL-19	Lauri Madrasa Bazar	22°58'26.84"N 89°13'41.27"E	10.01.2023	Commercial
20.	NL-20	Nearest Residential Area	22°58'36.47"N 89°13'43.65"E	11.01.2023	Mixed

Maheshpur 132/33 kV GIS Substation

21.	NL-21	Near 132/33 kV GIS Substation Maheshpur	23°20'32.97"N 88°54'44.69"E	12.01.2023	Mixed
22.	NL-22	Near Residential Area near Boga Jame Mosque	23°20'21.04"N 88°54'31.21"E	12.01.2023	Commercial
23.	NL-23	Bare Land	23°20'24.12"N 88°54'51.25"E	14.01.2023	Mixed
24.	NL-24	Near Chou-Rasta (Al Amin Confectionery)	23°20'40.83"N 88°54'44.38"E	14.01.2023	Mixed
25.	NL-25	Near Residential Area	23°20'32.50"N 88°54'39.87"E	15.01.2023	Mixed

Phultola 132/33 kV GIS Substation

26.	NL-26	Near 132/33 kV GIS Substation Phultola	22°55'27.22"N 89°29'7.94"E	05.01.2023	Industrial
27.	NL-27	Md. Afiful Islam House near the Road	22°55'11.60"N 89°29'5.83"E	05.01.2023	Mixed
28.	NL-28	Near BKSP Khulna	22°55'43.90"N 89°29'8.03"E	07.01.2023	Mixed
29.	NL-29	Local Residential Area	22°55'20.20"N 89°29'18.39"E	07.01.2023	Residential
30.	NL-30	Housing area opposite side of the FR Jute Mills Ltd.	22°55'37.36"N 89°29'19.04"E	08.01.2023	Residential

Source: Environmental Monitoring Report- August 2023. (Kaliganj-Maheshpur 132 kV double circuit transmission line) and Environmental Monitoring Report- January 2023 five substations under Package 7 (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur).

Monitoring dates and locations obtained from the Environmental Baseline Monitoring reports of the 3rd Party monitoring consultants appointed by EPC Contractors for the respective packages.

Table 4-21 Noise level Monitoring Pictures.

Kaliganj-Maheshpur 132 kV double circuit transmission line	
	
NL1; Kashipur, Azampur, Maheshpur, Jhenaidah (Near AP 3/1)	
	
NL2; Alampur, Azampur, Maheshpur, Jhenaidah (Near AP 5/2)	
	
NL3; Kadirkol, Fajilpur, Kaliganj, Jhenaidah (Near AP 8/8)	



NL4; Amtola Bazar, Ganna Road, Kaliganj, Jhenaidah (Near AP 9/5)



NL5; Near Sub-station, Shreerampur, Kaliganj.

Rupsha 230/132/33 kV GIS Substation





Meherpur 132/33 kV GIS Substation



Manirampur 132/33 kV GIS Substation

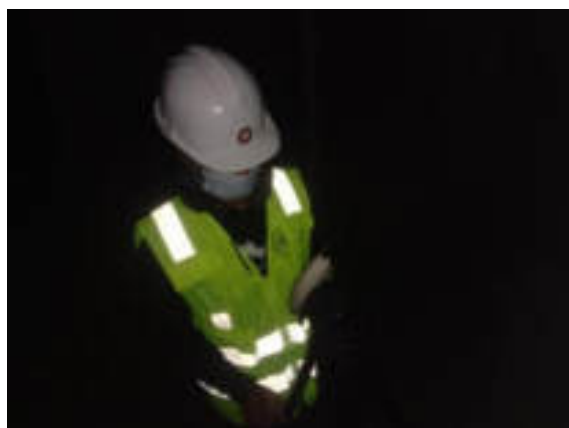


Maheshpur 132/33 kV GIS Substation





Phultola 132/33 kV GIS Substation



Source: Environmental Monitoring Report- August 2023. (Kaliganj-Maheshpur 132 kV double circuit transmission line) and Environmental Monitoring Report- January 2023 five substations under Package 7 (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur).

4.2.4.2 Analysis Results

58. An electronic and auto-recorded noise meter has been used to conduct the study. The recorded noise levels summary monitoring results are shown in Table 4-22.

Table 4-22: Noise Level Monitoring Results

Sl. No.	Code	Period	Ambient Noise Level [dB(A)]		Bangladesh Standard ¹⁴		IFC/WHO Standard ¹⁵		Category of Area/Receptor
			Leq _{day}	Leq _{night}	Day	Night	Day	Night	
Kaliganj-Maheshpur 132 kV double circuit transmission line									
1.	NL-1	Baseline (Aug.2023)	53.1	36.8	55	45	55	45	Residential Area
2.	NL-2	Baseline (Aug.2023)	55.8	36.3	60	50	-	-	Mixed Area
3.	NL-3	Baseline (Aug.2023)	49.9	35.8	50	40	55	45	Silent Area
4.	NL-4	Baseline (Aug.2023)	62.7	45.1	70	60	70	60	Commercial Area
5.	NL-5	Baseline (Aug.2023)	57.5	37.2	60	50	-	-	Mixed Area
Rupsha 230/132/33 kV GIS Substation									

¹⁴ Noise Pollution (Control) Rules, 2006, Schedule 1: Area-wise Noise Standards.¹⁵ Guidelines for Community Noise, World Health Organization (WHO), 1999; As per IFC EHS noise level guidelines

Sl. No.	Code	Period	Ambient Noise Level [dB(A)]		Bangladesh Standard ¹⁴		IFC/WHO Standard ¹⁵		Category of Area/Receptor
			Leq _{day}	Leq _{night}	Day	Night	Day	Night	
6.	NL-6	Baseline (Jan.2023)	58.37	47.91	60	50	-	-	Mixed
7.	NL-7	Baseline (Jan.2023)	63.70	52.31	70	60	70	70	Commercial
8.	NL-8	Baseline (Jan.2023)	68.25	57.64	70	60	70	70	Commercial
9.	NL-9	Baseline (Jan.2023)	43.80	39.41	60	50	-	-	Mixed
10.	NL-10	Baseline (Jan.2023)	51.80	40.41	60	50	-	-	Mixed
Meherpur 132/33 kV GIS Substation									
11.	NL-11	Baseline (Jan.2023)	56.08	47.41	60	50	-	-	Mixed
12.	NL-12	Baseline (Jan.2023)	52.32	39.62	60	50	-	-	Mixed
13.	NL-13	Baseline (Jan.2023)	51.98	40.30	60	50	-	-	Mixed
14.	NL-14	Baseline (Jan.2023)	53.32	41.34	60	50	-	-	Mixed
15.	NL-15	Baseline (Jan.2023)	72.18	52.50	70	60	70	70	Commercial
Manirampur 132/33 kV GIS Substation									

Sl. No.	Code	Period	Ambient Noise Level [dB(A)]		Bangladesh Standard ¹⁴		IFC/WHO Standard ¹⁵		Category of Area/Receptor
			Leq _{day}	Leq _{night}	Day	Night	Day	Night	
16.	NL-16	Baseline (Jan.2023)	51.08	42.41	60	50	-	-	Mixed
17.	NL-17	Baseline (Jan.2023)	72.32	59.62	75	70	70	70	Industrial
18.	NL-18	Baseline (Jan.2023)	73.98	57.30	70	60	70	70	Commercial
19.	NL-19	Baseline (Jan.2023)	72.32	54.34	70	60	70	70	Commercial
20.	NL-20	Baseline (Jan.2023)	52.18	42.50	60	50	-	-	Mixed
Maheshpur 132/33 kV GIS Substation									

Sl. No.	Code	Period	Ambient Noise Level [dB(A)]		Bangladesh Standard ¹⁴		IFC/WHO Standard ¹⁵		Category of Area/Receptor
			Leq _{day}	Leq _{night}	Day	Night	Day	Night	
21.	NL-21	Baseline (Jan.2023)	58.08	46.41	60	50	-	-	Mixed
22.	NL-22	Baseline (Jan.2023)	68.32	49.62	70	60	70	70	Commercial
23.	NL-23	Baseline (Jan.2023)	52.98	47.30	60	50	-	-	Mixed
24.	NL-24	Baseline (Jan.2023)	71.32	54.34	60	50	-	-	Mixed
25.	NL-25	Baseline (Jan.2023)	56.18	42.50	60	50	-	-	Mixed
Phultola 132/33 kV GIS Substation									
26.	NL-26	Baseline (Jan.2023)	71.08	59.41	75	70	70	70	Industrial
27.	NL-27	Baseline (Jan.2023)	59.32	44.34	60	50	-	-	Mixed
28.	NL-28	Baseline (Jan.2023)	57.32	45.62	60	50	-	-	Mixed
29.	NL-29	Baseline (Jan.2023)	50.18	37.50	55	45	55	45	Residential
30.	NL-30	Baseline (Jan.2023)	49.18	36.50	55	45	55	45	Residential

Source: Environmental Monitoring Report- August 2023. (Kaliganj-Maheshpur 132 kV double circuit transmission line) and Environmental Monitoring Report- January 2023 five substations under Package 7 (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur).

4.2.4.3 Discussion

59. According to Bangladesh Environmental Quality Standard ECR'23 categorizations, the current monitoring location falls into Mixed area (NL2, NL5, NL6, NL9-14, NL16, NL20-21, NL23-25 and NL27-28), Commercial area (NL4, NL7-8, NL15, NL18-19 and NL22), Silent zone (NL3), Industrial zone (NL17 and NL26) and Residential Area (NL1, NL29 and NL30). The daytime and nighttime noise level at most of the locations are found within the national standards.

4.2.5 Physiographic Features

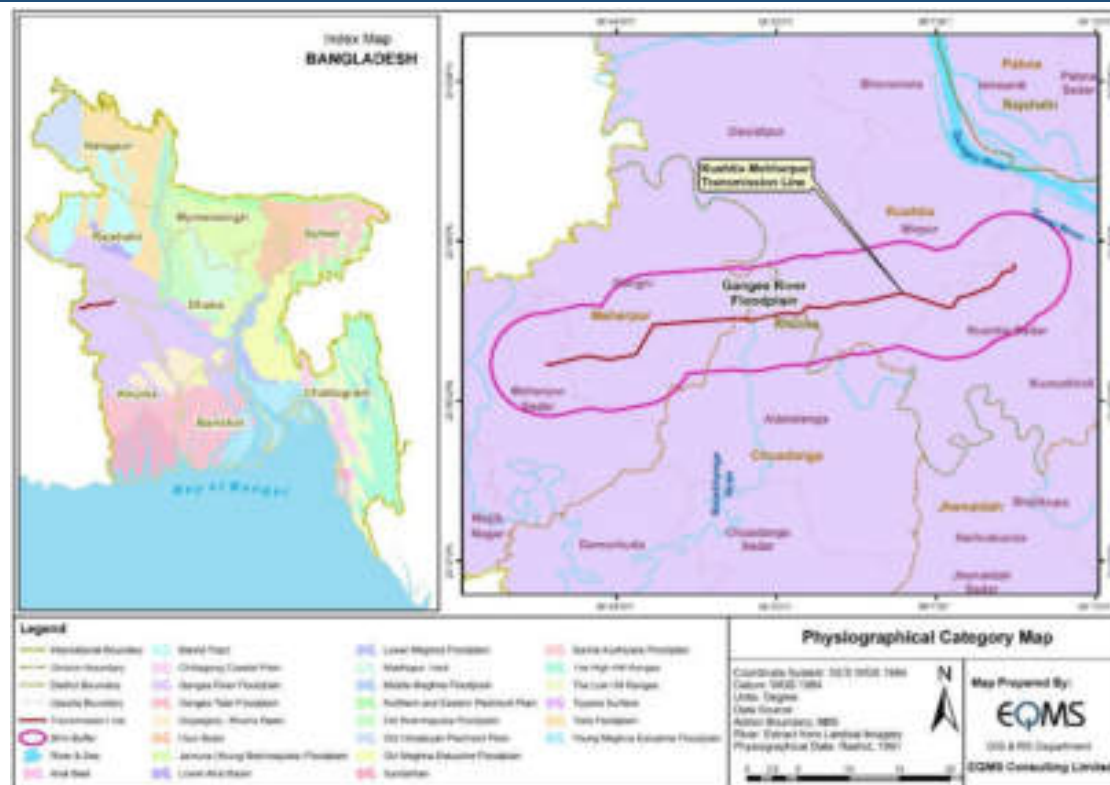
60. In the context of physiography, Bangladesh is classified into three distinct regions: (a) floodplains; (b) terraces; and (c) hills each having distinguishing characteristics of its own. Further, the physiography of the country has been divided into 24 sub regions and 54 units. The physiography of 5km buffer of Kaliganj- Maheshpur route fall in Ganges River Floodplain. Five substations fall into following physiographic locations depicted in below table.

Table 4-23: Physiographic features of five substations

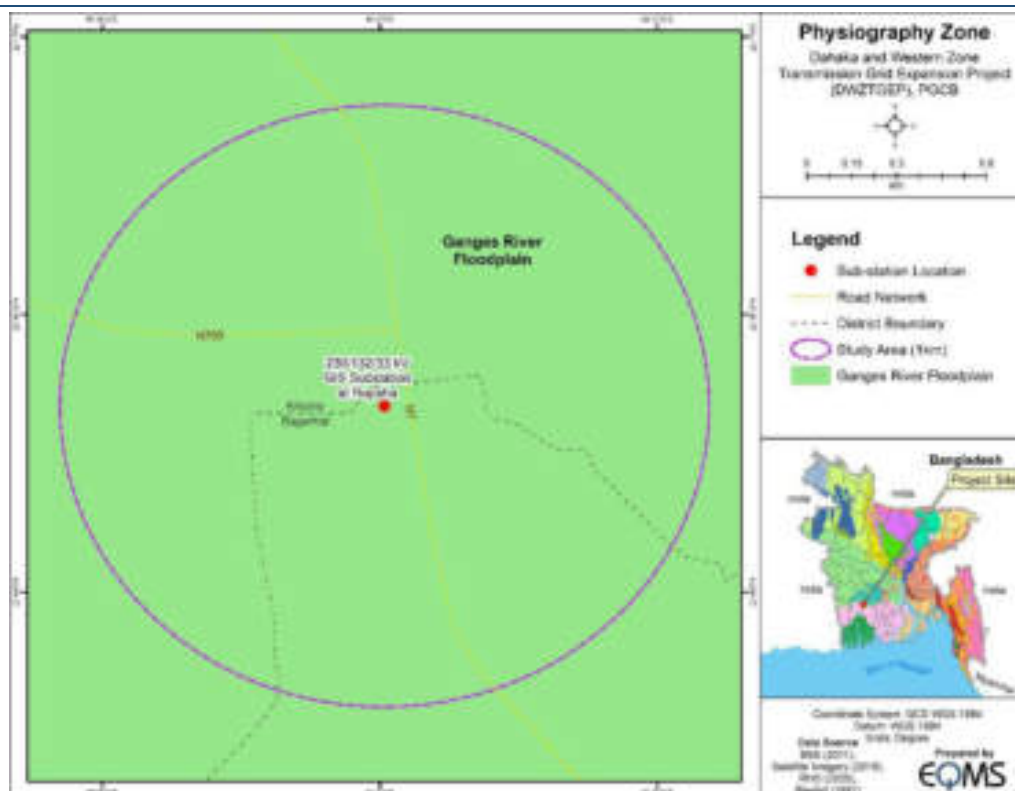
SI No.	Substations	Physiographic Features
1.	230/132/33 kV GIS Substation at Rupsha	Ganges River Floodplain
2.	132/33 kV GIS Substation Meherpur	Ganges River Floodplain
3.	132/33 kV GIS Substation Manirampur	Ganges River Floodplain
4.	132/33 kV GIS Substation Maheshpur	Ganges River Floodplain
5.	132/33 kV GIS Substation Phultola	Ganges River Floodplain

Figure 4-4 shows the physiographic condition of Kaliganj- Maheshpur, and five substation locations.

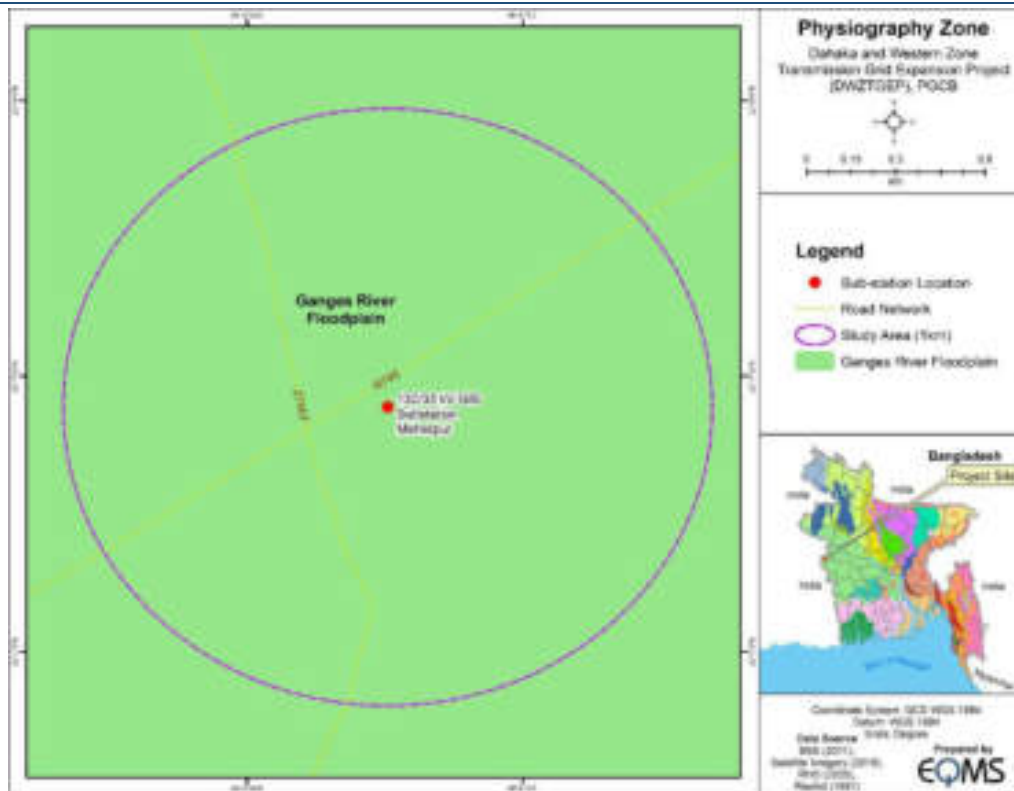
Figure 4-4: Physiographic Map of Kaliganj- Maheshpur TL and Rupsha, Meherpur, Manirampur, Maheshpur and Phultola Substations



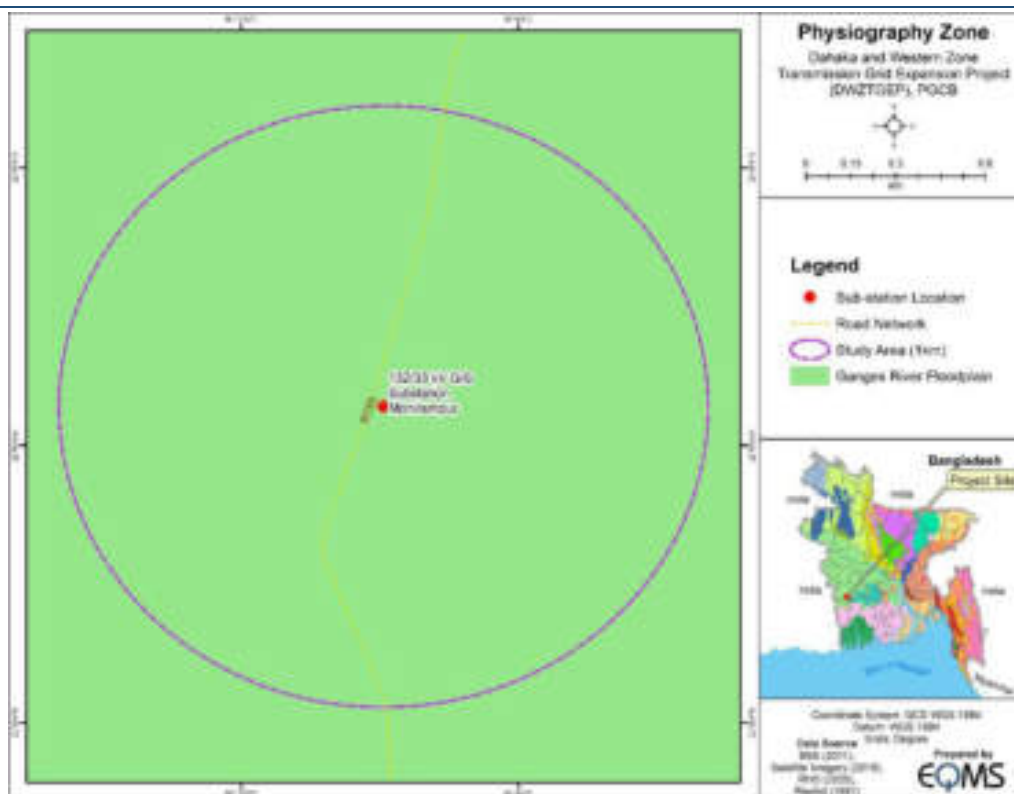
Kaliganj-Maheshpur 132 kV double circuit transmission line



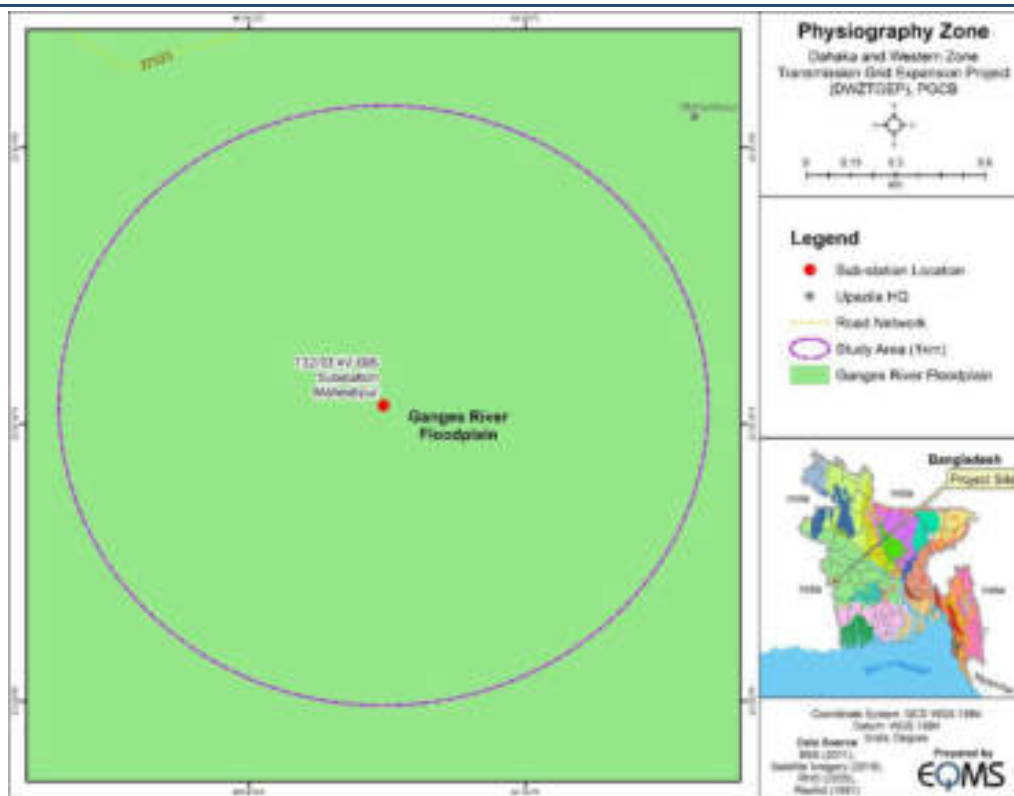
Rupsha 230/132/33 kV GIS Substation



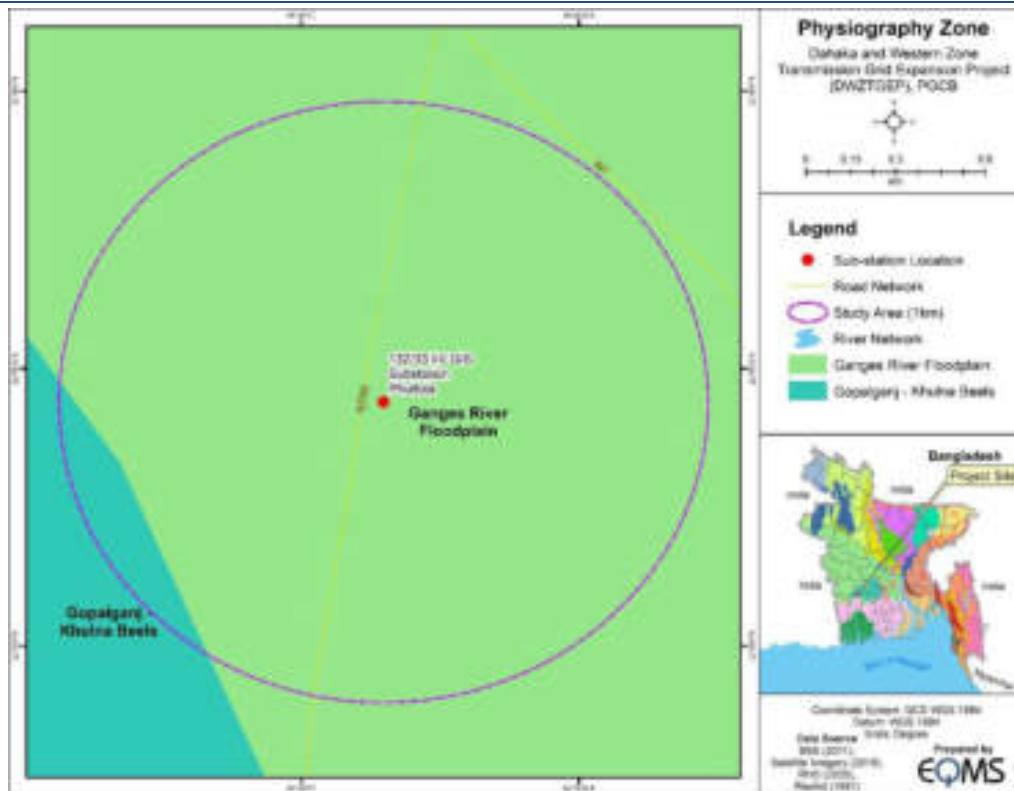
Meherpur 132/33 kV GIS Substation



Manirampur 132/33 kV GIS Substation



Maheshpur 132/33 kV GIS Substation



Phultola 132/33 kV GIS Substation

Source: SRDI, 1997, Rashid 1991, & Riemann, 1933

4.2.6 Topography

61. Bangladesh is one of the largest deltas in the world formed by the confluence of three Himalayan rivers: the Ganges (Padma); the Brahmaputra (Jamuna); and, the Meghna, with a long coastline along the Bay of Bengal. Floodplains (80%), terraces (8%) and hills (12%) cover the land area.

62. The country has a considerable topographic diversity. It has three distinctive features: (i) a broad alluvial plain subject to frequent flooding; (ii) a slightly elevated relatively older plain; and (iii) a small hill region drained by flashy rivers. The south is a highly irregular deltaic coastline of about 600 km fissured by many estuarine rivers and channels flowing into the Bay of Bengal. The alluvial plain is part of the larger plain of Bengal, which is sometimes called the Lower Gangetic Plain. Elevations of the plains are less than 10 m above the sea level; elevations further decline to near sea level in the coastal south. Most of the southwest project area in Khulna and Barisal divisions lies in the alluvial plain. The hilly areas of the southeastern region of Chattogram, the northeastern hills of Sylhet and highlands in the north and northwest are of low elevation. The Chattogram Hills constitute the only significant hill system in the country. They rise steeply to narrow ridgelines, with elevation ranging between 600 m and 900 m above mean sea level. The highest point of 1,230 m is at Mt. Keokradong. In between the hilly ridges lie the valleys that generally run north to south. West of the Chattogram hills is a narrow, wet coastal plain lying parallel to the shoreline.

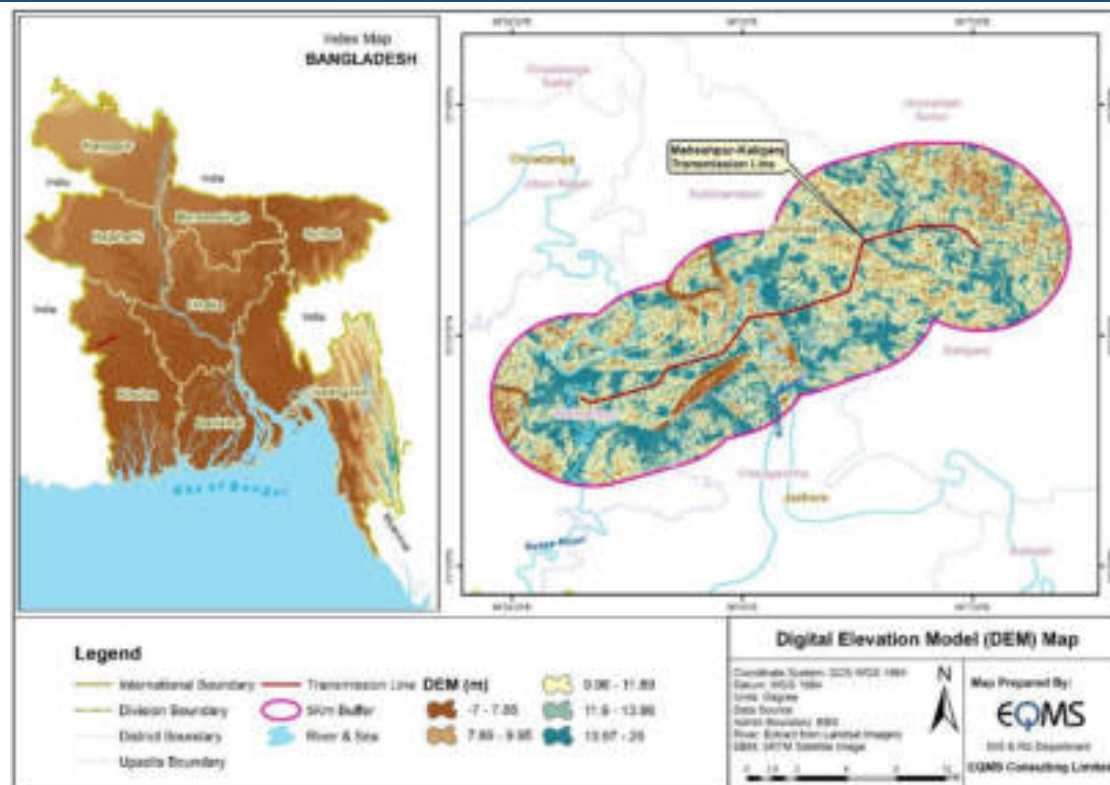
63. The average elevation of Kaliganj- Maheshpur alignment is 11.93- 18.92m. The average elevation of Five substations is depicted in below table.

Table 4-24: Topographic features of five substations

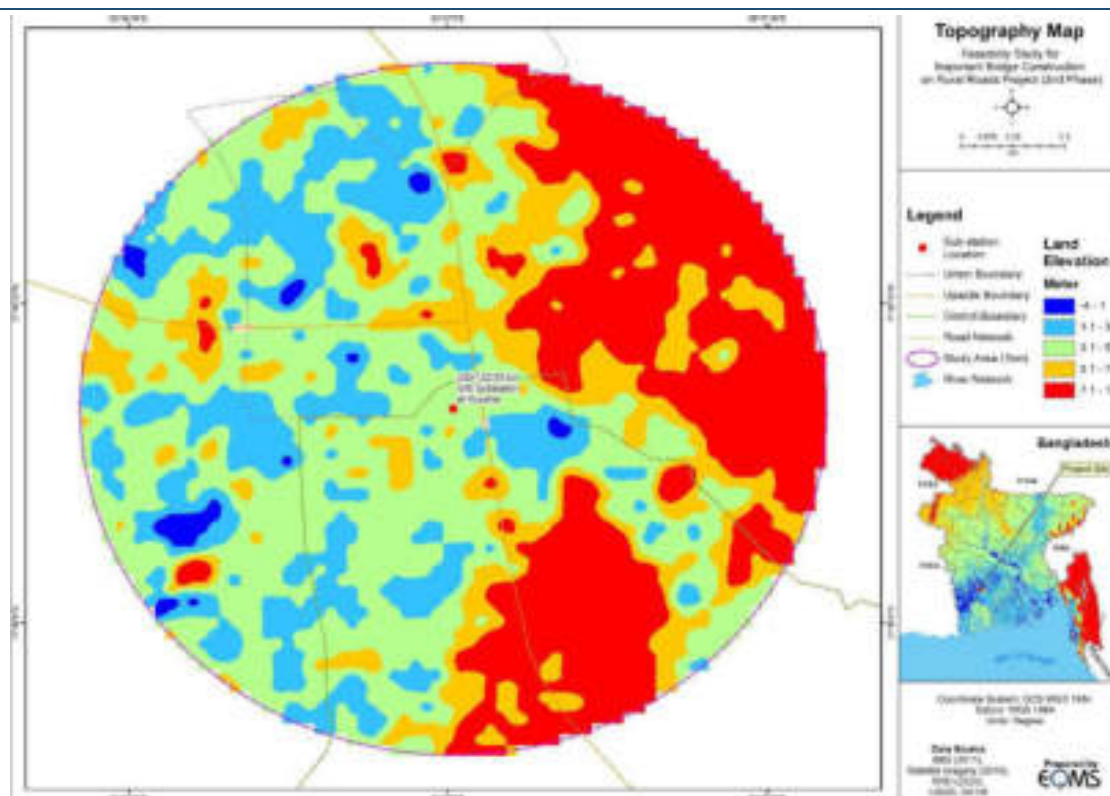
SI No.	Substations	Average Elevation (m)
1.	230/132/33 kV GIS Substation at Rupsha	3.1-5
2.	132/33 kV GIS Substation Meherpur	15-16
3.	132/33 kV GIS Substation Manirampur	0-5
4.	132/33 kV GIS Substation Maheshpur	2-9
5.	132/33 kV GIS Substation Phultola	0.4-1

The topographic map of these alignments is shown in Figure 4-5.

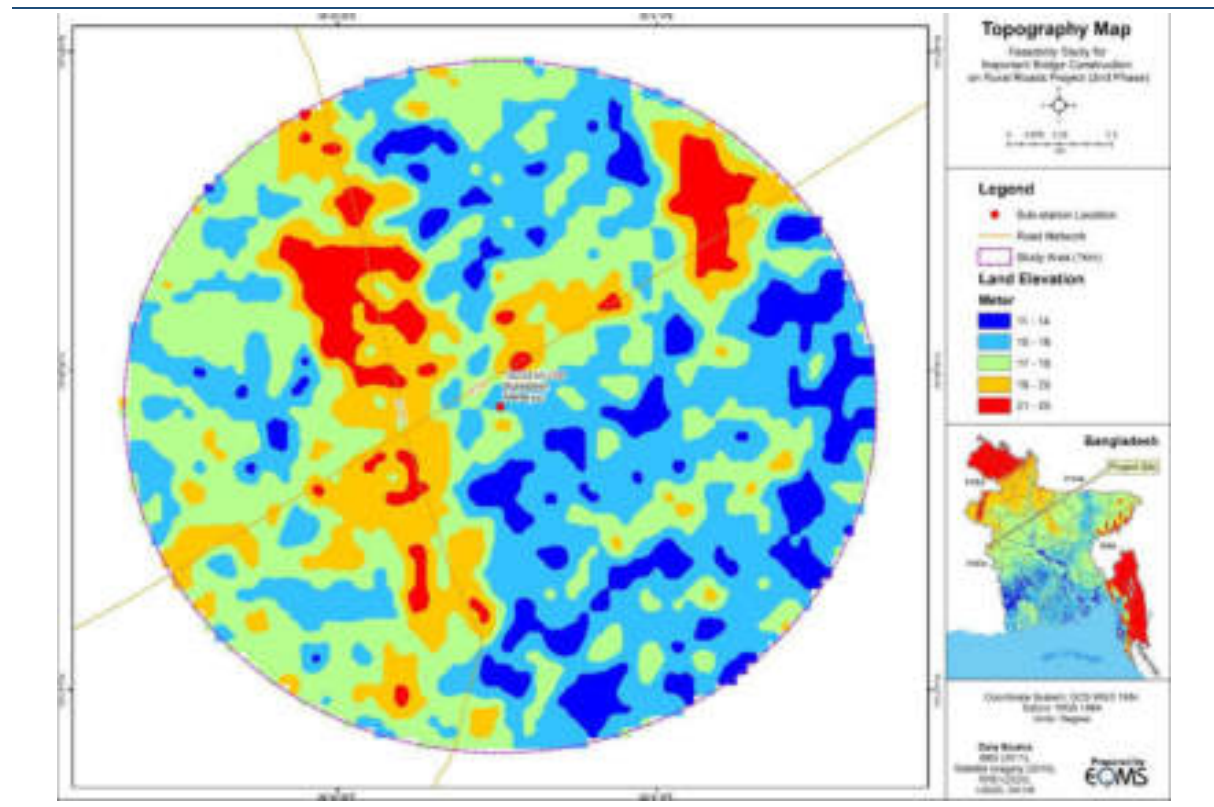
Figure 4-5: Topography of Kaliganj- Maheshpur TL and Rupsha, Meherpur, Manirampur, Maheshpur and Phultola Substations



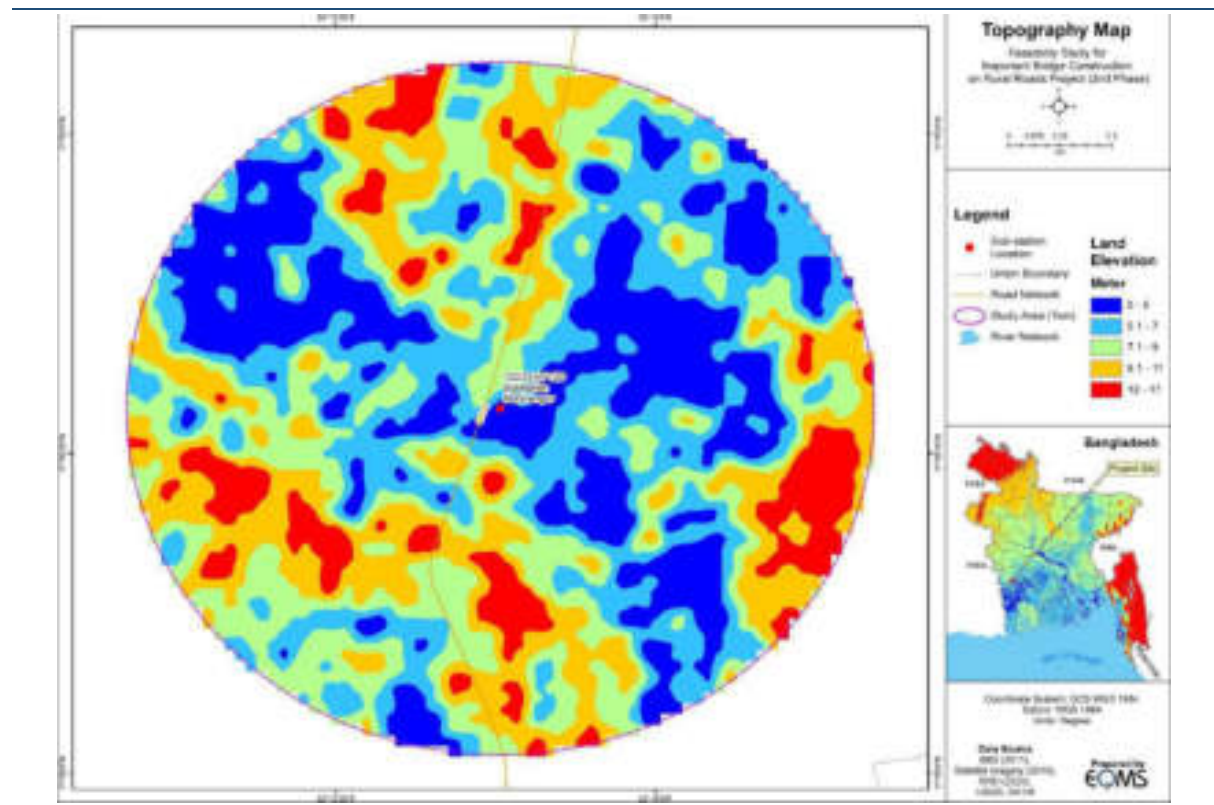
Kaliganj-Maheshpur 132 kV double circuit transmission line



Rupsha 230/132/33 kV GIS Substation



Meherpur 132/33 kV GIS Substation



Manirampur 132/33 kV GIS Substation

Topography Map
Preliminary Study for
Improving Bridge Construction
on Rural Roads Project (2nd Phase)

0 1000 200 300
(Scale in meters)

Legend

- Sub-station Location
- Road Network
- Study Area (Chen)
- Land Elevation

Value

- 4 - 1
- 1.1 - 2
- 2.1 - 5
- 5.1 - 7
- 7.1 - 12

Bangladesh

Coastline (Satellite) (2000-2010) Data
Satellite (2010) Data
(Scale: 1:100,000)

Data Source
DEM (2010)
Satellite Imagery (2010)
GPS (2010)
Roads (2010)

Prepared by
ECMS

Source: SRTM Satellite Image

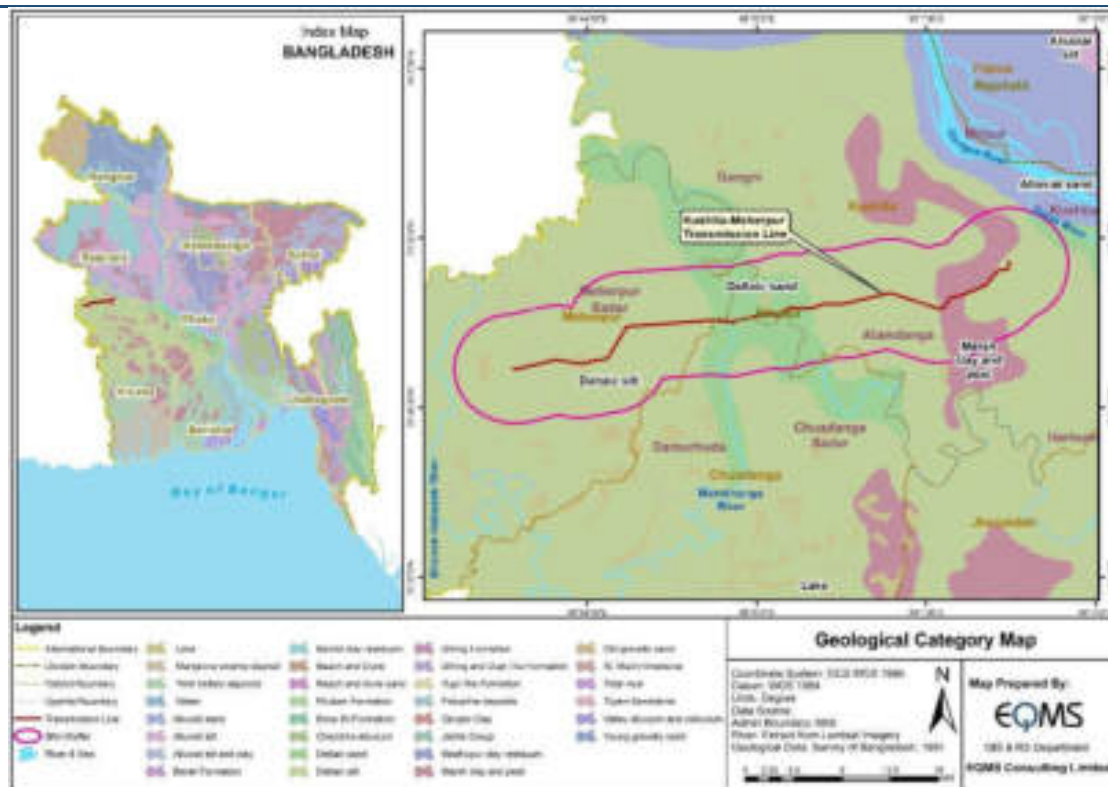
4.2.7 Geology

64. Bangladesh is situated to the east of the Indian sub-continental plate. Nearly 85% of Bangladesh is underlain by deltaic and alluvial deposits of the Ganges, Brahmaputra, and Meghna River systems. The project area consists of Holocene alluvial deposits in the floodplain and predominantly consisting of fine sand, silts and clay. The site is on deep Cenozoic deposits that overlie Precambrian basement rock. The Precambrian rocks form the basement of all geological formations of the Bengal Basin and shield areas. The materials deposited are a mixture of sediments transported by the old Brahmaputra and by the Jamuna (Brahmaputra) River. The generalized geological features of the project area are shown in the geological map of Bangladesh. As per the geological category map of Bangladesh, the majority of the 5 km buffer of Kaliganj- Maheshpur route falls under deltaic sand and deltaic silt category (Figure 4-6). Five substations fall into following geographic locations depicted in below table and Figure 4-6.

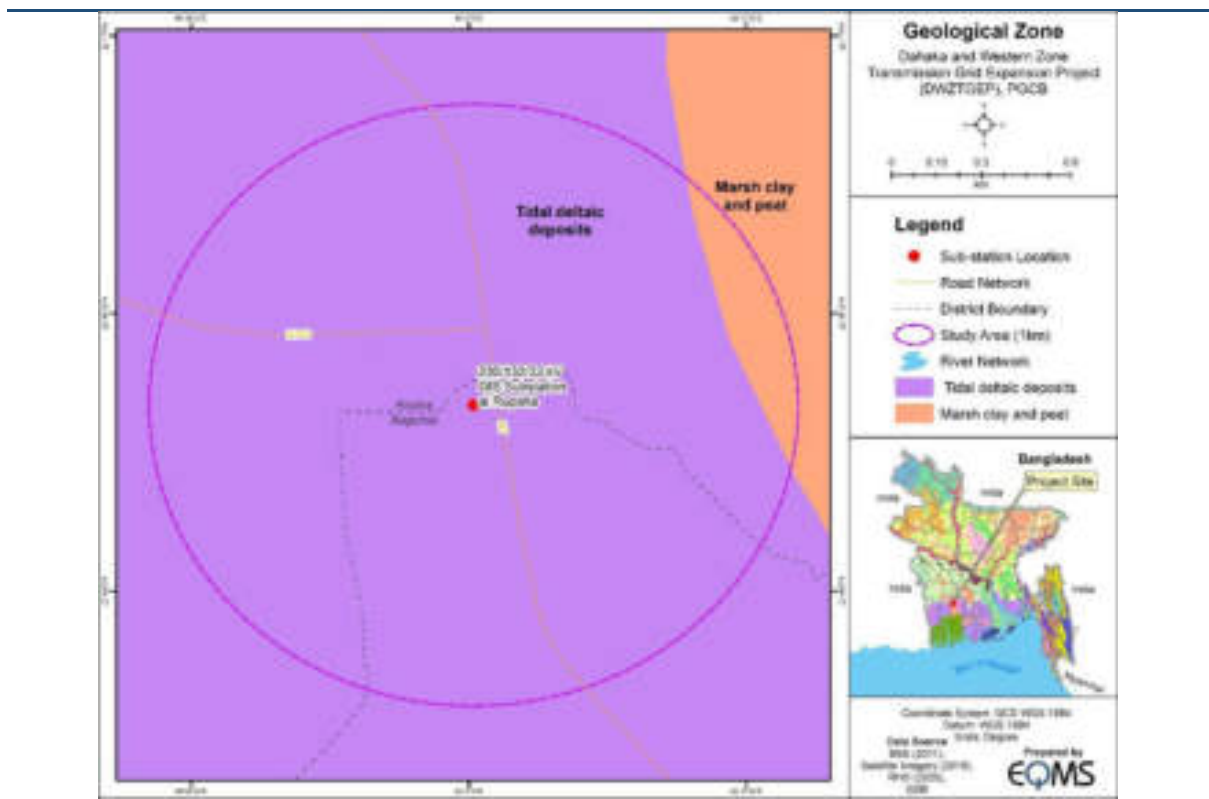
Table 4-25: Geographic features of five substations

Sl No.	Substations	Geographic Features
1.	230/132/33 kV GIS Substation at Rupsha	Tidal Deltaic Deposits
2.	132/33 kV GIS Substation Meherpur	Deltaic Silt
3.	132/33 kV GIS Substation Manirampur	Deltaic Silt
4.	132/33 kV GIS Substation Maheshpur	Deltaic Silt
5.	132/33 kV GIS Substation Phultola	Deltaic Silt

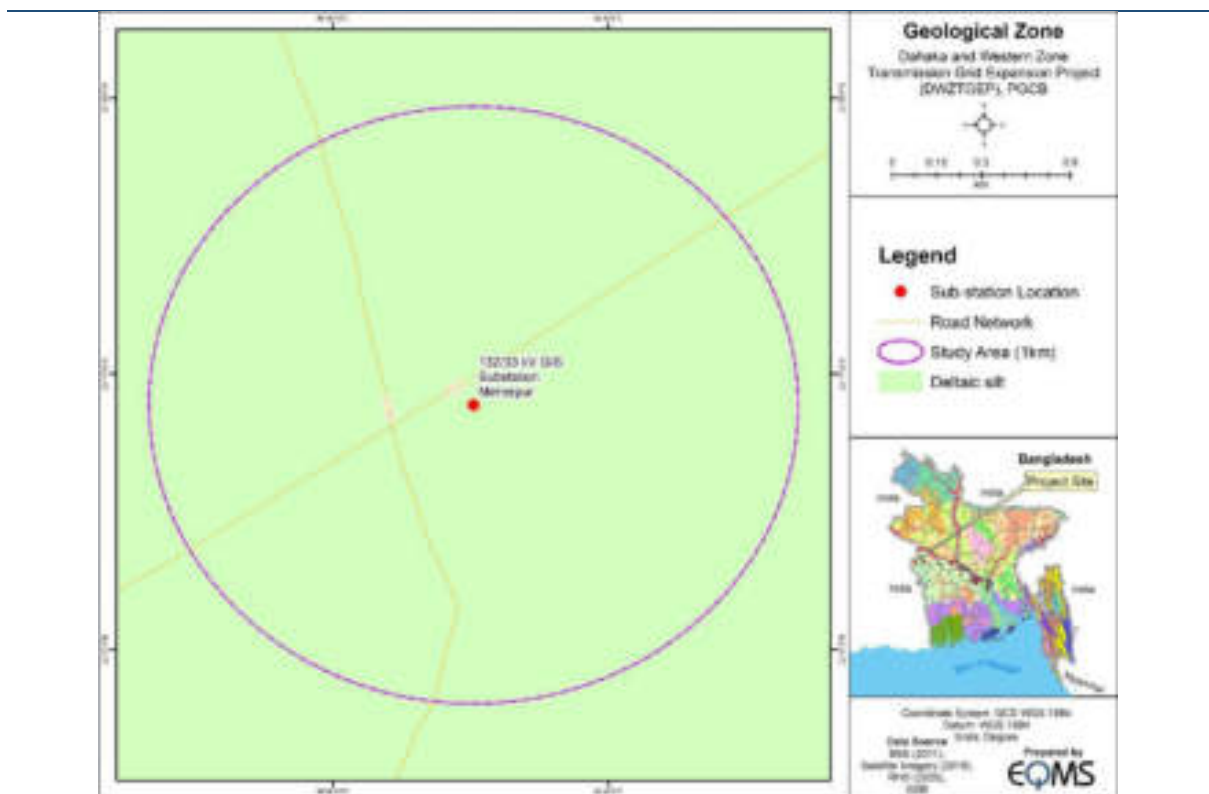
Figure 4-6: Geology of Kaliganj- Maheshpur TL and Rupsha, Meherpur, Manirampur, Maheshpur and Phultola Substations



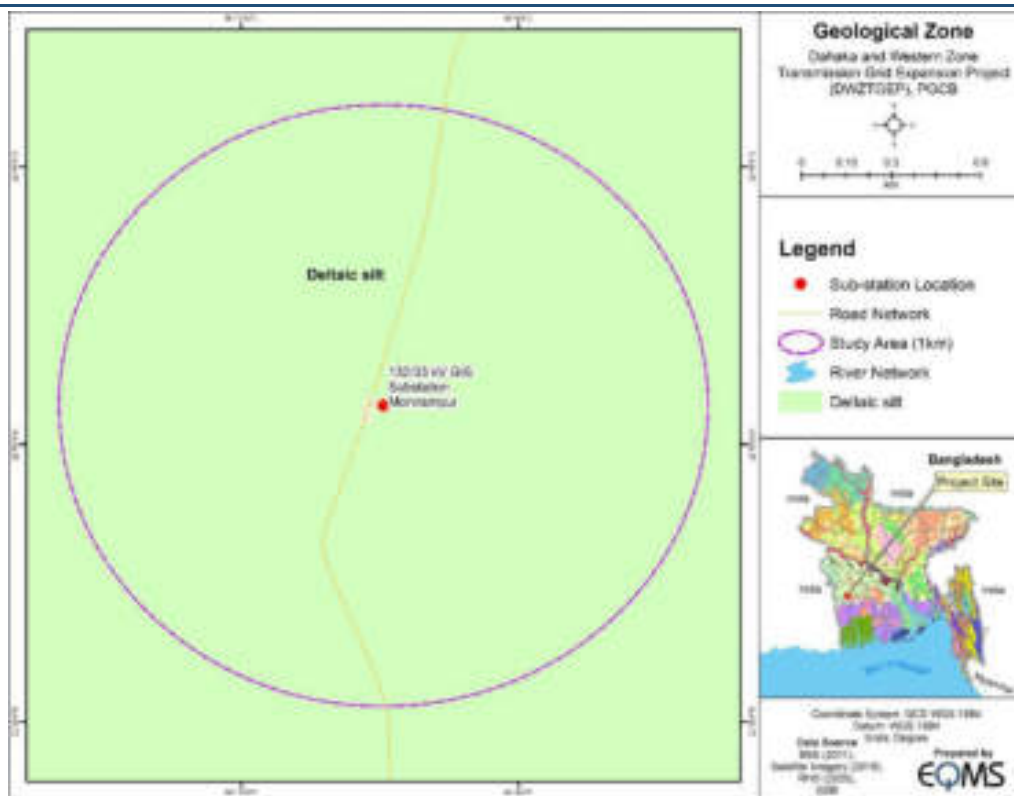
Kaliganj-Maheshpur 132 kV double circuit transmission line



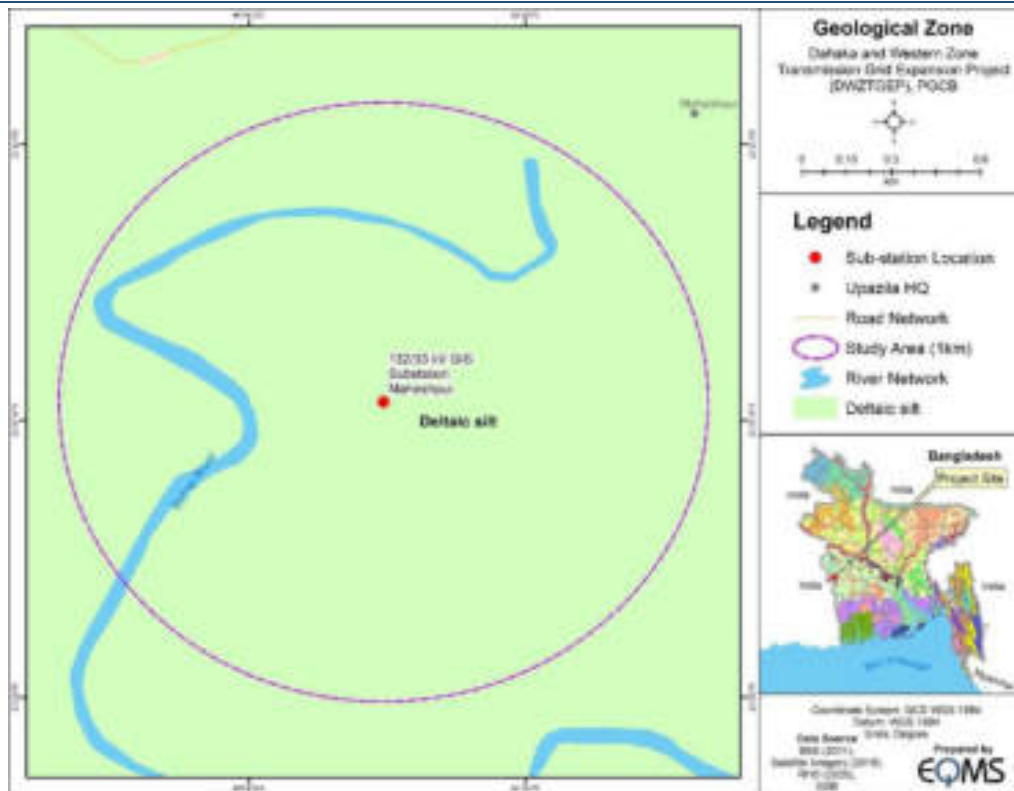
Rupsha 230/132/33 kV GIS Substation



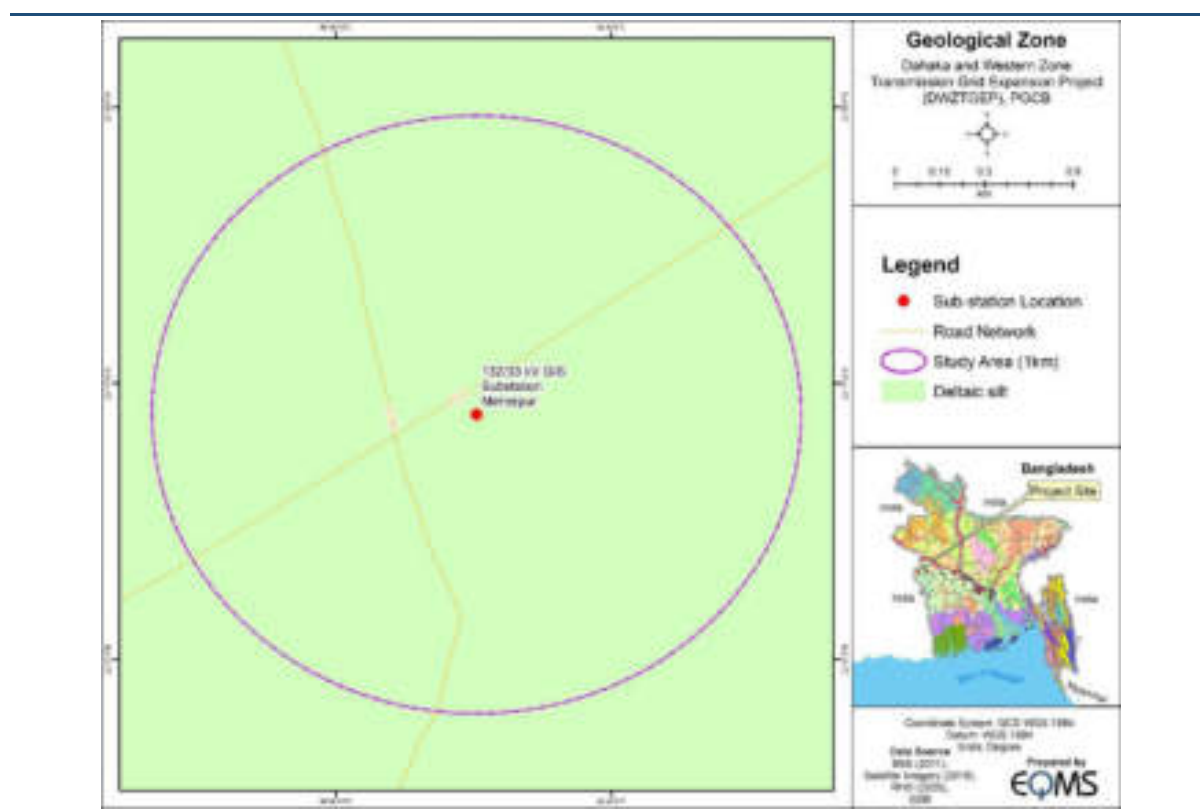
Meherpur 132/33 kV GIS Substation



Manirampur 132/33 kV GIS Substation



Maheshpur 132/33 kV GIS Substation

**Phultola 132/33 kV GIS Substation**

Source: Survey of Bangladesh

4.2.8 Soil

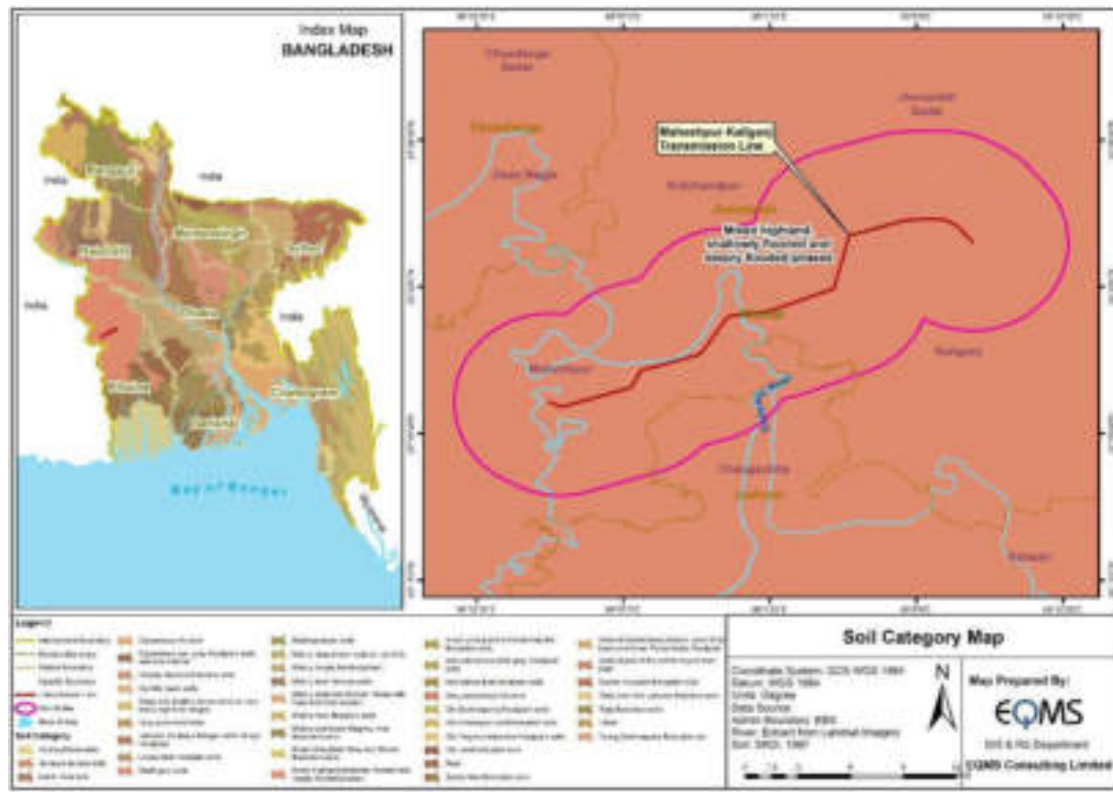
65. The project areas fall into seven different soil formation zones (Figure 4-7). The general soil types of 500m buffer of Kaliganj- Maheshpur is mixed highland and shallow flooded and deeply flooded phases. Five substations fall into following geographic locations depicted in below table.

Table 4-26: Soil features of five substations

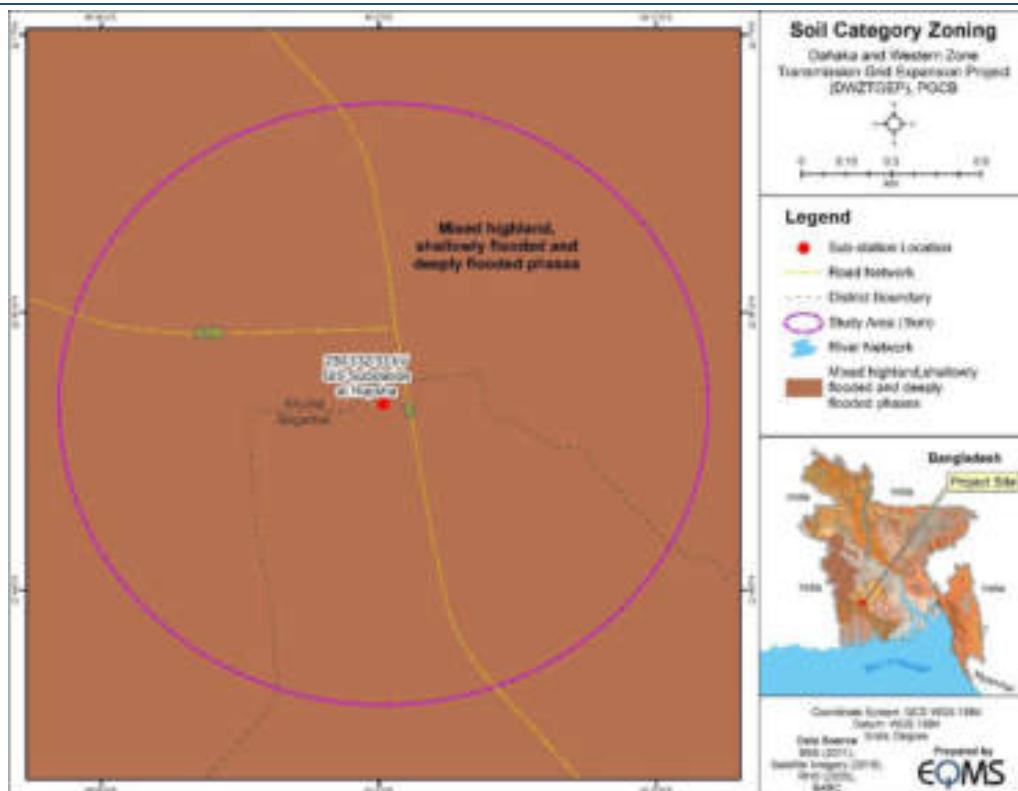
SI No.	Substations	Soil Features
1.	230/132/33 kV GIS Substation at Rupsha	mixed highland and shallow flooded and deeply flooded phases
2.	132/33 kV GIS Substation Meherpur	mixed highland and shallow flooded and deeply flooded phases
3.	132/33 kV GIS Substation Manirampur	mixed highland and shallow flooded and deeply flooded phases
4.	132/33 kV GIS Substation Maheshpur	mixed highland and shallow flooded and deeply flooded phases
5.	132/33 kV GIS Substation Phultola	mixed highland and shallow flooded and deeply flooded phases

The soil category of Kaliganj- Maheshpur and five substations are shown in Figure 4-7.

