

Final Addendum to Initial Environmental Examination

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September 2024**

Bangladesh: Dhaka and Western Zone Transmission Grid Expansion Project

Addendum- 5 (Package 2 and 5)- Part A

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

**Rampura- Bashundhara 132kV Underground Cable Line (package 2
400/230 kV GIS Substation at Fuldigram, Boktarpur, Kapasia Road, Kaliganj, Gazipur
400/230 kV GIS Substation at Mothbari, Kaliganj, Gazipur. under Package 5**



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

September 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	Underground Cable 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

Introduction

- i. This report is an addendum to the original Initial Environmental Examination (IEE) report approved by the Asian Development Bank (ADB) in July 2019. It focuses specifically on the Rampura-Bashundhara 132kV Underground Cable Line (Package 2) and two substations, the 400/230 kV GIS Substation at Fuldigram Boktarpur Kapasia Road, Kaliganj, Gazipur, and the 400/230 kV GIS Substation at Mothbari, Kaliganj, Gazipur, under Packages 5 and 6 respectively. This addendum considers the final alignment by the EPC Contractor and assesses the risks and impacts to formalize the management plan. The original IEE remains applicable, covering detailed project descriptions, baseline data, impact assessments, and management plans.

Objectives of the Initial Environmental Examination

- ii. The project's implementation may have both negative and positive impacts on the surrounding environment, influenced by environmental sensitivities and the design of responsive mitigation measures. These impacts encompass physical, ecological, and socio-economic dimensions. This project is categorized as Environmental Category B based on a rapid environmental assessment and ADB's Safeguard Policy Statement (SPS) 2009. For Category B projects, environmental impacts are site-specific and mostly reversible. An Initial Environmental Examination (IEE) is essential to address these impacts and suggest appropriate mitigation measures in the Environmental Management Plan (EMP). The IEE report adheres to the requirements of ADB's SPS 2009.

Scope of Work

- iii. The scope of the IEE involves:
 - Conducting field visits to collect data relevant to the study area and establishing the baseline environmental status.
 - Assessing impacts on environmental attributes due to the location, design, construction, and operation of the proposed project.
 - Identifying critical environmental parameters to be monitored post-implementation.
 - Consulting local people to gather public perception regarding the project.
 - Preparing an EMP and an Environmental Monitoring Plan (EMoP) with cost estimates for PGCB's compliance during project implementation.
 - Compiling an IEE report in accordance with ADB's SPS 2009 and national regulations.

Methodology

- iv. The IEE uses a combination of desk studies, field investigations, structured interviews, focus group discussions (FGDs), Google maps, and reports to gather data required for describing the existing environment and assessing potential impacts. Public consultations, both formal and informal, were conducted from March 2024 to April 2024, involving local villagers and Affected Persons (APs).
- v. Secondary data collection included reviewing literature and initial field investigations to prepare a preliminary assessment of the physical and social environment, biodiversity, and conservation significance of the project area. Relevant data were obtained from various government and non-governmental organizations.
- vi. Primary data collection involved field surveys, observations, and stakeholder discussions at key project locations. This approach aimed to understand people's perceptions of the project and its environmental impacts, aiding in the development of the mitigation plan. The primary data covered environmental and socioeconomic aspects, including the status of flora and fauna within the project area, gathered through literature reviews and field observations.

Environmental and Social Baseline

- vii. The baseline environmental status involves assessing the climate, water quality, air quality, noise levels, topography, geology, soil conditions, flood-prone areas, cyclones, river erosion, and agro-ecological zones. This comprehensive assessment helps in understanding the current state of the environment and anticipating potential project impacts.

Impact Assessment and Mitigation

- viii. The impact assessment identifies potential environmental and social impacts during the construction and operation phases of the project. Key areas of concern include the disruption of local ecosystems, noise pollution, air quality degradation, and socio-economic effects on local communities. The EMP outlines specific mitigation measures to address these impacts, including monitoring protocols and responsibilities for implementation.

Public Consultation and Disclosure

- ix. Extensive public consultations were conducted to ensure that the views and concerns of local communities and stakeholders are incorporated into the project planning and implementation. These consultations were crucial for understanding local issues, obtaining community support, and ensuring transparency in the decision-making process. The feedback received helped shape the mitigation measures and overall project approach.

Conclusion

- x. This IEE addendum emphasizes the need for continuous monitoring and adaptive management to mitigate environmental and social impacts. The project is designed to adhere to ADB's SPS 2009 and national regulations, ensuring that the environmental and social well-being of the affected areas is preserved. The successful implementation of the EMP and EMoP will be critical in achieving sustainable project outcomes.
- xi. By addressing the potential impacts and implementing robust mitigation measures, the project aims to balance development needs with environmental conservation and social responsibility.

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; Rampura- Bashundhara 132kV Underground Cable Line (package 2) and two substations, 400/230 kV GIS Substation at Fuldigram, Boktarpur, Kapasia Road, Kaliganj, Gazipur and 400/230 kV GIS Substation at Mothbari, Kaliganj, Gazipur. under Package 5 and 6 respectively. 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

2. In order to prepare this addendum 5, 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 consist of Rampura- Bashundhara 132kV Underground Cable Line (package 2) and two substations, 400/230 kV GIS Substation at Fuldigram, Boktarpur, Kapasia Road, Kaliganj, Gazipur and 400/230 kV GIS Substation at Mothbari, Kaliganj, Gazipur. under Package 5 and 6 respectively. 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 Underground Cable 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, Underground Cable 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 Underground Cable 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 Underground Cable 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.

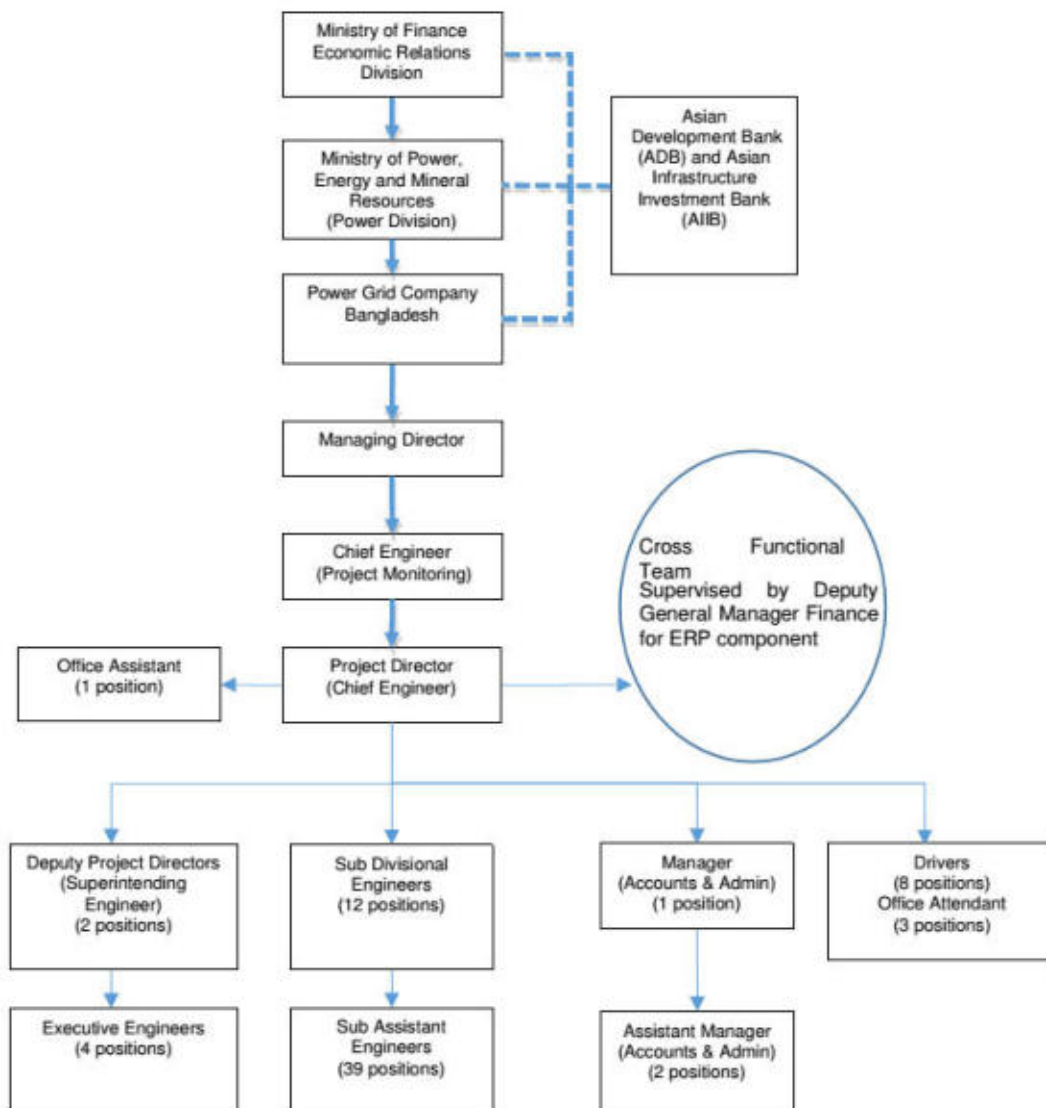
Component 1: Transmission system in Greater Dhaka expanded. The project will construct and commission substations with a total capacity of 4,450 MVA and 40 km of Underground Cable Lines in Greater Dhaka.

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 Underground Cable Lines in the 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.

1.4 Methodology

9. 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.

10. 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 2024 to April 2024.

1.4.1 Secondary Data Collection

11. 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.

12. 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

13. 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

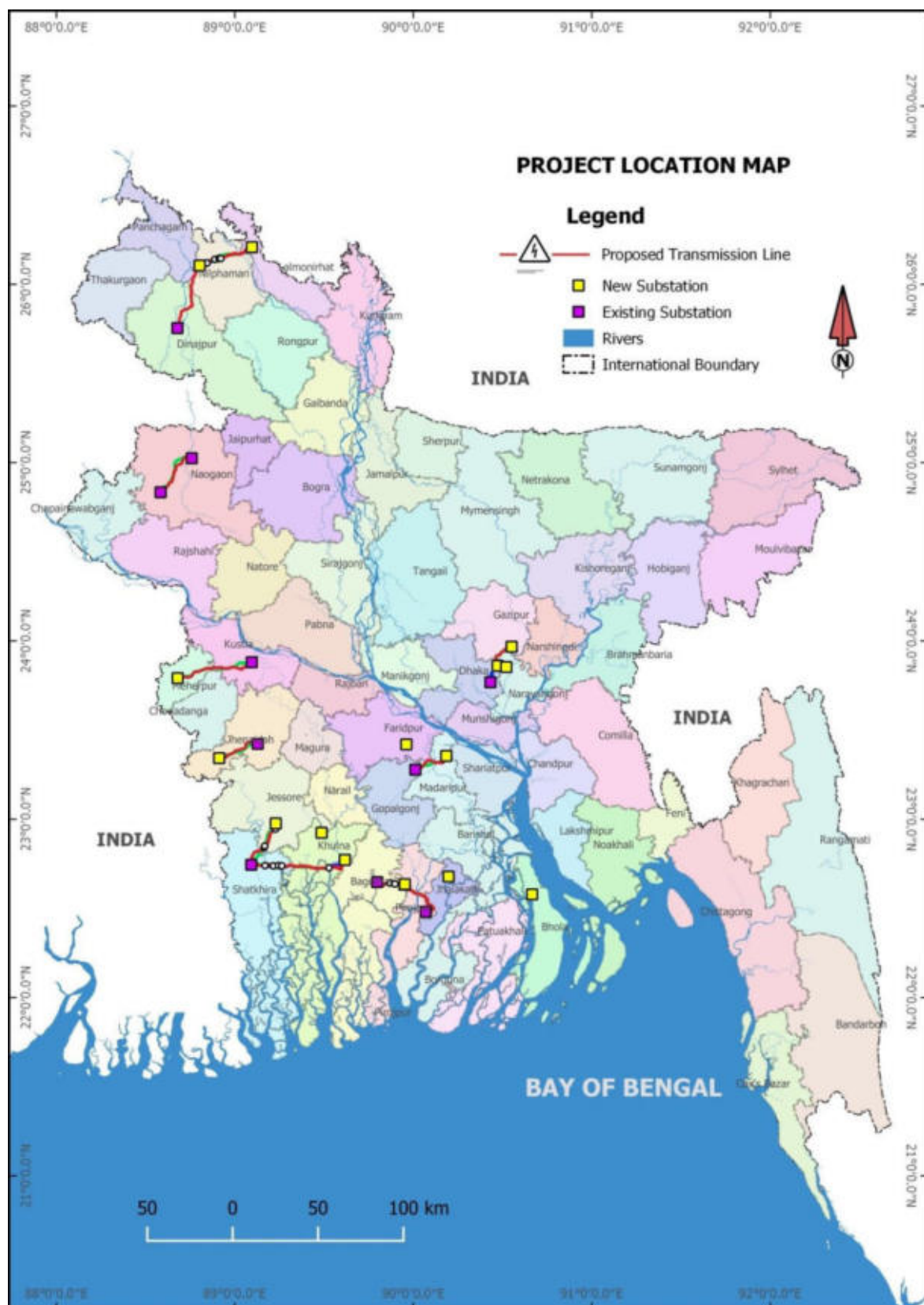
on the people's perceptions of the project and its environmental impacts and possible mitigation measures.

14. Primary data on the environmental and socioeconomic aspects of the project area were collected from September 2023 to February 2024 by the safeguards survey team to comprehensively evaluate the existing environmental baseline conditions of the project area.

15. 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.

16. 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



Source: Power Grid Company of Bangladesh, 2023

2. ADMINISTRATIVE AND LEGAL FRAMEWORK

17. 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.

18. 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	Underground Cable Line will cross Shatarkul lake and Rampura canal 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 Underground Cable 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 the Underground Cable 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.	Underground Cable 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 Underground Cable 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.	Underground Cable 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 Underground Cable 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.	Underground Cable 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	Underground Cable Line will ensure compliance with relevant provisions of this Act
The Protection and Conservation of Fish Act 1950 (amended 1973, 1982, 1995, 2002)	Provides 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.”	Underground Cable Line will ensure compliance with relevant provisions of this Act
Acquisition and Requisition of Immovable	The 2017 Act requires that compensation be paid for (i) land and assets permanently acquired (including houses, trees, and standing	-

Regulation	Brief Description	Remarks
property Act, 2017	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.	Underground Cable 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.	Underground Cable 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 Conservation Rules, 2023. • Manufacturers have to establish individual or joint collection centers and set aside	Underground Cable Line will ensure compliance with relevant provisions of this rules.

Regulation	Brief Description	Remarks
	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 waste hierarchy, such as the 3Rs, segregation, and reduction, must be	Underground Cable Line will ensure compliance with relevant provisions of this regulations.

Regulation	Brief Description	Remarks
	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

19. This addendum is only in respect of one Underground Cable Line; (i) Rampura- Bashundhara 132kV Underground Cable Line (Package 2), and two substations; (i) 400/230 kV GIS Substation at Fuldigram, Boktarpur, Kapasia Road, Kaliganj, Gazipur (Package 5) and (ii) 400/230 kV GIS Substation at Mothbari, Kaliganj, Gazipur (Package 6).

20. Rampura- Bashundhara (Rampura- Bashundhara 132kV Underground Cable Line) was finalized during original IEE (ref: Table 3-1 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
Rampura- Bashundhara 132kV Underground Cable Line	11 Km	DNCC	Dhaka	Dhaka	9 Km
Kaliganj 400/230 kV GIS Substation at Fuldigram, Boktarpur, Kapasia Road, Kaliganj, Gazipur	18.05 acres, Lat: 23.587122N, Lon: 90.325799E;	Kaliganj	Gazipur	Dhaka	18 acres
Purbachal 400/230/132 KV GIS Substation at Mathbari, Kaliganj, Gazipur	14.10 acres, Lat: 23.86195N, 90.47150E; 2.424m land filling	Kaliganj	Gazipur	Dhaka	14 acres

Source PGCB, 2024

3.1 Site Details

3.1.1 Location of the Project Site

21. This addendum is only in respect of one line and two substations; ((i) Rampura- Bashundhara 132kV Underground Cable Line (package 2), and two substations; (i) 400/230 kV GIS Substation at Fuldigram, Boktarpur, Kapasia Road, Kaliganj, Gazipur (Package 5) and (ii) 400/230/132 KV GIS Substation at Purbachal (Package 6). These alignments and substations comprise of one administrative divisions and three districts of Bangladesh: one TL (Underground Cable Line) and two substations located in Dhaka division (Rampura- Bashundhara underground TL, Gazipur and Purbachal). 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 Rampura- Bashundhara 132kV Underground Cable Line alignment covers Bashundhara Upazilla under Dhaka districts. 400/230 kV GIS Substation at Fuldigram, Boktarpur, Kapasia Road, Kaliganj, Gazipur and 400/230/132 KV GIS Substation at Purbachal covers Gazipur and districts. As per the EMP requirement, PGCB avoids housing or school structures directly over the line as the underground cable line route designed beside the road. As per the confirmation from PGCB and on ground site visits, there are no housing or school structures directly over these final routes. The major waterbodies covered in the final routes are canals and a lake, however, the underground cable line will not pose any risk to these wetlands as well as seasonal habitats of wildlife and birds.

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

3.2 Project Details

3.2.1 Rampura-Bashundhara 132kV Double Circuit Transmission Line.

23. Design, Supply, Installation, Testing and Commissioning of 132kV Rampura-Bashundhara Double Circuit Transmission line. Previously, approximately 9.5km Underground Cable line and approximately 1.5km Overhead line to be done under this contract. It has been updated that overhead line replaced with underground cable line.

Underground Cable portion:

24. Approximately 11 km from Rampura substation to Bashundhara substation, 132 kV double circuit underground cables with 6 nos. of single-core Cu 1200mm² XLPE cables and one (1) no. of 48 core optical fiber cable shall be installed.

25. Above mentioned underground cable line will pass through different housing society, may cross underground cable, gas pipeline etc. and will cross canal/khal, roads etc. at different locations through Cable Bridge or Horizontal Directional Drilling (HDD) or any other possible means acceptable to the Employer. The maximum length shall be 200m for HDD.

26. Underground distribution cables of DESCO are located near Power Grid's underground transmission lines in some places. As this transmission line will be terminated at DESCO's Bashundhara 132/33 kV substation, they are aware of the ongoing construction activities. In fact, this line is being constructed at the request of DESCO (Appendix F-1) and Power Grid has communicated with them about the line route (Appendix F-2).

The line passes through the properties of following 04 real estate organizations

1. Eastern Housing Ltd.
2. United Properties Ltd.
3. Swadesh Properties Ltd.
4. East West Property Development Ltd.

Power Grid and the contractor have maintained due consultation with all of these entities, designed the line route with their consent and provided necessary compensations to them (Appendix F-3). Detailed layout plan depicted in Appendix D.

Details of Construction Activities

The installation of underground cables inclusive excavation of cable trenches, cable laying, cable jointing and termination and backfilling the cable trenches and testing and commissioning shall be carried out under the supervision with approved cable manufacturer's engineer(s) who shall have sufficient knowledge and experience in construction of underground 400kV or higher voltage grade XLPE cable circuits. CV of cable engineers mentioning their experiences shall be submitted to the Employer by the Contractor before execution of installation of underground cable circuits for approval. This is a Hold Point. Cable drum shall be unloaded handle and in an approved manner on hard and well drained surface so that they must not sink. In no case shall the drum be stores flat i.e. with flange horizontal rolling of drums shall be avoided. For unreeling of cables, the drum shall be mounted on suitable jacks or on wheels. All possible care shall be taken during unreeling and laying to avoid dusting twist, kink or sharp bends. Bending radio for cables shall be as per manufacturer's recommendations. Manufacture's instruction shall be strictly adhered to and necessary conducting medium shall be provided over the cable outer sheath for checking the healthiness of outer sheath applied. Cable trenches shall be constructed for directly buried cables as per drawings of Drawing Section. Cables shall be installed by direct burial at an average depth of 1.5 meters from finished ground level.

Construction of trench for cable shall also include excavation, preparation of sieved sand bedding, riddled soil cover, supply and installation of concrete protective covers back filling and compacting supply and installation of route marker and joint marker. The Back filling shall be done by the material excavated. However, bigger stones and pieces of rock etc. shall be removed. The cables shall be laid in trefoil formation and shall be surrounded by well compacted shifted sand of approximately 100 mm thickness in all directions from cable surface for protection against damage. Concrete protective covers (RCC slabs) shall be installed/provided directly over the compacted sand over the cable surface, RCC slabs shall sufficiently cover the width of all the cables.

The cable jointing and termination work shall be carried out by experienced cable manufacturer's jointers who shall have adequate skill and experience in jointing a termination of 400kV or higher voltage grade XLPE cables. CV of cable jointers mentioning cable jointing experiences shall be submitted to the Employer by the Contractor before execution of cable jointing for approval. This is a Hold Point. Bidder shall carry out the earthing of cable metallic sheath with the cross bonding system. The sheath/screen shall be bonded to the earth through disconnecting type link boxes at straight through joints and both end of cable terminations to avoid any induced voltage.

3.2.2 400/230KV GIS SUBSTATION AT KALIGANJ

27. A new 400/230 KV indoor GIS substation at Kaliganj shall be connected to Kaliakoir 400/230/132KV Grid Substation and Bhulta 400/230kV Grid Substation through LILO of future Kaliakoir-Bhulta 400kV double circuit line. Also, this substation shall be connected to the upcoming Purbachal 400/230/132kV Grid substation through Purbachal-Kaliganj 400kV double circuit line. Detailed layout plan depicted in **Appendix D**.

28. At 230KV level, Kaliganj 400/230 KV GIS substation shall be connected to Ghorashal 230/132/33KV and Tongi 230/132/33KV through Ghorashal-Tongi 400 KV double circuit line (Initially charged at 230 KV) and LILO of existing Ghorashal-Tongi 230 kV double circuit line. There will also be a double circuit 230KV from under construction Bashundhara 230/132kV GIS substation.

29. The scope of work under this turnkey contract includes design, supply, delivery, installation, testing and commissioning of:

- Complete new 400/230KV indoor GIS substation.
- 400 kV GIS Switchgear with:
 - 400 KV double busbar system
 - Eight (8) Nos. of 400 KV transmission line bays
 - Three (03) Nos. of 400 kV transformer bays
 - Two (2) Nos. of 400 kV bus coupler bay
 - Two (2) Nos. of 400 kV bus section bay for HV testing.
 - Two (2) Nos. of three-phase power autotransformers 400/235/34.5 KV, 520/750 MVA.
- 230 kV GIS Switchgear, with:
 - 230 kV double busbar system
 - Ten (10) Nos. of 230 KV transmission line bays
 - Three (3) Nos. of 230 KV transformer bays
 - Two (2) Nos. of 230 KV bus coupler bays
 - Two (2) Nos. of 230 KV bus section bays.
- 33 KV AIS Switchgear:

- Two (02) Nos. of 33 KV auxiliary/earthing transformer bays.
 - Two (02) Nos. of three-phase, 33/0.415 kV, 700 kVA, auxiliary/earthing transformers.
 - Space for future 6 nos. of 400KV line bays.
 - Space for future 6 nos. of 230KV line bays.
 - Space for third three-phase power autotransformers 400/235/34.5 kV, 520/750 MVA.
 - Space for 400KV bus reactor.
 - SCADA Control for all bays at different voltage levels.
 - Associated substation control and monitoring system, relay protection, metering, telecommunication, AC & DC auxiliary power supply, cables, metal structure, earthing, and lightning protection.
30. Land development of complete switchyard area by cutting, land filling, compacting up to a suitable level including slope protection.
- Complete outdoor civil works, including 400 KV and 230 KV gantry foundation, 400 KV and 230 kV and 33 KV equipment foundation, power transformer and auxiliary transformer foundations, blast wall, substation main gate and guard house, security boundary wall, and internal fencing, access road, internal roads and parking, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes, etc., switchyard surface finishing, and gravel surfacing.
 - Complete civil works and facilities for two new GIS buildings for 400kV & 230 KV GIS and control building separately with basement floor, including foundation works, superstructure works, finishing works like rendering, painting, water supply, sanitary, floor finishing, rainwater drainage system, lightning protection, etc.
 - Complete water supply including deep tube well for drinking water, pump house, pump, water reservoir, water pipelines, etc., sewage facilities including septic tank, etc.
31. The equipment to be supplied, installed, and commissioned is shown on the bid drawings as per the mentioned specification.

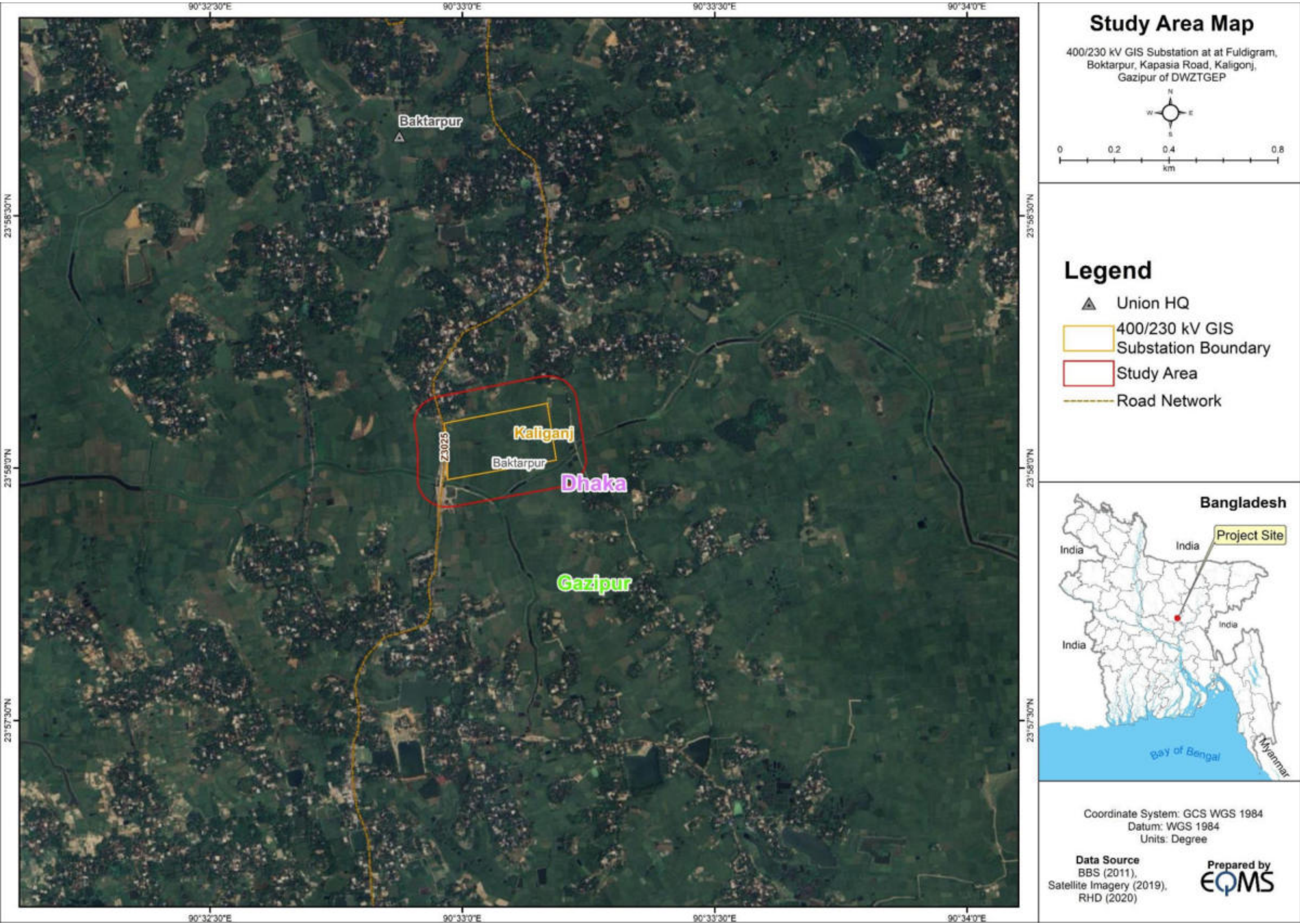
3.2.3 400/230/132KV GIS Substation at Purbachal

32. A new 400/230/132 KV indoor GIS substation at Purbachal shall be constructed. Detailed layout plan depicted in **Appendix D**. The scope of work under this turnkey contract includes design, supply, delivery, installation, testing & commissioning of:

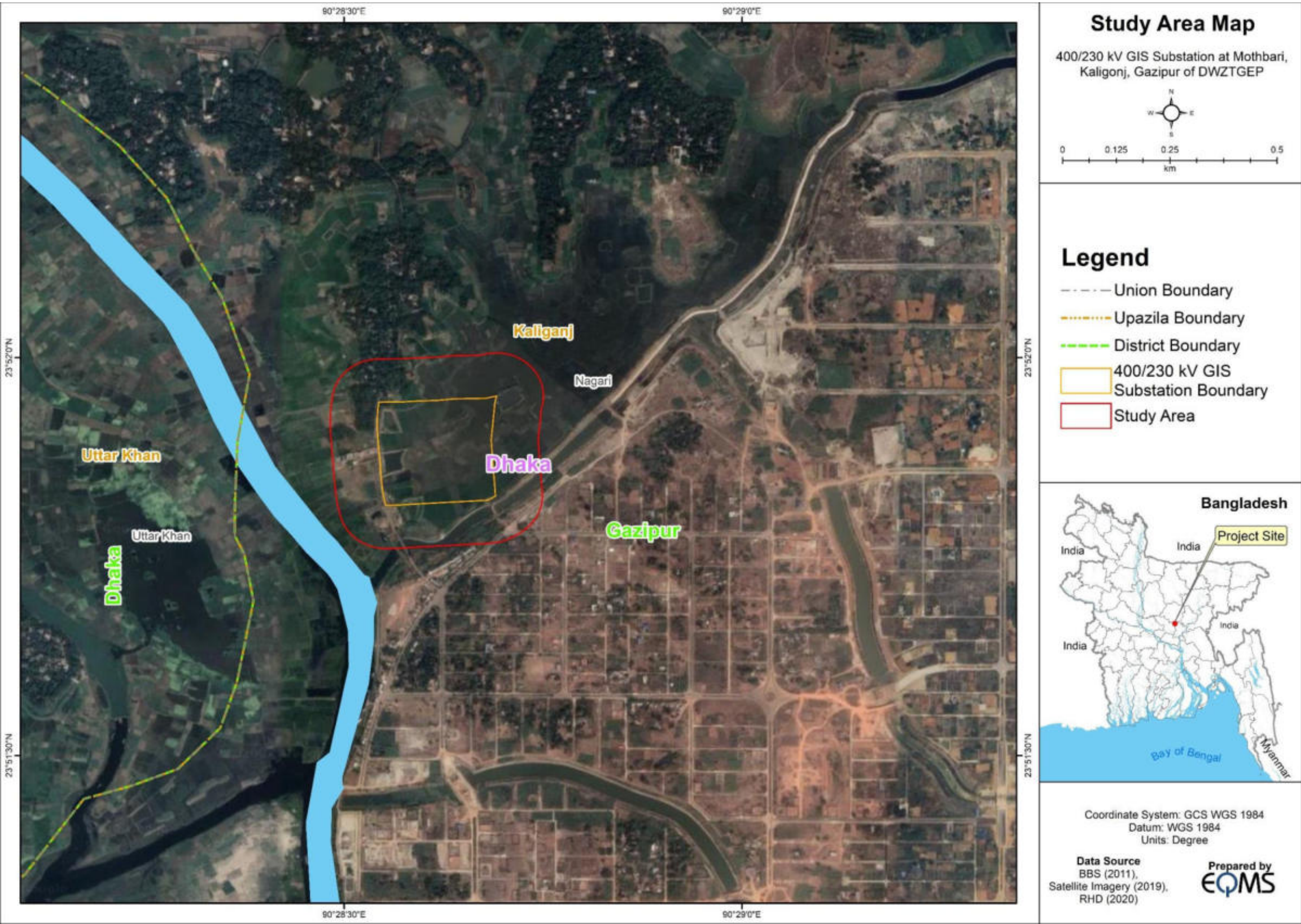
- Complete new 400/230/132KV indoor GIS substation.
- 400 kV GIS Switchgear with:
 - 400 kV double busbar system
 - Four (4) Nos. of 400 kV transmission line bays
 - Three (3) Nos. of 400 kV transformer bays
 - Two (2) Nos. of 400 kV bus coupler bays
 - Two (2) Nos. of 400 kV bus section bays for HV testing.
 - Three (3) Nos. of three-phase power autotransformers 400/235/34.5 kV, 520/750 MVA.
- 230 kV GIS Switchgear with:
 - 230 kV double busbar system

- Two (2) Nos. of 230 kV transmission line bays
 - Six (6) Nos. of 230 kV transformer bays
 - Two (2) Nos. of 230 kV bus coupler bays
 - Two (2) Nos. of 230 kV bus section bays
 - Two (2) Nos. of three-phase power autotransformers 230/135/34.5 kV, 350/450 MVA.
 - 132 kV GIS Switchgear with:
 - 132 kV double busbar system
 - Six (6) Nos. of 132 kV transmission line bays
 - Two (2) Nos. of 132 kV transformer bays
 - Two (2) Nos. of 132 kV bus coupler bays
 - Two (2) Nos. of 132 kV bus section bays
 - 33 kV AIS Switchgear:
 - Two (02) Nos. of 33 kV auxiliary/earthing transformer bays.
 - Two (02) Nos. of three-phase, 33/0.415 kV, 500 kVA auxiliary/earthing transformers.
 - Space for future four (4) nos. of 230 kV line bays.
 - Space for third three-phase power autotransformers 230/135/34.5 kV, 350/450 MVA.
 - Space for 400 kV bus reactor.
 - SCADA controls for all bays at different voltage levels.
 - Associated substation control and monitoring system, relay protection, metering, telecommunication, AC & DC auxiliary power supply, cables, metal structure, earthing, and lightning protection.
 - Land development of the complete switchyard area by cutting, land filling, compacting up to a suitable level, including slope protection.
 - Complete outdoor civil works, including 400 kV, 230 kV, and 132 kV gantry foundation, and 400 kV, 230 kV, 132 kV, and 33 kV equipment foundation, power transformer and auxiliary transformer foundations, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes, etc., switchyard surface finishing and gravel surfacing.
 - Complete civil works and facilities for two new GIS buildings for 400 kV & 230 kV/132 kV GIS and control building separately, including foundation works, superstructure works, finishing works like rendering, painting, water supply, sanitary, floor finishing, rainwater drainage system, and lightning protection.
 - Complete water supply including deep tube well for drinking water, pump house, pump, water reservoir, water pipelines, etc., sewage facilities including septic tank, etc.
33. The equipment to be supplied, installed, and commissioned is shown on the bid drawings as mentioned in the specification.





Kaliganj Substations Location



Purbachal Substations Location

Source: PGCB, 2024

4. ENVIRONMENTAL AND SOCIAL BASELINE

34. This section describes the existing environmental and social baseline status of proposed Rampura- Bashundhara 132kV Underground Cable Line (package 2) and two substations, 400/230 kV GIS Substation at Fuldigram, Boktarpur, Kapasia Road, Kaliganj, Gazipur and 400/230 kV GIS Substation at Mothbari, Kaliganj, Gazipur. under Package 5.

4.1 Methodology

35. 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.

36. 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.

37. 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.

38. 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

39. 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.

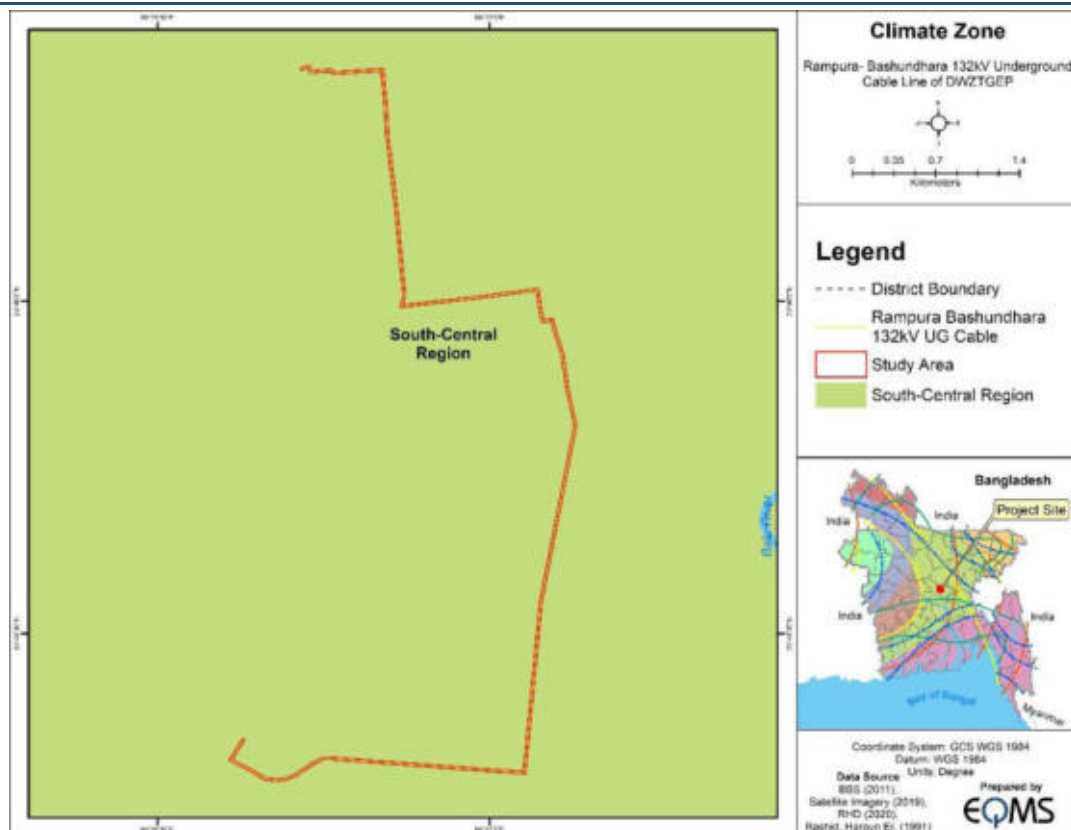
40. Three distinct seasons can be recognized in Bangladesh: the post-monsoon season from November to February; the pre-monsoon hot season from March to May, and the rainy monsoon season which lasts from June through to October. The month of March may also be considered as the spring season, and the period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

41. 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.

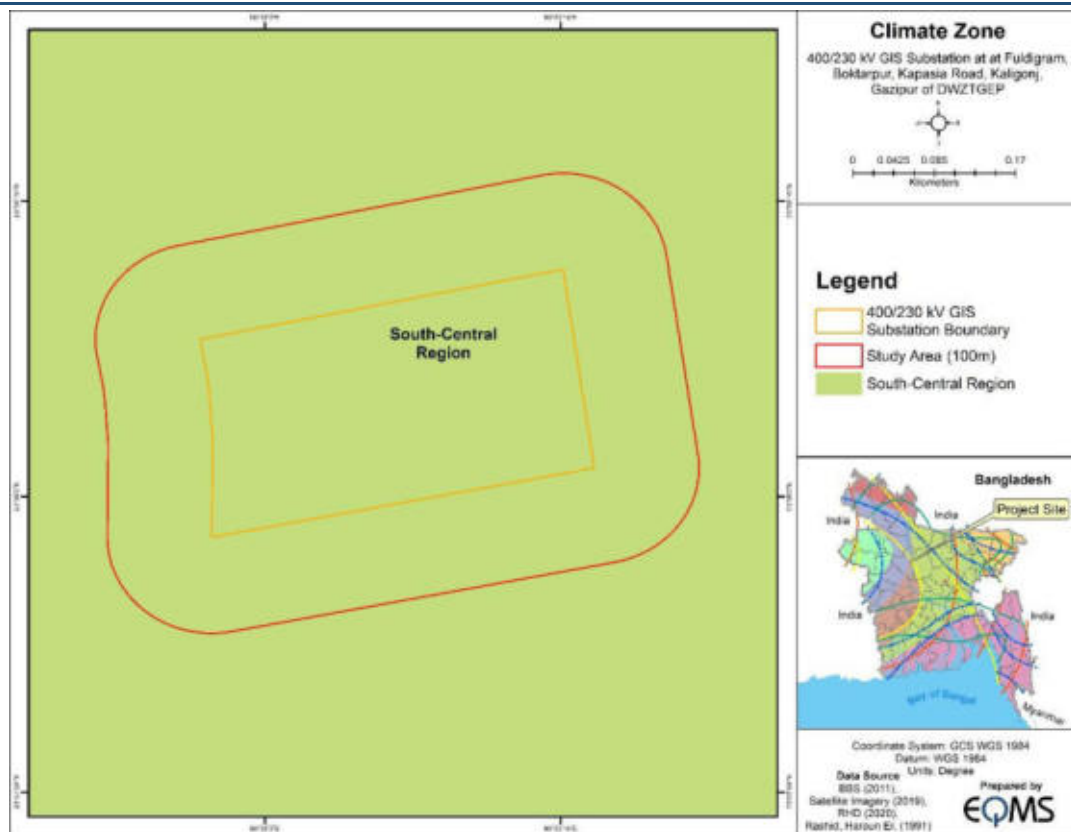
42. The pre-monsoon hot season (March-May) is characterized by high temperatures and the occurrence of thunderstorms. April is the hottest month when mean temperatures range from 27°C in the east and south to 31°C in the west-central part of the country. In the western part, summer temperatures sometimes 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 Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations Location.

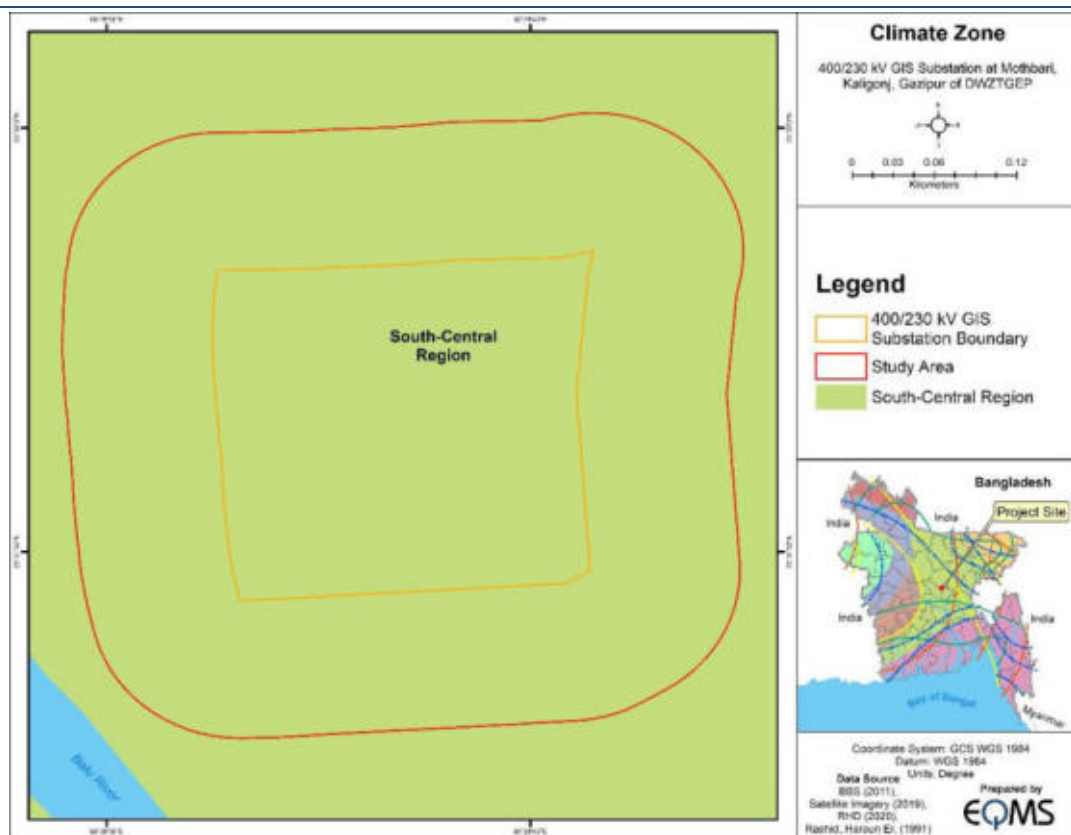
Figure 4-1: Climatic Zones of Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations Location



Climate Category of Rampura- Bashundhara 132kV Underground Cable Line Alignment



Climatic Category of Kaliganj, and Purbachal Substations Location



Climatic Category of Purbachal Substations Location

Source: Rashid, Haroun Er, 1991.

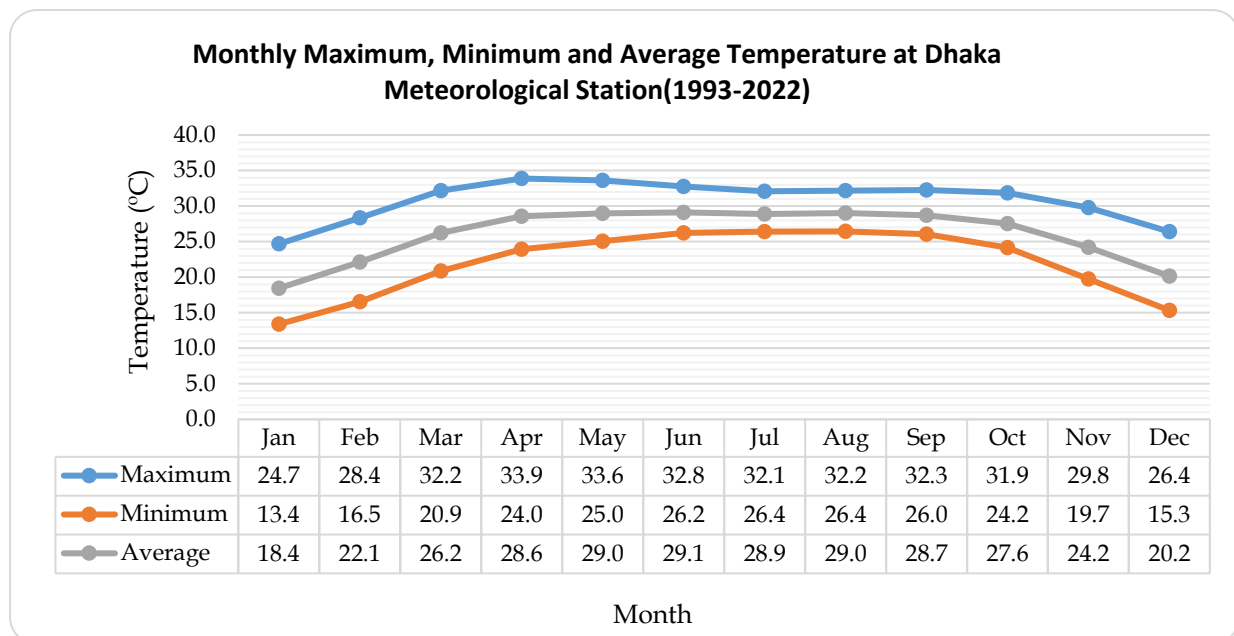
4.2.1.1 Climate at Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations

43. The source of climate data is Bangladesh Meteorological Department (BMD). The climate data was collected from nearby BMD station. For Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations Location, data was collected from Dhaka BMD station, which has the coverage for all the area crossed within this TL route and substation locations.

4.2.1.1.1 Temperature

44. The monthly average minimum and maximum temperatures recorded at the Dhaka weather station are presented in **Figure 4-2**. The monthly maximum temperature varies from 31.0 to 40.2°C whereas the monthly average minimum temperature varies from 18.4°C to 29.2°C. The lowest average temperature recorded in the past 30 years was in March 1995 (6.5°C). The highest average temperature was 40.2 °C in April 2014. Throughout the year, the highest temperatures are generally in March through October and the lowest temperatures are from December to January

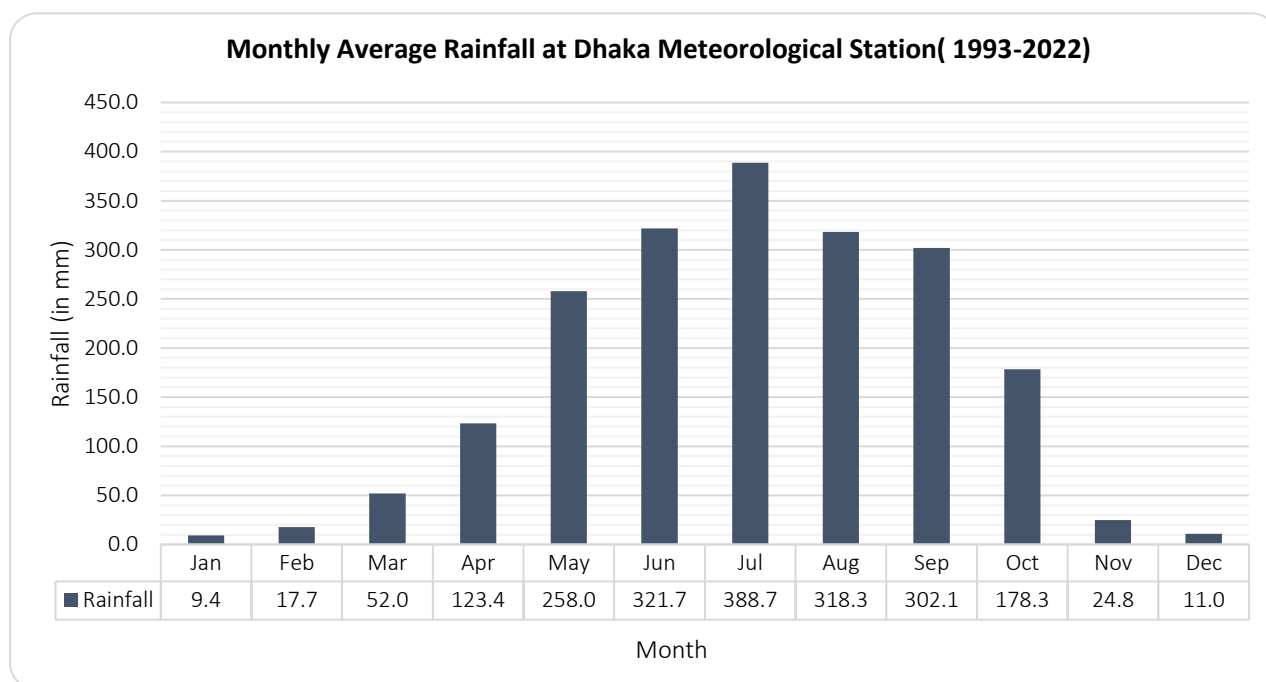
Figure 4-2: Temperature variation at Dhaka Station (1993 to 2022)



Source: Bangladesh Meteorological Department (BMD)

4.2.1.1.2 Rainfall

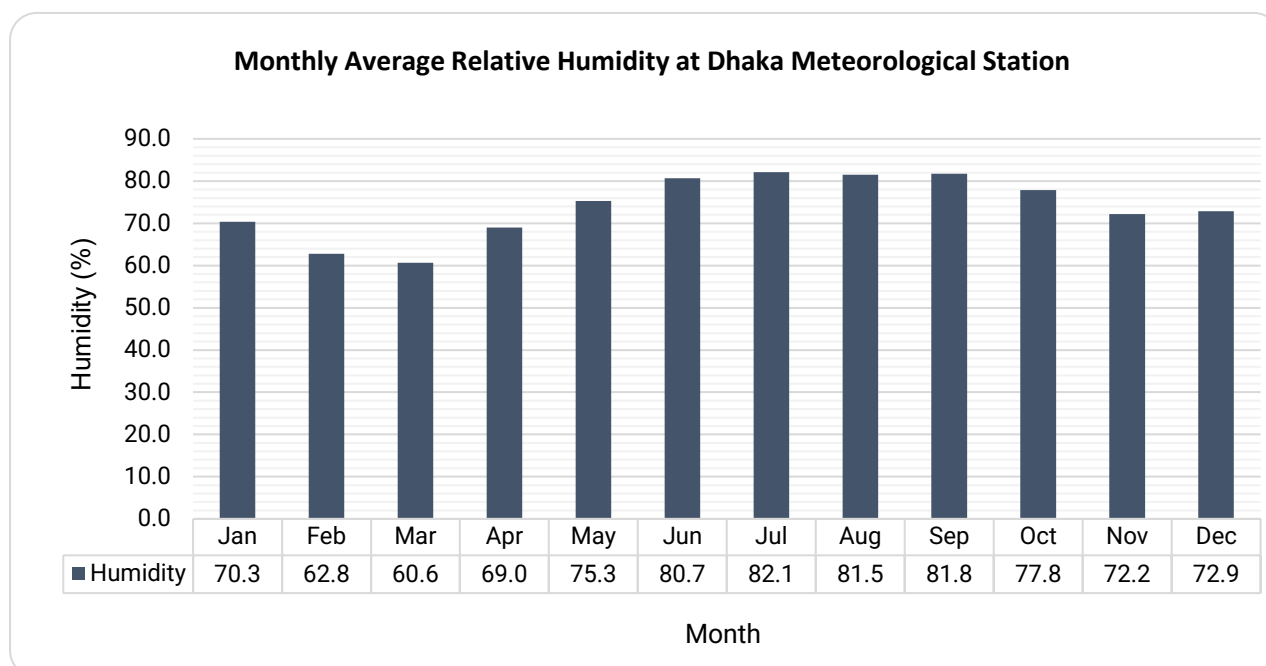
45. During the monsoon (June to September), wind direction from the southwest brings moisture laden air from the Bay of Bengal, when the heaviest rainfall occurs. About 80% of the total rainfall occurs in this period. Average annual total rainfall at Dhaka station is about 1974 mm from 1993 to 2022. The highest annual rainfall is recorded 2892 mm in 2017. The peak one-day highest rainfall is 341 mm recorded on 14 September 2004. An insignificant amount of rainfall has also been recorded in winter (November to February). Monthly average rainfall recorded at the Dhaka station (1993 to 2022) is shown in Figure 4-3.

Figure 4-3: Average of Total Monthly Rainfall in mm (1993-2022) at Dhaka Station

Source: Bangladesh Meteorological Department (BMD)

4.2.1.1.3 Humidity

46. The monthly average relative humidity varies from 60% to 81% in the study area. Humidity remains high in summer and comparatively low in winter season. The meteorological data of humidity from 1993 to 2022 indicates that humidity is highest during Rainy monsoon season (June to September) and lowest during the cool dry winter season (January-March). Monthly average relative humidity at the Dhaka station is shown in **Figure 4-4**

Figure 4-4: Average Monthly Relative Humidity in % (1993-2022) at Dhaka Station

Source: Bangladesh Meteorological Department (BMD)

4.2.2 Water Quality

4.2.2.1 Surface Water

47. Rampura- Bashundhara 132kV Underground Cable Line in Dhaka cross 2 canals and a lake. Moreover, canal and waterbodies were found in the 500 m radius of two substation (400/230 kV GIS Substation at Kaliganj, Gazipur and 400/230/132 KV GIS Substation at Purbachal) locations.

Table 4-1: Name of rivers/ other surface water sources and Underground Cable Lines

No.	Underground Cable Line and Substations	Names and Widths of River
1.	Rampura- Bashundhara 132kV Underground Cable Line	The line crosses Shatarkul lake and Rampura canal.
2.	400/230 kV GIS Substation at Kaliganj, Gazipur	A canal and some waterbodies were found in the 500 m radius of the substation
3.	400/230/132 KV GIS Substation at Purbachal,	Turag River and some temporary waterbodies were found in the 500 m radius of the substation

4.2.2.1.1 Surface Water Sampling Methods

48. 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.

49. The samples have been analyzed for parameters covering bacteriological and physio-chemical characteristics which include certain heavy metals and trace elements. Samples were collected from the center of the water body approximately 0.5 m below the water surface, following standard procedures for container preparation, and sample collection, storage and preservation. During surface water collection USEPA surface water sampling guideline (<https://www.epa.gov/quality/surface-water-sampling>) was followed.

50. Water samples were collected as grab samples in a pre-washed 5-litre plastic can and a 1-litre sterilized clean PET bottle for complete Physico- chemical tests respectively. Samples wear labeled properly. After that, the samples were submitted to the laboratories (DPHE and BEETLSL) for analysis of parameters. After analysis, surface water results have been compared with the national standards [ECR-2023, schedule-2A]. The name of the water quality parameters and their determination methods are given in **Table 4-2**.

Table 4-2: Analysis Method for Surface Water Samples

Sl. No.	Parameters	Unit	Analysis Method
1.	Ammonia	mg/L	UVS
2.	Biochemical Oxygen Demand (BOD)	mg/L	5 days Incubation
3.	Chemical Oxygen Demand (COD)	mg/L	CRM
4.	Coliform (Total)	N/100ml	MFM
5.	Dissolved Oxygen (DO)	mg/L	Multimeter

Sl. No.	Parameters	Unit	Analysis Method
6.	pH	-	pH Meter
7.	Total Dissolved Solid (TDS)	mg/L	Multimeter
8.	Total Suspended Solid (TSS)	mg/L	Gravimetric Method
9.	Turbidity	NTU	Turbidity Meter
10.	Oil & Grease	mg/L	APHA 23RD EDN. 2017 (5520- B)
11.	Total Nitrogen (TN)	mg/L	APHA-KJELDHAL

Sources: *Department of Public Health & Engineering (DPHE)

*The Environment Conservation Rules (ECR) 2023, Schedule-2A Standard for Inland Surface Water

51. 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

52. The monitoring team has observed various sources of water throughout the cable line route. A total of 3 water samples were taken from representative locations of the canal of the project corridor on 19 February 2024 for Rampura- Bashundhara 132kV Underground Cable Line alignments. Moreover, four (04) water samples were taken from 400/230 kV GIS Substation at Kaliganj, Gazipur locations of Khal on September 20, 2023. Furthermore, A total of Four (04) water samples were taken from 400/230/132 KV GIS Substation at Purbachal, locations on September 19, 2023. Samples were collected from the center of the water body approximately 0.5m below the water surface. Location of sample collection are presented in (Table 4-3). The analyzed results for surface water were compared to Bangladesh Standards (ECR, 2023) Guidelines. Results of inland surface water analysis are presented in Table 4-4 and Source: Environmental Baseline Monitoring Report of Package 2- February 2024. and Environmental Baseline Monitoring Report of Package 5 and 6- September 2023.

53. **Figure 4-6.**

Table 4-3: Surface Water Sampling Location

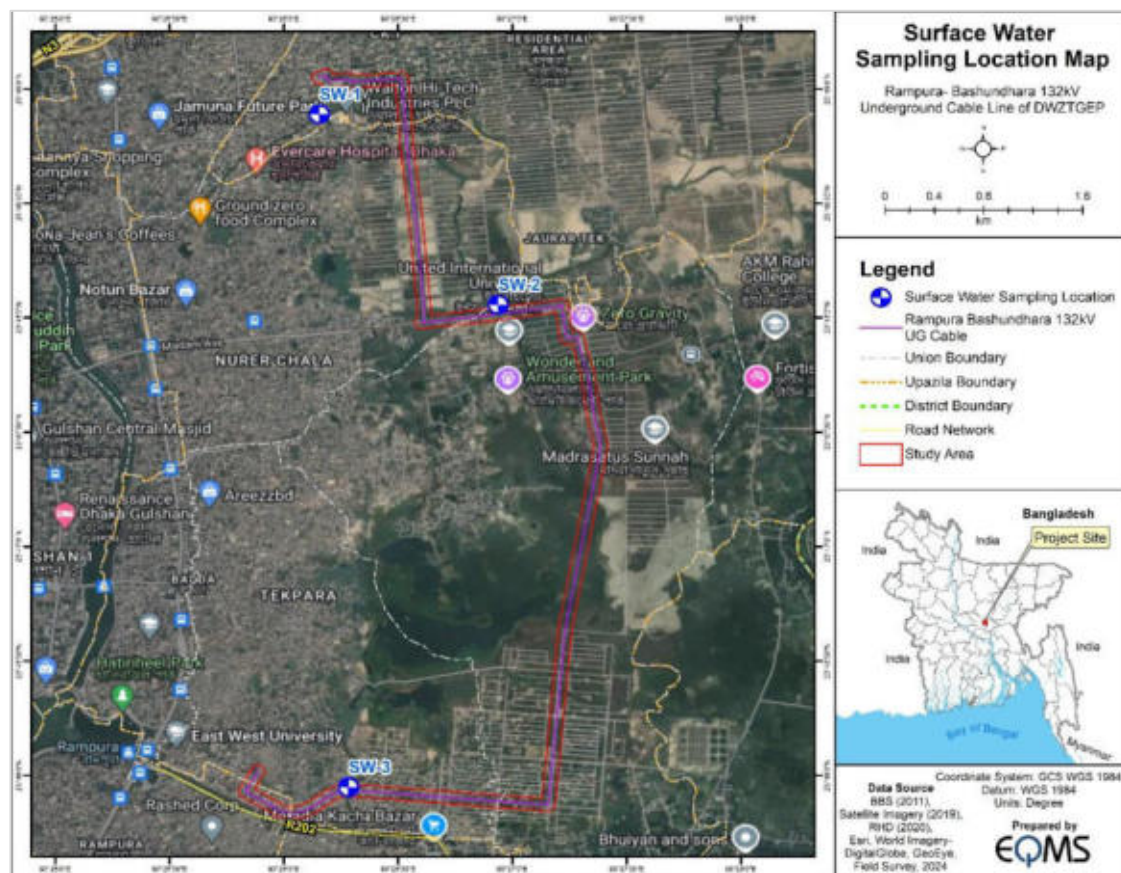
Sl. No.	Code	Sampling Location	GPS Coordinate	Type of Source	Sampling Date
Rampura- Bashundhara 132kV Underground Cable Line					
1.	SW-1	Canal, Near Bashundhara L Block	23.81481N 90.43594E	Canal	19.02.2024
2.	SW-2	Canal, Near UIU	23.80095N 90.44898E	Canal	
3.	SW-3	Canal,	23.76581N 90.43807E	Canal	
400/230 kV GIS Substation at Kaliganj, Gazipur					
4.	SW4	Nolir Khal	23.966951N 90.552715E	Canal	20.09.2023
5.	SW5	Nolir Khal	23.965599N 90.551005E	Canal	

Sl. No.	Code	Sampling Location	GPS Coordinate	Type of Source	Sampling Date
6.	SW6	Nolir Khal	23.966207N 90.549402E	Canal	
7.	SW7	Nolir Khal	23.966470N 90.548220E	Canal	
400/230/132 KV GIS Substation at Purbachal,					
8.	SW8	Khal Beside Dulal, Mia's Shop	23.864318 N 90.475926 E	Canal	19.09.2023
9.	SW9	Tongi Khal	23.863404 N 90.474864 E	Canal	
10.	SW10	Tongi Khal	23.862593 N 90.476197 E	Canal	
11.	SW11	Tongi Khal	23.862223 N 90.475782 E	Canal	

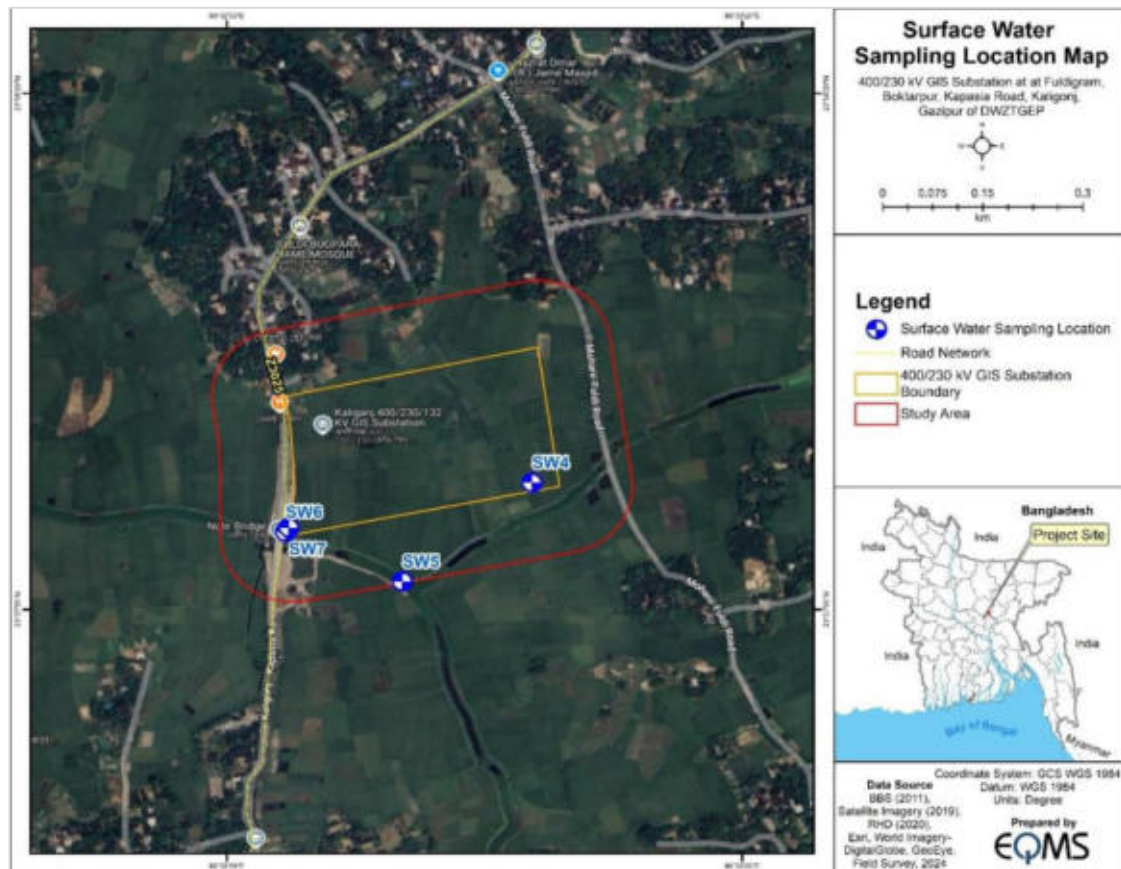
Source: Environmental Baseline Monitoring Report of Package 2- February 2024. and Environmental Baseline Monitoring Report of Package 5 and 6- September 2023.

**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.

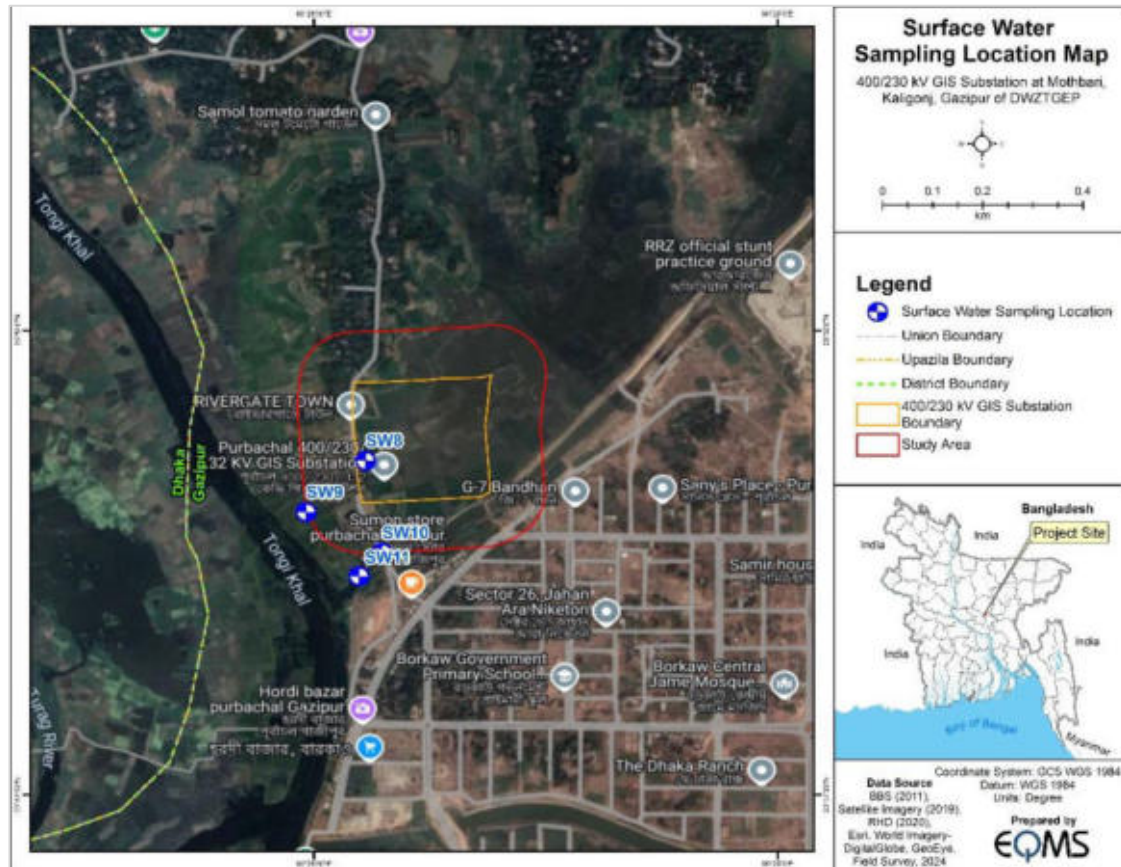
Figure 4-5: Surface Water Monitoring Location Map



Rampura- Bashundhara 132kV Underground Cable Line



400/230 kV GIS Substation at Kaliganj, Gazipur



400/230/132 KV GIS Substation at Purbachal

Source: Environmental Baseline Monitoring Report of Package 2- February 2024. and Environmental Baseline Monitoring Report of Package 5 and 6- September 2023.

Figure 4-6: Pictures of Sampling Location

Rampura- Bashundhara 132kV Underground Cable Line



SW-1- Lake side, Near Bashundhara L Block



SW-2- Canal, Near United International University



SW-3- Canal, Near Aftabnagar Steel Bridge

400/230 kV GIS Substation at Kaliganj, Gazipur



SW4



SW5



SW6



SW7

400/230/132 KV GIS Substation at Purbachal,



SW8



SW9



SW10



SW11

Source: Environmental Baseline Monitoring Report of Package 2- February 2024. and Environmental Baseline Monitoring Report of Package 5 and 6- September 2023.

4.2.2.1.3 Result Analysis

54. The analyzed results for surface water were compared to the Environment Conservation Rules (ECR) 2023, Schedule 2(A). Results of inland surface water analysis are presented in Table 4-4.

Table 4-4: Surface Water Analysis Result of Rampura- Bashundhara 132kV Underground Cable Line, 400/230 kV GIS Substation at Kaliganj, Gazipur and 400/230/132 KV GIS Substation at Purbachal,

Parameters		Concentration										
		NH ₃	BOD	COD	Total Coliform	DO	pH	TDS	TSS	Turbidity	Oil and Grease	Total Nitrogen
Unit		mg/L	mg/L	mg/L	µS/cm	--	ppt	°C	mg/L	mg/L	mg/L	mg/L
Rampura- Bashundhara 132kV Underground Cable Line												
SW1	Baseline (Feb. 2024)	1.2	17	6.3	361	7.03	0.49	24.7	64	180	0.78	-
SW2	Baseline (Feb. 2024)	0.8	14	6.4	379	7.15	0.91	24.2	69	189	0.27	-
SW3	Baseline (Feb. 2024)	1.2	9	6.1	217	7.15	0.17	23.9	54	108	0.51	-
400/230 kV GIS Substation at Kaliganj, Gazipur												
SW4	Baseline (Sep. 2023)	0.24	6	17	17	5.48	7.1	54	4	11.2	0.41	<1.0
SW5	Baseline (Sep. 2023)	0.21	6	19	15	5.52	7.1	51	3	10.8	0.39	<1.0
SW6	Baseline (Sep. 2023)	0.21	7	16	15	5.5	7.3	49	5	11.1	0.44	<1.0
SW7	Baseline (Sep. 2023)	0.22	5	18	14	5.6	7.1	47	4	10.3	0.43	<1.0
400/230/132 KV GIS Substation at Purbachal,												

Parameters		Concentration									Oil and Grease	Total Nitrogen
		NH ₃	BOD	COD	Total Coliform	DO	pH	TDS	TSS	Turbidity		
SW8	Baseline (Sep. 2023)	0.24	8	19	21	5.21	7.2	61	4	12.3	0.49	<1.0
SW9	Baseline (Sep. 2023)	0.31	9	23	27	5.11	6.9	67	7	17.1	0.53	<1.0
SW10	Baseline (Sep. 2023)	0.29	8	22	29	5.17	6.9	60	6	15.9	0.5	<1.0
SW11	Baseline (Sep. 2023)	0.33	10	26	31	5.04	6.9	69	9	19.3	0.61	<1.0
Bangladesh Standards ³	a	≤6	50	≥5	--	6-9	-	--	--	1000	-	-
	b	-	≤2	10	≤100	≥6	6.5-8.5	1,000	-	-	-	-
	c	-	≤3	10	≤50	≥5	6.5-8.5	1,000	-	-	-	-
	d	-	≤3	25	≤5,000	≥5	6.5-9	1,000	-	-	-	-
	e	-	3 or less	10	≤5,000	5 or more	6.5-8.5	1,000	-	-	-	-
	f	-	6 or less	50	-	5 or more	9-Jun	1,000	-	-	-	-

Source: The Environment Conservation Rules (ECR) 2023, Schedule 2-A (1) Standard for Inland Surface Water (a-f)

- a. Source of drinking water for supply only after disinfecting
- b. Water usable for recreational activity
- c. Source of drinking water for supply after conventional treatment
- d. Water usable for fisheries
- e. Water usable by various process and cooling industries
- f. Water usable for irrigation

Primary data Source: Department of Public Health & Engineering (DPHE) & Bangladesh Environmental Engineering Training & Lab Services Ltd. (BEETLSL) Laboratory, September 2023- February 2024

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

4.2.2.1.4 Discussion

55. There are six categories of standards that has been set out by Department of Environment according to ECR'2023. But the category (d) is more practical and suitable to compare as it indicates the standard usable for fisheries as we know Bangladesh is a riverine country and fishes are a vital source of income and occupation here. Therefore, it is expected to meet this standard by all the waterbody to mark it as non-polluted surface water sources.

56. In Rampura- Bashundhara 132kV Underground Cable Line study area, all the sources are canal and the BOD has been crossed the standard limit which lowers the value of DO respectively in the water body. As a result, the value of COD has been increased tremendously. The number of coliform (total) has also been observed as high which indicates the high contamination level of these sources. As a consequence, people living beside these sources severely face the bad odor pollution. Besides, it is important to figure out that, no standard has been set yet by Department of Environment for Ammonia, TSS, Turbidity and Oil & Grease for surface water respectively. However, the values of DO, BOD, and COD may negatively affect the waterbody.

57. In 400/230 kV GIS Substation at Kaliganj, Gazipur and 400/230/132 KV GIS Substation at Purbachal, study area, the result reflects that all parameters except BOD5 was found within the standard level according to the Environment Conservation Rules (ECR), 2023, Schedule-2 Standard for Inland Surface Water. The baseline value of BOD5 and DO were observed high and low accordingly as BOD and DO are inversely proportional to each other i.e., a decline in DO levels reflects a high level of BOD. Though, for Ammonia, TSS, Turbidity, TN & Oil and Grease, no standard has been set yet by Department of Environment, Bangladesh. However, all these parameters were observed within the permissible limit. Dissolved oxygen levels are increased by supplementing wind and wave action, adding plants to these water sources and exposing water to purified oxygen.

4.2.2.2 Ground Water

4.2.2.2.1 Ground Water Sampling Methods

58. To determine the quality of ground water, samples were collected from the deep tube well of the study area 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.

59. 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 4-5**.

Table 4-5: Analysis Method for Ground Water Samples

Sl. No.	Parameter	Unit	Analysis Method
1.	Arsenic (As)	mg/L	AAS
2.	Chloride	mg/L	Titrimetric
3.	Coliform (Fecal)	N/100ml	MFM
4.	Coliform (Total)	N/100ml	MFM
5.	Iron (Fe)	mg/L	AAS
6.	Manganese (Mn)	mg/L	AAS
7.	pH	-	pH Meter

Sl. No.	Parameter	Unit	Analysis Method
8.	Salinity	‰	Multimeter
9.	Turbidity	NTU	Turbidity Meter
10.	EC	µScm-1	EC Method

Sources: Department of Public Health & Engineering (DPHE)

4.2.2.2.2 Ground-Water Sampling Locations

60. 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 the line. Detail of the sampling location is provided in Table 4-6.

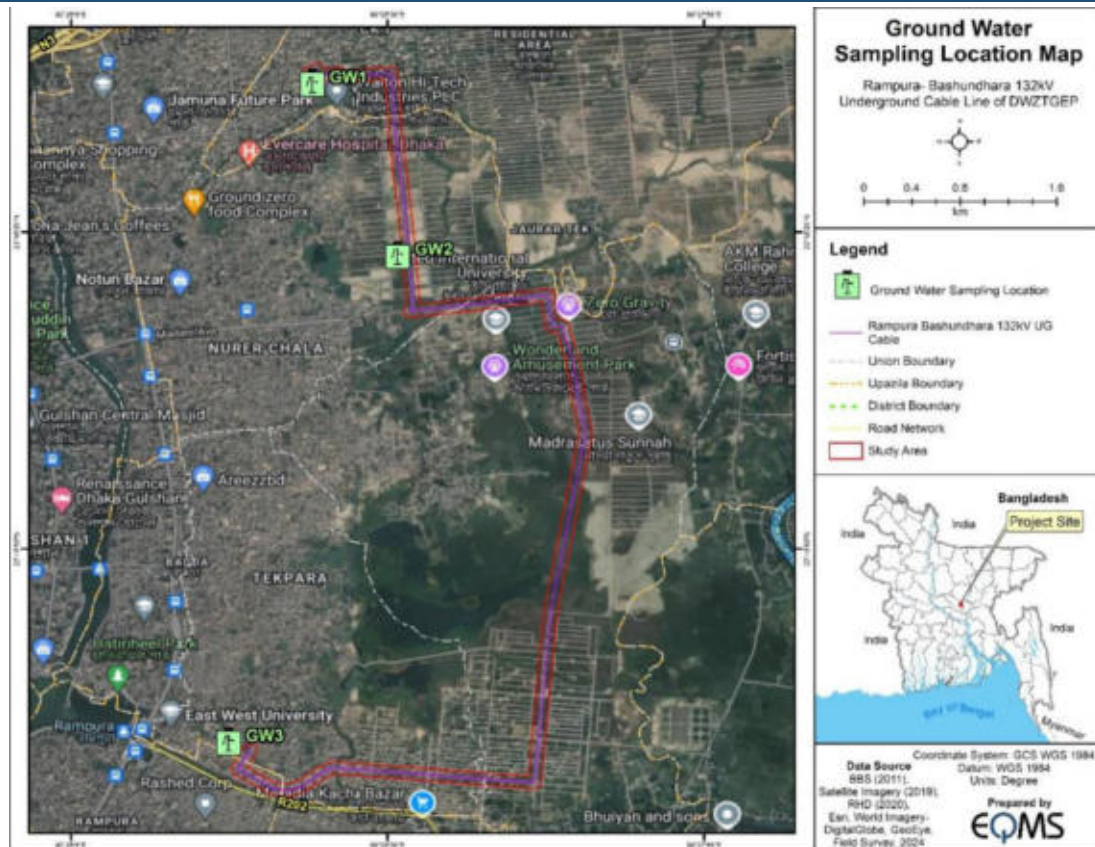
Table 4-6: Locations and Descriptions of Ground-Water Sampling

Sl. No.	Code	Sampling Location	GPS Coordinate	Type of Source	Sampling Date
Rampura- Bashundhara 132kV Underground Cable Line					
1.	GW1	Hospital, Near the Substation Area in Bashundhara Residential Area	23.81656N 90.43605E	Tube-Well	19.02.2024
2.	GW2	Mosque, Near United International University	23.80374N 90.44242E	Tube-Well	
3.	GW3	Mosque, Near the Substation Area	23.76747N 90.42981E	Tube-Well	
400/230 kV GIS Substation at Kaliganj, Gazipur					
4.	GW4	Hafej Sheikh's House	23.968512N 90.548888E	Tube-Well	20.09.2023
5.	GW5	Beside Kaliganj- Kapasia Rd. located near Nolir Bridge	23.963364N 90.548810E	Tube-Well	
6.	GW6	Mamun Mia's House	23.965455N 90.554317E	Tube-Well	
7.	GW7	Late Abdul Razzak's House	23.969981N 90.553189E	Tube-Well	
400/230/132 KV GIS Substation at Purbachal,					
8.	GW8	Beside Dulal Mia's Shop	23.864612 N 90.475215 E	Tube-Well	19.09.2023
9.	GW9	Beside Dipak Chakraborty' s Shop	23.866261 N 90.475607 E	Tube-Well	
10.	GW10	Beside Boro Kau Shree Shree Sarbojonin Durga Mondir	23.862167 N 90.477112 E	Tube-Well	
11.	GW11	Beside Mohadev Karmakar's house	23.868053 N 90.476480 E	Tube-Well	

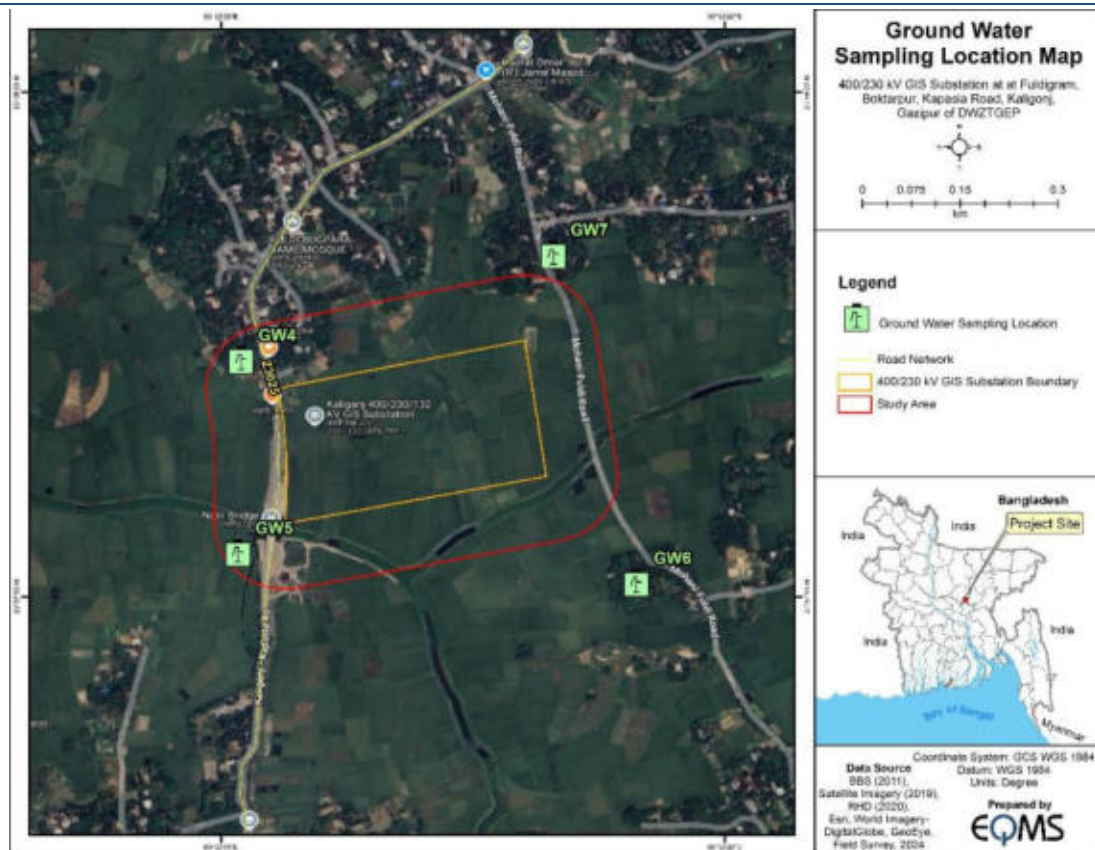
Source: Environmental Baseline Monitoring Report of Package 2- February 2024. and Environmental Baseline Monitoring Report of Package 5 and 6- September 2023.