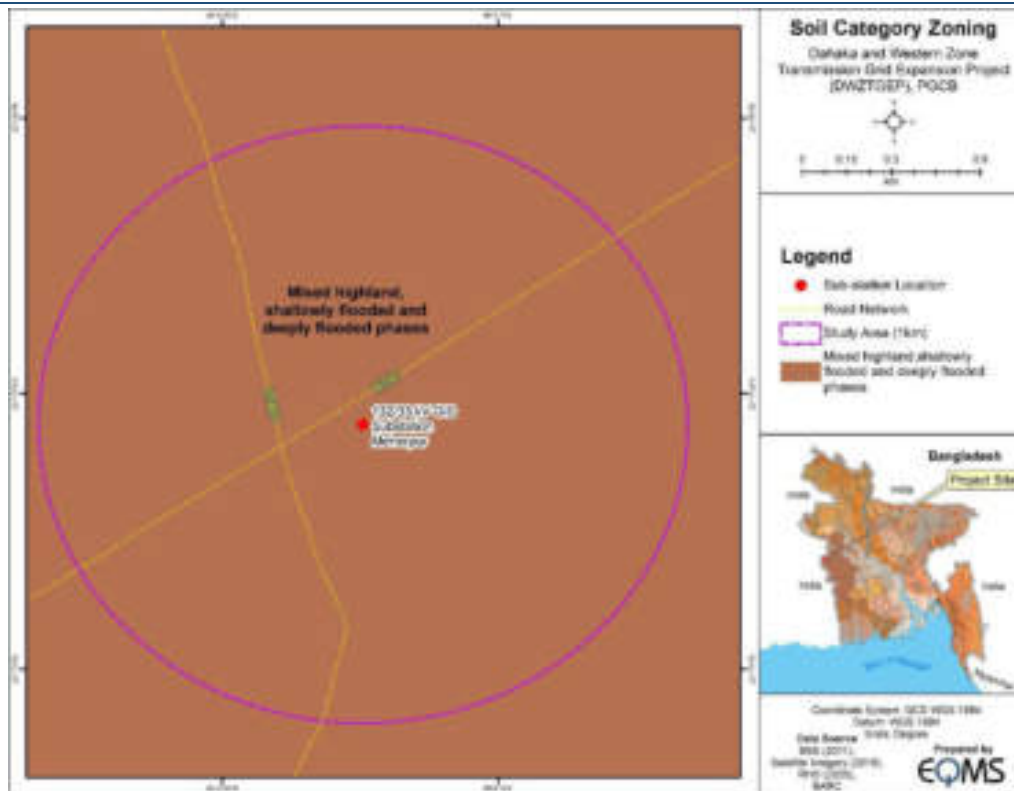
Figure 4-7: Soil Category of Kaliganj- Maheshpur TL and Rupsha, Meherpur, Manirampur, Maheshpur and Phultola Substations



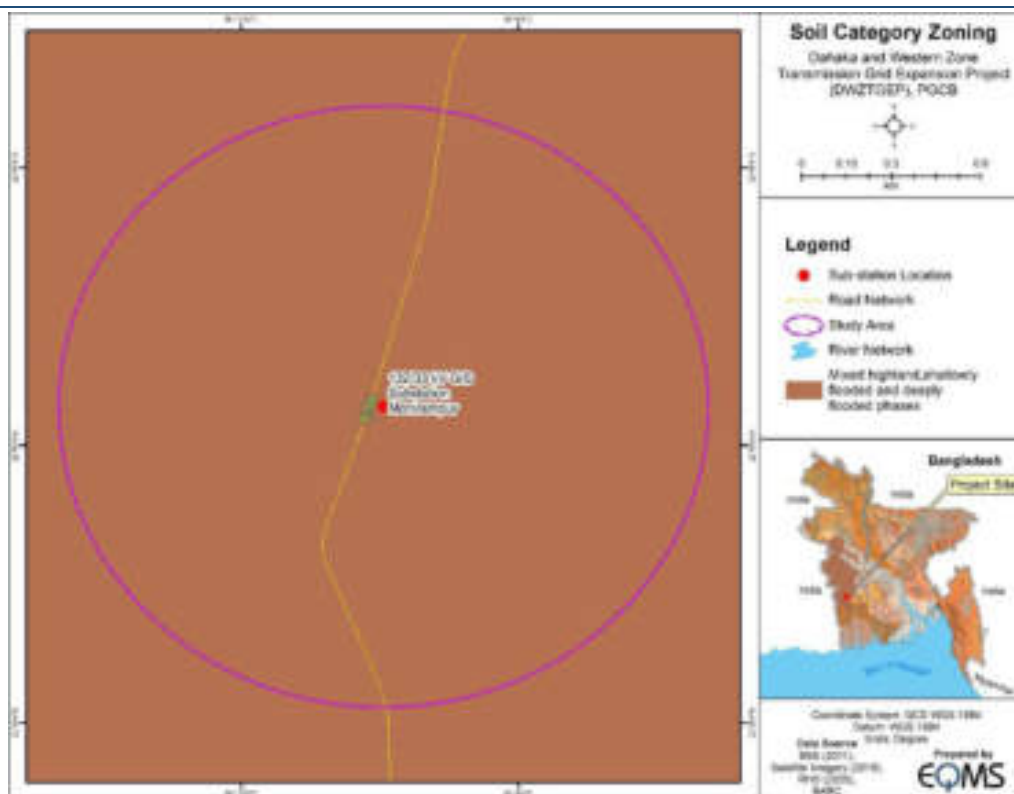
Kaliganj-Maheshpur 132 kV double circuit transmission line



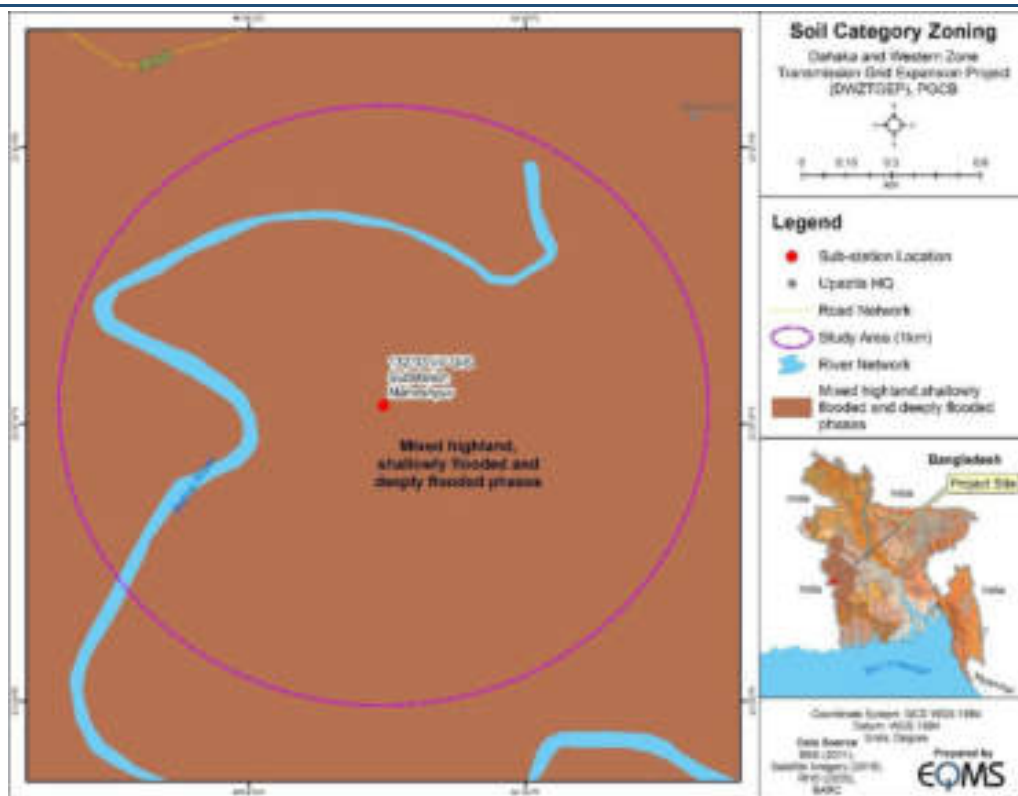
Rupsha 230/132/33 kV GIS Substation



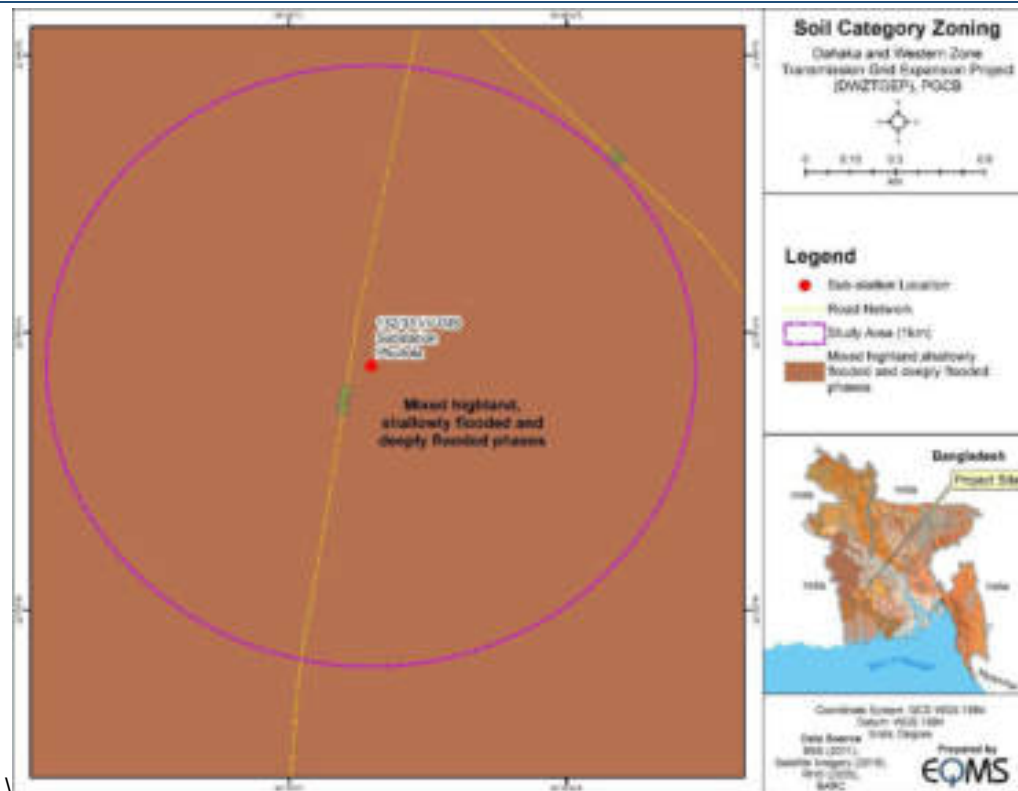
Meherpur 132/33 kV GIS Substation



Manirampur 132/33 kV GIS Substation



Maheshpur 132/33 kV GIS Substation



Phultola 132/33 kV GIS Substation

Source: Soil Resource Development Institute (SRDI)

4.2.9 Flood prone areas

66. Bangladesh is prone to flooding, due to being situated on the Ganges Delta with many tributaries flowing into the Bay of Bengal. Flooding normally occurs during the monsoon season from June to September. The convectional rainfall of the monsoon is added to by relief rainfall caused by the Himalayas. Meltwater from the Himalayas is also a significant input and contributes to floods every year. This often lasts for about a month. Seventy-five percent of Bangladesh is less than 10 m above sea level and 80% is floodplain; therefore, the country is very much at risk of widespread damage due to floods, despite its development. Each year in Bangladesh about 26,000 km² (around 18%) of the country is flooded^{16 17}. As per the flood category map, Kaliganj- Maheshpur alignments fall under low river flooding zone and partially in moderate tidal surge zone. Five substations fall into following flood prone locations depicted in below table.

Table 4-27: Flood prone Areas of five substations

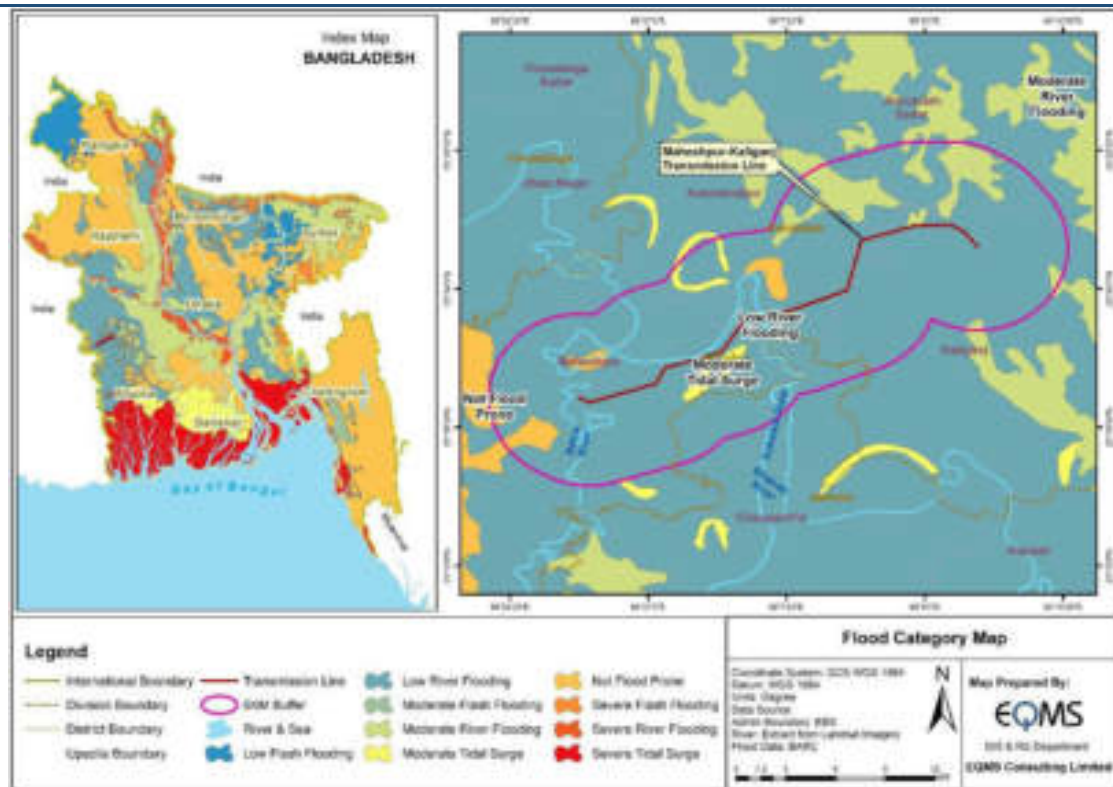
Sl No.	Substations	Flood prone Areas
1.	230/132/33 kV GIS Substation at Rupsha	Moderate Tidal Surge Zone
2.	132/33 kV GIS Substation Meherpur	Low River Flooding Zone
3.	132/33 kV GIS Substation Manirampur	Low River Flooding Zone
4.	132/33 kV GIS Substation Maheshpur	Low River Flooding Zone
5.	132/33 kV GIS Substation Phultola	Not Flood Prone Zone

Figure 4-8 represents flood prone areas Kaliganj- Maheshpur and five substation locations.

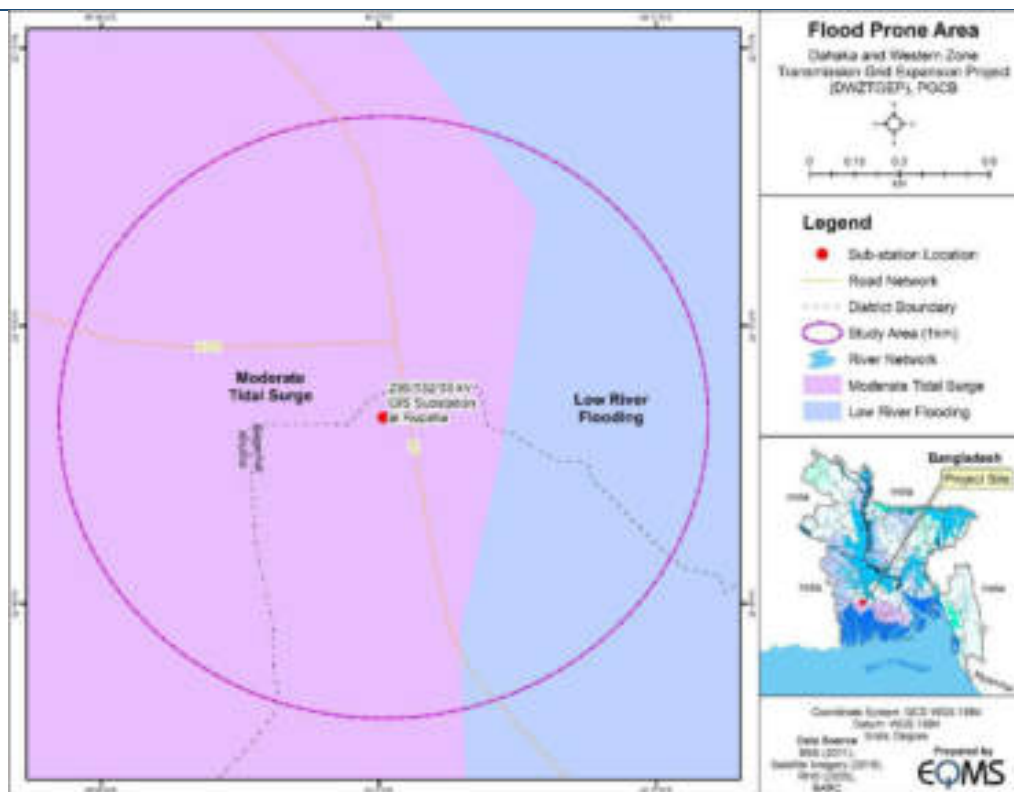
¹⁶ [http://en.banglapedia.org/index.php?title=Bangladesh Soil](http://en.banglapedia.org/index.php?title=Bangladesh_Soil)

¹⁷ Bangladesh Agricultural Research Council (BARC)/GIS Project, BGD/95/006)

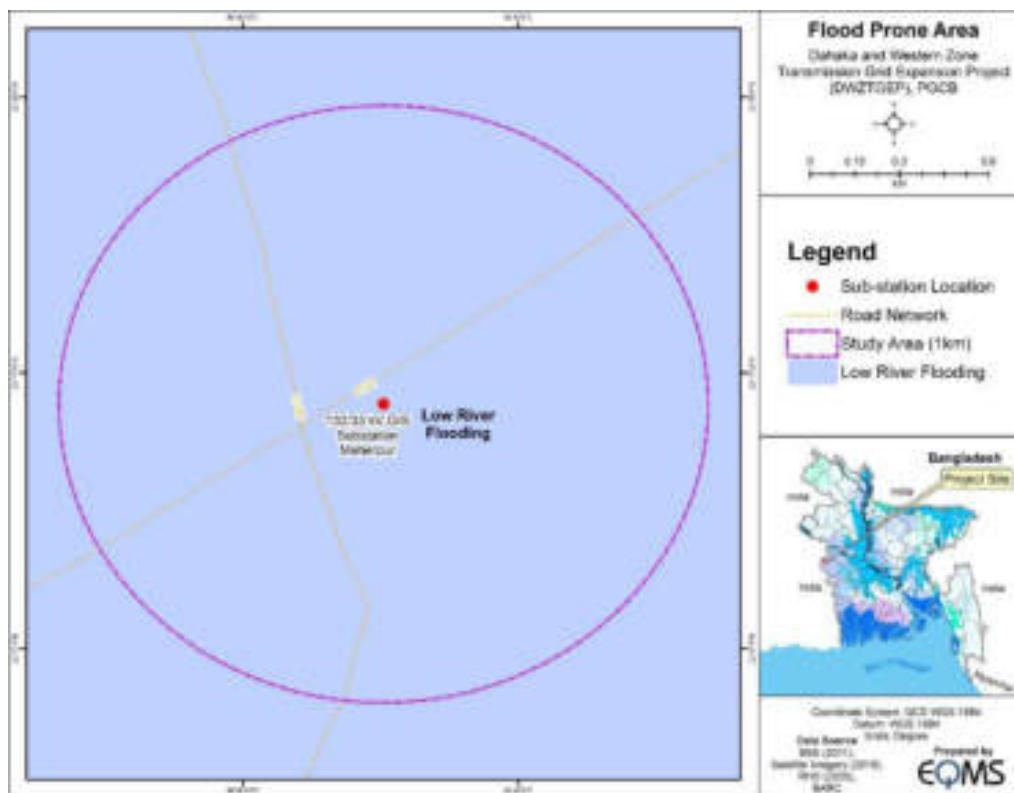
Figure 4-8: Flood Prone Category of Kaliganj- Maheshpur TL and Rupsha, Meherpur, Manirampur, Maheshpur and Phultola Substations



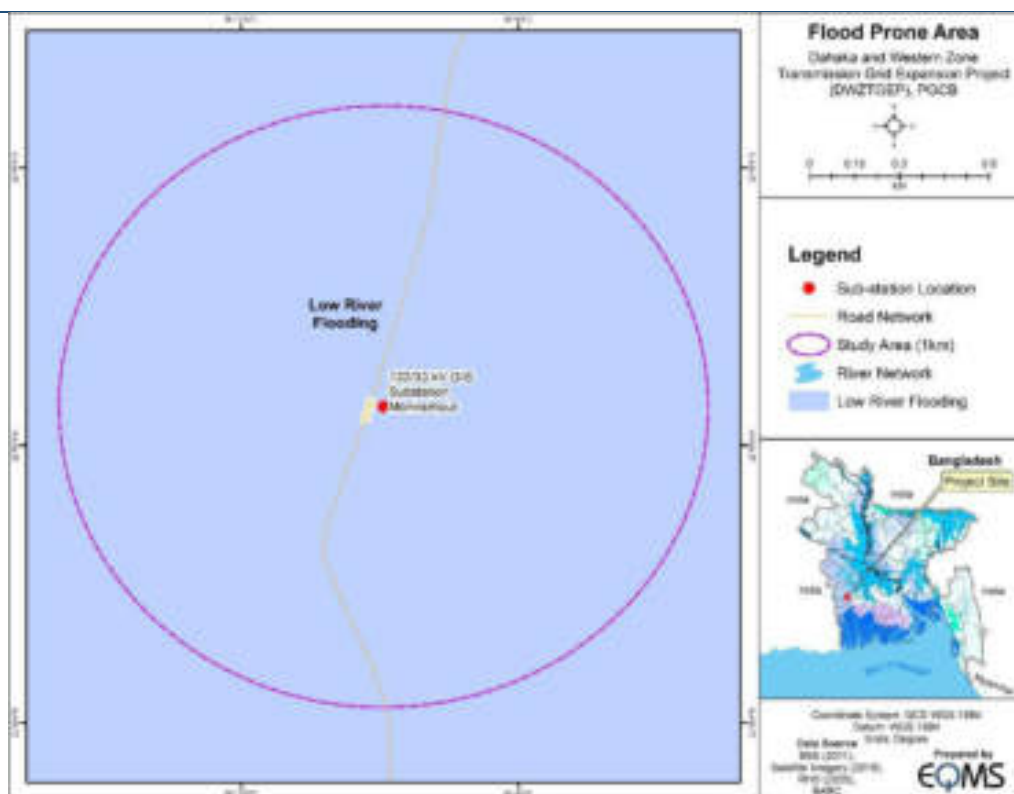
Kaliganj-Maheshpur 132 kV double circuit transmission line



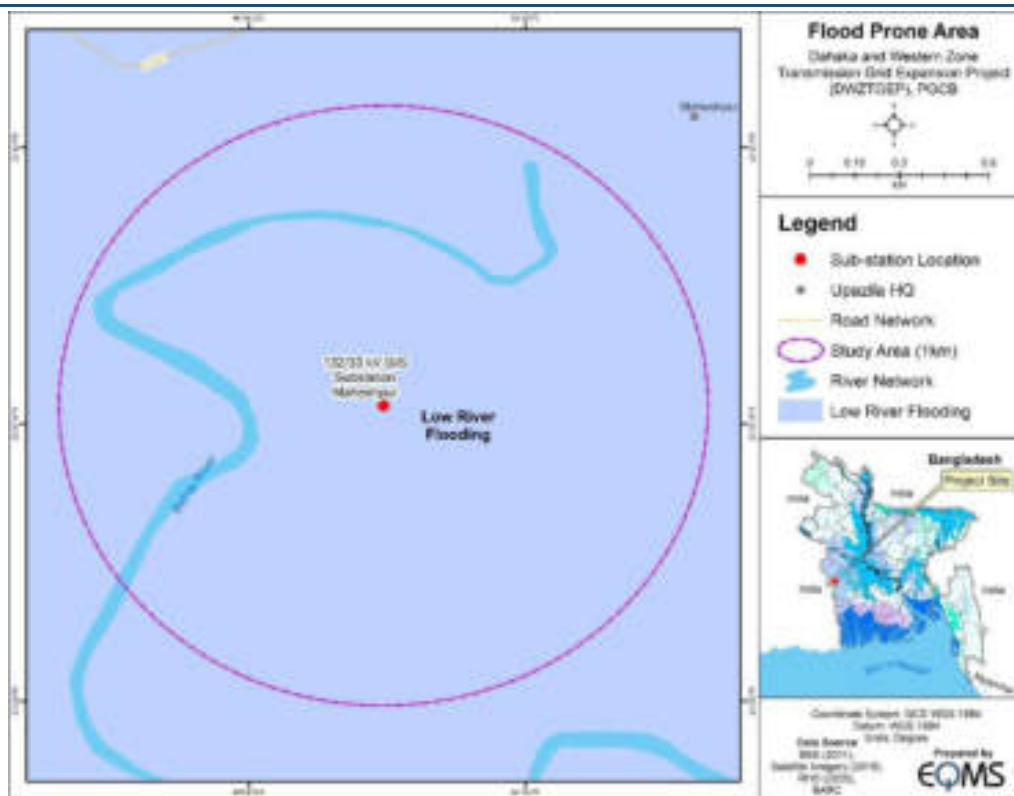
Rupsha 230/132/33 kV GIS Substation



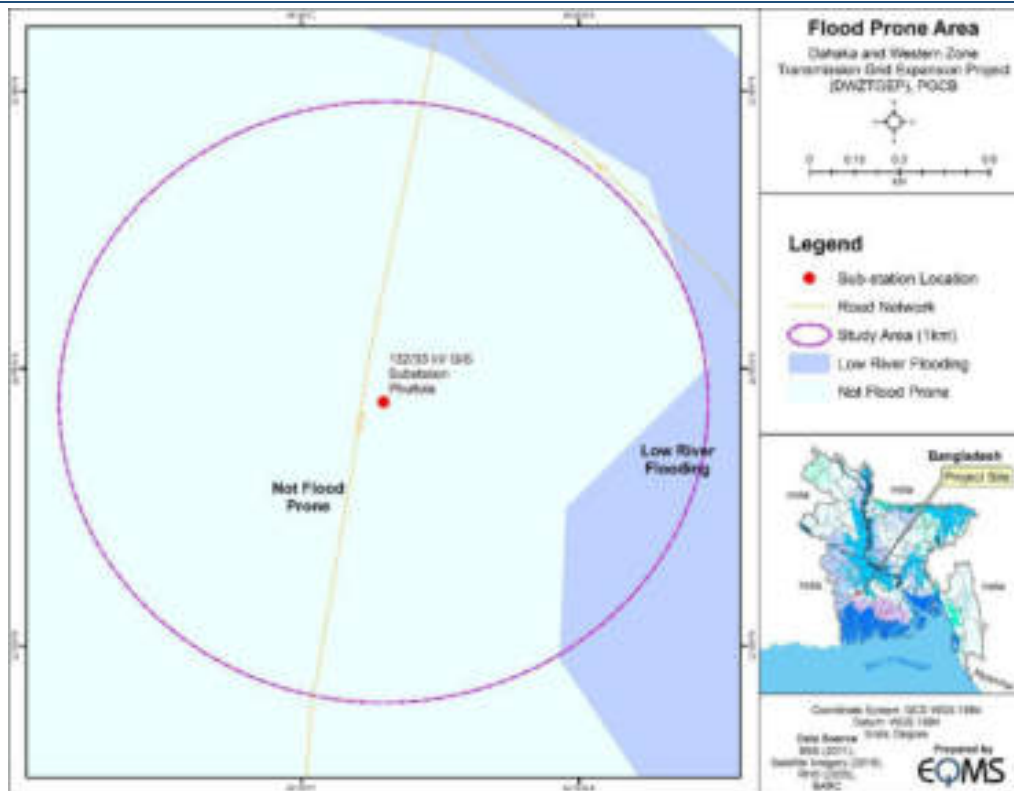
Meherpur 132/33 kV GIS Substation



Manirampur 132/33 kV GIS Substation



Maheshpur 132/33 kV GIS Substation



Phultola 132/33 kV GIS Substation

Source: Bangladesh Agricultural Research Council (BARC)

4.2.10 Cyclones

67. Bangladesh coast is one of the most cyclone prone areas of the world due to its geographical location and funnel shaped coast of the Bay of Bengal. Most of the damage occurs in the coastal regions of Khulna, Patuakhali, Barisal, Noakhali and Chattogram and the offshore islands of Bhola, Hatiya, Sandwip, Manpura, Kutubdia, Maheshkhali, Nijhum Dwip, Urir Char and other newly formed islands. Figure 4-9 shows cyclone affected area map of Bangladesh.

68. Devastating cyclones and associated storm surges hit the coastal zones almost every year and are usually accompanied by high-speed winds, sometimes reaching 250 km/hr. or more and with 3 m to 10 m high waves, causing extensive damage to life, property and livestock. These cyclones usually occur in two seasons, April- May and October-November i.e., before and after the monsoon season.

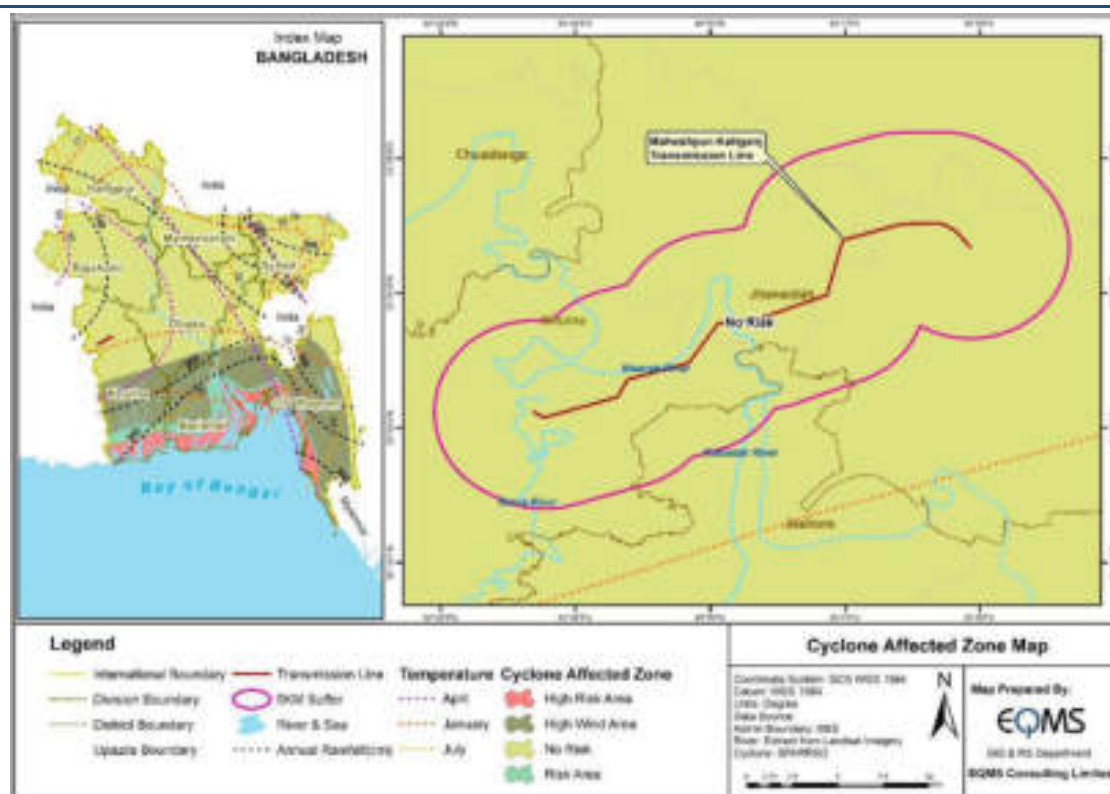
69. As per the cyclone affected zone map, majority of the Kaliganj- Maheshpur route fall under no risk area. Five substations fall into following cyclone affected zone depicted in below table.

Table 4-28: Cyclone Affected Zone Features of five substations

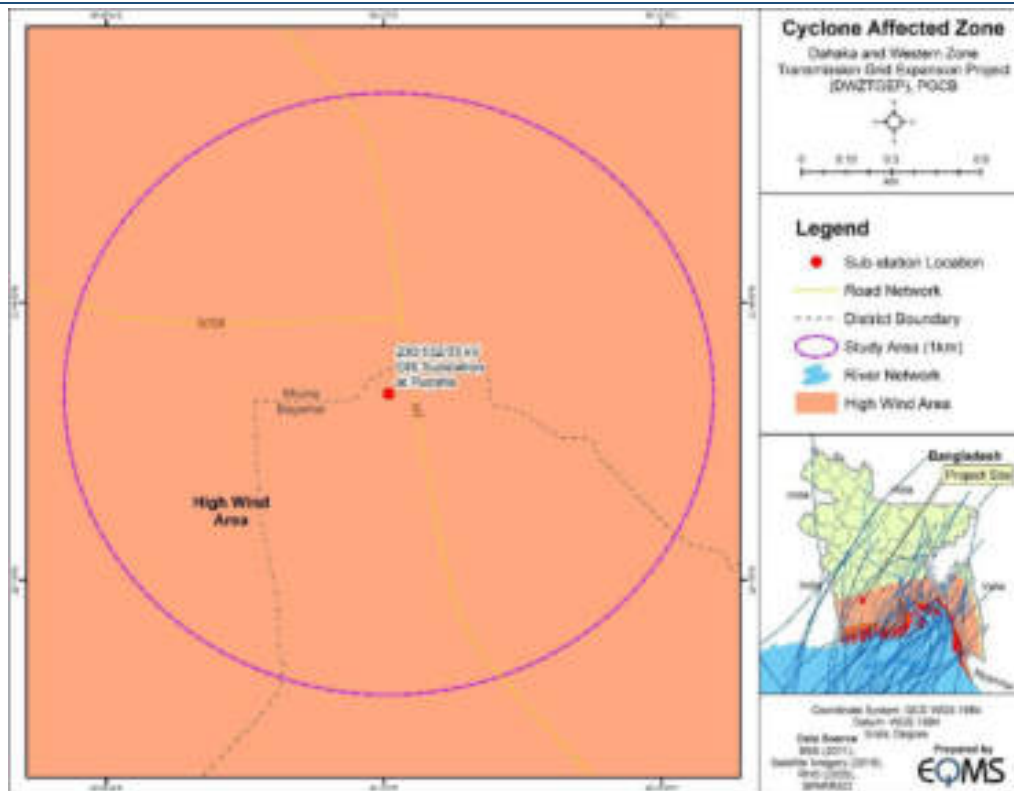
Sl No.	Substations	Cyclone Affected Zone Features
1.	230/132/33 kV GIS Substation at Rupsha	High Wind Area
2.	132/33 kV GIS Substation Meherpur	No Risk Zone
3.	132/33 kV GIS Substation Manirampur	No Risk Zone
4.	132/33 kV GIS Substation Maheshpur	No Risk Zone
5.	132/33 kV GIS Substation Phultola	High Wind Area

Figure 4-9 shows the cyclone affected zone map of the Kaliganj- Maheshpur routes and five substations.

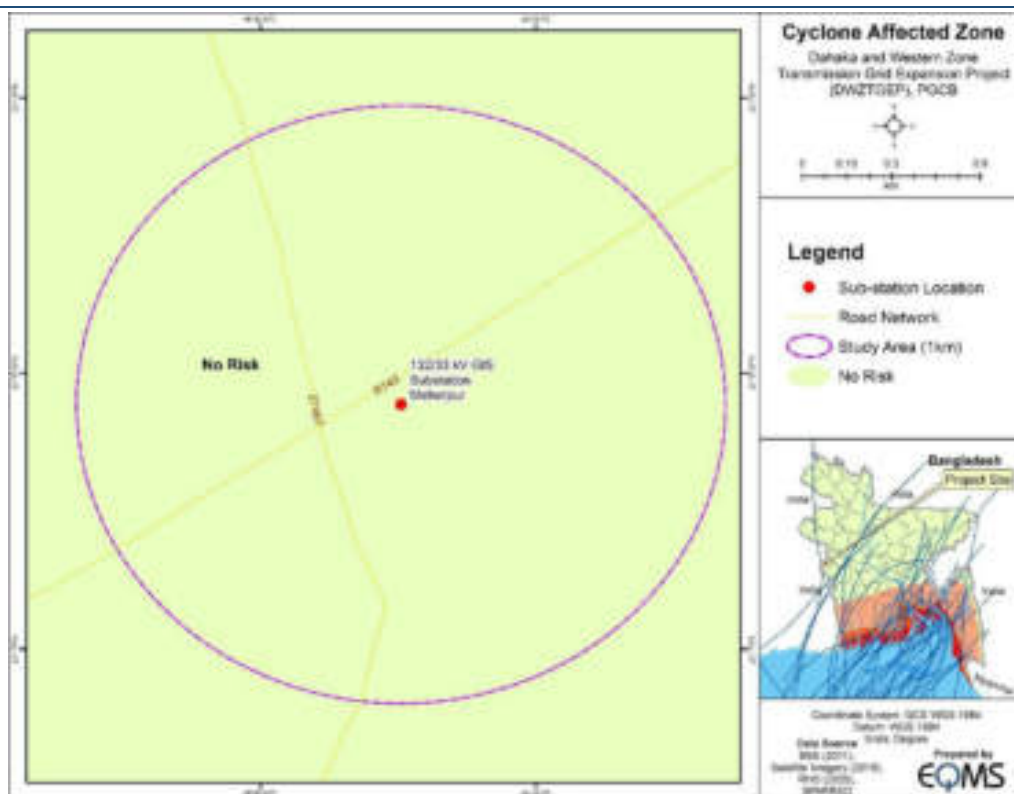
Figure 4-9: Cyclone affected zone map of the Kaliganj- Maheshpur TL and, Rupsha, Phultola, Maheshpur, Meherpur and Manirampur Substations



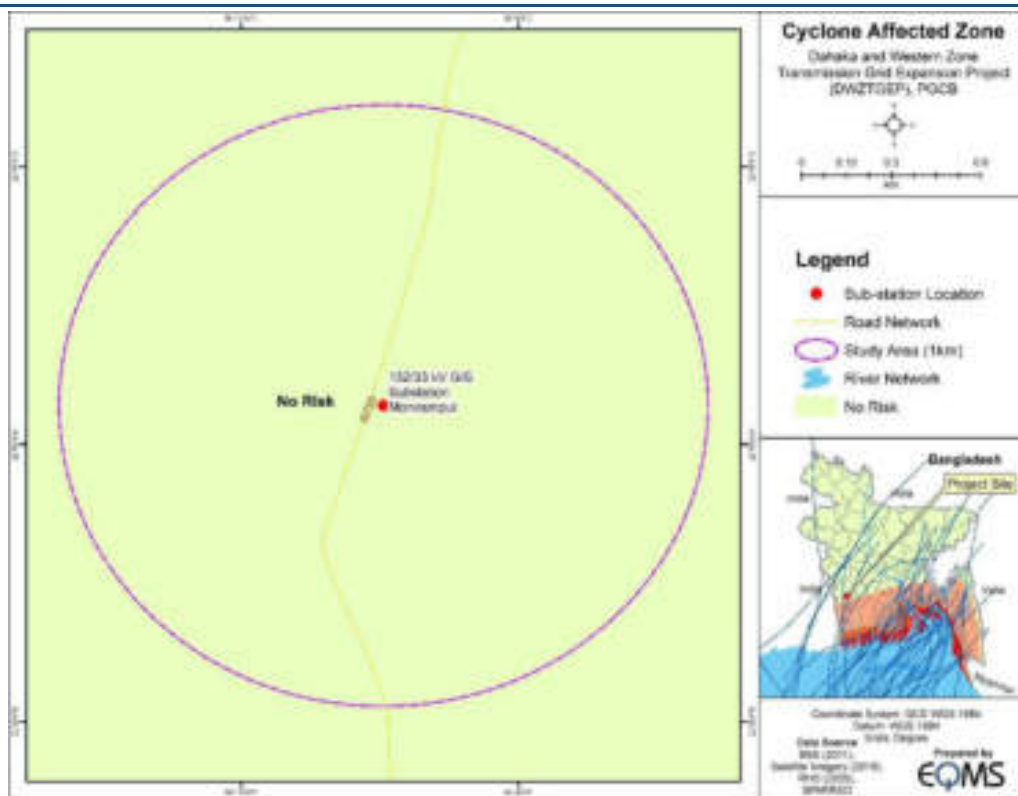
Kaliganj-Maheshpur 132 kV double circuit transmission line



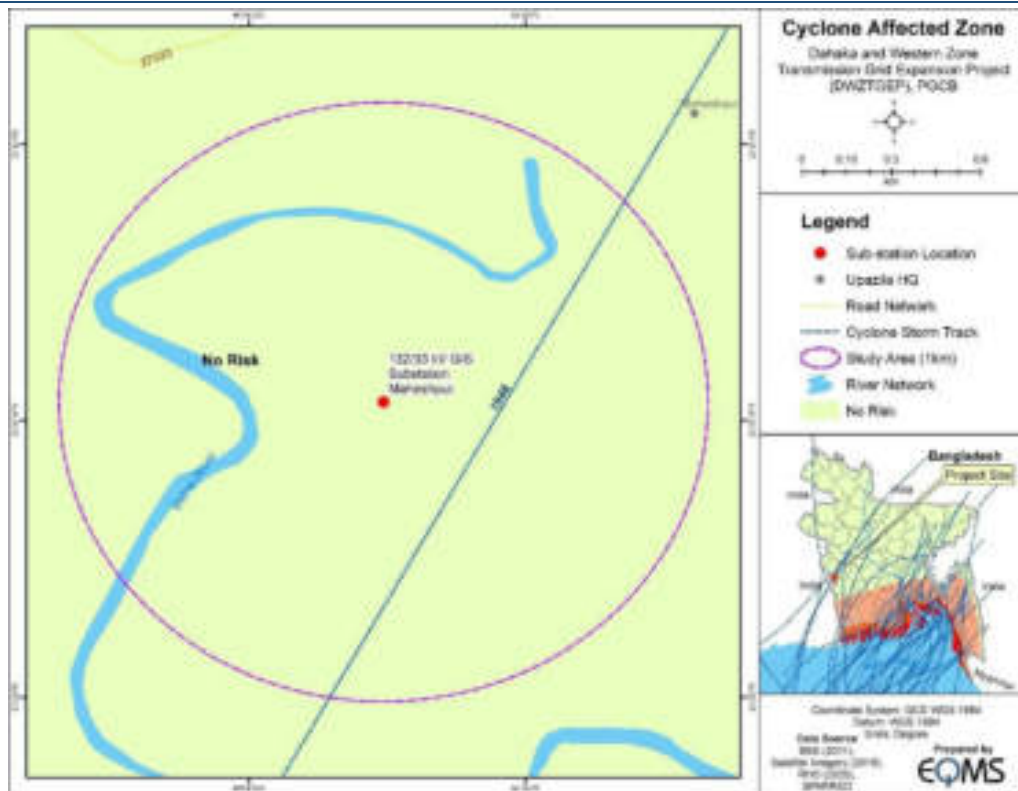
Rupsha 230/132/33 kV GIS Substation



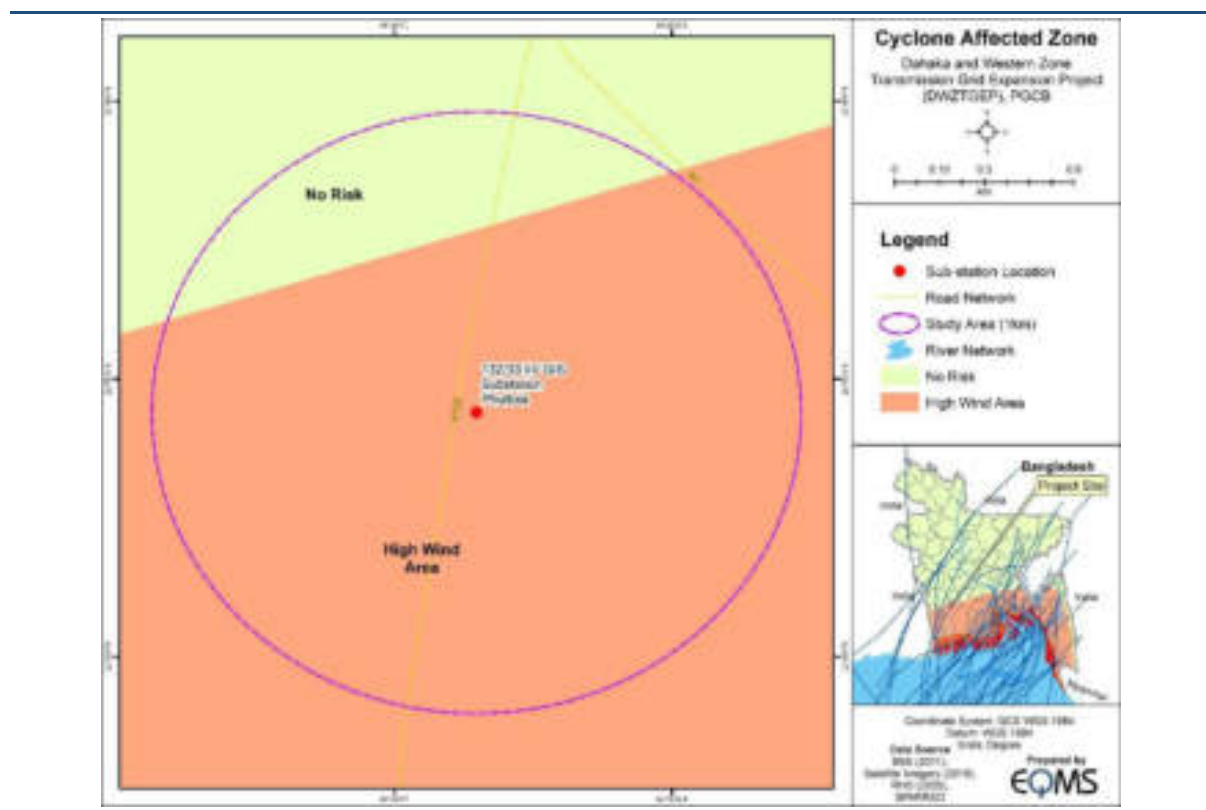
Meherpur 132/33 kV GIS Substation



Manirampur 132/33 kV GIS Substation



Maheshpur 132/33 kV GIS Substation



Phultola 132/33 kV GIS Substation

Source: Bangladesh Space Research and Remote Sensing Organization (SPARRSO)

4.2.11 River Erosion

70. During the monsoon, extensive riverbank spills and riverbank erosion are typical. Riverbank erosion mainly occurs due to the braided nature of rivers in Bangladesh, and is further aggravated by heavy rainfall, particularly upstream, and increased water flow. Most recently, due to climate change, the rate of riverbank erosion has drastically increased, resulting in collapse of riverbanks and devastation of whole Unions and Upazilla.

71. Every year, riverbank erosion leads to millions of people being affected as it results in damage and loss of crops, cattle, housing structures, and farmland. Additionally, it erodes away public infrastructure and communication systems. The unpredictable shifting behavior of the rivers and their encroachments not only affect the rural floodplain population but also the urban growth centers and infrastructures.

72. According to the Bangladesh Water Development Board (BWDB) the most erosion prone districts are Bogra, Sirajganj, Kurigram, Lalmonirhat, Gaibandha and Rangpur, in the country's north, and Chandpur, Manikganj, Rajbari Shariatpur, and Faridpur in Dhaka zone, with Tangail and Jamalpur in Mymensingh zone, and the coastal areas of Patuakhali. The most erosion prone area in Bangladesh is Sirajganj, which faced a total land erosion at a rate of 622.2 ha, according to a CEGIS study in 2009 (Unnayan Onneshan 2012).

73. As per the river erosion map, river erosion hazard is absent in majority of the Kaliganj-Maheshpur route. Five substations fall into the following cyclone affected zone depicted in below table.

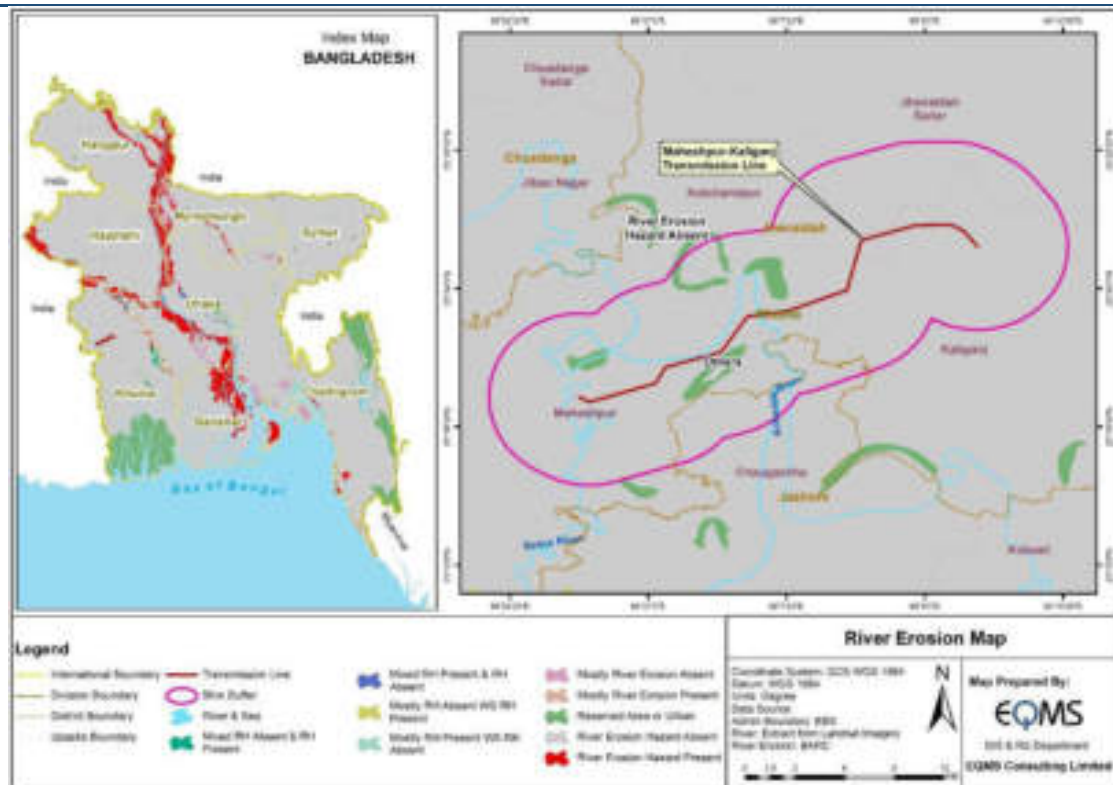
Table 4-29: River Erosion Map of five substations

SI No.	Substations	River Erosion Zone Features
1.	230/132/33 kV GIS Substation at Rupsha	River Erosion Hazard Absent

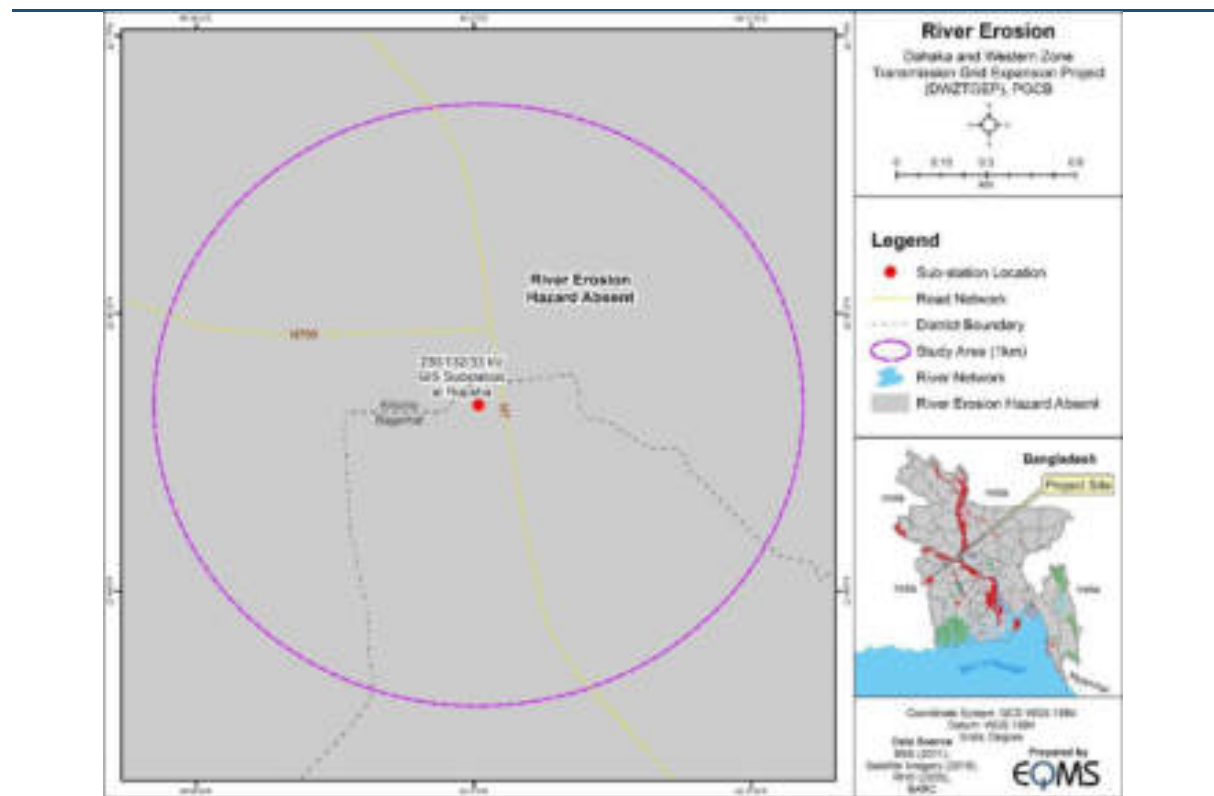
2.	132/33 kV GIS Substation Meherpur	River Erosion Hazard Absent
3.	132/33 kV GIS Substation Manirampur	River Erosion Hazard Absent
4.	132/33 kV GIS Substation Maheshpur	River Erosion Hazard Absent
5.	132/33 kV GIS Substation Phultola	River Erosion Hazard Absent

The river erosion map of Kaliganj- Maheshpur routes and five substations are shown in Figure 4-10.

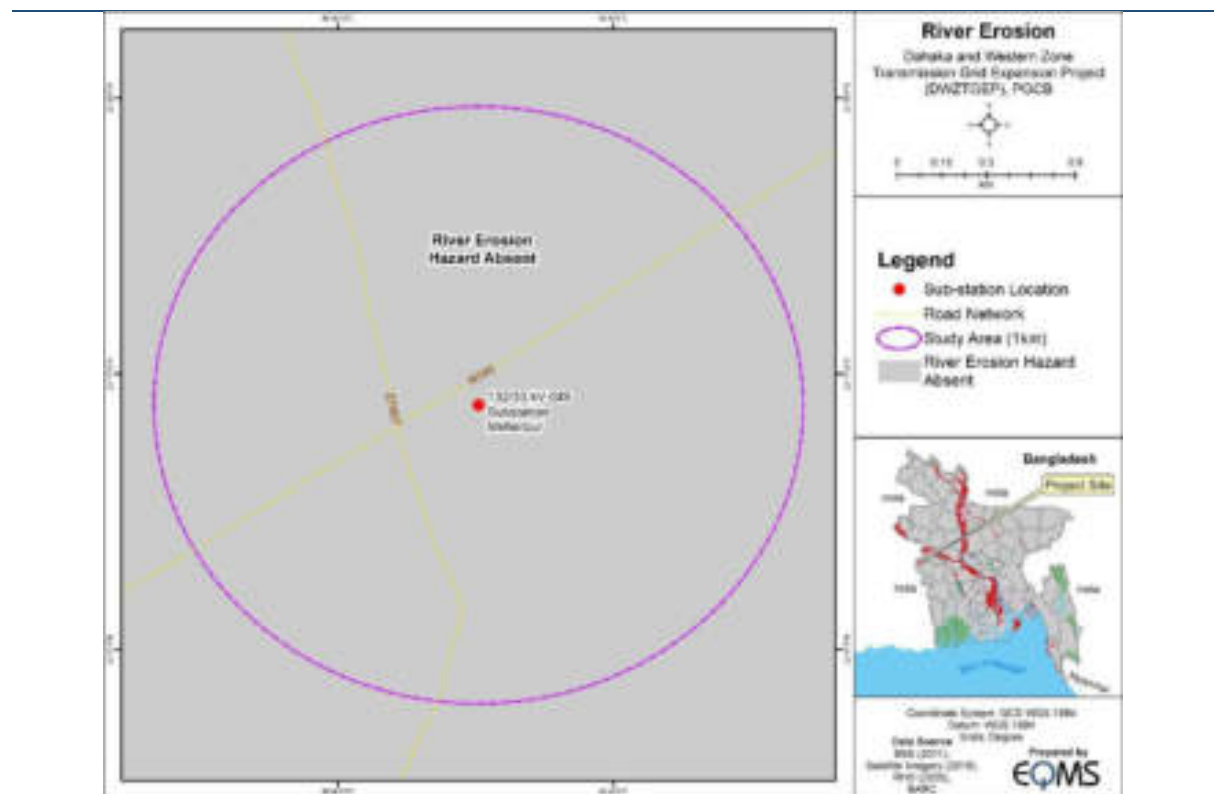
Figure 4-10: River erosion map of Kaliganj- Maheshpur TL and, Rupsha, Phultola, Maheshpur, Meherpur and Manirampur Substations



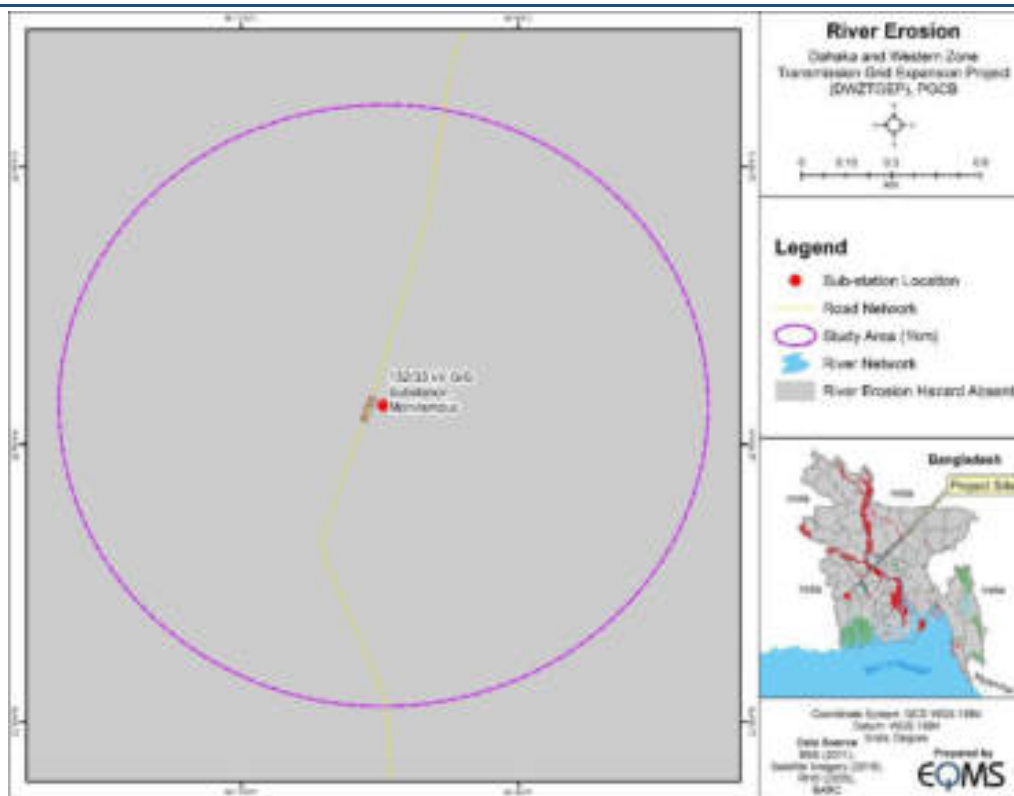
Kaliganj-Maheshpur 132 kV double circuit transmission line



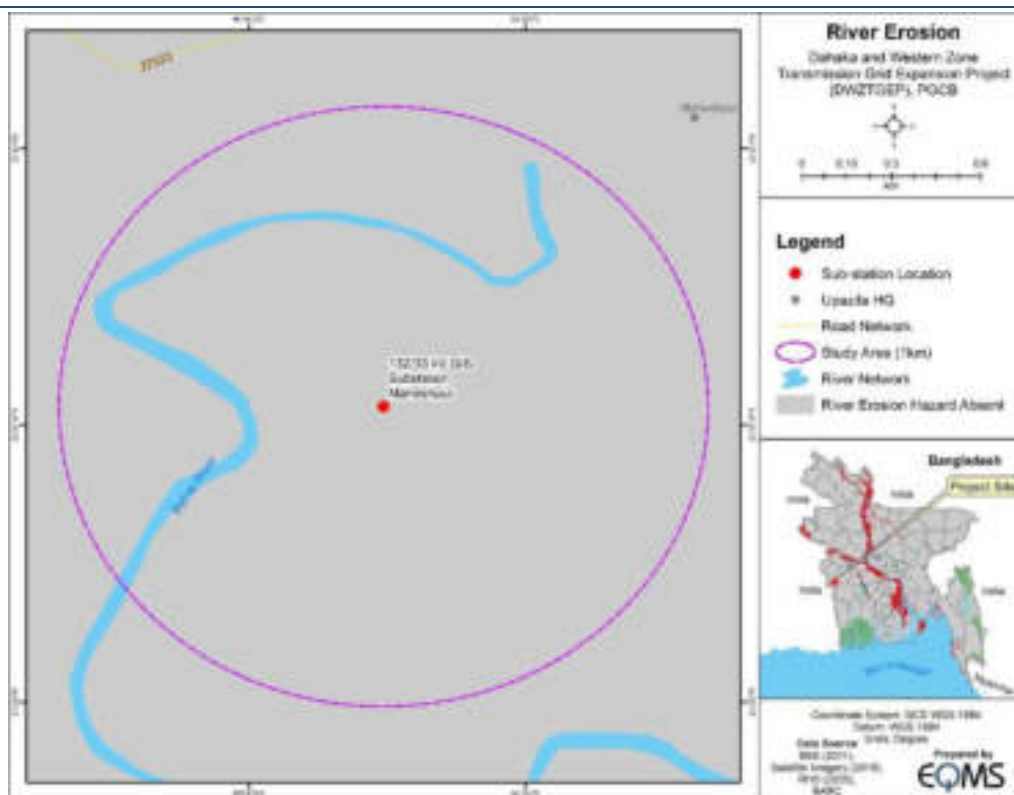
Rupsha 230/132/33 kV GIS Substation



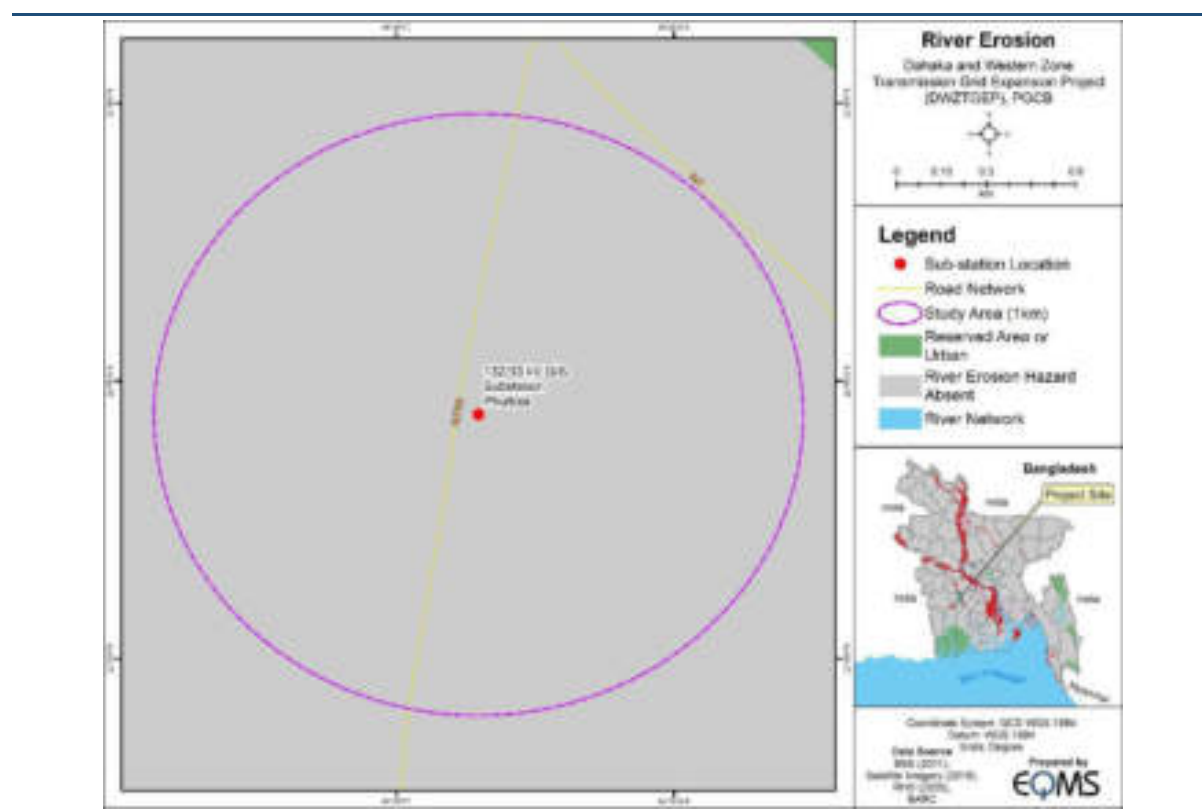
Meherpur 132/33 kV GIS Substation



Manirampur 132/33 kV GIS Substation



Maheshpur 132/33 kV GIS Substation



Phultola 132/33 kV GIS Substation

Source: Bangladesh Agricultural Research Council (BARC)

4.2.12 Agro-ecological zones of Bangladesh

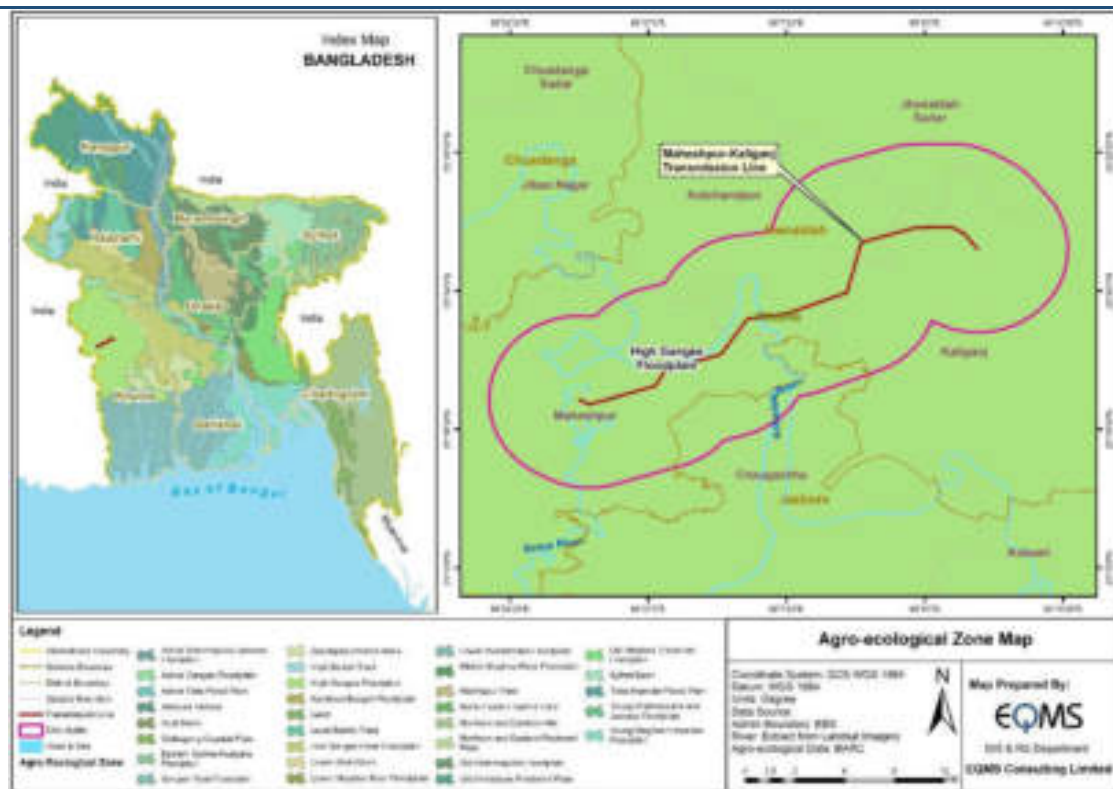
74. The agro-ecological zones of Bangladesh have been identified based on four elements including physiography, soils, land levels in relation to flooding, and agro-climatology. Bangladesh has been tentatively divided into 30 agro-ecological zones. These 30 zones have been further subdivided into 88 agro-ecological sub-regions, which have been further subdivided into 535 agro-ecological units. Kaliganj- Maheshpur transmission line alignment falls in the High Ganges Floodplain zone. Five substations fall into the following Agro-ecological zones depicted in the table below.