**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.

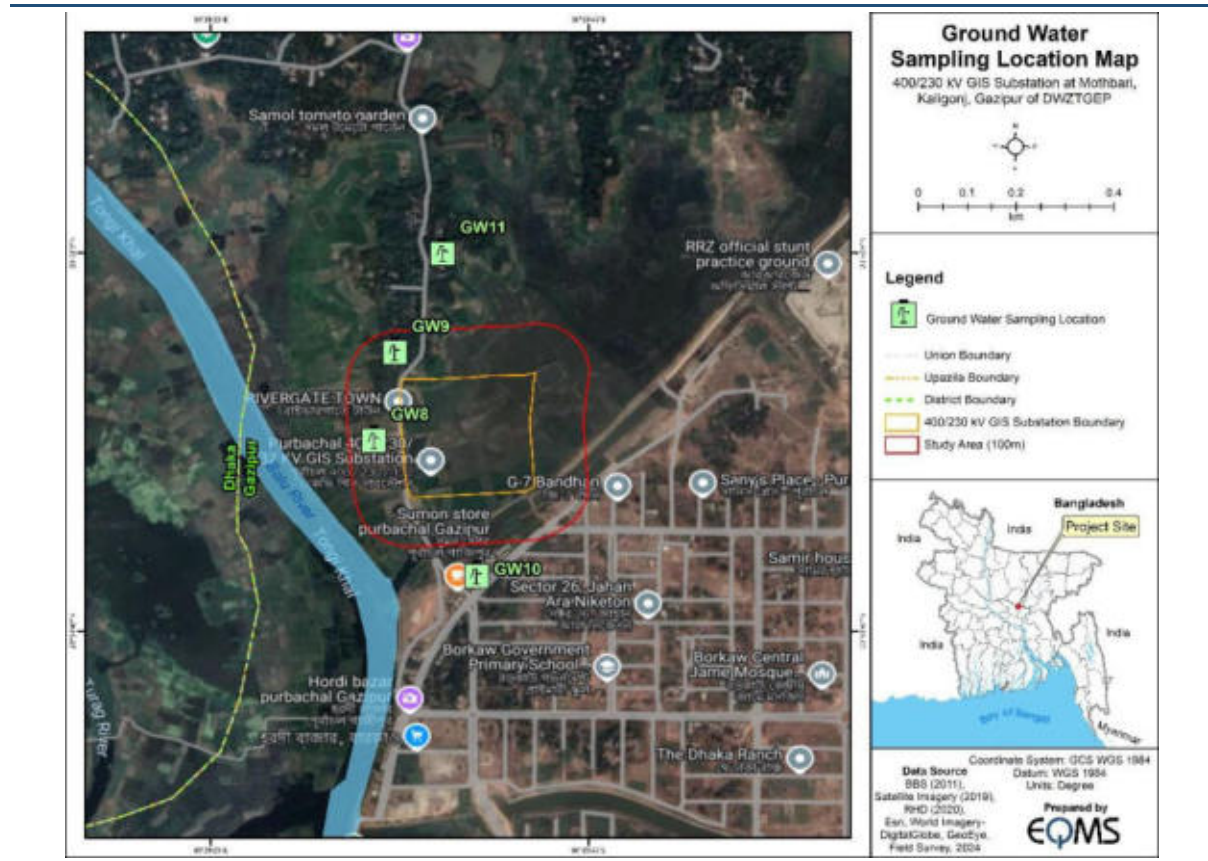
Figure 4-7: Groundwater Monitoring Location Map



Rampura- Bashundhara 132kV Underground Cable Line



400/230 kV GIS Substation at Kaliganj, Gazipur



400/230/132 KV GIS Substation at Purbachal

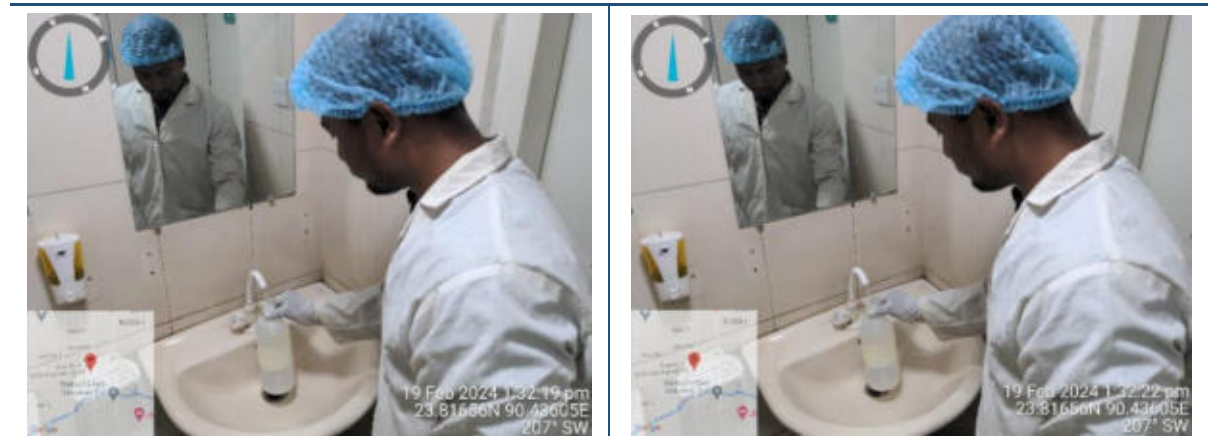
Source: Environmental Baseline Monitoring Report of Package 2- February 2024. and Environmental Baseline Monitoring Report of Package 5 and 6- September 2023.

4.2.2.2.3 Sampling Photographs

Sampling photographs of study area are mentioned in

Figure 4-8: Sampling photographs of study area

Rampura- Bashundhara 132kV Underground Cable Line



GW-1- Groundwater, Eye Hospital, Near the Substation Area in Bashundhara Residential Area



GW-2- Groundwater, Mosque, Near United International University



GW-3- Groundwater, Mosque, Near the Substation Area of Aftabnagar
400/230 kV GIS Substation at Kaliganj, Gazipur



GW4



GW5

 20 Sept 2023 4:27:57 p 23.96545493N 90.5543178E Gazipur Distri	 20 Sept 2023 3:35:14 p 23.96998181N 90.5531897E Gazipur Distri
GW6	GW7
400/230/132 KV GIS Substation at Purbachal,	
 19 Sept 2023 11:13:59 am 23.86461275N 90.47521527E Dhaka Division	 19 Sept 2023 12:36:11 pm 23.86626161N 90.47560743E Dhaka Division
GW8	GW9
 19 Sept 2023 9:32:13 am 23.86216762N 90.47711155E VF4R+QW বরগাড়া, Dhaka, Bangladesh	 19 Sept 2023 1:08:49 pm 23.86805374N 90.47648096E ঢাকা বিভাগ
GW10	GW11

Source: Environmental Baseline Monitoring Report of Package 2- February 2024. and Environmental Baseline Monitoring Report of Package 5 and 6- September 2023.

4.2.2.2.4 Ground-Water Quality Analysis Results

61. Analysis results of the Ground water are represented in Table 4-7 where the values are compared with the standard limit.

Table 4-7: Ground Water Quality Analysis Rampura- Bashundhara 132kV Underground Cable Line, and two substation locations (400/230 kV GIS Substation at Kaliganj, Gazipur and 400/230/132 KV GIS Substation at Purbachal,).

Parameters		Concentration									
		Arsenic (As)	Chloride	Coliform (Fecal)	Coliform (Total)	Iron (Fe)	Manganese (Mn)	pH	Salinity	Turbidity	EC
		mg/L	mg/L	N/100ml	N/100ml	mg/L	mg/L	-	‰	NTU	µScm-1
Rampura- Bashundhara 132kV Underground Cable Line											
GW1	Baseline (Feb. 2024)	0.001	45	0	0	0.3	0.03	7.8	0.21		
GW2	Baseline (Aug. 2023)	0.001	40	0	0	0.06	0.03	7.7	0.15		
GW3	Baseline (Aug. 2023)	0.002	20	0	0	0.07	0.03	7.7	0.13		
400/230 kV GIS Substation at Kaliganj, Gazipur											
GW4	Baseline (Sep. 2023)	0.002	21	-	-	1.3	0.02	7.1	-	0.04	231
GW5	Baseline (Sep. 2023)	0.002	19	-	-	1.1	0.03	7.3	-	0.02	257
GW6	Baseline (Sep. 2023)	0.001	19	-	-	1.1	0.02	7.3	-	0.03	234

Parameters		Concentration									
		Arsenic (As)	Chloride	Coliform (Fecal)	Coliform (Total)	Iron (Fe)	Manganese (Mn)	pH	Salinity	Turbidity	EC
		mg/L	mg/L	N/100ml	N/100ml	mg/L	mg/L	-	‰	NTU	µScm-1
GW7	Baseline (Sep. 2023)	0.001	20	-	-	1.2	0.02	7.2	-	0.03	237
400/230/132 KV GIS Substation at Purbachal,											
GW8	Baseline (Sep. 2023)	0.001	17			1.2	0.03	7.2		0.02	241
GW9	Baseline (Sep. 2023)	0.001	15			1.3	0.03	7.1		0.03	247
GW10	Baseline (Sep. 2023)	0.002	18			1.1	0.02	7.4		0.03	239
GW11	Baseline (Sep. 2023)	0.001	16			1.2	0.03	7.3		0.03	246
Bangladesh Standards ⁴		0.05	250	0	0	0.3-1.0	0.4	6.5-8.5	-	5	-

Primary data Source: Department of Public Health & Engineering (DPHE) & Bangladesh Environmental Engineering Training & Lab Services Ltd. (BEETLSL) Laboratory, September 2023- February 2024.

⁴ The Environment Conservation Rules (ECR), 2023, Schedule 2(B): Standards for Drinking Water

4.2.2.2.5 Discussion

62. 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

63. In Rampura- Bashundhara 132kV Underground Cable Line study area, all the samples have no significant fluctuations spotted for the value of Manganese, Arsenic, pH, and Salinity. Therefore, Chloride, and Iron level have been observed within the standard. On the other hand, the water sources are fully safe for drinking according to Sustainable Development Goal (SDG) Goal 6, Target 6.1 as the fecal coliform level is zero. In conclusion, all the drinking water sources have been spotted in a pollution free state which has no severe negative impact on the health of the local people, staff etc. residing in the project area.

64. In In 400/230 kV GIS Substation at Kaliganj, Gazipur and 400/230/132 KV GIS Substation at Purbachal, the result reflects that all the parameters except Iron (Fe) was found within the standard level according to the Environment Conservation Rules (ECR), 2023, Schedule-2 (B) Standard for Drinking Water. Therefore, the concentration of iron was observed slightly high compared to the standard in the project area and all other parameters were found below the permissible limits or standard. Moreover, the concentration of EC is below 250 μScm^{-1} at all the located points.

4.2.3 Air Quality

65. This section identifies the status of the ambient air quality in the alignments: Rampura-Bashundhara 132kV Underground Cable Line, and two substation locations (400/230 kV GIS Substation at Kaliganj, Gazipur and 400/230/132 KV GIS Substation at Purbachal,). 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, SO₂ 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

66. The existing ambient air quality of Rampura- Bashundhara 132kV Underground Cable Line, 400/230 kV GIS Substation at Kaliganj, Gazipur and 400/230/132 KV GIS Substation at Purbachal, locations have been monitored before the construction period of the project. The ambient status of major air pollutants viz. Particulate Matter (SPM, PM₁₀, PM_{2.5}), Gaseous substances (NO_x, SO₂, O₃ and CO) and Lead (Pb) has been assessed.

67. Portable OCEANUS AQM-09 Air Quality Monitoring Station & Single Head 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 4-8.

Table 4-8: Methodology for the Analysis of Ambient Air Quality.

Parameter	Instrument Name	Methods of Testing	Analysis Method
Pb	Air Sampler with Attachment (Single Head)	In-house Lab, ECIL	Atomic Absorption Spectroscopy (AAS)
SPM, PM ₁₀ , PM _{2.5}	OCENAU AQM-09	On Site Recording	Light Scattering Nephelometer
Sulfur dioxide (SO ₂)	OCENAU AQM-09	On Site Recording	High Sensitivity Electrochemical
Oxides of Nitrogen (NO _x)	OCENAU AQM-09	On Site Recording	High Sensitivity Electrochemical
Carbon monoxide (CO) and Ozone (O ₃)	OCENAU AQM-09	On Site Recording	High Sensitivity Electrochemical
Temperature, Humidity and Wind Speed	Anemometer- AH-4223	On Site Recording	Anemometer

Sources: ECIL Laboratory, February 2024

Table 4-9: Air Sample Collection Time and Method

Monitoring Element	Parameter	Unit	Sampling Time	Method
Ambient Air	SO ₂	ppb	24 Hr. Sampling	Monitoring Method: Continuously, automatically and real-time Measuring range: 0~1000 ppb Resolution: 1ppb Response time: < 45s

Monitoring Element	Parameter	Unit	Sampling Time	Method
	NO ₂	ppb	24 Hr. Sampling	Monitoring Method: Continuously, automatically and real-time Measuring range: 0~1000 ppb Resolution: 1ppb Response time: < 45s
	CO	ppm	8 Hr. Sampling	Monitoring Method: Continuously, automatically and real-time Measuring range: 0~200 ppm Resolution: 0.1 ppm Response time: < 45s
	SPM, PM ₁₀ and PM _{2.5}	µg/m ³	24 Hr. Sampling	Monitoring Method: Continuously, automatically and real-time Measuring Range: 0~1000ug/m ³ (Range can be extended) Resolution: 1ug/m ³
	Pb	µg/m ³	24 Hr. Sampling	Atomic absorption spectrometry (AAS) by using Air Sampler with Attachment (Double Head)

Sources: ECIL Laboratory, February 2024

4.2.3.2 Air Quality Monitoring Locations

68. In Rampura- Bashundhara 132kV Underground Cable Line location ambient air quality has been monitored in February 2024 at three locations in the project site. Also, Ambient Air Quality monitoring was carried out from Four (04) locations in both substation (400/230 kV GIS Substation at Kaliganj, Gazipur and 400/230/132 KV GIS Substation at Purbachal) locations in September 2023.

69. The portable OCEANUS AQM-09 Air Quality Monitoring Station & Single Head shown in Figure 3 was used to collect, measure and document critical pollutants including Pb, SPM, PM₁₀, PM_{2.5}, NO_x, SO₂, O₃ and CO. Temperature, Humidity and Wind Speed have been recorded on site by Anemometer-AH-4223. The location details are as follows Table 4-10.

70. Air quality monitoring samples has been monitored for a defined time interval and from different sampling points within project areas (Table 4-10) of Rampura- Bashundhara 132kV Underground Cable Line, and two substation locations (400/230 kV GIS Substation at Kaliganj, Gazipur and 400/230/132 KV GIS Substation at Purbachal,). Air quality analysis results are shown in Table 4-11. Monitoring photos are shown in **Error! Reference source not found.**

Table 4-10: Air Quality Measurement Locations and Descriptions

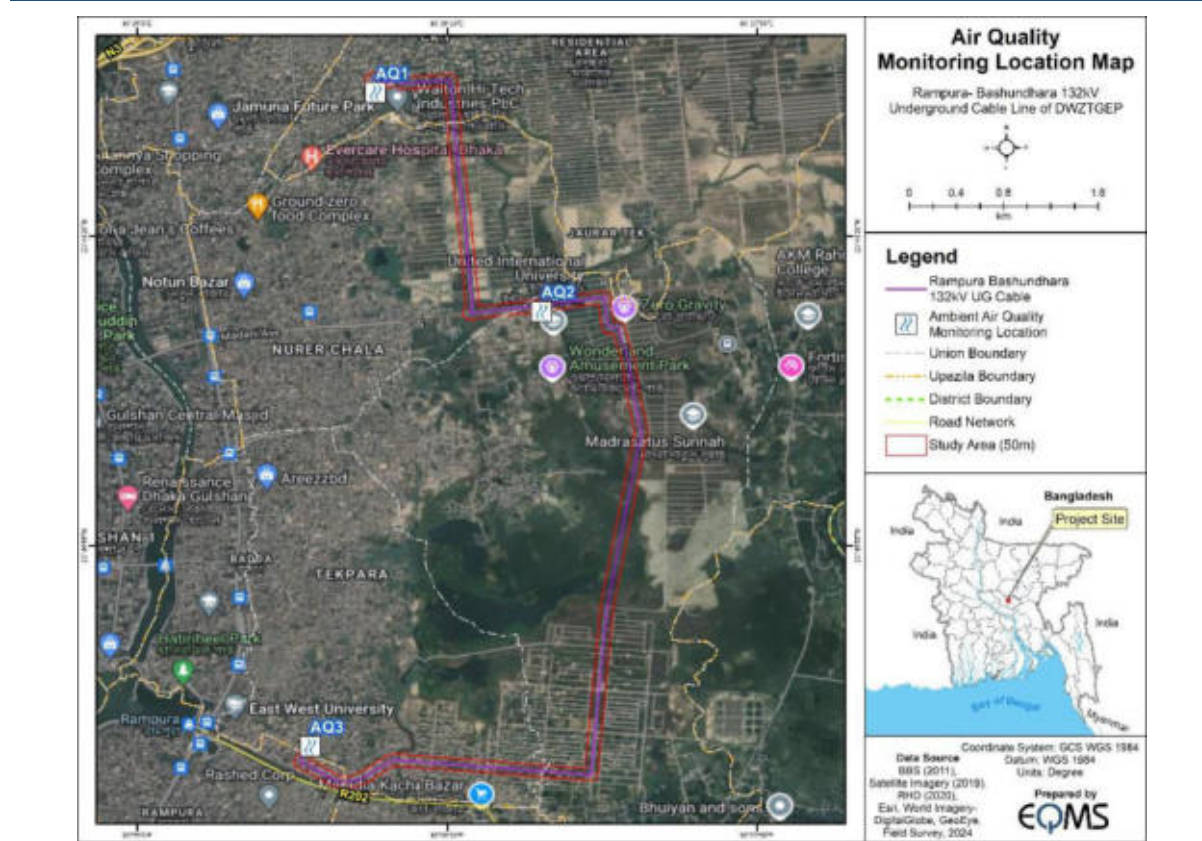
SL No	Sample ID	GPS Coordinate	Location Details	Date & Time
Rampura- Bashundhara 132kV Underground Cable Line				
1.	AQ1	23.81644N 90.43622E	Near the Substation Area in Bashundhara ResidentialArea	19.02.2024 and 20.02.2024
2.	AQ2	23.79979N 90.44887E	Near United International University (UIU) Mosque	
3.	AQ3	23.76667N 90.43124E	Near the Substation Area of Aftabnagar	
400/230 kV GIS Substation at Kaliganj, Gazipur				

SL No	Sample ID	GPS Coordinate	Location Details	Date & Time
4.	AQ4	23.968956 N 90.549117 E	In front of Hafej Sheikh's House	27-09-2023
5.	AQ5	23.963902 N 90.549012 E	Beside Kaliganj- Kapasia Rd. located near Nolir Bridge	20-09-2023
6.	AQ6	23.969834 N 90.552915 E	In front of Mamun Mia's House	30-09-2023
7.	AQ7	23.969790 N 90.552910E	In front of Late Abdul Razzak's House	30-09-2023
400/230/132 KV GIS Substation at Purbachal,				
8.	AQ8	23°47'30.39"N 88°40'48.08"E	In front of Dulal Mia's house	26-09-2023
9.	AQ9	23°47'36.26"N 88°40'54.21"E	In front of Dipak Chakraborty' s Shop	26-09-2023
10.	AQ10	23°47'32.12"N 88°40'45.93"E	In front of Boro Kau Shree Shree Sarbojonin Durga Mondir	19-09-2023
11.	AQ11	23°47'28.07"N 88°40'46.51"E	In front of Mohadev Karmakar'shouse	27-09-2023

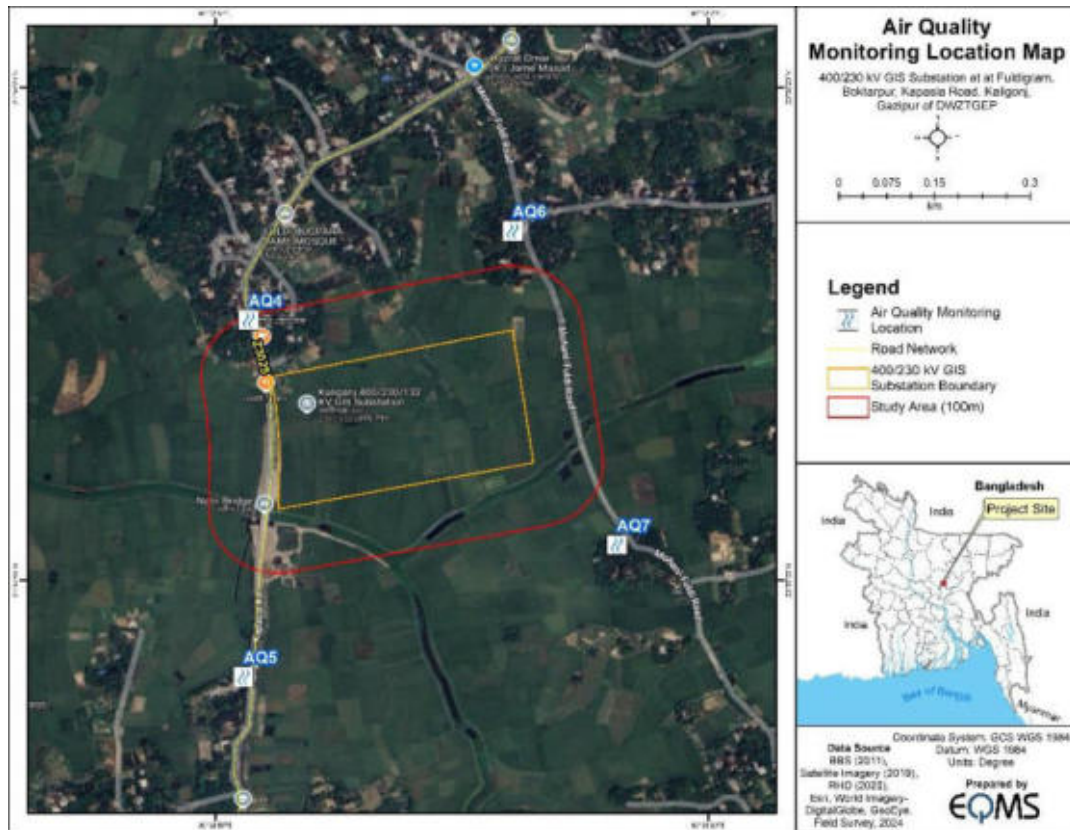
Source: Environmental Baseline Monitoring Report of Package 2- February 2024. and Environmental Baseline Monitoring Report of Package 5 and 6- September 2023.

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.

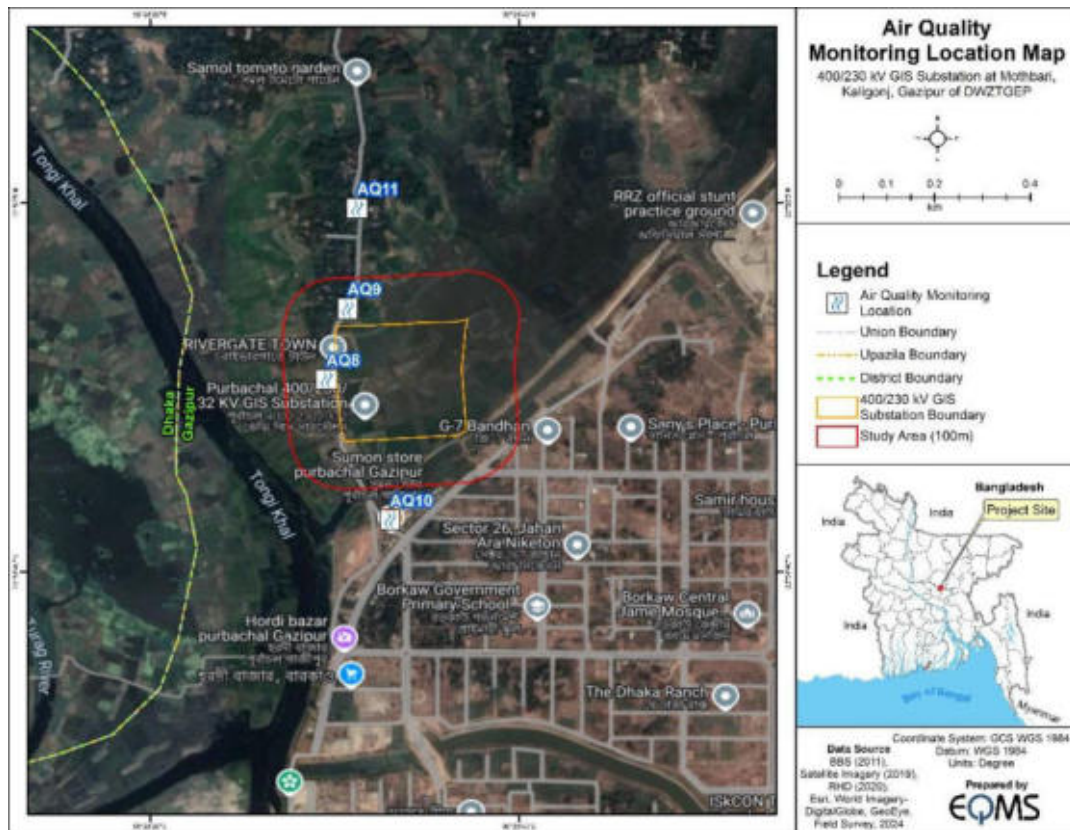
Figure 4-9: Air Quality Monitoring Location Map



Rampura- Bashundhara 132kV Underground Cable Line



400/230 kV GIS Substation at Kaliganj, Gazipur



400/230/132 KV GIS Substation at Purbachal

Source: Environmental Baseline Monitoring Report of Package 2- February 2024. and Environmental Baseline Monitoring Report of Package 5 and 6- September 2023.

Air Quality Monitoring Pictures.

Figure 4-10: Air Quality Monitoring Pictures

Rampura- Bashundhara 132kV Underground Cable Line



AQ1



AQ2



AQ3

400/230 kV GIS Substation at Kaliganj, Gazipur



AQ4



AQ5



AQ6



AQ7

400/230/132 KV GIS Substation at Purbachal,



AQ8



AQ9



AQ10



AQ11

Source: Environmental Baseline Monitoring Report of Package 2- February 2024. and Environmental Baseline Monitoring Report of Package 5 and 6- September 2023.

4.2.3.3 Analysis Results

71. Air quality data was measured automatically every one minute and directly recorded onsite for measured parameters (SPM, PM10, PM2.5, SO₂, NO_x, O₃ and CO). Different analysis methods, such as Particulates 90° Infrared Light Scattering for particulate matters (SPM, PM10, PM2.5), electrochemical sensors for toxic gases (NO_x, SO₂, O₃, and CO) and Atomic Absorption Spectroscopy (AAS) for Lead (Pb) are integrated in the device.

72. As per the national standard of ambient air quality CO was monitored for 8 hours to compare with the national standard. For Particulate Matter (SPM, PM10, and PM2.5), gaseous pollutants (NO_x, CO, O₃ and SO₂) and Pb, the standard duration is 24 hours. Analysis results of every location are briefly mentioned in the following Table 4-11.

Table 4-11: Air Quality Analysis Results Rampura- Bashundhara 132kV Underground Cable Line, and two substation locations (400/230 kV GIS Substation at Kaliganj, Gazipur and 400/230/132 KV GIS Substation at Purbachal)

Sl. No.	Code	Period	Ambient Air Pollution Concentration in µg/m3							
			SO2	NO2	CO	SPM	PM2.5	PM10	Pb	O ₃
			µg/m3	µg/m3	mg/m3	µg/m3	µg/m3	µg/m3	µg/m3	µg/m3
Rampura- Bashundhara 132kV Underground Cable Line										
1.	AQ1	19.02.2024	16.82	29.24	1.31	102.19	92.8	61.23	BDL	13.93
2.	AQ2	19.02.2024	27.49	40.23	2.86	84.25	122.1	57.43	BDL	17.56
3.	AQ3	20.02.2024	19.26	24.17	2.01	77.63	85.8	37.14	BDL	14.21
400/230 kV GIS Substation at Kaliganj, Gazipur										
4.	AQ4	27-09-2023	4.9	5.1	0.46	91	23	58	BDL	
5.	AQ5	20-09-2023	5.3	6.0	0.51	95	27	63	BDL	
6.	AQ6	30-09-2023	6.2	5.7	0.63	101	29	65	BDL	
7.	AQ7	30-09-2023	6.8	6.2	0.59	106	32	68	BDL	
400/230/132 KV GIS Substation at Purbachal,										
8.	AQ8	26-09-2023	6.7	7.2	0.59	107	32	70	BDL	6.7
9.	AQ9	26-09-2023	5.9	6.3	0.48	103	31	68	BDL	5.9
10.	AQ10	19-09-2023	5.4	6.7	0.51	98	29	66	BDL	5.4
11.	AQ11	27-09-2023	6.2	6.6	0.53	101	28	69	BDL	6.2
Duration (hours)			24 Hour	24 Hour	8 Hour	24 Hour	24 Hour	24 Hour	24 Hour	24 Hour

Sl. No.	Code	Period	Ambient Air Pollution Concentration in µg/m3							O ₃
			SO ₂	NO ₂	CO	SPM	PM _{2.5}	PM ₁₀	Pb	
			µg/m3	µg/m3	mg/m3	µg/m3	µg/m3	µg/m3	µg/m3	
		Bangladesh Standard ⁵	80 µg/m3	80 µg/m3	5 mg/m3	-	65 µg/m3	150 µg/m3	0.5 µg/m3	80 µg/m3
		**IFC/WHO Standard ⁶	40	200	10	NA	15	45	NA	40 µg/m3 (Air

Source: Environmental Baseline Monitoring Report of Package 2- February 2024. and Environmental Baseline Monitoring Report of Package 5 and 6- September 2023.

Note: BDL= Below Detection Limit, NA= Not available

⁵ Air Pollution (Control) Rules, 2022, Schedule 1: Ambient Air Quality Standards

⁶ 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

73. In Rampura- Bashundhara 132kV Underground Cable Line location, it has been spotted that no parameter's value has crossed the standard. Though, the maximum emission has been observed at AQ-1 specifically in the Near the Substation Area in Bashundhara Residential Area but all the value is observed well under the limit.

74. In both 400/230 kV GIS Substation at Kaliganj, Gazipur and 400/230/132 KV GIS Substation at Purbachal, study area, PM_{2.5} and PM₁₀ values were found to be above the international limit, overall air pollution levels in all testing locations were confirmed to be within the national and international standards level.

4.2.4 Noise Level Monitoring Methods

75. This section identifies the status of the ambient noise level in one alignment Rampura-Bashundhara 132kV Underground Cable Line, and two substation locations (400/230 kV GIS Substation at Kaliganj, Gazipur and 400/230/132 KV GIS Substation at Purbachal,). 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 4-12: Noise Level Standards/ Guidelines

Sl. No.	Category of Area/Receptor	Bangladesh Standard ⁷		IFC-WHO ⁸	
		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	-	-
4.	Commercial Area	70	60	70	70
5.	Industrial Area	75	70	70	70

Note: The daytime is considered from 6 a.m. to 9 p.m. and the nighttime is from 9 p.m. to 6 a.m.

76. 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 horns or other signals and loudspeakers are forbidden in Silent Zone.

4.2.4.1 Noise Level Monitoring Locations

77. Noise levels were recorded at seven locations in Rampura- Bashundhara 132kV Underground Cable Line. Also, noise levels were recorded at eight locations in two substation locations (400/230 kV GIS Substation at Kaliganj, Gazipur and 400/230/132 KV GIS Substation at Purbachal,). 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 4-13**.

⁷ Noise Pollution (Control) Rules, 2006- Schedule 1

⁸ Guidelines for Community Noise, World Health Organization (WHO), 1999; As per IFC EHS noise level guidelines,

78. **Table 4-13.** Noise level was measured at every location at different times. 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 4-13: Sensitive Noise Locations and Descriptions of Rampura- Bashundhara 132kV Underground Cable Line, and two substation locations (400/230 kV GIS Substation at Kaliganj, Gazipur and 400/230/132 KV GIS Substation at Purbachal,)

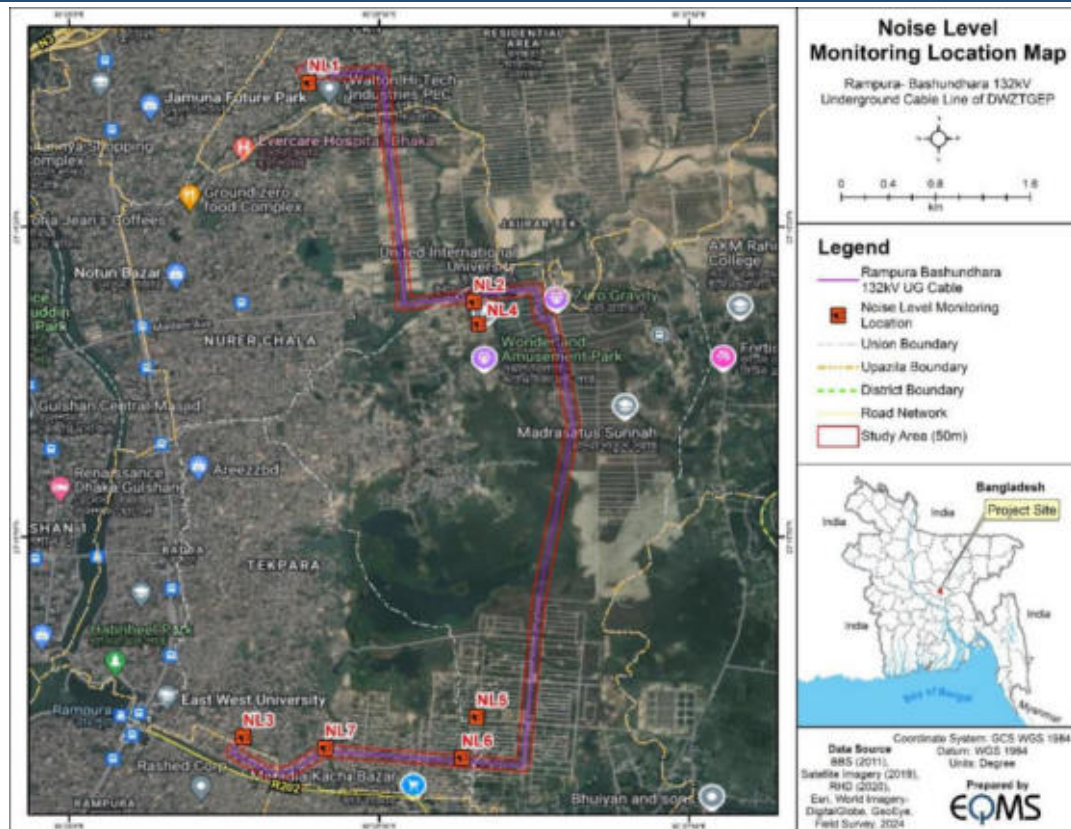
Sl. No.	Code	Location	GPS Coordinates	Sampling Date	Category
Rampura- Bashundhara 132kV Underground Cable Line					
1.	NL-1	Near the Substation Area in Bashundhara Residential area	23°47'51.28"N 88°44'41.88"E	19.02.2024	Mixed Area
2.	NL-2	Near United International University (UIU) Mosque	23°49'44.50"N 88°46'40.81"E		Silent Area
3.	NL-3	Near the Substation Area of Aftabnagar	23°50'8.75"N 88°54'12.71"E		Mixed Area
4.	NL-4	Near United International University (UIU)	23°50'27.29"N 89° 2'10.86"E		Mixed Area
5.	NL-5	Near Base Camp Area	23.76816N 90.44922E		Mixed Area
6.	NL-6	Near Mosque in Aftabnagar	23.76496N 90.44791E		Mixed Area
7.	NL-7	Near Hospital in Aftabnagar	23.76577N 90.43756E		Silent Area
400/230 kV GIS Substation at Kaliganj, Gazipur					
8.	NL-8	In front of Hafej Sheikh's House	23.968853 N 90.549165 E	20.09.2023	Residential Area
9.	NL-9	Beside Kaliganj-Kapasias Rd. located near Nolir Bridge	23.963585 N 90.549122 E		Mixed Area
10.	NL-10	In front of Mamun Mia's House	23.965680 N 90.554108 E		Residential Area
11.	NL-11	In front of Late Abdul Razzak's House	23.969766 N 90.552512 E		Residential Area
400/230/132 KV GIS Substation at Purbachal,					
12.	NL-12	In front of Dulal Mia's house	23.864745N 90.475689 E	19.09.2023	Mixed
13.	NL-13	In front of Dipak Chakraborty's Shop	23.865882N 90.475720 E		Mixed
14.	NL-14	In front of Badal Mia's house	23.861849N 90.476507 E		Residential Area

Sl. No.	Code	Location	GPS Coordinates	Sampling Date	Category
15	NL-15	In front of Mohadev Karmakar's house	23.867743N 90.476149 E		Residential Area

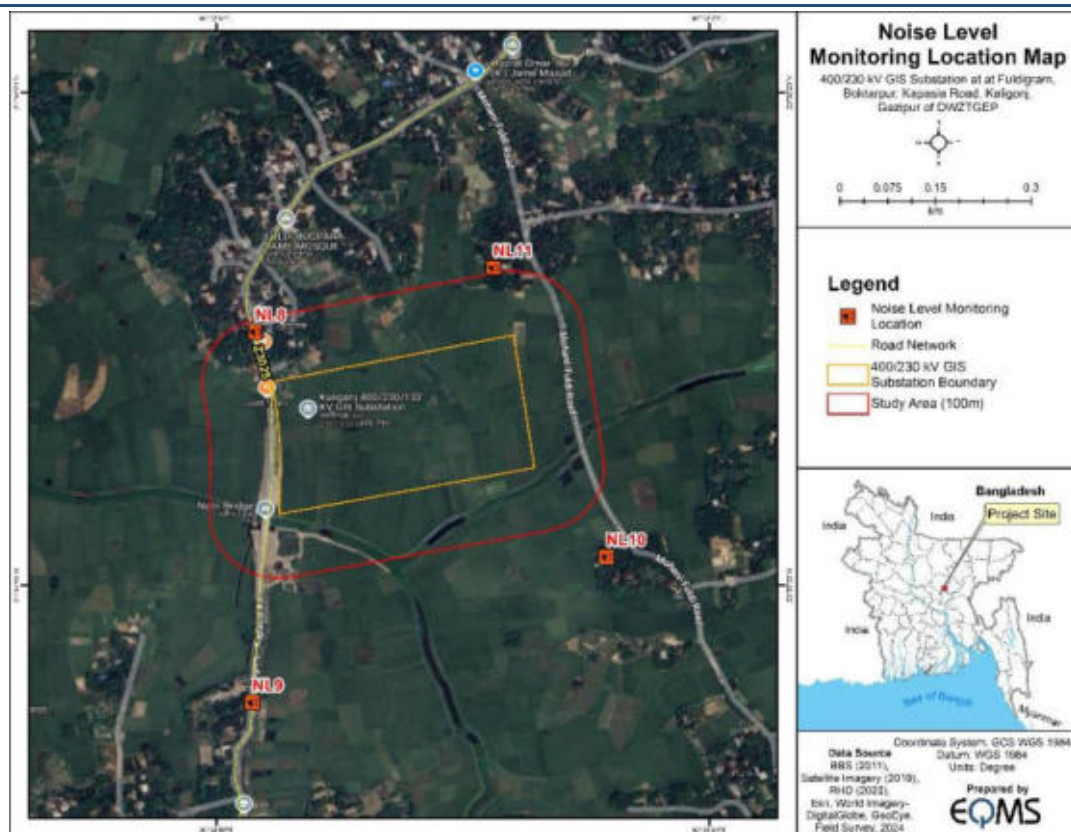
Source: Environmental Baseline Monitoring Report of Package 2- February 2024. and Environmental Baseline Monitoring Report of Package 5 and 6- September 2023.

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.

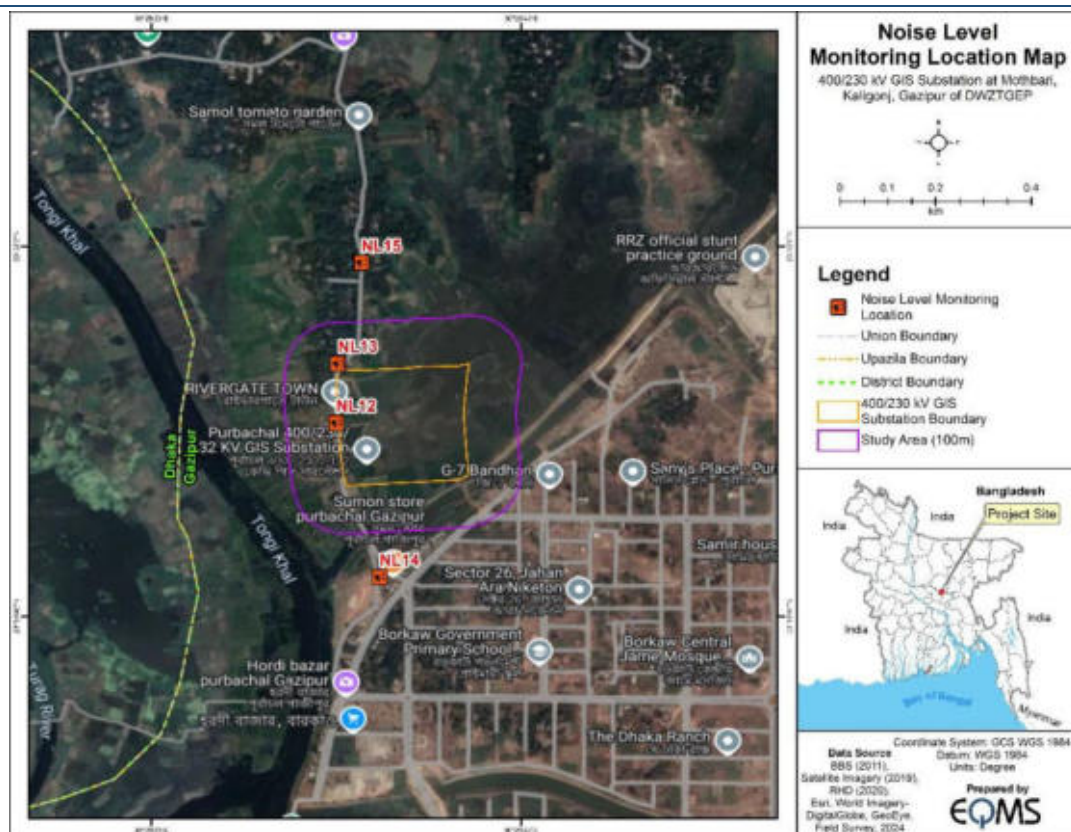
Figure 4-11: Noise Level Monitoring Location Map



Rampura- Bashundhara 132kV Underground Cable Line



400/230 kV GIS Substation at Kaliganj, Gazipur



400/230/132 KV GIS Substation at Purbachal

Source: Environmental Baseline Monitoring Report of Package 2- February 2024. and Environmental Baseline Monitoring Report of Package 5 and 6- September 2023.

Noise level Monitoring Pictures

Figure 4-12: Noise Monitoring in Study Area

Rampura- Bashundhara 132kV Underground Cable Line



NL1



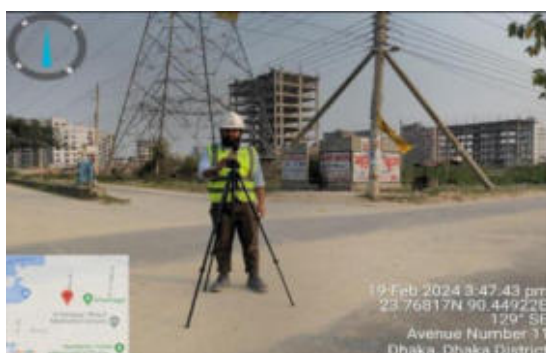
NL2



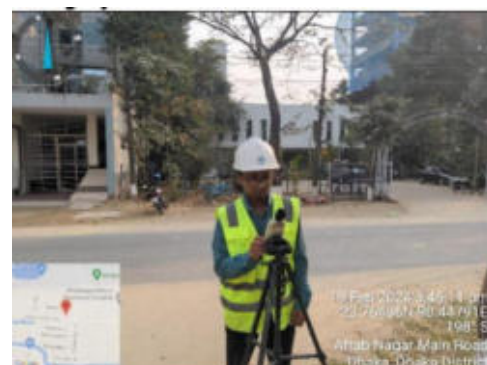
NL3



NL4



NL5



NL6



NL7

400/230 kV GIS Substation at Kaliganj, Gazipur



NL8



NL9



NL10



NL11

400/230/132 KV GIS Substation at Purbachal



Source: Environmental Baseline Monitoring Report of Package 2- February 2024, and Environmental Baseline Monitoring Report of Package 5 and 6- September 2023.

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.

4.2.4.2 Analysis Results

79. An electronic and auto-recorded noise meter has been used to conduct the study. The recorded noise levels summary monitoring results are shown inTable 4-14 Table 4-14.

Table 4-14: Noise Monitoring Level

Sl. No.	Code	Period	Ambient Noise Level [dB(A)]		Bangladesh Standard ⁹		IFC/WHO Standard ¹⁰		Category of Area/Receptor
			Leq _{day}	Leq _{night}	Day	Night	Day	Night	
Rampura- Bashundhara 132kV Underground Cable Line									
1.	NL-1	19.02.2024	51.38	37.34	60	50	55	45	Mixed Area
2.	NL-2	19.02.2024	46.82	39.13	50	40	55	45	Silent Area
3.	NL-3	19.02.2024	49.73	41.92	60	50	55	45	Mixed Area
4.	NL-4	19.02.2024	53.62	41.34	60	50	55	45	Mixed Area
5.	NL-5	19.02.2024	54.25	40.57	60	50	55	45	Mixed Area
6.	NL-6	19.02.2024	58.35	45.39	60	50	55	45	Mixed Area
7.	NL-7	19.02.2024	47.56	38.25	50	40	55	45	Silent Area
400/230 kV GIS Substation at Kaliganj, Gazipur									
8.	NL-8	20.09.2023	48.9	38.3	55	45	55	45	Residential Area
9.	NL-9	20.09.2023	50.71	40.88	60	50	55	45	Mixed Area
10.	NL-10	20.09.2023	48.7	35.6	55	45	55	45	Residential Area
11.	NL-11	20.09.2023	47.3	38.9	55	45	55	45	Residential Area
400/230/132 KV GIS Substation at Purbachal,									
12.	NL-12	19.09.2023	53.52	39.95	60	50	55	45	Mixed
13.	NL-13	19.09.2023	51.39	41.66	60	50	55	45	Mixed
14.	NL-14	19.09.2023	49.47	38.71	55	45	55	45	Residential Area
15.	NL-15	19.09.2023	50.54	39.92	55	45	55	45	Residential Area

Source: Environmental Baseline Monitoring Report of Package 2- February 2024. and Environmental Baseline Monitoring Report of Package 5 and 6- September 2023.

⁹ Noise Pollution (Control) Rules, 2006, Schedule 1: Area-wise Noise Standards.

¹⁰ Guidelines for Community Noise, World Health Organization (WHO), 1999; As per IFC EHS noise level guidelines

4.2.4.3 Discussion

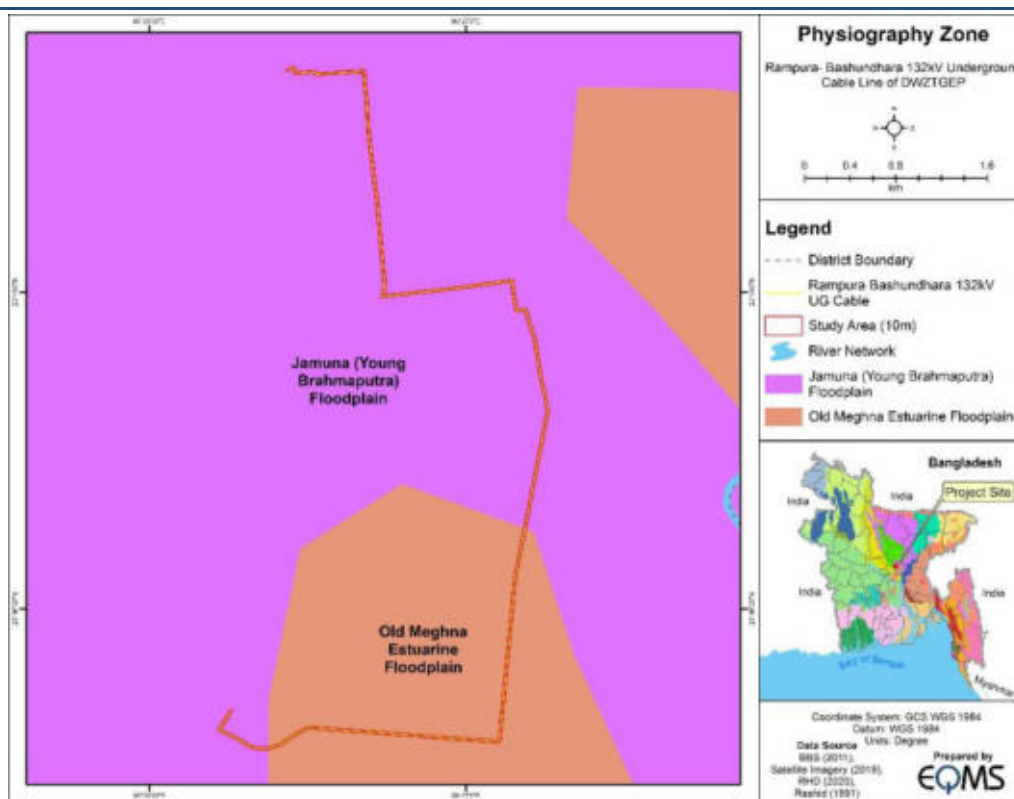
80. According to Noise Pollution (Control) Rules, 2006 categorizations, the current monitoring location falls into Mixed area (NL-1, NL-3, NL-4, NL-5, NL-6, NL-9, NL-12 and NL-13), Silent zone (NL2 and NL7) and Residential Area (NL-8, NL-10, NL-11, NL-14 and NL-15). The daytime and nighttime noise level at most of the locations are found within the national standards.

4.2.5 Physiographic Features

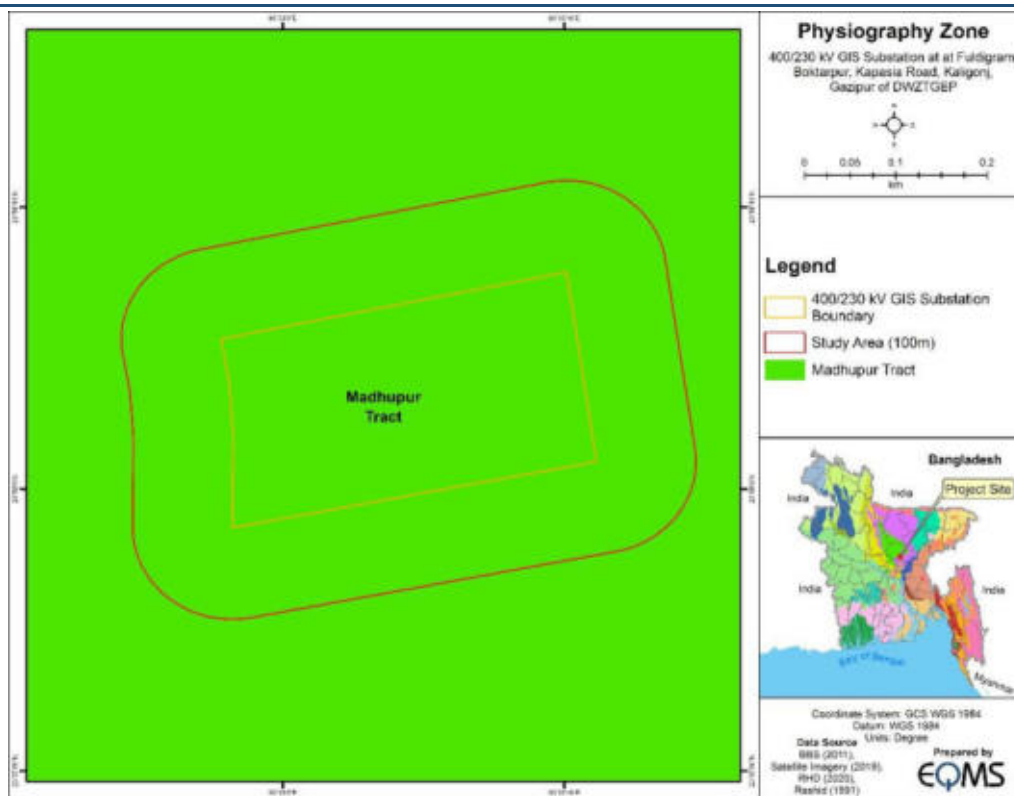
81. In the context of physiography, Bangladesh is classified into three distinct regions: (a) floodplains; (b) terraces; and (c) hills each having distinguishing characteristics of its own. Further, the physiography of the country has been divided into 24 sub regions and 54 units. The physiography of Rampura- Bashundhara 132kV Underground Cable Line fall in Jamuna (Young Brahmaputra) floodplain and Old Meghna Estuarine Floodplain. Kaliganj substation falls in Madhupur tract and Purbachal Substation falls in Jamuna (Young Brahmaputra) floodplain.

Figure 4-13 shows the physiographic condition of Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substation locations.

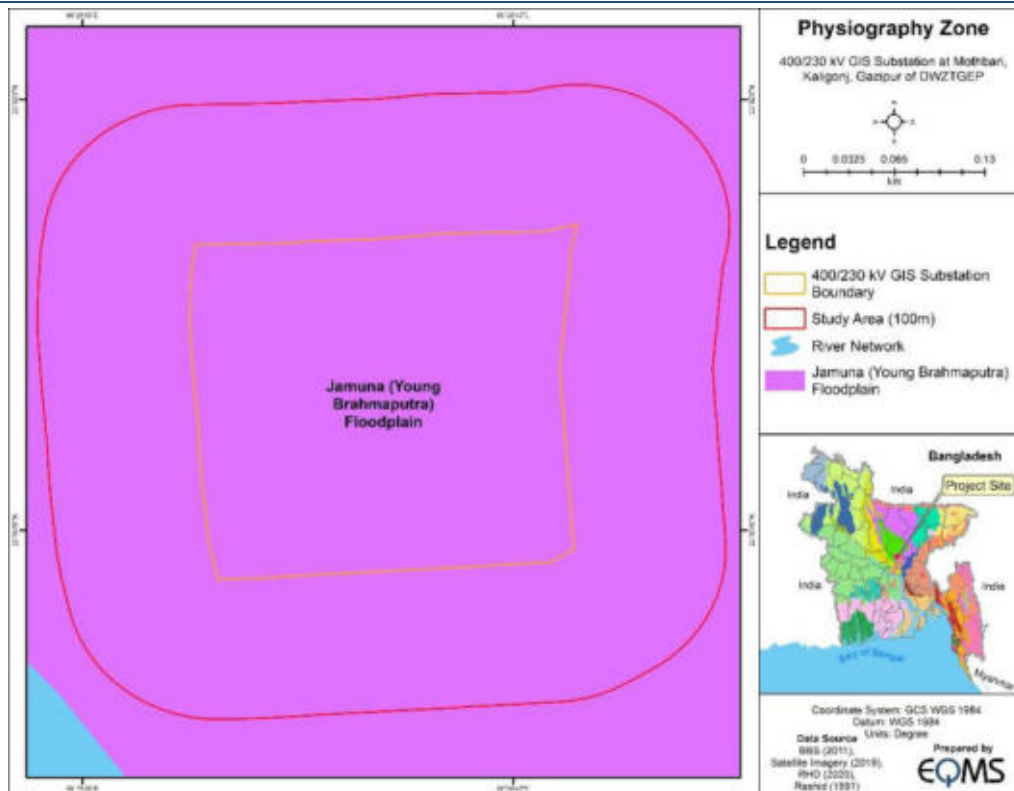
Figure 4-13: Physiographic Map of Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations



Rampura- Bashundhara 132kV Underground Cable Line



400/230 kV GIS Substation at Kaliganj, Gazipur



400/230/132 KV GIS Substation at Purbachal,

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

4.2.6 Topography

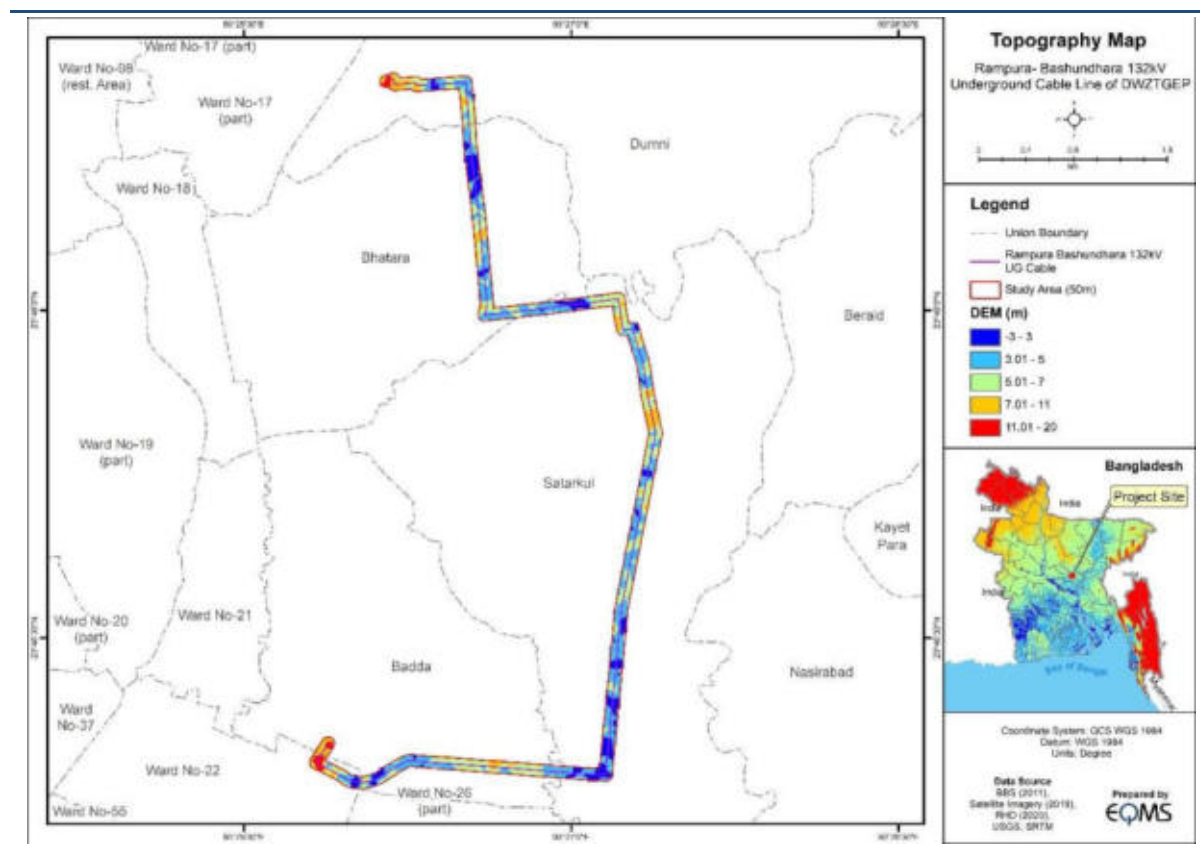
82. Bangladesh is one of the largest deltas in the world formed by the confluence of three Himalayan rivers: the Ganges (Padma); the Brahmaputra (Jamuna); and, the Meghna, with a long coastline along the Bay of Bengal. Floodplains (80%), terraces (8%) and hills (12%) cover the land area.

83. 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 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.

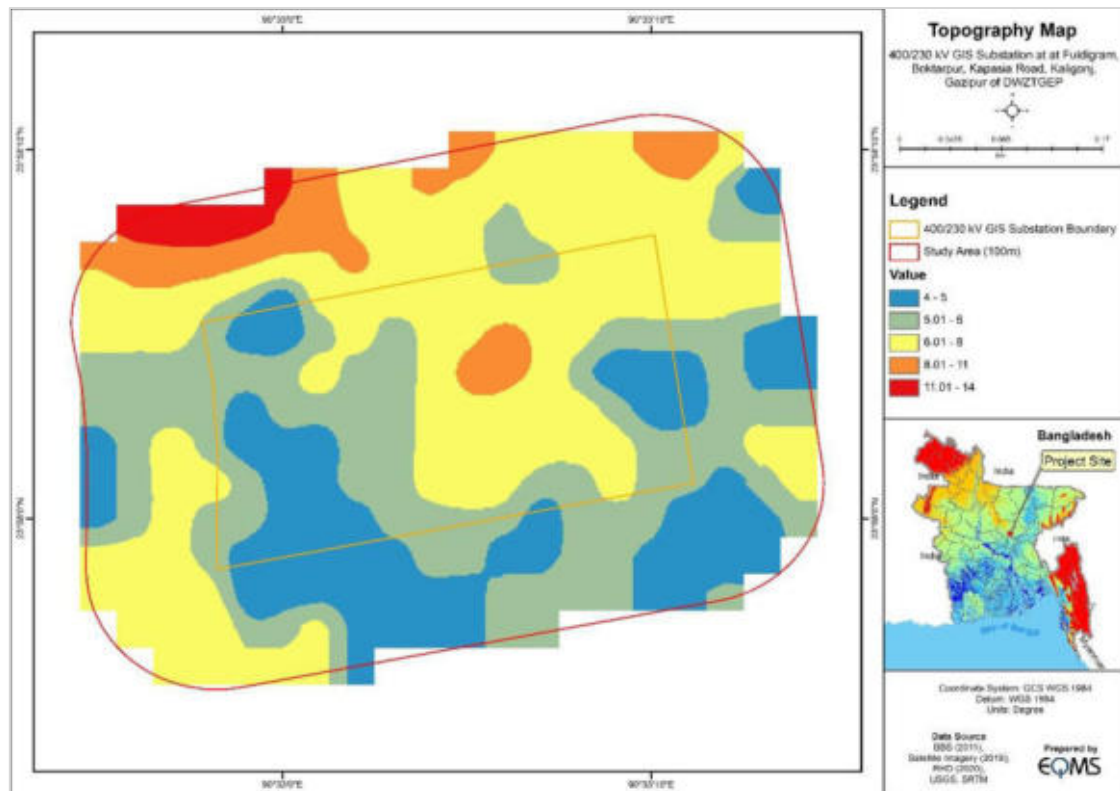
84. The average elevation of Rampura- Bashundhara 132kV Underground Cable Line alignment is 11.93- 18.92m. In Kaliganj and Purbachal Substations location average elevation is 4- 14 m. The average elevation of two substations is depicted in below table.

The topographic map of these Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations are shown in Figure 4-14.

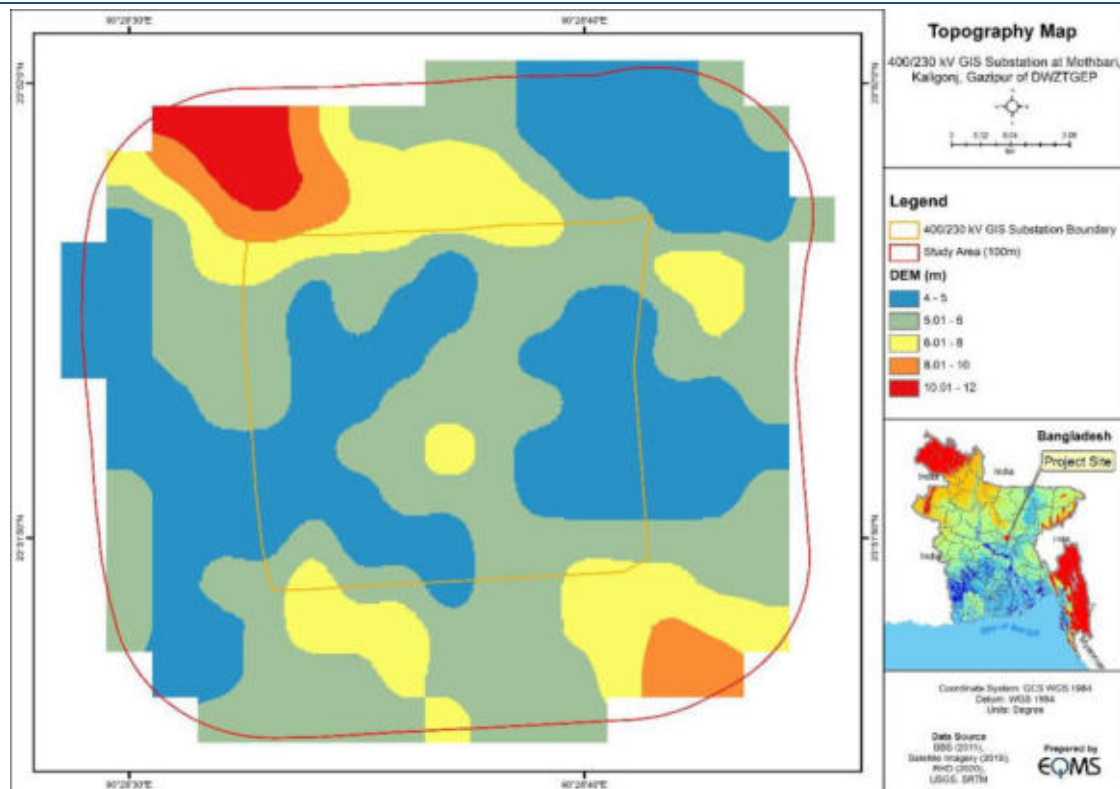
Figure 4-14: Topography Map of Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations



Rampura- Bashundhara 132kV Underground Cable Line



400/230 kV GIS Substation at Kaliganj, Gazipur



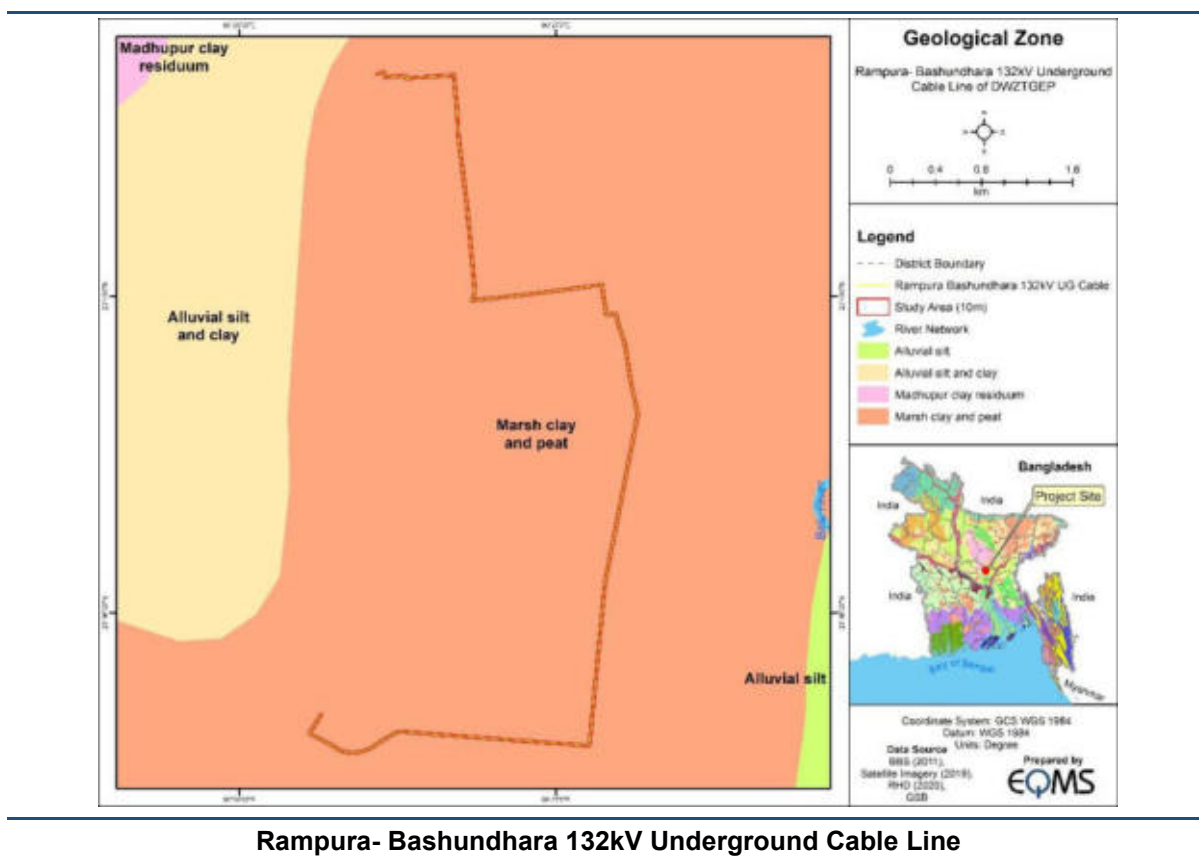
400/230/132 KV GIS Substation at Purbachal,

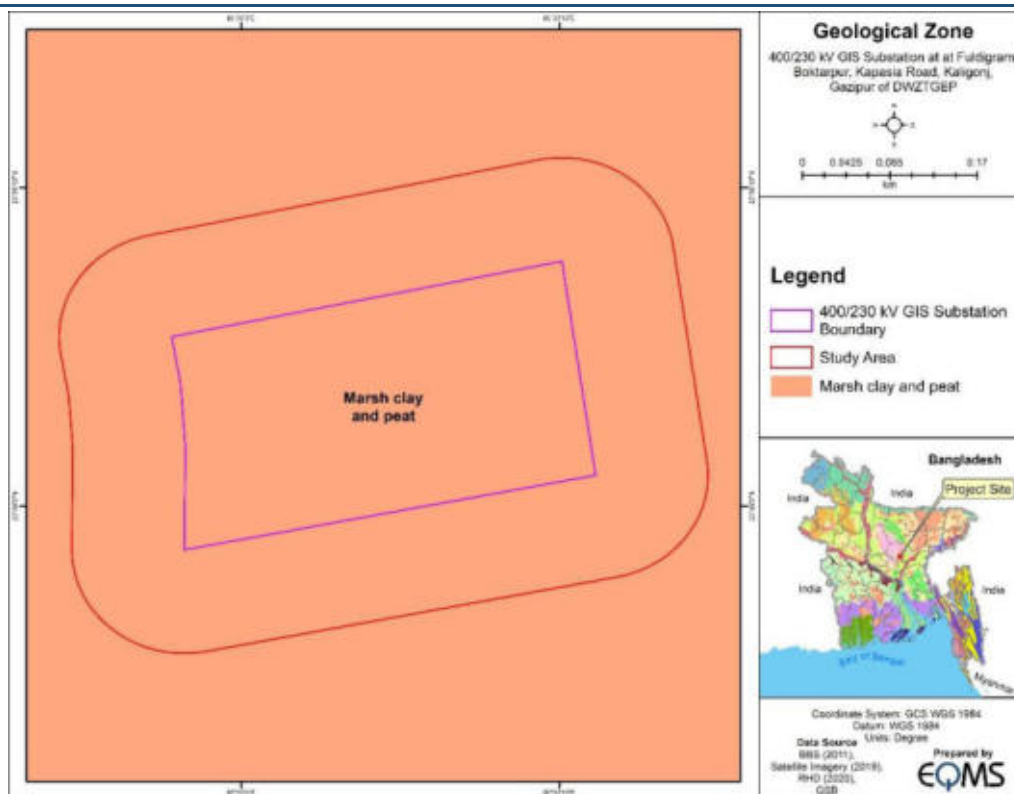
Source: SRTM Satellite Image

4.2.7 Geology

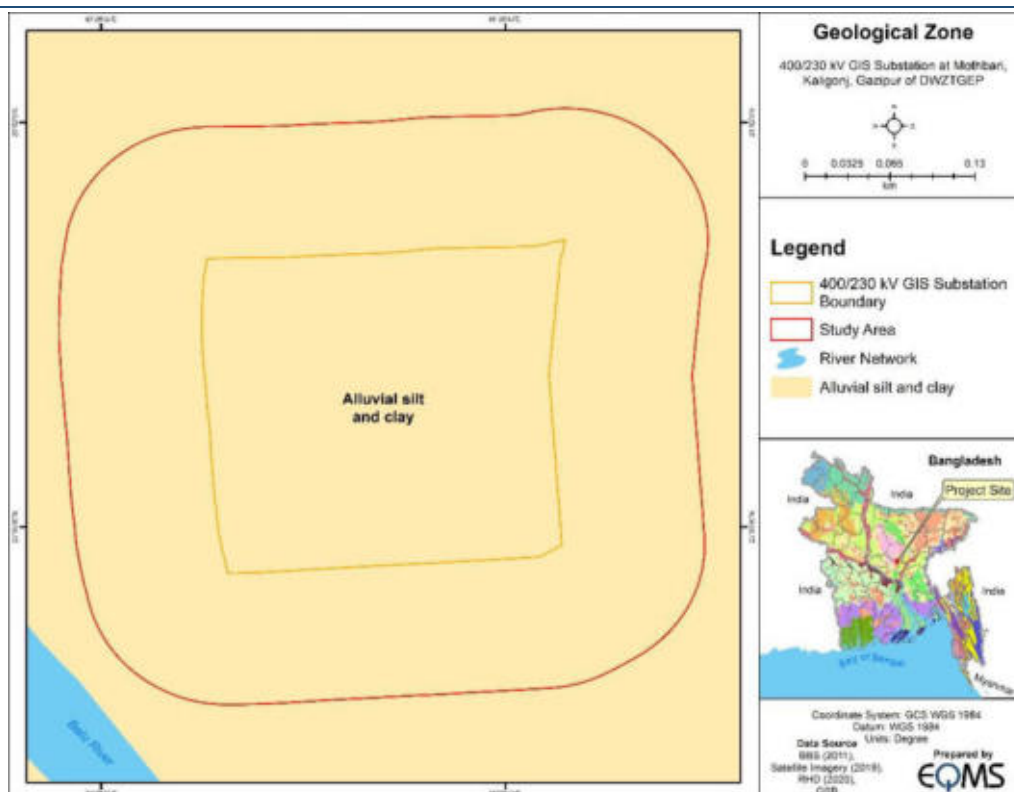
85. Bangladesh is situated to the east of the Indian sub-continental plate. Nearly 85% of Bangladesh is underlain by deltaic and alluvial deposits of the Ganges, Brahmaputra, and Meghna River systems. The project area consists of Holocene alluvial deposits in the floodplain and predominantly consists 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 Rampura- Bashundhara 132kV Underground Cable Line and 400/230 kV GIS Substation at Kaliganj, Gazipur falls under Marsh Clay and Peat category (Figure 4-15). 400/230/132 KV GIS Substation at Purbachal, falls in Alluvial Silt and Clay depicted in below Figure 4-15.