Table 4-30: Agro-ecological zones of five substations

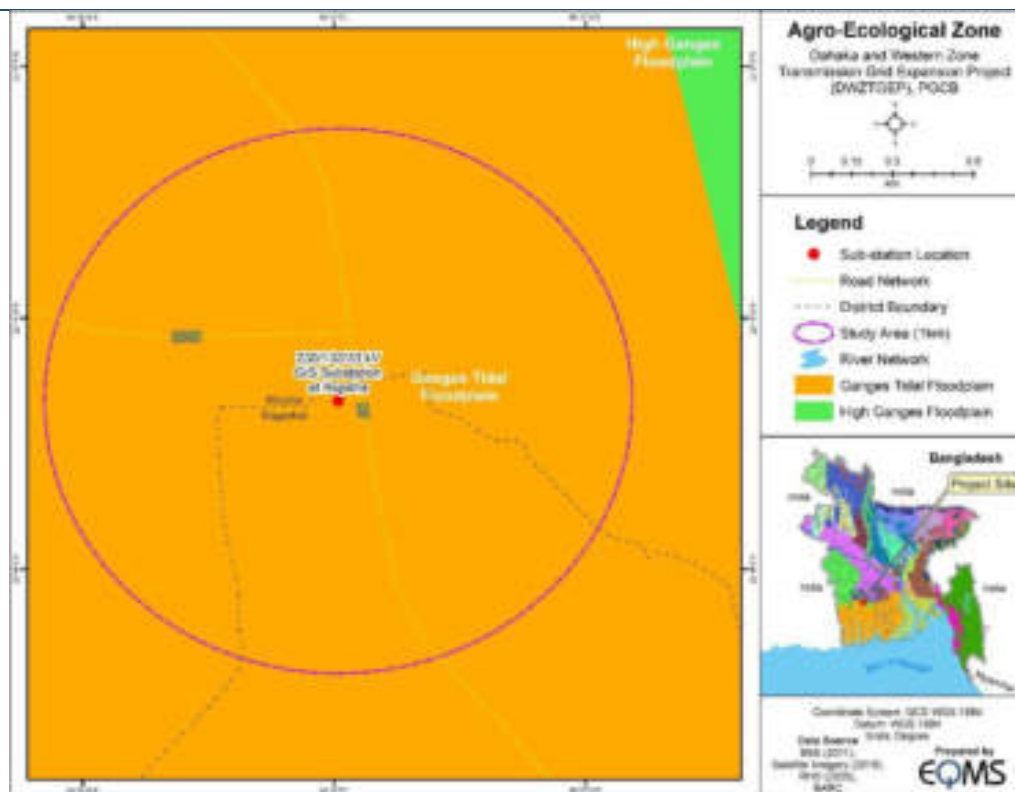
Sl No.	Substations	Agro-ecological Zone Features
1.	230/132/33 kV GIS Substation at Rupsha	Ganges Tidal Floodplain
2.	132/33 kV GIS Substation Meherpur	High Ganges Floodplain
3.	132/33 kV GIS Substation Manirampur	High Ganges Floodplain
4.	132/33 kV GIS Substation Maheshpur	High Ganges Floodplain
5.	132/33 kV GIS Substation Phultola	Gopalganj- Khulna Beels

The Agro-ecological zone of Kaliganj- Maheshpur, and five substations have been shown in Figure 4-11.

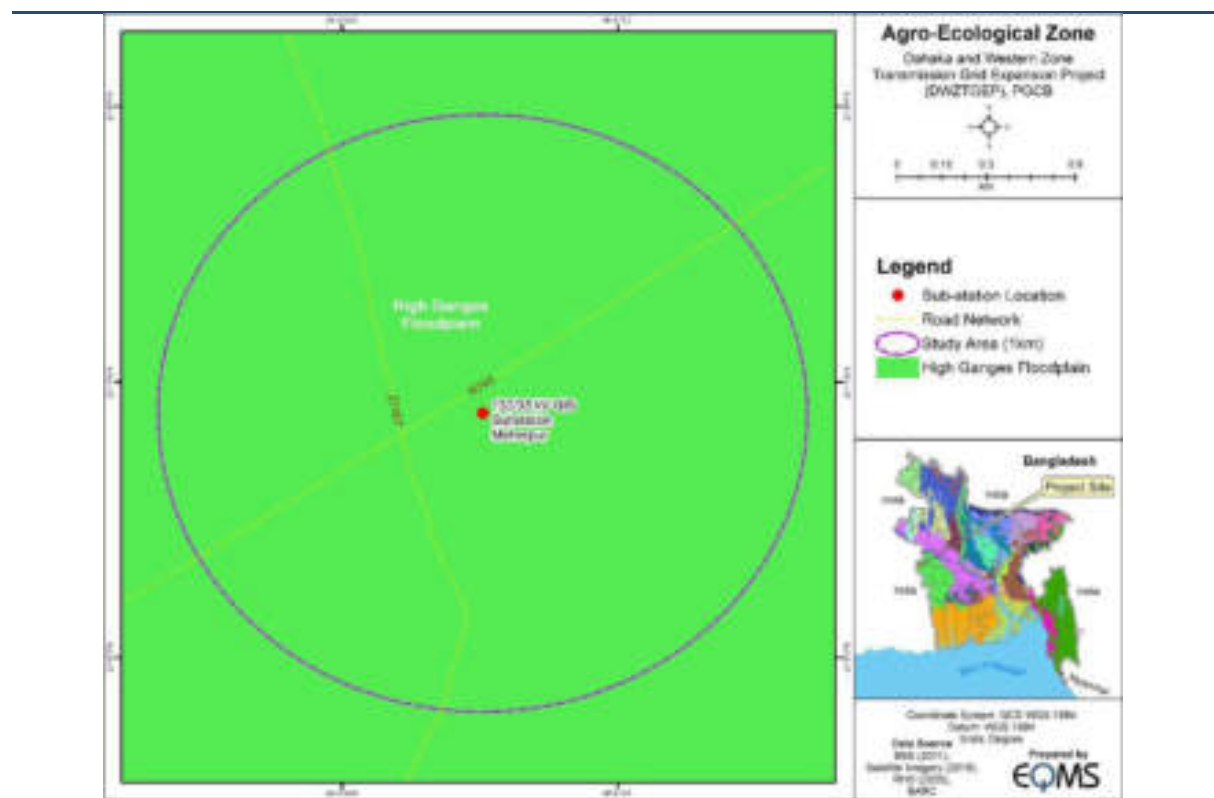
Figure 4-11: Agro-ecological zone of Kaliganj- Maheshpur TL and, Rupsha, Phultola, Maheshpur, Meherpur and Manirampur Substations



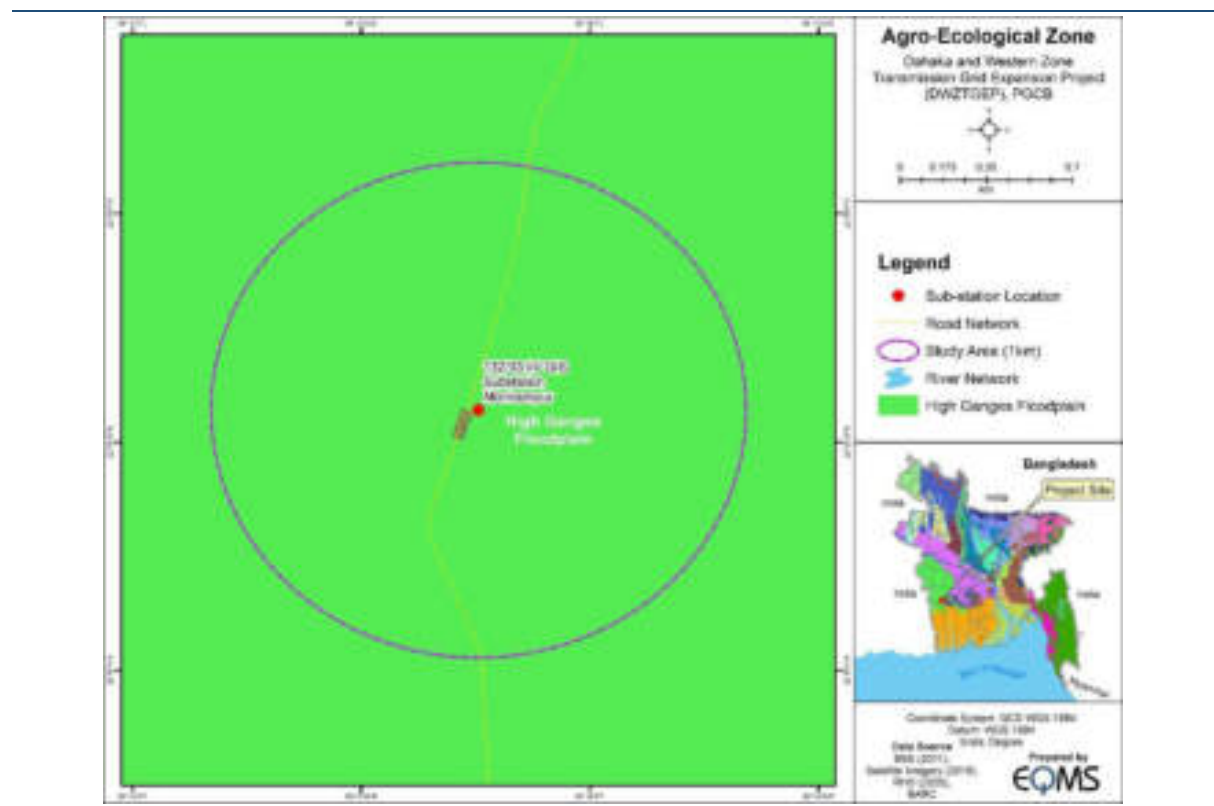
Kaliganj-Maheshpur 132 kV double circuit transmission line



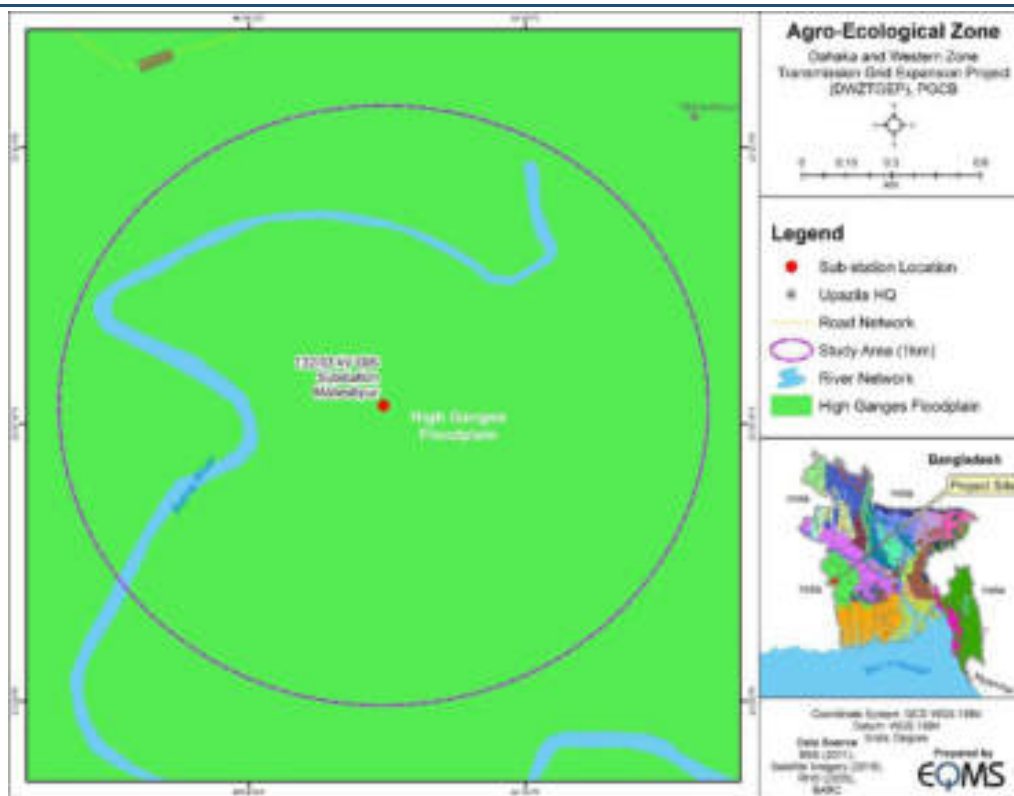
Rupsha 230/132/33 kV GIS Substation



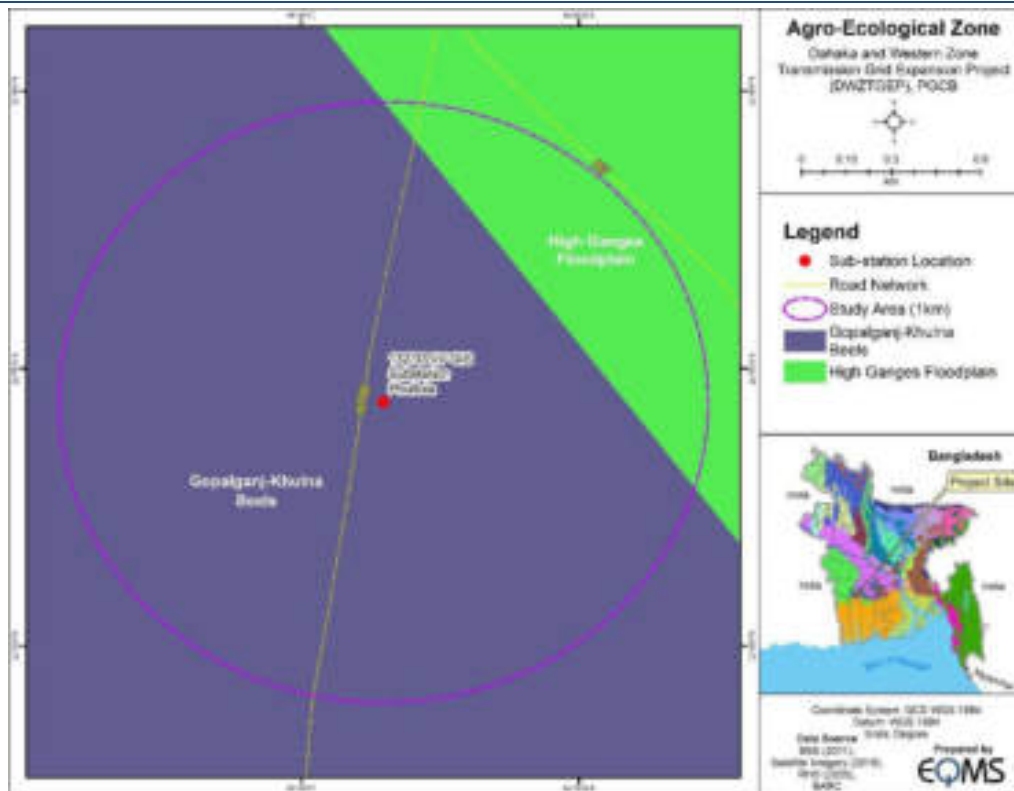
Meherpur 132/33 kV GIS Substation



Manirampur 132/33 kV GIS Substation



Maheshpur 132/33 kV GIS Substation



Phultola 132/33 kV GIS Substation

Source: Bangladesh Agricultural Research Council (BARC)

4.2.13 Seismic zones of Bangladesh

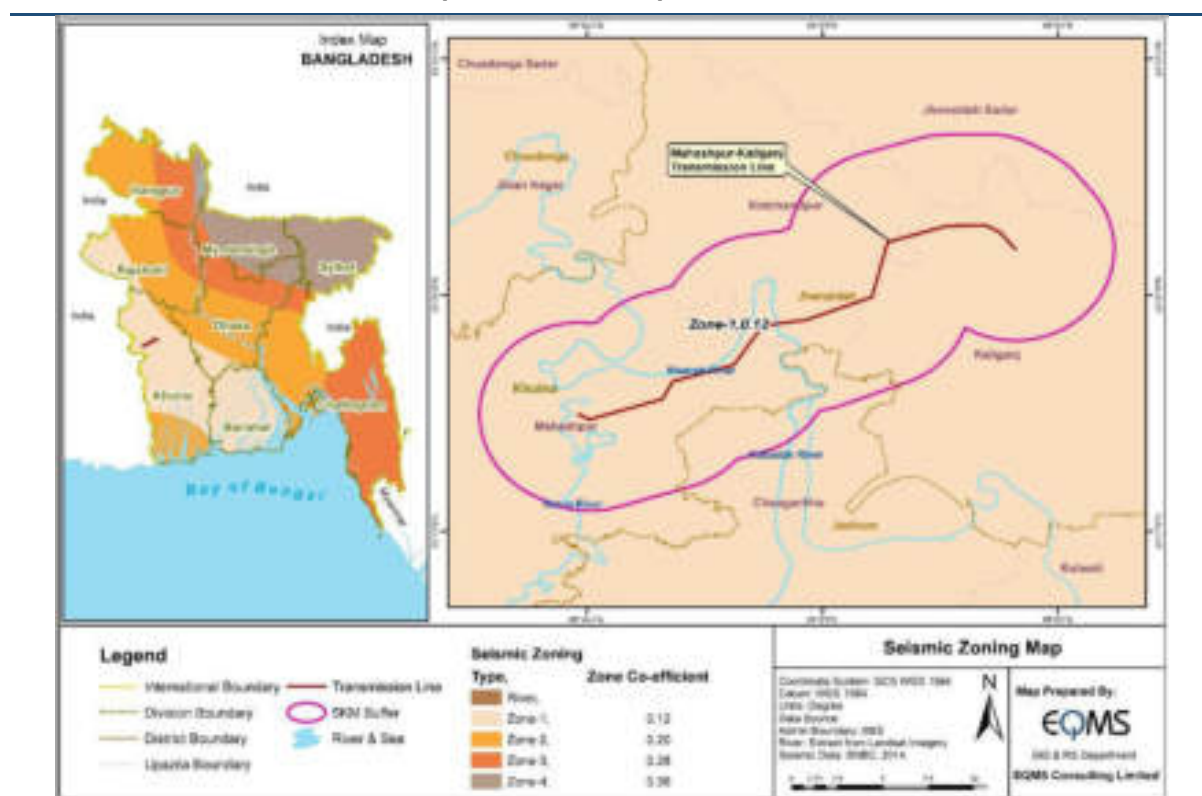
75. Bangladesh can be affected by moderate to strong earthquake events due to its proximity to the collision boundary of the Northeast moving Indian plate and the Eurasian Plate. Strong historical earthquakes with magnitude greater than 7.0 (Richter scale) have affected parts of Bangladesh in the last 150 years; some of them had their epicenters within the country. As per Bangladesh National Building Code (BNBC) seismic zoning map, Kaliganj- Maheshpur falls into Zone-1 having the coefficient of 0.12. Five substations fall into the following Seismic zones depicted in the table below.

Table 4-31: Agro-ecological zones of five substations

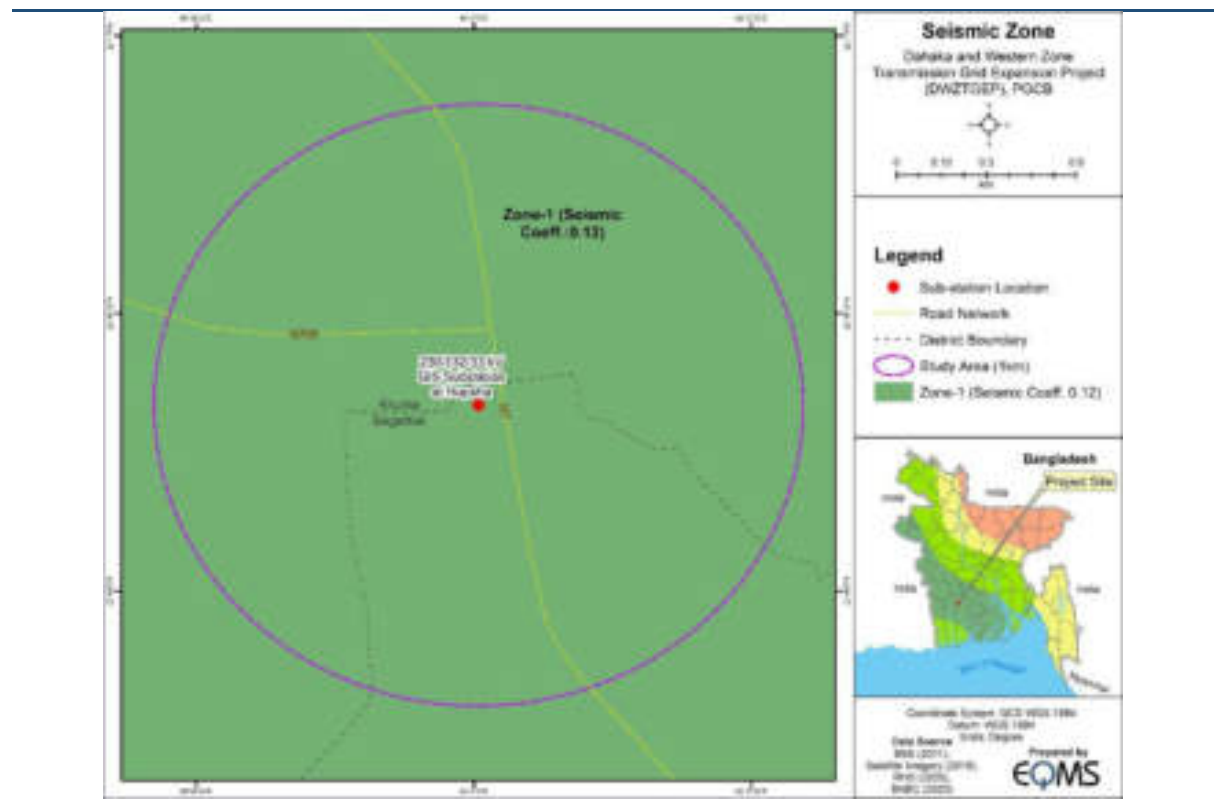
Sl No.	Substations	Seismic Zone	Seismic Coefficient
1.	230/132/33 kV GIS Substation at Rupsha	Zone-1	0.12
2.	132/33 kV GIS Substation Meherpur	Zone-1	0.12
3.	132/33 kV GIS Substation Manirampur	Zone-1	0.12
4.	132/33 kV GIS Substation Maheshpur	Zone-1	0.12
5.	132/33 kV GIS Substation Phultola	Zone-1	0.12

The seismic zoning map of Kaliganj- Maheshpur, and five substations have been shown in Figure 4-12.

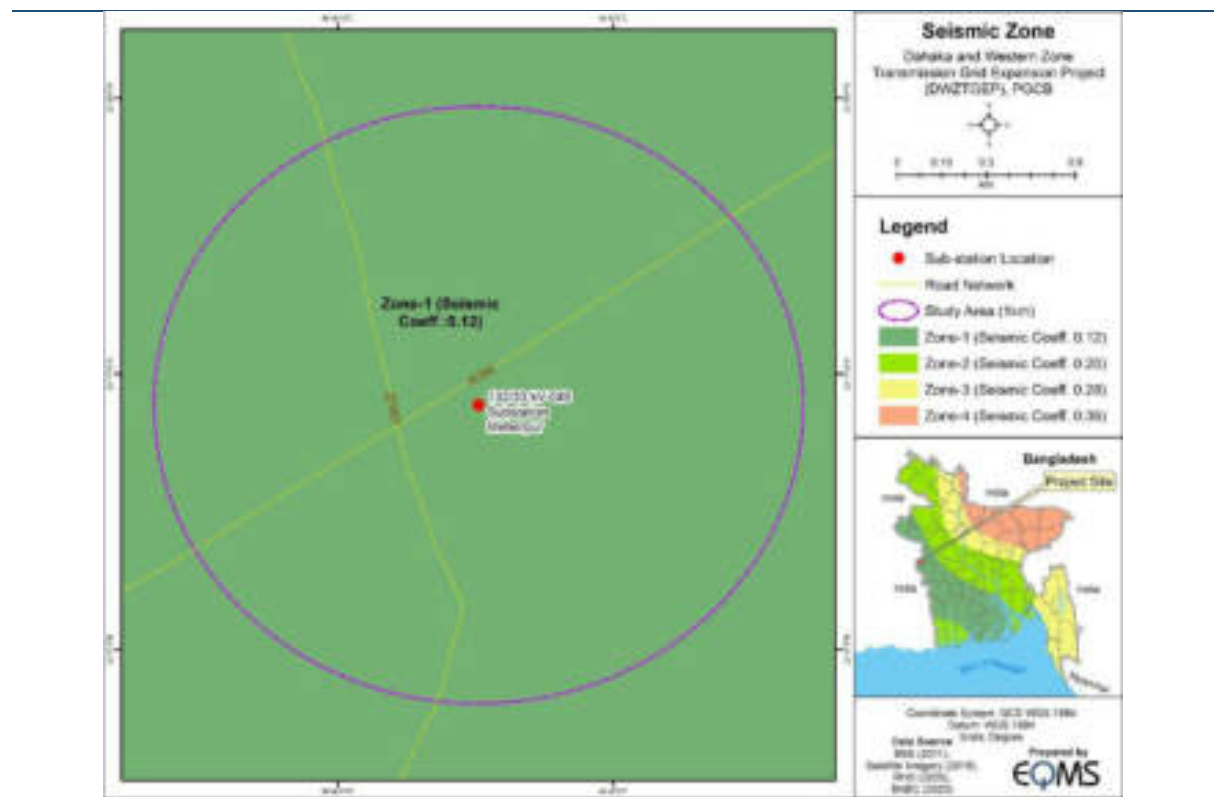
Figure 4-12: Seismic zoning of Kaliganj- Maheshpur TL and, Rupsha, Phultola, Maheshpur, Meherpur and Manirampur Substations



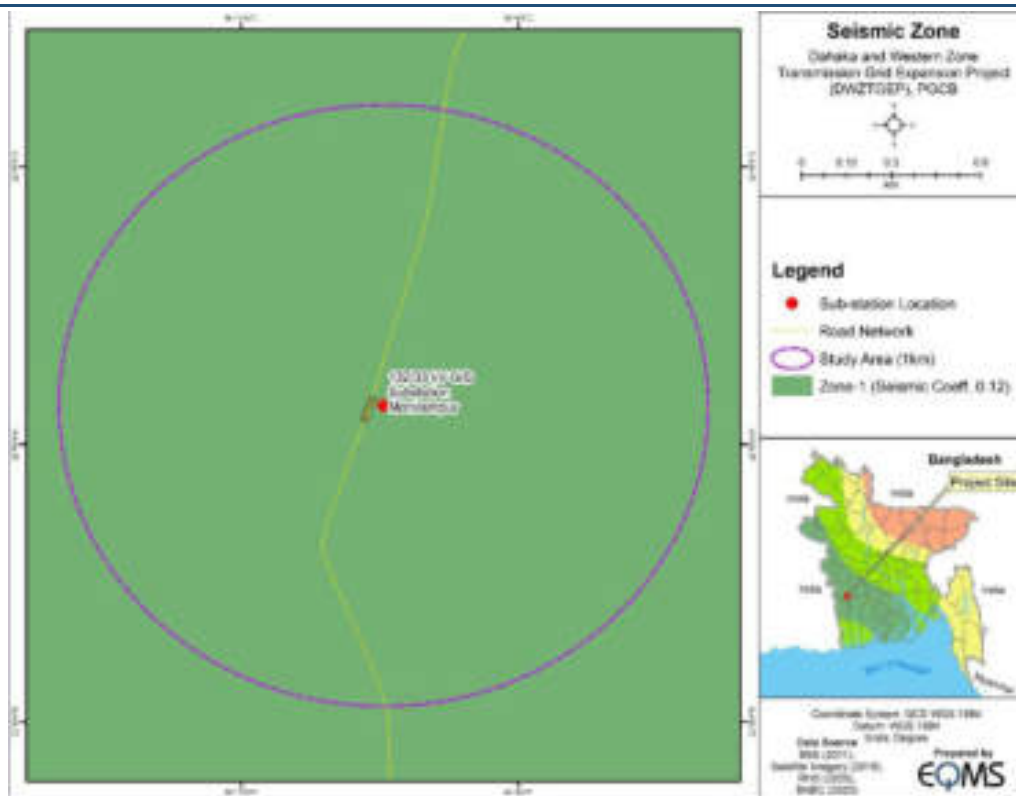
Kaliganj-Maheshpur 132 kV double circuit transmission line



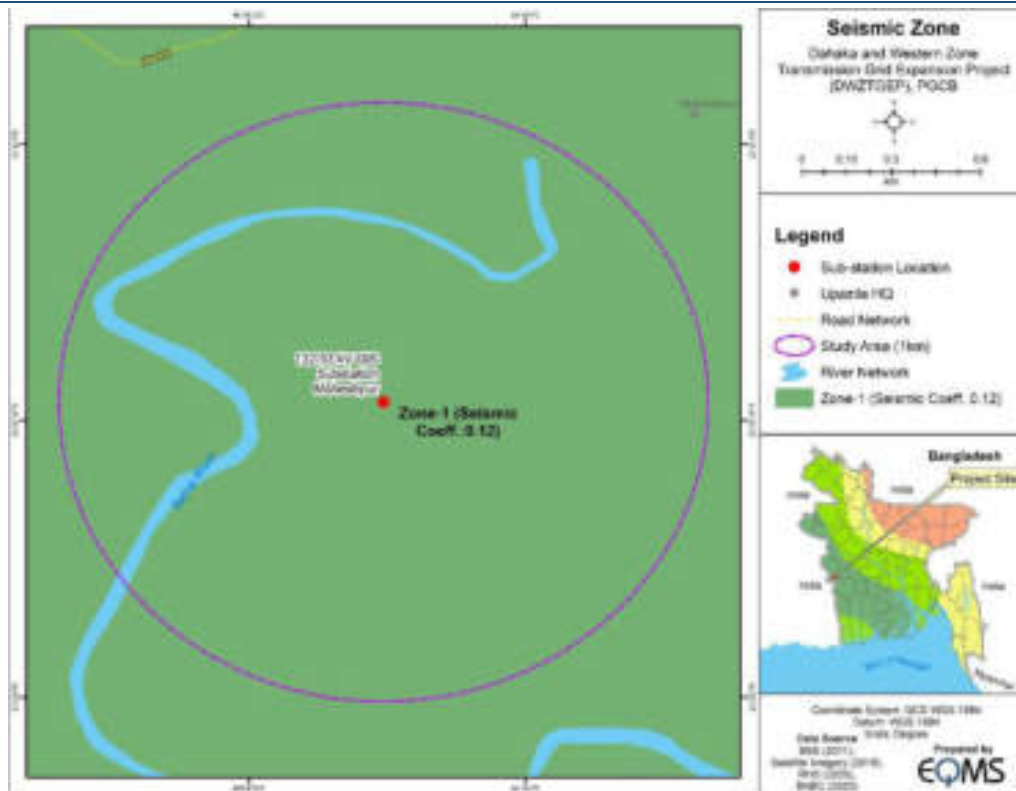
Rupsha 230/132/33 kV GIS Substation



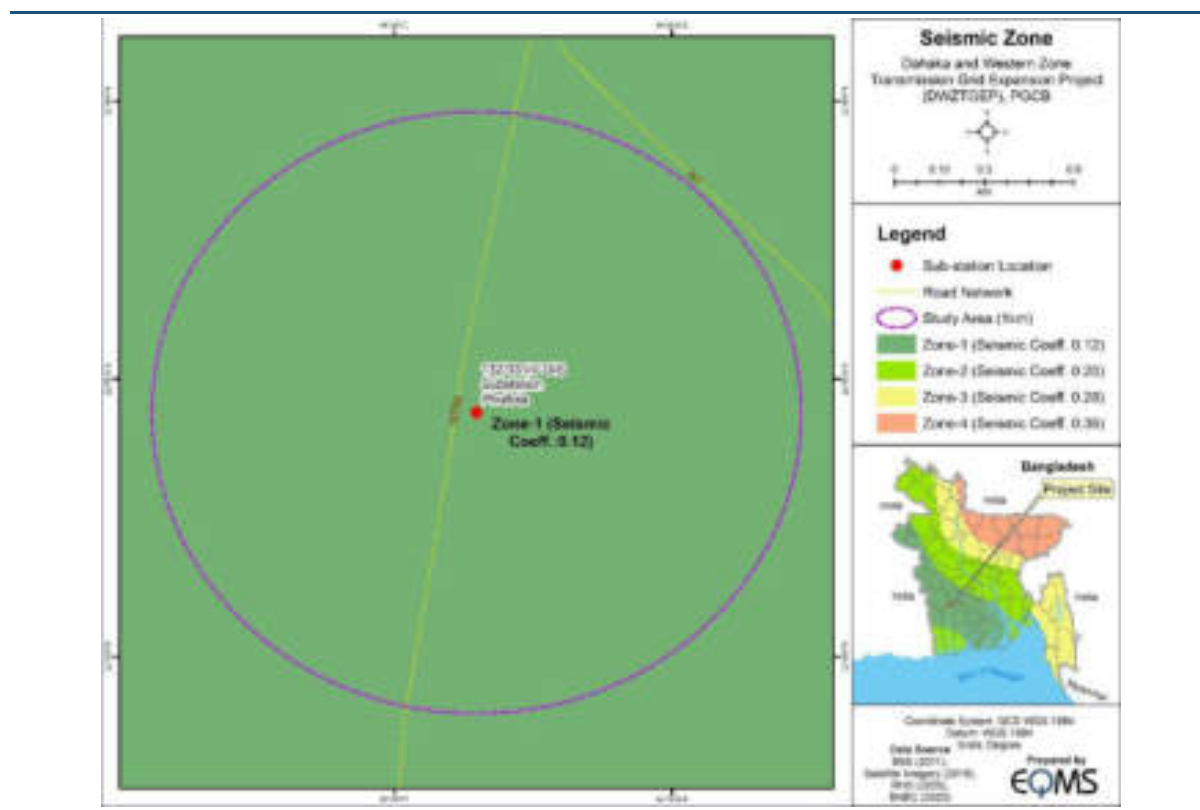
Meherpur 132/33 kV GIS Substation



Manirampur 132/33 kV GIS Substation



Maheshpur 132/33 kV GIS Substation



Phultola 132/33 kV GIS Substation

Source: Bangladesh National Building Code (BNBC)

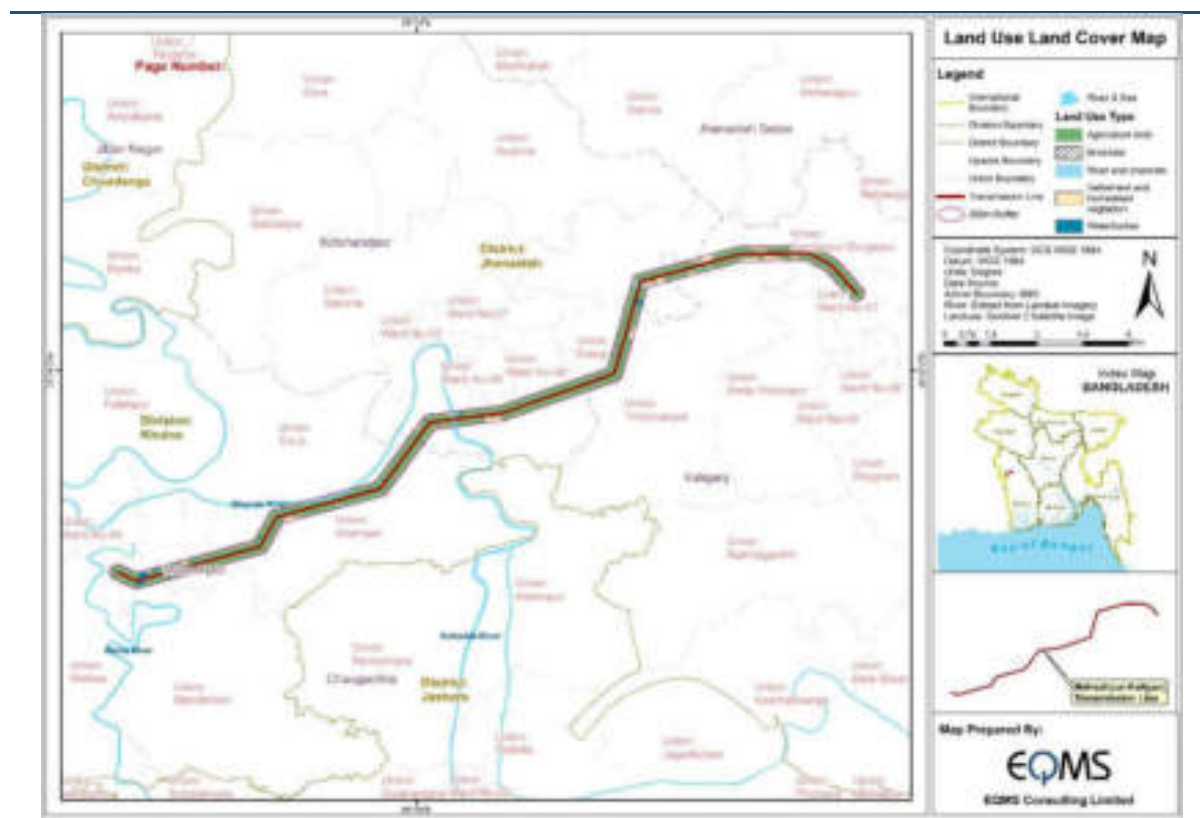
4.2.14 Land Use Interpretation of the Study Area

4.2.14.1 Kaliganj- Maheshpur

76. The predominant land use-land cover of 500 m buffer (250m each side of the alignment) of Kaliganj- Maheshpur route includes agriculture land (47.61%) and settlement and homestead vegetation (42.25%). Other categories of land-use and land cover in the study area includes Aquaculture (7.02%), River and Channels (2.92%) and Waterbodies (0.20), etc. During the survey, no settlements were found beneath the proposed transmission line route. The major waterbodies covered are ponds and canal, however, the transmission line will not pose any risk to seasonal habitats/wetlands and birds. The land use of the study area is presented in Table 4-32 and Figure 4-13.

Table 4-32: Land Use Pattern for Kaliganj- Maheshpur TL Route

Land use Type	Area (Acres)	Percentage
Agriculture land	2919.91	47.61
Aquaculture	430.55	7.02
River and Channels	179.16	2.92
Settlement and Homestead Vegetation	2591.01	42.25
Waterbodies	12.12	0.20
Grand Total	6132.75	100.00

Figure 4-13: Land Use Map of Kaliganj- Maheshpur TL Route

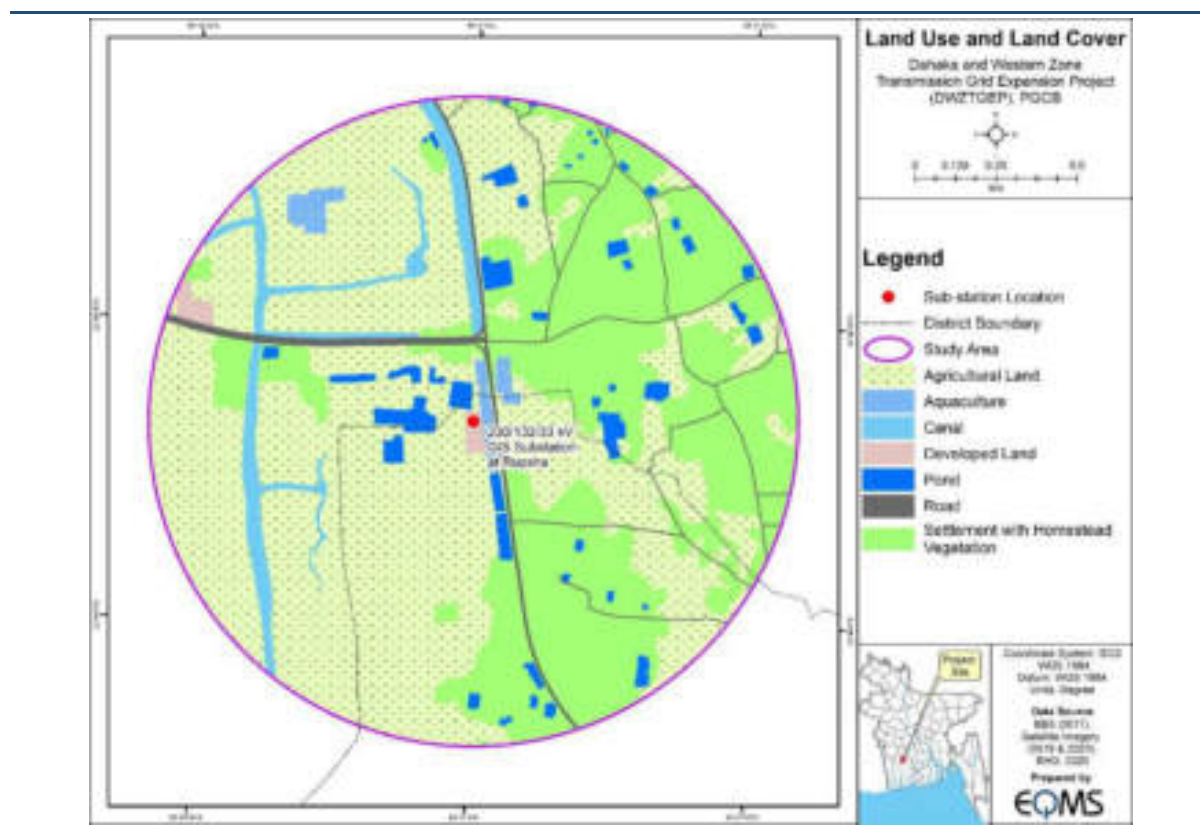
Source: GIS Mapping and Interpretation of Satellite imagery by EQMS

4.2.14.2 Rupsha 230/132/33 kV GIS Substation

77. The significant land use-land cover of 1km radius buffer of Rupsha 230/132/33 kV GIS Substation includes agriculture land (55.47 %) and settlement and homestead (33.61%). Other categories of land-use and land cover in the study area includes Canal (3.88%) and Pond (3.13 %) etc. During the survey, no settlements were found beneath the proposed 230/132/33 kV GIS Substation. The 230/132/33 kV GIS Substation will not pose any risk to seasonal habitats/wetlands and birds. The land use of the study area is presented in Table 4-32 and Figure 4-17.

Table 4-33: Land Use Pattern for Rupsha 230/132/33 kV GIS Substation

Type	Area (Acres)	Percentage
Agricultural Land	432.16	55.47
Aquaculture	8.71	1.12
Canal	30.21	3.88
Developed Land	4.89	0.63
Pond	24.42	3.13
Road	16.89	2.17
Settlement with Homestead Vegetation	261.84	33.61
Total	779.12	100

Figure 4-14: Land Use Map of Rupsha 230/132/33 kV GIS Substation

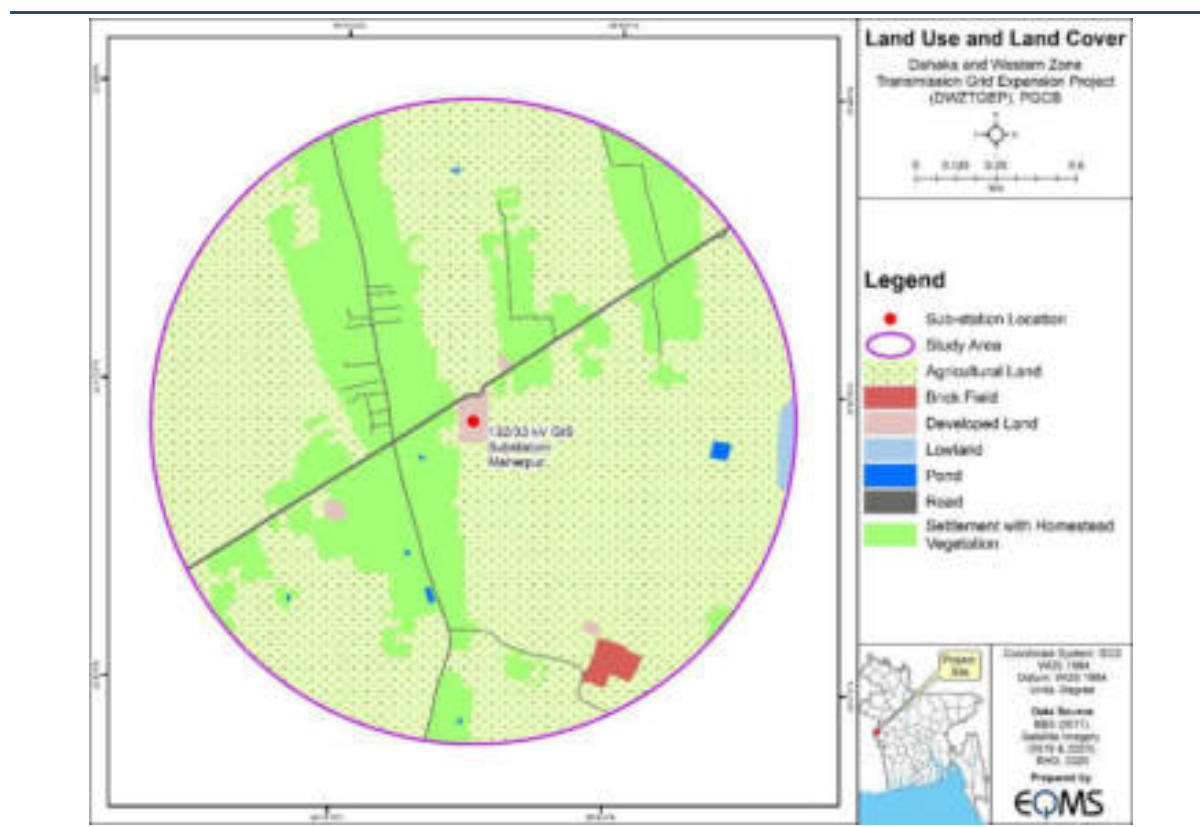
Source: GIS Mapping and Interpretation of Satellite imagery by EQMS

4.2.14.3 Meherpur 132/33 kV GIS Substation

78. The significant land use-land cover of 1km radius buffer (250m each side of the alignment) of Meherpur 132/33 kV GIS Substation includes agriculture land (70.39%) and settlement and homestead (26.69%). Other categories of land-use and land cover in the study area includes Road (1.16%) and Developed Land (0.65%) etc. During the survey, no settlements were found beneath the proposed Meherpur 132/33 kV GIS Substation. The Meherpur 132/33 kV GIS Substation will not pose any risk to seasonal habitats/wetlands and birds. The land use of the study area is presented in Table 4-32 and Figure 4-17.

Table 4-34: Land Use Pattern for Meherpur 132/33 kV GIS Substation

Type	Area (Acres)	Percentage
Agricultural Land	548.57	70.39
Brick Field	4.21	0.54
Developed Land	5.10	0.65
Lowland	3.22	0.41
Pond	1.26	0.16
Road	9.04	1.16
Settlement with Homestead Vegetation	207.98	26.69
Total	779.38	100

Figure 4-15: Land Use Map of Meherpur 132/33 kV GIS Substation

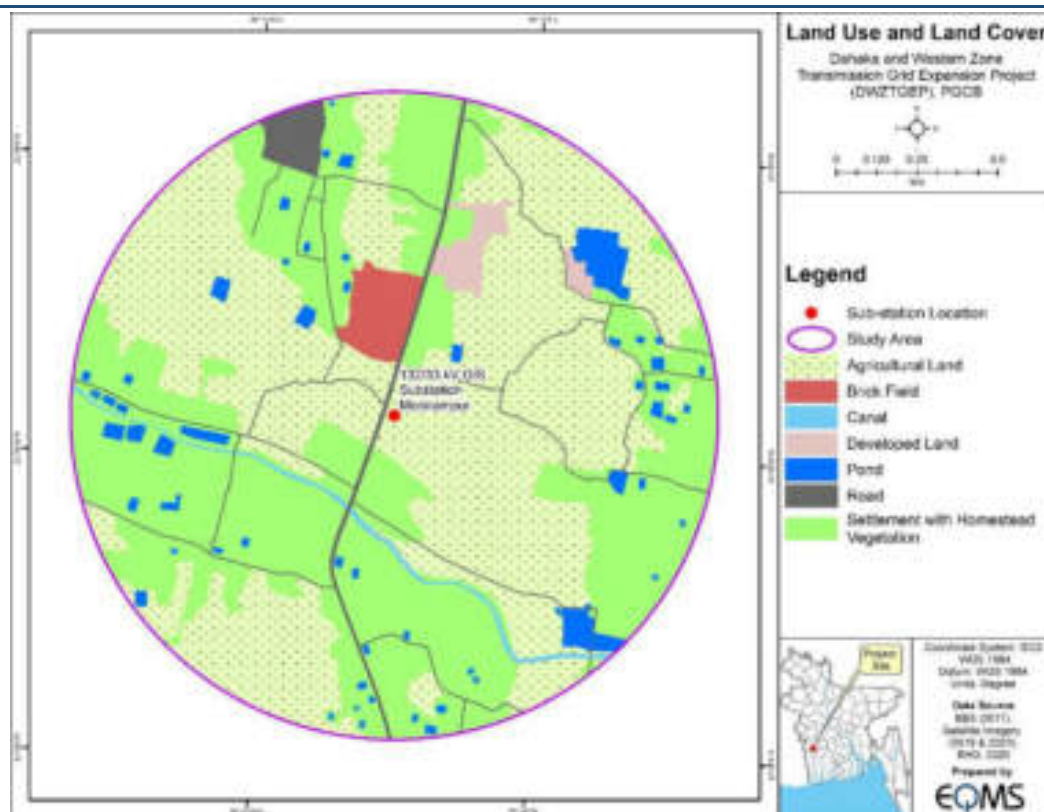
Source: GIS Mapping and Interpretation of Satellite imagery by EQMS

4.2.14.4 Manirampur 132/33 kV GIS Substation

79. The significant land use-land cover of 1km radius buffer (250m each side of the alignment) of Manirampur 132/33 kV GIS Substation route includes agriculture land (48.97%) and settlement and homestead (41.02%). Other categories of land-use and land cover in the study area includes Pond (3.11%) and Road (3.05 %) etc. During the survey, no settlements were found beneath the proposed Manirampur 132/33 kV GIS Substation. The Manirampur 132/33 kV GIS Substation will not pose any risk to seasonal habitats/wetlands and birds. The land use of the study area is presented in Table 4-32 and Figure 4-17.

Table 4-35: Land Use Pattern for Manirampur 132/33 kV GIS Substation

Type	Area (Acres)	Percentage
Agricultural Land	381.45	48.97
Brick Field	13.73	1.76
Canal	5.46	0.70
Developed Land	10.82	1.39
Pond	24.26	3.11
Road	23.75	3.05
Settlement with Homestead Vegetation	319.55	41.02
Total	779.02	100

Figure 4-16: Land Use Map of Manirampur 132/33 kV GIS Substation

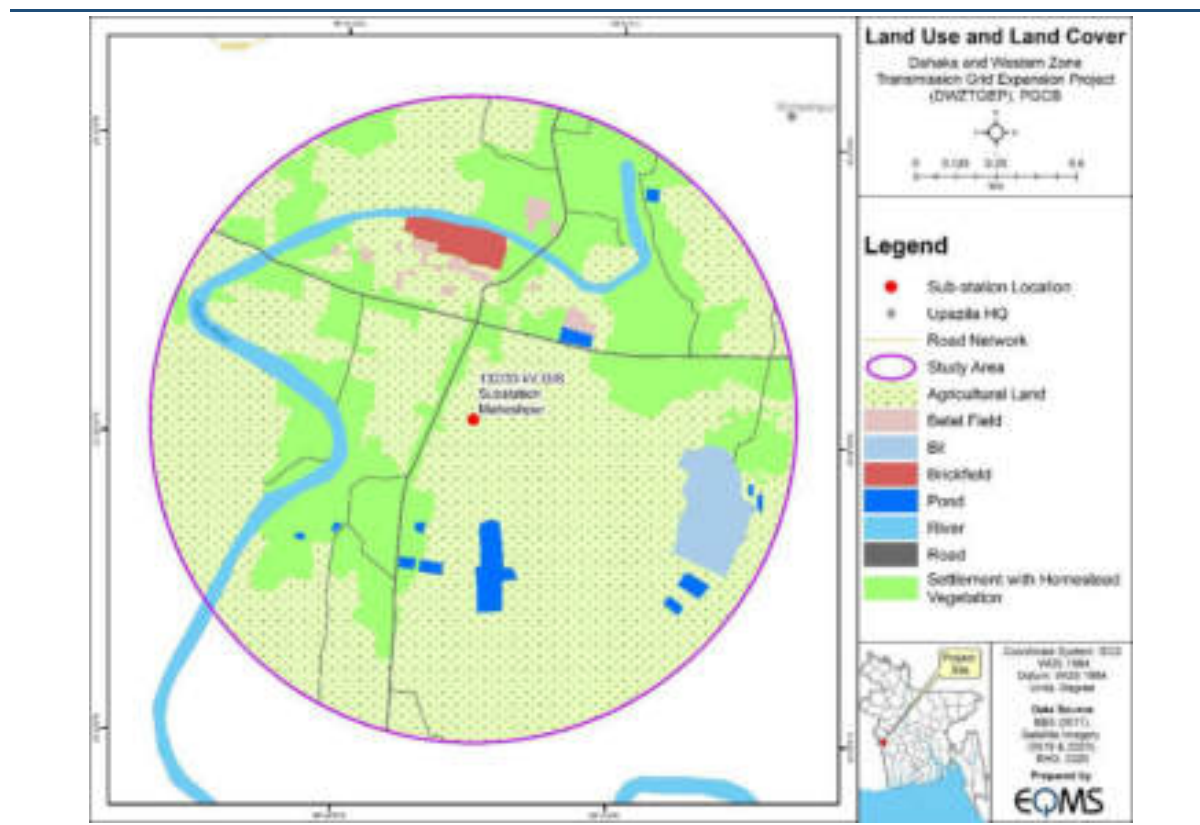
Source: GIS Mapping and Interpretation of Satellite imagery by EQMS

4.2.14.5 Maheshpur 132/33 kV GIS Substation

80. The significant land use-land cover of 1km radius buffer (250m each side of the alignment) of Maheshpur 132/33 kV GIS Substation includes agriculture land (62.99%) and settlement and homestead (26.48%). Other category land-use and land cover in the study area includes river (4.12 %) and Bil (2.20 %) etc. During the survey, no settlements were found beneath the proposed substation. The Maheshpur 132/33 kV GIS Substation will not pose any risk to seasonal habitats/wetlands and birds. The land use of the study area is presented in Table 4-32 and Figure 4-17.

Table 4-36: Land Use Pattern for Maheshpur 132/33 kV GIS Substation

Type	Area (Acres)	Percentage
Agricultural Land	490.73	62.99
Betel Field	7.05	0.91
Bil	17.14	2.20
Brickfield	7.20	0.92
Pond	10.40	1.33
River	32.11	4.12
Road	8.15	1.05
Settlement with Homestead Vegetation	206.27	26.48
Total	779.05	100

Figure 4-17: Land Use Map of Maheshpur 132/33 kV GIS Substation

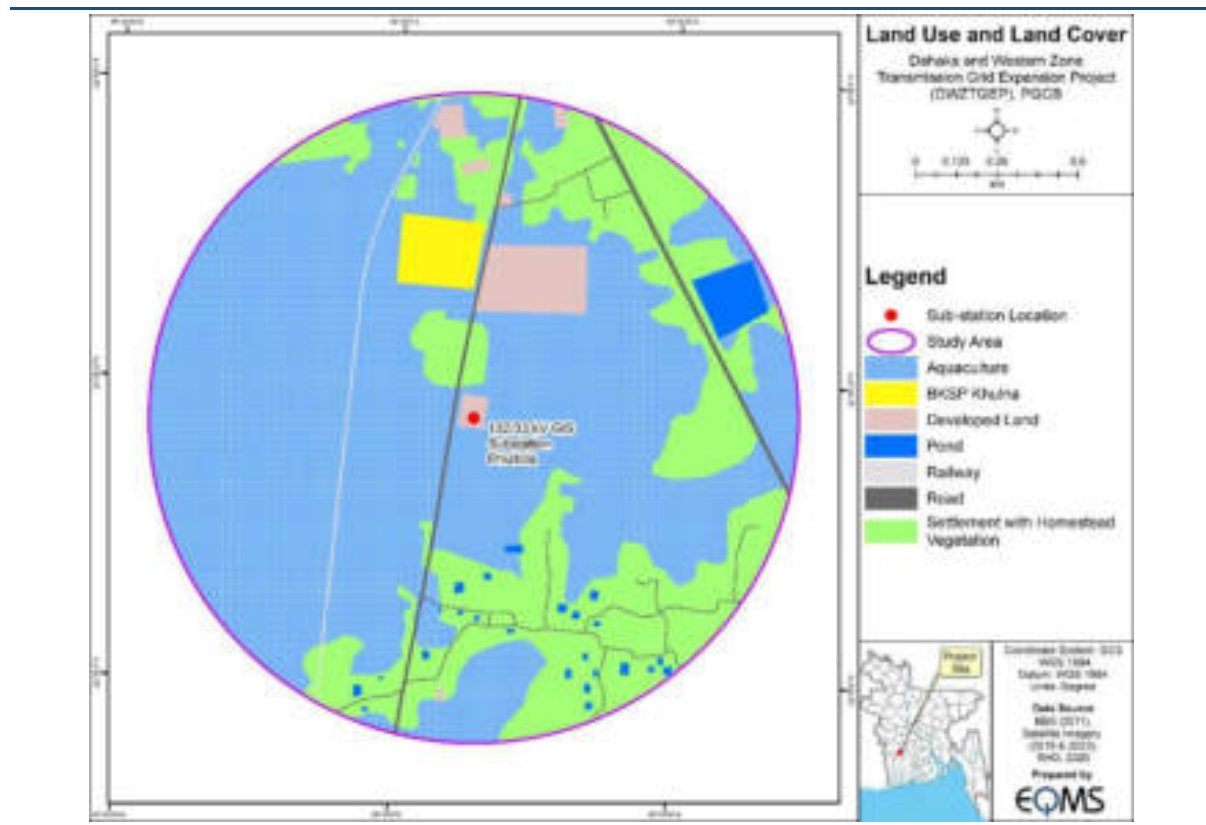
Source: GIS Mapping and Interpretation of Satellite imagery by EQMS

4.2.14.6 Phultola 132/33 kV GIS Substation

81. The significant land use-land cover of 1km radius buffer (250m each side of the alignment) of Phultola 132/33 kV GIS Substation includes agriculture land (65.31%) and settlement and homestead vegetation (26.69%). Other category land-use and land cover in the study area includes Developed Land (2.89 %) and BKSP Khulna (1.78%) etc. During the survey, no settlements were found beneath the proposed Substation. The Phultola 132/33 kV GIS Substation will not pose any risk to seasonal habitats/ wetlands and birds. The land use of the study area is presented in Table 4-32 and Figure 4-17.