Figure 4-15: Geology Map of Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations





400/230 kV GIS Substation at Kaliganj, Gazipur



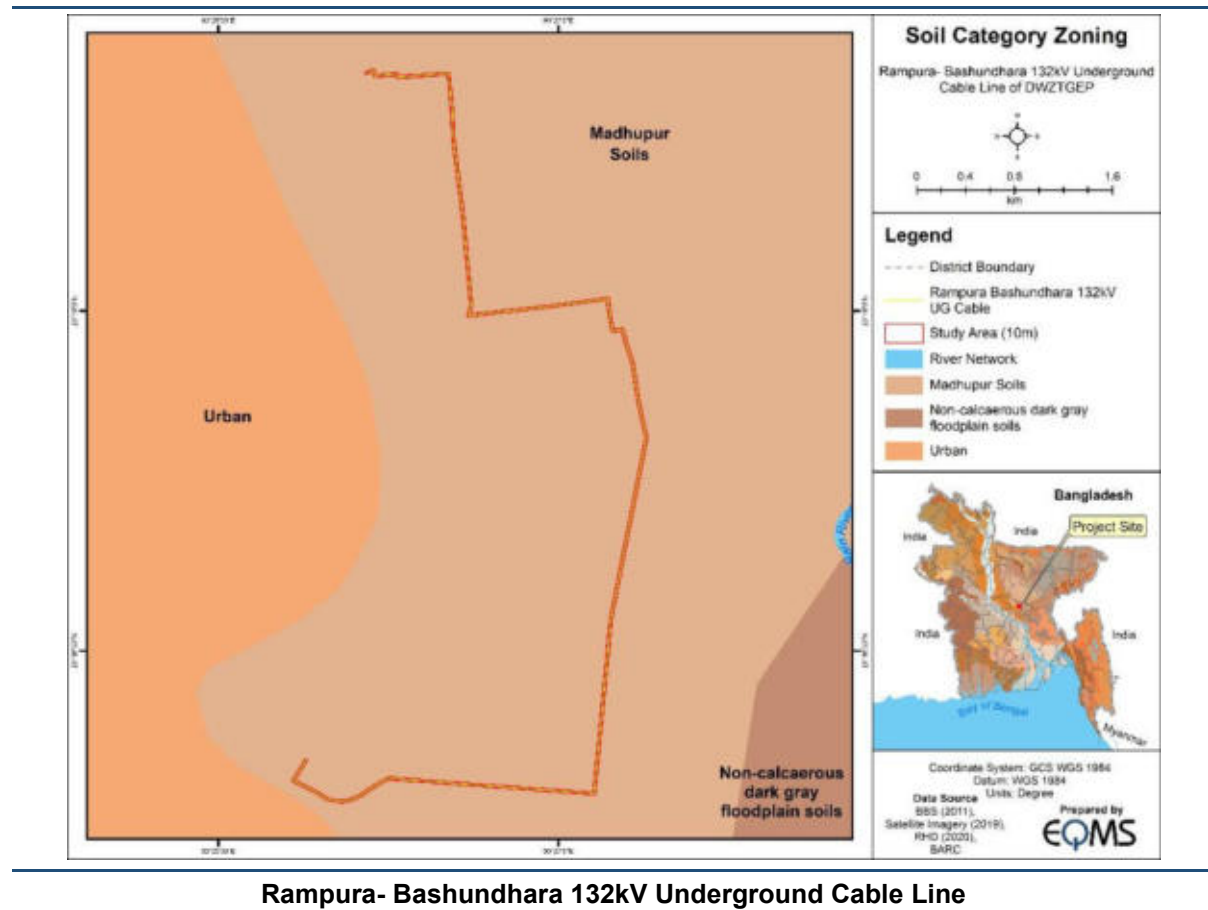
400/230/132 KV GIS Substation at Purbachal,

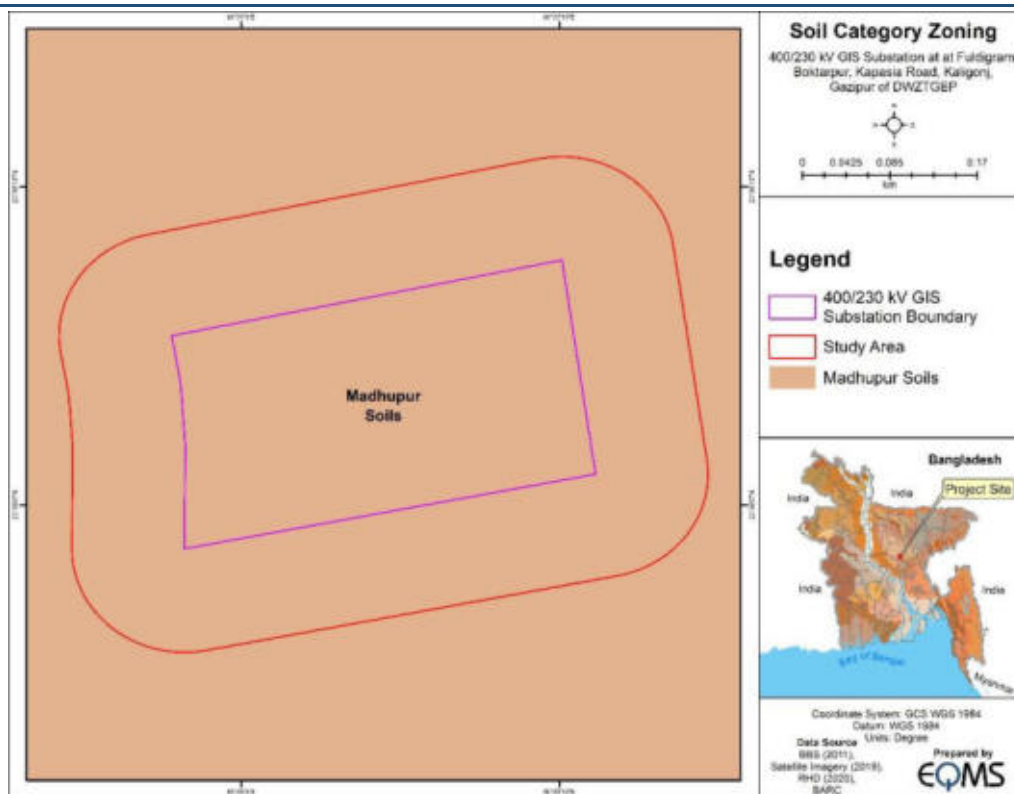
Source: Survey of Bangladesh

4.2.8 Soil

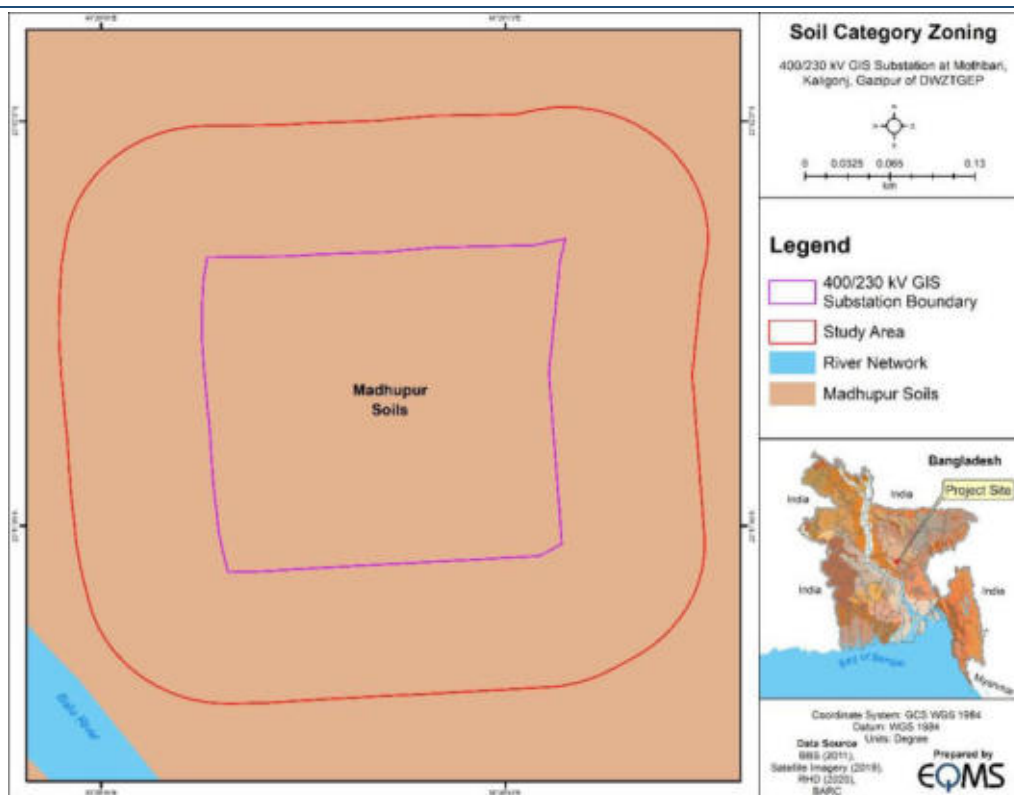
86. The project areas fall into seven different soil formation zones (Figure 4-16). The general soil types of Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj substation and Purbachal Substation fall under Madhupur soil category depicted in below Figure 4-16.

Figure 4-16: Soil Category of Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations





400/230 kV GIS Substation at Kaliganj, Gazipur



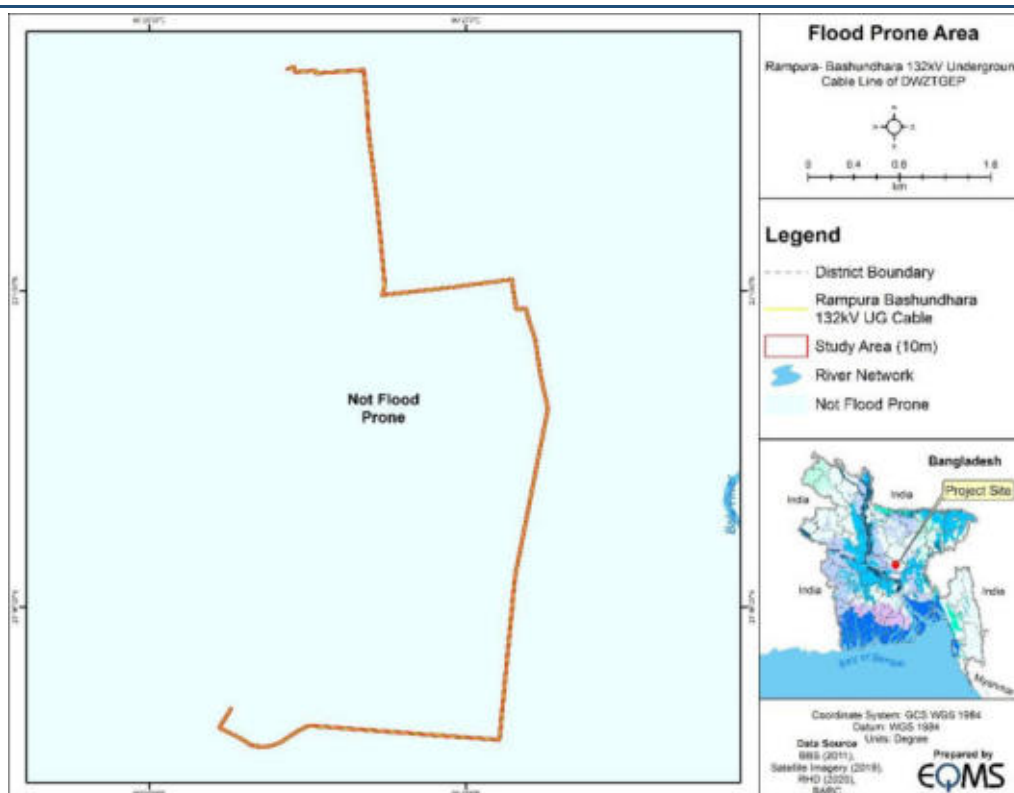
400/230/132 kV GIS Substation at Purbachal,

Source: Soil Resource Development Institute (SRDI)

4.2.9 Flood prone areas

87. 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^{11 12}. As per the flood category map, Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj substation and Purbachal Substation locations are not flood prone area depicted in below Figure 4-17.

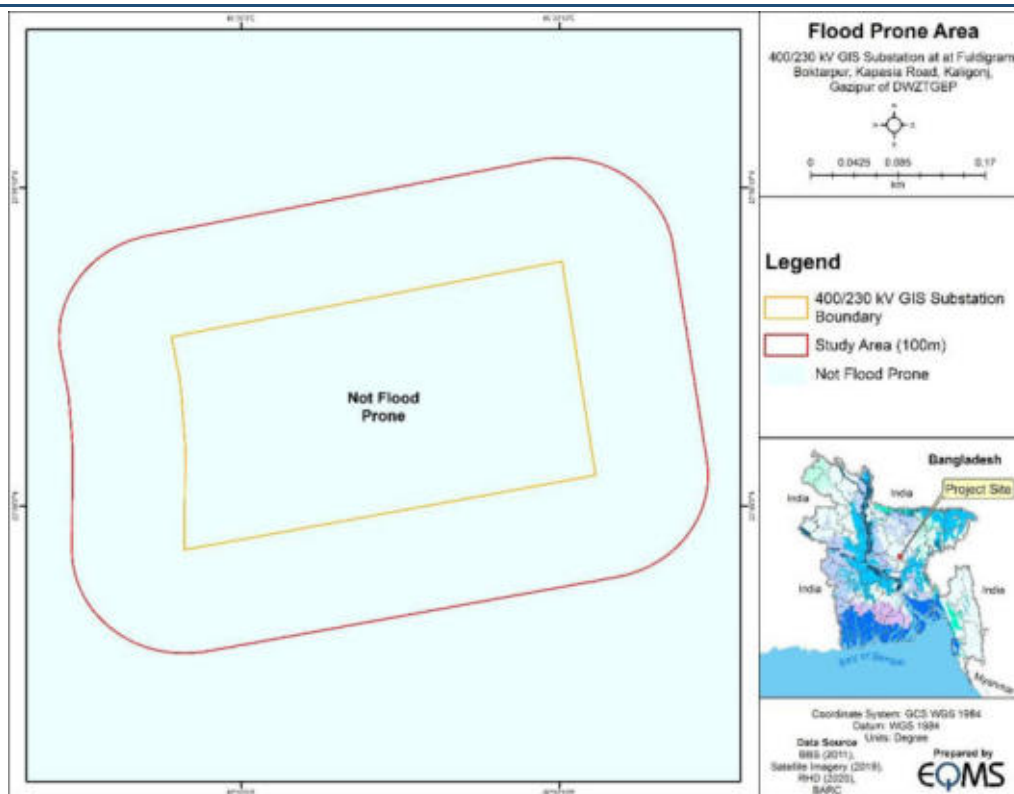
Figure 4-17: Flood Prone Category Map of Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations



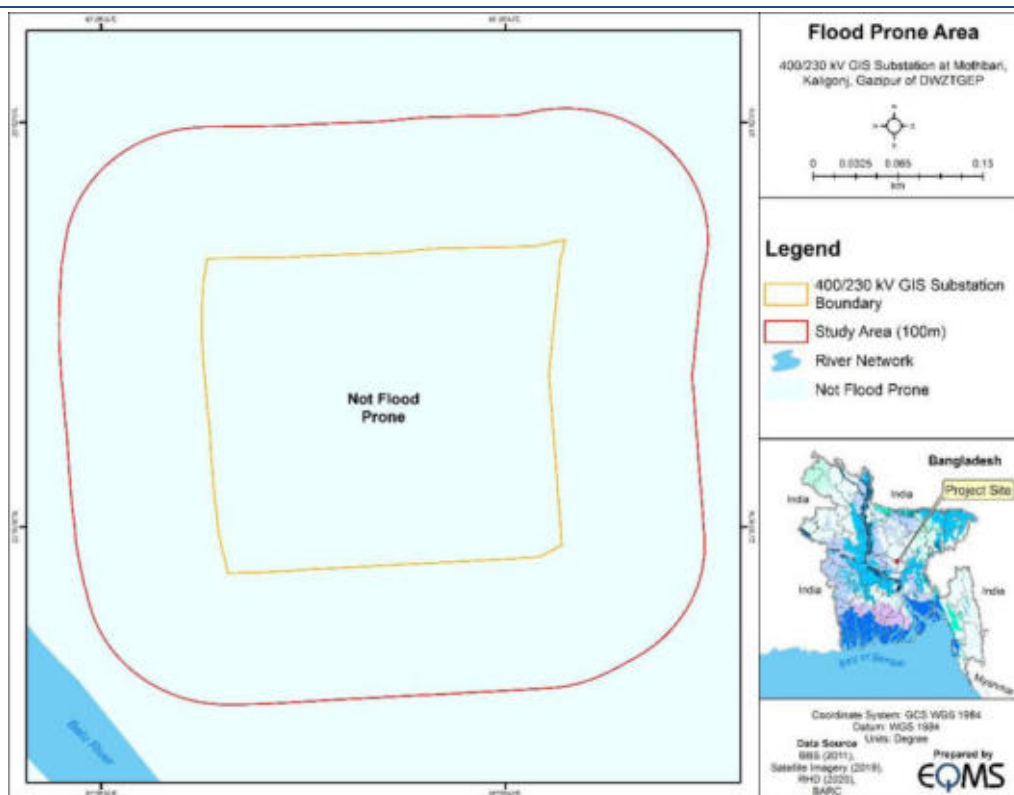
Rampura- Bashundhara 132kV Underground Cable Line

¹¹ [http://en.banglapedia.org/index.php?title=Bangladesh Soil](http://en.banglapedia.org/index.php?title=Bangladesh_Soil)

¹² Bangladesh Agricultural Research Council (BARC)/GIS Project, BGD/95/006



400/230 kV GIS Substation at Kaliganj, Gazipur



400/230/132 KV GIS Substation at Purbachal,

Source: Bangladesh Agricultural Research Council (BARC)

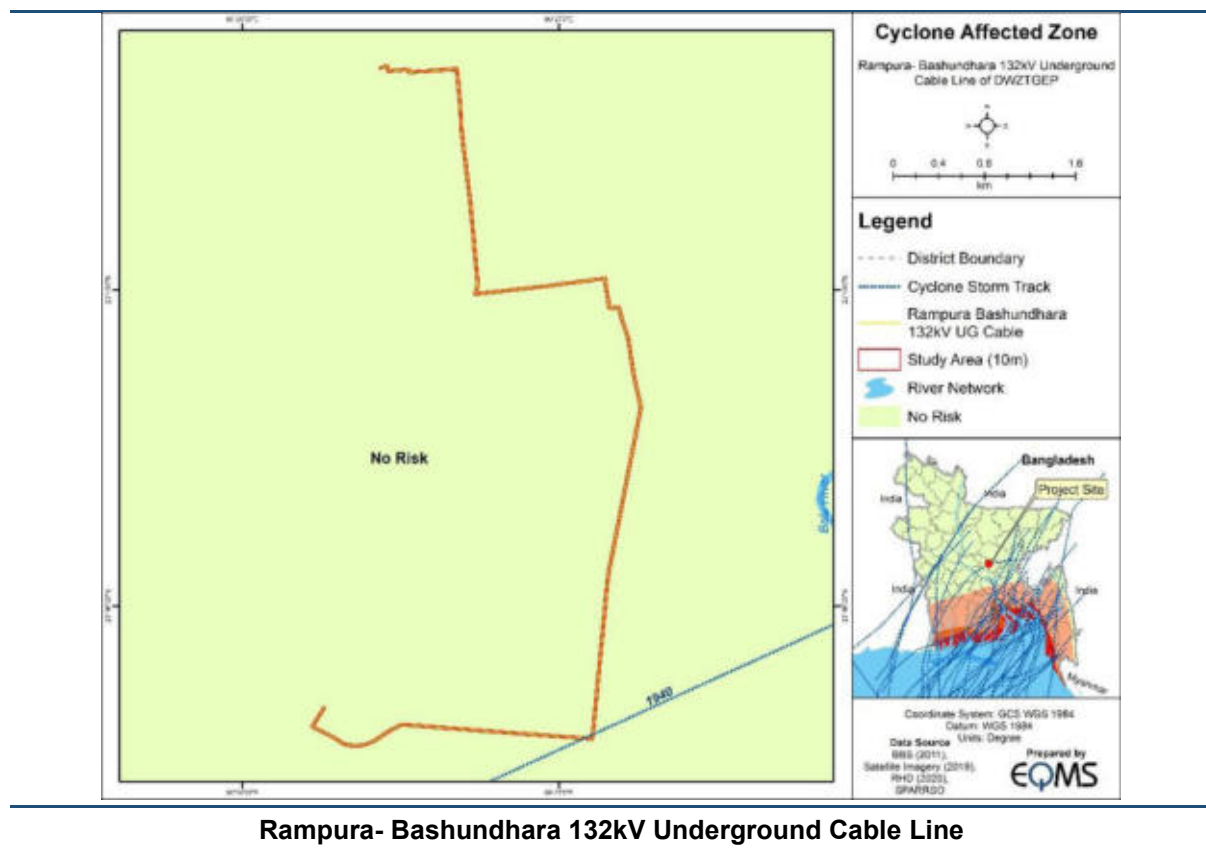
4.2.10 Cyclones

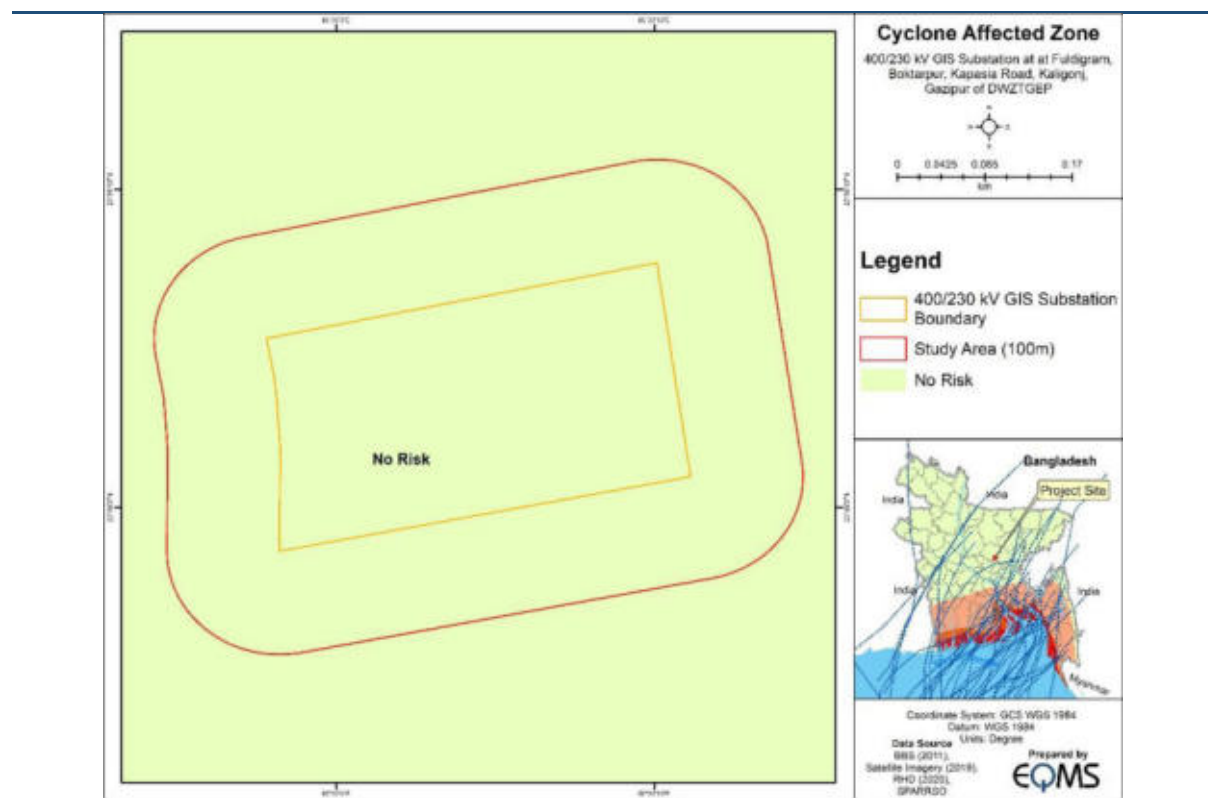
88. Bangladesh coast is one of the most cyclone prone areas of the world due to its geographical location and funnel shaped coast of the Bay of Bengal. Most of the damage occurs in the coastal regions of Khulna, Patuakhali, Barisal, Noakhali and Chattogram and the offshore islands of Bhola, Hatiya, Sandwip, Manpura, Kutubdia, Moheshkhali, Nijhum Dwip, Urir Char and other newly formed islands. Figure 4-18 shows cyclone affected area map of Bangladesh.

89. 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.

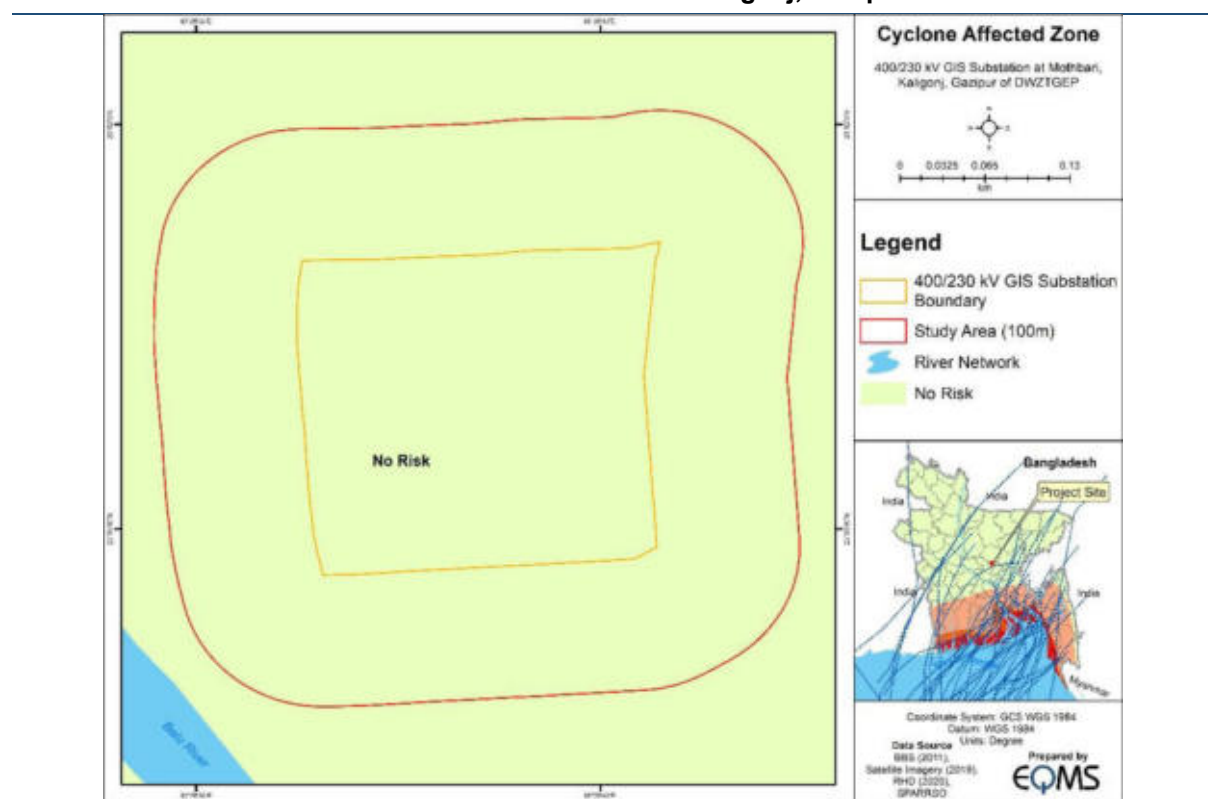
90. As per the cyclone affected zone map, Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj substation and Purbachal Substation locations are fall under no cyclone risk zone depicted in below Figure 4-18.

Figure 4-18: Cyclone affected zone map of the Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations





400/230 kV GIS Substation at Kaliganj, Gazipur



400/230/132 KV GIS Substation at Purbachal,

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

4.2.11 River Erosion

91. 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 the collapse of riverbanks and devastation of whole Unions and Upazilla.

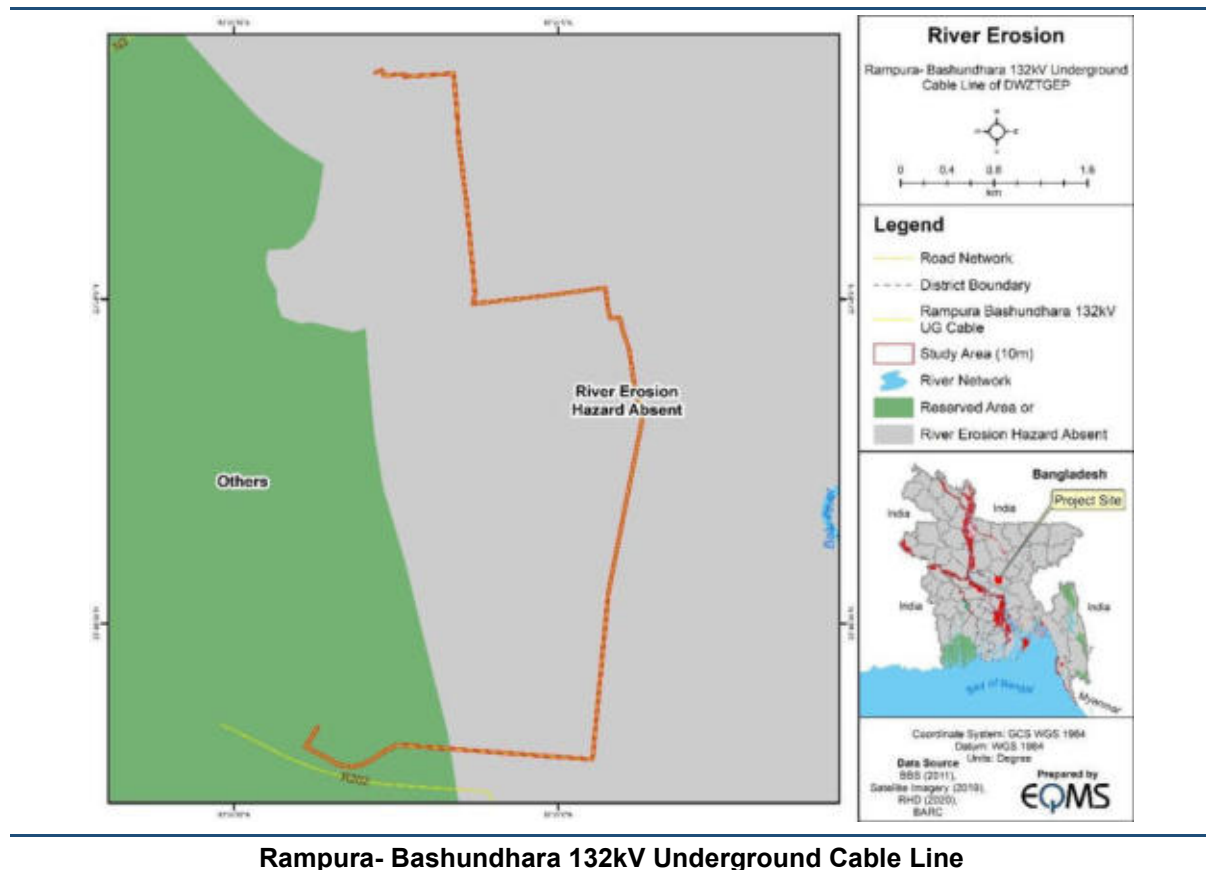
92. Every year, riverbank erosion leads to millions of people being affected as it results in damage and loss of crops, cattle, housing structures, and farmland. Additionally, it erodes public infrastructure and communication systems. The unpredictable shifting behavior of the rivers and their encroachments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

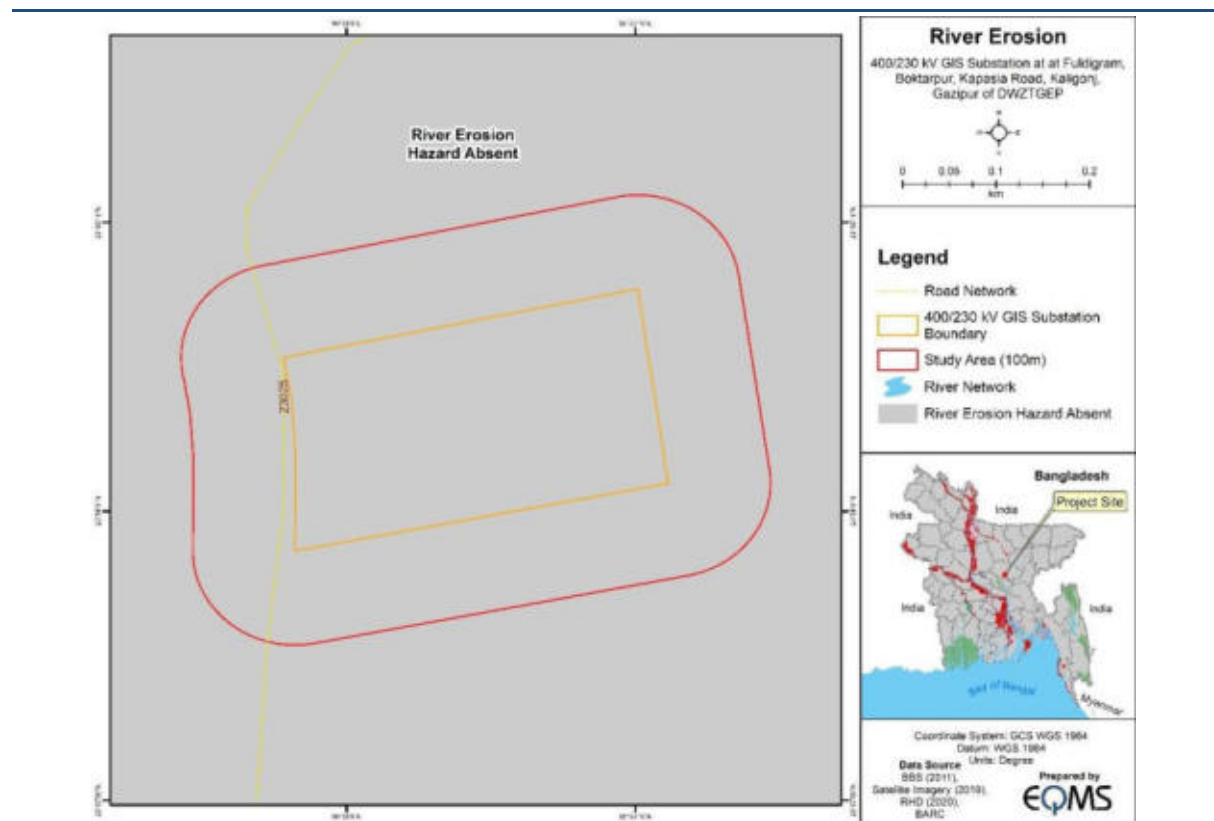
93. According to the Bangladesh Water Development Board (BWDB) the most erosion prone districts are Bogra, Sirajganj, Kurigram, Lalmonirhat, Gaibandha and Rangpur, in the country's north, and Chandpur, Manikganj, Rajbari Shariatpur, and Faridpur in Dhaka zone, with Tangail and Jamalpur in Mymensingh 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).

94. As per the river erosion map, river erosion hazard is absent in majority of the Rampura-Bashundhara 132kV Underground Cable Line route. Kaliganj and Purbachal Substations fall into the no hazard risk zone.

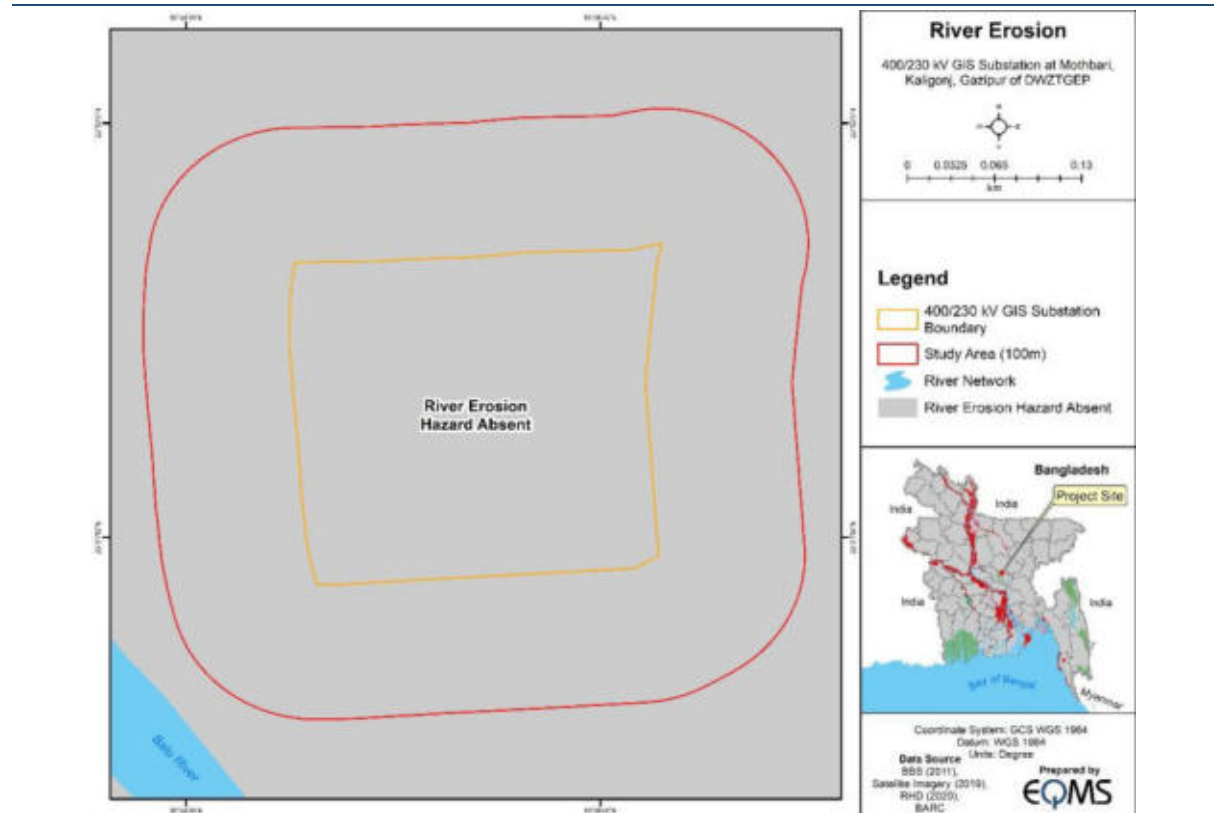
The river erosion map of Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj and Purbachal Substations are shown in Figure 4-19.

Figure 4-19: River erosion map of Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj and Purbachal Substations





400/230 kV GIS Substation at Kaliganj, Gazipur



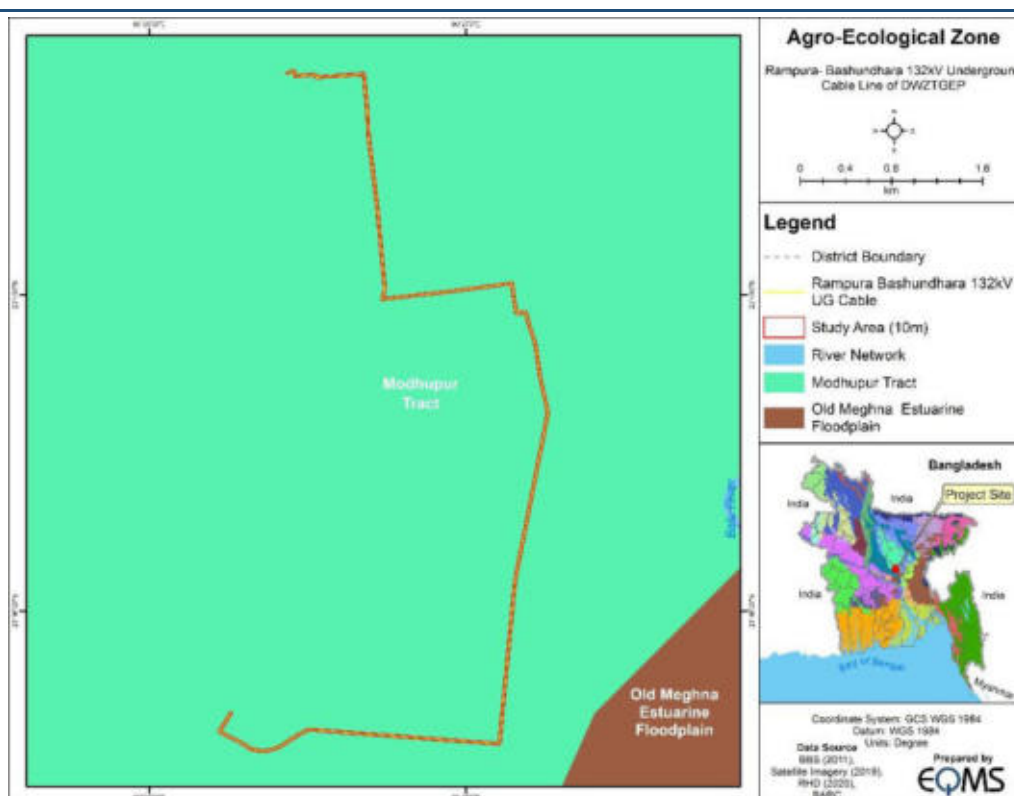
400/230/132 KV GIS Substation at Purbachal,

Source: Bangladesh Agricultural Research Council (BARC)

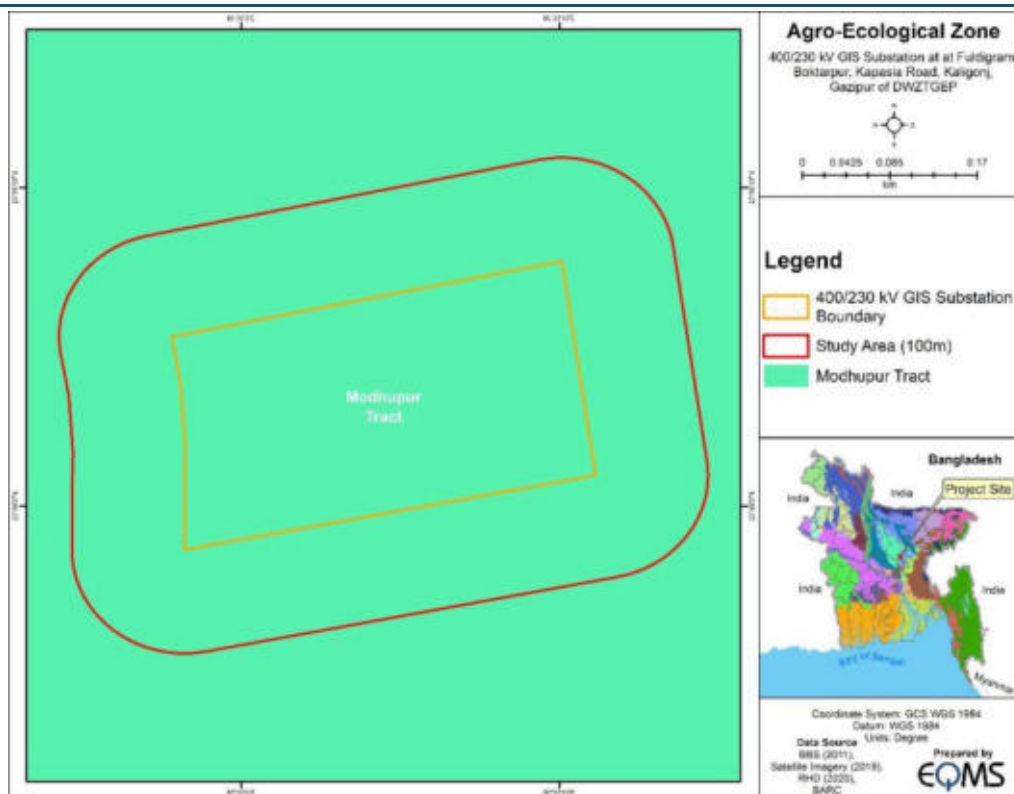
4.2.12 Agro-ecological zones of Bangladesh

95. 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. As per Agro-ecological zone category map, Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj substation and Purbachal Substation fall under Madhupur tract depicted in the Figure 4-20.

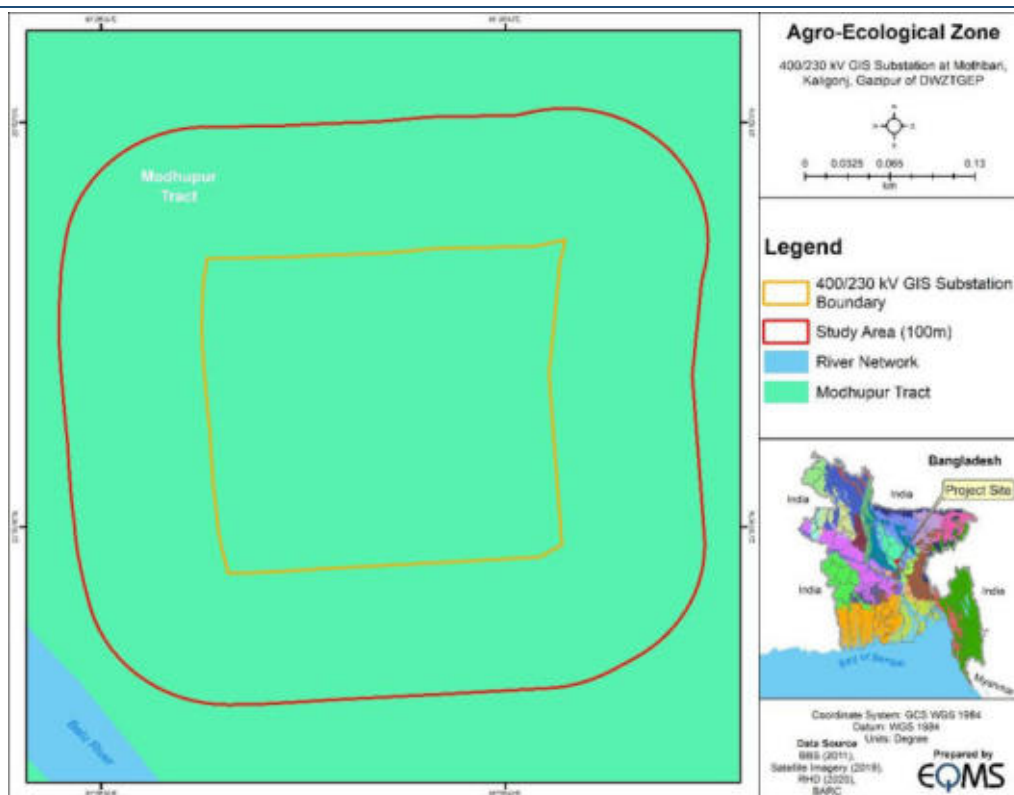
Figure 4-20: Agro-ecological zone of Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations



Rampura- Bashundhara 132kV Underground Cable Line



400/230 kV GIS Substation at Kaliganj, Gazipur



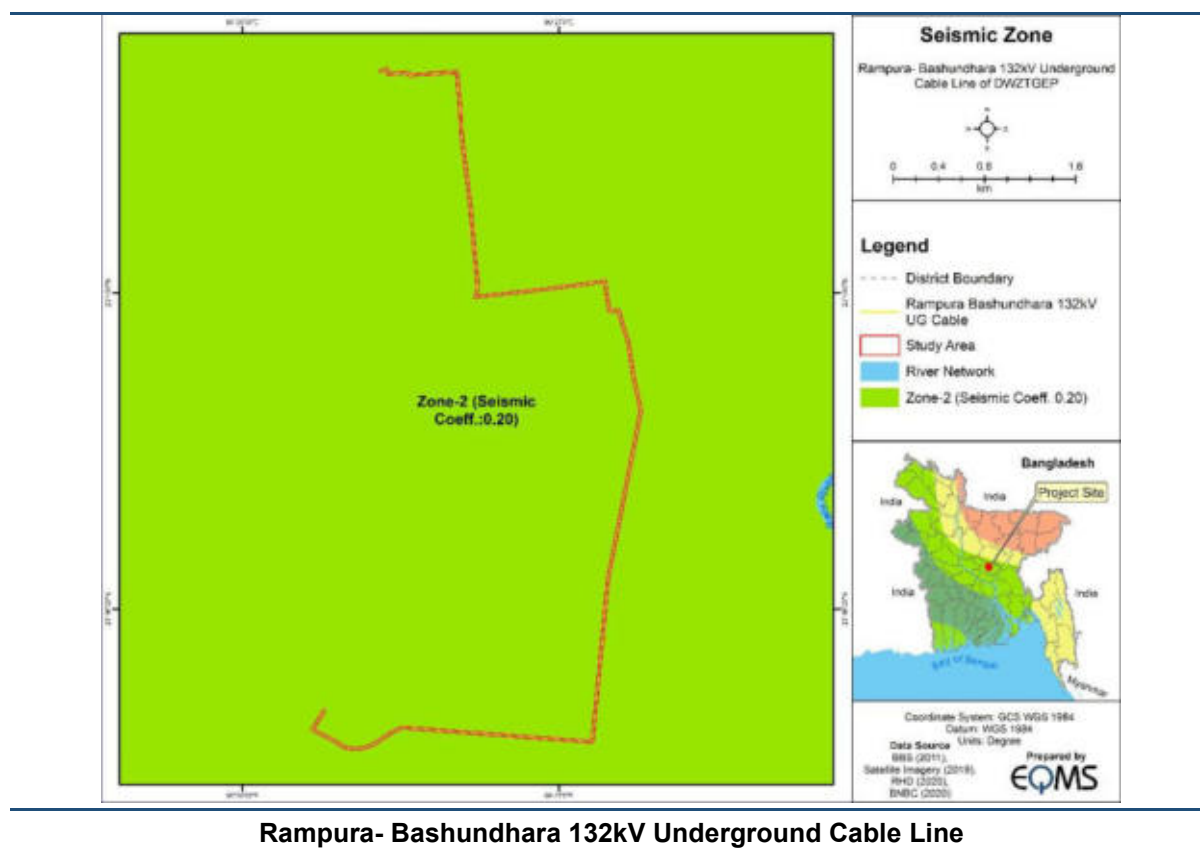
400/230/132 KV GIS Substation at Purbachal,

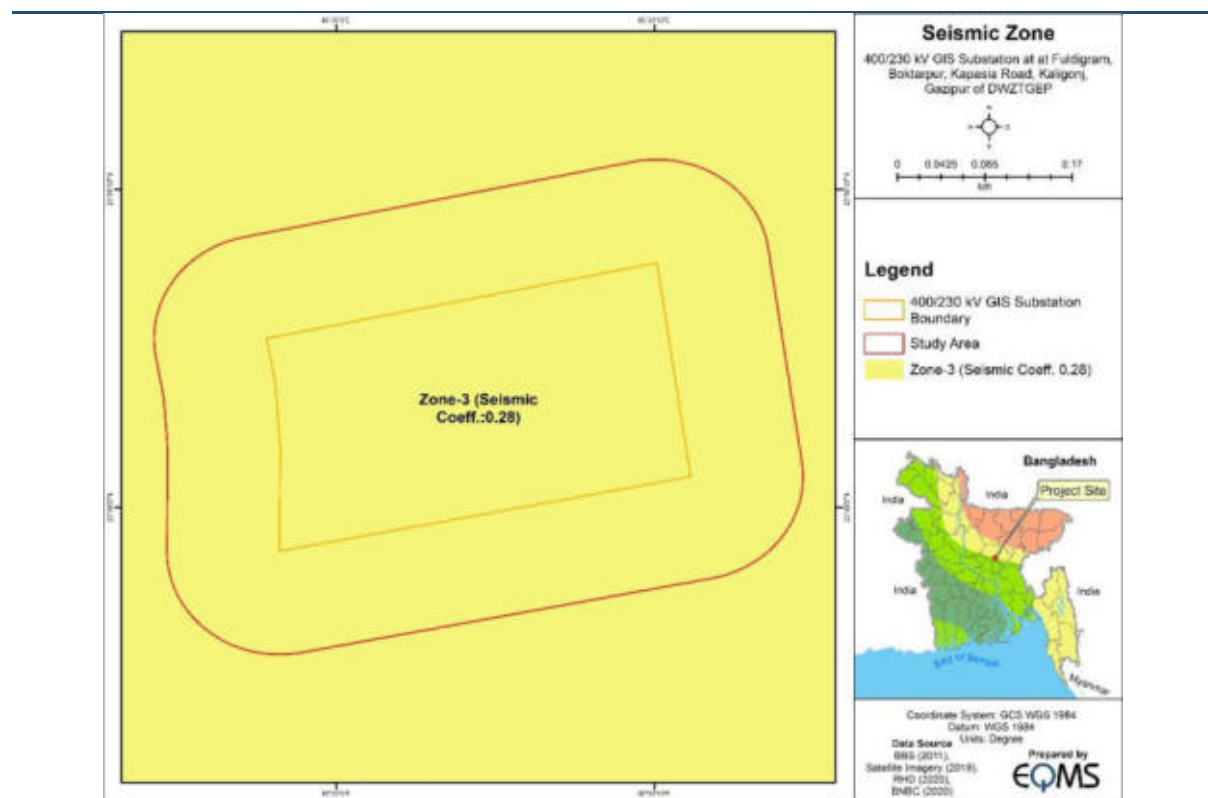
Source: Bangladesh Agricultural Research Council (BARC)

4.2.13 Seismic zones of Bangladesh

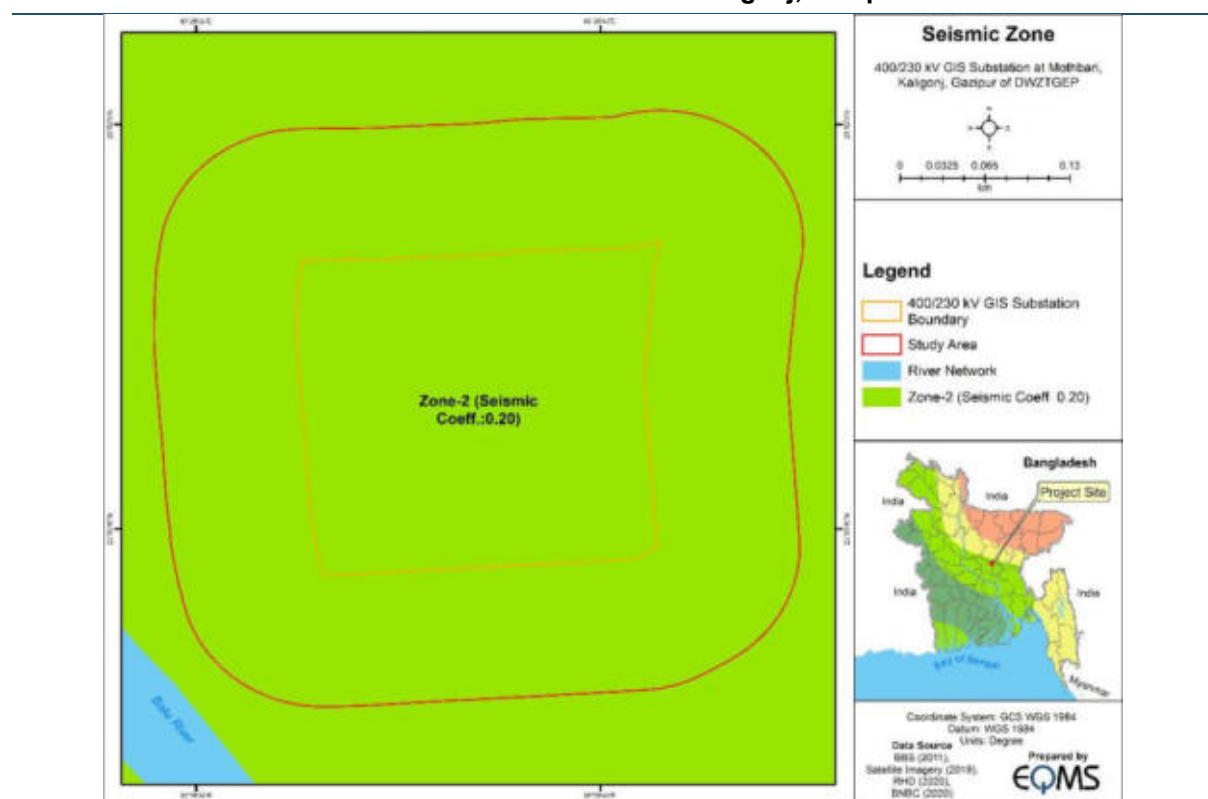
96. Bangladesh can be affected by moderate to strong earthquake events due to its proximity to the collision boundary of the Northeast moving Indian plate and the Eurasian Plate. Strong historical earthquakes with magnitude greater than 7.0 (Richter scale) have affected parts of Bangladesh in the last 150 years; some of them had their epicenters within the country. As per Bangladesh National Building Code (BNBC) seismic zoning map, Rampura- Bashundhara 132kV Underground Cable Line and Purbachal Substation fall into Zone-2 having the coefficient of 0.20. Whereas Kaliganj substation falls into Zone-3 having the coefficient of 0.28 depicted in the Figure 4-21.

Figure 4-21: Seismic zoning of Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations





400/230 kV GIS Substation at Kaliganj, Gazipur



400/230/132 KV GIS Substation at Purbachal,

Source: Bangladesh National Building Code (BNBC)

4.2.14 Land Use Interpretation of the Study Area

4.2.14.1 Rampura- Bashundhara 132kV Underground Cable Line

97. The predominant land use-land cover of 100 m buffer (100m each side of the alignment) of Rampura- Bashundhara 132kV Underground Cable Line includes mostly developed land (35.43%) and settlement with homestead vegetation (32.30%). During the survey, no settlements were found over the proposed underground cable line route. The major waterbodies covered are lake and canal, however, the line will not pose any risk to seasonal habitats/ wetlands and birds.

98. The significant land use-land cover of 500 m radius buffer of 400/230 kV GIS Substation at Kaliganj, Gazipur Substation includes mostly agriculture land (83.7 %) and settlement and homestead (6.1 %). During the survey, no settlements were found beneath the proposed Substation. The 230/132/33 kV GIS Substation will not pose any risk to seasonal habitats/wetlands and birds.

99. The significant land use-land cover of 500m radius buffer of 400/230/132 KV GIS Substation at Purbachal, includes mostly agriculture land (55.6 %), low land (17.9 %) and settlement and homestead (14.0 %). During the survey, no settlements were found beneath the proposed Substation. The Substation will not pose any risk to seasonal habitats/wetlands and birds.

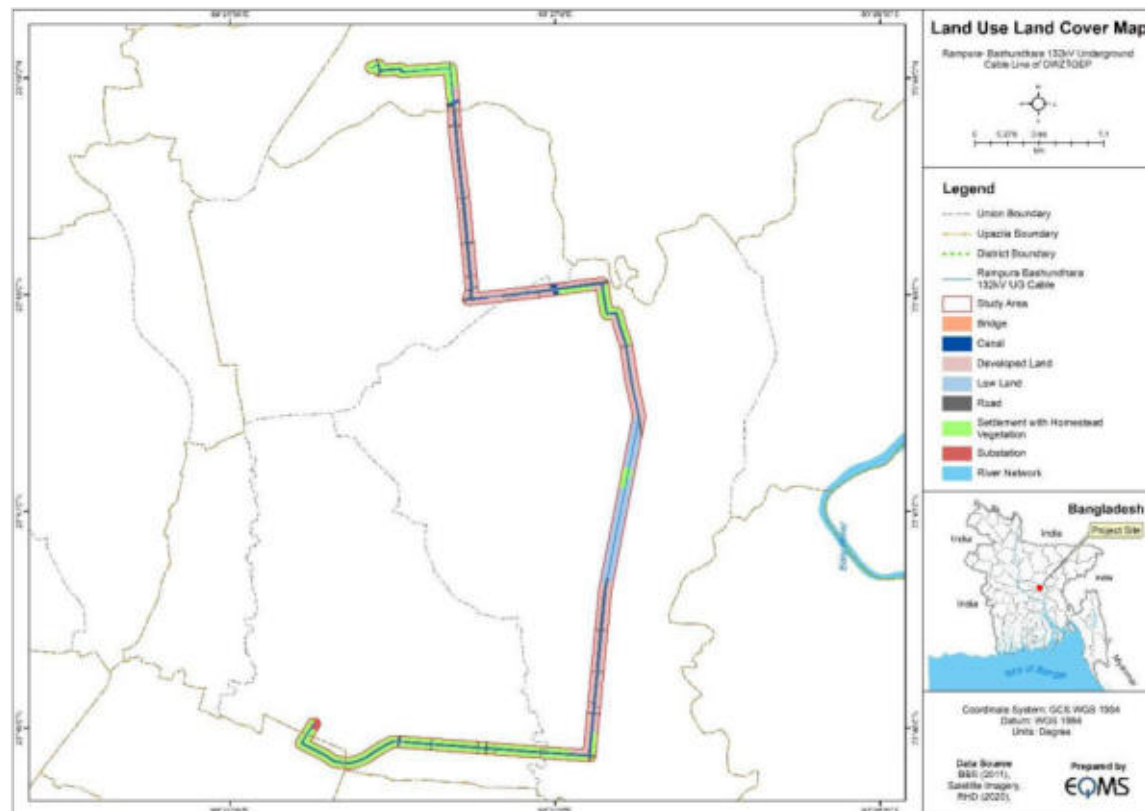
100. The land use of the Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations study area is presented in Table 4-15 and Figure 4-22.

Table 4-15: Land Use Pattern for Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations

Land use Type	Area (Acres)	Percentage
Rampura- Bashundhara 132kV Underground Cable Line		
Bridge	1.22	0.47
Canal	2.29	0.89
Developed Land	91.44	35.43
Low Land	30.69	11.89
Road	47.81	18.52
Settlement with Homestead Vegetation	83.37	32.30
400/230 kV GIS Substation at Kaliganj, Gazipur		
Agricultural Land	45.5	83.7
Bridge	0.2	0.3
Canal	2.1	3.9
Developed Land	1.0	1.8
Road	0.7	1.3
Settlement with Homestead Vegetation	3.3	6.1
Waterbody	1.5	2.8
400/230/132 KV GIS Substation at Purbachal,		
Agricultural Land	25.5	55.6
Canal	2.0	4.4
Low Land	8.2	17.9
Road	1.0	2.2

Land use Type	Area (Acres)	Percentage
Settlement with Homestead Vegetation	6.4	14.0
Waterbody	2.6	5.8

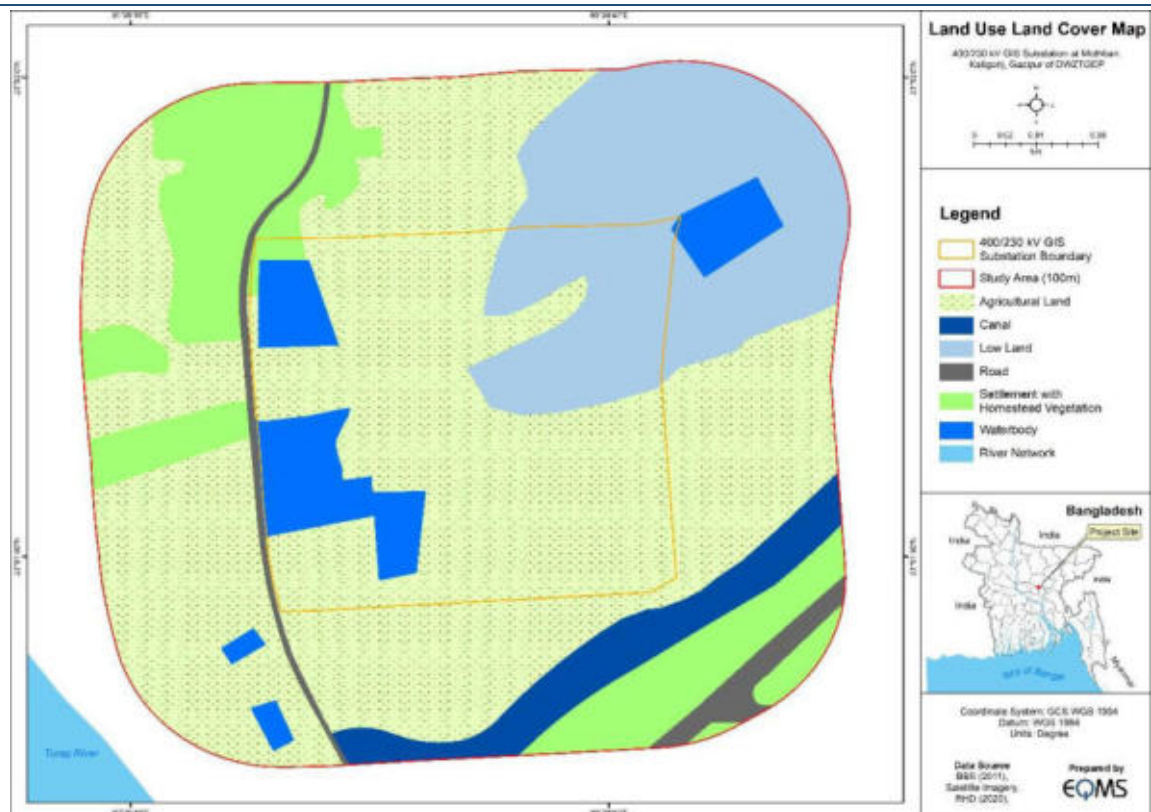
Figure 4-22: Land Use Map of Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations



Rampura- Bashundhara 132kV Underground Cable Line



400/230 kV GIS Substation at Kaliganj, Gazipur



400/230/132 KV GIS Substation at Purbachal,

Source: GIS Mapping and Interpretation of Satellite imagery by EQMS

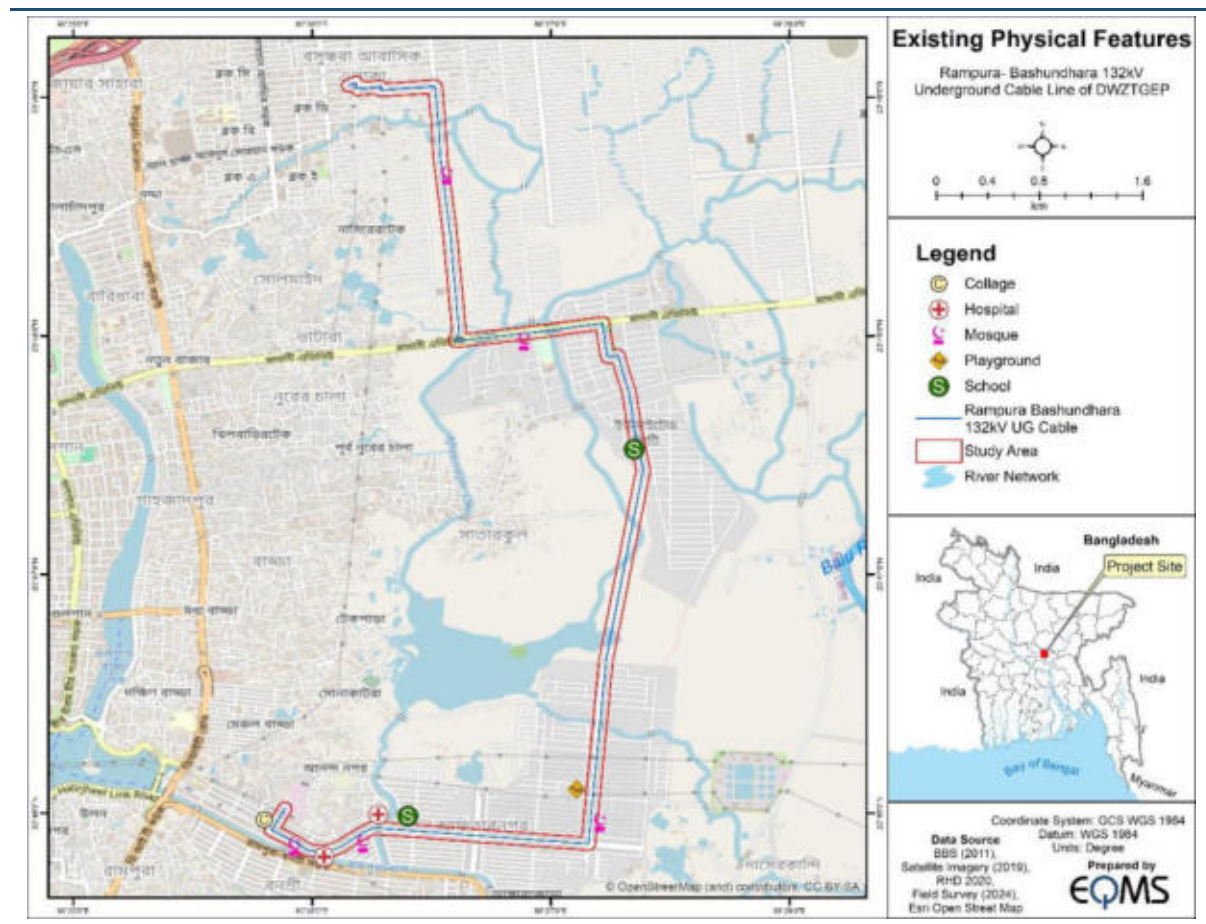
4.2.15 Existing Physical Cultural Features

In Rampura- Bashundhara 132kV Underground Cable Line, school, collage, hospital, mosque and playground were found in 100m buffer area of the alignment. No resources will be affected directly by the route of the underground cable line. However, 100 m buffer zone no physical cultural resources such as school, college, religious infrastructures were found in both substation locations. Existing physical cultural feature's locations along the alignment of Rampura- Bashundhara 132kV Underground Cable Line are shown in Figure 4-23. Nearest Physical Cultural Features from underground cable line mentioned in below table.

Table 4-16: Nearest Physical Cultural Features Information

Physical Cultural Features Name	Location	Distance from the Cable Line (Meter)
Dhaka Imperial College	Aftabnagar	84.6
Ambassador School and College	Aftabnagar	113.5
Masjid Al Mustafa	Madani Ave, Dhaka	65.5
Baitus Sobhan Jame Mosque	Bashundhara	37.2
Glenrich International School, Satarkul	Sunvalley Sharoni, Satarkul Rd	33.4
Aftabnagar Playground	Aftabnagar	98
Aftabnagar Masjid Madrasha Complex	Block M Jahurul Islam Ave, Aftabnagar	65.3
Gazi Jame Masjid	Jamtolamor, Aftabnagar	71.7
BLCS Institute & Hospital	Jahurul Islam Ave, Aftabnagar	94.8
Nagorik Specialized Hospital Limited	Jamtola Mor, Aftabnagar	35.6
C Block Jame Mosque	Rampura	32.4
Playpen School - School	Bashundhara	87.9

Figure 4-23: Existing physical cultural feature map of Rampura- Bashundhara 132kV Underground Cable Line



4.3 Biological Environment

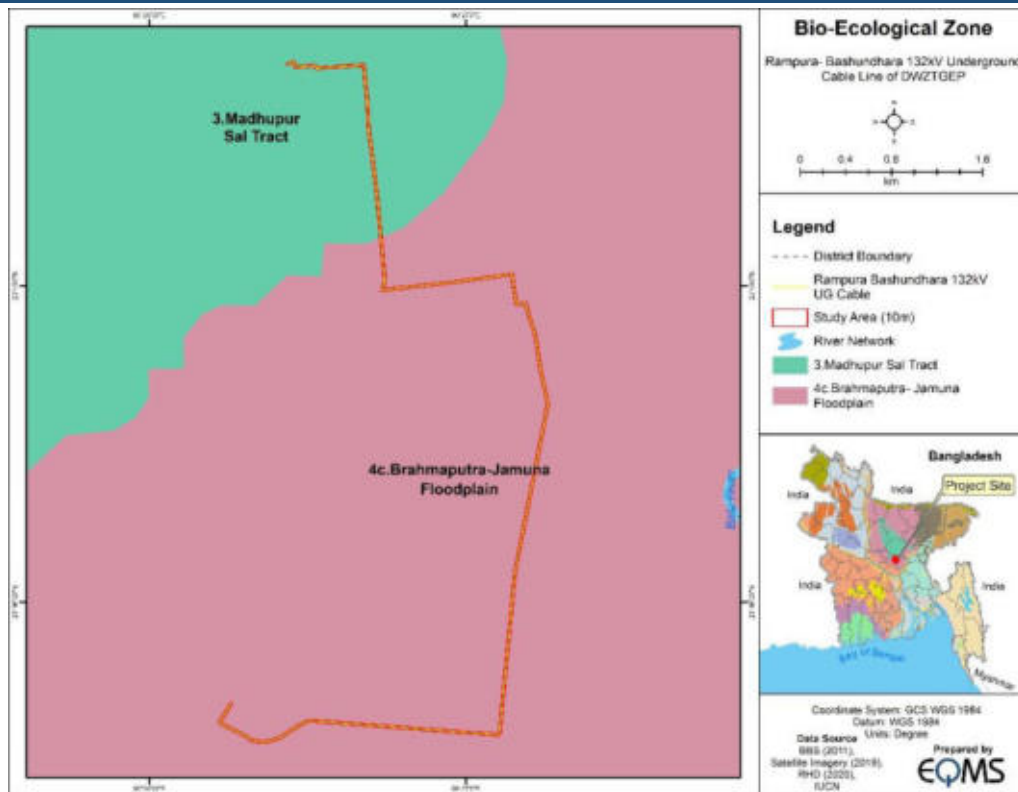
4.3.1 Bio-Ecological Zones

101. 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, agro- ecosystems and homestead ecosystems, while seasonal and perennial wetlands, rivers, lakes, coastal mangroves, coastal mudflats and chars, and marine ecosystems fall into the aquatic category.

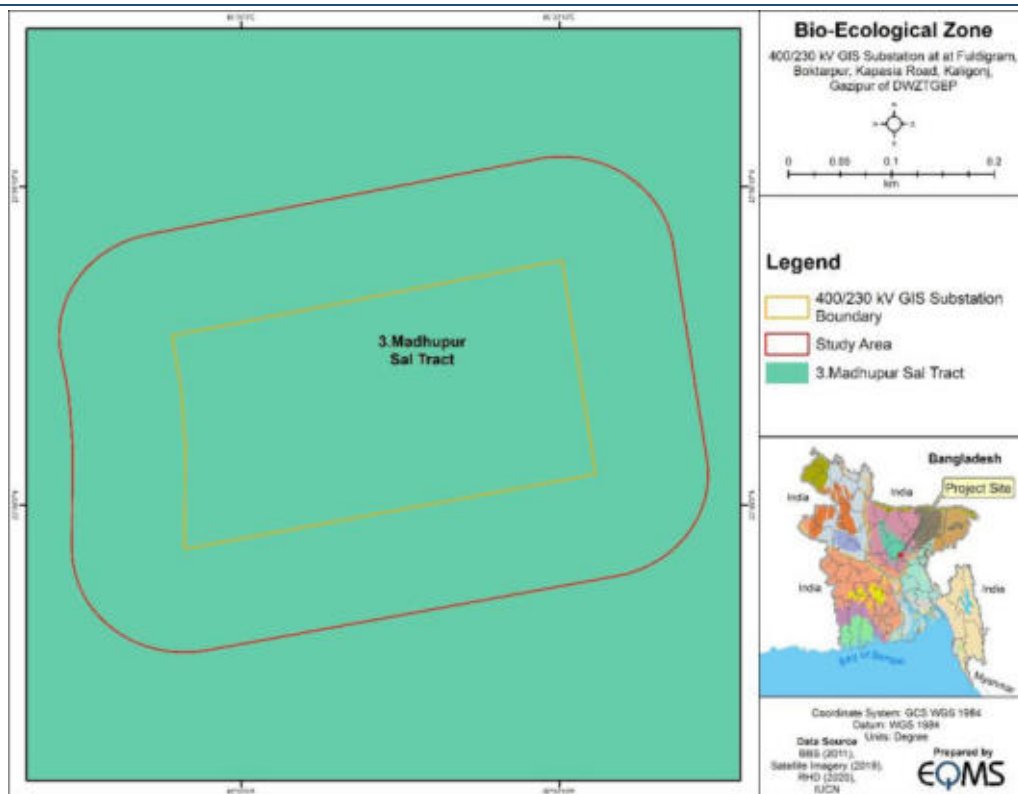
102. In 2002, the International Union for Conservation of Nature (IUCN) classified the country into 12 bio-ecological zones (25 sub-bio-ecological zones) according to factors such as fauna and flora, geographical characteristics, annual average rainfall, administrative regions, soil types, water level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

103. The project site has fallen under bio-ecological zone- 3. Madhupur Sal Tract & 4c. Brahmaputra-Jamuna Floodplain (IUCN, 2002).

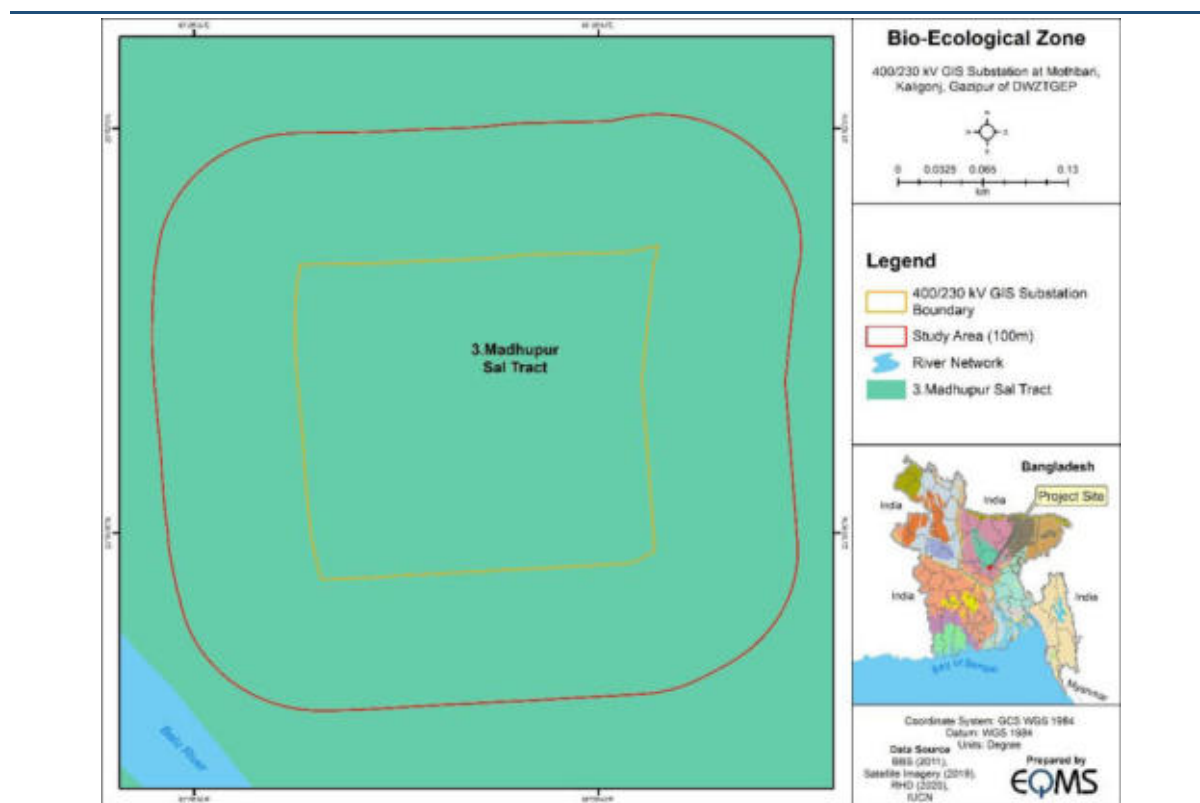
Figure 4-24: Bio-ecological Zones of Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations



Rampura- Bashundhara 132kV Underground Cable Line



400/230 kV GIS Substation at Kaliganj, Gazipur

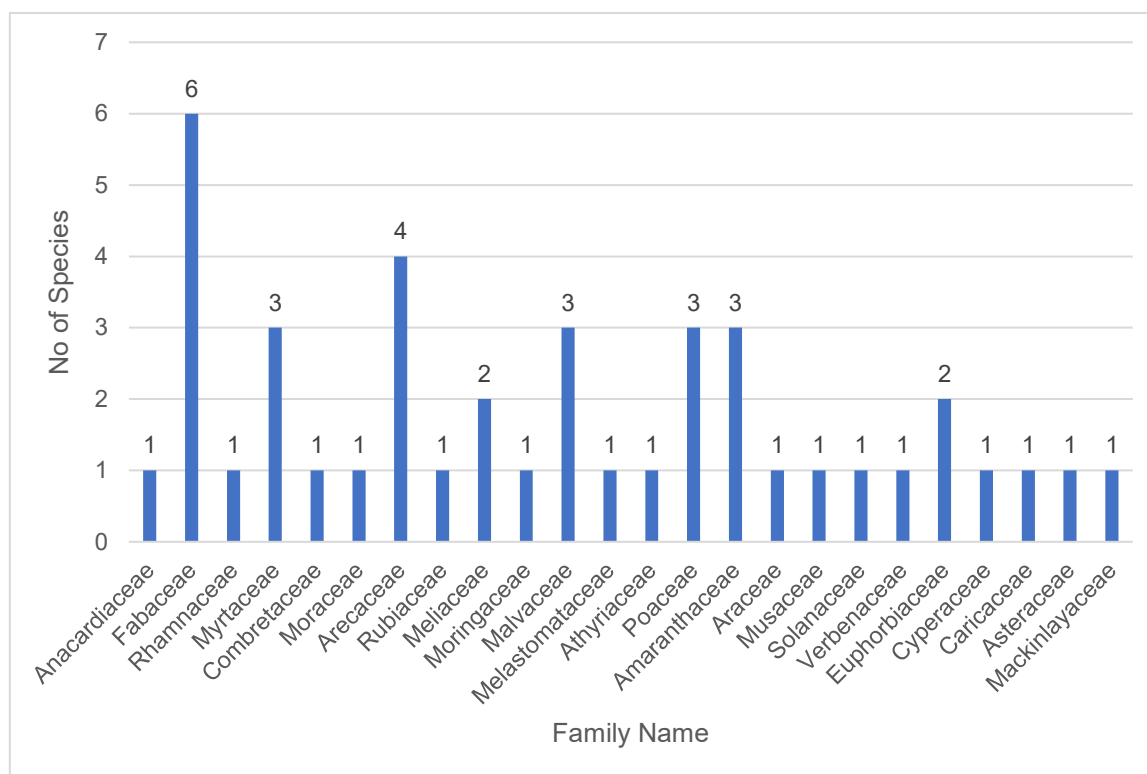


400/230/132 KV GIS Substation at Purbachal

Source: International Union for Conservation of Nature (IUCN)

4.3.2 Terrestrial Flora

104. A total of 42 terrestrial flora species were recorded under 29 families from the project area. Among these plant species, 21 species under 11 families of trees and 15 species of Herbs under 11 families and 6 species of shrubs were recorded from the project area. The most abundant family is Fabaceae which includes 6 (Six) plant species. A comparison of all flora species based on their family (taxonomic classification) has been shown in Figure 4-25. A checklist of all recorded tree and herbs & shrubs species with their occurrence in three project area has been provided in Table 4-17 and Table 4-18.