Table 4-37: Land Use Pattern for Phultola 132/33 kV GIS Substation

Type	Area (Acres)	Percentage
Aquaculture	508.84	65.31
BKSP Khulna	13.89	1.78
Developed Land	22.54	2.89
Pond	11.45	1.47
Railway	3.12	0.40
Road	11.37	1.46
Settlement with Homestead Vegetation	207.97	26.69
Total	779.17	100

Figure 4-18: Land Use Map of Phultola 132/33 kV GIS Substation

Source: GIS Mapping and Interpretation of Satellite imagery by EQMS

4.3 Bio-Ecological Zones

82. Within a relatively small geographic area, Bangladesh has a diverse array of ecosystems. Being a low-lying deltaic country, seasonal variation in water availability is the major factor, which generates different ecological scenarios in Bangladesh. Temperature, rainfall, physiographic variations in soil and different hydrological conditions play vital roles in the country's diverse ecosystems. The ecosystems of Bangladesh are categorized into two major groups: (i) land based and (ii) aquatic. The land-based ecosystems include forest and hill ecosystems, agroecosystems and homestead ecosystems, while seasonal and perennial wetlands, rivers, lakes, coastal mangroves, coastal mudflats and chars, and marine ecosystems fall into the aquatic category.

83. In 2002, the International Union for Conservation of Nature (IUCN) classified the country into 12 bio-ecological zones (25 sub-bio-ecological zones) according to factors such as fauna and flora, geographical characteristics, annual average rainfall, administrative regions, soil types, water level in Bangladesh.

4.3.1 Diversity of Floral and Faunal Species

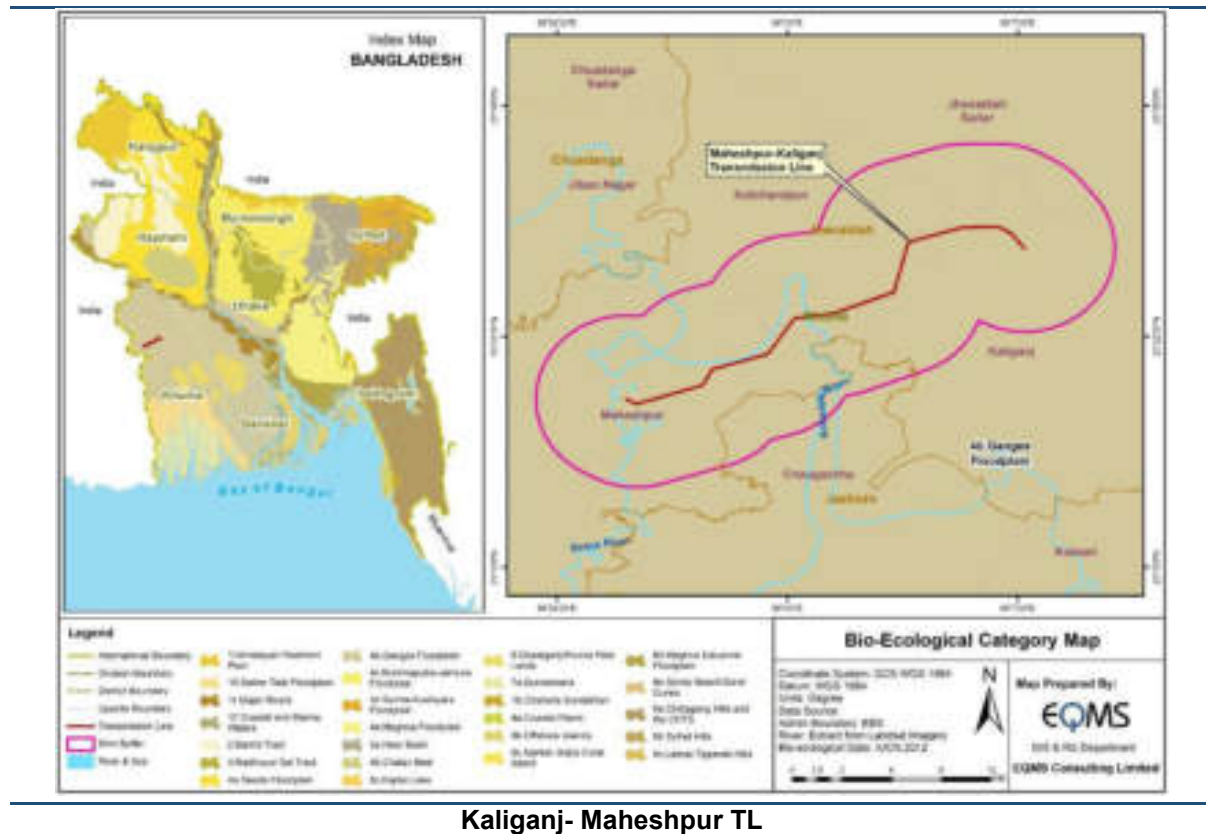
84. The subproject impact areas are mixed with different vegetation. Crops and vegetables dominate and are cultivated in the surrounding areas and include mainly paddy (rice), jute, mustard, onion, garlic, potato and a variety of homestead vegetables. A sizeable number of fruit trees with economic value were observed in the project area.

85. As per EQMS Survey 2022, In Kaliganj- Maheshpur transmission line, the number of trees estimated in the 12 m clearing width of the line was 674 (>5 m in height). The number of trees in the clearing width which are less than 5 m in height was 478. Additionally, during the field visit and the survey, it was observed that, about 143 bamboo yard will be affected at different points of Kushtia-

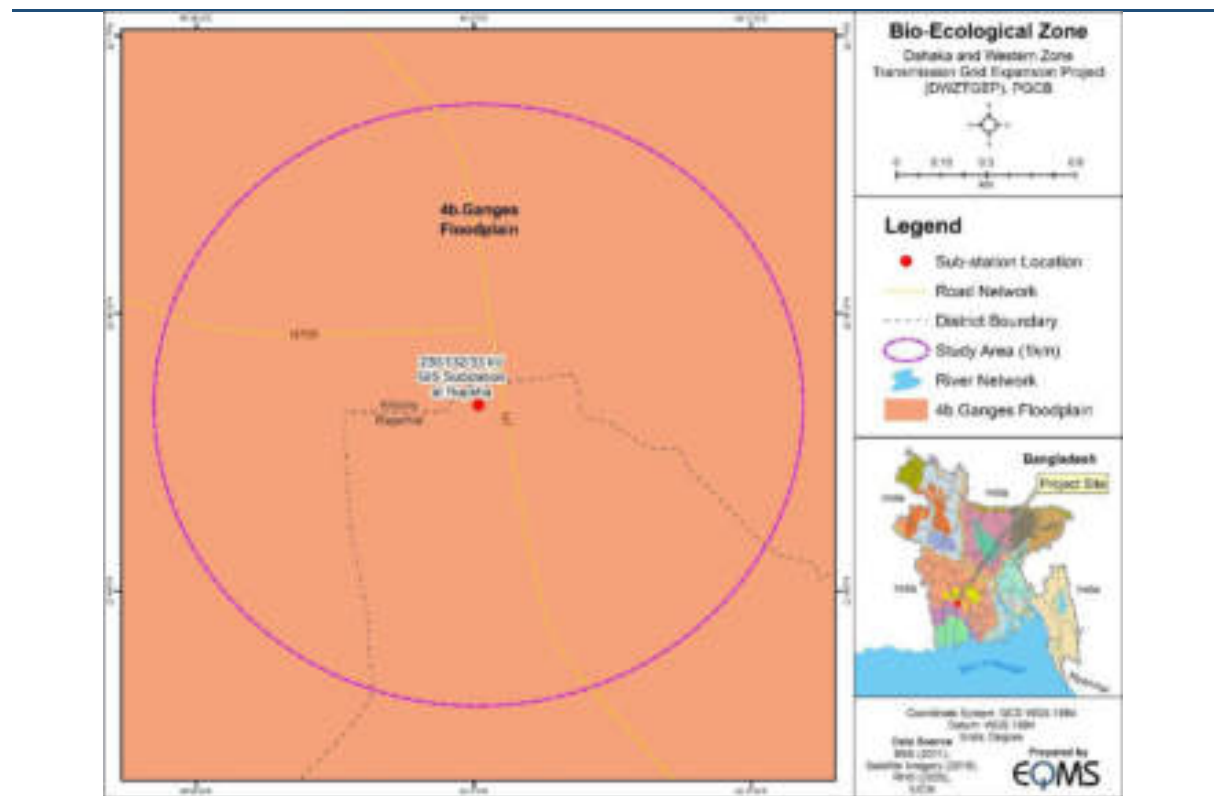
Meherpur transmission line. Different size of bamboo must be cleared in the ROW as it is considered the fastest growing species. No significant tree species were found in five substation locations.

86. No IUCN Red listed threatened species were recorded during site visit walkover. Major waterbodies covered in the alignments are rivers and gher. The proposed transmission line will not pose any risk to seasonal habitats/wetlands and birds. Bio-ecological Zones of Kaliganj- Maheshpur, and Five substations are shown in Figure 4-19.

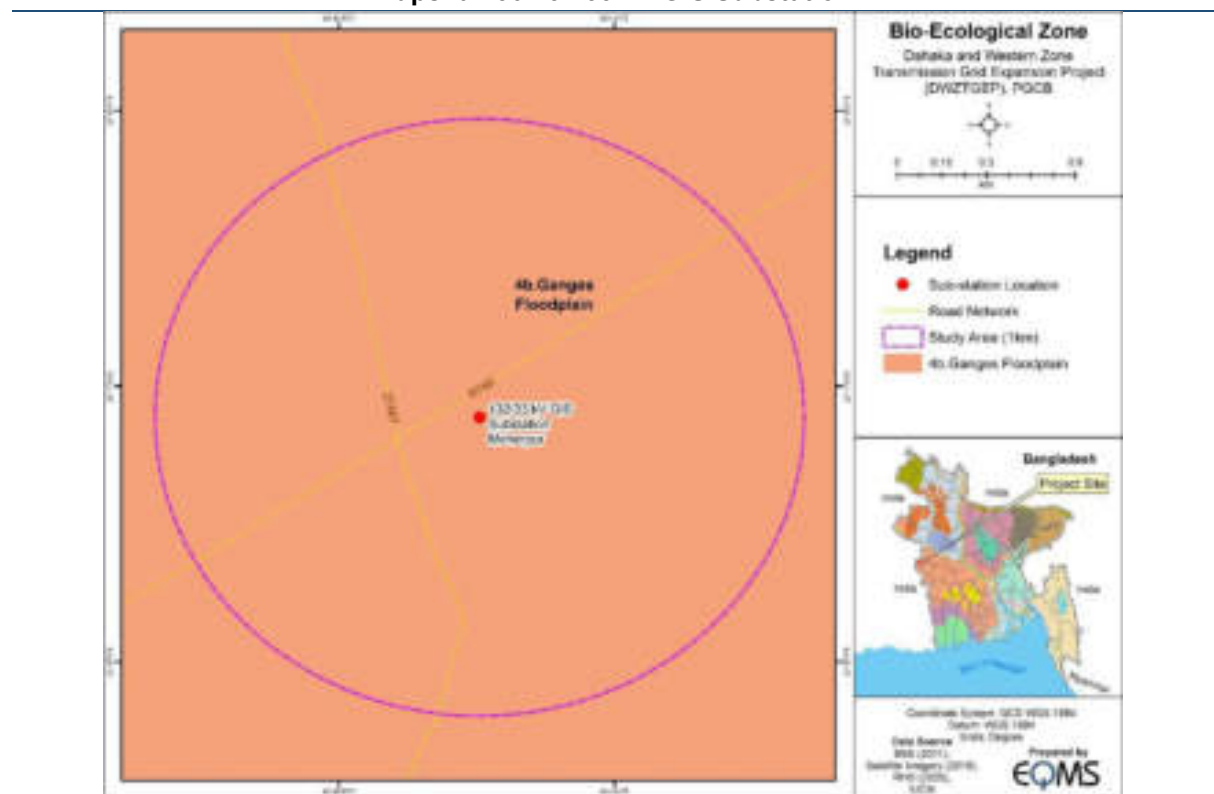
Figure 4-19: Bio-ecological Zones of Kaliganj- Maheshpur TL and, Rupsha, Phultola, Maheshpur, Meherpur and Manirampur Substations



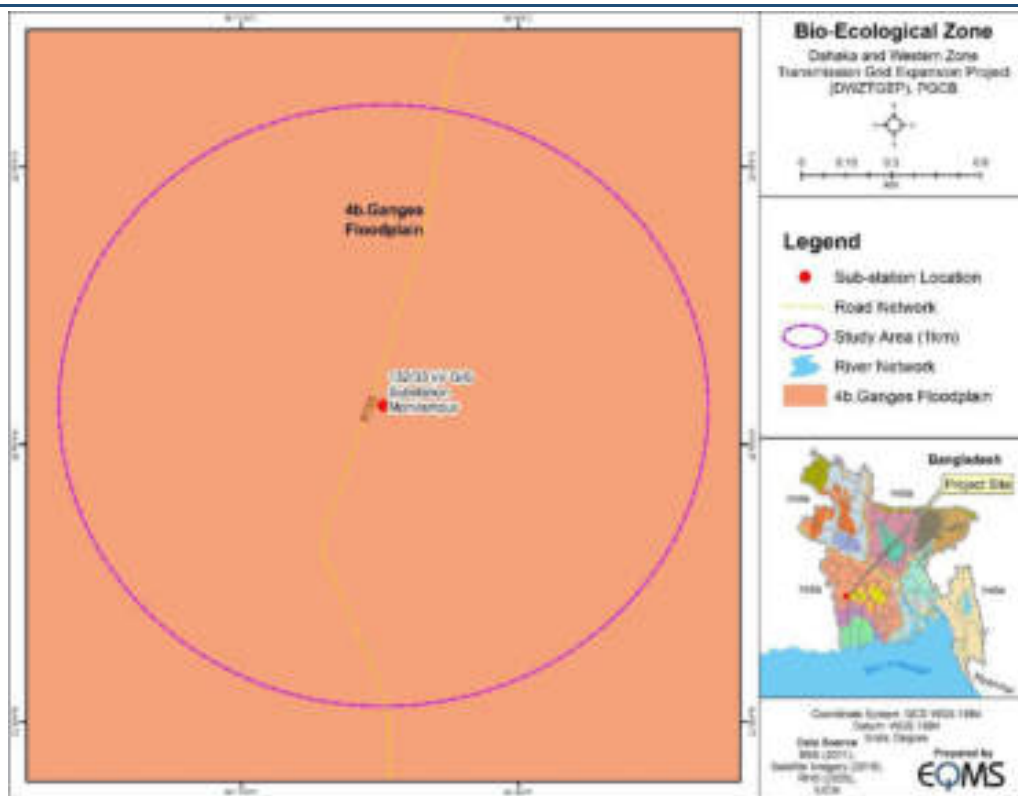
Kaliganj- Maheshpur TL



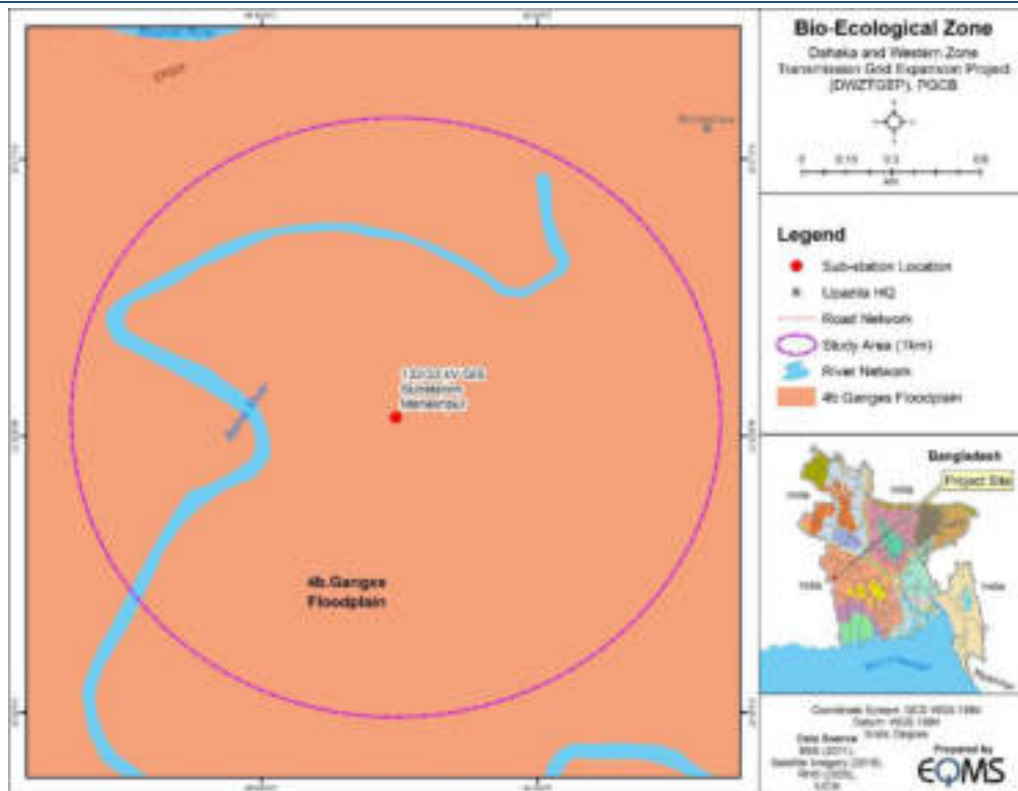
Rupsha 230/132/33 kV GIS Substation



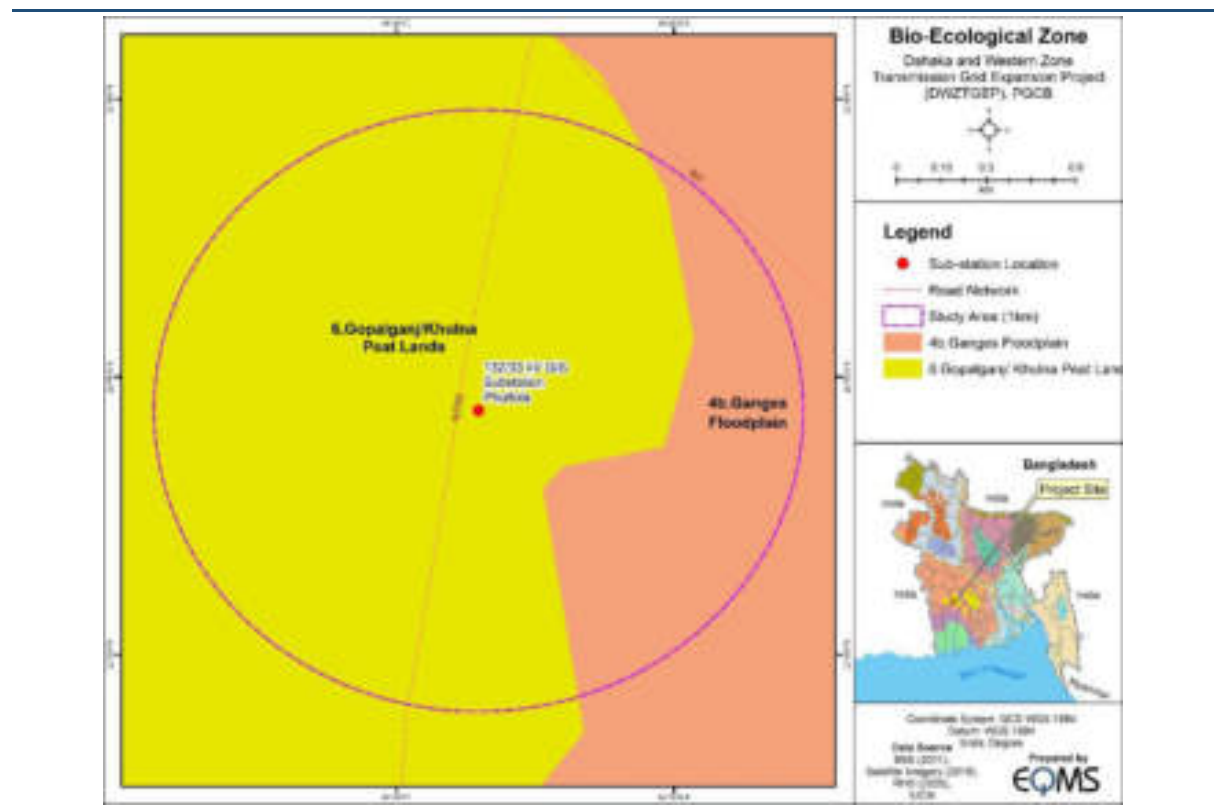
Meherpur 132/33 kV GIS Substation



Manirampur 132/33 kV GIS Substation



Maheshpur 132/33 kV GIS Substation



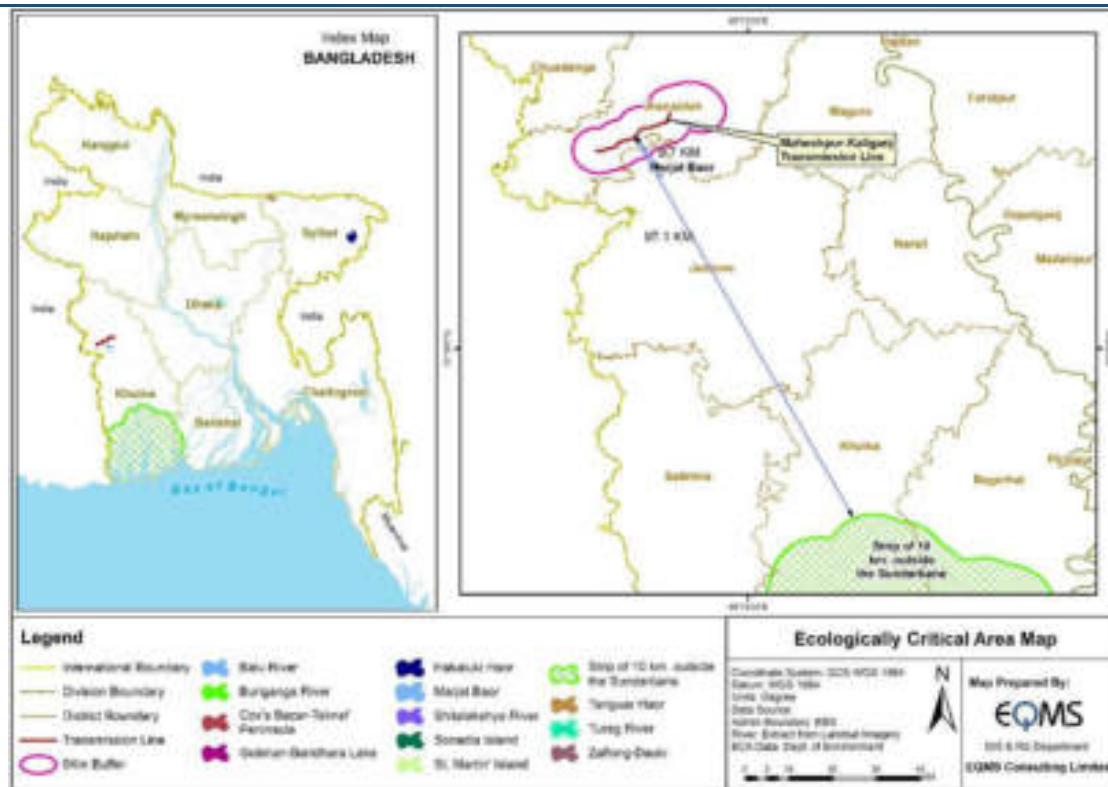
Phultola 132/33 kV GIS Substation

Source: International Union for Conservation of Nature (IUCN)

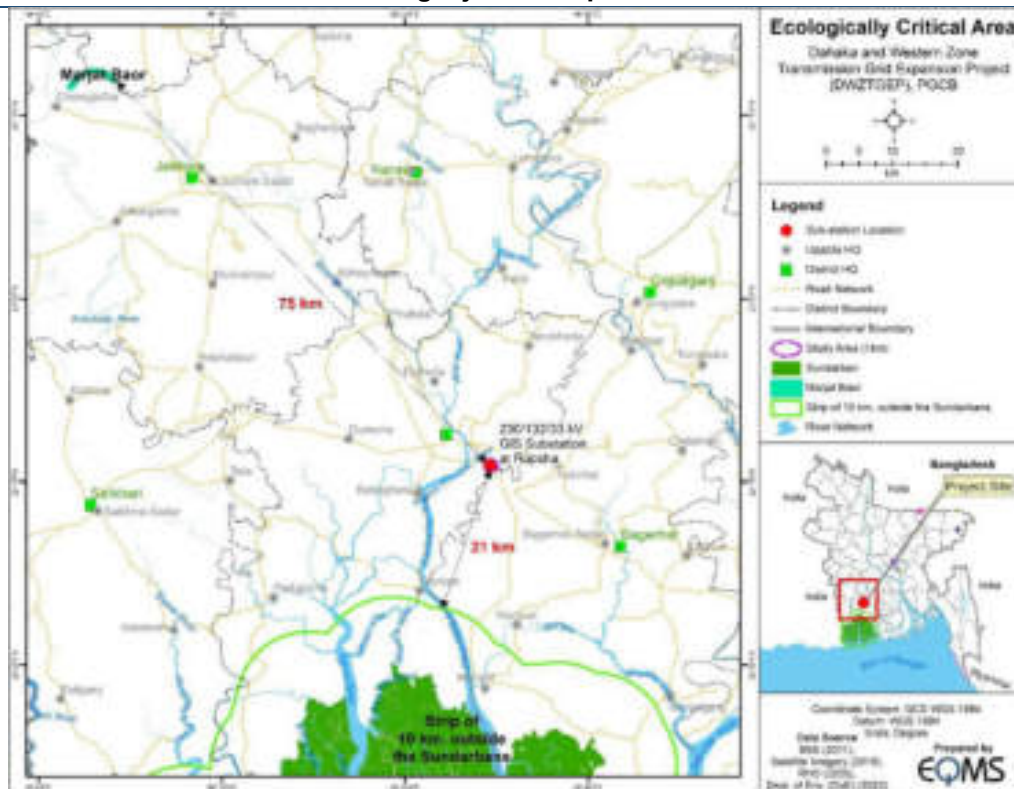
4.3.2 Ecologically Critical Area (ECA)

87. The nearest ECA from the Kaliganj- Maheshpur alignment is Marjat Baor which is 9.7 km away and 14 km away from Maheshpur Substation. The ECAs near transmission lines of Kaliganj- Maheshpur, and five substations are shown in Figure 4-20.

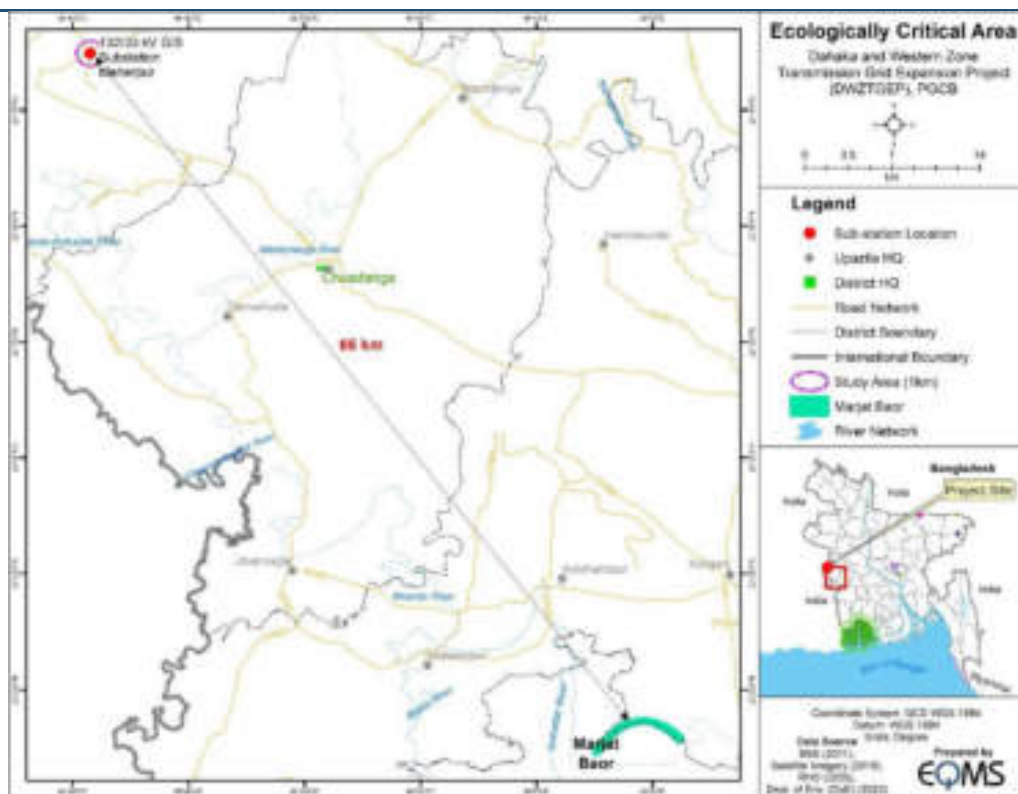
Figure 4-20: ECAs near transmission lines of Kaliganj- Maheshpur TL and, Rupsha, Phultola, Maheshpur, Meherpur and Manirampur Substations



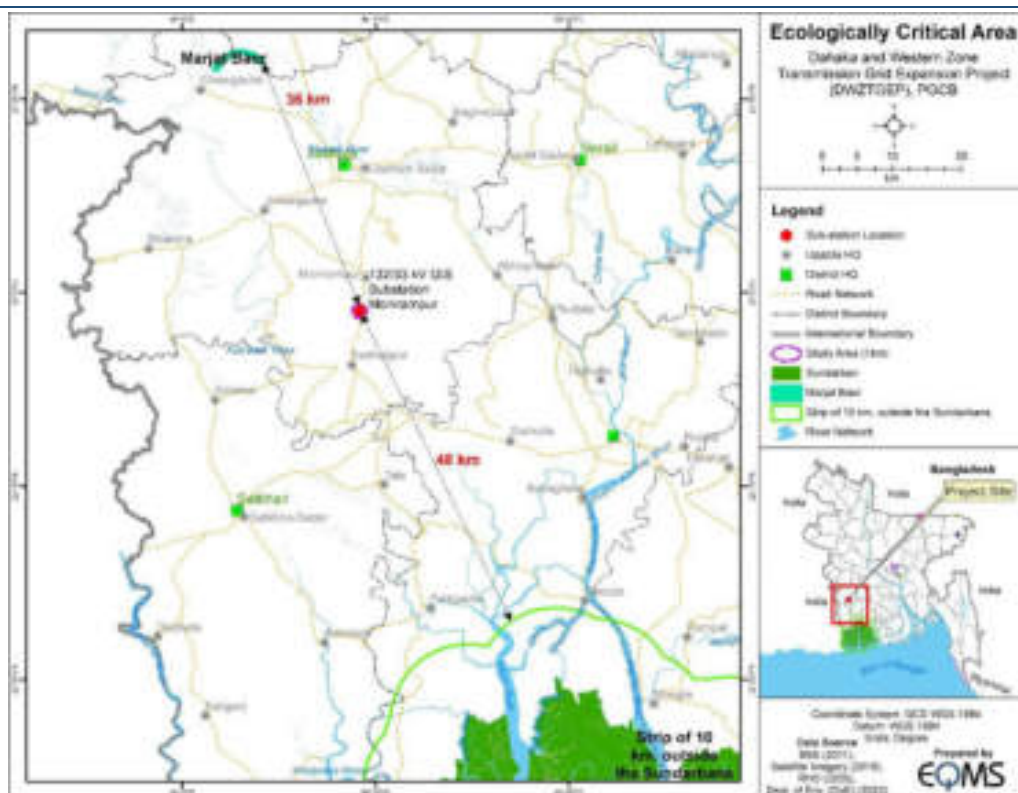
Kaliganj- Maheshpur TL



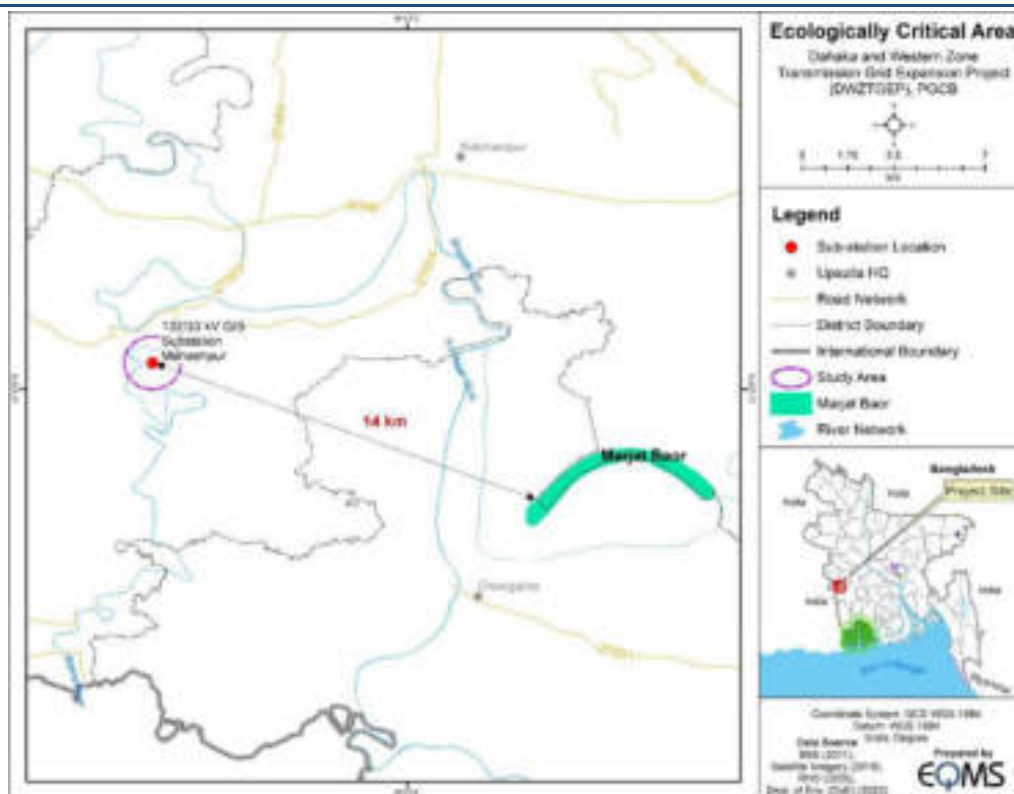
Rupsha 230/132/33 kV GIS Substation



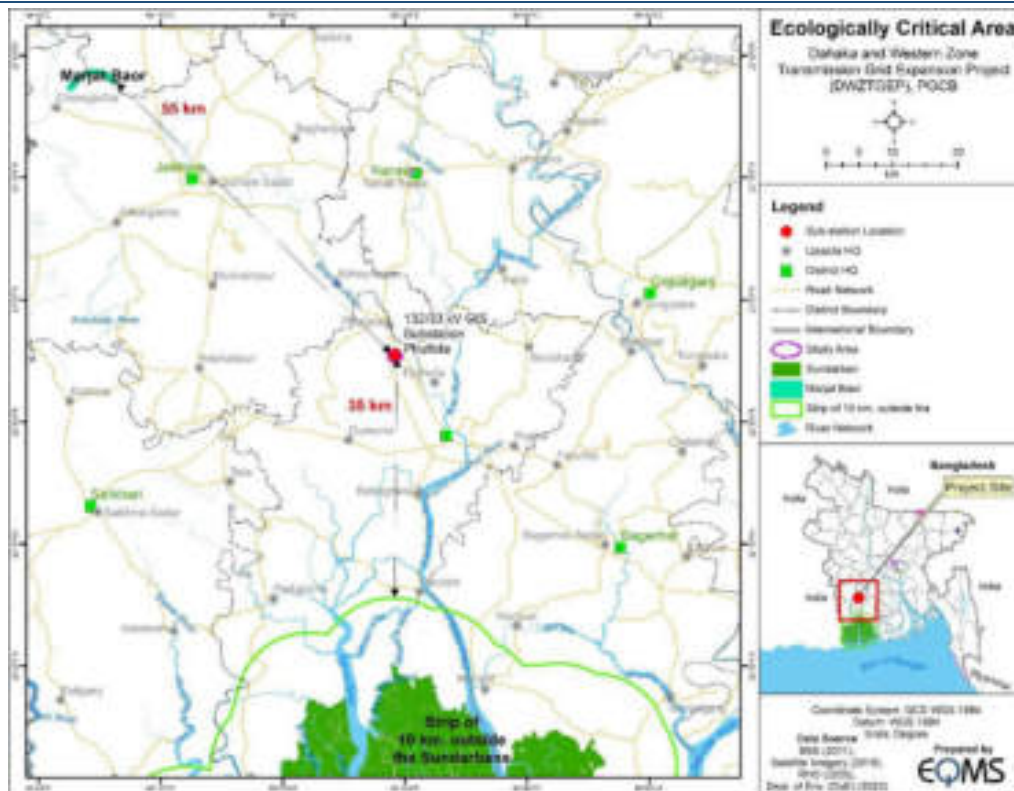
Meherpur 132/33 kV GIS Substation



Manirampur 132/33 kV GIS Substation



Maheshpur 132/33 kV GIS Substation



Phultola 132/33 kV GIS Substation

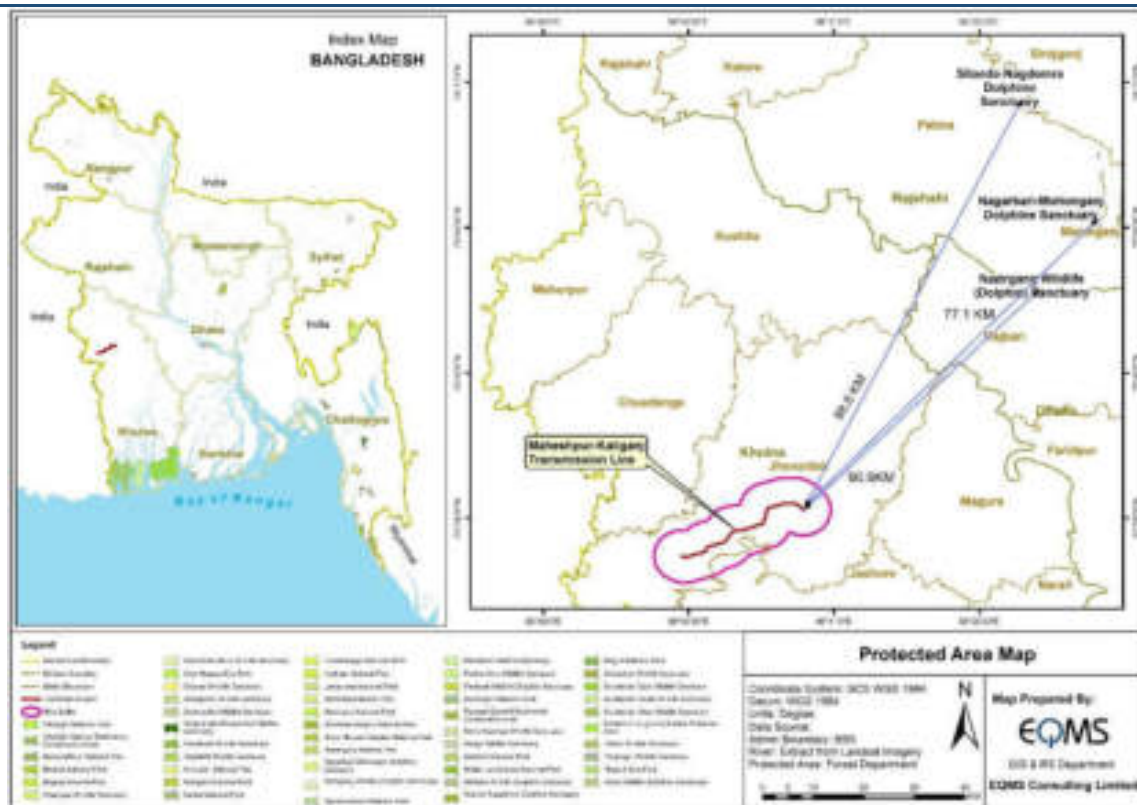
Source: Department of Environment (DOE)

4.3.3 Protected Areas

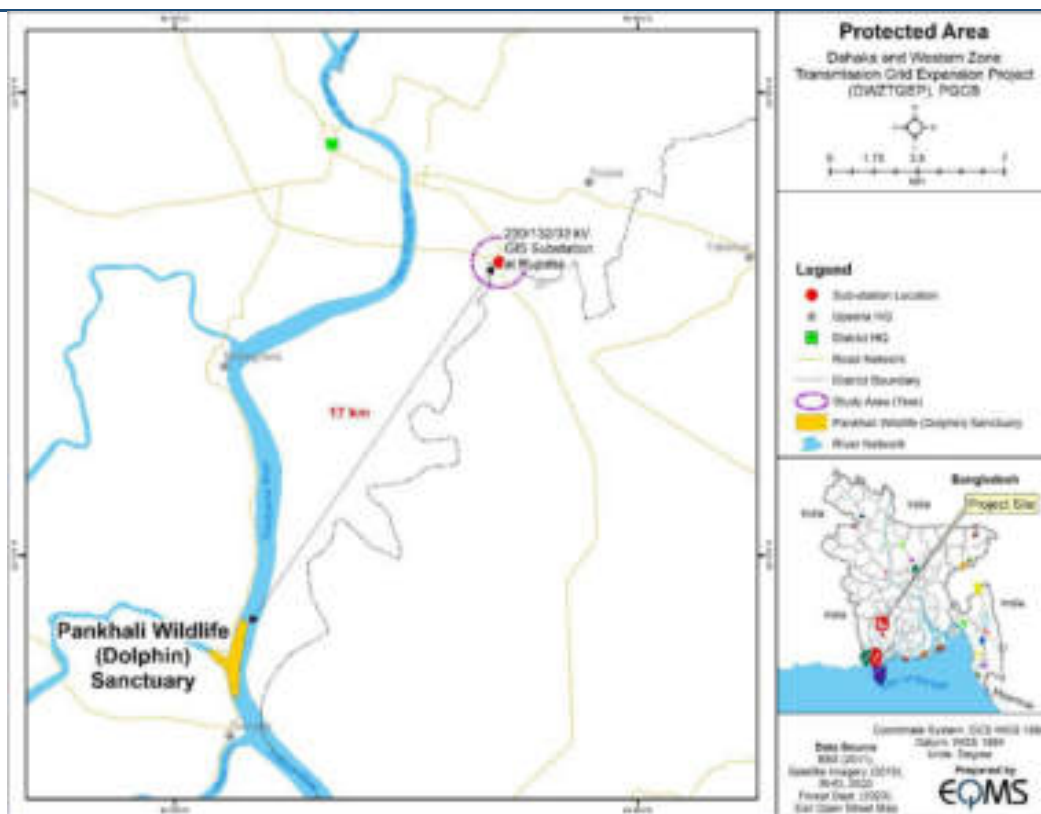
88. The nearest protected areas that are situated in the North-East corner from Kaliganj- Maheshpur transmission line are: Silanda- Nagdemra Dolphin Sanctuary (88.8 km), Nagarbari-Mohonganj Dolphin Sanctuary (77.1 km) and Nazirgang Wildlife Sanctuary (60.9 km). The nearest protected area from Rupsha, Manirampur and Phultala substation is Pankhali Wildlife (Dolphin) Sanctuary (30.51, 48 and 31 km respectively).

89. The nearest protected areas near transmission lines of Kaliganj- Maheshpur TL and, Rupsha, Phultola, Maheshpur, Meherpur and Manirampur Substations are shown in Figure 4-21.

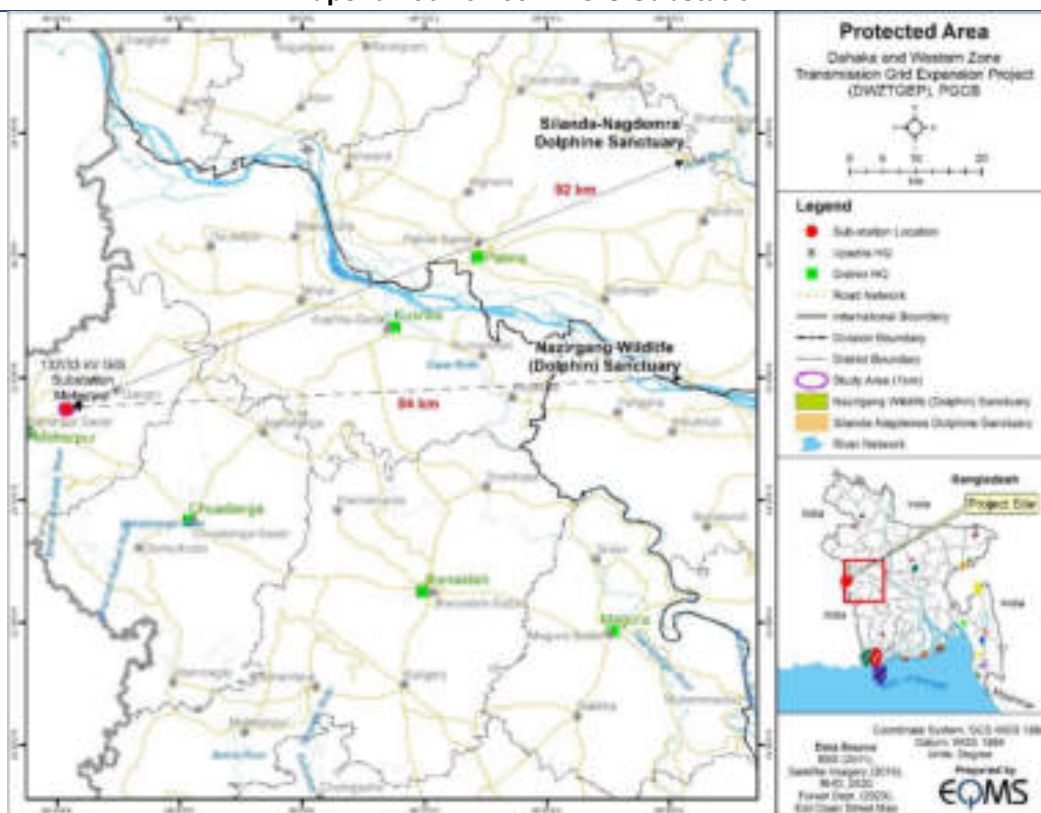
Figure 4-21: Protected areas near transmission lines of Kaliganj- Maheshpur TL and, Rupsha, Phultola, Maheshpur, Meherpur and Manirampur Substations



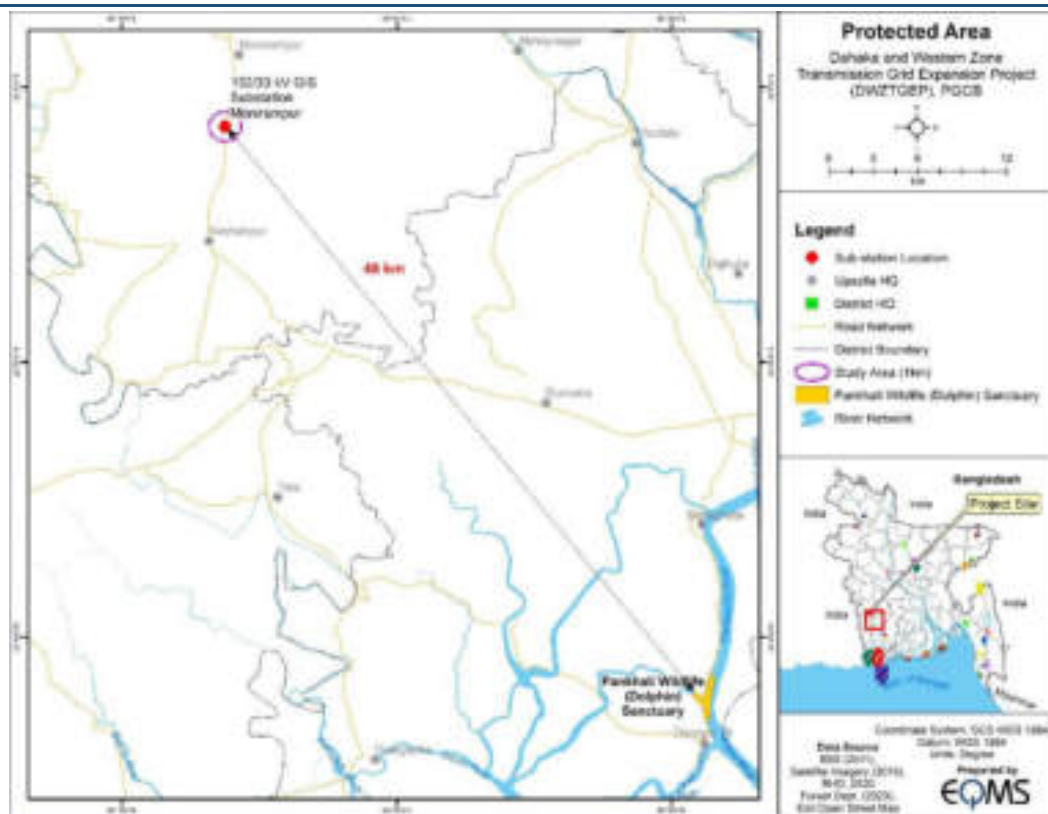
Kaliganj- Maheshpur TL



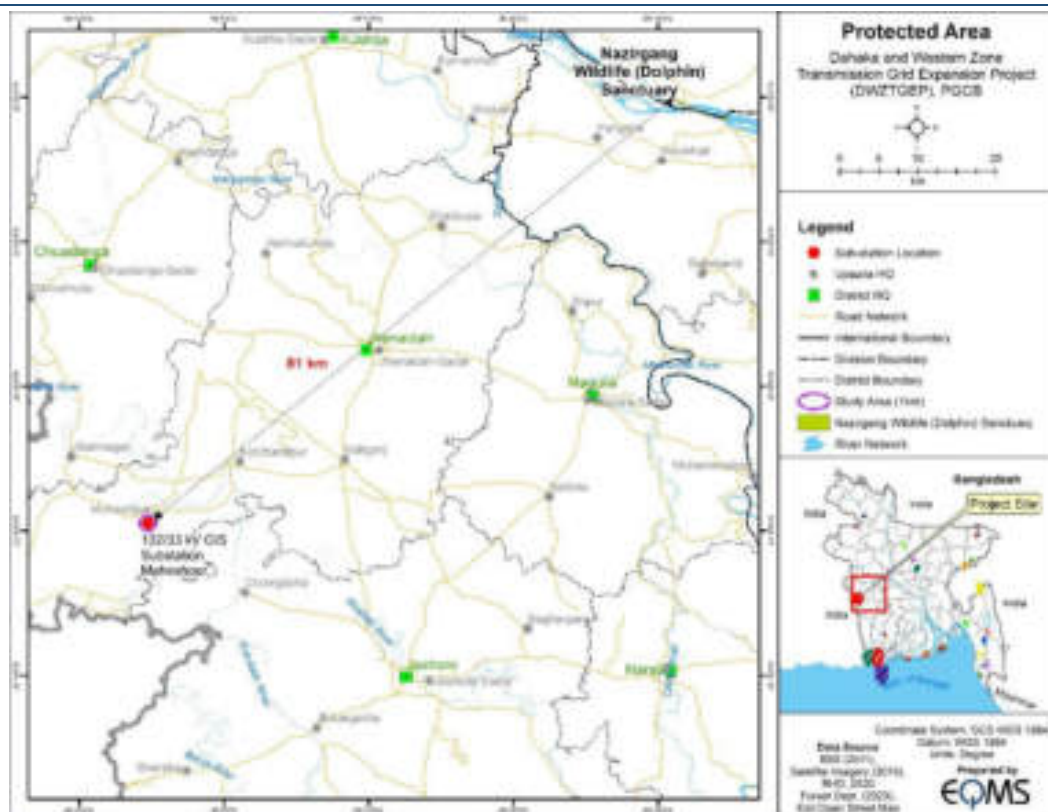
Rupsha 230/132/33 kV GIS Substation



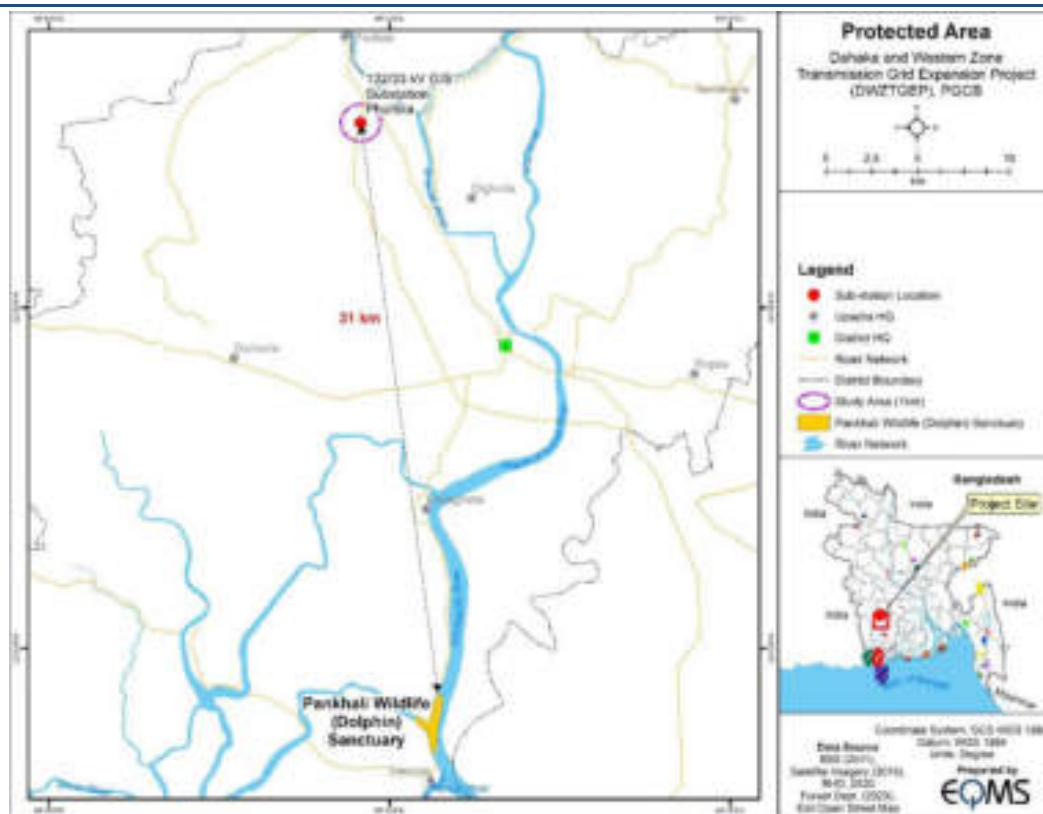
Meherpur 132/33 kV GIS Substation



Manirampur 132/33 kV GIS Substation



Maheshpur 132/33 kV GIS Substation



Phultola 132/33 kV GIS Substation

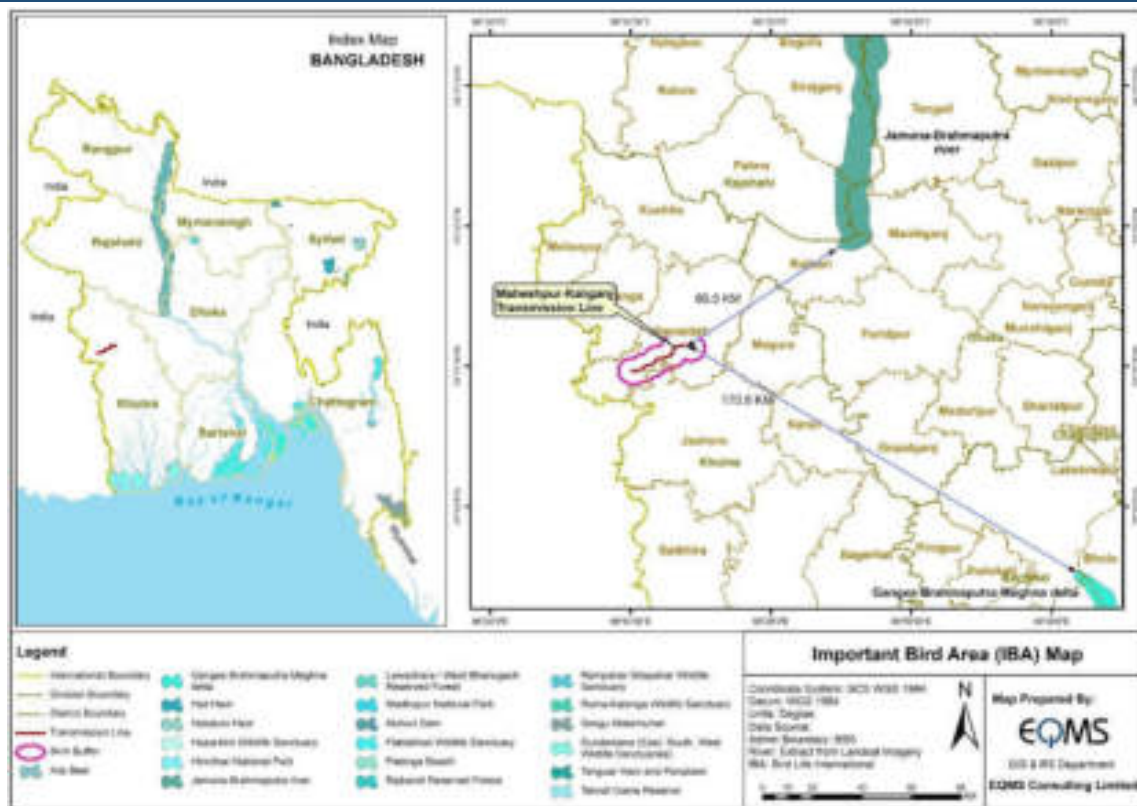
Source: Forest Department (FD)

4.3.4 Important Bird Areas

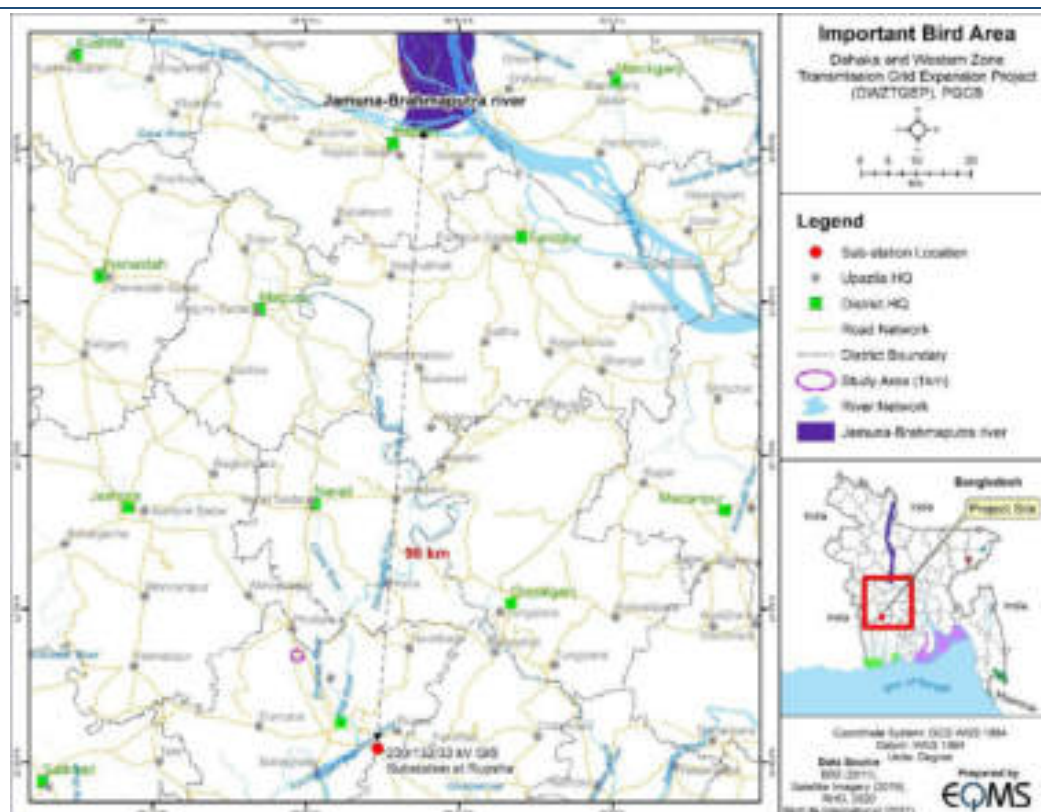
90. Bangladesh's Important Bird Areas (IBAs) cover less than 4% of the total land area of the country, reflecting the great reduction and fragmentation of natural habitats. However, additional sites are likely to be added to this preliminary list of IBAs in the future. Of the 20 IBAs in Bangladesh, 11 support globally threatened species, 10 have biome-restricted species and nine qualify as IBAs because they hold large congregations of water birds. Ten IBAs (53%) contain examples of terrestrial forest ecosystems, which together cover all significant areas of forest known to remain in Bangladesh. They include the Indo- Malayan tropical dry forests in Madhupur National Park (IBA 1) to the north of Dhaka, three IBAs in north-eastern Bangladesh where Indochinese tropical moist forest is the dominant biome, and six IBAs in the Chattogram hill tracts in the south-east of the country, where Indochinese tropical moist forest and Sino-Himalayan subtropical forest are the main habitats.

91. The nearest IBA, the Jamuna – Brahmaputra River is located at 65.5 km away from the Kaliganj- Maheshpur route. Figure 4-22 shows the nearest IBAs from transmission alignments and five substations.