Figure 4-25: Comparison of the Number of Floral Species by Family**Table 4-17: Checklist of Terrestrial Floral (Tree) Species Recorded within the Project AOI**

SI No	Local Name	Common Name	Scientific name	Family	Use	Occurrence*		
						1	2	3
1.	Aam	Mango	<i>Mangifera indica</i>	Anacardiaceae	Fruit	✓	✓	✓
2.	Akashmoni	Acacia	<i>Acacia auriculiformis</i>	Fabaceae	Timber	-	-	✓
3.	Boroi	Indian Jujube	<i>Ziziphus mauritiana</i>	Rhamnaceae	Medicinal	✓	✓	✓
4.	Bakul	Bokul	<i>Mimusops elengi</i>	Sapotaceae	Aesthetic	✓	✓	✓
5.	Eucalyptus	Eucalyptus	<i>Eucalyptus citriodora</i>	Myrtaceae	Timber	-	✓	-
6.	Ipil Ipil	River tamarind	<i>Leucaena leucocephala</i>	Fabaceae	Timber	-	✓	-
7.	Jam	Java Plum	<i>Syzygium cumini</i>	Myrtaceae	Fruit, Timber	✓	✓	✓
8.	Kath Badam	Indian Almond	<i>Terminalia catappa</i>	Combretaceae	Fruit	✓	✓	✓
9.	Kathal	Jackfruit	<i>Artocarpus heterophyllus</i>	Moraceae	Fruit	✓	✓	✓
10.	Khejur	Date palm	<i>Phoenix sylvestris</i>	Arecaceae	Fruit	-	✓	✓
11.	Kodom	Burflower-tree	<i>Neolamarckia cadamba</i>	Rubiaceae	Aesthetic	✓	✓	✓

SI No	Local Name	Common Name	Scientific name	Family	Use	Occurrence*		
						1	2	3
12.	Krishnochura	Royal poinciana	<i>Delonix regia</i>	Fabaceae	Aesthetic	✓	-	-
13.	Mahogany	Mahogoni	<i>Swietenia mahagoni</i>	Meliaceae	Timber	✓	✓	✓
14.	Narikel	Coconut	<i>Cocos nucifera</i>	Arecaceae	Fruit	✓	✓	✓
15.	Neem	Neem Tree	<i>Azadirachta indica</i>	Meliaceae	Medicinal	✓	✓	✓
16.	Peyara	Guava	<i>Psidium guajava</i>	Myrtaceae	Fruit	✓	✓	✓
17.	Sada Koroi	White Siris	<i>Albizia procera</i>	Fabaceae	Timber	✓	✓	✓
18.	Sajne	Moringa	<i>Moringa oleifera</i>	Moringaceae	Medicinal	-	✓	✓
19.	Shimul	Cotton tree	<i>Bombax ceiba</i>	Malvaceae	Timber	-	✓	-
20.	Supari	Areca palm	<i>Areca catechu</i>	Arecaceae	Fruit	✓	✓	✓
21.	Tal	Tal palm	<i>Borassus flabellifer</i>	Arecaceae	Fruit	-	✓	-
22.	Tetul	Tamarind tree	<i>Tamarindus indica</i>	Fabaceae	Fruit	✓	✓	✓

*Occurrence: 1- Rampura- Bashundhara 132kV Underground Cable Line, 2- 400/230 kV GIS Substation at Kaliganj, Gazipur, 3- 400/230/132 KV GIS Substation at Purbachal

Table 4-18: Checklist of Terrestrial Herbs & Shrubs Species Recorded within the Project AOI

SI No	Local Name	Common Name	Scientific name	Family	Occurrence*		
					1	2	3
Herb							
1.	Berela	Cuban jute	<i>Sida rhombifolia</i>	Malvaceae	✓	✓	✓
2.	Dheki Shak	Vegetable fern	<i>Diplazium esculentum</i>	Athyriaceae	✓	✓	✓
3.	Durba	Bermuda Grass	<i>Cynodon dactylon</i>	Poaceae	✓	✓	✓
4.	Kashful	Wild Sugarcane	<i>Saccharum spontaneum</i>	Poaceae	-	✓	✓
5.	Khurakata	Spiny amaranth	<i>Amaranthus spinosus</i>	Amaranthaceae	-	✓	✓
6.	Kochu	Taro	<i>Colocasia esculenta</i>	Araceae	✓	✓	✓
7.	Kola	Banana	<i>Musa sapientum</i>	Musaceae	✓	✓	✓
8.	Lojjaboti	Mimosa plant	<i>Mimosa pudica</i>	Fabaceae	-	✓	✓
9.	Mati Konduri	Sessile Joy weed	<i>Alternanthera sessilis</i>	Amaranthaceae	✓	✓	✓
10.	Mukta Juri	Indian Nettle	<i>Acalypha indica</i>	Euphorbiaceae	✓	✓	✓
11.	Mutha	Java Grass	<i>Cyperus rotundus</i>	Cyperaceae	✓	✓	✓
12.	Nol khagra	Tall Reed	<i>Phragmites karka</i>	Poaceae	-	✓	✓

SI No	Local Name	Common Name	Scientific name	Family	Occurrence*		
					1	2	3
13.	Opango ful	Prickly Chaff Flower	<i>Achyranthes aspera</i>	Amaranthaceae	✓	✓	✓
14.	Rabon lata	American rope	<i>Mikania micrantha</i>	Asteraceae	✓	✓	✓
15.	Thankuni	Indian pennywort	<i>Centella asiatica</i>	Mackinlayaceae	✓	✓	✓
Shrub							
1.	Datrangea	Malabar melastome	<i>Melastoma malabathricum</i>	Melastomataceae	-	✓	✓
2.	Joba	China Rose	<i>Hibiscus rosa-sinensis</i>	Malvaceae	✓	-	-
3.	Kontikari	Sticky Nightshade	<i>Solanum sisymbriifolium</i>	Solanaceae	-	✓	✓
4.	Lonthon ful	Sage	<i>Lantana camara</i>	Verbenaceae	✓	-	-
5.	Pepe	Papaya	<i>Carica papaya</i>	Caricaceae	✓	✓	✓
6.	Venna	Castor oil plant	<i>Ricinus communis</i>	Euphorbiaceae	-	✓	✓

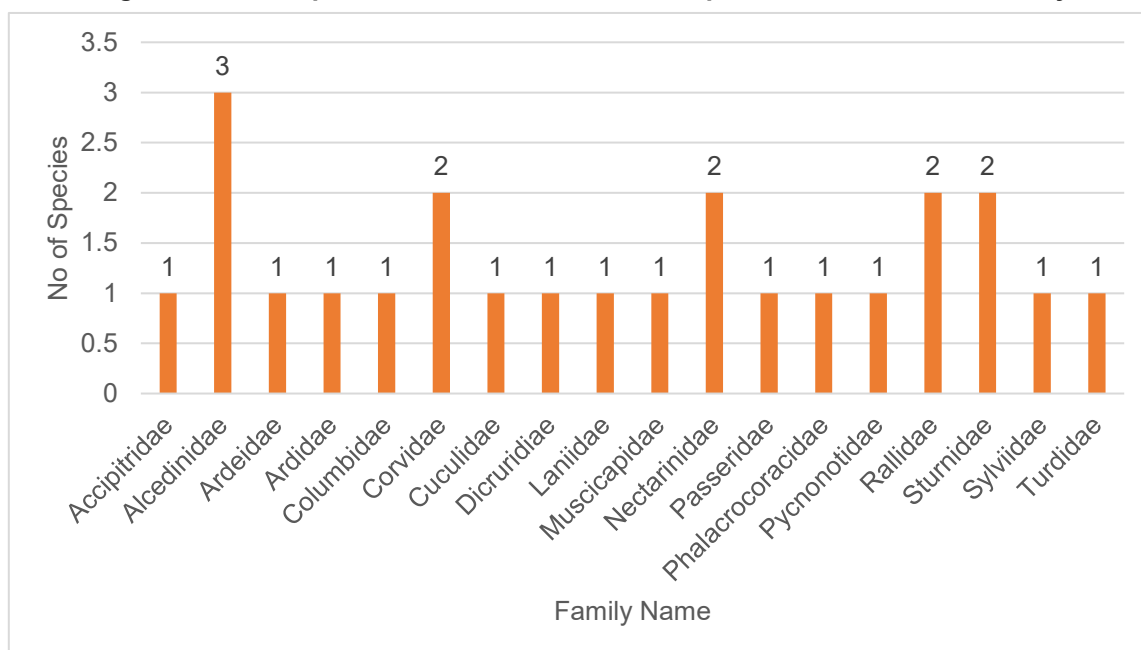
*Occurrence: 1- Rampura- Bashundhara 132kV Underground Cable Line, 2- 400/230 kV GIS Substation at Kaliganj, Gazipur, 3- 400/230/132 KV GIS Substation at Purbachal

4.3.3 Fauna

105. The faunal biodiversity of the project AOI can be divided into five major classes - Avifauna, Herpetofauna (Amphibians & Reptiles), Mammal and Fisheries Resources.

4.3.3.1 Avifauna

106. A total of 24 species of birds under 16 families were recorded from the study area. The highest number of birds belong to the family Alcedinidae. All the bird species found in the study area are Least Concern (LC) both for Global IUCN Red List Status (Version 2024-1) and IUCN Bangladesh Red List (2015). A Comparison of Avian species based on family is presented in Figure 4-26. A checklist of all recorded avian species with their occurrence in three project area has been provided in Table 4-19.

Figure 4-26: Comparison of the number of bird species based on their Family

4.3.3.2 Herpetofauna (Amphibians and Reptiles)

107. A total of five (05) species of amphibians belonging to three (03) families and six (06) species of reptiles belonging to five (05) families were listed from the project area.

108. All the amphibian species are included in the Bangladesh Wildlife (Conservation and Security) Act, 2012, under Schedule-II, which protects them from hunting, killing, and capturing. Amphibians recorded or reported to be present in the AOI are found to be Least Concern (LC) species. According to the IUCN Bangladesh Red List (2015) and Global IUCN Red List Status (Version 2024-1), One (01) Near Threatened (NT) reptile species, Bengal Monitor Lizard (*Varanus bengalensis*) was found in the project area. Recorded herpetofauna species with their occurrence in three project area presented in Table 4-20.

4.3.3.3 Mammals

109. Seven (07) terrestrial Mammal species belonging to Five (05) families were recorded in the project area. Each mammalian species found are Least Concern (LC) both locally and globally, according to IUCN Red List. A detailed checklist of recorded mammals with their occurrence in three project area has been provided in Table 4-21.

4.3.3.4 Fisheries Resources

110. The prime objective of the fisheries study is to examine and evaluate the overall fisheries status (capture and cultured fish species) in the study area. The project area of 400/230/132 KV GIS Substation at Purbachal is located adjacent to the canal originated from the Tongi Khal, the project area of 400/230 kV GIS Substation at Kaliganj, Gazipur has canal and ponds and Rampura- Bashundhara 132kV Underground Cable Line has canal, pond and Hatirjheel lake. Usually there are no fishing activities in the project Aol of these waterbodies. However, lakes and ponds within the project area may serve as reservoirs for fish species. The fish species recorded within the project area are Indian major carp i.e., Rui (*Labeo rohita*) and Katla (*Catla catla*), Tilapia (*Oreochromis niloticus*), Sarputi (*Systemus sarana*), Punti (*Puntius chola*), Baila (*Awaous guamensis*), Taki (*Channa punctatus*), Tengra (*Mystus tengra*), etc.

Table 4-19: Checklist of Avifaunal species of the project AOI

SI No	Common Name	Local Name	Scientific name	Family	Local Status*	Global Status**	Occurrence***		
							1	2	3
1.	Asian koel	Kokil, Koel	<i>Eudynamys scolopacea</i>	Cuculidae	LC	LC	✓	✓	✓
2.	Asian pied starling	Pakra/Gubra shalik	<i>Sturnus contra</i>	Sturnidae	LC	LC	✓	✓	✓
3.	Black drongo	Kala Fingey	<i>Dicrurus macrocercus</i>	Dicruridae	LC	LC	✓	✓	✓
4.	Brahminy Kite	Shonkho Cheel	<i>Haliastur indus</i>	Accipitridae	LC	LC	✓	✓	✓
5.	Common Kingfisher	Choto Machranga	<i>Alcedo atthis</i>	Alcedinidae	LC	LC	✓	✓	✓
6.	Common myna	Bhat Salik	<i>Acridotheres tristis</i>	Sturnidae	LC	LC	✓	✓	✓
7.	Common tailor bird	Tuntuni	<i>Orthotomus sutorius</i>	Sylviidae	LC	LC	✓	✓	✓
8.	House crow	Pati Kak	<i>Corvus splendens</i>	Corvidae	LC	LC	✓	✓	✓
9.	House sparrow	Pati choro	<i>Passer domesticus</i>	Passeridae	LC	LC	✓	✓	✓
10.	Indian pond heron	Kani Bok	<i>Ardeola grayii</i>	Ardidae	LC	LC	✓	✓	✓
11.	Large-billed crow /Jungle crow	Dar kak	<i>Corvus macrorhynchos</i>	Corvidae	LC	LC	✓	✓	✓
12.	Little cormorant	Choto Pankowri	<i>Microcarbo niger</i>	Phalacrocoracidae	LC	LC	✓	✓	✓
13.	Little egret	Choto boga	<i>Egretta garzetta</i>	Ardeidae	LC	LC	✓	✓	✓
14.	Long-tailed shrike	Lenja Latora	<i>Lanius schach</i>	Laniidae	LC	LC	✓	✓	✓
15.	Orange-headed Thrush	Komla Dama	<i>Zoothera citrina</i>	Turdidae	LC	LC	-	✓	✓
16.	Oriental magpie robin	Doel	<i>Copsychus saularis</i>	Muscicapidae	LC	LC	✓	✓	✓
17.	Pied kingfisher	Pakra Machranga	<i>Ceryle rudis</i>	Alcedinidae	LC	LC	✓	✓	✓
18.	Purple sunbird	Niltuni	<i>Cinnyris asiaticus</i>	Nectarinidae	LC	LC	✓	✓	✓

SI No	Common Name	Local Name	Scientific name	Family	Local Status*	Global Status**	Occurrence***		
							1	2	3
19.	Purple-rumped sunbird	Moutusi	<i>Leptocoma zeylonica</i>	Nectarinidae	LC	LC	✓	✓	✓
20.	Red-vented bulbul	Bangla BHulbul	<i>Pycnonotus cafer</i>	Pycnonotidae	LC	LC	✓	✓	✓
21.	Rock dove	Gola Paira/Jalali Kabutor	<i>Columba livia</i>	Columbidae	LC	LC	✓	✓	✓
22.	Spotted dove	Tila Ghughu	<i>Streptopelia chinensis</i>	Rallidae	LC	LC	✓	✓	✓
23.	White-breasted kingfisher	Dhola Gola Machranga	<i>Halcyon smyrnensis</i>	Alcedinidae	LC	LC	✓	✓	✓
24.	White-breasted Waterhen	Dholabuk Dahuk	<i>Amaurornis phoenicurus</i>	Rallidae	LC	LC	✓	✓	✓

*IUCN Bangladesh. 2015. Red List of Bangladesh Volume 3: Birds; LC=Least Concern, NT=Near Threatened

**IUCN 2024. The IUCN Red List of Threatened Species. Version 2024-1. (<https://www.iucnredlist.org/>)

****Occurrence: 1- Rampura- Bashundhara 132kV Underground Cable Line, 2- 400/230 kV GIS Substation at Kaliganj, Gazipur, 3- 400/230/132 KV GIS Substation at Purbachal

Table 4-20: A checklist on Herpetofauna recorded from the project AOI

SI No	Family	Common Name	Local Name	Scientific Name	Local Status*	Global Status**	Wildlife conservation and security Act, 2012	Occurrence***		
								1	2	3
Amphibians										
1.	Bufonidae	Asian Common Toad	Kuno Bang	<i>Duttaphrynus melanostictus</i>	LC	LC	Schedule II	✓	✓	✓
2.	Dicroglossidae	Indian Bullfrog	Kola bang	<i>Hoplobatrachus tigerinus</i>	LC	LC	Schedule II	✓	✓	✓
3.		Indian skipper frog	Kotkoti bang	<i>Euphlyctis cyanophlyctis</i>	LC	LC	Schedule II	✓	✓	✓
4.	Rhacophoridae	Common Tree Frog	Dorakata Gecho Bang	<i>Polypedates leucomystax</i>	LC	LC	Schedule II	-	✓	✓

SI No	Family	Common Name	Local Name	Scientific Name	Local Status*	Global Status**	Wildlife conservation and security Act, 2012	Occurrence***		
								1	2	3
5.		Tree Frog	Dui-dagi Khudey Gecho Bang	<i>Chiromantis vittatus</i>	LC	LC	Schedule II	-	✓	✓

Reptiles

1.	Varanidae	Bengal monitor Lizard	Gui Shap	<i>Varanus bengalensis</i>	NT	NT	Schedule II	✓	✓	✓
2.	Gekkonidae	House Gecko	Tiktiki	<i>Hemidactylus frenatus</i>	LC	LC	Schedule II	✓	✓	✓
3.	Agamidae	Common Garden Lizard	Roktochosa	<i>Calotes versicolor</i>	LC	LC	Schedule II	✓	✓	✓
4.	Scincidae	Keeled Grass Skink	Angina	<i>Eutropis carinata</i>	LC	LC	Schedule II	✓	✓	✓
5.	Colubridae	Checkered Keelback	Dhora Shap	<i>Xenochrophis piscator</i>	LC	LC	Schedule I	✓	✓	✓
6.		Indian Rat Snake	Darash Shap	<i>Ptyas mucosa</i>	LC	LC	Schedule I	✓	✓	✓

*IUCN Bangladesh. 2015. Red List of Bangladesh Volume 4: Reptiles and Amphibians; LC=Least Concern; NT=Near Threatened; NE=Not Evaluated

**IUCN 2024. The IUCN Red List of Threatened Species. Version 2024-1. (<https://www.iucnredlist.org/>)

****Occurrence: 1- Rampura- Bashundhara 132kV Underground Cable Line, 2- 400/230 kV GIS Substation at Kaliganj, Gazipur, 3- 400/230/132 KV GIS Substation at Purbachal

Table 4-21: Checklist of recorded mammals from the Study AOI

SI No	Common Name	Local Name	Scientific Name	Family	Local Status*	Global Status**	Wildlife Conservation and Security Act, 2012	Occurrence***		
								1	2	3
1.	Common Indian Field Mouse	Metho Idur	<i>Mus booduga</i>	Muridae	LC	LC	Schedule III	✓	✓	✓
2.	Small Indian Mongoose	Choto beji	<i>Urva auropunctata</i>	Herpestidae	LC	LC	Schedule I	✓	✓	✓
3.	Common House Rat	Idur	<i>Rattus rattus</i>	Muridae	LC	LC	-	✓	✓	✓
4.	House Mouse	Nengti Idur	<i>Mus musculus</i>	Muridae	LC	LC	Schedule III	✓	✓	✓

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5.	Indian Flying Fox	Badur	<i>Pteropus giganteus</i>	Pteropodidae	LC	LC	Schedule I	✓	✓	✓
6.	Golden Jackal	Pati-Shiyal	<i>Canis aureus</i>	Canidae	LC	LC	Schedule I	-	✓	✓
7.	Irrawaddy Squirrel	Kathbirali	<i>Callosciurus pygerythrus</i>	Sciuridae	LC	LC	Schedule I	✓	-	-

*IUCN Bangladesh. 2015. Red List of Bangladesh Volume 2: Mammals; LC=Least Concern, NT= Near Threatened

**IUCN 2024. The IUCN Red List of Threatened Species. Version 2024-1. (<https://www.iucnredlist.org/>)

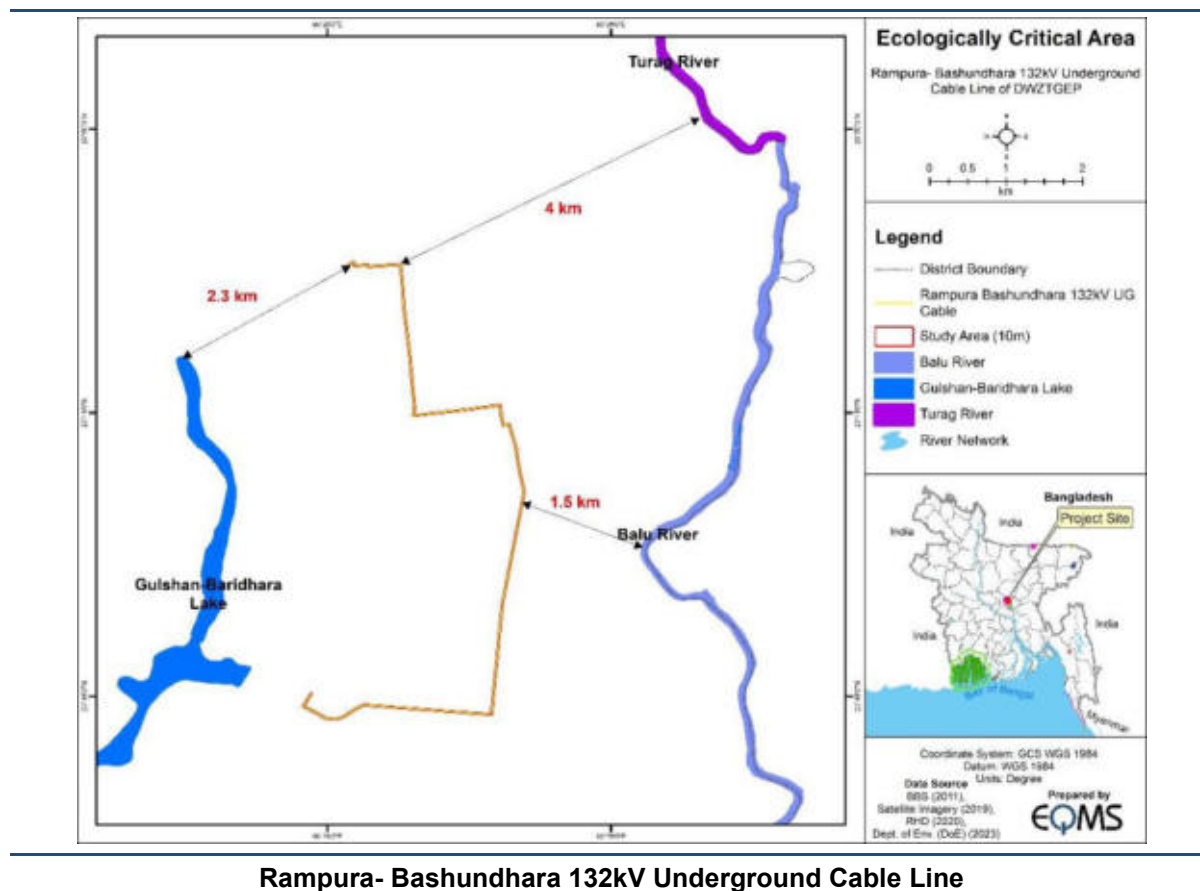
****Occurrence: 1- Rampura- Bashundhara 132kV Underground Cable Line, 2- 400/230 kV GIS Substation at Kaliganj, Gazipur, 3- 400/230/132 KV GIS Substation at Purbachal

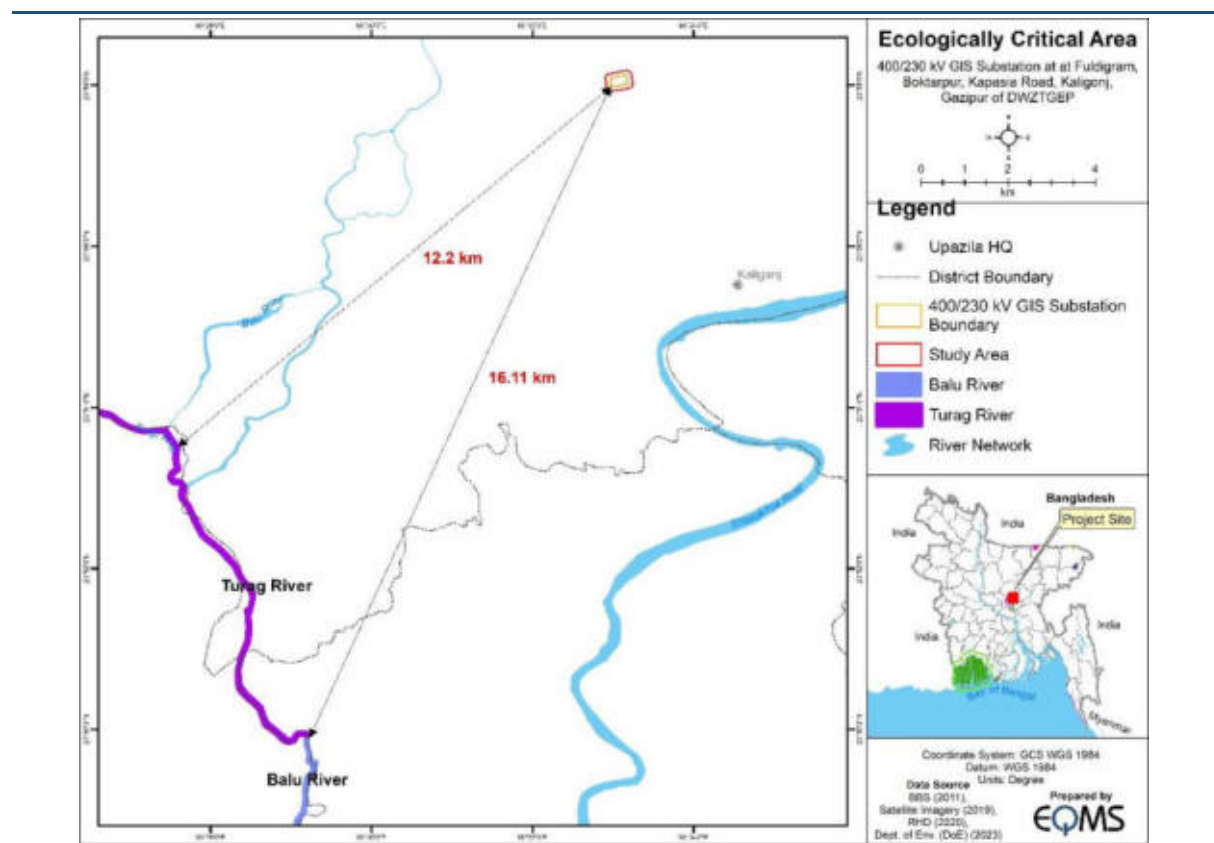
4.3.4 Ecologically Critical Area (ECA)

111. The nearest ECA from the Rampura- Bashundhara 132kV Underground Cable Line are Balu River, Gulshan Baridhara Lake and Turag River which are 1.5 km, 2.3 km and 4 km away respectively. The Kaliganj substation is located 12.2 km from the Turag River and 16.11 km from the Balu River, whereas the distances from these rivers to the Purbachal substation are 140 meters and 3.6 km, respectively.

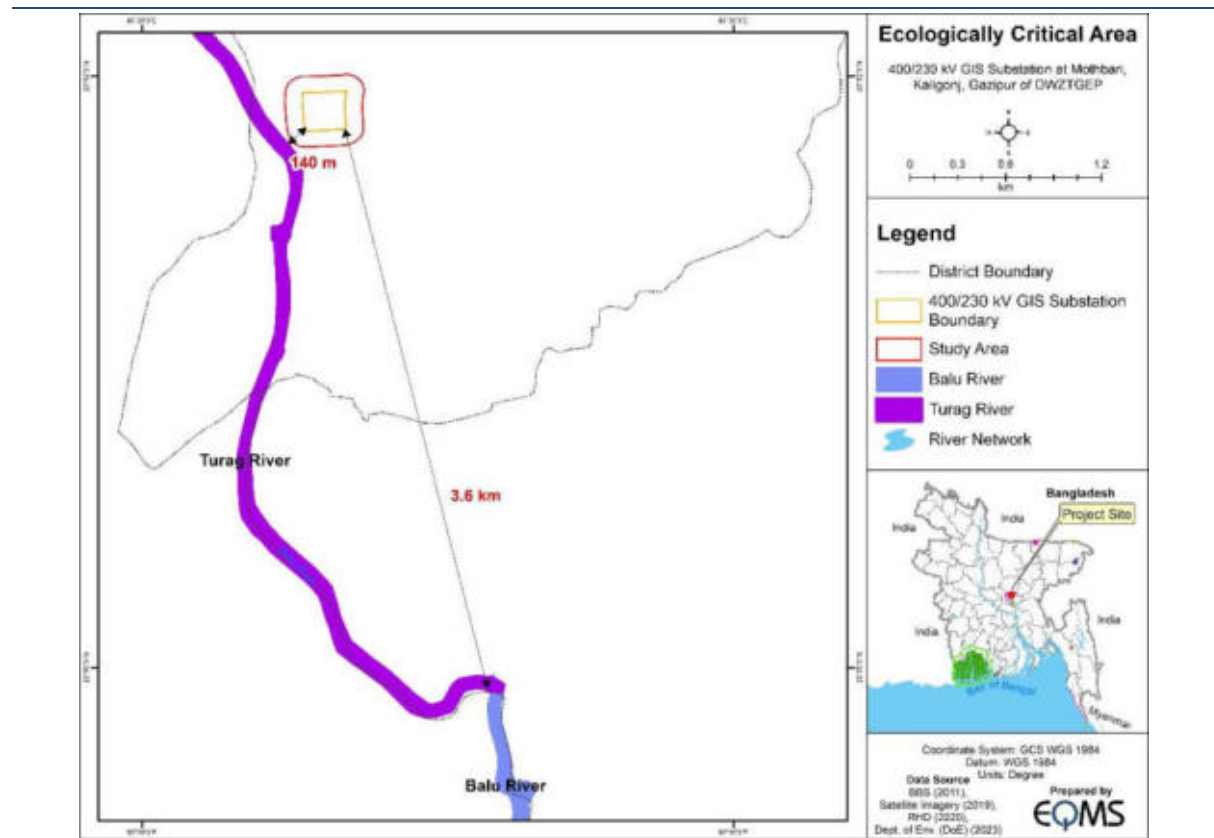
112. The ECAs near of Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations are shown in Figure 4-27.

Figure 4-27: ECAs near Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj and Purbachal Substations





400/230 kV GIS Substation at Kaliganj, Gazipur



400/230/132 KV GIS Substation at Purbachal,

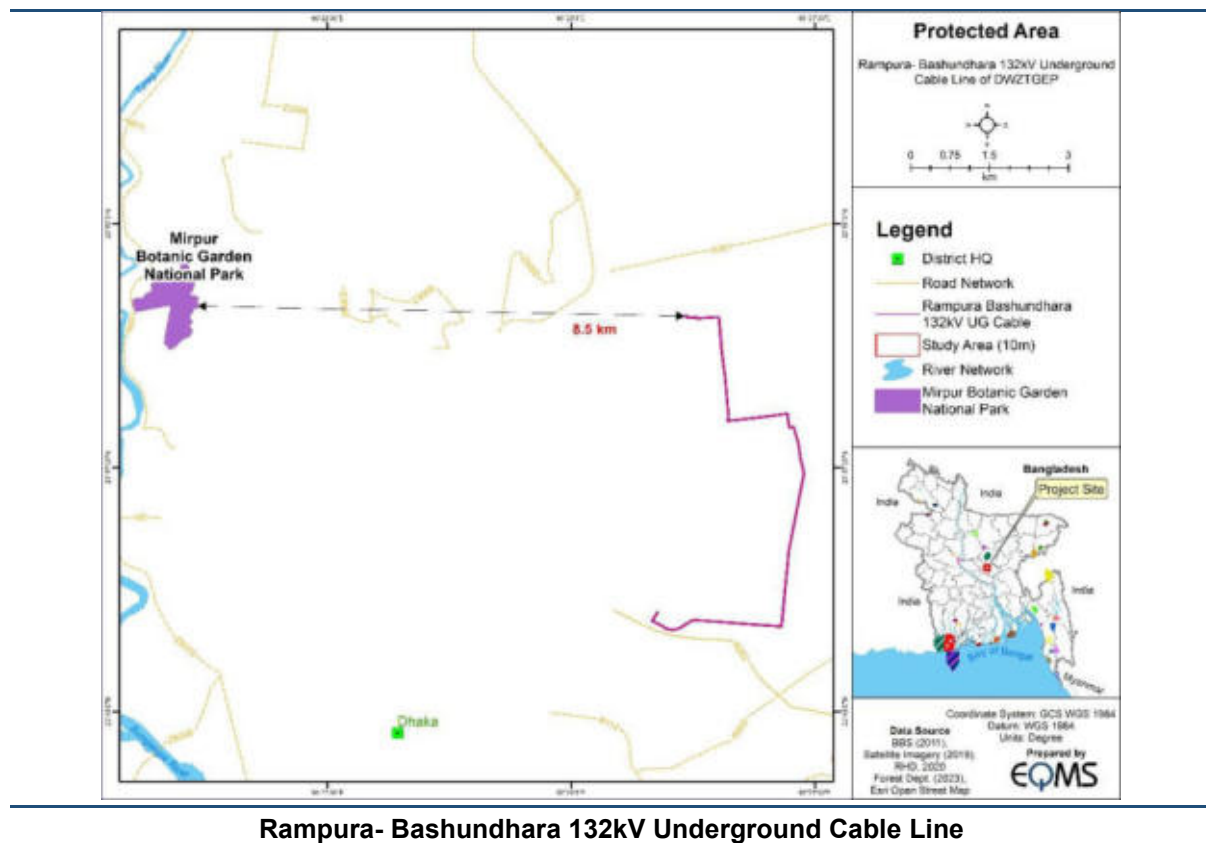
Source: Department of Environment (DOE), September 2024

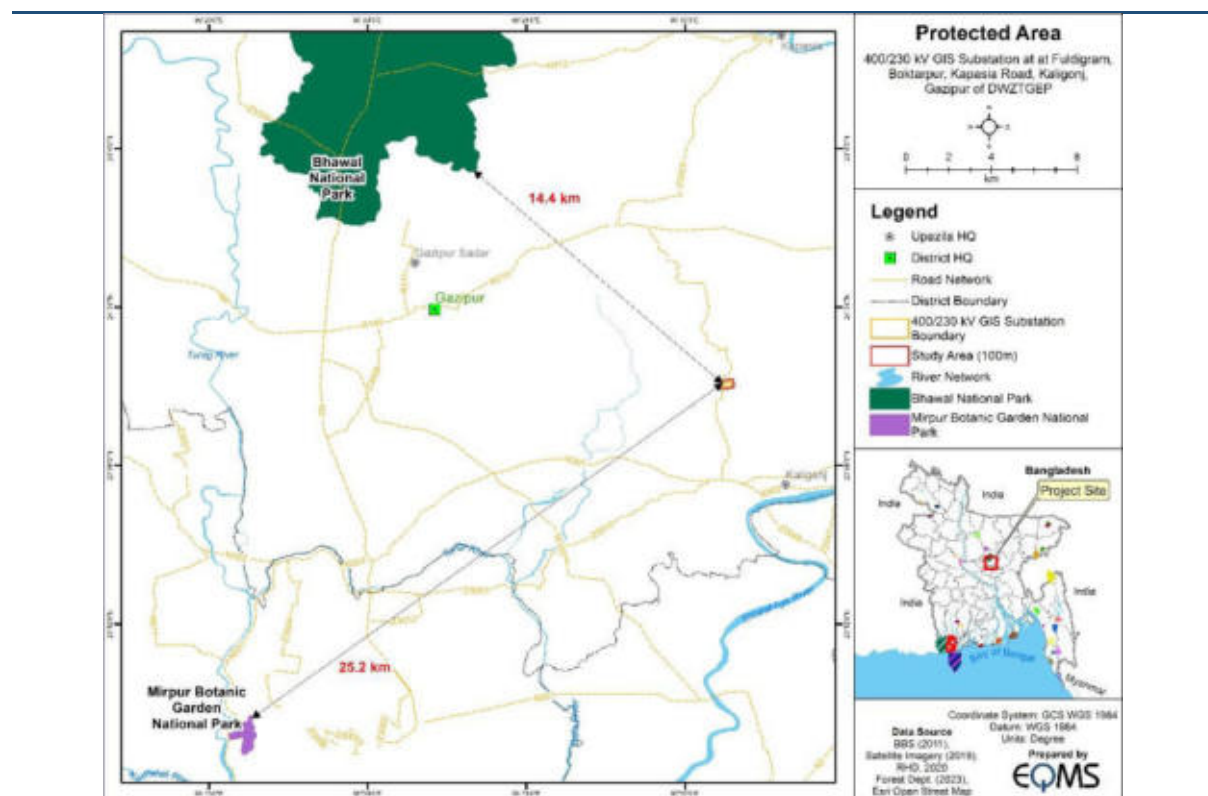
4.3.5 Protected Areas

113. The nearest protected areas that are situated in the North-East corner from Rampura-Bashundhara 132kV Underground Cable is Mirpur Botanic Garden (8.5 Km). Moreover, the nearest protected areas from Kaliganj, and Purbachal Substations are Bhawal National Garden (14.4 km) and Mirpur Botanic Garden (13.15 Km) respectively.

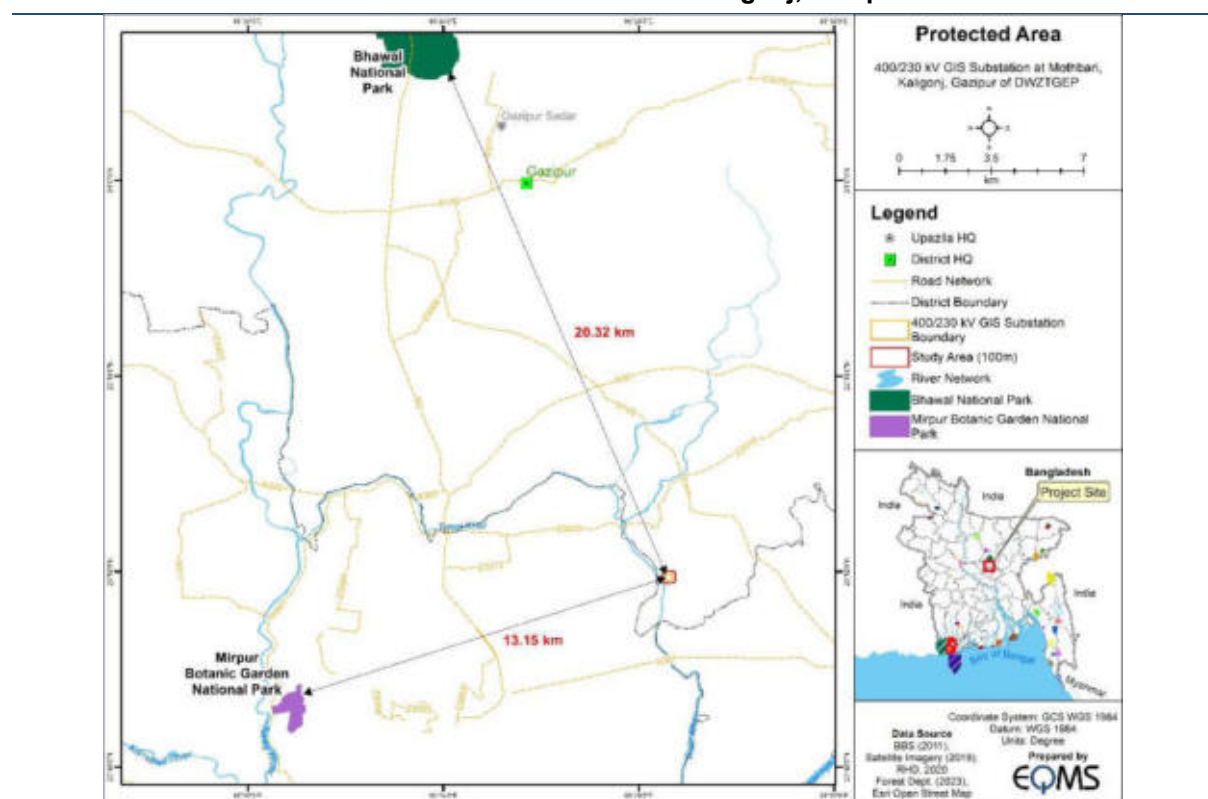
114. The nearest protected areas near Underground Cable Lines of Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations are shown in Figure 4-28.