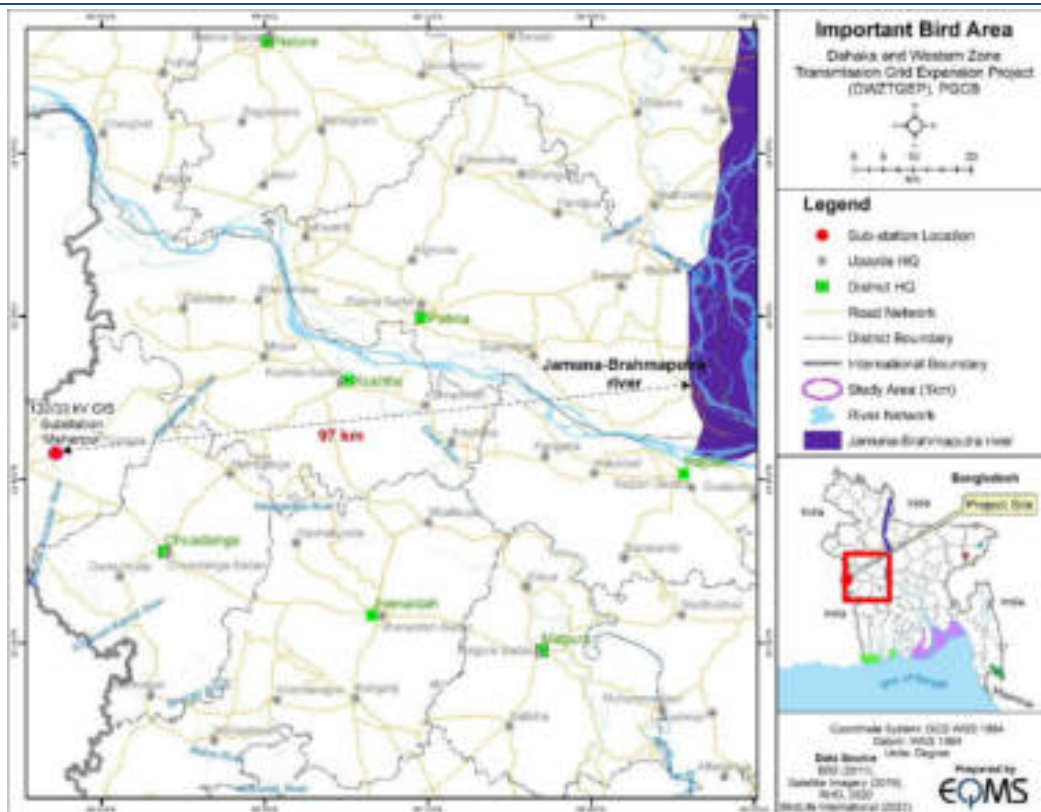
Figure 4-22: Nearest Bird Staging Areas (IBA) in Kaliganj- Maheshpur TL and, Rupsha, Phultola, Maheshpur, Meherpur and Manirampur Substations



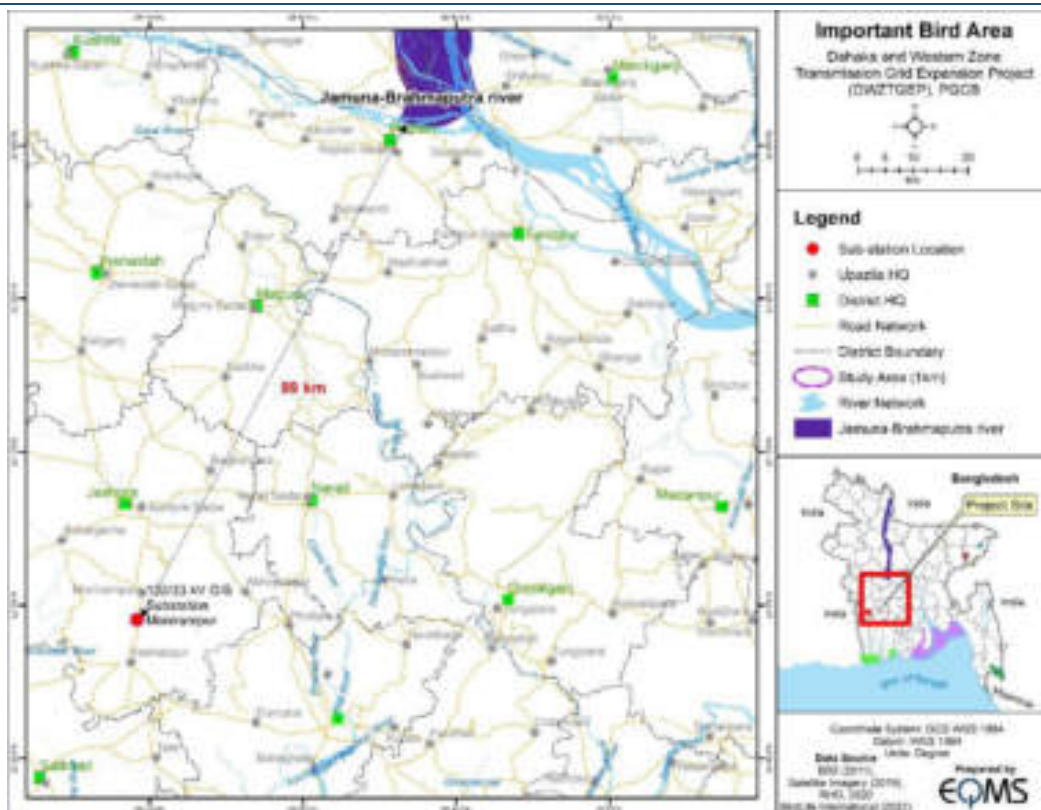
Kaliganj- Maheshpur TL



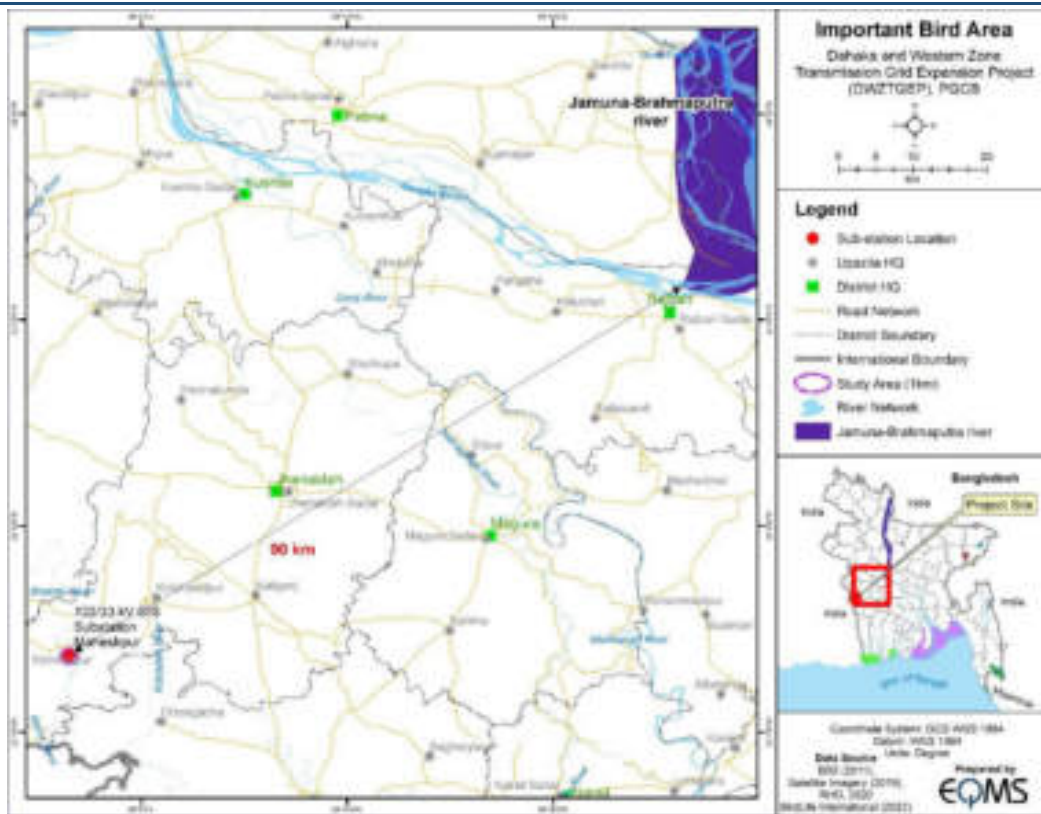
Rupsha 230/132/33 kV GIS Substation



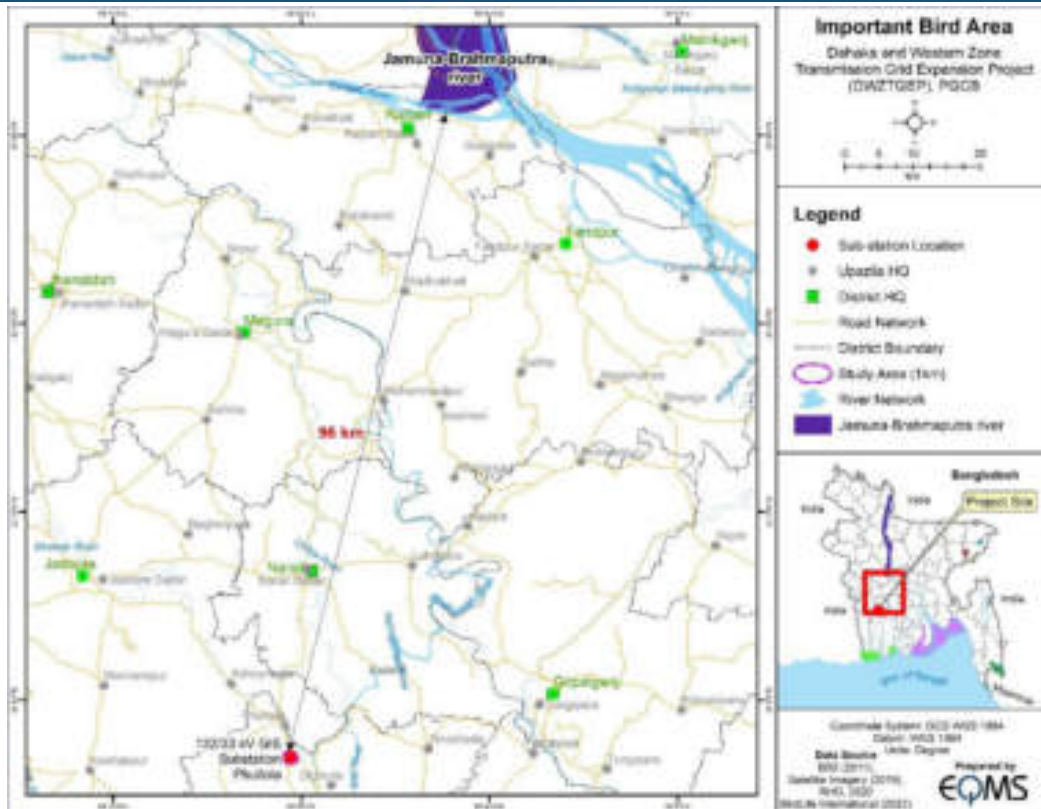
Meherpur 132/33 kV GIS Substation



Manirampur 132/33 kV GIS Substation



Maheshpur 132/33 kV GIS Substation



Phultola 132/33 kV GIS Substation

Source: BirdLife International

4.4 Socio- economic Information and Profile

4.4.1 Kaliganj Maheshpur TL and Maheshpur 132/33 kV GIS Substation

4.4.1.1 Introduction

92. The proposed project transmission line will cross Three upazilas named Kaliganj, Kotchandpur, and Maheshpur. 76 transmission towers will be established in this area of which PGCB already approved all the 76 transmission towers. The length of total transmission line is 28 Km.

93. The landowners were considered for conducting the social survey. A total of 68 households comprising 278 people were considered to understand the socio-economic scenario of the alignment.

94. The socio-economic profile of the 68 affected HHs is presented following demographic profile of the HHs. A total of 68 HHs comprising 278 people will be affected by the project with average HH size 4.08 which is slightly higher than the national average (4.0)¹⁸ according to BBS (2022).

Table 4-38: General Profile of Affected Population

Number of Total Project Affected Households (PAHs)	68
Number of Total Project Affected Population (PAPs)	278
Average HH Size	4.08

Source: Socioeconomic Survey, EQMS, March 2023

4.4.1.2 Demographic Profile of the Project Affected Households

95. The demographic profile of the affected households has been analyzed as part of the socioeconomic profile of the project area. This comprises of gender profile and age-sex distribution of the PAPs. In the study area, about 68 households (HHs) were surveyed with a total population of that will be directly affected by the implementation of the proposed project. The average sex ratio is 112.2 (National average 98.04¹⁹) and the average household size is 4.08 (national average 4.0²⁰). **Table 4-39** shows the demographic profile in the project area.

Table 4-39: Demographic Profile of Affected Households

District Name	Upazila	Total HHs	Total Pop	Sex Ratio	Avg. HH Size
Jhenaidah	Kaliganj	19	70	125.8	3.68
	Kotchandpur	27	113	114.5	4.18
	Maheshpur	22	95	97.9	4.31
Totals		68	278	112.2	4.08

Source: Socioeconomic Survey, EQMS, March 2023

4.4.1.3 Sex Profile of Affected Populations

96. Sex profile of the affected populations is shown in **Figure 4-23** Error! Reference source not found.. From the sex profile, we can find out that the percentage of male populations is higher than the females in the project area. The overall male female ratio of the project area is 100:112.2 (the national

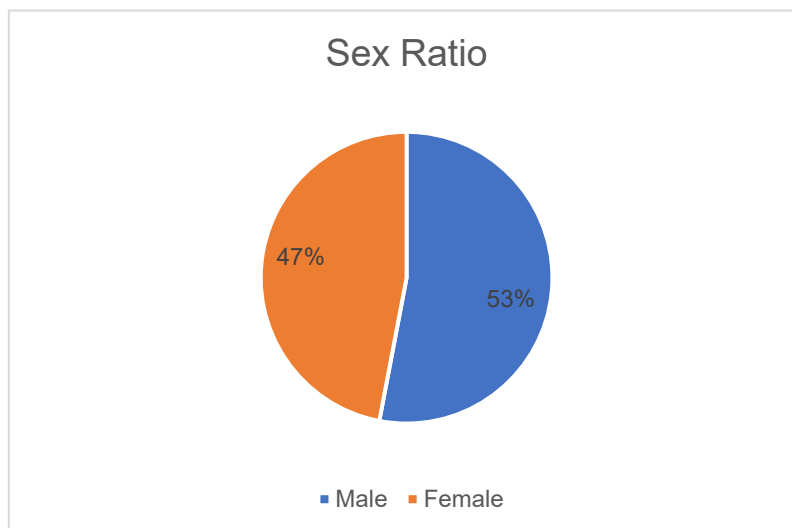
¹⁸Population and Housing Census Preliminary Report August 2022

¹⁹ Population and Housing Census Preliminary Report August 2022

²⁰ Population and Housing Census Preliminary Report August 2022

ratio is 100:98.04²¹) which implies that the project area is quite different from the corresponding national condition with a higher male population.

Figure 4-23: Sex Profile of Affected Populations

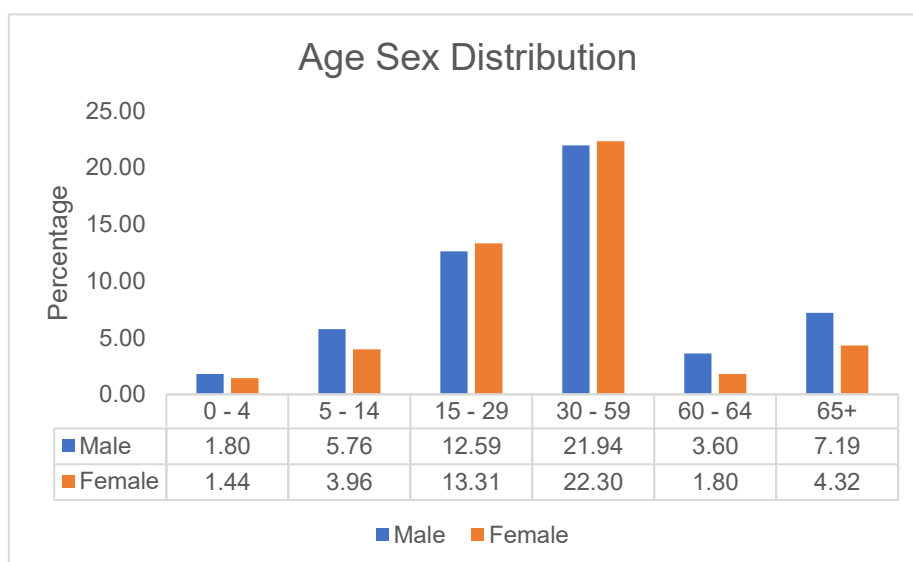


Source: Socioeconomic Survey, EQMS, March 2023

4.4.1.4 Age and Sex Distribution of Affected Population

97. **Figure 4-24** presents age-sex distribution of the affected Populations. The survey findings indicate that population percentage increases respectively from the age group of 5-14 years. According to the age group distribution, the most prominent one is 30-59 years, which comprises of 21.94% of the total male population and 22.30% of the total female population. The numbers of affected persons steadily decrease at the age limit 60-64 years. The steady decline in the number of populations after this age limit can be considered significant for low life expectancy in the region.

Figure 4-24: Age Sex Distribution of the PAPs



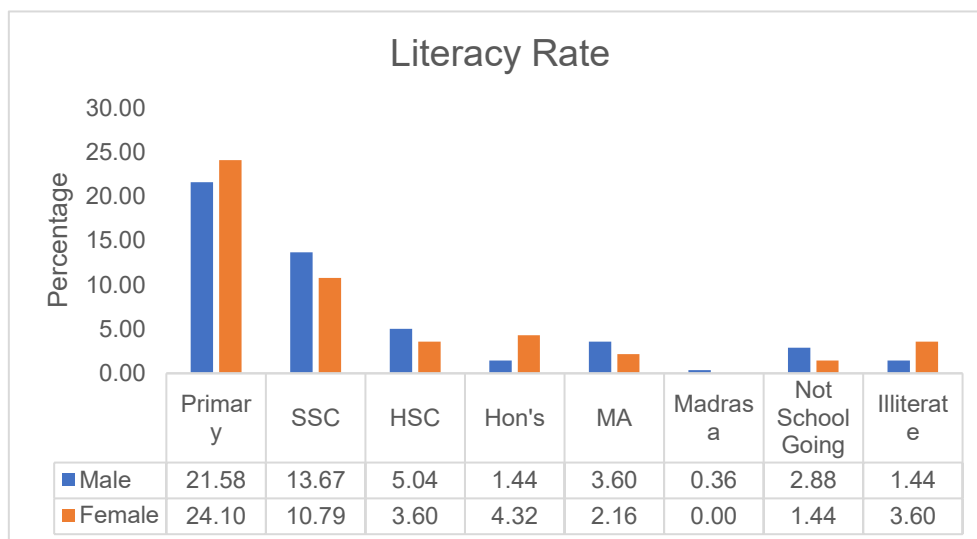
Source: Socioeconomic Survey, EQMS, March 2023

²¹ Population and Housing Census Preliminary Report August 2022

4.4.1.5 Level of Education of Affected Population

98. Education level of the affected population is presented in the below **Figure 4-25**. The table demonstrates that primary and secondary level enrolment is high in the area. It also indicates that higher education rate is comparatively higher among male population. Furthermore, illiteracy is high among female population. According to the Population and Housing Census Preliminary Report - August 2022 of Bangladesh Bureau of Statistics, 51.77% of total population in Bangladesh are literate which includes 51.44% male and 49.44% female²².

Figure 4-25: Level of Education

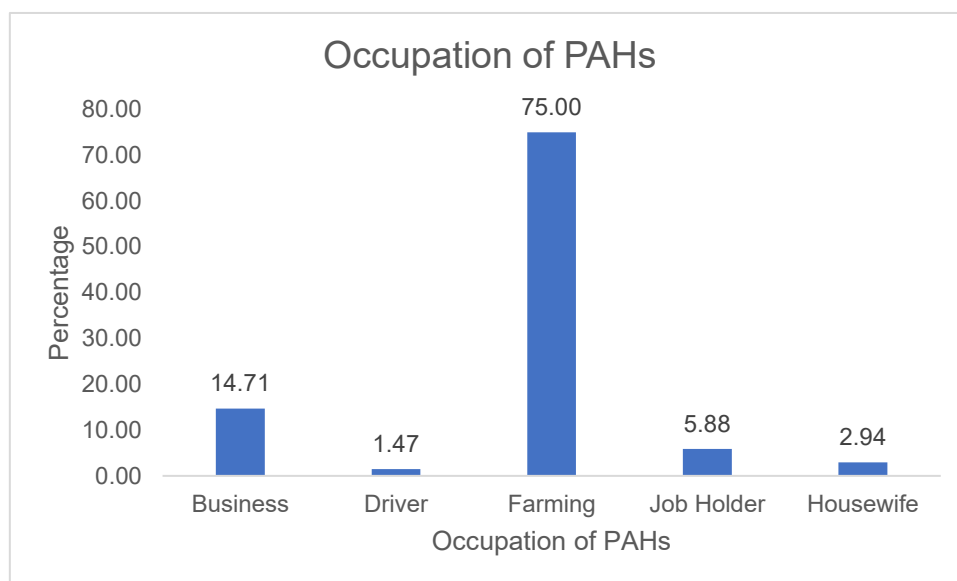


Source: Socioeconomic Survey, EQMS, March 2023

4.4.1.6 Primary Occupation of Affected Households

99. According to the survey of the affected households, 75.00% HHs primary occupation is agriculture. There will not be any impact on their income as compensation will be paid for the entire construction period and after the construction period, affected HHs will be able to use land as usual. Based on the income level, their socio-economic condition is better than the rest of the population in that region. In addition to Agriculture, the other significant occupations are business, service, teaching etc.

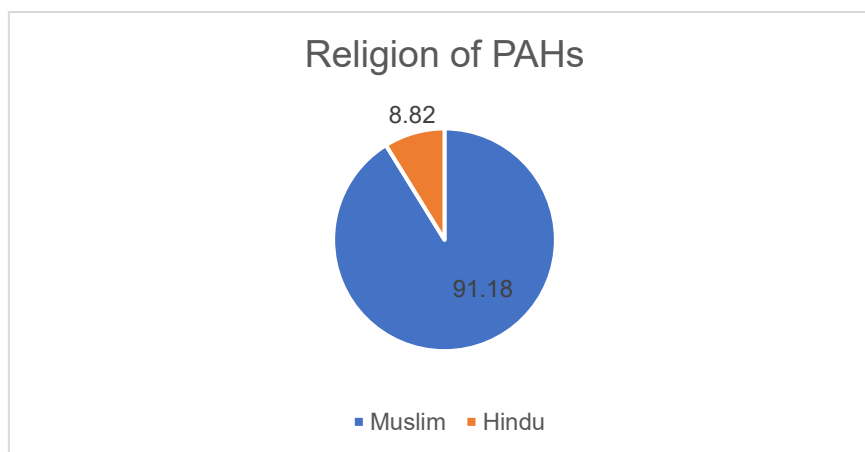
²² Population and Housing Census Preliminary Report August 2022

Figure 4-26: Occupation of PAHs

Source: Socioeconomic Survey, EQMS, March 2023

4.4.1.7 Religion of Affected Households

100. The religious background of the affected HHs is presented in **Figure 4-27** revealing that 91.18% of affected household are Muslim. On the other hand, only 8.82% of the affected households are Hindu in religion in this project area.

Figure 4-27: Religion of PAHs

Source: Socioeconomic Survey, EQMS, March 2023

4.4.1.8 Income of Affected HH

101. The average monthly incomes of 54.41% households are Tk 20,000 to 30,000. Another 26.47% have monthly incomes ranging from Tk 10,000 to Tk 20,000. Households receiving monthly incomes between Tk 30,000 to Tk 40,000 are 7.35%. Monthly incomes of the below 10,000 are 7.35%. Around only 1.47% of households earn more than 40000 per month. As per the official poverty line of Bangladesh, households earning an annual income of less than Tk 65000 are considered those living below the poverty line. **Table 4-40** shows the monthly income range of the affected households.

Table 4-40: Monthly Income of the AHHs

Income Range	Frequency	Percent (%)
Below 10000	5	7.35
10000 - 20000	18	26.47
20000 - 30000	37	54.41
30000 - 40000	5	7.35
40000 - 50000	1	1.47
Above 50000	2	2.94
Total	68	100

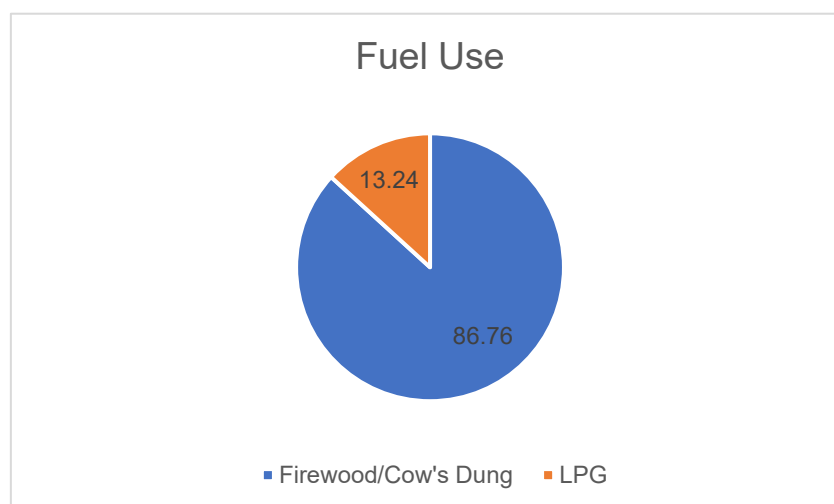
Source: Socioeconomic Survey, EQMS, March 2023

4.4.1.9 Energy Use of PAHs

102. Electricity is the main source of lighting for 100% grid connected households. Households use multiple and combined energy sources for domestic purposes. Households in the project affected areas experience frequent load shedding which deprives them of a regular supply of electricity throughout the day. Daily power shedding is extensive and continues for several hours both daytime and night. Load shedding adversely affect the farmers in irrigating their cultivation fields and providing a regular supply of water, children's studies at nighttime, and women in watching television programs during their leisure time. Sleeping at night after a day's hard work is difficult as they cannot operate fans particularly during summer seasons.

4.4.1.10 Fuel Source of PAHs

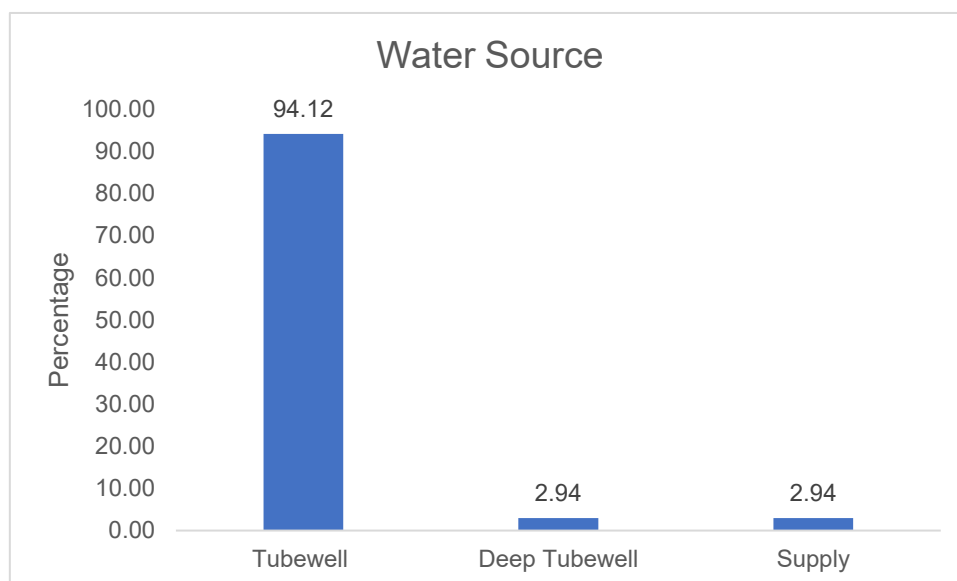
103. Firewood is the main source of energy used by most of the households (86.76%) for cooking and boiling purposes followed by 4.41% using liquefied petroleum gas, particularly by people living closer to urban areas. Below **Figure 4-28** shows the source of fuel of the affected area.

Figure 4-28 : Fuel Source of PAHs

Source: Socioeconomic Survey, EQMS, March 2023

4.4.1.11 Water Source of AHs

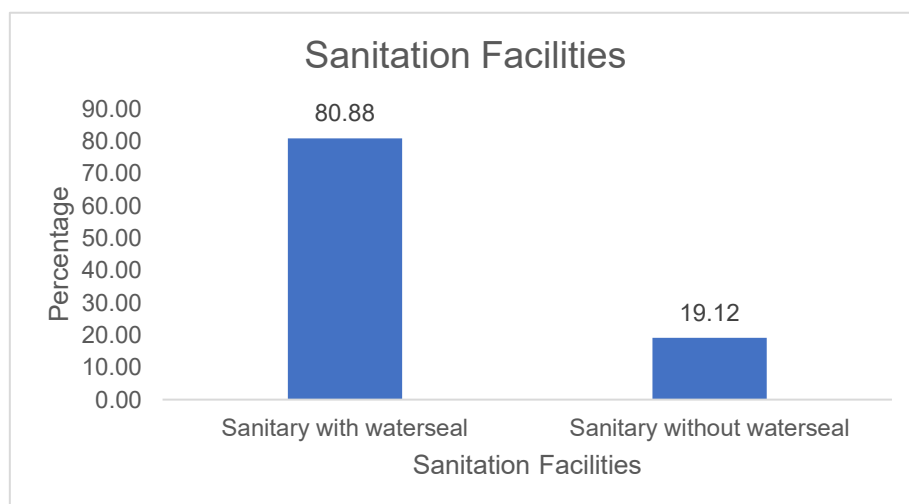
104. The main source of drinking water in these areas is tube-well where about 94.12% of people use tube-well water. The rest of the people use both deep tube well and supply water. Usually, the people of this area do not preserve rainwater for their domestic use.

Figure 4-29: Drinking water Source of PAHs

Source: Socioeconomic Survey, EQMS, March 2023

4.4.1.12 Sanitation Facilities of PAHs

105. About 80.88% and 19.12% of households use water sealed and non-water-sealed sanitary latrine facility. The following **Figure 4-30** shows sanitation facility of the project area.

Figure 4-30: Sanitation Facilities of the PAHs

Source: Socioeconomic Survey, EQMS, March 2023

4.4.1.13 Role of Women and Gender Issues

106. Women in the project affected areas are engaged in multiple activities. Apart from their household roles such as household cooking, cleaning, fetching water, feeding children, helping in children's studies, and looking after the in-laws (particularly those living in extended families), women across the project areas also make a significant contribution to the household economy.

107. Despite strong pressures from the families to dissuade women finding employment, they take a lead role in livestock farming and take care of the feeding of their cattle, goats, and poultry. Home gardening is another important economic activity of women, produce of which is used for both household consumption and marketing. Other forms of economic activities conducted by women

include agricultural labor work, dressmaking, handicraft-making, employment in apparel industries etc. Educated women are employed in both government and private sector jobs. Women's earnings are mainly used for children's education and clothing, to supplement the households' consumption needs, and to repay the past debts. Some women would also save some money to be used in emergencies or for their children's future. In some communities, however, it has been reported that women must hand over their earnings to husbands or else get prior consent of the husband to spend their earnings. Women also participate in the activities of NGOs like BRAC and Grameen Bank to access micro-credit which they would use to buy cattle, goats, and poultry.

108. Household level decision-making is largely vested with the husband. A few instances of joint decision making by both men and women were reported. Women also perform a significant role in managing household assets despite the key immovable assets like land and house are owned by men. Physical assets such as land and jewelry received by women as part of their dowry remain in her possession but on some occasions, they are transferred to the ownership of men as part of matrimonial agreements. Women are discouraged from participating in social and political activities mostly by their male counterparts. However, many women struggle to change this situation.

4.4.1.14 Indigenous Peoples

109. There are no indigenous people's settlements in the affected area of the project. Therefore, no permanent or temporary and direct or indirect impacts on indigenous people's communities are anticipated. The project has taken necessary steps to avoid the indigenous people's communities and their properties and other social and cultural activities from the areas identified for project implementation.

4.4.1.15 Vulnerability Assessment

4.4.1.15.1 Economically Vulnerable

110. According to the reports of the World Bank, the 'International Poverty Line' is currently set at \$1.90 a day. It means, the people who do not have the ability to earn \$1.90/ BDT. 180 per day (BDT 65,700 per year) in the project area, are below the poverty line and economically vulnerable. In the project area, only one surveyed household were identified as vulnerable who is stayed below poverty line and earns only 4000 BDT per month. The other surveyed households had an income of more than 5500 per month/ 65700 per year.

4.4.1.15.2 Physically Vulnerable

111. Physical vulnerability in the surveyed populations refers to those people with disabilities. Only 11 person was found out of 278 people in the survey as person with disabilities or physically vulnerable.

4.4.1.15.3 Dependent Group

112. The children (0-18 years)²³ and the elderly (above 65 years old), a total of 32 people out of 278 were recorded as dependent group in the surveyed populations.

4.4.1.15.4 Women Headed Households

113. The male and female composition of the population is relatively equitable indicating a marginally higher male dominated population as compared to female population. Vulnerable groups include specific groups of persons, households or a section of the community vulnerable to multiple stressors including abuse, social marginalization, social exclusion, domination or are under greater susceptibility to external influence. Among all the surveyed household, no female headed household has been found.

²³ The Children Act, 2013

4.4.2 Rupsha 230/132/33 kV GIS Substation

4.4.2.1 Introduction

114. The socio-economic condition of the people of the project area will provide sound reference and assess probable socio-economic impact of the proposed interventions. This will enable us to compare the changes and impacts of the project interventions in present. The socio-economic baseline scenario describes the socio-economic characteristics of project area on the basis of secondary data which was collected during Population and Housing Census of 2011. The socio-economic characteristics include administrative area, demographic, household size, education, occupation, housing, employment opportunity, access to water and sanitation status etc.

4.4.2.2 Population

4.4.2.2.1 Administrative Area and Location

115. The proposed project is located in the Rangamati district under Chattogram division. Based on the assessment of the project, its surroundings and its environmental & social influence, a 2 kilometers radius is considered from the project boundary as the study area for the social study. Table 4-41 shows the study area of the project across Unions, Upazilas and Districts. The socio-economic features of the study area are discussed in this section.

Table 4-41: Administrative Boundary of the Study Area

District	Upazila	Union
Khulna	Rupsha	Naihati
		T.S Bahirdia
Bagerhat	Fakirhat	Lakhpur

116. The project study area lies within the administrative area of Rupsha and Fakirhat Upazila under Khulna and Bagerhat district in the Khulna division. The socio-economic study area is shown in Figure 4-31.

Figure 4-31: 1 kilometers Buffer Map for Socio-economic Study



Source: EQMS

4.4.2.2.2 Demography

117. In the study area, there are about 23,344 households (HHs) including squatters with a total population of 96,588 that might be influenced by the implementation of the proposed project. The average sex ratio²⁴ is 101.3 and the average household size is 4.1. The demography of the study area is shown in the following Table 4-42.

Table 4-42: Demography of the Study Area

District	Upazila	Union	Total Pop	Total HHs	Sex Ratio	Avg. HH size
Khulna	Rupsha	Naihati	58299	14456	100	4
		T.S Bahirdia	17874	4080	104	4.3
Bagerhat	Fakirhat	Lakhpur	20415	20415	100	4.2
Total			96588	23344	101.3	4.1

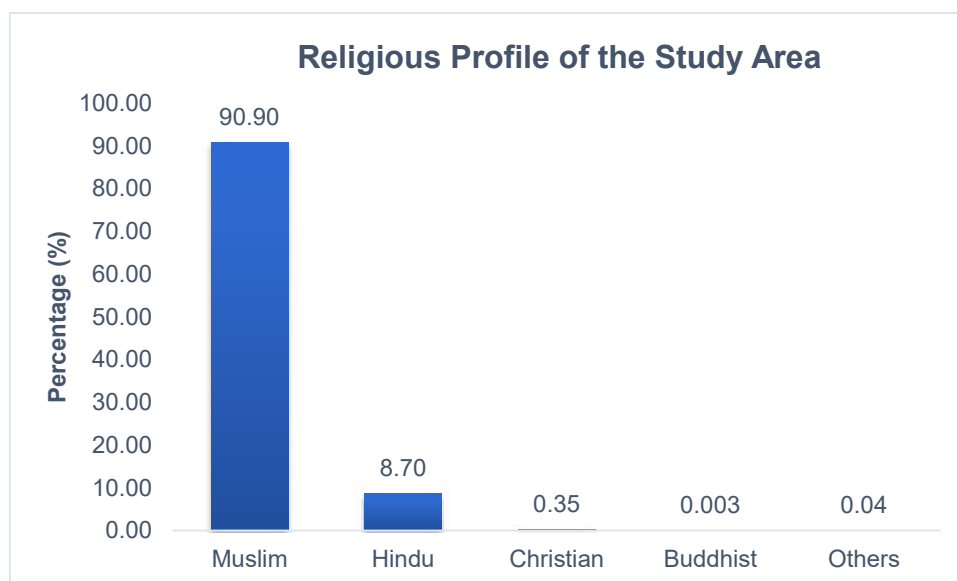
Source: Population and Housing Census, BBS, 2011

4.4.2.2.3 Religion

118. According to the Population and Housing Census (2011), the population of the study area is dominated by the Muslim community constituting almost 90.90% of the total population. The remaining 8.70% is Hindu, 0.35% is Christian, 0.003% is Buddhist and rest belongs to other religion. The following Figure 4-32 indicates the various religious profile of the project study area.

²⁴The sex ratio is the ratio of males to females in a population. (Source: Wikipedia)

Figure 4-32: Religious Profile of the Study Area



Source: Population and Housing Census, BBS, 2011

4.4.2.2.4 Ethnic Composition

119. According to Population and Housing Census (2011), within the 1-kilometer radius from the project site 1 Households were found where 4 number of ethnic people live. All of them belong to Others ethnic group. The following Table 4-43 indicates the various ethnic composition of the project study area.

Table 4-43: Ethnic Profile of the Study Area

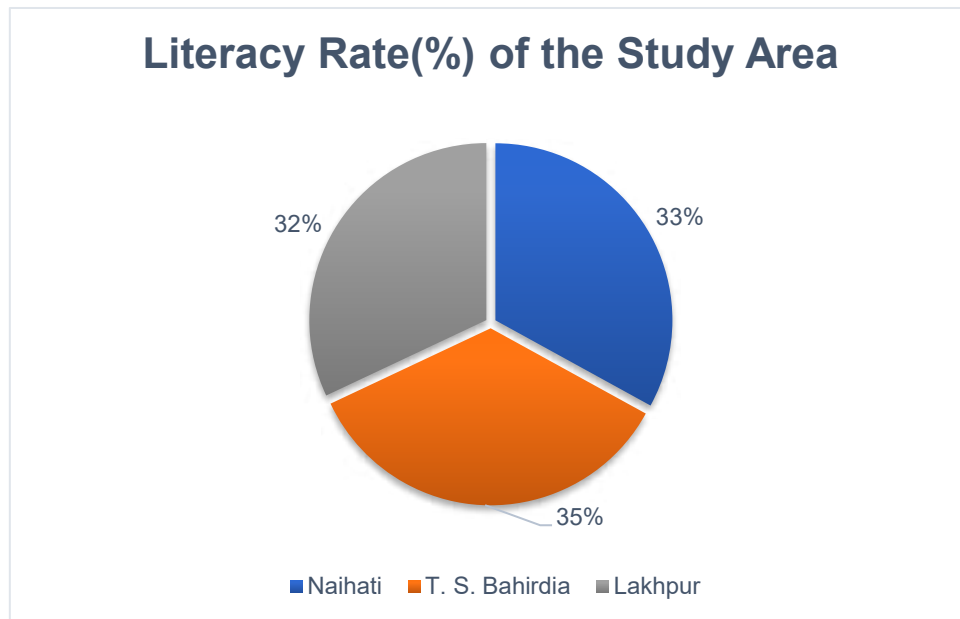
Upazila	Union	HH	Ethnic Population			Ethnic Population in main groups			
			Total	Male	Female	Monda	Chakma	Barmon	Others
Rupsha	Naihati	0	0	0	0	0	0	0	0
	T.S Bahirdia	1	4	1	3	0	0	0	4
Fakirhat	Lakhpur	0	0	0	0	0	0	0	0
Total		1	4	1	3	0	0	0	4

Source: Population and Housing Census, BBS, 2011

4.4.2.2.5 Education

120. According to the Population and Housing Census (2011), the average literacy rate in the study area is 60.7%. The following Figure 4-33 shows the literacy rate of the project study area.

Figure 4-33: Literacy Rate of the Study Area

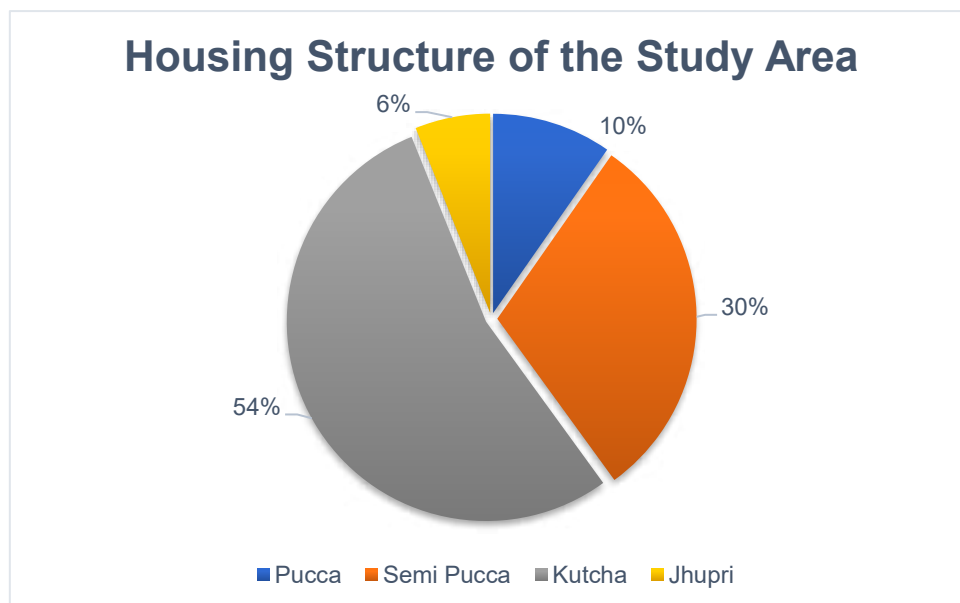


Source: Population and Housing Census, BBS, 2011

4.4.2.3 Settlement and Housing

121. According to the Population and Housing Census (2011), the predominant structure of these study area is Kutcha (54 %) followed by Semi-pukka (30 %), Pukka and Jhupri (10 % and 6%). The housing tenancy of the study area is owned by (83.1 %), rented (13.4 %) and rent free (3.4%). The following Figure 4-34 and Table 4-44 shows the type of structure and housing tenancy in the project study area.

Figure 4-34: Housing Structure in the Study Area



Source: Population and Housing Census, BBS, 2011

Table 4-44: Housing tenancy in the Study Area

Upazila	Union	Number of HHs	Housing Tenancy (%)		
			Owned	Rented	Rent free
Rupsha	Naihati	14380	59.4	33.8	6.7
	T.S Bahirdia	4062	94.7	3.4	1.8
Fakirhat	Lakhpur	4806	95.2	3.1	1.7
Total		23248	83.1	13.4	3.4

Source: Population and Housing Census, BBS, 2011

4.4.2.4 Public Utilities

4.4.2.4.1 Water Supply

122. At the project study area, the major source of drinking water is tube-well where about 97.8% population use tube-well water. About 0.6% of people have access to tap water. And (1.6%) People have access to neither tube-well nor tap water. An overview is depicted in below Table 4-45.

Table 4-45: Sources of Drinking Water in the Study Area

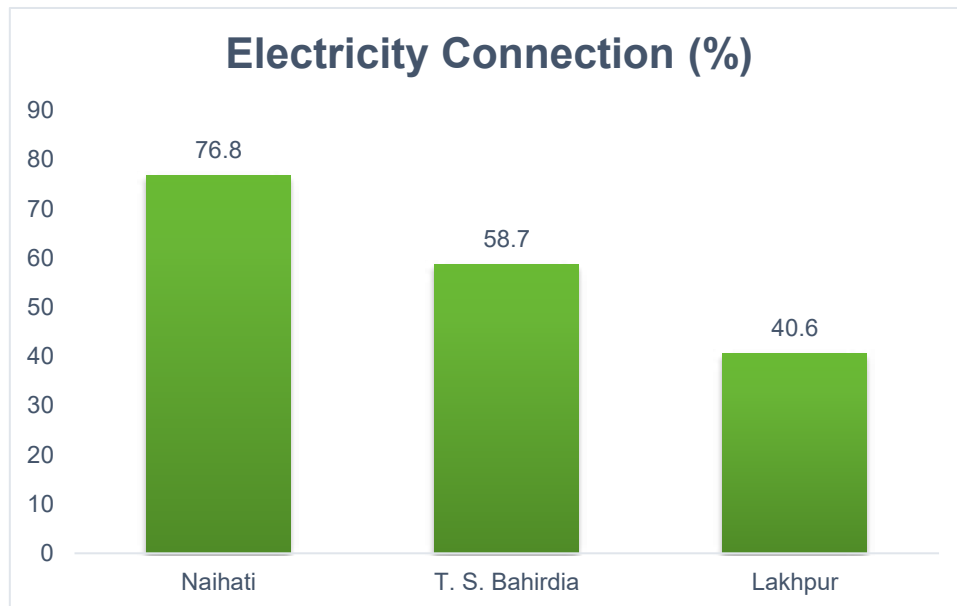
Upazila	Union	Number of HHs	Source of Drinking Water (%)		
			Tap	Tube-well	Other
Rupsha	Naihati	14380	1.1	97.5	1.4
	T.S Bahirdia	4062	0.7	97.3	2
Fakirhat	Lakhpur	4806	0.0	98.7	1.3
Total		23248	0.6	97.8	1.6

Source: Population and Housing Census, BBS, 2011

4.4.2.4.2 Electricity

123. Electricity is an important indicator for measuring the quality of life. In the study area, on average 58.7% of the households have grid electricity connection. The Figure 4-35 shows the detail electricity connection situation by union.

Figure 4-35: Electricity connection of the Study Area

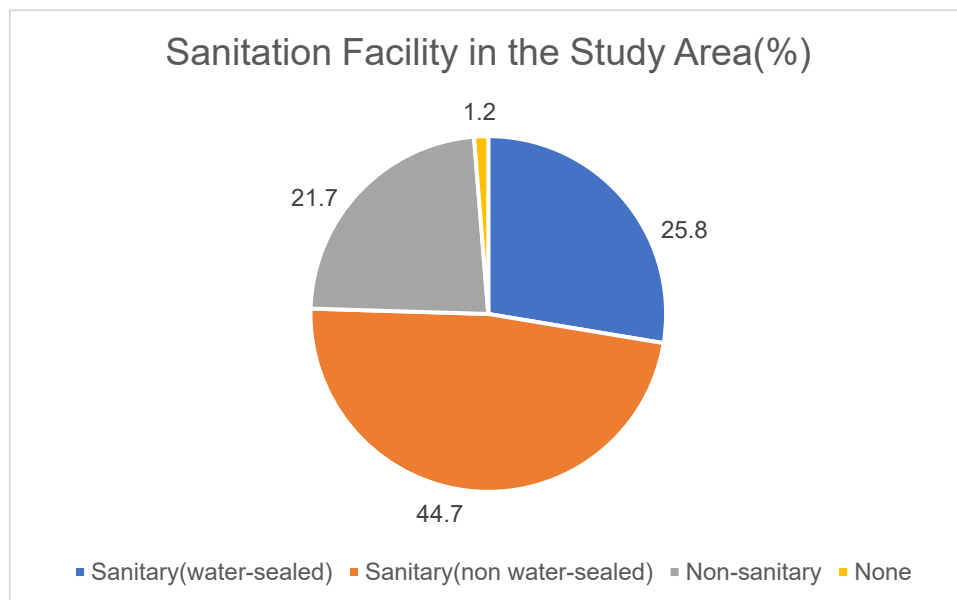


Source: Population and Housing Census, BBS, 2011

4.4.2.4.3 Sanitation

124. In the study area, households that use water-sealed sanitary latrine and non-water-sealed sanitary latrine facility are 25.8% and 44.7% respectively. Whereas around 21.7% households avail non-sanitary facilities. The rest 1.2% households have no access to hygienic latrine facilities. The following Figure 4-36 shows sanitation facility of the project area.

Figure 4-36: Sanitation Facility in the Study Area



Source: Population and Housing Census, BBS, 2011

4.4.2.4.4 Health Care Facility

125. According to the District Statistics (2011), there are 1 Private Hospitals in Rupsha Upazila and 4 Private Hospital in Fakirhat Upazila with 18 MBBS/FCPS doctors in the study area. Also, 8 diagnostic centers are found in the proposed study area.

4.4.2.4.5 Solid Waste

126. Uncontrolled waste generation coupled with inadequate collection and disposal systems have the potential to give rise to pollution and environmental degradation as well as disease. While no specific data on local waste management was collected from the study area, it is likely that – as with many other parts of rural Bangladesh– the villages within the study area have no formal waste management facilities, and that in general people dispose of their waste in landfills or in fallow land.

4.4.2.5 Economy and Employment

127. Agriculture, comprising crop cultivation, fisheries, direct farming, sharecropping, agricultural laborers, and so on, is the most common source of employment in the study area, according to the Population and Housing Census (2011). Agriculture employs approximately 94.3% males and 5.7% females. Furthermore, a sizable proportion of the study area's population (73.1% male and 26.9% female) is employed in the service sector. In addition, the industrial sector employs 65.1% men and 34.9% women. The following Table 4-46 shows the employment status of the project area.

Table 4-46: Employment status of the Study Area

Upazila	Union	Population Aged 7+, not attending school but employed			Field of Activity					
					Agriculture		Industry		Service	
		Total	Male	Female	Male	Female	Male	Female	Male	Female
Rupsha	Naihati	5156	3670	1486	739	42	870	579	2061	865
	T.S Bahirdia	802	714	88	474	39	58	11	182	38
Fakirhat	Lakhpur	2015	1864	151	1291	69	241	38	332	44
Total		7973	6248	1725	2504	150	1169	628	2575	947

Source: Population and Housing Census, BBS, 2011

4.4.2.6 Traffic and Transport

128. According to the District Statistics (2011), in Upazila total metalled road is 329 km and there is 135 km semi metalled road. In these upazilas total unmetalled (kacha) road is 849 km. There are no railway stations in these upazilas. There are 10 Bus stands in the study area. No steamer or launch station was found in these upazilas. Water way in monsoon is 75 km and Water way round the year is 18 km found in the area. The following Table 4-47 shows the traffic and transportation status of the project area.

Table 4-47: Traffic and Transportation of the Study Area

Length of metalled, semi metalled and unmetalled road				Length of railway and water way			Stations		
Upazila	Metalled road	Semi metalled	Unmetalled Kacha Road	Total Railway	Water way in monsoon	Water way round the year	Railway Station	Steamer/ launch station	Bus Stand
Rupsha	149	125	446	720	65	0	0	0	2
Fakirhat	180	10	403	593	10	18	0	0	8
Total	329	135	849	1313	75	18	0	0	10

Source: District Statistics, 2011

4.4.3 Meherpur 132/33 kV GIS Substation

4.4.3.1 Introduction

129. The socio-economic condition of the people of the project area will provide sound reference and assess probable socio-economic impact of the proposed interventions. This will enable us to compare the changes and impacts of the project interventions at present. The socio-economic baseline scenario describes the socio-economic characteristics of the project area on the basis of secondary data which was collected during Population and Housing Census of 2011. The socio-economic characteristics include administrative area, demographic, household size, education, occupation, housing, employment opportunity, access to water and sanitation status etc.

4.4.3.2 Population

4.4.3.2.1 Administrative Area and Location

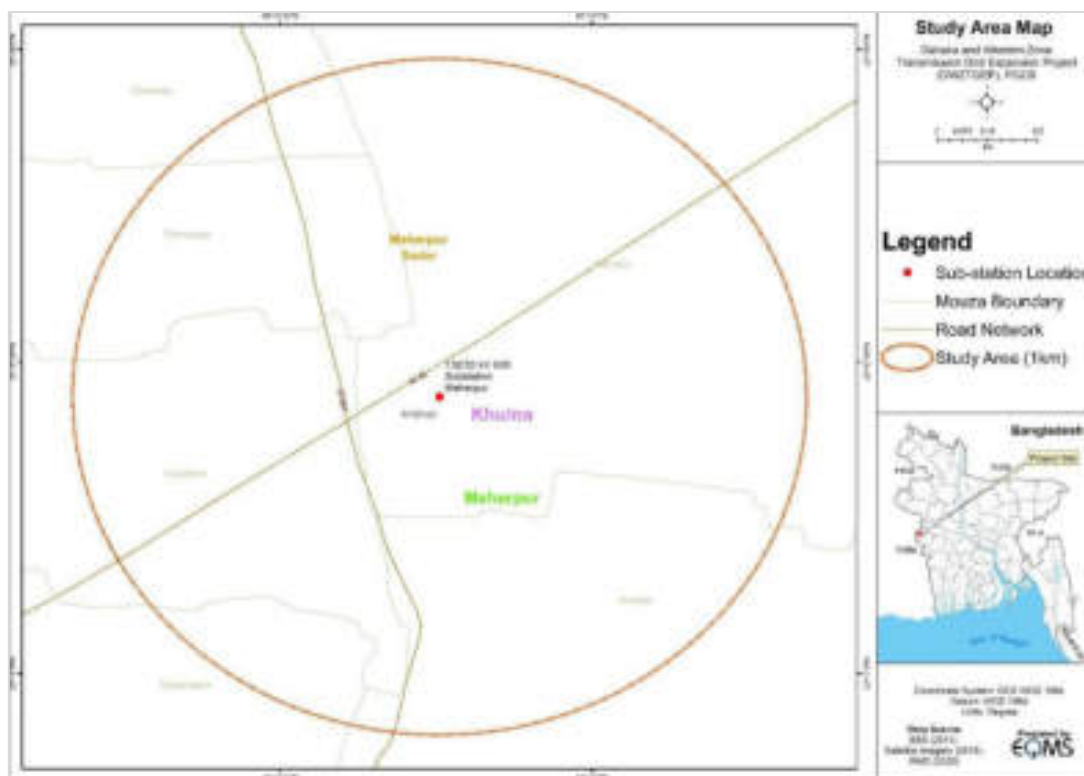
130. The proposed project is located in the Meherpur district under Khulna division. Based on the assessment of the project, its surroundings and its environmental & social influence, a 1 kilometer radius is considered from the project boundary as the study area for the social study. Table 4-41 shows the study area of the project across Unions, Upazilas and Districts. The socio-economic features of the study area are discussed in this section.

Table 4-48: Administrative Boundary of the Study Area

District	Upazila	Union
Meherpur	Meherpur Sadar	Amjhupi

131. The project study area lies within the administrative area of Meherpur Sadar Upazila under Meherpur district in the Khulna division. The socio-economic study area is shown in Figure 4-31.

Figure 4-37: 1 kilometers Buffer Map for Socio-economic Study



Source: EQMS

4.4.3.2.2 Demography

132. In the study area, there are about 64130 households (HHs) including squatters with a total population of 256642 that might be influenced by the implementation of the proposed project. The average sex ratio²⁵ is 98 and the average household size is 4. The demography of the study area is shown in the following Table 4-42.

Table 4-49: Demography of the Study Area

District	Upazila	Union	Total Pop	Total HHs	Sex Ratio	Avg. HH size
Meherpur	Meherpur Sadar	Amjhupi	256642	64130	98	4
Total			256642	64130	98	4

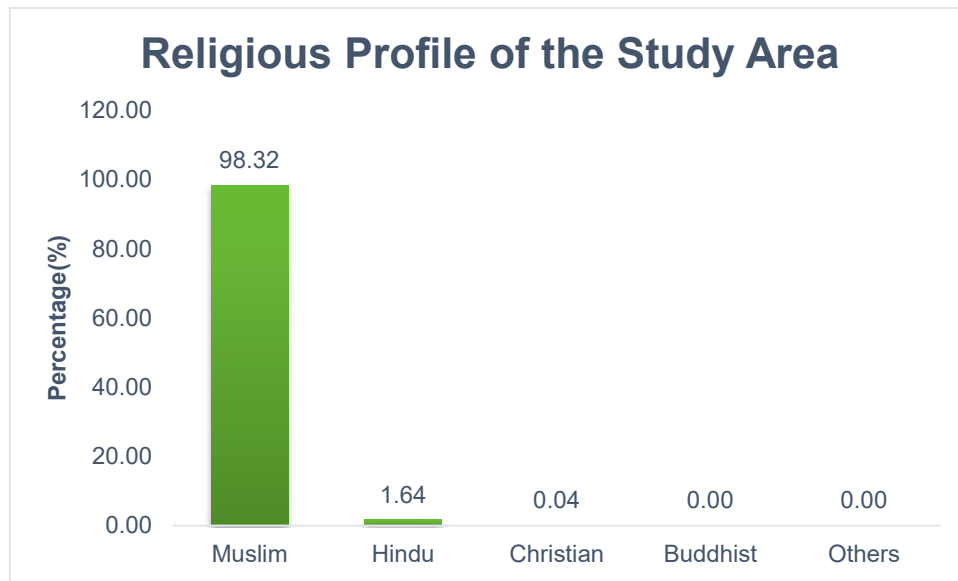
Source: Population and Housing Census, BBS, 2011

4.4.3.2.3 Religion

133. According to the Population and Housing Census (2011), the population of the study area is dominated by the Muslim community constituting almost 98.32% of the total population. The remaining 1.64% is Hindu, 0.04% is Christian, 0.00% is Buddhist and there is no other religion. The following Figure 4-38 indicates the various religious profile of the project study area.

²⁵The sex ratio is the ratio of males to females in a population. (Source: Wikipedia)

Figure 4-38: Religious Profile of the Study Area



Source: Population and Housing Census, BBS, 2011

4.4.3.2.4 Ethnic Composition

134. According to Population and Housing Census (2011), within the 1 kilometer radius from the project site 3 Households were found where 11 number of ethnic people live. 3 number are sawntal and 4 number are Others ethnic group. The following Table 4-43 indicates the various ethnic composition of the project study area.

Table 4-50: Ethnic Profile of the Study Area

Upazila	Union	HH	Ethnic Population			Ethnic Population in main groups			
			Total	Male	Female	Sawntal	Marma	Garos	Others
Meherpur Sadar	Amjhupi	3	11	5	6	3	4	0	4
Total		3	11	5	6	3	4	0	4

Source: Population and Housing Census, BBS, 2011

4.4.3.2.5 Education

135. According to the Population and Housing Census (2011), the average literacy rate in the study area is 49.4%. The following Table 4-51 shows the literacy rate of the project study area.

Table 4-51: Literacy Rate of the Study Area

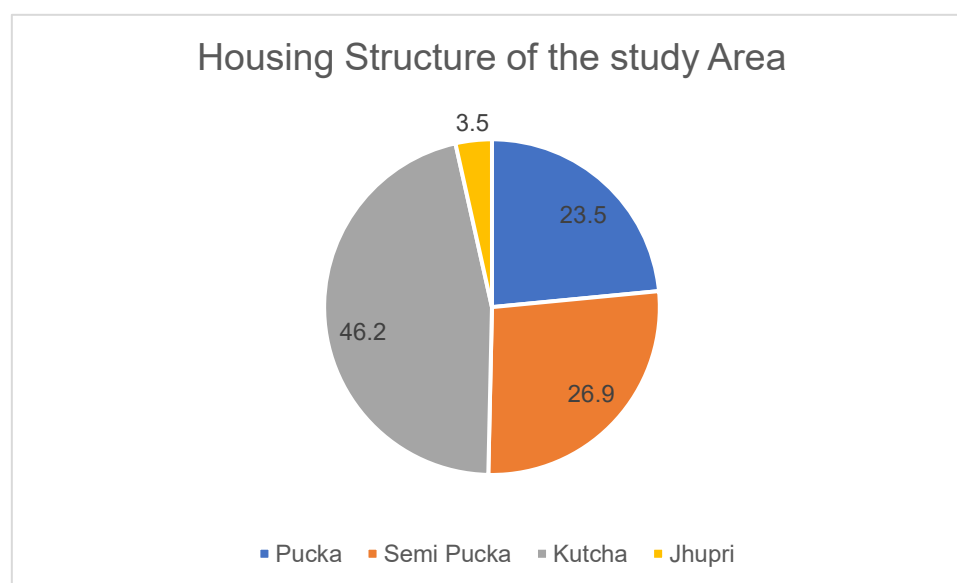
District	Upazila	Union	Male	Female	Literacy (%) Both
Meherpur	Meherpur Sadar	Amjhupi	50.3	48.4	49.4
Total			50.3	48.4	49.4

Source: Population and Housing Census, BBS, 2011

4.4.3.3 Settlement and Housing

136. According to the Population and Housing Census (2011), the predominant structure of these study area is Kutcha (46.2 %) followed by Semi-pukka (26.9 %), Pukka and Jhupri (23.5 % and 3.5%). The housing tenancy of the study area is owned by (92.7 %), rented (3.0 %) and rent free (4.3%). The following Figure 4-39 and Table 4-52 shows the type of structure and housing tenancy in the project study area.

Figure 4-39: Housing Structure in the Study Area



Source: Population and Housing Census, BBS, 2011

Table 4-52: Housing tenancy in the Study Area

Upazila	Union	Number of HHs	Housing Tenancy (%)		
			Owned	Rented	Rent free
Meherpur Sadar	Amjhupi	63938	92.7	3.0	4.3
Total		63938	92.7	3.0	4.3

Source: Population and Housing Census, BBS, 2011

4.4.3.4 Public Utilities

4.4.3.4.1 Water Supply

137. At the project study area, the major source of drinking water is tube-well where about 90.9% population use tube-well water. About 6.9% of people have access to tap water. And (2.1%) People have access to neither tube-well nor tap water. An overview is depicted in below Table 4-53.

Table 4-53: Sources of Drinking Water in the Study Area

Upazila	Union	Number of HHs	Source of Drinking Water (%)		
			Tap	Tube-well	Other
Meherpur Sadar	Amjhupi	63938	6.9	90.9	2.1
Total		63938	6.9	90.9	2.1

Source: Population and Housing Census, BBS, 2011

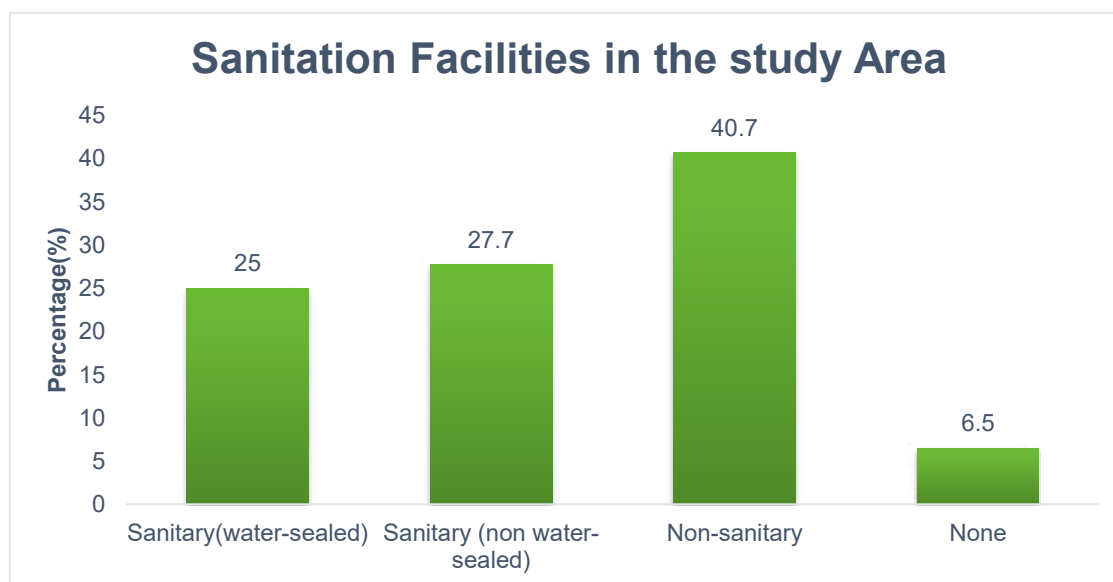
4.4.3.4.2 Electricity

138. Electricity is an important indicator for measuring the quality of life. In the study area, 63% of households have grid electricity connection.

4.4.3.4.3 Sanitation

139. In the study area, households that use water-sealed sanitary latrine and non-water-sealed sanitary latrine facility are 25% and 27.7% respectively. Whereas around 40.7% households avail non-sanitary facilities. The rest 6.5% of households have no access to hygienic latrine facilities. The following Figure 4-40 shows sanitation facility of the project area.

Figure 4-40: Sanitation Facility in the Study Area



Source: Population and Housing Census, BBS, 2011

4.4.3.4.4 Health Care Facility

140. According to the District Statistics (2011), there are 7 Private Hospitals in Manirampur Upazila Private with 14 MBBS/FCPS doctors in the study area. Also, 1 diagnostic center is found in the proposed study area.

4.4.3.4.5 Solid Waste

141. Uncontrolled waste generation coupled with inadequate collection and disposal systems have the potential to give rise to pollution and environmental degradation as well as disease. While no specific data on local waste management was collected from the study area, it is likely that – as with many other parts of rural Bangladesh– the villages within the study area have no formal waste management facilities, and that in general people dispose of their waste in landfills or in fallow land.

4.4.3.5 Economy and Employment

142. Agriculture, comprising crop cultivation, fisheries, direct farming, sharecropping, agricultural laborers, and so on, is the most common source of employment in the study area, according to the Population and Housing Census (2011). Agriculture employs approximately 98% males and 2.0% females. Furthermore, a sizable proportion of the study area's population (89.0% male and 11.0% female) is employed in the service sector. In addition, the industrial sector employs 92.2% men and 7.8% women. The following Table 4-54 shows the employment status of the project area.

Table 4-54: Employment status of the Study Area

Upazila	Union	Population Aged 7+, not attending school but employed			Field of Activity					
					Agriculture		Industry		Service	
		Total	Male	Female	Male	Female	Male	Female	Male	Female
Meherpur Sadar	Amjhupi	35149	33864	1285	27847	558	553	47	5484	680
Total		35149	33864	1285	27847	558	553	47	5484	680

Source: Population and Housing Census, BBS, 2011

4.4.3.6 Traffic and Transport

143. According to the District Statistics (2011), in Upazila total metalled road is 206 km and there is 115 km semi metalled road. In these upazilas total unmetalled (kacha) road is 273 km. There are no railway stations in these upazilas. There are 3 Bus stands in the study area. No steamer or launch station was found in these upazilas. Water way in monsoon is 0 km and Water way round the year is 0 km found in the area. The following Table 4-55 shows the traffic and transportation status of the project area.

Table 4-55: Traffic and Transportation of the Study Area

Length of metalled, semi metalled and unmetalled road				Length of railway and water way			Stations		
Upazila	Metalled road	Semi metalled	Unmetalled Kacha Road	Total Railway	Water way in monsoon	Water way round the year	Railway Station	Steamer/ launch station	Bus Stand
Meherpur Sadar	206	115	273	0	0	0	0	0	3
Total	206	115	273	0	0	0	0	0	3

4.4.4 Manirampur 132/33 kV GIS Substation

4.4.4.1 Introduction

144. The socio-economic condition of the people of the project area will provide sound reference and assess probable socio-economic impact of the proposed interventions. This will enable us to compare the changes and impacts of the project interventions at present. The socio-economic baseline scenario describes the socio-economic characteristics of the project area on the basis of secondary data which was collected during Population and Housing Census of 2011. The socio-economic characteristics include administrative area, demographic, household size, education, occupation, housing, employment opportunity, access to water and sanitation status etc.

4.4.4.2 Population

4.4.4.2.1 Administrative Area and Location

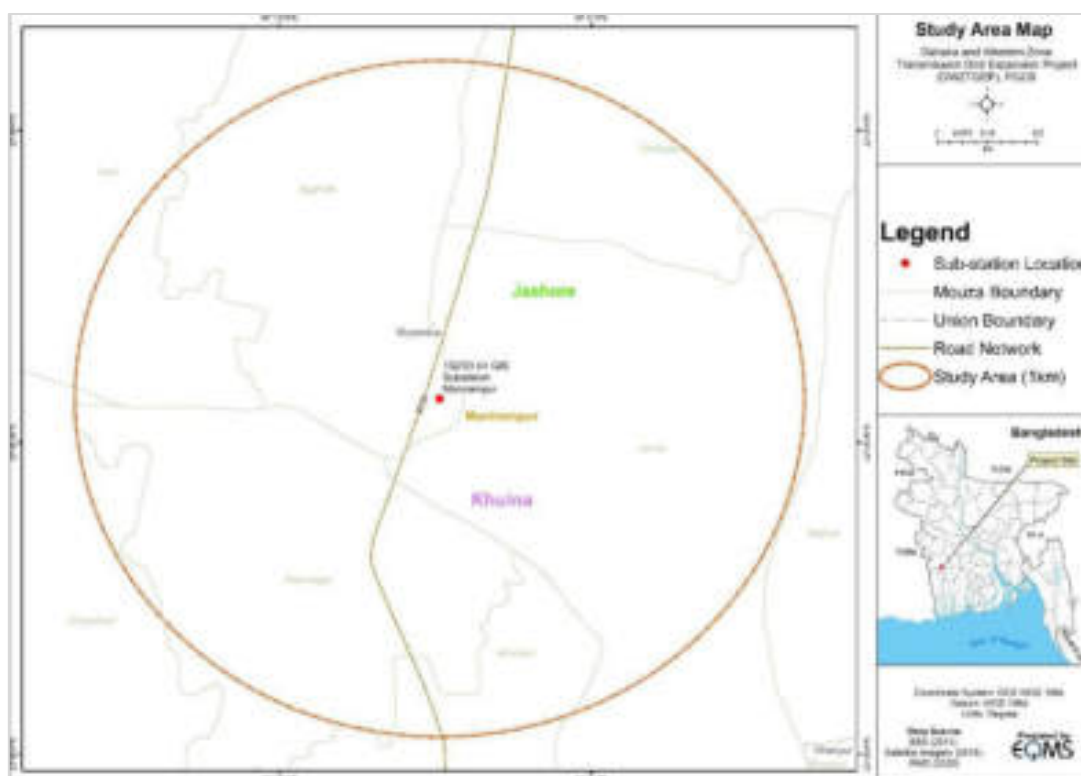
145. The proposed project is located in the Jashore district under Khulna division. Based on the assessment of the project, its surroundings and its environmental & social influence, a 1 kilometer radius is considered from the project boundary as the study area for the social study. Table 4-56 shows the study area of the project across Unions, Upazilas and Districts. The socio-economic features of the study area are discussed in this section.

Table 4-56: Administrative Boundary of the Study Area

District	Upazila	Union
Jashore	Manirampur	Shyamkur

146. The project study area lies within the administrative area of Manirampur Upazila under Jessore district in the Khulna division. The socio-economic study area is shown in Figure 4-41.

Figure 4-41: 1 kilometers Buffer Map for Socio-economic Study



Source: EQMS

4.4.4.2.2 Demography

147. In the study area, there are about 8,422 households (HHs) including squatters with a total population of 35166 that might be influenced by the implementation of the proposed project. The average sex ratio²⁶ is 99 and the average household size is 4.2. The demography of the study area is shown in the following Table 4-57.

Table 4-57: Demography of the Study Area

District	Upazila	Union	Total Pop	Total HHs	Sex Ratio	Avg. HH size
Jashore	Manirampur	Shyamkur	35166	8422	99	4.2
Total			35166	8422	99	4.2

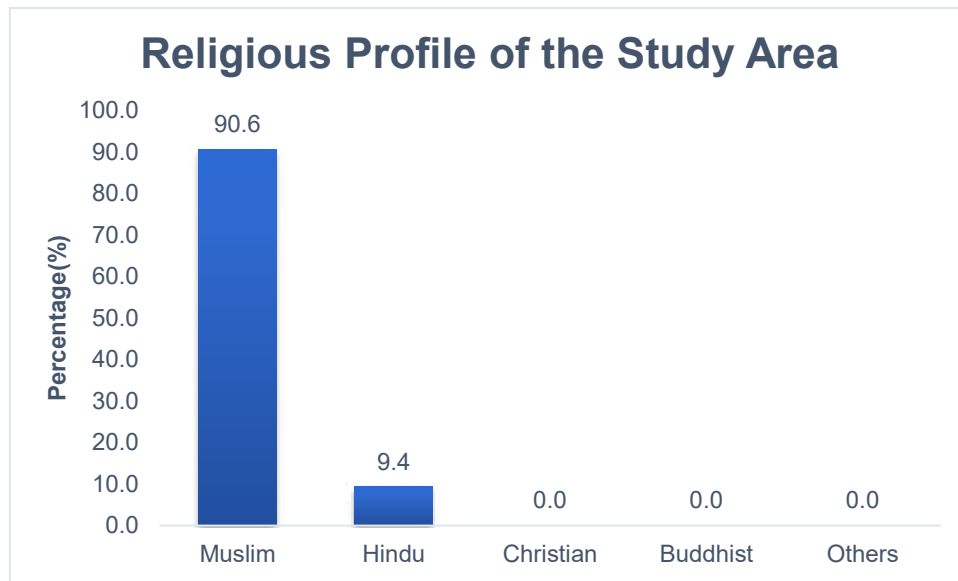
Source: Population and Housing Census, BBS, 2011

4.4.4.2.3 Religion

148. According to the Population and Housing Census (2011), the population of the study area is dominated by the Muslim community constituting almost 90.6% of the total population. The remaining 9.4% is Hindu, 0.00% is Christian, 0.00% is Buddhist and there is no other religion. The following Figure 4-42 indicates the various religious profile of the project study area.

²⁶The sex ratio is the ratio of males to females in a population. (Source: Wikipedia)

Figure 4-42: Religious Profile of the Study Area



Source: Population and Housing Census, BBS, 2011

4.4.4.2.4 Ethnic Composition

149. According to Population and Housing Census (2011), within the 1 kilometer radius from the project site 41 Households were found where 200 number of ethnic people live. All of them belong to Others ethnic group. The following Table 4-58 indicates the various ethnic composition of the project study area.

Table 4-58: Ethnic Profile of the Study Area

Upazila	Union	HH	Ethnic Population			Ethnic Population in main groups			
			Total	Male	Female	Tripura	Chakma	Barmon	Others
Manirampur	Shyamkur	41	200	113	87	0	0	0	200
Total		41	200	113	87	0	0	0	200

Source: Population and Housing Census, BBS, 2011

4.4.4.2.5 Education

150. According to the Population and Housing Census (2011), the literacy rate in the study area is 51.3%. The following Table 4-59 shows the literacy rate of the project study area.

Table 4-59: Literacy Rate of the Study Area

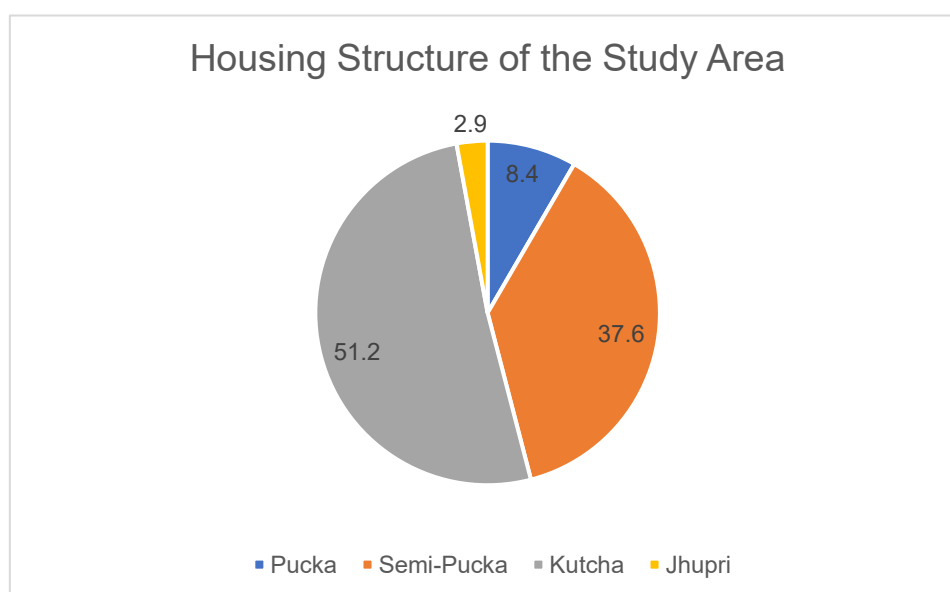
District	Upazila	Union	Male	Female	Literacy (%) Both
Jashore	Manirampur	Shyamkur	53.6	49.1	51.3
Total			53.6	49.1	51.3

Source: Population and Housing Census, BBS, 2011

4.4.4.3 Settlement and Housing

151. According to the Population and Housing Census (2011), the predominant structure of these study areas is Kutcha (51.2 %) followed by Semi-pucka (37.6 %), Pucka and Jhupri (8.4 % and 2.9 %). The housing tenancy of the study area is owned by (98 %), rented (0.6 %) and rent free (1.4%). The following Figure 4-43 and Table 4-60 shows the type of structure and housing tenancy in the project study area.

Figure 4-43: Housing Structure in the Study Area



Source: Population and Housing Census, BBS, 2011

Table 4-60: Housing tenancy in the Study Area

Upazila	Union	Number of HHs	Housing Tenancy (%)		
			Owned	Rented	Rent free
Manirampur	Shyamkur	8411	98	0.6	1.4
Total		8411	98	0.6	1.4

Source: Population and Housing Census, BBS, 2011

4.4.4.4 Public Utilities

4.4.4.4.1 Water Supply

152. At the project study area, the major source of drinking water is tube-well where about 97.1% population use tube-well water. About 1.1% of people have access to tap water. And (1.7%) People have access to neither tube-well nor tap water. An overview is depicted in below Table 4-61.

Table 4-61: Sources of Drinking Water in the Study Area

Upazila	Union	Number of HHs	Source of Drinking Water (%)		
			Tap	Tube-well	Other
Manirampur	Shyamkur	8411	1.1	97.1	1.7
Total		8411	1.1	97.1	1.7

Source: Population and Housing Census, BBS, 2011

4.4.4.4.2 Electricity

153. Electricity is an important indicator for measuring the quality of life. In the study area, 37.5% of households have grid electricity connection.

4.4.4.4.3 Sanitation

154. In the study area, households that use water-sealed sanitary latrine and non-water-sealed sanitary latrine facility are 24.5% and 28% respectively. Whereas around 40.5% households avail non-sanitary facilities. The rest 7.1% of households have no access to hygienic latrine facilities. The following Figure 4-44 shows sanitation facility of the project area.

Figure 4-44: Sanitation Facility in the Study Area



Source: Population and Housing Census, BBS, 2011

4.4.4.4.4 Health Care Facility

155. According to the District Statistics (2011), there are 4 Private Hospitals in Manirampur Upazila Private with 7 MBBS/FCPS doctors in the study area. Also, 1 diagnostic center is found in the proposed study area.

4.4.4.4.5 Solid Waste

156. Uncontrolled waste generation coupled with inadequate collection and disposal systems have the potential to give rise to pollution and environmental degradation as well as disease. While no specific data on local waste management was collected from the study area, it is likely that – as with many other parts of rural Bangladesh– the villages within the study area have no formal waste management facilities, and that in general people dispose of their waste in landfills or in fallow land.

4.4.4.5 Economy and Employment

157. Agriculture, comprising crop cultivation, fisheries, direct farming, sharecropping, agricultural laborers, and so on, is the most common source of employment in the study area, according to the Population and Housing Census (2011). Agriculture employs approximately 94.5% males and 5.5% females. Furthermore, a sizable proportion of the study area's population (88.7% male and 11.3% female) is employed in the service sector. In addition, the industrial sector employs 93.0% men and 7.5% women. The following Table 4-62 shows the employment status of the project area.

Table 4-62: Employment status of the Study Area

Upazila	Union	Population Aged 7+, not attending school but employed			Field of Activity					
					Agriculture		Industry		Service	
		Total	Male	Female	Male	Female	Male	Female	Male	Female
Manirampur	Shyamkur	3359	3122	237	2122	124	267	20	733	93
Total		3359	3122	237	2122	124	267	20	733	93

Source: Population and Housing Census, BBS, 2011

4.4.4.6 Traffic and Transport

158. According to the District Statistics (2011), in Upazila total metalled road is 300.3 km and there is 122 km semi metalled road. In these upazilas total unmetalled (kacha) road is 973.97 km. There are no railway stations in these upazilas. There are 6 Bus stands in the study area. No steamer or launch station was found in these upazilas. Water way in monsoon is 0 km and Water way round the year is 0 km found in the area. The following Table 4-63 shows the traffic and transportation status of the project area.

Table 4-63: Traffic and Transportation of the Study Area

Length of metalled, semi metalled and unmetalled road				Length of railway and water way			Stations		
Upazila	Metalled road	Semi metalled	Unmetalled Kacha Road	Total Railway	Water way in monsoon	Water way round the year	Railway Station	Steamer/ launch station	Bus Stand
Manirampur	300.3	122	973.97	0	0	0	0	0	6
Total	300.3	122	973.97	0	0	0	0	0	6

4.4.5 Maheshpur 132/33 kV GIS Substation

4.4.5.1 Introduction

159. The socio-economic condition of the people of the project area will provide sound reference and assess probable socio-economic impact of the proposed interventions. This will enable us to compare the changes and impacts of the project interventions at present. The socio-economic baseline scenario describes the socio-economic characteristics of the project area on the basis of secondary data which was collected during Population and Housing Census of 2011. The socio-economic characteristics include administrative area, demographic, household size, education, occupation, housing, employment opportunity, access to water and sanitation status etc.

4.4.5.2 Population

4.4.5.2.1 Administrative Area and Location

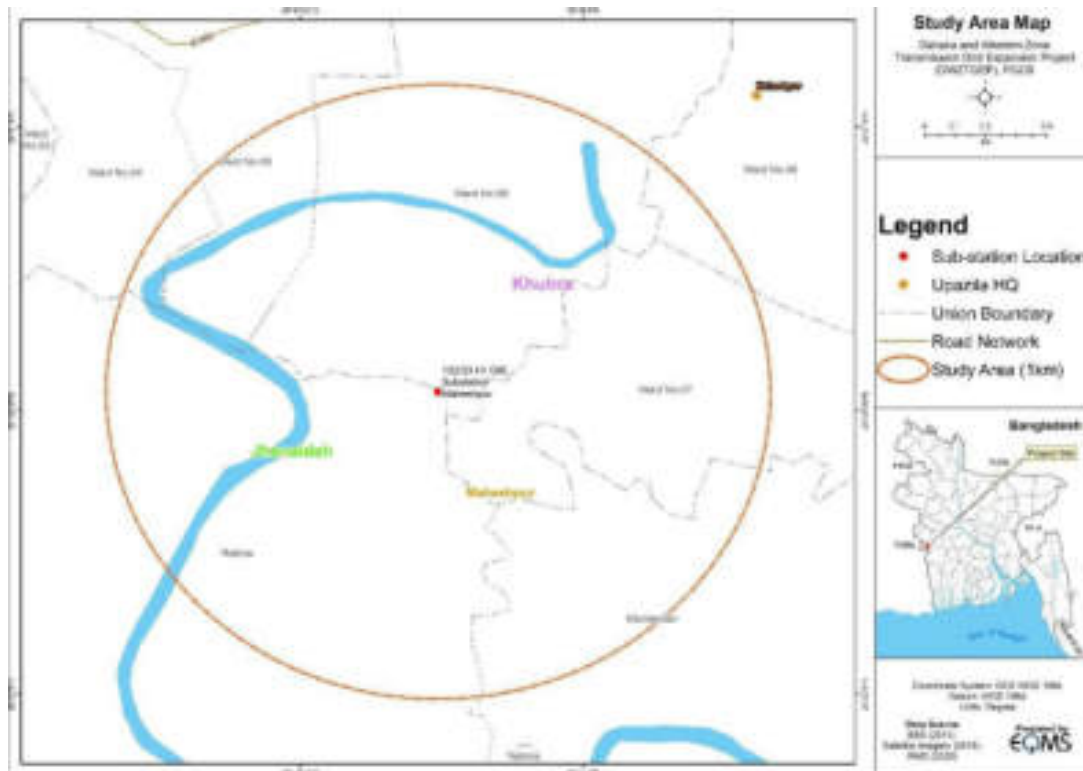
160. The proposed project is located in the Jhenaidah district under Khulna division. Based on the assessment of the project, its surroundings and its environmental & social influence, a 1 kilometer radius is considered from the project boundary as the study area for the social study. Table 4-64 shows the study area of the project across Unions, Upazilas and Districts. The socio-economic features of the study area are discussed in this section.

Table 4-64: Administrative Boundary of the Study Area

District	Upazila	Union
Jhenaidah	Maheshpur	Ward No-04
		Ward No-05
		Ward No-07
		Natima
		Manderbari
		Ward No-08
		Ward No-06

161. The project study area lies within the administrative area of Maheshpur Upazila under Jhenaidah district in the Khulna division. The socio-economic study area is shown in Figure 4-45.

Figure 4-45: 1 kilometer Buffer Map for Socio-economic Study



Source: EQMS

4.4.5.2.2 Demography

162. In the study area, there are about 17199 households (HHs) including squatters with a total population of 70509 that might be influenced by the implementation of the proposed project. The average sex ratio²⁷ is 100.9 and the average household size is 4.1. The demography of the study area is shown in the following Table 4-65.

²⁷The sex ratio is the ratio of males to females in a population. (Source: Wikipedia)

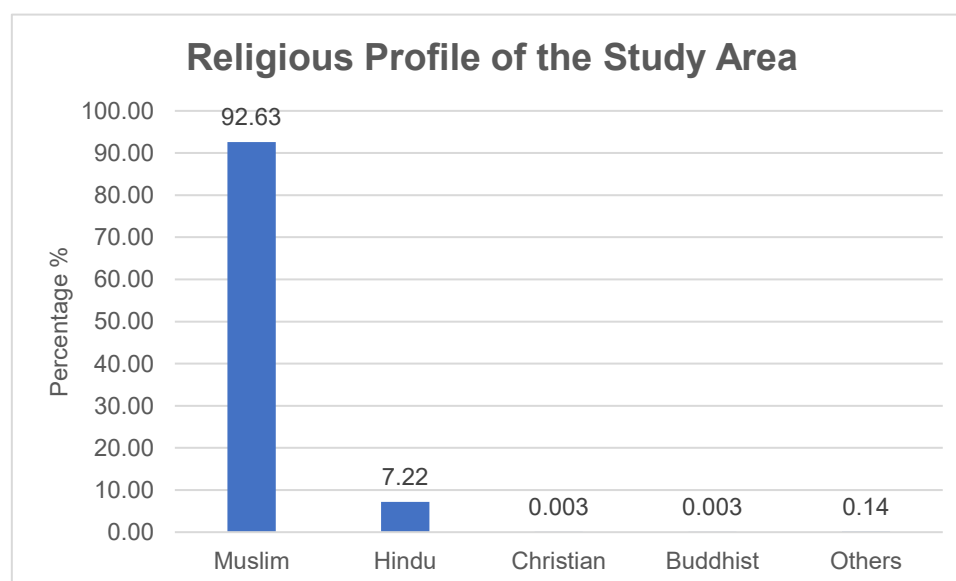
Table 4-65: Demography of the Study Area

District	Upazila	Union	Total Pop	Total HHs	Sex Ratio	Avg. HH size
Khulna	Maheshpur	Ward No-04	3443	754	99	4.5
		Ward No-05	3128	756	103	4.1
		Ward No-07	2953	702	101	4.2
		Natima	25520	6348	99	4.1
		Manderbari	28116	6845	100	4.1
		Ward No-08	3794	932	99	4.1
		Ward No-06	3555	862	105	4.0
Total			70509	17199	100.9	4.1

Source: Population and Housing Census, BBS, 2011

4.4.5.2.3 Religion

163. According to the Population and Housing Census (2011), the population of the study area is dominated by the Muslim community constituting almost 92.63% of the total population. The remaining 7.22% is Hindu, 0.003% is Christian, 0.003% is Buddhist and the rest belongs to other religion. The following Figure 4-46 indicates the various religious profile of the project study area.

Figure 4-46: Religious Profile of the Study Area

Source: Population and Housing Census, BBS, 2011

4.4.5.2.4 Ethnic Composition

164. According to Population and Housing Census (2011), within the 1 kilometer radius from the project site a total of 18 Households were found where 101 number of different ethnic people live. All of them are Pahari ethnic group. The following Table 4-66 indicates the various ethnic composition of the project study area.

Table 4-66: Ethnic Profile of the Study Area

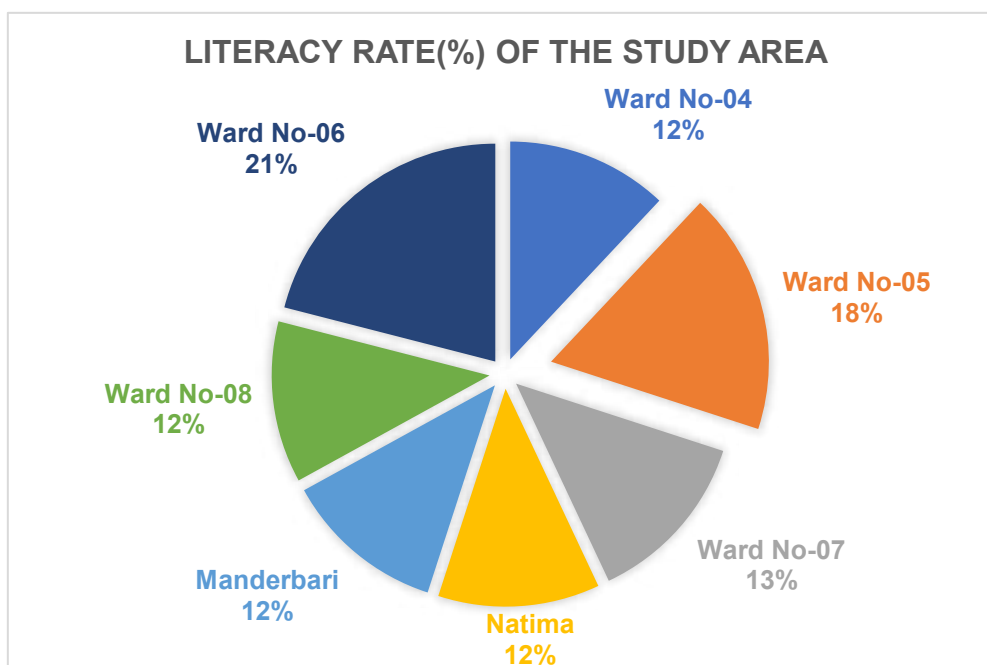
Upazila	Union	HH	Ethnic Population			Ethnic Population in main groups			
			Total	Male	Female	Pahari	Barmon	Tripura	Others
Maheshpur	Ward No-04	0	0	0	0	0	0	0	
	Ward No-05	0	0	0	0	0	0	0	0
	Ward No-07	18	101	49	52	101	0	0	0
	Natima	0	0	0	0	0	0	0	0
	Manderbari	0	0	0	0	0	0	0	0
	Ward No-08	0	0	0	0	0	0	0	0
	Ward No-06	0	0	0	0	0	0	0	0
Total		18	101	49	52	101	0	0	0

Source: Population and Housing Census, BBS, 2011

4.4.5.2.5 Education

165. According to the Population and Housing Census (2011), the average literacy rate in the study area is 54.62%. The following Figure 4-47 shows the literacy rate of the project study area.

Figure 4-47: Literacy Rate of the Study Area

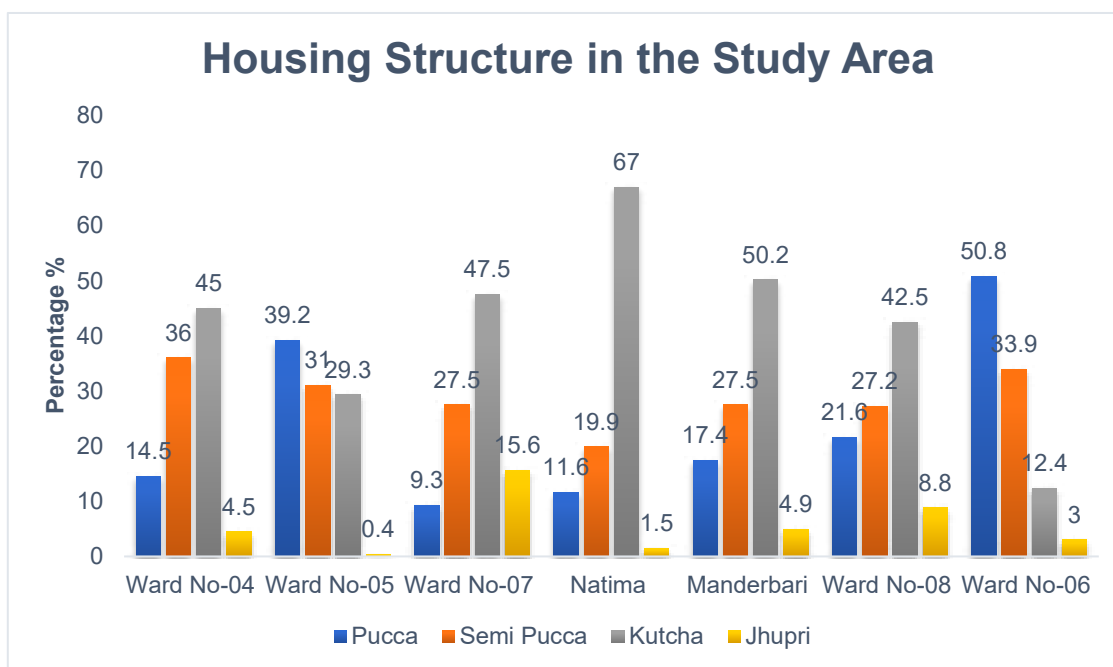


Source: Population and Housing Census, BBS, 2011

4.4.5.3 Settlement and Housing

166. According to the Population and Housing Census (2011), the predominant structure of these study area is Kutcha (42.0 %) followed by Semi-pukka (29.0 %), Pukka and Jhupri (23.5 % and 5.5 %). Housing tenancy of the study area is owned by (89.4 %), rented (7.9 %) and rent free (2.7%). The following Figure 4-48 and Table 4-67 shows the type of structure and housing tenancy in the project study area.

Figure 4-48: Housing Structure in the Study Area



Source: Population and Housing Census, BBS, 2011

Table 4-67: Housing tenancy in the Study Area

Upazila	Union	Number of HHs	Housing Tenancy (%)		
			Owned	Rented	Rent free
Maheshpur	Ward No-04	753	95.8	2.7	1.6
	Ward No-05	744	85.5	12.8	1.7
	Ward No-07	697	94.7	0.7	4.6
	Natima	6348	97.5	0.1	2.4
	Manderbari	6845	97.3	0.8	1.9
	Ward No-08	928	86.6	8.3	5.1
	Ward No-06	847	68.5	30	1.5
Total		17162	89.4	7.9	2.7

Source: Population and Housing Census, BBS, 2011

4.4.5.4 Public Utilities

4.4.5.4.1 Water Supply

167. At the project study area, the major source of drinking water is tube-well where about 85.8% population use tube-well water. About 13.4% of people have access to tap water and 0.8 % have access to neither tube-well nor tap water. An overview is depicted in below Table 4-68.

Table 4-68: Sources of Drinking Water in the Study Area

Upazila	Union	Number of HHs	Source of Drinking Water (%)		
			Tap	Tube-well	Other
	Ward No-04	753	3.7	95.4	0.9

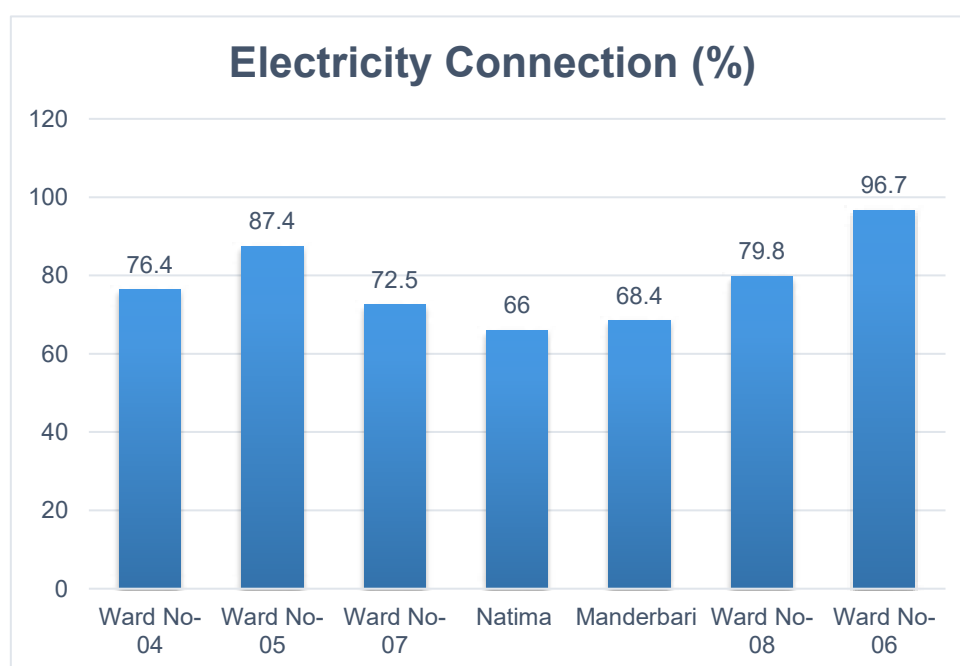
Upazila	Union	Number of HHs	Source of Drinking Water (%)		
			Tap	Tube-well	Other
Maheshpur	Ward No-05	744	37.5	62.1	0.4
	Ward No-07	697	1.9	96.1	2
	Natima	6348	0.1	99.7	0.1
	Manderbari	6845	0.2	97.6	2.2
	Ward No-08	928	2.8	97.2	0
	Ward No-06	847	47.8	52.2	0
Total		17162	13.4	85.8	0.8

Source: Population and Housing Census, BBS, 2011

4.4.5.4.2 Electricity

168. Electricity is an important indicator for measuring the quality of life. In the study area, on average 78.17% of the households have grid electricity connection. The Figure 4-49 shows the detail electricity connection situation by union.

Figure 4-49: Electricity connection of the Study Area

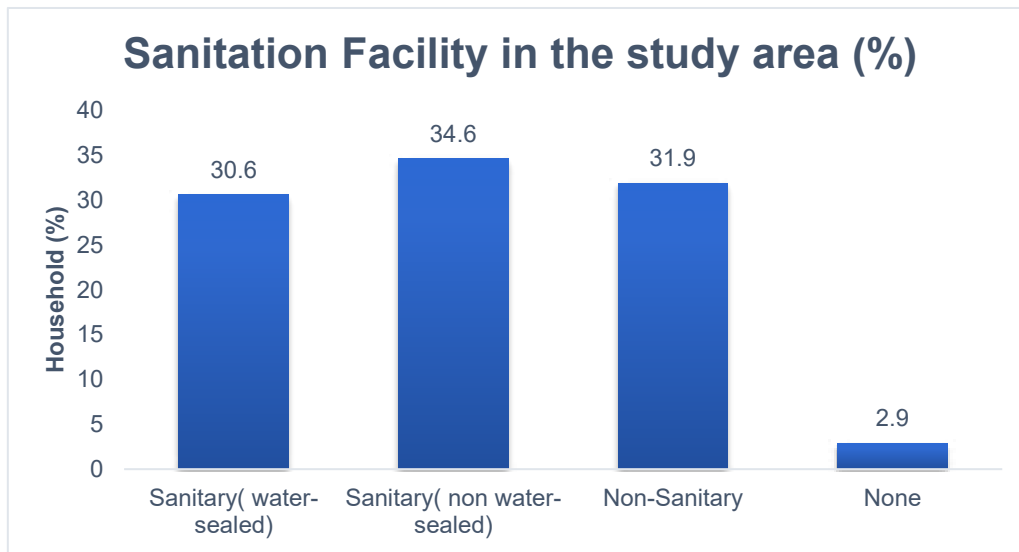


Source: Population and Housing Census, BBS, 2011

4.4.5.4.3 Sanitation

169. In the study area, households that use water-sealed sanitary latrine and non-water-sealed sanitary latrine facility are 30.6% and 34.6% respectively. Whereas around 31.9% households avail non-sanitary facilities. The rest 2.9% of households have no access to hygienic latrine facilities. The following Figure 4-50 shows sanitation facility of the project area.

Figure 4-50: Sanitation Facility in the Study Area



Source: Population and Housing Census, BBS, 2011

4.4.5.4.4 Health Care Facility

170. According to the District Statistics (2011), there are 4 Private Hospitals in Upazila with 1 MBBS/FCPS doctor in the study area. Also, 2 diagnostic centers are found in the proposed study area.

4.4.5.4.5 Solid Waste

171. Uncontrolled waste generation coupled with inadequate collection and disposal systems have the potential to give rise to pollution and environmental degradation as well as disease. While no specific data on local waste management was collected from the study area, it is likely that – as with many other parts of rural Bangladesh– the villages within the study area have no formal waste management facilities, and that in general people dispose of their waste in landfills or in fallow land.

4.4.5.5 Economy and Employment

172. Agriculture, comprising crop cultivation, fisheries, direct farming, sharecropping, agricultural laborers, and so on, is the most common source of employment in the study area, according to the Population and Housing Census (2011). Agriculture employs approximately 98.7% males and 1.3% females. Furthermore, a sizable proportion of the study area's population (83.0 % male and 17.0 % female) is employed in the service sector. In addition, the industrial sector employs 95.0% men and 5.0 % women. The following Table 4-69 shows the employment status of the project area.

Table 4-69: Employment status of the Study Area

Upazila	Union	Population Aged 7+, not attending school but employed			Field of Activity					
					Agriculture		Industry		Service	
		Total	Male	Female	Male	Female	Male	Female	Male	Female
Maheshpur	Ward No-04	370	354	16	195	5	72	5	87	6
	Ward No-05	209	186	23	63	3	13	1	110	19
	Ward No-07	440	415	25	289	2	11	0	115	23
	Natima	3637	3462	175	3022	56	86	10	354	109
	Manderbari	3767	3687	80	3220	24	170	7	297	49
	Ward No-08	610	590	20	373	1	94	0	123	19
	Ward No-06	119	104	15	13	0	6	1	85	14
Total		9152	8798	354	7175	91	452	24	1171	239

Source: Population and Housing Census, BBS, 2011

4.4.5.6 Traffic and Transport

173. According to the District Statistics (2011), in Upazila total metalled road is 152 km and there is 190 km semi metalled road. In these upazilas total unmetalled (kacha) road is 521 km. There are 16 railway stations in these upazilas. There are 5 Bus stands in the study area. 0 steamer or launch station found in these upazilas. Water way in monsoon is 45 km and Water way round the year is 0 km found in the area. The following Table 4-70 shows the traffic and transportation status of the project area.

Table 4-70: Traffic and Transportation of the Study Area

Length of metalled, semi metalled and unmetalled road				Length of railway and water way			Stations		
Upazila	Metalled road	Semi metalled	Unmetalled Kacha Road	Total Railway	Water way in monsoon	Water way round the year	Railway Station	Steamer/ launch station	Bus Stand
Maheshpur	152	190	521	263	45	0	16	0	5
Total	152	190	521	263	45	0	16	0	5

Source: District Statistics, 2011

4.4.6 Phultola 132/33 kV GIS Substation

4.4.6.1 Introduction

174. The socio-economic condition of the people of the project area will provide sound reference and assess probable socio-economic impact of the proposed interventions. This will enable us to compare the changes and impacts of the project interventions at present. The socio-economic baseline scenario describes the socio-economic characteristics of the project area on the basis of secondary data which was collected during Population and Housing Census of 2011. The socio-economic characteristics include administrative area, demographic, household size, education, occupation, housing, employment opportunity, access to water and sanitation status etc.

4.4.6.2 Population

4.4.6.2.1 Administrative Area and Location

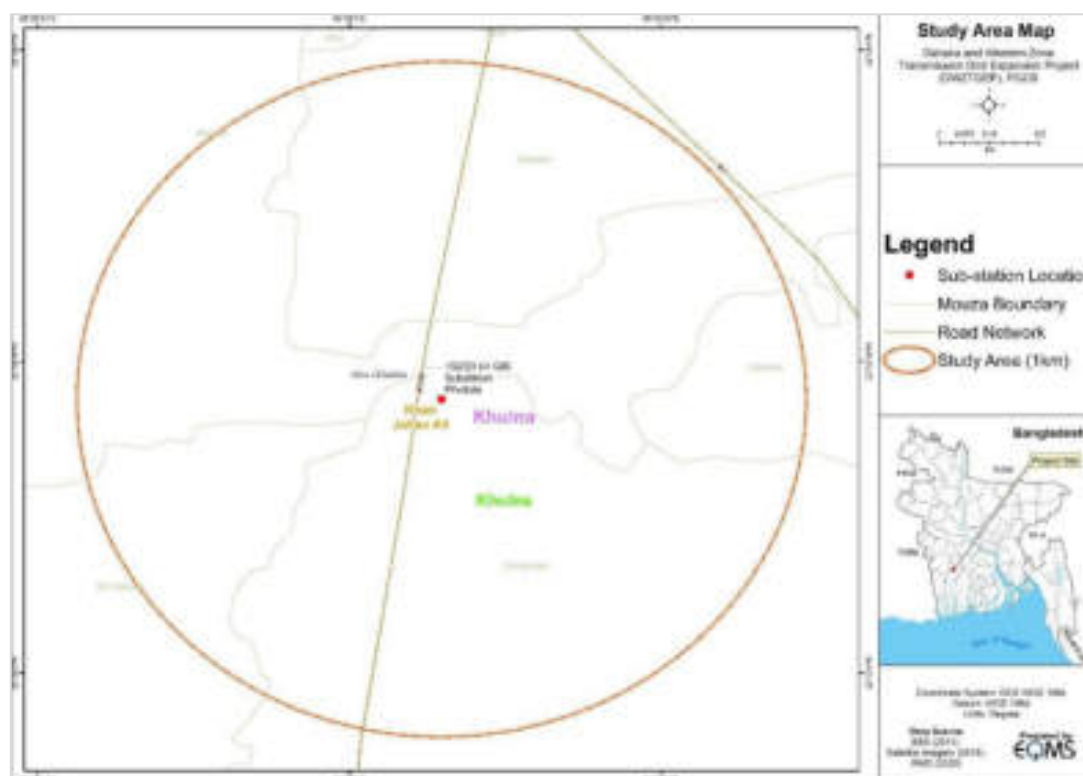
175. The proposed project is located in the Khulna district under Khulna division. Based on the assessment of the project, its surroundings and its environmental & social influence, a 1 kilometer radius is considered from the project boundary as the study area for the social study. Table 4-71 shows the study area of the project across Unions, Upazilas and Districts. The socio-economic features of the study area are discussed in this section.

Table 4-71: Administrative Boundary of the Study Area

District	Upazila	Union
Khulna	Khan Jahan Ali	Atra Gilatala

176. The project study area lies within the administrative area of Khan Jahan Ali Upazila under Khulna and district in the Khulna division. The socio-economic study area is shown in Figure 4-51.

Figure 4-51: 1 kilometers Buffer Map for Socio-economic Study



Source: EQMS

4.4.6.2.2 Demography

177. In the study area, there are about 18,755 households (HHs) including squatters with a total population of 81,313 that might be influenced by the implementation of the proposed project. The average sex ratio²⁸ is 114 and the average household size is 4.1. The demography of the study area is shown in the following Table 4-72.

Table 4-72: Demography of the Study Area

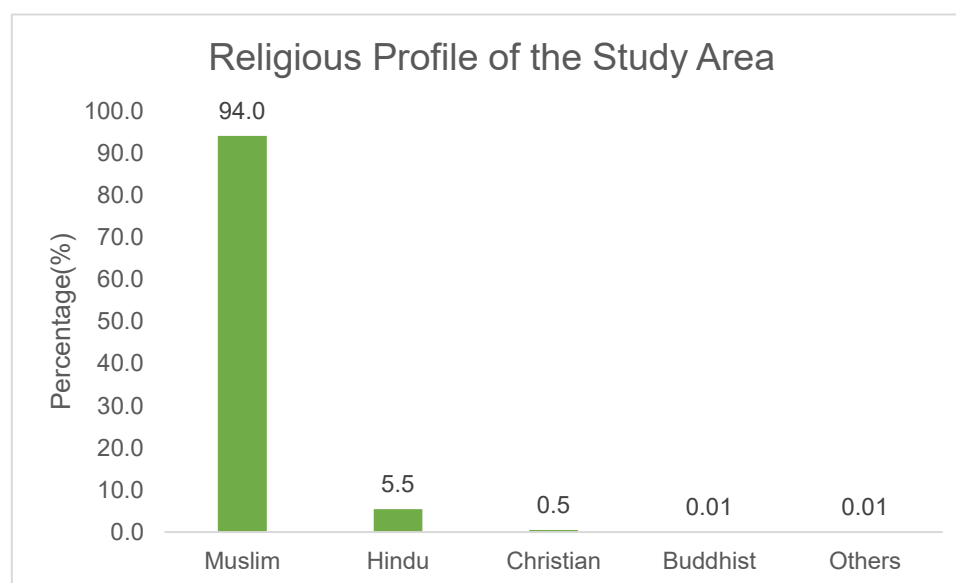
District	Upazila	Union	Total Pop	Total HHs	Sex Ratio	Avg. HH size
Khulna	Khan Jahan Ali	Atra Gilatala	81313	18755	114	4.1
Total			81313	18755	114	4.1

Source: Population and Housing Census, BBS, 2011

4.4.6.2.3 Religion

178. According to the Population and Housing Census (2011), the population of the study area is dominated by the Muslim community constituting almost 94.0% of the total population. The remaining 5.5% is Hindu, 0.5% is Christian, 0.01% is Buddhist and 0.01% is other religion. The following Figure 4-52 indicates the various religious profile of the project study area.

Figure 4-52: Religious Profile of the Study Area



Source: Population and Housing Census, BBS, 2011

4.4.6.2.4 Ethnic Composition

179. According to Population and Housing Census (2011), within the 1 kilometer radius from the project site 2 Households were found where 5 number of ethnic people live. 4 number of Garo and 1 of them are Others ethnic group. The following Table 4-73 indicates the various ethnic composition of the project study area.

²⁸The sex ratio is the ratio of males to females in a population. (Source: Wikipedia)

Table 4-73: Ethnic Profile of the Study Area

Upazila	Union	HH	Ethnic Population			Ethnic Population in main groups			
			Total	Male	Female	Sawntal	Marma	Garos	Others
Khan Jahan Ali	Atra Gilatala	2	5	4	1	0	0	4	1
Total		2	5	4	1	0	0	4	1

Source: Population and Housing Census, BBS, 2011

4.4.6.2.5 Education

180. According to the Population and Housing Census (2011), the literacy rate in the study area is 71.2%. The following Table 4-74 shows the literacy rate of the project study area.

Table 4-74: Literacy Rate of the Study Area

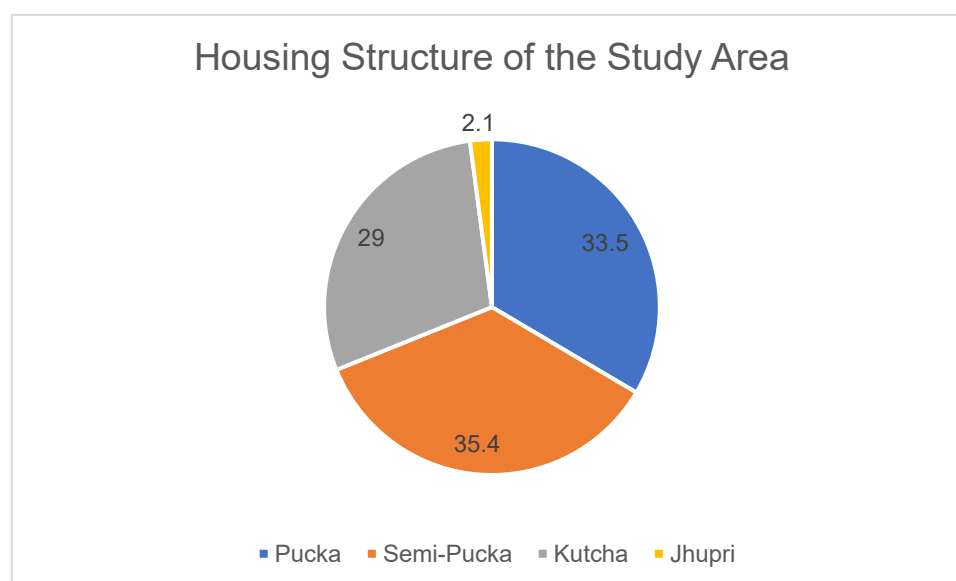
District	Upazila	Union	Male	Female	Literacy (%) Both
Khulna	Khan Jahan Ali	Atra Gilatala	75.5	66.3	71.2
Total			75.5	66.3	71.2

Source: Population and Housing Census, BBS, 2011

4.4.6.3 Settlement and Housing

181. According to the Population and Housing Census (2011), the predominant structure of these study area is Kutcha (29 %) followed by Semi-pucka (35.4 %), Pucka and Jhupri (33.5% and 2.1%). The housing tenancy of the study area is owned by (57.8 %), rented (37.6 %) and rent free (4.6%). The following Figure 4-53 and Table 4-75 shows the type of structure and housing tenancy in the project study area.

Figure 4-53: Housing Structure in the Study Area



Source: Population and Housing Census, BBS, 2011

Table 4-75: Housing tenancy in the Study Area

Upazila	Union	Number of HHs	Housing Tenancy (%)		
			Owned	Rented	Rent free
Khan Jahan Ali	Atra Gilatala	18293	57.8	37.6	4.6
Total		18293	57.8	37.6	4.6

Source: Population and Housing Census, BBS, 2011

4.4.6.4 Public Utilities

4.4.6.4.1 Water Supply

182. At the project study area, the major source of drinking water is tube-well where about 96.2% population use tube-well water. About 3.1% of people have access to tap water. And (0.7%) People have access to neither tube-well nor tap water. An overview is depicted in below Table 4-76.

Table 4-76: Sources of Drinking Water in the Study Area

Upazila	Union	Number of HHs	Source of Drinking Water (%)		
			Tap	Tube-well	Other
Khan Jahan Ali	Atra Gilatala	18293	3.1	96.2	0.7
Total		18293	3.1	96.2	0.7

Source: Population and Housing Census, BBS, 2011

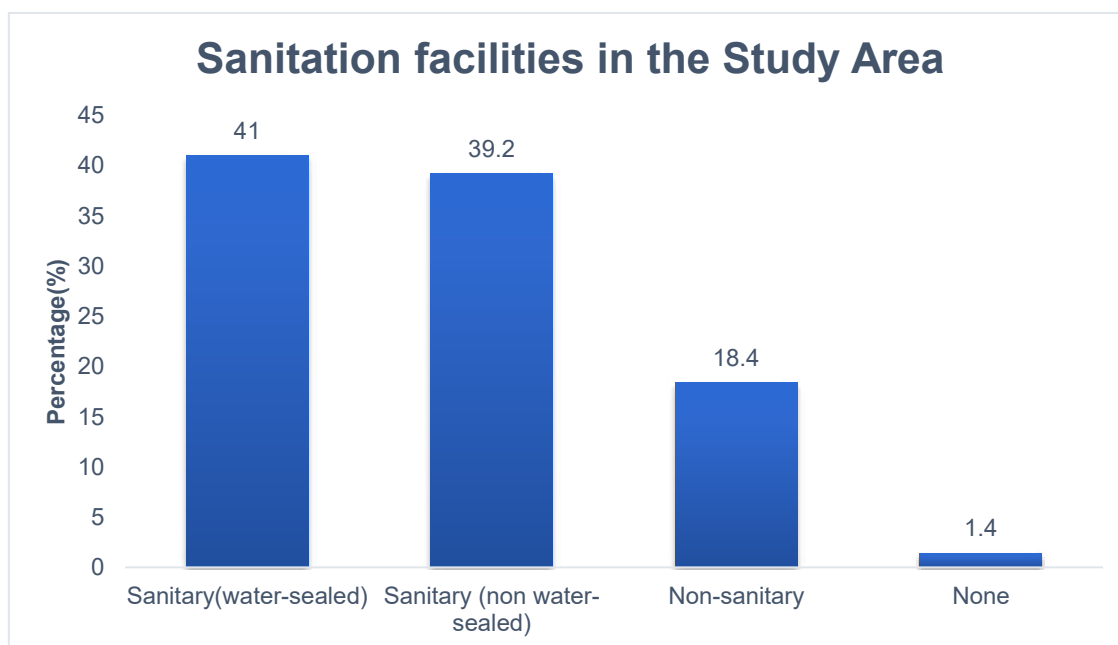
4.4.6.4.2 Electricity

183. Electricity is an important indicator for measuring the quality of life. In the study area, 92.6% of households have grid electricity connection.

4.4.6.4.3 Sanitation

184. In the study area, households that use water-sealed sanitary latrine and non-water-sealed sanitary latrine facility are 41% and 39.2% respectively. Whereas around 18.4% households avail non-sanitary facilities. The rest 1.4% of households have no access to hygienic latrine facilities. The following Figure 4-54 shows sanitation facility of the project area.

Figure 4-54: Sanitation Facility in the Study Area



Source: Population and Housing Census, BBS, 2011

4.4.6.4.4 Health Care Facility

185. According to the District Statistics (2011), there are 3 Private Hospitals in Manirampur Upazila Private with 4 MBBS/FCPS doctors in the study area. Also, 1 diagnostic center is found in the proposed study area.

4.4.6.4.5 Solid Waste

186. Uncontrolled waste generation coupled with inadequate collection and disposal systems have the potentiality to give rise to pollution and environmental degradation as well as disease. While no specific data on local waste management was collected from the study area, it is likely that – as with many other parts of rural Bangladesh– the villages within the study area have no formal waste management facilities, and that in general people dispose of their waste in landfills or in fallow land.

4.4.6.5 Economy and Employment

187. Agriculture, comprising crop cultivation, fisheries, direct farming, sharecropping, agricultural laborers, and so on, is the most common source of employment in the study area, according to the Population and Housing Census (2011). Agriculture employs approximately 91.0% males and 9.0% females. Furthermore, a sizable proportion of the study area's population (81.1% male and 18.9% female) is employed in the service sector. In addition, the industrial sector employs 74.3% men and 25.7% women. The following Table 4-77 shows the employment status of the project area.

Table 4-77: Employment status of the Study Area

Upazila	Union	Population Aged 7+, not attending school but employed			Field of Activity					
					Agriculture		Industry		Service	
		Total	Male	Female	Male	Female	Male	Female	Male	Female
Khan Jahan Ali	Atra Gilatala	4826	3816	1010	573	57	1739	602	1504	351
Total		4826	3816	1010	573	57	1739	602	1504	351

Source: Population and Housing Census, BBS, 2011

4.4.6.6 Traffic and Transport

188. According to the District Statistics (2011), in Upazila total metalled road is 47 km and there is 40 km semi metalled road. In these upazilas total unmetalled (kacha) road is 100 km. 2 railway stations in these upazilas. There are 10 Bus stands in the study area. No steamer or launch station was found in these upazilas. Water way in monsoon is 0 km and Water way round the year is 0 km found in the area. The following Table 4-78 shows the traffic and transportation status of the project area.

Table 4-78: Traffic and Transportation of the Study Area

Length of metalled, semi metalled and unmetalled road				Length of railway and water way			Stations		
Upazila	Metalled road	Semi metalled	Unmetalled Kacha Road	Total Railway	Water way in monsoon	Water way round the year	Railway Station	Steamer/ launch station	Bus Stand
Meherpur Sadar	47	40	100	17	0	0	2	0	10
Total	47	40	100	17	0	0	2	0	10

5. IMPACT ASSESSMENT AND EVALUATION

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

190. The section 5 of the original IEE (Table 5-3 of the original IEE) remains as applicable for impact evaluation of the project.

191. This section evaluates additional potential impacts based on activities that will be involved in construction and operation phase of the one proposed transmission line: ; (i) Kaliganj-Maheshpur 132 kV double circuit transmission line (Package 3), and five substations (Package 7); (i) 230/132/33 kV GIS Substation at Rupsha, (ii) 132/33 kV GIS Substation Phultola, (iii) 132/33 kV GIS Substation Maheshpur, (iv) 132/33 kV GIS Substation Meherpur and (v) 132/33 kV GIS Substation Manirampur.

5.1 Impact Assessment Methodology

192. The impact assessment has involved the prediction, evaluation, and mitigation of impacts and report on impacts including residual impacts and cumulative impacts. The impact assessment methodology of this addendum follows the methodology of the original IEE (section 5.2 of the original IEE).

5.2 Impact Identification

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

194. The interaction matrix enables a methodical identification of the potential interactions each project activity may have on the range of resources/receptors within the area of influence i.e., the study area of the project. The interaction matrix for the project activities and likely impacted resources/receptors is presented in Table 5-1.

Table 5-1: Potential environmental impacts on the IECs during the Phases and Comparison with Addendum-4

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-4
Pre-construction Stage					
Physical Environment					
Ambient air quality	Vehicular emissions: dust from excavation works, land clearing, and material stockyards may affect ambient air quality.	Medium	Minor	Minor Adverse	Same as previous
Ambient noise	Noise level may increase due to mobilization of vehicles and unloading of materials.	Medium	Minor	Minor Adverse	Same as previous
Quality of surface and groundwater	The quality of surface water of the water bodies close to the project construction sites may deteriorate if erosion products and silt reach water bodies, especially during rains	Medium	Moderate	Moderate Adverse	Same as previous
Soil	During the pre-construction period, site clearance work will be done accordingly. Site clearance will impact the fertile top soils that are enriched with nutrients	Low	Minor	Minimal Adverse	Same as previous
Land and Agricultural Resources					
Land use	Would be partially impacted in RoW	Low	Minor	Minimal Adverse	Minimal Adverse/ Same as previous
Crop production	Would be highly impacted, at tower foundation areas and substation lands	Medium	Moderate	Moderate Adverse	Same as previous
Fisheries Resources					
Fish habitat	Fish habitat quantity and quality will be changed.	Medium	Moderate	Moderate Adverse	Same as previous

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-4
Fish production	Production reduced due to waterbody loss	Low	Minor	Minimal Adverse	Same as previous
Socioeconomic Resources					
Land price	Reduced near RoW and substation lands, increase away from transmission lines and substations due to availability of electricity	Low	Minor	Minimal Adverse	Same as previous
Employment opportunities	Temporary or minimal opportunities at this stage.	Medium	Moderate	Moderate Beneficial	Same as previous
Human health and safety	Ensure proper Health and safety for workers involved for site clearance. Road traffic safety with number of trucks for fill import.	Low	Minor	Minimal Adverse	Same as previous
Road/ river/ canal/ water body crossings	Minimal impacts	Low	Minor	Minimal adverse	Same as previous
PCRs	Proper chance find procedures will also be implemented in case of a chance find.	Low	Minor	Minimal Adverse	Same as previous
Construction Stage					
Physical Environment					
Ambient air quality	Suspended particulate matter from excavation works and land clearing, including vehicular emissions, may affect workers and community.	Medium	Moderate	Moderate Adverse	Monitoring results were found well within the limits of national standards for both the alignments.

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-4
Ambient noise	Mobilization of heavy equipment and machinery, use of construction vehicles, transport of materials, pile driving, and construction activities may increase ambient noise level. Exposure to high level ambient noise may cause anxiety and disturbance to workers and community.	Medium	Moderate	Moderate Adverse	Monitoring results were found well within the limits of national standards.
Quality of surface and groundwater	Potential for siltation due to construction works near pond or river.	Medium	Moderate	Moderate Adverse	Monitoring results were found well within the limits of national standards.
Riverbank erosion	Potential erosion due to ground movements along the riverbank.	Medium	Major	Moderate Adverse	Same as previous
Soil	During construction, top soil at the tower footings may be eroded during excavation. Construction wastes like metal scraps and wooden packing material, and polythene may create a disturbance to the surrounding land, settlements, and the communities; Domestic wastes from labor camp.	Medium	Major	Moderate Adverse	Same as previous
Land and Agricultural Resources					
Land use	Would be partially impacted as agricultural land may be permanently lost due to the tower footings.	Medium	Moderate	Moderate Adverse	Same as previous

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-4
Crop production	May be moderately affected due to crop loss at the tower footings and in the clearing for RoW.	Medium	Moderate	Moderate Adverse	Same as previous
Intercropping	Maybe affected due to the erection of towers	Low	Minor	Minimal Adverse	Same as previous
Change in topography/terrain	Excavation and erection work for the transmission towers may affect topography.	Low	Minor	Minimal Adverse	Same as previous
Impairment of visual aesthetics	Transmission towers partially visible on the skyline.	Low	Minor	Minimal Adverse	Same as previous
Fisheries Resources					
Fish habitat	Few lands selected for substations having water bodies, permanent loss of fish habitats in substation lands. Construction activities may temporarily affect nearby fish habitats.	Medium	Minor	Minor Adverse	Same as previous
Fish production	Lands earmarked for 2 substations contain 3-acre waterbodies. These waterbodies might be filled for the construction of substations. This will affect the fish production.	Medium	Moderate	Moderate Adverse	Same as previous
Terrestrial Resources (Flora and Fauna)					
Terrestrial vegetation	Vegetation clearing/ tree cutting is required at the tower footings and RoW.	Medium	Moderate	Medium Adverse	In these alignment, tree cutting due to tower footings and RoW will be less than the previous count

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-4
Wildlife habitat and their disturbance	Route will be mainly in urban or peri-urban areas. Habitat in the areas affected may not host wildlife.	Medium	Moderate	Medium Adverse	Same as previous
Socioeconomic Resources					
Compensation for crop damage	Standing crops at the tower footings and RoW may be damaged.	Medium	Moderate	Moderate Adverse	Crop compensation status has been incorporated in the updated RAP
Land price	Value of land may be temporarily affected.	Medium	Moderate	Moderate Adverse	Same as previous
Temporary employment opportunity	Both technical and non-technical laborers will be required	Medium	Moderate	Moderate Beneficial	Same as previous
Human health and safety	The safety and health of the public may be impacted due to the hazards created during the construction period, e.g., movement of heavy equipment, vehicles, and machineries. Damages to structure within RoW. Workers may be exposed to occupational health risks and safety hazards, mostly working with electricity and working at height.	Medium	Minor	Minor Adverse	Moderate Adverse. Occupational health risk observed in both the alignments due to lack of general safety requirements and precautions while working at construction sites
Road/ river/ canal/ water body crossings	Road use for construction activities as haulage of construction materials, spoil, and equipment, riverbank and Soil erosion	Medium	Moderate	Moderate Adverse	Same as previous
PCRs	Proper chance find procedures will also be implemented in case of a chance find.	Low	Minor	Minimal Adverse	Same as previous

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-4
Regional and national development	May create development opportunities in anticipation of stable power supply.	Medium	Moderate	Moderate Beneficial	Same as previous
Operation Stage					
Physical-Chemical Environment					
Ambient air quality	Climate change from fugitive emission (negligible) of SF ₆	Low	Minor	Minimal Adverse ²⁹	Same as previous
Ambient noise	Noise in the form of buzzing or humming can often be heard around transformers or power lines producing corona. Outside of RoW will be negligible.	Low	Minor	Minimal Adverse	Same as previous
Quality of surface and groundwater	Transformer oil spill and leakage	Low	Minor	Minimal Adverse	Same as previous
Riverbank erosion	No or minimal impact	Low	Minor	Minimal Adverse	Same as previous
Soil/Land contamination	Potential for spill or improper disposal of mineral oil used as insulating oil in transformers. No use of PCB or PCB-containing material will be allowed.	Low	Minor	Minimal Adverse	Same as previous
Land and Agricultural Resources					
Land use	No impact (changes will have occurred in construction phase).	Low	Minor	Minimal Adverse	Same as previous

²⁹ Due to high global warming potential, SF₆ may contribute to the man-made greenhouse-effect, if it is released into the atmosphere. However in electrical switchgear the SF₆ gas is always used in gas-tight compartments, greatly minimizing leakage. This makes the real impact on greenhouse effect negligible. As per ECOFYS, Sina Wartmann, Dr. Jochen Harnisch, June 2005, "Reductions of SF₆ Emissions from High and Medium Voltage Equipment in Europe" study, the contribution to the greenhouse effect in Europe is estimated to 0.05 %.

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-4
Crop production	Tower footings may have minor impact on crop production due to permanent loss of agricultural land.	Medium	Minor	Minor Adverse	Same as previous
Change in surface topography/ terrain	Transmission towers will have minimal impact on topography.	Low	Minor	Minimal Adverse	Same as previous
Impairment of visual aesthetics	Transmission towers visible on the skyline.	Low	Minor	Minimal Adverse	Same as previous
Fisheries Resources					
Fish habitat	No change expected	Low	Minor	Minimal Adverse	Same as previous
Fish production	No change expected	Low	Minor	Minimal Adverse	Same as previous
Terrestrial Resources (Flora and Fauna)					
Terrestrial vegetation	Restriction of vegetation height below the transmission line.	Low	Minimal	Minimal Adverse	Same as previous
Wildlife habitat and their disturbance	Natural forest, Protected areas or ecologically sensitive areas are not present in the proposed substation lands or along the transmission line routes	Low	Minimal	Minimal Adverse	Same as previous
Socioeconomic Resources					
Compensation	Ongoing permanent loss of land at the tower footings (but occurred at the construction stage).	Medium	Moderate	Moderate Adverse	Same as previous
Land price	No land value at the tower footings (compensation already paid); development restrictions below the transmission line and between towers may affect land value.	Medium	Moderate	Moderate Adverse	Same as previous

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-4
Employment opportunity	Jobs will be created directly due to the project and indirectly through businesses and development resulting from the availability of power supply.	Medium	Minor	Minor Beneficial	Same as previous
Human health and safety	- Occupational and community safety risks (project maintenance); - There is public and scientific concern over the potential health effects associated with exposure to EMF.	Medium	Minor	Moderate Adverse	- Same as previous - As per the final alignment and confirmation from PGCB, there are no housing or school structures directly lies underneath the transmission line. - PGCB confirms that consultations with the nearby residents undertaken to discuss the health and safety implications, with education program for residents and communities on how to minimize the risks involved.

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-4
Road/ river/ canal/ water body crossings	No disturbances to vehicular traffic	Low	Minor	Minimal Adverse	Same as previous
Regional and national development	Availability of a stable and reliable power supply may improve productivity and national development.	Medium	Moderate	Moderate Beneficial	Same as previous

5.3 Potential Impacts during Addendum- 4

5.3.1 Terrestrial Resources (Flora and Fauna)

5.3.1.1 Clearing of Vegetation during Construction Phase

195. As per the original IEE, 2019, a significant number of big trees were estimated to be cleared in Kaliganj- Maheshpur transmission line, where no trees were felled during the land development of five substations. Therefore, impact for five substation is negligible. However, as per the primary survey during this addendum, the total number of trees to be cut for tower footing were counted 16. The comparison of tree count is given in Table 5-2 .

Table 5-2: Comparison of tree count

SN	Sub-projects	Counted during original IEE, 2019*	Counted during Addendum-4, 2022*
1.	Kaliganj-Maheshpur 132 kV double circuit transmission line	1405 (>5 m in height)	999 (>5 m in height)

*Source: <https://www.adb.org/projects/documents/ban-51137-003-iee> and EQMS Survey March 2023

196. Most of the trees in the RoW of the TL need to be trimmed rather than cut, and thus the impact will be only moderately significant. Both the transmission alignment falls inside paddy fields/ floodplain areas, so tree felling will mostly be restricted to settlement areas.

Mitigation Measures

- Vegetation clearance should be minimum within the designated areas.
- Indigenous vegetation in areas that will not be impacted by the project shall not be disturbed.
- Workers should be aware of the importance of natural resources and should not unnecessarily clear any area or break branches, twigs, flowers, etc. of adjacent vegetation.
- Crops and plant health monitoring should be conducted.
- Soil contamination by fuel and chemical storages shall be minimized by siting them on an impervious base within an embanked area and secured by fencing;
- Site clearance, piling, excavation and construction should not be carried out during rainy season and scheduled accordingly to avoid extreme weather events as heavy rainfall and high winds to minimize erosion and run-off;
- Workers should be aware of the importance of natural resources and should not unnecessarily clear any area or break branches, twigs, flowers, etc. of adjacent vegetation.
- Nighttime work should be limited, and lights at night should not disrupt the movement of nocturnal wildlife.
- Signage for speed limit, limiting sirens and horns, awareness for biodiversity conservation, etc. should be provided.
- Disturbance to wildlife should be monitored regularly.
- Rescue, rehabilitation and relocation should be done for terrestrial fauna of those forests when necessary.
- A detailed migratory bird survey needs to be conducted along the transmission line focused on the major river crossings to confirm the findings of the IEE that it does not have a significant impact on their route and staging.

197. As the project impact will be for long term in a local extent within the adjacent areas of the project site, potential impact on Terrestrial Flora can be reduced to Very Low by following proper mitigation measures.

5.3.2 Occupational health and safety during Construction Phase

198. The construction of civil works such as transmission towers and substations poses an inherent risk of injury to workers from accidents and hazardous working environments. Unsafe working conditions could place workers at risk of injury or death. Such conditions could be caused by vehicles and equipment that do not meet safety standards (seat belts, horns, lights, tires, etc.), unprotected access to dangerous locations (unmarked excavations), poor practices and equipment for lifting operations, poor electrical safety (untrained workers, inadequate tools, etc.), inadequate safeguards on tools and equipment (unprotected saws, etc.), and other poor practices.

199. During the survey of this addendum, it was observed that lack of general safety requirements and precautions prevails at TL and substation construction yards. This non-compliance will trigger the possibility of risk of injury to workers. Also, sanitation facility of the workers was observed in poor conditions at the construction yards of the TL alignments.

200. Inadequate water and/or sanitation can affect workers' health, contaminate soil and surface water, and lead to worker illness or disease. Contractors will also have to provide sanitary facilities, including portable toilets in remote areas, and to enforce the Code of Conduct's prohibition on using the non-pit latrine.

Mitigation Measures for both Transmission line and Substation Construction Yards

- Provide preventive and protective measures, including modification, substitution, or elimination of hazardous conditions, with particular attention to live power lines, working at height, working above water, high noise levels.
- Provide measures for the management and appropriate disposal of hazardous wastes to ensure protection of the workforce and the prevention and control of releases and accidents.
- Provide the provision of appropriate fire extinguishers and fire response plans and appropriately trained first aid response staff.
- Provide for the provision of appropriately stocked first-aid equipment and stations at both work sites and temporary construction camps, including appropriately trained first-aid staff on site and provision of adequate transport facilities for moving injured persons to the nearest hospital.
- Provide the provision of appropriate personal protective equipment (PPE) to minimize risks, such outerwear, boots, and gloves; eye protectors; ear plugs safety helmets, etc.
- Provide training for workers and establish appropriate incentives to use and comply with health and safety procedures and utilize PPE; Include procedures for documenting and reporting occupational accidents, diseases, and incidents; Include emergency prevention, preparedness, and response arrangements in place.
- Secondary container should be available for preventing oil and chemical spillage

5.3.3 Impact due to River Crossing

201. Kaliganj- Maheshpur 132 kV double circuit transmission line crosses two rivers and two canals, and a pond along the length of the line. Rivers are Kapotaksha river and Chitra River ranging from 50-110 m. As per PGCB and observation from survey, no towers will be constructed in the rivers, canals and other waterbodies. Moreover, 500 m radius of five substation location there is no river boundaries. Therefore, no significant impact is expected due to construction of substations and transmission lines in the river crossings. However, additional mitigation measures have been incorporated in the EMP.

5.3.4 Land Loss

202. A substantial loss of land of 16.38 acres is anticipated for the proposed five substations. Natural habitats and water bodies are not found in any of the sites proposed for the construction of substations. Waste management and site drainage will be important during construction of the substations, to prevent soil and water pollution. All sites will also require secure fencing to maintain local community safety (no entry possible). Also, no resettlement issues were found in five substation locations. Moreover, most of the substation location is not agricultural land. Overall anticipated impact on land for construction of substation are cumulatively low.

203. For tower footing, a Resettlement Plan (RP) has been prepared in conjunction with the IEE to determine the land ownership, affected structures, trees, and crops to determine the compensation. A large number of households were originally identified within the chosen alignments and deviations to the routes were selected to reduce the number of affected houses.

204. The Electricity Rule 1910 of the Power Division, Bangladesh does not provide provisions for compensation for the land required for the foundations and platforms for transmission line towers. ADB's SPS 2009 requires compensation for loss of land at transmission tower sites. The RP provides compensation details. The Electricity Act, 1910 has been repealed on 12th February 2018 by re-enacting the Electricity Act 2018 for ensuring better supply as well as use and for meeting up the gradual accumulative demand of electrical energy all over the country. Therefore, the impact on land for tower footing are negligible.

6. ENVIRONMENTAL MANAGEMENT PLAN

205. The primary objective of the Environmental Management Plan (EMP) is to avoid or eliminate or reduce the negative environmental impacts by possible mitigation measures and to enhance the positive impacts by enhancement measures. It would also address any unexpected or unforeseen impacts that may arise during construction and operation stages of the subprojects.

206. The aim of the EMP is to ensure implementation of the recommended mitigation and enhancement measures effectively. The mitigation measures are designed either to prevent impacts or by mitigating those to reduce the negative impacts to an acceptable level that complies with the environmental guidelines of the DOE and ADB.

207. The section EMP of the original IEE (Table 9.1 of the original IEE) remains as applicable management plan that depicts possible mitigation measures to avoid or eliminate or reduce the negative impacts and to enhance the positive impacts.

208. The additional mitigation measures under this addendum for Kaliganj-Maheshpur 132 kV double circuit transmission line (package 3) and five substations under Package 7 (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur) are incorporated in the Table 6-1 and Table 6-2.

Table 6-1: Mitigation Measures for the Impacts of Transmission Line of during Addendum-4

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Supervision Agency
(a) Pre-construction/ Construction Stage				
Tree cutting, Clearing of vegetation	999 trees (>5 m in height) will be directly affected by cutting and trimming along the RoW of Kaliganj-Maheshpur 132 kV double circuit transmission line	• Prior to the start of clearing of vegetation, provide adequate compensation to the owners. • Tree cutting and vegetation clearance should be done within the designated areas. • A compensatory tree plantation program should be adopted. Tree plantation will be carried out with a ratio of 1:3. The contractor will be responsible for the plantation and maintenance (replacing losses) of the trees for at least 3 years under the supervision of PGCB. These plantations would be the part of 75,000 trees that are already included in the EMP for the operational stage in the original IEE. • Trees should be checked by an ecologist for nests and holes before cutting. Active nests, eggs, hatchling must be safeguarded. • Indigenous vegetation in areas that will not be impacted by the project shall not be disturbed. • Workers should be aware of the importance of natural resources and should not unnecessarily clear any area or break branches, twigs, flowers, etc. of adjacent vegetation. • Crops and plant health monitoring should be conducted. • Soil contamination by fuel and chemical storage shall be minimized by sitting them on an impervious base within an embanked area and secured by fencing.	Contractor	DSC/ PGCB

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Supervision Agency
		• Site clearance, piling, excavation and construction should not be carried out during the rainy season and scheduled accordingly to avoid extreme weather events such as heavy rainfall and high winds to minimize erosion and run-off. • Workers should be aware of the importance of natural resources and should not unnecessarily clear any area or break branches, twigs, flowers, etc. of adjacent vegetation. • Nighttime work should be limited, and lights at night should not disrupt the movement of nocturnal wildlife. • Signage for speed limit, limiting sirens and horns, awareness for biodiversity conservation, etc. should be provided. • Disturbance to wildlife should be monitored regularly. • Rescue, rehabilitation and relocation should be done for terrestrial fauna of those forests when necessary. • A detailed migratory bird survey needs to be conducted along the transmission line focused on the major river crossings to confirm the findings of the IEE that it does not have a significant impact on their route and staging.		
Occupational health and safety (H&S)	Health and safety risks of construction workers.	• Site H&S Manager must be engaged on each alignment. • Only permitting trained and certified workers to work with any electrical equipment. • Before access to site granted, contractor to prepare H&S plan based on risk assessment for approval by	Contractor	DSC/ PGCB

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Supervision Agency
		PGCB following national and EHS guideline requirements. • Safety instruction by the E&H Manager should be provided for the workers and visitors before they will be allowed to access the site. • First aid box and personal protective equipment, PPE (such as helmet, safety shoes, eye protection glass, ear plugs, waist belt, mask, hand gloves, body protective apron, earmuff and insulating boots, as needed) must be provided to the workers, and ensure their use by workers. • Safety signs as needed at the tower sites. • Provide the provision of appropriate fire extinguishers and fire response plans and appropriately trained first aid response staff. • The EPC Contractor will be required to provide affordable group medical and accident insurance to their workers or arrange with the local health facilities to aid in the event of emergency. • Noise barriers will be installed in areas and equipment with high level noise. • EPC Contractor will provide workers with sanitary facilities, safe drinking water, wash area, adequate water for washing purposes, fire-fighting unit, etc. • Construction materials to be stored in a safe manner at designated and demarked place with robust fences and safety signage provided rather storing them on the public road, adjacent to trees, or in the worker's camp		

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Supervision Agency
		area etc. • Temporary resting areas to be adequately ventilated and provide comfortable accommodation for construction workers. • Temporary overnight accommodations need to be of sound construction with adequate ventilation, space and beds meeting the labor and H&S requirements of Government of Bangladesh and the ILO guidance on worker accommodation (https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/multi/documents/publication/wcms_116344.pdf) • Doors and security gates need to be provided for worker's camp area. • COVID-19 precaution measures (e.g., handwashing facilities/sanitizer, temperature screening) at the worksite premises need to be ensured whilst the pandemic is still declared. • Group insurance covering all the construction workers to be provided by EPC contractors. • EPC contractors to ensure adequate numbers of EHS staff to cover all active working sites		
Pollution prevention	Risks to the natural environment within the impact zones of the proposed alignments	• Piling mud must not overtop the designated decanting pond to encroach on adjacent land, drains of designated decanting ponds need to be well built and maintained so that this cannot occur. • Construction machinery must be in good condition and well maintained.	Contractor	DSC/ PGCB

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Supervision Agency
		• Oil spill management (e.g., drip tray, spill absorbent kit) to be adopted for all oil or diesel driven engines/generators/machines. • All waste awaiting recycling or disposal to be stored in garbage bins or other designated and demarked storage area, not left scattered around. • Separate garbage bins for segregation of waste to be provided and need to be labelled biodegradable, non-biodegradable (recyclable) and non-biodegradable (residual waste) • Waste management register to be maintained at every work site including details on volume of waste disposed by type, means/ method of disposal etc. • Both full and empty barrels to be stored in designated and demarcated storage site with pollution prevention measures in place. • Storage areas to be kept in a tidy manner with labelled locations for different materials to be stored. • Ponded water to be avoided through provision of good drainage around working areas to avoid waterlogging and water borne vector (mosquito) disease spread; avoid the formation of stagnant water and algal blooms. • To confirm any drinking water provided by tube well is safe to drink it must be tested against Government of Bangladesh (WHO) drinking water standards including testing for arsenic and coliforms as common pollutants encountered, water that does not meet the standards		

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Supervision Agency
		must not be supplied for drinking water purposes		
- Quality of surface and groundwater - Riverbank erosion - Road/ river/ canal/ water body crossings	- Surface Water Pollution - Potential erosion due to ground movements along the riverbank.	- Construction work should be completed within the dry season. - Ensure that minimum water is lost during construction activities and no water remains stagnant at any place. - Contractors shall use silt traps and erosion control measures where the construction is carried out in close proximity to the water bodies to avoid cement particles, rock, rubbles and wastewater entering the surrounding water bodies. - All construction vehicles and equipment should be maintained in proper conditions to prevent any leakage. - All liquid raw materials and semi-liquid components must be kept at impermeable floorings and covered properly with appropriate labeling which shall avoid any leakage that might occur due to accidental spill or rainwater runoff.	Contractor	DSC/ PGCB
Community health and safety	Health and safety risks to the community	- Condition of access roads needs to be maintained in at least pre-project condition and in a state that does not pose a safety risk to project and other users. - Disturbed land where the condition has been changed because of construction to be tidied up, landscaped, and revegetated to the satisfaction of the borrower and the landowner before leaving the construction site. - Construction materials to be stored in a safe manner at designated and demarked place with robust fences and safety signage provided rather storing them on the	Contractor	DSC/ PGCB

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Supervision Agency
		public road, adjacent to trees, or in the worker's camp area etc. • Emergency procedures (e.g., names and contacts of persons responsible and emergency contact numbers like fire, police station, hospital) need to be visibly placed in a prominent location at all work sites and worker accommodation. • Posting of grievance box outside the worksite so that community people can drop grievance if they have any		
Gender-Based Violence (GBV)	Risks of violence against women and vulnerable community.	• Contractors should prepare and implement the code of conduct on GBV and Sexual Exploitation and Abuse (SEA). • Contractor should conduct GBV/SEA awareness raising program with the workers.	Contractor	DSC/ PGCB

Table 6-2: Mitigation Measures for the Impacts of Five substations during Addendum-4

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Super- vision Agency
(a) Preconstruction/Construction Stage				
Land acquisition/ requisition	Loss of 16.38 acres of land for the construction of 5 substations. Temporary loss of land (requisition) for construction camps etc.	Prior to commencement of construction activities, the owners of the affected lands must be notified and provided proper compensation in time as per the government and ADB guidelines. As per the government and ADB guidelines, RP should be prepared for land acquisition/ requisition/ compensation and follow it. Use GIS instead of AIS, in order to reduce land requirement.	DC	DSC/ PGCB
Top soil	As the lands, are paddy fields removal of topsoil might not be required before the land filling.	Site specific mitigation measures will be required in 5 substation lands	Contractor	DSC/ PGCB
Cutting of trees/ Clearing of vegetation	Lands selected for the construction of 5 substations are paddy fields, including small extents of marshy lands and waterbodies. There was no trees found during the survey. Loss of standing crops (if any), grass and bushes at substation sites and construction camp sites is anticipated.	Prior to the start of removal of trees/ clearing of vegetation, provide adequate compensation to the owners.	Contractor	DSC/ PGCB
Fauna (Wildlife)	Disturbance of wildlife due to project activities such as earthworks, moving of project	Prepare construction management plan (CMP, by the contractor) to be approved by PGCB before access to site is permitted and follow it properly. Follow the government rules and regulations, EHS	DC Contractor	DSC/ PGCB

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Super- vision Agency
	equipment and transports, especially during nighttime.	guidelines and WHO noise guidance whichever is more stringent on noise. Project workers should not disturb or kill any wildlife. Fishing is not allowed.		
Construction Waste	Generation of construction wastes from the construction materials.	Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time. Provision of facilities for handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements. Purchase of perishable construction materials such as paints incrementally to ensure reduced spoilage of unused materials. Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste. Use of construction materials containing recycled content when possible and in accordance with accepted standards. Adequate collection, separation, and storage of waste on site and safe transportation to the disposal sites and disposal methods at designated, licensed, engineered and sanitary landfills shall be provided.	Contractor	DSC/ PGCB

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Super- vision Agency
Drainage congestion and flooding	Reducing floodplain storage area and increase local flooding, due to earth filling of substation sites and access roads above highest flood level (HFL). This will be a major environment impact as the 14 lands selected for construction of substations consist of paddy lands, marshes and waterbodies.	Provide culverts enough for accommodating flood flows in the access road of the substation. Ensure timely monitoring, especially if construction works are carried out during the monsoon period. Provision for pumping of congested water, if needed. No discharge to the surface water. Consideration of the HFL during design of substations, to avoid inundation.	Contractor	DSC/ PGCB
	Drainage congestion if the surrounding sites are blocked by the earth embankment.	Substation civil designs will include drainage and flood control measures to avoid adverse impacts by land filling in new substation lands and also specify that the soil/sand shall be sourced only from existing licensed suppliers who are authorized by the government to supply soil/sand for land filling.	Contractor	DSC/ PGCB
Noise level	Noise pollution due to construction activities, generators and construction vehicle movement.	Use of noise reducers in heavy construction equipment. It is required that no construction should be allowed during nighttime (9 PM to 6 AM). As per EHS guidelines, avoid prolonged exposure to noise (produced by equipment) by workers. Regulate use of horns and avoid use of hydraulic horns in project vehicles. Generators should be placed within rooms (concrete walls with roof).	Contractor	DSC/ PGCB

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Super- vision Agency
		Noise levels will continue to be monitored in pre-construction and construction, and if there is exceedance at the village edges, noise baffles will be constructed.		
Air quality and dust	Air pollution and dust generation due to construction activities especially due to the underground cabling, generators and construction vehicle movements.	All vehicles (e.g., trucks, equipment, and other vehicles that support construction works) shall be well maintained and not emit dark or smoky emissions in excess of the limits described in the EQS. Specific training will be focused on minimizing dust and exhaust gas emissions from heavy construction vehicles. Drivers of vehicles used during construction will be under strict instructions to minimize unnecessary trips and minimize idling of engines. Dust suppression facilities (water sprayer) shall be available where earth and cement works are required. Spray water on dry and loose surfaces of the construction sites regularly. Maintain adequate moisture content of soil to minimize dust during transportation, compaction and handling. Construction materials (sand, gravel, and rocks) and spoil materials will be transported in trucks covered with tarpaulins.	Contractor	DSC/ PGCB

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Super- vision Agency
		Sprinkle and cover stockpiles of loose construction materials (e.g., fine aggregates, sand). Avoid use of equipment such as stone crushers at the sites, which produce significant amount of particulate matter. N95 masks should be provided to all personnel in areas prone to dust emissions throughout the period of construction.		
Soil quality	Soil pollution	Laboratory analysis of the river bed materials to be confirmed prior to starting collection from the river by existing licensed suppliers. Prevention of spillage and leakage of liquids at construction sites and camp. Ensure no use of transformers containing PCB to avoid soil and air pollution. Oil storage in drums stored on impermeable surface with 110% bunded capacity.	Contractor	DSC/ PGCB
Siting of construction camps	Removal of vegetation such as grass, standing crops (if any) shrubs and trees. Environmental pollution (such as air/dust, noise, water, wastes, excess soil) affecting nearby the settlements.	Prior to the start of clearing of vegetation, provide adequate compensation to the owners in time. Locate construction camps away from residential settlements, cultural sites, water bodies, etc. (minimum 0.5 km). Try to use fallow land to avoid crop damage.	Contractor	DSC/ PGCB

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Super- vision Agency
		Just after completion of the construction, hand over the camp sites to the owners as in earlier condition.		
Traffic congestion/ road accident	Traffic congestion and road accidents due to movement of construction vehicles.	Follow Bangladesh Road Traffic Authority (BRTA) traffic rules and regulations to develop a traffic plan. Schedule deliveries of materials/ equipment during off-peak hours. Engage flagmen especially at the entry of the substation sites and construction camps for traffic control. Engage experienced drivers to drive project vehicles. Arrange for signal lights at night. Prepare and follow proper traffic management to be approved by PGCB before access to site granted. Avoid stockpiling of materials, especially at the roadsides, that could disturb traffic movement.	Contractor	DSC/ PGCB
Pollution due to wastes	Pollution due to wastes (construction wastes from construction activities and general wastes from workers' camps)	Solid wastes collection system will be essential, which should include separation and collection of solid wastes in the dustbins/waste containers throughout the work sites, construction yard/ labour camps.	Contractor	DSC/ PGCB

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Super-vision Agency
		Wastes such as pieces of rods and wood, newspapers, containers etc. can be sold to the vendors and the rest of the waste must be taken to the licensed, engineered sanitary landfill by the contractor or licensed third party. A log of the disposal of toxic and other waste materials is to be kept by the Contractors. Prior to the start of construction, contractor should prepare waste management plan (WMP) based on the EMP, for approval by PGCB before access to site reflecting national and EHS guideline requirements.		
Community health and safety (H&S)	Community H&S nearby the substation site could be affected.	Safety barriers and warning signs surrounding the construction site. Generators should be placed in closed rooms. Formulate and implement an emergency risk management plan, for approval by PGCB before access to site reflecting national and EHS Guideline requirements.	Contractor	DSC/ PGCB
Occupational health and safety (H&S)	Health and safety risks of construction workers.	An experienced Health & Safety (H&S) Manager must be engaged on each works package with appropriate qualifications and experience and not doubling up on any other job by the contractor prior to start of construction.	Contractor	DSC/ PGCB

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Super- vision Agency
		Before access to site granted, contractor to prepare H&S plan based on risk assessment for approval by PGCB following national and EHS guideline requirements. Only permit trained and certified workers to work with any electrical equipment. Safety induction by the H&S Manager should be provided for the workers and visitors before they will be allowed to access the site.		
		Prior to starting work, a tool box meeting should be arranged by the H&S Manager for the workers. First Aid Box and personal protective equipment, PPE (such as safety helmets, safety shoes, eye protection glasses, ear plugs/muffs, waist belts, masks, hand gloves, body protective aprons and insulating boots) must be provided to the workers and ensure their use by the workers. Safety signs, health signs, prohibition signs, warning signs, mandatory signs, emergency escape signs, first-aid signs, information signs, signboards, supplementary signboards, safety collar, symbol, pictogram, illuminated signs, acoustic signals, verbal communication and hand signals must be fitted at the designated sites of the subproject areas.		

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Super- vision Agency
Physical, Cultural Resources	Possibility of damage to Physical Cultural Resources.	Chance Find Procedure to be developed following the IFC Guidance Note 8 and BAN regulations	Contractor	DSC/ PGCB
Employment generation/ income	Employment opportunities for the local people, especially for PAPs.	Employ local people, especially PAPs, for the project activities (as much as possible).	Contractor	DSC/ PGCB
(b) Operation Stage				
Tree replantation	A total of 75,000 indigenous tree species (three times the number of affected trees from both substations and transmission line) can be planted in home gardens and govt. lands	Planting of 75,000 saplings to replace felled trees, on the side slopes of the access roads, during the monsoon period. The number of saplings which die within 3 years of planting should be replaced by new saplings. Nursing period of planted saplings should not less than 3 years.	FD	PGCB
Drainage congestion	Drainage congestion could occur in the surface drains within the substation area, if proper O&M is not done regularly.	Clean the drains, especially during the monsoon, regularly. Ensure adequate monitoring.	PGCB	PGCB
Community health and safety	Community H&S nearby the substation site.	Safety barriers and warning signs surrounding the substation sites with awareness raising programme.	PGCB	PGCB

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Super- vision Agency
		Generators should be placed in the closed rooms. operational H&S risk assessment to be undertaken.		
Safety and security of workers	Risk to continuous power supply and even damage of substation.	Ensure security of substation in collaboration with law enforcement agencies. Keep complaint book in the substation for recording of people's complaints. Ensure availability of adequate safety gear for substation operations.	PGCB	PGCB
Power Supply	Due to adequate reliability of power supply, social life and economic condition of the people will be improved.	O&M of the substations should be done in time for adequate power generation.	PGCB	PGCB
Short Circuit/ Accident	Due to a possible short circuit of the substation, disruption of power and accident could occur.	O&M of substations should be done in time by experienced personnel.	PGCB	PGCB

6.1 Environmental Monitoring

209. The environmental and social monitoring plan for Kaliganj- Maheshpur TL and five substation subprojects has been incorporated in Table 6-3 and Table 6-4.

Table 6-3: Environmental Monitoring Plan for Kaliganj- Maheshpur TL During Addendum 4

Environmental Issues/Parameters	Monitoring Parameters	Standards/ Guidelines	Means of Monitoring	Frequency	Location	Implement ation Agency	Supervision Agency	Update until Addendum-4
Pre-construction/ Construction Stage								
Requirement of land	Ensure that PAPs get compensation as per RP	As per RP	Inspection	As per RP	RoW of the TL lines	DC	DSC/PGC B	Same as previous
Trimming of trees within RoW and clearing vegetation from the tower bases of the TL lines.	Checking whether proper compensation as mentioned in RP is received by PAPs.	DoE/FD	Inspection	Regular during tree felling and site clearing operations	Trimming of trees within RoW and clearing vegetation from the tower bases of the TL lines	FD	DSC/PGC B	Same as previous
Ambient Air Quality Parameters	SPM, PM10, PM2.5, SOx, NOx, CO & Pb- 24hr monitoring	DoE standards	Sampling/ laboratory analysis	Before construction, then quarterly	At representative tower construction sites	Contractor	PGCB	Monitoring conducted for Kaliganj- Maheshpur alignments and five substations (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur). under this addendum.
Noise Pollution	Ambient noise level	DoE standards	Measurement	Regularly during construction at the locations with sensitive receptors and during piling works if any.	At adjacent subproject cultural sites and construction camps	Contractor	DSC/PGC B	Monitoring conducted for Kaliganj- Maheshpur alignments and five substations (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur). under this addendum.
Pollution due to Wastes	Checking storage, transportation, handling, and disposal of wastes. Wastes from construction sites and camps to be disposed properly at the designated waste dumping sites.	DoE guidelines	Inspection	Regular	Construction sites and camps	Contractor	DSC/PGC B	Monitoring conducted for Kaliganj- Maheshpur alignments and five substations (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur). under this addendum.
Surface Water Quality	pH, BOD5, COD, NH3-N, PO4, TPH and coliforms	DoE Standards	Sampling and Laboratory Analysis	At all river crossings within 500m of waterbodies before and after works	River Crossing, other surface waterbodies near towers construction sites	Contractor	DSC/PGC B	• Monitoring conducted for Kaliganj- Maheshpur alignments and five substations (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur). under this addendum.
Groundwater /Drinking Water Quality	pH, Mn, Fe, As, TC, FC, TPH	DoE Standards	Sampling and Laboratory Analysis	Quarterly at all tube wells within 500m	At representative tower construction sites	Contractor	DSC/PGC B	• Monitoring conducted for Kaliganj- Maheshpur alignments and five substations (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur). under this addendum.
Traffic congestion/ Road Accident	Checking road crossing points, roads adjacent to towers.	BRTA	Inspection	Regular	At road/railway crossing points and roads adjacent to towers	Contractor	DSC/PGC B	• Monitoring conducted for Kaliganj- Maheshpur alignments and five substations (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur). under this addendum.

Environmental Issues/Parameters	Monitoring Parameters	Standards/ Guidelines	Means of Monitoring	Frequency	Location	Implement ation Agency	Supervisio n Agency	Update until Addendum-4
Cultural sites (such as a mosque)	Checking whether cultural sites are affected by the project activities such as noise, wastes, etc.	DoE guidelines	Inspection	As and when required	In the project Aol	Contractor	DSC/PGC B	Same as previous
Physical Cultural Resources	Chance finds procedure to be developed	DoE/IFC guidelines	Inspection	Regular	At construction site	Contractor	DSC/PGC B	Same as previous
Occupational health and safety	Use of PPE, general health, water supply and sanitation. Record of all occupational H&S incidents, any people lost time or fatal must be reported to ADB within 48hrs with corrective action plan.	DoE/IFC guidelines	Inspection	Regular	At construction sites and camps	Contractor	DSC/PGC B	Same as previous
Community health and safety	Awareness of local people. Record of all community H&S incidents, any people lost time or fatal must be reported to ADB within 48hrs with corrective action plan.	DoE/IFC guidelines	Inspection	Regular	At tower construction sites and crossing of roads	Contractor	DSC/PGC B	Same as previous
Operation Stage								
Tree replantation	Replanting of saplings and checking replacement of dead saplings, and watering and fertilizing of saplings for 3 years	FD	Inspection	Quarterly	Access roadside slopes	FD	PGCB	Same as previous
Tall trees	Trimming of tall trees under the transmission line	FD	Inspection	Once every year and as directed by the Relevant engineer of PGCB	Along the TL Lines	PGCB	PGCB	Same as previous
EMF	Checking of clearance of transmission line and tops of houses (for housing structures) and for river crossing clearance from HFL to TL	Australian Standard for the safety of power lines (No BD standard and no device available in BD)	Inspection	As and when required	At populated/ housing areas where TL lines pass over	PGCB	PGCB	Same as previous
Short circuit/ accident	Safety	DoE guidelines	Inspection	Regular	Along the TL	PGCB	PGCB	Same as previous
Occupational and Community Health and Safety	Use of PPE. Record of all occupational and community H&S incidents, any people lost time or fatal must be reported to ADB within 48hrs with corrective action plan.	As required	Inspection	Regular	Along the TL	PGCB	PGCB	Same as previous
Power Supply	Access to electricity in the rural area on priority basis.	DoE/PDB guidelines	Inspection	Whole project period	Along the TL	PGCB	PGCB	Same as previous

As = arsenic, BD = Bangladesh, BOD5 = five-day biochemical oxygen demand, BRTA= Bangladesh Road Traffic Authority, COD = chemical oxygen demand, DC = Deputy Commissioner, DoE = Department of Environment, DSC = Design and Supervision Consultants, EMF = electromagnetic field, FC = fecal coliform, Fe = iron, HFL = highest flood level, IFC = International Finance Corporation, m = meter, Mn = manganese, NH3-N = ammonia nitrogen, OHS = Occupational Health and Safety, PAP = project affected person, PDB = Power Development Board, PGCB = Power Grid Company of Bangladesh, PO4 = phosphate, PPE = personalprotective equipment, RoW = right of way, RP = Resettlement Plan, TC = total coliform, TL = transmission line.

Table 6-4: Environmental Monitoring Plan for Five Substation Subprojects During Addendum 4

Environmental Parameters	Issues/	Monitoring Parameters	Standards/ Guidelines	Means of Monitoring	Frequency	Location	Implementation Agency	Supervision Agency
Preconstruction ³⁰/Construction Stage								
Clearing of vegetation		Checking whether proper compensation as mentioned in the RP is received by PAPs.	DoE/FD	Inspection	Regular frequency during site clearing operations.	Within the substation land and access road sites	Contractor/FD	DSC/PGCB
Fauna (Wildlife)		Checking whether wildlife is disturbed/ killed by the workers.	DoE/FD	Inspection	Weekly	Substation sites	Contractor/FD	DSC/PGCB
Drainage Congestion/ Flooding		Checking drainage congestion and top of substation site above HFL.	Hydrological/ Drainage study	Inspection	Regularly during earthworks	Substation sites	Contractor	DSC/PGCB
Noise Pollution		Ambient noise level	DoE Noise Pollution Control Rules, 2006	Measurement	Regularly during construction at the substation sites and during piling works Monitor noise of traffic movements at substation sites with exceptionally large volume of infills during peak movements	At construction sites, roadsides and camps	Contractor	DSC/PGCB
Dust Pollution		Dust should be controlled by water spraying regularly, especially during dry period.	DoE guidelines	Inspection	Regularly During land fill works should do quantitative dust monitoring at substation sites	Substation sites	Contractor	DSC/PGCB
Surface Water Quality		pH, BOD5, COD, NH3-N, Total Petroleum Hydrocarbons (TPH), conforms, PO4	DoE Standards	Sampling and Laboratory Analysis	Quarterly for substation sites	Nearby Waterbodies	Contractor	DSC/PGCB
Ground Water/Drinking Water Quality		pH, Mn, Fe, As, TC, FC, TPH	DoE Standards	Sampling and Laboratory Analysis	Quarterly at all tube wells within 500m	At construction camps	Contractor	DSC/PGCB
Pollution due to Wastes		Checking collection, storage, transportation, and disposal of waste. Waste from construction sites to be collected and disposed safely to the designated sites. Wastes from labor camp to be disposed properly at the designated sites.	DoE guidelines	Inspection	Regular	Construction camps	Contractor	DSC/PGCB

³⁰ The EPC contractor will collect a set of baseline data prior to any civil work commencement.

Environmental Parameters	Issues/	Monitoring Parameters	Standards/ Guidelines	Means of Monitoring	Frequency	Location	Implementation Agency	Supervision Agency
Traffic Congestion/ Road Accident		Checking meeting points of existing road and access road	BRTA	Inspection	Regular	Meeting point of existing road and access road	Contractor	DSC/PGCB
Occupational health and safety		Checking health, use of PPE and first aid facilities, DWQ, sanitation and accommodation. Record of all occupational H&S incidents, any people lost time or fatal must be reported to ADB within 48hrs with corrective action plan.	DoE/IFC guidelines	Inspection and testing of DWQ	Regular	At construction sites and camps	Contractor	DSC/PGCB
Community health and safety		Awareness of local people and staying safely away from the project activities Record of all community H&S incidents, any people lost or fatal must be reported to ADB within 48hrs with corrective action plan.	DoE/IFC guidelines	Inspection	Regular	At construction site and camps	Contractor	DSC/PGCB
Physical Cultural Resources		Chance finds procedure to be developed	DoE/IFC guidelines	Inspection	Regular	At construction site	Contractor	DSC/PGCB
Operation Stage								
Tree replantation		Replanting of saplings and checking replacement of dead saplings, and watering and fertilizing of saplings for 3 years	FD	Inspection	Quarterly	Access roadside slopes	FD	PGCB
Drainage congestion		Checking drainage congestion in the substation sites during monsoon	Hydrological /Drainage study	Inspection	As and when required during monsoon	Substation sites	PGCB	PGCB
Community health and safety		Community H&S near the substation site. Record of all community H&S incidents, any people lost time or fatal must be reported to ADB within 48hrs with corrective action plan.	DoE/IFC guidelines	Inspection	Regular	Substation sites	PGCB	PGCB
Safety and security of substation and workers		Checking use of PPE and duties of security force. Record of all occupational H&S incidents, any people lost time or fatal must be reported to ADB within 48hrs with corrective action plan.	DoE/IFC guidelines	Inspection	Regular	Substation sites	PGCB	PGCB

6.2 Tree Plantation Plan

210. As per the original IEE, 2019, a significant number of big trees were estimated to be cleared in Kaliganj- Maheshpur transmission line, where no trees were felled during the land development of five substations. However, as per the primary survey during this addendum, the total number of trees to be cut was tentatively 16. The comparison of tree count is given in Table 5-2 .

Table 6-5: Total Tree Count for Compensation

SN	Sub-projects	Counted during original IEE, 2019*	Counted during Addendum-4, 2022*
1.	Kaliganj-Maheshpur 132 kV double circuit transmission line	1405 (>5 m in height)	999 (>5 m in height)

*Source: <https://www.adb.org/projects/documents/ban-51137-003-iee> and EQMS Survey March 2023

211. Tree Plantation Plan for Kaliganj-Maheshpur TL mentioned below **Table 6-6**.

Table 6-6: Tree Plantation Plan for Kaliganj-Maheshpur TL

Trees Species estimated to be cut	Scientific Name	Number of Trees to be cut	Number of Trees to be Planted	Location	Responsibilities
Mango	<i>Mangifera indica</i>	2	6	Homestead Forest and Government Forest	PGCB
Shishu	<i>Dalbergia sissoo</i>	1	3	Homestead Forest and Government Forest	PGCB
Mehogoni	<i>Swietenia macrophylla</i>	1	3	Homestead Forest and Government Forest	PGCB
Jackfruit	<i>Artocarpus heterophyllus</i>	2	6	Homestead Forest and Government Forest	PGCB
Gab	<i>Diospyros malabarica</i>	1	3	Homestead Forest and Government Forest	PGCB
Coconut	<i>Cocos nucifera</i>	2	6	Homestead Forest and Government Forest	PGCB
Babla	<i>Vachellia nilotica</i>	1	3	Homestead Forest and Government Forest	PGCB

Trees Species estimated to be cut	Scientific Name	Number of Trees to be cut	Number of Trees to be Planted	Location	Responsibilities
Nim	<i>Azadirachta indica</i>	1	3	Homestead Forest and Government Forest	PGCB
Jarul	<i>Lagerstroemia speciosa</i>	1	3	Homestead Forest and Government Forest	PGCB
Arjun	<i>Terminalia arjuna</i>	2	6	Homestead Forest and Government Forest	PGCB
Horitoki	<i>Terminalia chebula</i>	2	6	Homestead Forest and Government Forest	PGCB

6.3 Budget For EMP

212. Budget for EMP implementation for Kaliganj- Maheshpur TL and five substation are mentioned in Table 6-7 and Table 6-8.

Table 6-7: Budget for EMP implementation Cost for Kaliganj-Maheshpur TL.

Item	Qty	Rate	Total Amount (BDT)
Tree planting (three times of trees removed for project interventions)	2997 seedlings/ saplings to be planted in home gardens and govt. lands, maintenance for three years	20 Taka per seedlings/ saplings	59,940
Environmental Quality			
Surface Water	5 samples/Annual	8000	40000
Ground Water	5 samples/ Annual	12000	60000
Air	5 samples/ Annual	6000	30000
Noise	5 samples/ Annual	1200	6000
Waste management and dust suppression	91 tower locations	Lump sum	36400
Drainage Management	91 tower locations	Lump sum	27300
Traffic Management	91 tower locations	Lump sum	13650

OHS	91 tower locations	Lump sum	50050
Community Health and Safety	91 tower locations	Lump sum	31850
Total Cost			355190

Table 6-8: Budget for Environment Management Plan (EMP) implementation Cost for five substation subprojects

Item	Qty	Rate	Total Amount (BDT)
Voluntary Tree plantation (No trees were felled for this five substation subprojects)	500 seedlings/ saplings to be planted in home gardens and govt. lands, maintenance for three years	20 Taka per seedlings/ saplings	10,000
Environmental Quality			
Surface Water	5 samples/Annual	8000	40,000
Ground Water	5 samples/ Annual	12000	60,000
Air	5 samples/ Annual	6000	30,000
Noise	5 samples/ Annual	1200	6,000
Environmental Health and Safety			
Waste management and dust suppression	5 Substation locations	Lump sum	125,000
Drainage Management	5 Substation locations	Lump sum	92,500
Traffic Management	5 Substation locations	Lump sum	50,000
OHS	5 Substation locations	Lump sum	80,000
Community Health and Safety	5 Substation locations	Lump sum	42,500
Total Cost			536,000

7. GRIEVANCE REDRESS MECHANISM

213. A Grievance Redress Mechanism (GRM), consistent with the requirements of ADB's SPS 2009 has been established by PGCB to prevent and address community concerns, reduce risks, and assist the project to maximize environmental and social benefits. A three-tire GRM has been established to deal with and resolve complaints and grievances faster and thus enhance project performance standards in terms of environmental and social management. The detailed grievance mechanism and resolution procedure has been incorporated in the original IEE, 2019. Until the date of addendum-4 no grievance has been reported with respect to environmental and social issues.

8. PUBLIC CONSULTATION AND DISCLOSURE

214. The public consultations were conducted in Kaliganj- Maheshpur TL and Maheshpur Substation in March 2023 and consultations for other four substation carried out in 2022 and 2023 through stakeholder consultations, and individual meetings during the environmental study of the proposed project in conformity with the DoE's environmental guidelines to achieve the following objectives:

- To share information on the subprojects (substations, transmission lines) of the proposed project.
- To understand stakeholders, including PAPs, concerns regarding various aspects of the proposed project including existing power supply facilities/system and expected potential environmental impacts along with possible mitigation measures during the construction and operation stages of the proposed project.
- To identify the conflict issues in advance and to find acceptable solutions; and,
- To gather local knowledge before decision making on the proposed project.

215. Also, the consultations followed the below requirements of ADB SPS 2009 requirements for meaningful consultations.

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

8.1 Focus Group Discussions

216. Focus group Discussion (FGD) is a small, but demographically diverse group of people whose reactions are studied about a proposed project or something else to determine the reactions that can be expected from a larger population. It is a form of qualitative study consisting of interviews in which groups of people are asked about their perceptions, opinions, beliefs, and attitudes towards the project, service, concept, advertisement, idea, or packaging. Questions are asked in an interactive group setting where participants are free to talk with other group members. During the study, eleven FGDs with various groups including women and affected people were conducted using local language (Bengali) for easy understanding of the opinions for both the transmission lines.

217. Discussion was held with the local people at near the proposed project site. **Table 8-1** shows the date, location, and the number of participants of each discussion.

Table 8-1: Location and number of participants at FGDs (Transmission Line and Substations)

SN	Name of Transmission line/Substation	Venue	No. of Male (M)/ Female(F)		Total Participants	Date
			M	F		
1.	Kaliganj-Maheshpur TL and Maheshpur Substation	Maladhorpur, Azompur, Maheshpur	-	9	9	March 2023
		Gorinathpur, Azompur, Maheshpur	6	-	6	
		Shingdaho, Sundarpur, Kaliganj	-	6	6	
		Srirampur, Kaliganj	8	-	8	
		Shisherkundu, Elangi, Kotchandpur	-	9	9	
		Chandpara, Elangi, Kotchandpur	6	-	6	
2.	Meherpur Substation	Juginda, Gangni, Meherpur	10	-	10	July 2022
		Chitla, Gangni, Meherpur	7	-	7	
		Raipur, Gangni, Meherpur	6	-	6	
3.	Manirampur Substation	Ranagar	12	4	16	January 2022
4.	Rupsha Substation	Morol Para	10	3	13	February 2022
5.	Phultala Substation	Bejerdanga	8	-	8	January 2024

8.1.1 Summary of Focus Group Discussion with Local Community and Affected Persons (Transmission Line)

- Participants had been informed about the project before through public advertisement. They appreciated the project after knowing that the objective of the Project is to increase the supply of electricity.
- The major crops grown are vegetables and rice like. Irri and Amon paddy is grown in the region. Rice is cultivated twice a year. Moreover, Corn is also cultivated a lot in these areas.
- Due to transmission line, natural forest will be affected. A huge amount of deforestation might be happened for covering the transmission line.
- There will be a possibility of some environmental impacts on the area during the construction period and most of the people are mostly concerned about it. The survey team explained those impacts will be temporary and can be mitigated to a minor level.
- Using locally available materials during the construction phase of the proposed subprojects will contribute towards growth of the economy by contributing to the gross domestic product.
- People of that area think that the project will develop the electricity condition of the area. Project might increase the availability of new industries and factories in the area. These industries and factories will create job opportunities for local affected people to develop their economic condition.
- Labor is available in the project area and the participants expect that PGCB/Contractor will engage local labor to support the economic condition of the local community. Moreover, due to

Covid-19 many people have lost their jobs and are waiting to engage them in any work including labor.

- Local people want priority to work as labor and employee based on their qualifications during construction phase.

8.1.2 Summary of Focus Group Discussion with Women Group

- Women of the area mostly involved in household works and a few are working outside to assist men in agricultural work.
- Most of the women of the area are illiterate, some are Primarily educated. A very few women have passed S.S.C and H.S.C level.
- Early Marriage is the most common problem faced by the women of the project area.
- Most women are supportive for the proposed project to be implemented at their locality. They think some agricultural land may be lost, but the nation as well as the project area will benefit by the proposed project.
- Project might increase the availability of new industries and factories in the area. These industries and factories will create job opportunity for local women to develop their economic condition.
- Electricity is available for 3-4 hours in peak season. Most people are unhappy with the present power situation and demanded an uninterruptable eclectic supply from PGCB.
- Study of local children will be easier after getting uninterruptable eclectic supply.
- Economic activities would be much better.
- There was concern over the possibility of high noise and vibration levels in the project site as a result of construction works. However, the proponent will have to take appropriate steps to minimize noise production by ensuring that all construction equipment is well maintained.
- They don't have any land parcel of their own name in the proposed project area.
- Contractor should be careful about decreasing gender-based violence such as sexual harassment which can be occurred by labor influx in the project site. So, contractors should avoid labor influx in project site and give priority to local labors.

9. CONCLUSION AND RECOMMENDATIONS

218. This addendum report to original IEE³¹ study has been conducted based on the final surveyed alignments of the transmission line route Kaliganj- Maheshpur, and five substation under package 7; (i) 230/132/33 kV GIS Substation at Rupsha, (ii) 132/33 kV GIS Substation Phultola, (iii) 132/33 kV GIS Substation Maheshpur, (iv) 132/33 kV GIS Substation Meherpur and (v) 132/33 kV GIS Substation Manirampur, where the main scope was to update the baseline condition, impact assessment and suggest environmental management plan. As per the impact assessment it has been found that many of the impacts are localized and short-term or temporary in nature and can be mitigate as suggested in the EMP of the original IEE and this addendum. The Project received favorable support from local people and other stakeholders during consultations. Stakeholders appreciated that in addition to providing a reliable power supply to the region, the Project will have several other benefits such as supporting economic growth in the region by opening avenues for further development, employment (direct and indirect) and improving local infrastructure.

219. Kaliganj- Maheshpur 132 kV transmission line is estimated at 28 km by the PGCB. During the field surveys it was observed that the line has some deviations considering less impacts e.g., damage to community structures, tree cutting etc. to the original line route. The final route avoided all the settlements and structures within the RoW. The protected or environmentally sensitive areas, forest, scrublands or wildlife reserves are not found along the line route. There are no springs or deep wells/tubewell other common and individual properties situated underneath this line. During the consultation and site visit of the consultants, it was revealed that there were no physical cultural resources situated within ROW. The major waterbodies covered are rivers and Gher, however, the transmission line will not pose any risk to seasonal habitats/wetlands. Due to the slight deviation towards the end of the final route, a smaller number of trees to be cut in this alignment than the original route.

220. In five substation locations during the field surveys it was observed that the locations have some deviations considering less impacts e.g., damage to community structures, tree cutting etc. to the substation locations. There are no settlements, structures, springs or deep wells/tubewell other common and individual properties situated underneath these locations. There are no protected areas, ecologically critical areas, reserve forests and other wildlife reserves are found within the RoW. There are no springs or deep wells/tubewell other common and individual properties situated underneath these locations. During the consultation and site visit of the consultants, it was revealed that there were no physical cultural resources situated within 10-15 km radius.

221. A detailed birds survey/migratory birds surveys for Kaliganj- Maheshpur alignments and five substation locations are suggested to be conducted in order to eliminate any potential threat to their route and staging.

222. In conclusion, there will be some minor negative impacts caused by the project during implementation. Compensation will be paid for loss of land, trees, and crops. The impacts identified in the original IEE and this addendum can be mitigated with implementation of the EMP and monitoring measures.

³¹ <https://www.adb.org/projects/documents/ban-51137-003-iee>

APPENDIX

Appendix A: Coordinates of Final Alignments of Transmission Lines of Kaliganj- Maheshpur**Appendix A-1: Kaliganj- Maheshpur 132 kV double circuit transmission line**Line Length: 28 km

Sl No	Coordinates (Decimal Degrees)		Elevation (m)	Name	Angle
	Latitude	Longitude			
1.	88.912497	23.341116	11.00	Start Point	0.00
2.	88.918055	23.338445	11.00	AP-01	41.41
3.	88.954158	23.348545	13.00	AP-2	44.32
4.	88.959117	23.357214	11.00	AP-3	45.10
5.	88.989401	23.365482	12.00	AP-4	37.78
6.	89.003854	23.384855	9.00	AP-5	45.92
7.	89.025161	23.387596	13.00	AP-6	12.02
8.	89.057803	23.398998	10.00	AP-7	54.80
9.	89.06559	23.426135	11.00	AP-8	58.89
10.	89.094923	23.434114	12.00	AP-9	14.43
11.	89.114438	23.434375	15.00	AP-10	27.45
12.	89.121272	23.430941	11.00	AP-11	21.56
13.	89.128692	23.422624	11.00	End Point	0.00

APPENDIX B: Photographs of the Existing Environment and Public Consultations

Existing Environment

Kaliganj- Maheshpur 132 kV double circuit transmission line

	
AP 3	TL 3/2
	
TL 3/3	TL 3/4
	
TL 3/5	TL 3/6

 Mar 16, 2023 11:48:39 Road Section - Jhenaidah Highway Jhenaidah District Khulna Division AP 7	 Mar 16, 2023 11:50:51 AM R748 Jhenaidah District Khulna Division AP 7
TL 7/3	TL 7/4
 Mar 16, 2023 11:10:55 AM Unnamed Road Jhenaidah District Khulna Division 7/2	 16 Mar 2023 8:26:02 am Jhenaidah District Khulna Division R/7
TL 7/9	TL 8/3
 Mar 16, 2023 11:46:26 Unnamed Road Jhenaidah District Khulna Division 7/2	 Mar 16, 2023 1:50:08 PM Asan Nagar Road Jhenaidah District Khulna Division R/7
AP 11	TL 11/2

Appendix B-1: The Safeguard Consultation Photographs (January and August 2023)

Kaliganj- Maheshpur



Public Consultation -1



Public Consultation 2



Public Consultation 3



Public Consultation 4



Public Consultation 5



Public Consultation 6



Public Consultation 7



Public Consultation 8

Appendix B-2: Five Substation Locations (Rupsha, Phultola, Maheshpur, Meherpur and Manirampur)



Public Consultation 1



Public Consultation 2



Public Consultation 3



Public Consultation 4



Public Consultation 5



Public Consultation 6



Public Consultation 7



Public Consultation 8

Appendix C: Attendance of Consultations

Dhaka & Western Zone Grid Expansion Project

Location:	Meladharpur, Azompur, Moheshpur		
Date:	15/03/23	Time:	10:15 AM

Sl.	Name of Participants	Age	Occupation	Phone Number	Signature
1.	আবুল কালাম	25	শ্রমিক		আবুল কালাম
2.	মাসুম	16	ছাত্র		মাসুম
3.	মাসুম	23	শ্রমিক	01791210764	মাসুম
4.	আবুল কালাম	60	U		আবুল কালাম
5.	আবুল কালাম	32	n		আবুল কালাম
6.	আবুল কালাম	30	n		আবুল কালাম
7.	আবুল কালাম	58	n		আবুল কালাম
8.	আবুল কালাম	55	n		আবুল কালাম
9.	আবুল কালাম	30	n	01998736435	আবুল কালাম
10.					
11.					
12.					
13.					
14.					
15.					

Dhaka & Western Zone Grid Expansion Project

Location:	chandpara Elong, Katchandpur	
Date:	12-03-2023	Time: 3:30 pm

Sl.	Name of Participants	Age	Occupation	Phone Number	Signature
1.	কাজীম হোসেন	28	কৃষক	0151531048	কাজীম
2.	মাহিউজ্জামান	24	কৃষক	01589162878	মাহিউজ্জামান
3.	কাজীম হোসেন	25	ন	01309371432	কাজীম
4.	ফাহিম হোসেন	26	ন	01761480788	ফাহিম
5.	মাহমুদ হোসেন	24	কৃষক	01557722659	মাহমুদ হোসেন
6.	মাহমুদ হোসেন	25	কৃষক	01727515788	মাহমুদ
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					

Dhaka & Western Zone Grid Expansion Project

Location: Srinampur, 1 no. ward, Kaliganj, Dhaka-12
Date: 16/03/2013 Time: 9:05

Sl.	Name of Participants	Age	Occupation	Phone Number	Signature
1.	কবির (রাসদ)	36	ই. ইঞ্জিনিয়ার	01723720516	কবির
2.	সদু	37	ই. ইঞ্জিনিয়ার	01723648686	সদু
3.	আবদুল হক	49	"	0016878738	আবদুল হক
4.	আবদুল হক	46	"	01767376072	আবদুল হক
5.	আবদুল হক	35	"	01345761546	আবদুল হক
6.	আবদুল হক	54	"		আবদুল হক
7.	আবদুল হক	28	ই. ইঞ্জিনিয়ার	0171180609	আবদুল হক
8.	আবদুল হক	58	ই. ইঞ্জিনিয়ার	01716887836	আবদুল হক
9.					
10.					
11.					
12.					
13.					
14.					
15.					

Dhaka & Western Zone Grid Expansion Project

Location:	Shingdheho, Surberipara Surberipara Khatun		
Date:	16/03/2023	Time:	11:15 AM

Sl.	Name of Participants	Age	Occupation	Phone Number	Signature
1.	শ্রী	31	স্বতন্ত্র	01725727462	শ্রী
2.	আমিন	55	"	01761028423	আমিন
3.	আব্দুল	40	"	01729144887	আব্দুল
4.	আব্দুল	33	"	01320836655	আব্দুল
5.	শ্রী	35	"	01887066550	শ্রী
6.	আব্দুল	38	"	01718335324	আব্দুল
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
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Dhaka & Western Zone Grid Expansion Project

Location:	Gorinathpur, Azampur, Mohanpur		
Date:	15 / 03 / 2023	Time:	11:20 AM

Sl.	Name of Participants	Age	Occupation	Phone Number	Signature
1.	সত্যজিৎ কুমার	32	GTWB	01845440990	সত্যজিৎ
2.	সত্যজিৎ	33	কৃষক	01860381813	সত্যজিৎ
3.	সত্যজিৎ কুমার	40	জনক	01728081199	Sahajit Kumar
4.	সত্যজিৎ কুমার	44	জনক	01755824192	সত্যজিৎ
5.	সত্যজিৎ কুমার	62	কৃষক		
6.	সত্যজিৎ	58	ন		সত্যজিৎ
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Dhaka & Western Zone Grid Expansion Project

Location: <i>Shirsharkundi, Elanga, Katchandpur</i>
Date: <i>12/03/23</i> Time: <i>10:30</i>

Sl.	Name of Participants	Age	Occupation	Phone Number	Signature
1.	<i>মুন্সব</i>	25	<i>ছাত্র</i>	<i>০১৩৫৩৩৫৬৬</i>	<i>মুন্সব</i>
2.	<i>মুন্সব</i>	45	"		<i>(মুন্সব)</i>
3.	<i>মুন্সব</i>	22	"	<i>০১৫৫৫৬৭৮৫</i>	<i>জামিনা</i>
4.	<i>মুন্সব</i>	25	"		<i>মুন্সব</i>
5.	<i>মুন্সব</i>	22	"	<i>০১৭৭৭৭৭৭৭৭</i>	<i>মুন্সব</i>
6.	<i>মুন্সব</i>	24	"	<i>০১৬৬৬৬৬৬৬৬</i>	<i>মুন্সব</i>
7.	<i>মুন্সব</i>	32	"	<i>০১৩৩৩৩৩৩৩৩</i>	<i>মুন্সব</i>
8.	<i>মুন্সব</i>	55	"		<i>মুন্সব</i>
9.	<i>মুন্সব</i>	60	"		<i>মুন্সব</i>
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Dr. B. & Western Zone Technical GHS Expert Panel

**FOCUS GROUP DISCUSSION
ATTENDANCE SHEET**

Location: Raipur, Gangan, Mahespur.

Date: 21-07-2021 Time: 4:00

Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
1	Asadul Islam	31	Man Driver	01713-039108	আসাদ
2	Abu Hanif	38	Business	01702-923093	আবু হানিফ
3	Kamruzzaman	43	Farmen	01935-234300	কামরুজামান
4	Johurul Islam	33	Farmen	01924-145213	জাহুরুল ইসলাম
5	Fazlun Rahman	45	Teacher	01580-703077	ফাযলুন রহমান
6	Saeed Uddin.	36	Farmen.	01791-814186	সৈয়দ উদ্দিন
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Dhaka & Western Zone Transmission Grid Expansion Project

FOCUS GROUP DISCUSSION
ATTENDANCE SHEET

Location	Chilla, Gangan, Mehrpur		
Date	21-07-2022	Time	11:00

Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
1	Haseem Ali	32	Farmer	01321-965128	হাসেম আলি
2	Kibria	37	Farmer	01743-187018	কিব্রিয়া
3	Robiul	35	Business	01965-309218	রবিউল
4	Tonun Kanti	31	Auto Driver	01754-298107	তুন কান্তি
5	Hafizul Islam	34	Farmer	01487-521430	হাফিজুল ইসলাম
6	Ejazul Haque	33	Auto Driver	01976-410329	এজাজ হােক
7	Anifur Islam	39	Business	01732-076907	আনিফুর ইসলাম
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Chak-6 Western Zone Transmission Grid Expansion Project

**FOCUS GROUP DISCUSSION
ATTENDANCE SHEET**

Location: Juginda, Gangan, Mahan

Date: 21-07-2012 Time: 9:55

Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
1	Shirajul Islam	35	Daily Labor	01796-410960	[Signature]
2	Fari'd	39	Agriculture	01741-965475	[Signature]
3	Nasir	45	"	01963-187697	[Signature]
4	Hogin Ali Sheikh	38	"	01523-743253	[Signature]
5	Amisuzzaman	42	Business	01807-521031	[Signature]
6	Jannuddin	58	—	01985-345813	[Signature]
7	Abdur Rahman	39	Agriculture	01774-298708	[Signature]
8	Ripon Ali	36	"	01952-076586	[Signature]
9	Hafiz	45	Business	01918-632142	[Signature]
10	Swapn	37	Driver	01730-854364	[Signature]
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Thaka & Western Zone Transmission Grid Extension Project

FOCUS GROUP DISCUSSION
ATTENDANCE SHEET

Location: Pregpur, Blandenga, Chusdenga

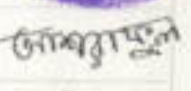
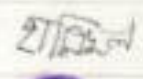
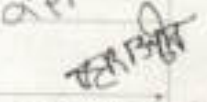
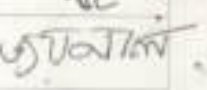
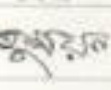
Date: 21-07-2021 Time: 11:35.

Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
1	Muzahidul Islam	35	Farmer	01995-256125	
2	Mofazzal Haque Mafiz	42	"	01917-978325	
3	Al Amin Hossen	21	Student	01706-367219	
4	Merina Sultana	37	Housewife	01728-589936	
5	Selima Akter	31	Housewife	01786-869948	
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Dhaka & Western Zone Transmission Grid Expansion Project

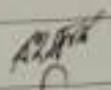
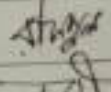
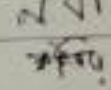
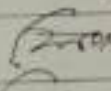
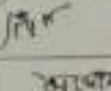
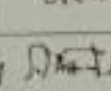
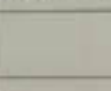
FOCUS GROUP DISCUSSION
ATTENDANCE SHEET

Location	Hatboydiga, Alamdanga, Choudanga.
Date	21-07-2022
Time	9:45

Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
1	Abdul Mannan	45	Farmen	01729-596999	
2	Rumman Ali	43	Farmen	01741-718136	
3	Irfanul Islam	58	Farmen	01418-485683	
4	Md. Ashraf	41	Business	01507-374592	
5	Hamidul Islam	43	Farmen	01974-041269	
6	Liton	47	Daily Lab	01730-607025	
7	Muza Karim	41	Driver	01963-930358	
8	Jahangir Alam	46	Business	01785-152370	
9	Joydul Abedin	42	Farmen	01951-822247	
10	Nurul Islam	39	Farmen	01696-263481	
11	Humayun	43	Farmen	01329-596714	
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Dhaka & Western Zone Grid Expansion Project

Location: <u>সোণাইয়া গ্রাম</u>
Date: <u>১৬, আগস্ট ২০১৮</u> Time: <u>সন্ধ্যা ১০</u>

Sl.	Name of Participants	Age	Occupation	Phone Number	Signature
1.	আবুল কালাম আজাদ	৬৫	মাস্টার	০১৬০-৭৫০৪০১	
2.	আবুল কালাম আজাদ	৬০	ফার্মার	০১৫১-১৭১১১১	
3.	আবুল কালাম আজাদ	৫৫	ফার্মার	-	
4.	আবুল কালাম আজাদ	৬০	-	-	
5.	আবুল কালাম আজাদ	৪২	-	০১৭৭-১০৬০৪৭	
6.	আবুল কালাম আজাদ	২৫	ফার্মার	০১৩৩-০১১১১১	
7.	আবুল কালাম আজাদ	৬২	ফার্মার	-	
8.	আবুল কালাম আজাদ	৪০	ফার্মার	০১৩৭-১০৬০৪৭	
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Appendix D: Environmental Monitoring (Lab sheet)

Appendix D-1: Kaliganj- Maheshpur

EQMS

Ref: EQMS/Air Quality/2023/11271568

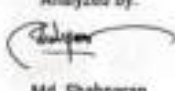
EQMS ENVIRONMENTAL LABORATORY
Motoring Results of Ambient Air Quality

Project Name : Design, Supply, Installation, Testing & commissioning of 230kv&132kv Transmission Lines in western Zone on Turnkey Basis (ACB Package-3)
Transmission Line : Kaliganj-Maheshpur 132KV Transmission Line
Monitoring Activity : Ambient Air Quality Monitoring
Monitoring Personnel : Md. Rajib Hassan Raju, Assistant Consultant, EQMS
Monitoring Location : AQ1: Kashipur, Azampur, Maheshpur, Jhenaidah (Near AP 3/1)
Monitoring Date : 27th August 2023
Analysis Date : 11th September 2023
Description of Analysis :

Location	GPS Coordinate	Ambient Air Pollutants Concentration ($\mu\text{g}/\text{m}^3$)							CO ppm
		PM _{2.5}	PM ₁₀	SO ₂	NO _x	SPM	O ₃	Pb	
AQ1	23°47'51.28"N 88°44'41.88"E	35.7	51.2	12.5	15.7	92.8	14.1	BDL	0.051
Duration (hr.)		24	24	24	24	8	8	8	8
ECR, 1997 and amendment in 2005 Standard (Schedule-2)		65	150	365	108 (Annual)	200	157	0.5	9
IFC/WHO Standard		25	50	20	40 (Annual)	-	100	-	-
Method of Analysis Instrument Use: Haz-Scanner™ HM 6000		Light Scattering Aperturemeter	Light Scattering Aperturemeter	Light Scattering Aperturemeter	High Sensitivity Electrochemical	High Sensitivity Electrochemical	High Sensitivity Electrochemical	AAS	High Sensitivity Electrochemical

Note: Regular Checkup and calibration of the equipment are done by the manufacturers and EQMS personnel to avoid any error.
Legend: SPM-Suspended Particulate Matter, PM₁₀-Particulate Matter of a diameter of 10 micron or less, PM_{2.5}-Particulate Matter of a diameter of 2.5 micron or less, SO₂-Sulphur Di-Oxide, NO_x-Oxides of Nitrogen, CO - Carbon Monoxide, AAS- Atomic Absorption Spectroscopy, BDL = below detection limit <0.1.

Received By: 
Shihabuddin Ahmed Imran
Consultant
EQMS Consulting Limited

Analyzed By: 
Md. Shahparan
Technical Manager
EQMS Consulting Limited

Checked By: 
Md. Jahidul Islam
Quality Manager
EQMS Consulting Limited

Head Office: H # 53, R # 04, 9th Floor, Dhaka-1213, Bangladesh
Lab Office: Flat # F1, House # To-134/A, Sakhati Sarani, Gulshan-Badda Link Road, Dhaka - 1212
Toronto Office: 7 Arnd Street, Scarborough Ontario, M1K4B5 Canada












Ref: EQMS/Air Quality/202311271509

EQMS ENVIRONMENTAL LABORATORY

Monitoring Results of Ambient Air Quality

Project Name	: Design, Supply, Installation, Testing & commissioning of 230kv&132kv Transmission Lines in western Zone on Turnkey Basis (ADB Package-3)
Transmission Line	: Kaliganj-Maheshpur 132KV Transmission Line
Monitoring Activity	: Ambient Air Quality Monitoring
Monitoring Personnel	: Md. Rajib Hassan Raju, Assistant Consultant, EQMS
Monitoring Location	: AQ2: Alampur, Azampur, Maheshpur, Jhensidah (Near AP 5/2)
Monitoring Date	: 28 th August 2023
Analysis Date	: 11 th September 2023
Description of Analysis	:

Location	GPS Coordinate	Ambient Air Pollutants Concentration ($\mu\text{g}/\text{m}^3$)							CO ppm
		PM ₁₀	PM _{2.5}	SO ₂	NO _x	SPM	O ₃	Pb	
AQ2	22°57'37.97"N 89°13'47.58"E	44.8	67.5	23.3	32.4	122.1	18.6	BDL	0.213
Duration (hr.)		24	24	24	24	8	8	8	8
ECR, 1997 and amendment in 2005 Standard (Schedule-2)		65	150	365	100 (Annual)	200	157	0.5	9
IFC/WHO Standard		25	50	20	40 (Annual)	-	100	-	-
Method of Analysis Instrument Use: Haz-Scanner™ HM 6000		Light Scattering Nephelometer	Light Scattering Nephelometer	Light Scattering Nephelometer	High Sensitivity Electrochemical	High Sensitivity Electrochemical	High Sensitivity Electrochemical	AAS	High Sensitivity Electrochemical

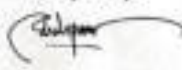
Note: Regular Checkup and calibration of the equipment are done by the manufacturers and EQMS personnel to avoid any error.
Legend: SPM- Suspended Particulate Matter, PM10- Particulate Matter of a diameter of 10 micron or less, PM2.5- Particulate Matter of a diameter of 2.5 micron or less, SO₂- Sulphur Di-Oxide, NO_x- Oxides of Nitrogen, CO- Carbon Monoxide, AAS- Atomic Absorption Spectroscopy, BDL- below detection limit <0.1.

Received By:



Shihabuddin Ahmed Imran
Consultant
EQMS Consulting Limited

Analyzed By:



Md. Shshparan
Technical Manager
EQMS Consulting Limited

Checked By:



Md. Jahidul Islam
Quality Manager
EQMS Consulting Limited



Head Office: H # 53, R # 04, B # C, Banani, Dhaka -1213, Bangladesh
Lab Office: Flat # F1, House # Ta-134/A, Bolshakhi Sarani, Gulshan-Badda Link Road, Dhaka - 1212
Toronto Office: 7 Amot Street, Scarborough Ontario, M1X4B5 Canada



EQMS

Ref: EQMS/Air Quality/2023/1271516

EQMS ENVIRONMENTAL LABORATORY**Monitoring Results of Ambient Air Quality**

Project Name : Design, Supply, Installation, Testing & commissioning of 230kv&132kv Transmission Lines in western Zone on Turnkey Basis (ADB Package-3)
Transmission Line : Kaliganj-Maheshpur 132KV Transmission Line
Monitoring Activity : Ambient Air Quality Monitoring
Monitoring Personnel : Md. Rajib Hassan Raju, Assistant Consultant, EQMS
Monitoring Location : AQ3: Kadirkol, Fajilpur, Kaliganj, Jhensaidah (Near AP 8/8)
Monitoring Date : 28th August 2023
Analysis Date : 11th September 2023
Description of Analysis :

Location	GPS Coordinate	Ambient Air Pollutants Concentration ($\mu\text{g}/\text{m}^3$)							CO ppm
		PM _{2.5}	PM ₁₀	SO ₂	NO _x	SPM	O ₃	Pb	
AQ3	22°45'17.80"N 89° 6'35.25"E	31.6	48.3	9.8	17.5	85.8	11.7	BDL	0.021
Duration (hr.)		24	24	24	24	8	8	8	8
ECR, 1997 and amendment in 2005 Standard (Schedule-2)		65	150	365	100 (Annual)	200	157	0.5	9
IFC/WHO Standard		25	50	20	40 (Annual)	-	100	-	-
Method of Analysis Instrument Use: Haz-Scanner™ HIM 6000		Light Scattering Nephelometer	Light Scattering Nephelometer	Light Scattering Nephelometer	High Sensitivity Electrochemical	High Sensitivity Electrochemical	High Sensitivity Electrochemical	AAS	High Sensitivity Electrochemical

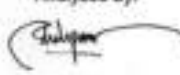
Note: Regular Checkup and calibration of the equipment are done by the manufacturers and EQMS personnel to avoid any error.
 Legend: SPM - Suspended Particulate Matter, PM₁₀ - Particulate Matter of a diameter of 10 micron or less, PM_{2.5} - Particulate Matter of a diameter of 2.5 micron or less, SO₂ - Sulphur Dioxide, NO_x - Oxides of Nitrogen, CO - Carbon Monoxide, AAS - Atomic Absorption Spectroscopy, BDL - below detection limit <0.1.

Received By:



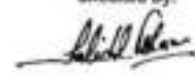
Shihabuddin Ahmed Imran
Consultant
EQMS Consulting Limited

Analyzed By:



Md. Shahparan
Technical Manager
EQMS Consulting Limited

Checked By:



Md. Jahidul Islam
Quality Manager
EQMS Consulting Limited



Head Office: H # 53, R # 04, B # C, Banani, Dhaka -1213, Bangladesh
 Lab Office: Flat # F1, House # Ta-134/A, Bolehkhali Sarani, Gulshan-Badda Link Road, Dhaka - 1212
 Toronto Office: 7 Amot Street, Scarborough Ontario, M1K4B5 Canada



Ref: EQMS/Air Quality/2023/1271511

EQMS

EQMS ENVIRONMENTAL LABORATORY**Monitoring Results of Ambient Air Quality**

Project Name : Design, Supply, Installation, Testing & commissioning of 230kv&132kv Transmission Lines in western Zone on Turnkey Basis (ADB Package-3)

Transmission Line : Kaliganj-Maheshpur 132KV Transmission Line

Monitoring Activity : Ambient Air Quality Monitoring

Monitoring Personnel : Md. Rajib Hassan Raju, Assistant Consultant, EQMS

Monitoring Location : AQ4: Amtola Bazar, Ganna Road, Kaliganj, Jhenaidah (Near AP 9/5)

Monitoring Date : 29th August 2023

Analysis Date : 11th September 2023

Description of Analysis :

Location	GPS Coordinate	Ambient Air Pollutants Concentration ($\mu\text{g}/\text{m}^3$)							CO ppm
		PM _{2.5}	PM ₁₀	SO ₂	NO _x	SPM	O ₃	Pb	
AQ4	22°44'8.73"N 89°17'41.52"E	38.2	56.7	14.7	27.2	98.7	15.1	BDL	0.125
Duration (hr.)		24	24	24	24	8	8	8	8
ECR, 1997 and amendment in 2005 Standard (Schedule-2)		65	150	365	100 (Annual)	200	157	0.5	9
IFC/WHO Standard		25	50	20	40 (Annual)	-	100	-	-
Method of Analysis Instrument Use: Naz-Scanner™ HIM 6000		Light Scattering Nephelometer	Light Scattering Nephelometer	Light Scattering Nephelometer	High Sensitivity Electrochemical	High Sensitivity Electrochemical	High Sensitivity Electrochemical	AAS	High Sensitivity Electrochemical

Note: Regular Checkup and calibration of the equipment are done by the manufacturers and EQMS personnel to avoid any error.

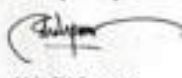
Legend: SPM - Suspended Particulate Matter, PM₁₀ - Particulate Matter of a diameter of 10 micron or less, PM_{2.5} - Particulate Matter of a diameter of 2.5 micron or less, SO₂ - Sulphur Dioxide, NO_x - Oxides of Nitrogen, CO - Carbon Monoxide, AAS - Atomic Absorption Spectrophotometry, BDL - below detection limit <0.1.

Received By:



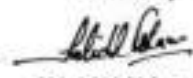
Shatabuddin Ahmed Imran
Consultant
EQMS Consulting Limited

Analyzed By:



Md. Shahparan
Technical Manager
EQMS Consulting Limited

Checked By:



Md. Jahidul Islam
Quality Manager
EQMS Consulting Limited



Head Office: H # 53, R # 04, B # C, Banani, Dhaka - 1213, Bangladesh
 Lab Office: Flat # F1, House # 10-134/A, Baishakhi Sarani, Gulshan-Badda Link Road, Dhaka - 1212
 Toronto Office: 7 Amot Street, Scarborough Ontario, M1K 4B5 Canada



Ref: EQMS/Air Quality/2023/1271512

EQMS

EQMS ENVIRONMENTAL LABORATORY**Monitoring Results of Ambient Air Quality**

Project Name : Design, Supply, Installation, Testing & commissioning of 230kv&132kv Transmission Lines in western Zone on Turnkey Basis (ADB Package-3)
Transmission Line : Kaliganj-Maheshpur 132KV Transmission Line
Monitoring Activity : Ambient Air Quality Monitoring
Monitoring Personnel : Md. Rajib Hassan Raju, Assistant Consultant, EQMS
Monitoring Location : AQ5: Near Sub-station, Shreerampur, Kaliganj.
Monitoring Date : 29th August 2023
Analysis Date : 11th September 2023
Description of Analysis :

Location	GPS Coordinate	Ambient Air Pollutants Concentration ($\mu\text{g}/\text{m}^3$)							CO ppm
		PM ₁₀	PM _{2.5}	SO ₂	NO _x	SPM	O ₃	Pb	
AQ5	22°42'43.80"N 89°33'7.72"E	41.1	58.5	20.4	35.5	106.2	19.7	BDL	0.098
Duration (hr.)		24	24	24	24	8	8	8	8
ECR, 1997 and amendment in 2005 Standard (Schedule-2)		65	150	365	100 (Annual)	200	157	0.5	9
IFC/WHO Standard		25	50	20	40 (Annual)	-	100	-	-
Method of Analysis Instrument Use: Haze-Scanner™ HIM 6000		Light Scattering Nephelometer	Light Scattering Nephelometer	Light Scattering Nephelometer	High Sensitivity Electrochemical	High Sensitivity Electrochemical	High Sensitivity Electrochemical	AAS	High Sensitivity Electrochemical

Note: Regular Checkup and calibration of the equipment are done by the manufacturers and EQMS personnel to avoid any error.
 Legend: SPM - Suspended Particulate Matter, PM₁₀ - Particulate Matter of a diameter of 10 micron or less, PM_{2.5} - Particulate Matter of a diameter of 2.5 micron or less, SO₂ - Sulphur Dioxide, NO_x - Oxides of Nitrogen, CO - Carbon Monoxide, AAS - Atomic Absorption Spectroscopy, BDL = below detection limit <0.1.

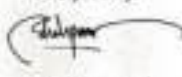
Received By:



Shihabuddin Ahmed Imran
Consultant
EQMS Consulting Limited



Analyzed By:



Md. Shahparan
Technical Manager
EQMS Consulting Limited



Checked By:



Md. Jahidul Islam
Quality Manager
EQMS Consulting Limited



Head Office: H # 53, R # 04, S # C, Banani, Dhaka -1213, Bangladesh
 Lab Office: Rat # F1, House # 10-134/A, Baitakhil Sarani, Gulshan-Badda Link Road, Dhaka - 1212
 Toronto Office: 7 Armat Street, Scarborough Ontario, M1K4B5 Canada



EQMS

Ref: EQMS/Noise Level /2023/1127/1513

EQMS ENVIRONMENTAL LABORATORY

Monitoring Results of Noise Level

Project Name : Design, Supply, Installation, Testing & commissioning of 230kv&132kv Transmission Lines in western Zone on Turnkey Basis (ADB Package-3)
Transmission Line : Kaliganj-Maheshpur 132KV Transmission Line
Description of Activity : Noise Level Monitoring
Monitoring Personnel : Md. Rajib Hassan Raju, Assistant Consultant, EQMS
Monitoring Date : 27th August to 29th August 2023
Analysis Date : 11th September 2023
Description of Analysis :

Code	Categories	Location	Noise Level [dB (A)]			
			Language	Language	Language	Language
NL1	Residential Area	Kashipur, Azampur, Maheshpur, Jhenaidah (Near AP 3/1)	53.1	36.8	58.4	32.9
NL2	Mixed Area	Alampur, Azampur, Maheshpur, Jhenaidah (Near AP 5/2)	55.8	36.3	65.8	33.4
NL3	Silent Area	Kadirkol, Fajipur, Kaliganj, Jhenaidah (Near AP 8/8)	49.9	35.8	55.2	32.3
NL4	Commercial Area	Amtola Bazar, Ganna Road, Kaliganj, Jhenaidah (Near AP 9/5)	62.7	45.1	71.3	35.8
NL5	Mixed Area	Near Sub-station, Shreerampur, Kaliganj.	57.5	37.2	66.2	35.2

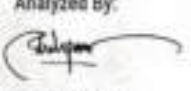
*Noise Pollution (Control) Rules, 2006	Day [dB (A)]	Night [dB (A)]
Silent Area	50	40
Residential Area	55	45
Mixed Area	60	50
Commercial Area	70	60
Industrial Area	75	70

Received By:



Shihabuddin Ahmed Imran
Consultant
EQMS Consulting Limited

Analyzed By:



Md. Shahparan
Technical Manager
EQMS Consulting Limited

Checked By:



Md. Jahidul Islam
Quality Manager
EQMS Consulting Limited





Head Office: H # 53, R # 04, B # C, Banani, Dhaka -1213, Bangladesh

Lab Office: Plot # F1, House # To-134/A, Bokshakhi Sarani, Gulshan-Badda Link Road, Dhaka - 1212

Toronto Office: 7 Annet Street, Scarborough Ontario, M1E4B5 Canada








EQMS

Ref: EQMS/Water Quality /202311271514

EQMS WET LABORATORY

Test Results of Surface Water Quality

Project Name Transmission Line Description of Sample Sample Collector Sampling Location	: Design, Supply, Installation, Testing & commissioning of 230kv&132kv Transmission Lines in western Zone on Turnkey Basis (ADB Package-3) : Kaliganj -Maheshpur 132KV Transmission Line : Surface Water : Md. Mahabur Rahman, Assistant Consultant, EQMS : SW1: Alampur, Azampur, Maheshpur, Jhenaidah (Near AP 5/3) : SW2: Elangi, Kathalia, Kotchadpur (Near AP 7/7) : SW3: Fajilpur, Kaliganj (Near AP 8/8) : SW4: Near Singdah Primary School, Kaliganj, Jhenaidah (Near AP 9/5) : SW5: Near Sub-station, Shreerampur, Kaliganj Sampling Date : 28 th August and 29 th August 2023 Date of Analysis : 11 th September 2023 Description of Analysis :
--	--

Parameters	Unit	Concentrations					Analysis Method	Bangladesh Standards *
		SW1	SW2	SW3	SW4	SW5		
BOD	mg/L	1.2	0.8	1.2	3	2.1	5 days Incubation	50
COD	mg/L	17	14	9	28	11	Closed Reflux	200
DO	mg/L	6.3	6.4	6.1	5	6	Ion electrode	4.5-8
EC	µS/cm	361	379	217	249	277	Ion electrode	1200
pH	—	7.03	7.15	7.15	7.15	7.16	Ion electrode	6.5 – 8.5
Salinity	ppt	0.49	0.91	0.17	0.28	0.37	Ion electrode	—
Temperature (T)	°C	24.7	24.2	23.9	24.4	24.6	Ion electrode	40
Hardness	mg/L	64	69	54	60	63	Colorimetric	—
TDS	mg/L	180	189	108	124	138	Ion electrode	2100

* The Environment Conservation Rules, 1997 (Schedule 3 (A)) BOD- Biochemical Oxygen Demand, COD- Chemical Oxygen Demand, DO- Dissolved Oxygen, EC-Electrical Conductivity, TDS- Total Dissolved Solid



REGULATORY AND MONITORING GROUP
Authorized for ISO 9001:2015



LABORATORY AUTHORIZED FOR ISO 17025:2017



Head Office: H # 53, R # 04, B # C, Banani, Dhaka -1213, Bangladesh

Lab Office: Flat # F1, House # Ta-134/A, Bishakhari Sorani, Gulshan-Badda Link Road, Dhaka - 1212

Toronto Office: 7 Amel Street, Scarborough Ontario, M1K4B5 Canada











EQMS

Parameters	Unit	Concentrations					Analysis Method	Bangladesh Standards *
		SW1	SW2	SW3	SW4	SW5		
NH ₄ -N	mg/L	0.78	0.27	0.51	1.95	0.36	Gravimetric method	50
PO ₄	mg/L	1.5	1.1	2.1	11	1.7	Photometric Method	-
TPH	mg/L	1.2	0.7	1.7	2.6	0.9	Gravimetric method	-
Total Coliform	n/100 ml	12	10	14	22	17		50

* The Environment Conservation Rules, 1997 (Schedule 3 (A), BOD- Biochemical Oxygen Demand, COD- Chemical Oxygen Demand, DO- Dissolved Oxygen, EC-Electrical Conductivity, TDS- Total Dissolved Solid

Received By:



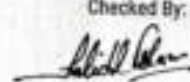
Shihabuddin Ahmed Inran
Consultant
EQMS Consulting Limited

Analyzed By:



Ahmed Jubaer
Chemist
EQMS Consulting Limited

Checked By:



Md. Jahidul Islam
Quality Manager
EQMS Consulting Limited



Head Office: H # 53, R # 04, B # C, Banani, Dhaka-1213, Bangladesh
Lab Office: Flat # F1, House # 1a-134/A, Bolshakhi Sarani, Gulshan-Sadda Link Road, Dhaka-1212
Toronto Office: 7 Annet Street, Scarborough Ontario, M1K4B5 Canada



EQMS

Ref: EQMS/Water Quality /2023/112/1515

EQMS WET LABORATORY

Test Results of Ground Water Quality

Project Name

Transmission Line

Description of Sample

Sample Collector

Sampling Location

: Design, Supply, Installation, Testing & commissioning of 230kv&132kv Transmission Lines in western Zone on Turnkey Basis (ADB Package-3)

: Kaliganj -Maheshpur 132KV Transmission Line

: Ground Water

: Md. Mahabur Rahman, Assistant Consultant, EQMS

: GW1: Kashipur, Azampur, Maheshpur, Jhenaidah (Near AP 3/1)

: GW2: Alampur primary school, Azampur, Maheshpur, Jhenaidah (Near AP 5/2)

: GW3: Kadirkol, Fajilpur, Kaliganj, Jhenaidah (Near AP 8/8)

: GW4: Amtola Bazar, Ganna Road, Kaliganj, Jhenaidah (Near AP 9/5)

: GW5: Shreerampur primary school, Near Sub-station, Shreerampur, Kaliganj)

Sampling Date

Date of Analysis

Description of Analysis

: 27th August to 29th August 2023

: 11th September 2023

:

Parameters	Unit	Concentration					Analysis Method	Bangladesh Standards **
		GW1	GW2	GW3	GW4	GW5		
BOD	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	5 days incubation	0.2
COD	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	Closed Reflux	4
DO	mg/L	6.1	6.2	6	6.2	6.1	Ion electrode	6
EC	µS/cm	2026	1688	1511	1443	1431	Ion electrode	—
pH	—	7.06	7.22	7.52	7.25	7.25	Ion electrode	6.5 – 8.5
Salinity	ppt	0.1	0.08	0.07	0.07	0.07	Ion electrode	—
Temperature (T)	°C	23.1	22.7	23.3	22.8	23.5	Ion electrode	20 – 30
Hardness	mg/L	519	411	339	309	302	Colorimetric	200 – 500
TDS	mg/L	1014	820	752	718	712	Ion electrode	1000
Manganese (Mn)	mg/L	0.05	0.04	0.05	0.06	0.02	Photometric method	0.1

*BDL = Below detection limit <0.05mg/L.

** The Environment Conservation Rules, 1997 Schedule 3 (A) BOD- Biochemical Oxygen Demand, COD- Chemical Oxygen Demand, DO- Dissolved Oxygen, EC-Electrical Conductivity, TDS- Total Dissolved Solid.



EQMS CONSULTING LIMITED



BAB



EQMS Consulting Limited



Head Office: H # 53, R # 04, S # C, Banani, Dhaka -1213, Bangladesh

Lab Office: Plot # F1, House # To-134/A, Boishakhi Sarani, Gulshan-Badda Link Road, Dhaka - 1212

Toronto Office: 7 Arnot Street, Scarborough Ontario, M1K4B5 Canada



BAB ACCREDITED



BAB



BAB



Accredited ISO 9001



WTS

4532 • J. Neurosci., September 24, 2008 • 28(39):4525–4532

** The Environmental Conservation Rules, 1987 (Schedule 3 (A)). BOD—Biochemical Oxygen Demand; COD—Chemical Oxygen Demand; DO—Dissolved Oxygen; EC—Electrical Conductivity; TSS—Total Dissolved Solid.

[Signature]

[Signature]

Richard G. ...



Appendix D-2: Rupsha 230/132/33 kV GIS Substation



EnviroCare
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Ref: EIL/2023/1910

ENVIROCARE ENVIRONMENTAL LABORATORY**Results of Ambient Air Quality Analysis**

Name of Project	Design, Supply, Installation, Testing and Commissioning of 230/132/33 kV GIS substation at Rupsha and 132/33 kV GIS substation at Phultola, Monirampur, Maheshpur, Meherpur on turnkey basis
Name of the Substation	230/132/33 kV GIS substation at Rupsha
Description of sample	Ambient Air Quality Analysis
Sample Collector	Envirocare Technical Team
Sample Date	January 02, 2023 to January 04, 2023
Date of Analysis	January 05, 2023 to January 15, 2023

Monitoring Location

Location	ID	GPS Coordinates
Near Friendship Church	SS1_AQ1	22°46'23.87"N 89°38'41.46"E
Residential Area near the Joy Petroleum	SS1_AQ2	22°46'14.24"N 89°37'4.47"E
Near the police box area beside Khulna Mongla Road	SS1_AQ3	22°46'26.70"N 89°36'58.31"E
Barren Land	SS1_AQ4	22°46'14.58"N 89°36'56.56"E
Near 230/132/33 kV GIS Substation at Rupsha	SS1_AQ5	22°46'19.73"N 89°37'0.50"E

Discription of Analysis

Sample ID	PM _{2.5} (µg/m ³)	PM ₁₀ (µg/m ³)	SPM (µg/m ³)	SO _x (µg/m ³)	NO _x (µg/m ³)	CO (mg/m ³)	Lead (µg/m ³)
SS1_AQ1	48.3	74.4	175.3	19.8	28.1	0.22	0.01
SS1_AQ2	50.7	72.7	180.5	20.6	31.4	0.34	0.03
SS1_AQ3	47.1	70.5	168.4	21.1	29.8	0.25	0.02
SS1_AQ4	40.5	61.6	153.2	15.1	26.1	0.19	0.01
SS1_AQ5	57.2	73.5	178.6	21.4	38.8	0.41	0.04
Duration (Hours)	24	24	8	24	8	8	8
Bangladesh Standard	65	150	200	365	100	10	0.5

* Standard: Air Pollution Control Rules 2022


Prepared By
Md. Siddin
Junior Environmental
Specialist
Envirocare International
Limited




Reviewed By
Sanjoy Kumar Mondol
Technical Manager
Envirocare International
Limited


Approved By:
Shorov Roy
Quality Manager
Envirocare International Limited

Address: House #9 (3rd Flr), Road # 6, Sector # 12, Uttara, Dhaka-1230, Bangladesh. Cell: 01925687029,
Phone: +88 0255087283, Web: www.envirocarebd.com, Email: info@envirocarebd.com



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International Ltd.

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Results of Noise Level Analysis

Name of Project	: Design, Supply, Installation, Testing and Commissioning of 230/132/33 kV GIS substation at Rupsha and 132/33 kV GIS substation at Phultola, Monirampur, Maheshpur, Meherpur on turnkey basis.
Name of Substation	: 230/132/33 kV GIS Substation at Rupsha
Description of sample	: Sample was collected from project area
Sample Collector	: Collected by Envirocare Technical Team
Sample Date	: January 02, 2023 to January 04, 2023
Date of Analysis	: January 05, 2023 to January 07, 2023

Result analysis:

Location ID	Monitoring Time	Noise level [dB(A)]			Standard* (dBA)	Land Use Category
		Leq	L _{max}	L _{min}		
SS1_NL 01	Day	58.37	81.2	41.3	60	Mixed
	Night	47.91	62.7	38.7	50	
SS1_NL 02	Day	63.70	75.8	51.1	70	Commercial
	Night	52.31	64.1	43.8	60	
SS1_NL 03	Day	68.25	78.9	58.5	70	Commercial
	Night	57.64	72.5	49.7	60	
SS1_NL 04	Day	43.80	61.4	37.0	60	Mixed
	Night	39.41	52.4	31.8	50	
SS1_NL 05	Day	51.80	67.4	39.0	60	Mixed
	Night	40.41	55.4	33.8	50	

*Standard: The Environment Conservation Rules (ECR), 1997 and Subsequent amendment in 2006.



Golam Saclayen

Prepared By
Md. Golam Saclayen
B.Sc. in Environmental Science
and Resource Management
(MBSTU)
Environmental Analyst

Sanjoy Kumar Mondol

Reviewed By
Sanjoy Kumar Mondol
B.Sc. in ESRM
(MBSTU)
MS in Environmental
Science (MBSTU)
Technical Manager

Shorov Roy

Approved By:
Shorov Roy
B.Sc. in ESRM (MBSTU)
MS in Environmental Science
(BAU)
Quality Manager

Address: House #9 (1st Flr), Road # 6, Sector # 12, Uttara, Dhaka-1230, Bangladesh. Cell: 01925687029,
Phone: +88 0255087283, Web: www.envirocarebd.com, Email: info@envirocarebd.com



Ref: ECL/2023/01-26

Results of Surface Water Analysis

Name of Project	Design, Supply, Installation, Testing and Commissioning of 230/132/33 kV GIS substation at Rupsha and 132/33 kV GIS substation at Phutola, Monirampur, Maheshpur, Meherpur on turnkey basis
Name of the Substation	230/132/33 kV GIS substation at Rupsha
Description of sample	Surface water Quality Analysis
Sample Collector	Envirocare Technical Team
Sample Date	January 04, 2023
Report Date	January 30, 2023

Result analysis:

Parameters	Unit	Concentration Present	ECR '97 Standard*		
		SS1_SW1	b	d	f
pH	-	6.6	6.5-8.5	6.5-8.5	6.5-8.5
Biochemical Oxygen Demand (BOD)	mg/L	3.8	3 or less	6 or less	10 or less
Chemical Oxygen Demand (COD)	mg/L	11	NYS	NYS	NYS
Dissolved Oxygen (DO)	mg/L	3.4	5 or more	5 or more	5 or more
Total Dissolved Solid (TDS)	mg/L	685	NYS	NYS	NYS
Total Suspended Solid (TSS)	mg/L	4.6	NYS	NYS	NYS
Nitrogen	mg/L	0.097	NYS	NYS	NYS
Ammonium	mg/L	0.27	NYS	NYS	NYS
Total Coliform	CFU/100ml	6.2×10^2	200 or Less	NYS	1000 or less
Turbidity	NTU	9.87	NYS	NYS	NYS
Temperature	°C	25.5	NYS	NYS	NYS
Oil & Grease	mg/L	1.9	NYS	NYS	NYS

*The Environment Conservation Rules (ECR) 1997, Schedule 3-A Standard for Inland Surface Water (b.d.f)

* The parameters were measured in ECL Laboratory.



Signature
Prepared By
 Md. Golam Saclayen
 B.Sc. in Environmental Science
 and Resource Management
 (MBSTU)
 Environmental Analyst

Signature
Reviewed By
 Sanjoy Kumar Mondol
 B.Sc. in ESRM
 (MBSTU)
 MS in Environmental
 Science (MBSTU)
 Technical Manager

Signature
Approved By:
 Shorov Roy
 B.Sc. in ESRM (MBSTU)
 MS in Environmental Science
 (BAU)
 Quality Manager

Address: House #9 (3rd Flr), Road # 6, Sector # 12, Uttara, Dhaka-1230, Bangladesh. Cell: 01925687029,
 Phone: +88 0255087283, Web: www.envirocarebd.com, Email: info@envirocarebd.com

1



Ref: ECI/2023/01-21

Result of Groundwater Quality

Name of the Project	Design, Supply, Installation, Testing and Commissioning of 230/132/33 kV GIS substation at Rupsha and 132/33 kV GIS substation at Phultola, Monirampur, Mahesganj, Meherpur on turnkey basis.
Name of the Substation	230/132/33 kV GIS Substation at Rupsha
Sample Collected By	Envirocare Technical Team
Collection Date	January 04, 2023
Reporting Date	January 30, 2023

Sampling Location

Location	ID	GPS Coordinates
Residential Area near the Joy Petroleum at Rupsha	SS1_GW 01	22°46'14.66"N 89°37'4.94"E

Description of Analysis

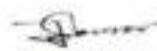
Parameter	Unit	Concentration Present SS1_GW 01	Bangladesh ECR-1997*	WHO-2011**	Analysis Method
pH	-	6.83	6.5-8.5	6.5-8.5	Electrometric
Turbidity	NTU	0.52	10	5	Nephelometric method
Electrical Conductivity (EC)	µS/cm	468.87	NYS	NYS	Electrometric
Chloride	mg/l	5	150-600	250	Argentometric
Iron (Fe)	mg/l	0.009	0.3-1.0	0.3	AAS
Manganese (Mn)	mg/l	0.036	0.1	0.4	AAS
Arsenic (As)	mg/l	<0.01	0.05	0.01	AS-test kit
Total Coliform (TC)	CFU/100 ml	0	0	0	Membrane Filtration

* Data Source: Envirocare Laboratory, Dhaka; Date: 30 January 2023; Standard: ECR, 1997 [Schedule-3B] and WHO 2011


Prepared By
 Md. Sijuddin
 Junior Environmental Specialist
 EnviroCare International Limited




Checked By
 Sanjoy Kumar Mondol
 Technical Manager
 EnviroCare International Limited


Approved By
 Shorov Roy
 Quality Manager
 EnviroCare International Limited

Address: House #9 (3rd Flr), Road # 6, Sector # 12, Uttara, Dhaka-1230, Bangladesh. Cell: 01925687029,
 Phone: +88 0255087283, Web: www.envirocarebd.com, Email: info@envirocarebd.com

1

Appendix D-3: Meherpur 132/33 kV GIS Substation



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Ref: EIL/2023/1914

ENVIRCARE ENVIRONMENTAL LABORATORY

Results of Ambient Air Quality Analysis

Name of Project	Design, Supply, Installation, Testing and Commissioning of 230/132/33 kV GIS substation at Rupsha and 132/33 kV GIS substation at Phutola, Monirampur, Maheshpur, Meherpur on turnkey basis
Name of the Substation	132/33 kV GIS Substation Meherpur
Description of sample	Ambient Air Quality Analysis
Sample Collector	Envirocare Technical Team
Sample Date	January 16, 2023 to January 18, 2023
Date of Analysis	January 19, 2023 to January 30, 2023

Monitoring Location

Location	ID	GPS Coordinates
Selfie Feeling Station	SS5_AQ1	23°47'30.39"N 88°40'48.08"E
Residential Area	SS5_AQ2	23°47'36.26"N 88°40'54.21"E
Barren Land	SS5_AQ3	23°47'32.12"N 88°40'45.93"E
Near 132/33 kV GIS Substation Meherpur	SS5_AQ4	23°47'28.07"N 88°40'46.51"E
Near Nutun Modna Vanga Bazar	SS5_AQ5	23°47'25.97"N 88°40'40.53"E

Discription of Analysis

Sample ID	PM _{2.5} (µg/m³)	PM ₁₀ (µg/m³)	SPM (µg/m³)	SO _x (µg/m³)	NO _x (µg/m³)	CO (mg/m³)	Lead (µg/m³)
SS5_AQ1	55.8	78.4	171.4	21.5	35.6	0.34	0.04
SS5_AQ2	48.7	74.7	164.5	16.6	25.2	0.19	0.01
SS5_AQ3	44.1	70.6	160.3	19.7	31.7	0.21	0.02
SS5_AQ4	58.8	79.3	178.2	24.2	34.5	0.38	0.04
SS5_AQ5	46.7	59.5	158.5	18.6	27.9	0.18	0.01
Duration (Hours)	24	24	8	24	8	8	8
Bangladesh Standard	65	150	200	365	100	10	0.5

* Standard: Air Pollution Control Rules 2022

[Signature]

Prepared By:
Md. Sjuddin
Junior Environmental
Specialist
Envirocare International
Limited

[Signature]

Technical Manager:
Sanjoy Kumar Mondol
Technical Manager
Envirocare International
Limited

[Signature]

Approved By:
Shorov Roy
Quality Manager
Envirocare International Limited



Address: House #9 (3rd Flr), Road # 6, Sector # 12, Uttara, Dhaka-1230, Bangladesh. Cell: 01925687029,
Phone: +88 0255087283, Web: www.envirocarebd.com, Email: info@envirocarebd.com


EnviroCare
International Ltd.

A house of Inspection, Testing, Assessment & Consultancy

Results of Noise Level Analysis

Name of Project	: Design, Supply, Installation, Testing and Commissioning of 230/132/33 kV GIS substation at Rupsha and 132/33 kV GIS substation at Phultola, Monirampur, Maheshpur, Meherpur on turnkey basis.
Name of Substation	: 132/33 kV GIS Substation Meherpur
Description of sample	: Sample was collected from project area
Sample Collector	: Collected by Envirocare Technical Team
Sample Date	: January 16, 2023 to January 18, 2023
Date of Analysis	: January 19, 2023 to January 21, 2023

Result analysis:

Location ID	Monitoring Time	Noise level [dB(A)]			Standard* (dBA)	Land Use Category
		Leq	L _{max}	L _{min}		
SS5_NL 01	Day	56.08	76.1	45.4	60	Mixed
	Night	47.41	59.8	33.5	50	
SS5_NL 02	Day	52.32	75.3	49.7	60	Mixed
	Night	39.62	63.0	32.7	50	
SS5_NL 03	Day	51.98	78.0	47.3	60	Mixed
	Night	40.30	60.7	34.4	50	
SS5_NL 04	Day	53.32	79.3	48.7	60	Mixed
	Night	41.34	57.7	33.4	50	
SS5_NL 05	Day	72.18	74.2	53.5	70	Commercial
	Night	52.50	55.9	49.6	60	

*Standard: The Environment Conservation Rules (ECR), 1997 and Subsequent amendment in 2006.



Prepared By
Md. Golam Saclayen
B.Sc. in Environmental Science
and Resource Management
(MBSTU)
Environmental Analyst

Reviewed By
Sanjoy Kumar Mondol
B.Sc. in ESRM
(MBSTU)
MS in Environmental
Science (MBSTU)
Technical Manager

Approved By:
Shorov Roy
B.Sc. in ESRM (MBSTU)
MS in Environmental Science
(BAU)
Quality Manager

Address: House #9 (3rd Flr), Road # 6, Sector # 12, Uttara, Dhaka-1230, Bangladesh, Cell: 01925687029,
Phone: +88 0255087283, Web: www.envirocarebd.com, Email: info@envirocarebd.com

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Ref. ECIL/2023/01-30

Results of Surface Water Analysis

Name of Project	Design, Supply, Installation, Testing and Commissioning of 230/132/33 kV GIS substation at Rupsha and 132/33 kV GIS substation at Phultola, Monirampur, Maheshpur, Meherpur on turnkey basis
Name of the Substation	132/33 kV GIS substation at Meherpur
Description of sample	Surface water Quality Analysis
Sample Collector	Envirocare Technical Team
Sample Date	January 18, 2023
Report Date	January 30, 2023

Result analysis:

Parameters	Unit	Concentration Present SS5, SW1	ECR'97 Standard*		
			b	d	f
pH	-	6.7	6.5-8.5	6.5-8.5	6.5-8.5
Biochemical Oxygen Demand (BOD)	mg/L	4.9	3 or less	6 or less	10 or less
Chemical Oxygen Demand (COD)	mg/L	12	NYS	NYS	NYS
Dissolved Oxygen (DO)	mg/L	1.6	5 or more	5 or more	5 or more
Total Dissolved Solid (TDS)	mg/L	368	NYS	NYS	NYS
Total Suspended Solid (TSS)	mg/L	2.3	NYS	NYS	NYS
Nitrogen	mg/L	0.066	NYS	NYS	NYS
Ammonium	mg/L	0.28	NYS	NYS	NYS
Total Coliform	CFU/100ml	5.1×10^2	200 or Less	NYS	1000 or less
Turbidity	NTU	7.32	NYS	NYS	NYS
Temperature	°C	25	NYS	NYS	NYS
Oil & Grease	mg/L	1.1	NYS	NYS	NYS

*The Environment Conservation Rules (ECR) 1997, Schedule 3-A Standard for Inland Surface Water (b,d,f).

* The parameters were measured in ECL Laboratory.



Prepared By
Md. Golam Saclayen
B.Sc. in Environmental Science
and Resource Management
(MBSTU)
Environmental Analyst

Reviewed By
Sanjoy Kumar Mondol
B.Sc. in ESRM
(MBSTU)
MS in Environmental
Science (MBSTU)
Technical Manager

Approved By:
Shorov Roy
B.Sc. in ESRM (MBSTU)
MS in Environmental Science
(BAU)
Quality Manager

Address: House #9 (3rd Flr), Road # 6, Sector # 12, Uttara, Dhaka-1230, Bangladesh, Cell: 01925487029,
Phone: +88 0255087283, Web: www.envirocarebd.com, Email: info@envirocarebd.com

5



Ref: ECIL/2023/01-25

Result of Groundwater Quality

Name of the Project	Design, Supply, Installation, Testing and Commissioning of 230/132/33 kV GIS substation at Rupsha and 132/33 kV GIS substation at Phultola, Monirampur, Maheshpur, Meherpur on turnkey basis.
Name of the Substation	132/33 kV GIS Substation Meherpur
Sample Collected By	Envirocare Technical Team
Collection Date	January 18, 2023
Reporting Date	January 30, 2023

Sampling Location

Location	ID	GPS Coordinates
Selfie Feeling Station in Meherpur	SSS_GW 01	23°47'30.24"N 88°40'48.14"E

Description of Analysis

Parameter	Unit	Concentration Present SSS_GW 01	Bangladesh ECR-1997*	WHO- 2011**	Analysis Method
pH	-	6.96	6.5-8.5	6.5-8.5	Electrometric
Turbidity	NTU	1.41	10	5	Nephelometric method
Electrical Conductivity (EC)	µS/cm	218.68	NYS	NYS	Electrometric
Chloride	mg/l	21	150-600	250	Argentometric
Iron (Fe)	mg/l	0.167	0.3-1.0	0.3	AAS
Manganese (Mn)	mg/l	0.085	0.1	0.4	AAS
Arsenic (As)	mg/l	<0.01	0.05	0.01	AS-test kit
Total Coliform (TC)	CFU/100 ml	0	0	0	Membrane Filtration

* Data Source: Envirocare Laboratory, Dhaka; Date: 30 January 2023; Standard: ECR, 1997 [Schedule-3B] and WHO 2011

Prepared By
Md. Sijuddin
Junior Environmental Specialist
EnviroCare International Limited



Checked By
Sanjoy Kumar Mondol
Technical Manager
EnviroCare International Limited

Approved By
Shorov Roy
Quality Manager
EnviroCare International Limited

Address: House #9 (3rd Flr), Road # 6, Sector # 12, Uttara, Dhaka-1230, Bangladesh. Cell: 01925687029,
Phone: +88 0255087283, Web: www.envirocarebd.com, Email: info@envirocarebd.com

5

Appendix D-4: Monirampur 132/33 kV GIS Substation


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Ref: EIL/2023/1912

ENVIROCARE ENVIRONMENTAL LABORATORY**Results of Ambient Air Quality Analysis**

Name of Project	Design, Supply, Installation, Testing and Commissioning of 230/132/33 kV GIS substation at Rupsha and 132/33 kV GIS substation at Phultola, Monirampur, Maheshpur, Meherpur on turnkey basis
Name of the Substation	132/33 kV GIS Substation Monirampur
Description of sample	Ambient Air Quality Analysis
Sample Collector	Envirocare Technical Team
Sample Date	January 09, 2023 to January 11, 2023
Date of Analysis	January 12, 2023 to January 22, 2023

Monitoring Location

Location	ID	GPS Coordinates
Near 132/33 kV GIS Substation Monirampur	SS3_AQ1	22°58'34.73"N 89°13'44.69"E
Baitullah Jame Mosque	SS3_AQ2	22°58'43.47"N 89°13'47.66"E
Near Ranagar Secondary School	SS3_AQ3	22°58'13.97"N 89°13'42.00"E
Lauri Madrasa Bazar	SS3_AQ4	22°58'26.84"N 89°13'41.27"E
Nearest Residential Area	SS3_AQ5	22°58'36.81"N 89°13'44.17"E

Description of Analysis

Sample ID	PM _{2.5} (µg/m ³)	PM ₁₀ (µg/m ³)	SPM (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)	CO (mg/m ³)	Lead (µg/m ³)
SS3_AQ1	52.5	77.4	165.9	23.3	34.4	0.27	0.02
SS3_AQ2	51.9	98.9	184.4	127.8	87.5	2.13	0.04
SS3_AQ3	49.2	72.7	158.6	21.6	30.1	0.26	0.02
SS3_AQ4	50.6	76.1	162.8	19.2	29.5	0.19	0.02
SS3_AQ5	47.7	63.3	160.6	19.3	28.8	0.21	0.01
Duration (Hours)	24	24	8	24	8	8	8
Bangladesh Standard	65	150	200	365	100	10	0.5

* Standard: Air Pollution Control Rules 2022

Prepared By
Md. Sijuddin
Junior Environmental
Specialist
Envirocare International
Limited



Reviewed By
Sanjoy Kumar Mondol
Technical Manager
Envirocare International
Limited

Approved By:
Shorov Roy
Quality Manager
Envirocare International Limited

Address: House #9 (3rd Flr), Road # 6, Sector # 12, Uttara, Dhaka-1230, Bangladesh. Cell: 01925687029,
Phone: +88 0255087283, Web: www.envirocarebd.com, Email: info@envirocarebd.com



EnviroCare
International Ltd.

A house of Inspection, Testing, Assessment & Consultancy

Results of Noise Level Analysis

Name of Project	: Design, Supply, Installation, Testing and Commissioning of 230/132/33 kV GIS substation at Rupsha and 132/33 kV GIS substation at Phultola, Monirampur, Maheshpur, Meherpur on turnkey basis.
Name of Substation	: 132/33 kV GIS Substation Monirampur
Description of sample	: Sample was collected from project area
Sample Collector	: Collected by Envirocare Technical Team
Sample Date	: January 09, 2023 to January 11, 2023
Date of Analysis	: January 12, 2023 to January 14, 2023

Result analysis:

Location ID	Monitoring Time	Noise level [dB(A)]			Standard* (dBA)	Land Use Category
		Leq	L _{max}	L _{min}		
SS3_NL 01	Day	51.08	76.1	39.4	60	Mixed
	Night	42.41	59.6	34.5	50	
SS3_NL 02	Day	72.32	80.3	59.7	75	Industrial
	Night	59.62	63.0	56.7	70	
SS3_NL 03	Day	73.98	78.0	57.3	70	Commercial
	Night	57.30	60.7	54.4	60	
SS3_NL 04	Day	72.32	79.3	58.7	70	Commercial
	Night	54.34	57.7	41.4	60	
SS3_NL 05	Day	52.18	74.2	43.5	60	Mixed
	Night	42.50	55.9	34.6	50	

*Standard: The Environment Conservation Rules (ECR), 1997 and Subsequent amendment in 2006.



Golam

Prepared By:
Md. Golam Saclayen
B.Sc. in Environmental Science
and Resource Management
(MBSTU)
Environmental Analyst

Sanjoy

Reviewed By:
Sanjoy Kumar Mondol
B.Sc. in ESRM
(MBSTU)
MS in Environmental
Science (MBSTU)
Technical Manager

Shorov

Approved By:
Shorov Roy
B.Sc. in ESRM (MBSTU)
MS in Environmental Science
(BAU)
Quality Manager

Address: House #9 (3rd Flr), Road # 6, Sector # 12, Uttara, Dhaka-1230, Bangladesh. Cell: 01925687029.
Phone: +88 0255087283, Web: www.envirocarebd.com, Email: info@envirocarebd.com



Ref: ECIL/2023/01-28

Results of Surface Water Analysis

Name of Project	Design, Supply, Installation, Testing and Commissioning of 230/132/33 kV GIS substation at Rupsha and 132/33 kV GIS substation at Phullola, Monirampur, Maheshpur, Meherpur on turnkey basis
Name of the Substation	132/33 kV GIS substation at Monirampur
Description of sample	Surface water Quality Analysis
Sample Collector	Envirocare Technical Team
Sample Date	January 11, 2023
Report Date	January 30, 2023

Result analysis:

Parameters	Unit	Concentration Present	ECR'97 Standard*		
		SS3_SWt	b	d	f
pH	-	5.87	6.5-8.5	6.5-8.5	6.5-8.5
Biochemical Oxygen Demand (BOD)	mg/L	1.5	3 or less	6 or less	10 or less
Chemical Oxygen Demand (COD)	mg/L	13	NYS	NYS	NYS
Dissolved Oxygen (DO)	mg/L	4.86	5 or more	5 or more	5 or more
Total Dissolved Solid (TDS)	mg/L	578	NYS	NYS	NYS
Total Suspended Solid (TSS)	mg/L	3.3	NYS	NYS	NYS
Nitrogen	mg/L	0.084	NYS	NYS	NYS
Ammonium	mg/L	0.21	NYS	NYS	NYS
Total Coliform	CFU/100ml	5.8 × 10 ²	200 or Less	NYS	1000 or less
Turbidity	NTU	7.34	NYS	NYS	NYS
Temperature	°C	25	NYS	NYS	NYS
Oil & Grease	mg/L	1.1	NYS	NYS	NYS

*The Environment Conservation Rules (ECR) 1997, Schedule 3-A Standard for Inland Surface Water (b,d,f).

* The parameters were measured in ECL Laboratory.



Prepared By
Md. Golam Saqlayen
B.Sc. in Environmental Science
and Resource Management
(MBSTU)
Environmental Analyst

Reviewed By
Sanjoy Kumar Mondol
B.Sc. in ESRM
(MBSTU)
MS in Environmental
Science (MBSTU)
Technical Manager

Approved By:
Shorov Roy
B.Sc. in ESRM (MBSTU)
MS in Environmental Science
(BAU)
Quality Manager

Address: House #9 (3rd Flr), Road # 6, Sector # 12, Uttara, Dhaka-1230, Bangladesh. Cell: 01925667029,
Phone: +88 0255087283, Web: www.envirocarebd.com, Email: info@envirocarebd.com



Ref: ECIL/2023/01-23

Result of Groundwater Quality

Name of the Project	Design, Supply, Installation, Testing and Commissioning of 230/132/33 kV GIS substation at Rupsha and 132/33 kV GIS substation at Phultola, Monirampur, Maheshpur, Meherpur on turnkey basis.
Name of the Substation	132/33 kV GIS Substation Monirampur
Sample Collected By	Envirocare Technical Team
Collection Date	January 11, 2023
Reporting Date	January 30, 2023

Sampling Location

Location	ID	GPS Coordinates
Baitullah Jame Mosque in Monirampur	SS3_GW 01	22°58'42.75"N 89°13'47.31"E

Description of Analysis

Parameter	Unit	Concentration Present	Bangladesh ECR-1997*	WHO-2011**	Analysis Method
		SS3_GW 01			
pH	-	6.84	6.5-8.5	6.5-8.5	Electrometric
Turbidity	NTU	1.51	10	5	Nephelometric method
Electrical Conductivity (EC)	µS/cm	332.22	NYS	NYS	Electrometric
Chloride	mg/l	19	150-600	250	Argentometric
Iron (Fe)	mg/l	0.091	0.3-1.0	0.3	AAS
Manganese (Mn)	mg/l	0.098	0.1	0.4	AAS
Arsenic (As)	mg/l	<0.01	0.05	0.01	AS-test kit
Total Coliform (TC)	CFU/100 ml	0	0	0	Membrane Filtration

* Data Source: Envirocare Laboratory, Dhaka, Date: 30 January 2023; Standard: ECR, 1997 [Schedule-3B] and WHO 2011.


Prepared By
 Md. Sijuddin
 Junior Environmental Specialist
 EnviroCare International Limited




Checked By
 Sanjoy Kumar Mondol
 Technical Manager
 EnviroCare International Limited


Approved By
 Shorov Roy
 Quality Manager
 EnviroCare International Limited

Address: House #9 (3rd Flr), Road # 6, Sector # 12, Uttara, Dhaka-1230, Bangladesh. Call: 01925687029,
 Phone: +88 0255087283, Web: www.envirocarebd.com, Email: info@envirocarebd.com

Appendix D-5: Maheshpur 132/33 kV GIS Substation



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Ref: EIL/2023/1913

ENVIROCARE ENVIRONMENTAL LABORATORY

Results of Ambient Air Quality Analysis

Name of Project	Design, Supply, Installation, Testing and Commissioning of 230/132/33 kV GIS substation at Rupsha and 132/33 kV GIS substation at Phultola, Monirampur, Maheshpur, Meherpur on turnkey basis
Name of the Substation	132/33 kV GIS Substation Maheshpur
Description of sample	Ambient Air Quality Analysis
Sample Collector	Envirocare Technical Team
Sample Date	January 12, 2023 to January 15, 2023
Date of Analysis	January 16, 2023 to January 28, 2023

Monitoring Location

Location	ID	GPS Coordinates
Near 132/33 kV GIS Substation Maheshpur	SS4_AQ1	23°20'33.18"N 88°54'43.78"E
Near Residential Area near Boga Jame Mosque	SS4_AQ2	23°20'20.98"N 88°54'31.37"E
Barren Land	SS4_AQ3	23°20'23.60"N 88°54'51.82"E
Near Chou-Rasta (Al Amin Confectionery)	SS4_AQ4	23°20'41.27"N 88°54'44.55"E
Near Residential Area	SS4_AQ5	23°20'32.69"N 88°54'39.29"E

Description of Analysis

Sample ID	PM _{2.5} (µg/m ³)	PM ₁₀ (µg/m ³)	SPM (µg/m ³)	SO ₂ (µg/m ³)	NO ₂ (µg/m ³)	CO (mg/m ³)	Lead (µg/m ³)
SS4_AQ1	51.7	73.3	178.8	28.4	33.4	0.37	0.04
SS4_AQ2	49.4	71.9	168.4	19.5	26.5	0.16	0.01
SS4_AQ3	46.6	68.4	162.3	17.9	27.8	0.25	0.01
SS4_AQ4	52.9	65.5	168.2	26.5	28.7	0.18	0.03
SS4_AQ5	50.2	61.4	171.9	18.2	25.9	0.14	0.02
Duration (Hours)	24	24	8	24	8	8	8
Bangladesh Standard	65	150	200	365	100	10	0.5

* Standard: Air Pollution Control Rules 2022

[Signature]



Prepared By:
Md. Sijuddin
Junior Environmental
Specialist
Envirocare International
Limited

[Signature]

Reviewed By:
Sanjoy Kumar Mondol
Technical Manager
Envirocare International
Limited

[Signature]

Approved By:
Shorov Roy
Quality Manager
Envirocare International Limited

Address: House #8 (3rd Flr), Road # 6, Sector # 12, Uttara, Dhaka-1230, Bangladesh. Cell: 01925687029,
Phone: +88 0255087283, Web: www.envirocarebd.com, Email: info@envirocarebd.com



A house of Inspection, Testing, Assessment & Consultancy

Results of Noise Level Analysis

Name of Project	: Design, Supply, Installation, Testing and Commissioning of 230/132/33 kV GIS substation at Rupsha and 132/33 kV GIS substation at Phultola, Monirampur, Maheshpur, Meherpur on turnkey basis.
Name of Substation	: 132/33 kV GIS Substation Maheshpur
Description of sample	: Sample was collected from project area
Sample Collector	: Collected by Envirocare Technical Team
Sample Date	: January 12, 2023 to January 15, 2023
Date of Analysis	: January 16, 2023 to January 18, 2023

Result analysis:

Location ID	Monitoring Time	Noise level [dB(A)]			Standard* (dBA)	Land Use Category
		Leq	L _{max}	L _{min}		
SS4_NL 01	Day	58.08	66.1	43.4	60	Mixed
	Night	46.41	59.8	34.5	50	
SS4_NL 02	Day	68.32	74.3	59.7	70	Commercial
	Night	49.62	63.0	56.7	60	
SS4_NL 03	Day	52.98	61.0	37.3	60	Mixed
	Night	47.30	50.7	34.4	50	
SS4_NL 04	Day	71.32	79.3	58.7	60	Mixed
	Night	54.34	57.7	48.4	50	
SS4_NL 05	Day	56.18	74.2	43.5	60	Mixed
	Night	42.50	55.9	35.6	50	

*Standard: The Environment Conservation Rules (ECR), 1997 and Subsequent amendment in 2006.



Gulam

Prepared By
Md. Golam Saqlayen
B.Sc. in Environmental Science
and Resource Management
(MBSTU)
Environmental Analyst

Sanjoy

Reviewed By
Sanjoy Kumar Mondol
B.Sc. in ESRM
(MBSTU)
MS in Environmental
Science (MBSTU)
Technical Manager

Shorov

Approved By:
Shorov Roy
B.Sc. in ESRM (MBSTU)
MS in Environmental Science
(BAU)
Quality Manager

Address: House #9 (3rd Flr), Road # 6, Sector # 12, Uttara, Dhaka-1250, Bangladesh. Cell: 01925687029,
Phone: +88 0255087283, Web: www.envirocarebd.com, Email: info@envirocarebd.com



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International Ltd.

A house of Inspection, Testing, Assessment & Consultancy

Ref: ECIL/2023/01-29

Results of Surface Water Analysis

Name of Project	Design, Supply, Installation, Testing and Commissioning of 230/132/33 kV GIS substation at Rupsha and 132/33 kV GIS substation at Phultola, Monirampur, Maheshpur, Meherpur on turnkey basis
Name of the Substation	132/33 kV GIS substation at Maheshpur
Description of sample	Surface water Quality Analysis
Sample Collector	Envirocare Technical Team
Sample Date	January 15, 2023
Report Date	January 30, 2023

Result analysis:

Parameters	Unit	Concentration Present SS4_SW1	ECR'97 Standard*		
			b	d	f
pH	-	7.2	6.5-8.5	6.5-8.5	6.5-8.5
Biochemical Oxygen Demand (BOD)	mg/L	1.5	3 or less	6 or less	10 or less
Chemical Oxygen Demand (COD)	mg/L	19	NYS	NYS	NYS
Dissolved Oxygen (DO)	mg/L	5.88	5 or more	5 or more	5 or more
Total Dissolved Solid (TDS)	mg/L	368	NYS	NYS	NYS
Total Suspended Solid (TSS)	mg/L	3.5	NYS	NYS	NYS
Nitrogen	mg/L	0.046	NYS	NYS	NYS
Ammonium	mg/L	0.27	NYS	NYS	NYS
Total Coliform	CFU/100ml	5.5 × 10 ²	200 or Less	NYS	1000 or less
Turbidity	NTU	4.54	NYS	NYS	NYS
Temperature	°C	26.5	NYS	NYS	NYS
Oil & Grease	mg/L	1.0	NYS	NYS	NYS

*The Environment Conservation Rules (ECR) 1997, Schedule 3-A Standard for Inland Surface Water (b,d,f).

* The parameters were measured in ECL Laboratory.



[Signature]

Prepared By
Md. Golam Saclayen
B.Sc. in Environmental Science
and Resource Management
(MBSTU)
Environmental Analyst

[Signature]

Reviewed By
Sanjoy Kumar Mondol
B.Sc. in ESRM
(MBSTU)
MS in Environmental
Science (MBSTU)
Technical Manager

[Signature]

Approved By:
Shorov Roy
B.Sc. in ESRM (MBSTU)
MS in Environmental Science
(BAU)
Quality Manager

Address: House #9 (3rd Flr), Road # 6, Sector # 12, Uttara, Dhaka-1230, Bangladesh. Cell: 01925687029,
Phone: +88 0255087283, Web: www.envirocarebd.com, Email: info@envirocarebd.com



Ref: ECIL/2023/01-24

Result of Groundwater Quality

Name of the Project	Design, Supply, Installation, Testing and Commissioning of 230/132/33 kV GIS substation at Rupsha and 132/33 kV GIS substation at Phultola, Monirampur, Maheshpur, Meherpur on turnkey basis.
Name of the Substation	132/33 kV GIS Substation Maheshpur
Sample Collected By	Envirocare Technical Team
Collection Date	January 15, 2023
Reporting Date	January 30, 2023

Sampling Location

Location	ID	GPS Coordinates
Residential Area near substation in Maheshpur	SS4_GW 01	23°20'32.62"N 88°54'39.59"E

Description of Analysis

Parameter	Unit	Concentration Present SS4_GW 01	Bangladesh ECR-1997*	WHO- 2011**	Analysis Method
pH	-	6.90	6.5-8.5	6.5-8.5	Electrometric
Turbidity	NTU	0.88	10	5	Nephelometric method
Electrical Conductivity (EC)	µS/cm	283.71	NYS	NYS	Electrometric
Chloride	mg/l	16	150-600	250	Argentometric
Iron (Fe)	mg/l	0.078	0.3-1.0	0.3	AAS
Manganese (Mn)	mg/l	0.068	0.1	0.4	AAS
Arsenic (As)	mg/l	<0.01	0.05	0.01	AS-test kit
Total Coliform (TC)	CFU/100 ml	0	0	0	Membrane Filtration

* Data Source: Envirocare Laboratory, Dhaka; Date: 30 January 2023; Standard: ECR, 1997 [Schedule-3B] and WHO 2011

Prepared By
Md. Sijuddin
Junior Environmental Specialist
EnviroCare International Limited



Checked By
Sanjoy Kumar Mondol
Technical Manager
EnviroCare International Limited

Approved By
Shorov Roy
Quality Manager
EnviroCare International Limited

Address: House #9 (3rd Flr), Road # 6, Sector # 12, Uttara, Dhaka-1230, Bangladesh. Cell: 01925687029,
Phone: +88 0255087283, Web: www.envirocarebd.com, Email: info@envirocarebd.com

Appendix D-6: Phultola 132/33 kV GIS Substation


EnviroCare
 International Ltd.

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Ref: EIL/2023/1911

ENVIROCARE ENVIRONMENTAL LABORATORY**Results of Ambient Air Quality Analysis**

Name of Project	Design, Supply, Installation, Testing and Commissioning of 230/132/33 kV GIS substation at Rupsha and 132/33 kV GIS substation at Phultola, Monirampur, Maheshpur, Meherpur on turnkey basis
Name of the Substation	132/33 kV GIS Substation Phultola
Description of sample	Ambient Air Quality Analysis
Sample Collector	Envirocare Technical Team
Sample Date	January 05, 2023 to January 08, 2023
Date of Analysis	January 09, 2023 to January 19, 2023

Monitoring Location

Location	ID	GPS Coordinates
Near 132/33 kV GIS Substation Phultola	SS2_AQ1	22°55'24.53"N 89°29'8.10"E
Md. Ariful Islam House near the Road	SS2_AQ2	22°55'12.26"N 89°29'5.72"E
Near BKSP Khulna	SS2_AQ3	22°55'43.57"N 89°29'8.43"E
Local Residential Area	SS2_AQ4	22°55'20.21"N 89°29'18.79"E
Housing area opposite side of the FR Jute Mills Ltd.	SS2_AQ5	22°55'24.53"N 89°29'8.10"E

Description of Analysis

Sample ID	PM _{2.5} (µg/m ³)	PM ₁₀ (µg/m ³)	SPM (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)	CO (mg/m ³)	Lead (µg/m ³)
SS2_AQ1	50.5	71.5	170.7	24.7	33.6	0.48	0.03
SS2_AQ2	48.9	69.9	176.3	21.2	30.0	0.32	0.02
SS2_AQ3	53.0	70.8	180.2	20.0	31.5	0.41	0.04
SS2_AQ4	45.9	60.5	153.1	17.1	21.1	0.19	0.01
SS2_AQ5	48.6	70.7	172.5	22.3	24.9	0.31	0.01
Duration (Hours)	24	24	8	24	8	8	8
Bangladesh Standard	65	150	200	365	100	10	0.5

* Standard: Air Pollution Control Rules 2022

Prepared By
 Md. Sijuddin
 Junior Environmental
 Specialist
 Envirocare International
 Limited



Reviewed By
 Sanjoy Kumar Mondol
 Technical Manager
 Envirocare International
 Limited

Approved By:
 Shorov Roy
 Quality Manager
 Envirocare International Limited

Address: House #9 (3rd Flr), Road # 6, Sector # 12, Uttara, Dhaka-1230, Bangladesh. Cell: 01925687029,
 Phone: +88 0255087283, Web: www.envirocarebd.com, Email: info@envirocarebd.com



Results of Noise Level Analysis

Name of Project	: Design, Supply, Installation, Testing and Commissioning of 230/132/33 kV GIS substation at Rupsha and 132/33 kV GIS substation at Phultola, Monirampur, Maheshpur, Meherpur on turnkey basis.
Name of Substation	: 132/33 kV GIS Substation Phultola
Description of sample	: Sample was collected from project area
Sample Collector	: Collected by Envirocare Technical Team
Sample Date	: January 05, 2023 to January 08, 2023
Date of Analysis	: January 09, 2023 to January 11, 2023

Result analysis:

Location ID	Monitoring Time	Noise level [dB(A)]			Standard* (dBA)	Land Use Category
		Leq	L _{max}	L _{min}		
SS2_NL 01	Day	71.08	76.1	55.4	75	Industrial
	Night	59.41	59.8	53.5	70	
SS2_NL 02	Day	59.32	69.3	48.7	60	Mixed
	Night	44.34	67.7	33.4	50	
SS2_NL 03	Day	57.32	80.3	41.7	60	Mixed
	Night	45.62	63.0	36.7	50	
SS2_NL 04	Day	50.18	68.2	39.5	55	Residential
	Night	37.50	65.9	32.6	45	
SS2_NL 05	Day	49.18	58.2	35.5	55	Residential
	Night	36.50	55.9	30.6	45	

*Standard: The Environment Conservation Rules (ECR), 1997 and Subsequent amendment in 2006.



[Signature]

Prepared By
Md. Golam Saclayen
B.Sc. in Environmental Science
and Resource Management
(MBSTU)
Environmental Analyst

[Signature]

Reviewed By
Sanjoy Kumar Mondol
B.Sc. in ESRM
(MBSTU)
MS in Environmental
Science (MBSTU)
Technical Manager

[Signature]

Approved By:
Shorov Roy
B.Sc. in ESRM (MBSTU)
MS in Environmental Science
(BAU)
Quality Manager

Address: House #9 (3rd Flr), Road # 6, Sector # 12, Uttara, Dhaka-1230, Bangladesh. Cell: 01925687029,
Phone: +88 0255087283, Web: www.envirocarebd.com, Email: info@envirocarebd.com





Ref: ECIL/2023/01-27

Results of Surface Water Analysis

Name of Project	Design, Supply, Installation, Testing and Commissioning of 230/132/33 kV GIS substation at Rupsha and 132/33 kV GIS substation at Phutola, Monirampur, Maheshpur, Meherpur on turnkey basis
Name of the Substation	132/33 kV GIS substation at Phutola
Description of sample	Surface water Quality Analysis
Sample Collector	Envirocare Technical Team
Sample Date	January 08, 2023
Report Date	January 30, 2023

Result analysis:

Parameters	Unit	Concentration Present SS2, SW1	ECR'97 Standard*		
			b	d	f
pH	-	6.8	6.5-8.5	6.5-8.5	6.5-8.5
Biochemical Oxygen Demand (BOD)	mg/L	1.7	3 or less	6 or less	10 or less
Chemical Oxygen Demand (COD)	mg/L	13	NYS	NYS	NYS
Dissolved Oxygen (DO)	mg/L	4.19	5 or more	5 or more	5 or more
Total Dissolved Solid (TDS)	mg/L	672	NYS	NYS	NYS
Total Suspended Solid (TSS)	mg/L	4.3	NYS	NYS	NYS
Nitrogen	mg/L	0.078	NYS	NYS	NYS
Ammonium	mg/L	0.43	NYS	NYS	NYS
Total Coliform	CFU/100ml	6.5×10^3	200 or Less	NYS	1000 or less
Turbidity	NTU	7.92	NYS	NYS	NYS
Temperature	°C	25.4	NYS	NYS	NYS
Oil & Grease	mg/L	1.5	NYS	NYS	NYS

*The Environment Conservation Rules (ECR) 1997, Schedule 3-A Standard for Inland Surface Water (b,d,f).

* The parameters were measured in ECL Laboratory.



Prepared By
Md. Golam Saclayen
B.Sc. in Environmental Science
and Resource Management
(MBSTU)
Environmental Analyst

Reviewed By
Sanjoy Kumar Mondol
B.Sc. in ESRM
(MBSTU)
MS in Environmental
Science (MBSTU)
Technical Manager

Approved By:
Shorav Roy
B.Sc. in ESRM (MBSTU)
MS in Environmental Science
(BAU)
Quality Manager

Address: House #9 (3rd Flr), Road # 6, Sector # 12, Uttara, Dhaka-1230, Bangladesh. Cell: 01925687029,
Phone: +88-0255087283, Web: www.envirocarebd.com, Email: info@envirocarebd.com



Ref: ECIL/2023/01-22

Result of Groundwater Quality

Name of the Project	Design, Supply, Installation, Testing and Commissioning of 230/132/33 kV GIS substation at Rupsha and 132/33 kV GIS substation at Phultola, Monirampur, Maheshpur, Meherpur on turnkey basis.
Name of the Substation	132/33 kV GIS Substation Phultola
Sample Collected By	Envirocare Technical Team
Collection Date	January 08, 2023
Reporting Date	January 30, 2023

Sampling Location

Location	ID	GPS Coordinates
Md. Afifur Islam House near the Road at Phultola	SS2_GW 01	22°55'11.04"N 89°29'6.68"E

Description of Analysis

Parameter	Unit	Concentration Present SS2_GW 01	Bangladesh ECR-1997*	WHO- 2011**	Analysis Method
pH	-	6.84	6.5-8.5	6.5-8.5	Electrometric
Turbidity	NTU	0.81	10	5	Nephelometric method
Electrical Conductivity (EC)	µS/cm	395.31	NYS	NYS	Electrometric
Chloride	mg/l	24	150-600	250	Argentometric
Iron (Fe)	mg/l	0.244	0.3-1.0	0.3	AAS
Manganese (Mn)	mg/l	0.148	0.1	0.4	AAS
Arsenic (As)	mg/l	<0.01	0.05	0.01	AS-test kit
Total Coliforms (TC)	CFU/100 ml	0	0	0	Membrane Filtration

* Data Source: Envirocare Laboratory, Dhaka; Date: 30 January 2023; Standard: ECR/1997 [Schedule-3B] and WHO 2011

Prepared By
Md. Sijuddin
Junior Environmental Specialist
EnviroCare International Limited



Checked By
Sanjoy Kumar Mondol
Technical Manager
EnviroCare International Limited

Approved By
Shorov Roy
Quality Manager
EnviroCare International Limited

Address: House #9 (3rd Flr), Road # 6, Sector # 12, Uttara, Dhaka-1230, Bangladesh. Cell: 01925687029,
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