Figure 4-28: Protected areas near Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations





400/230 kV GIS Substation at Kaliganj, Gazipur



400/230/132 KV GIS Substation at Purbachal,

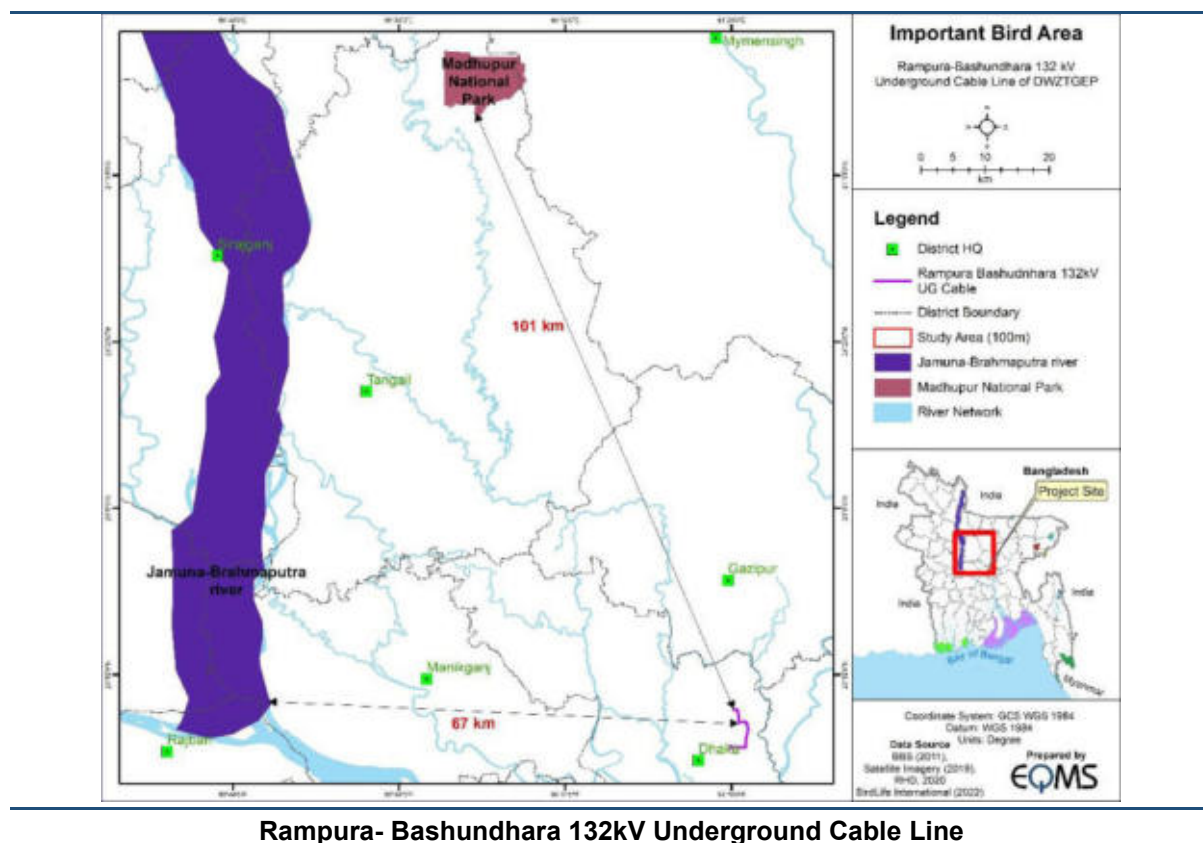
Source: Forest Department, September 2024

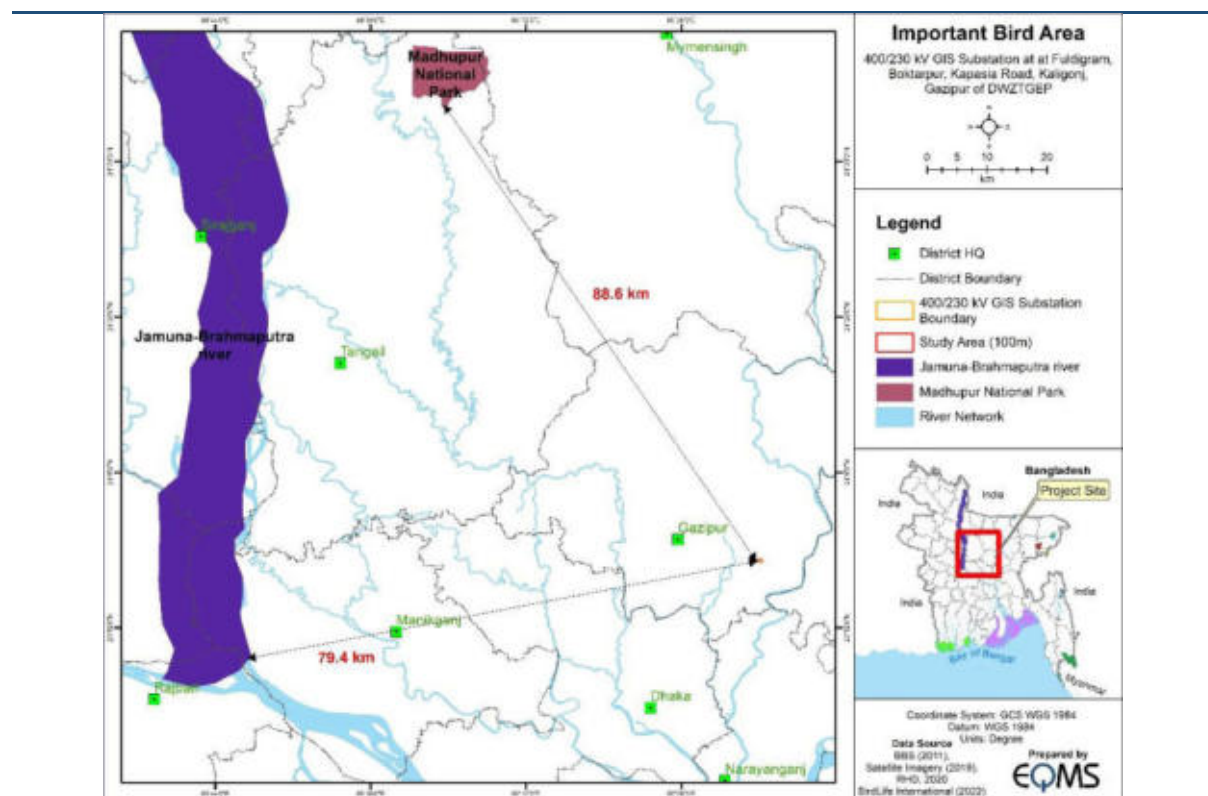
4.3.6 Important Bird Areas

115. 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 (IBA1) 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.

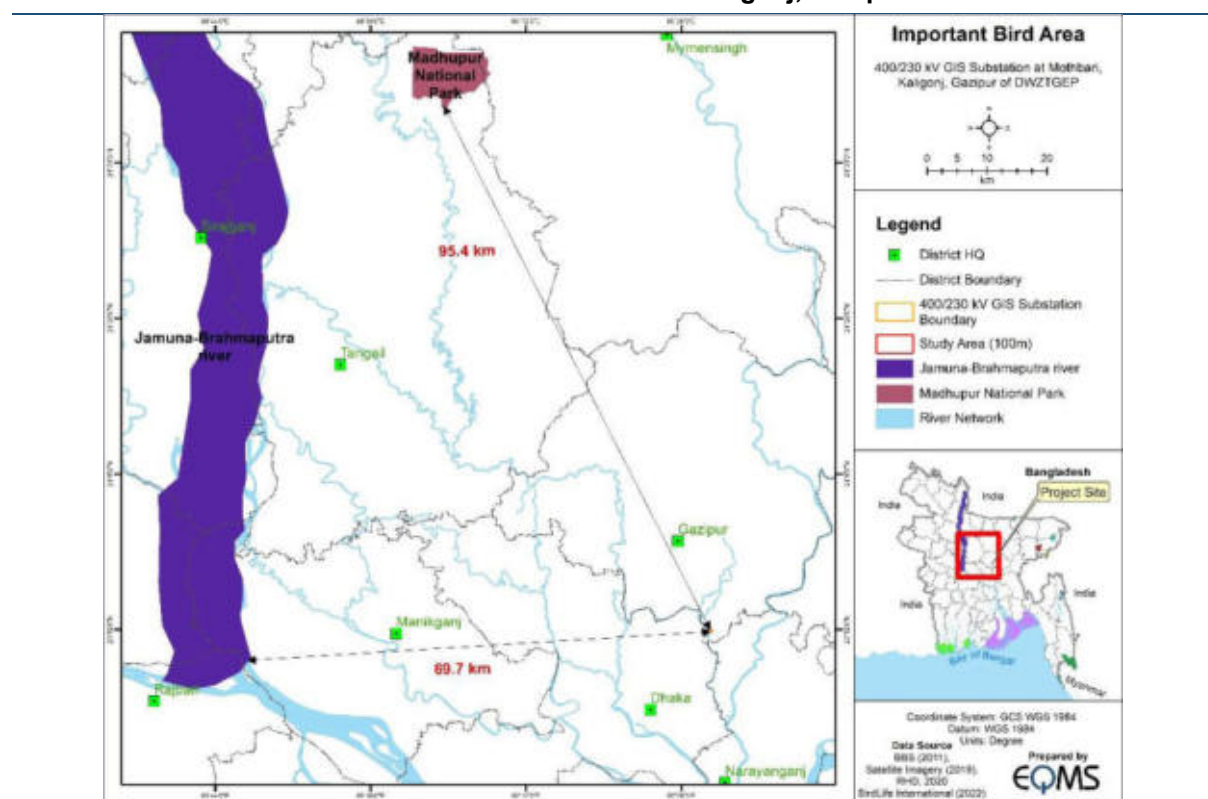
116. The nearest IBA, the Jamuna – Brahmaputra River is located 67, 79.4 and 69.7 km away from the Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations respectively. Figure 4-29 shows the nearest IBAs from transmission alignments and Two substations.

Figure 4-29: Nearest Important Bird Areas (IBA) in Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations





400/230 kV GIS Substation at Kaliganj, Gazipur



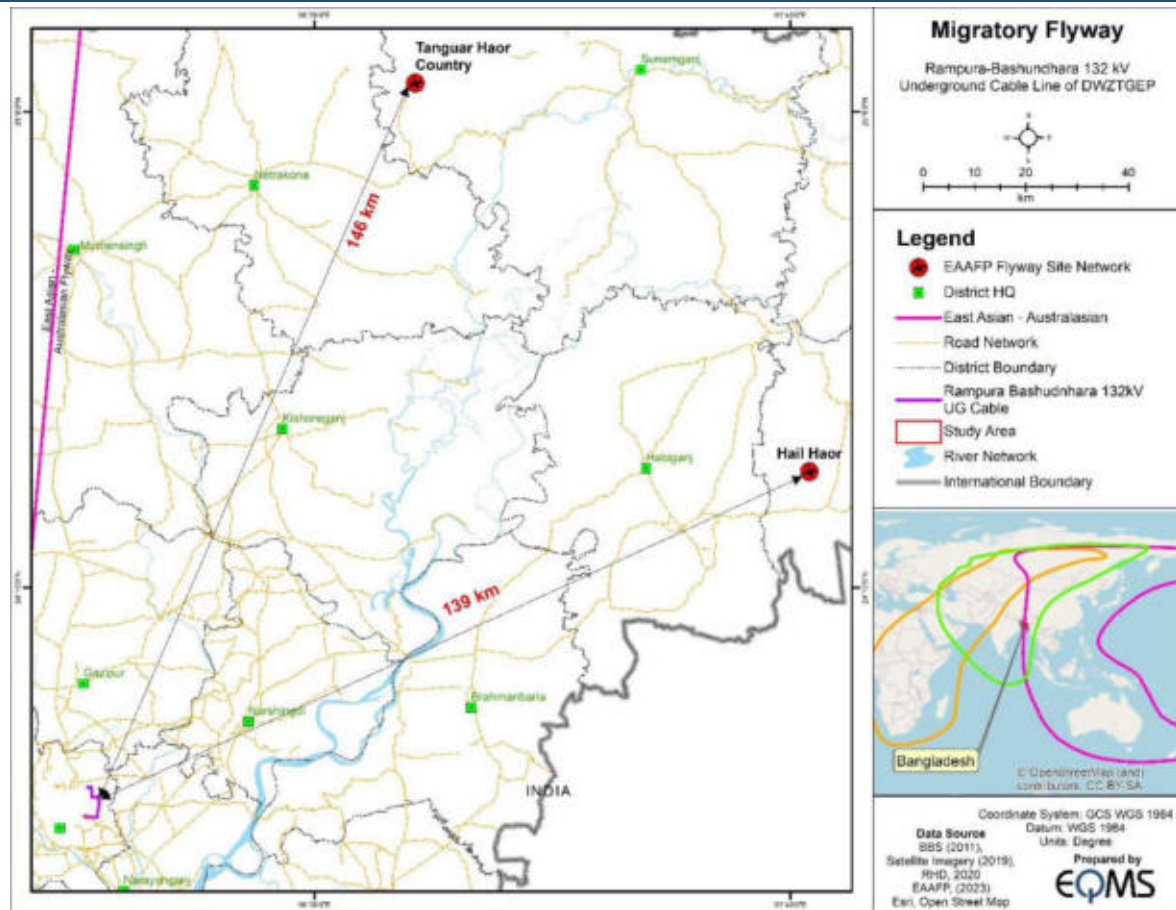
400/230/132 KV GIS Substation at Purbachal,

Source: BirdLife International, September 2024

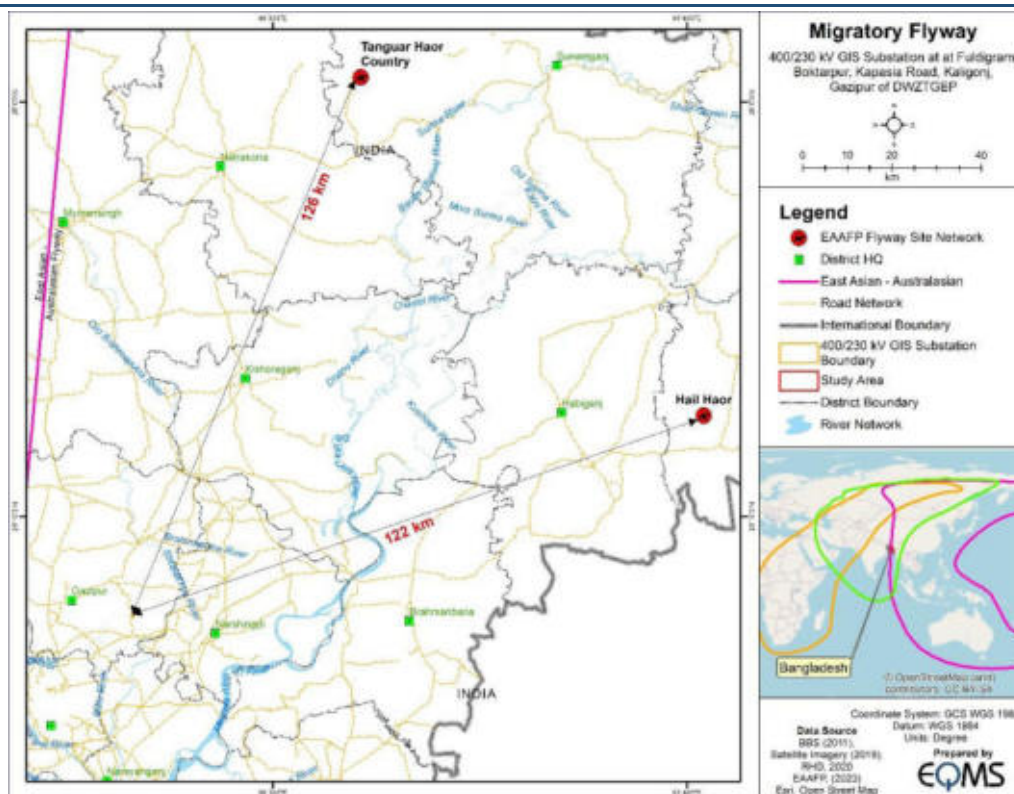
4.3.7 Migratory Bird Flyway Network

The nearest migratory bird flyway network from Rampura- Bashundhara 132kV Underground Cable Lines are Hail Haor and Tanguar Haor which are respectively 139 km and 146 km away from the project site. Also, the nearest migratory bird flyway network Hail Haor and Tanguar Haor are more than 100km away from both substations. Migratory flyway network map for the project sites is shown in Figure 4-30.

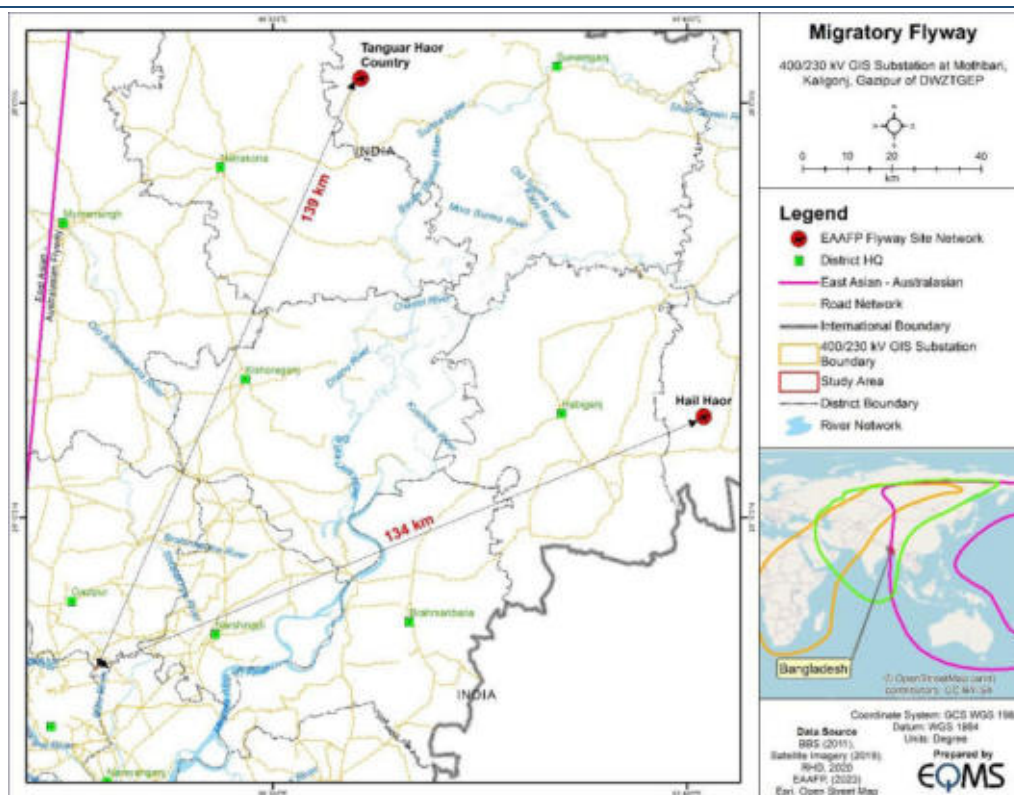
Figure 4-30: Migratory bird flyway network map for the project sites



Rampura- Bashundhara 132kV Underground Cable Line



400/230 kV GIS Substation at Kaliganj, Gazipur



400/230/132 KV GIS Substation at Purbachal,

4.4 Socio- economic Information and Profile

The socio-economic conditions of the people of the project area in 2011 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.

4.4.1 Population

4.4.1.1 Administrative Area and Location

Rampura- Bashundhara 132kV Underground Cable Line, 400/230 kV GIS Substation at Kaliganj, Gazipur and 400/230/132 KV GIS Substation at Purbachal project situated in Dhaka district under Dhaka division. Based on the assessment of the project, its surroundings and its environmental & social influence, a 500 m radius is considered from the project boundary as the study area for the social study.

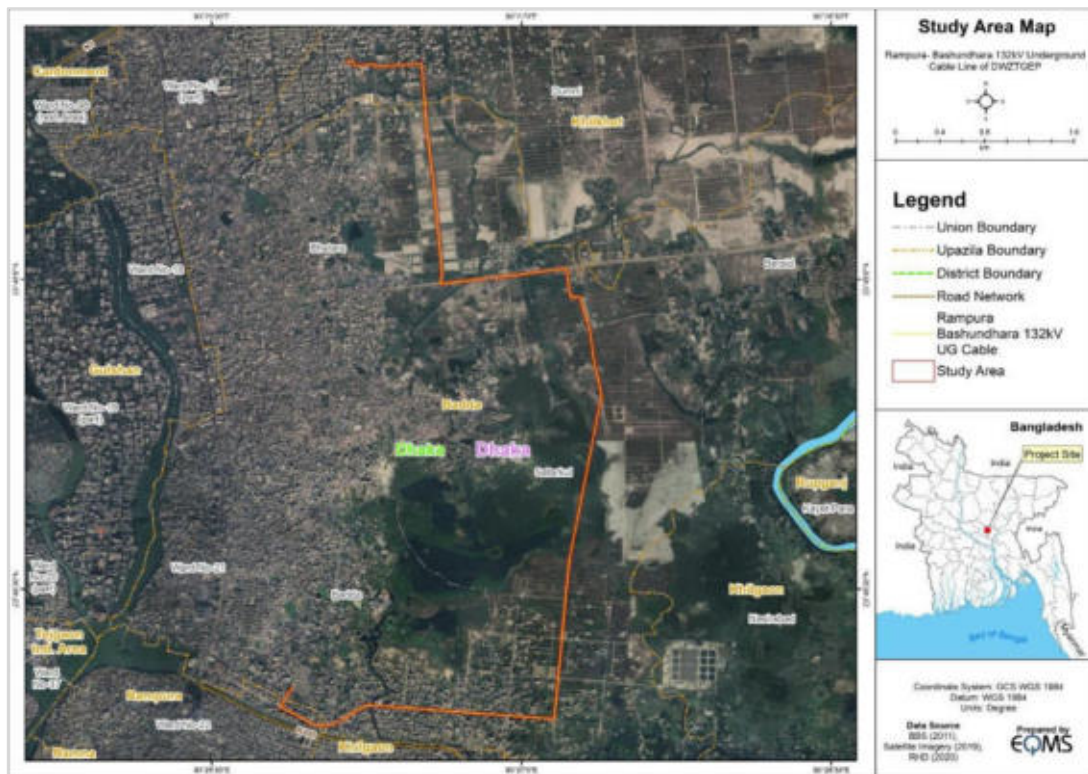
Table 4-22 shows the study area of the project across Unions, Upazilas and Districts. The socio-economic features of the study area are discussed in this section.

Table 4-22: Administrative Boundary of the Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations

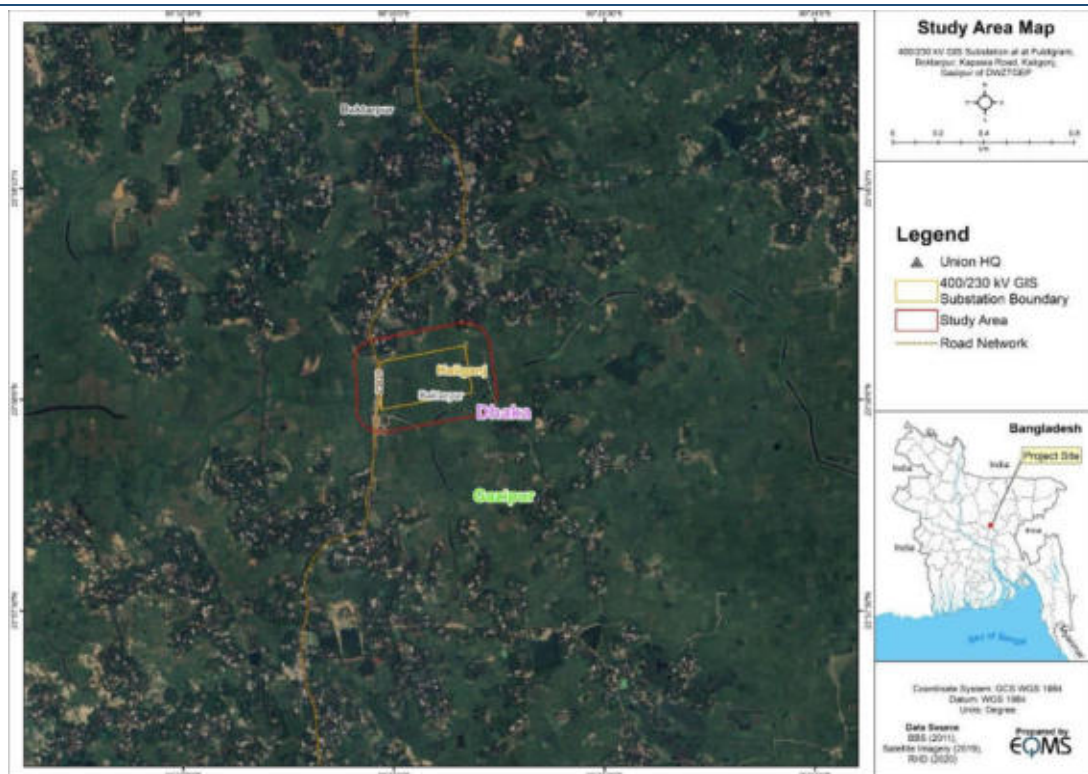
Project	District	Upazila	Union
Kaliganj Substation	Gazipur	Kaliganj	Baktarpur
Purbachal Substation	Gazipur	Kaliganj	Nagari
Rampura- Bashundhara 132kV Underground Cable Line	Dhaka	Khilkhet	Dumni
	Dhaka	Badda	Bhatara
	Dhaka	Badda	Satarkul
	Dhaka	Badda	Badda
	Dhaka	Rampura	Uttar Banasree

The project study area lies within the administrative area of Kaliganj, Khilkhet, Badda and Rampura Upazila under Gazipur and Dhaka District under Dhaka division. The socio-economic study area is shown in **Figure 4-31**.

Figure 4-31: Socio-economic Study Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations



Rampura- Bashundhara 132kV Underground Cable Line



Kaliganj Substations



Purbachal Substations

4.4.1.2 Demography

In the study area, there are about households (HHs) including squatters with a total population of that might be influenced by the implementation of the proposed project. The average sex ratio¹³ is and the average household size is. The demography of the study area is shown in the following **Table 4-23**.

Table 4-23: Demography of the Study Area

Project	Total Pop	Total HHs	Avg. HH size	Sex Ratio
Kaliganj Substation	31814	6659	4.8	95
Purbachal Substation	34103	7672	4.4	101
Rampura-Bashundhara 132kV Underground Cable Line	16862	3559	4.5	123
	126694	31214	4.0	134
	23663	5582	4.2	113
	180554	43690	4.1	124
	7308	7308	4.7	106

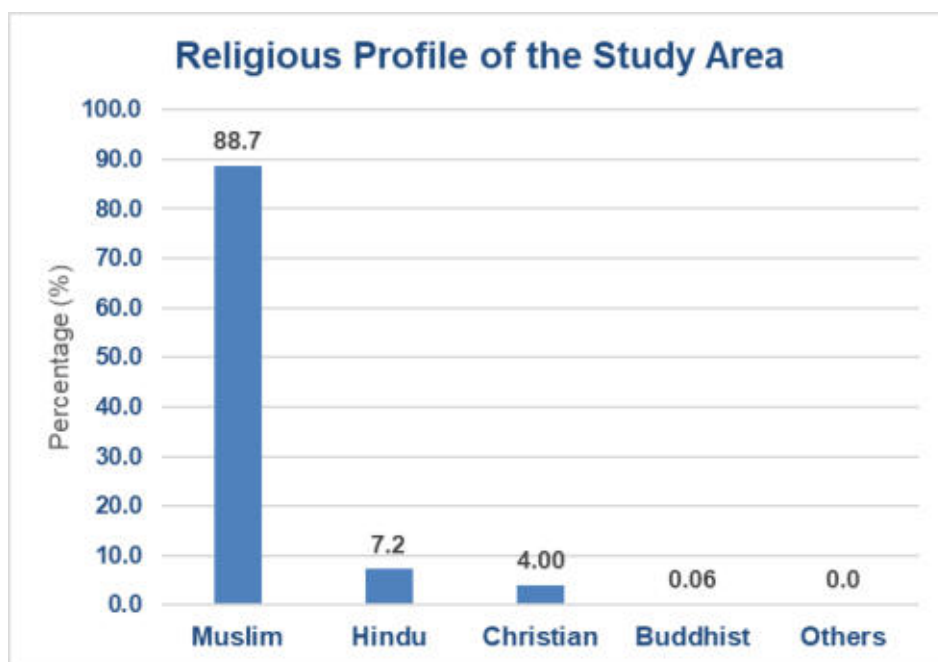
Source: Population and Housing Census, BBS, 2011

4.4.1.3 Religion

According to the Population and Housing Census (2011), the population of the study area is dominated by the Muslim community constituting almost 88.7% of the total population. The remaining 7.2% is Hindu and the rest belongs to other religion. The following **Figure 4-32** indicates the various religious profile of the project study area.

¹³The 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

4.4.1.4 Ethnic Composition

According to Population and Housing Census (2011), within the 2 kilometers radius from the project site a total of 158 Households were found where 595 number of different ethnic people live. The majority of them belong to Garo ethnic group. The following **Table 4-24** indicates the various ethnic composition of the project study area.

Table 4-24: Ethnic Profile of the Study Area

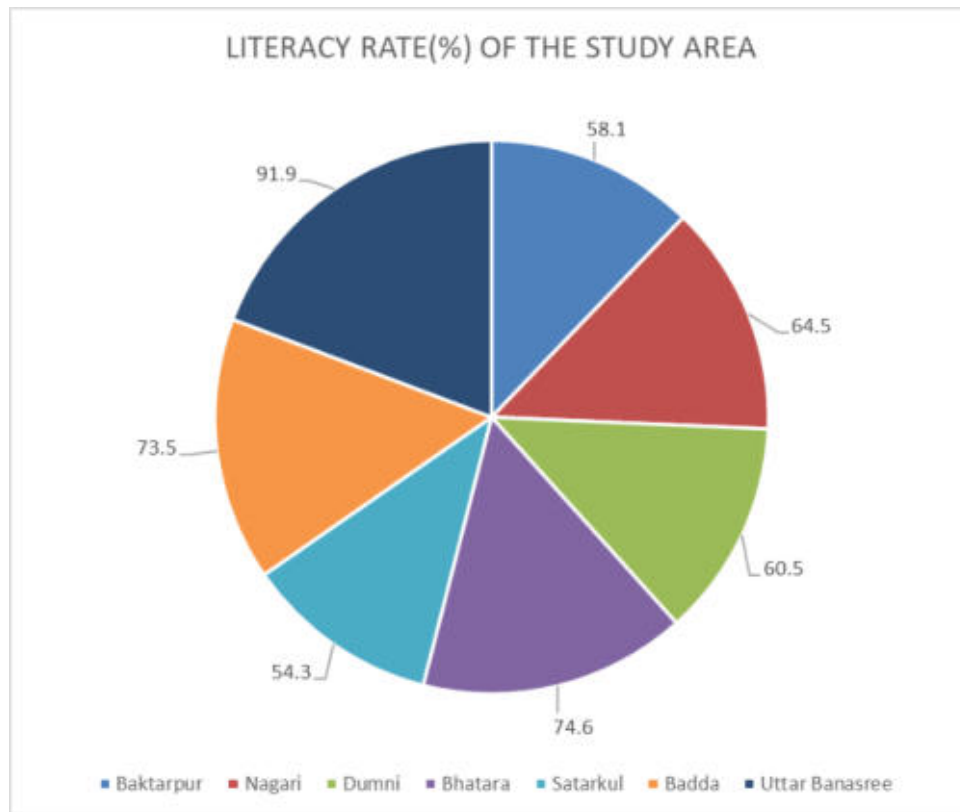
Upazila	HH	Ethnic Population			Ethnic Population in main groups			
		Total	Male	Female	Garo	Chakma	Marma	Others
Kaliganj Substation	1	7	3	4	7	0	0	0
Purbachal Substation	26	116	74	42	90	0	0	26
Rampura-Bashundhara 132kV Underground Cable Line	4	16	13	3	8	0	0	8
	73	262	146	116	148	67	19	28
	3	9	5	4	0	9	0	0
	33	118	66	52	48	26	8	36
	18	67	29	38	33	18	0	16

Source: Population and Housing Census, BBS, 2011

4.4.1.5 Education

According to the Population and Housing Census (2011), the average literacy rate in the study area is 65.8%. The following **Figure 4-33** shows the literacy rate of the project study area.

Figure 4-33: Literacy Rate of the Study Area

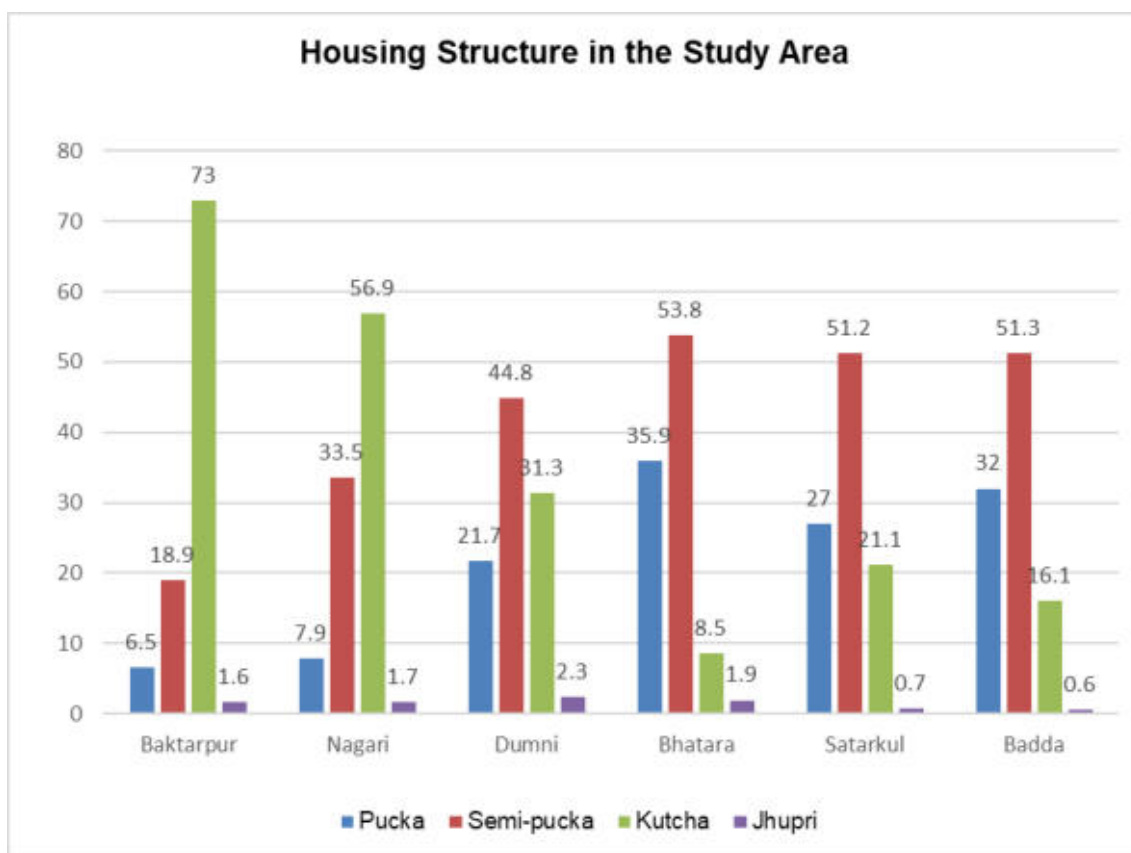


Source: Population and Housing Census, BBS, 2011

4.4.2 Settlement and Housing

According to the Population and Housing Census (2011), total household of the project study area is 100160. The predominant structure of these study area is Pucca (32.8%) followed by Semi-pucca (36.3%), Kutcha and Jhupri (29.7% and 1.3%). Housing tenancy of the study area is owned by (76.5%), rented (19.8%) and rent free (3.6%). The following **Figure 4-34** and **Table 4-25** 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 4-25: Housing tenancy in the Study Area

Upazila	Number of HHs	Housing Tenancy (%)		
		Owned	Rented	Rent free
Kaliganj Substation	6659	98.1	0.4	1.5
Purbachal Substation	7672	94.9	3.5	1.6
Rampura-Bashundhara 132kV Underground Cable Line	3559	76.5	19.8	3.6
	31214	10.7	88.1	1.2
	5582	33.3	65.4	1.3
	43690	9.9	88.6	1.5
	7308	19.2	75.8	5.0

Source: Population and Housing Census, BBS, 2011

4.4.3 Public Utilities

4.4.3.1 Water Supply

At the project study area, the major source of drinking water is tube-well where about 50.3% population use tube-well water. About 47.9% of people have access to tap water. The other 1.7% people have access to neither tube-well nor tap water. An overview is depicted in below **Table 4-26**.

Table 4-26: Sources of Drinking Water in the Study Area

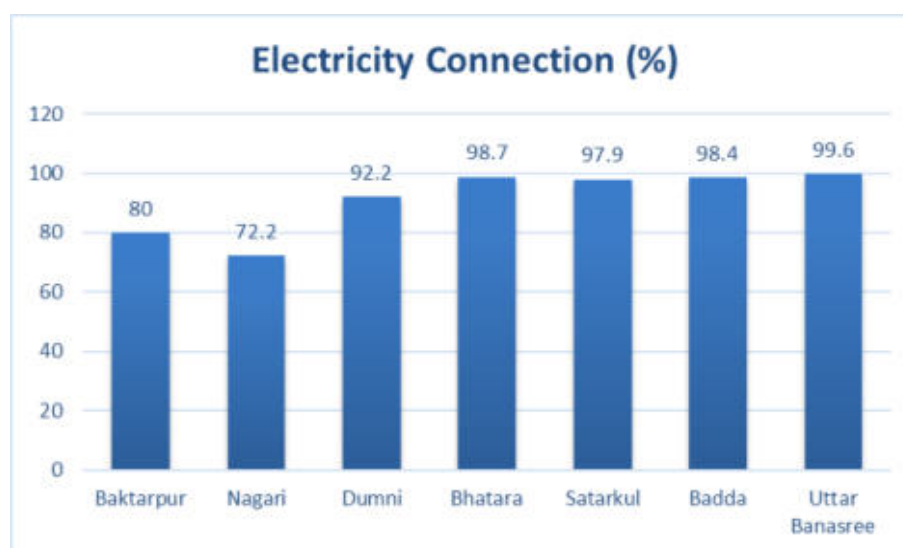
Upazila	Number of HHs	Source of Drinking Water (%)		
		Tap	Tube-well	Other
Kaliganj Substation	6659	1.1	96.8	2.2
Purbachal Substation	7672	9.6	88.4	2.0
Rampura-Bashundhara 132kV Underground Cable Line	3559	20.8	73.4	5.8
	31214	80.4	19.2	0.4
	5582	42.5	56.4	1.1
	43690	82.2	17.3	0.5
	7308	99.0	0.9	0.1
Total	100160	47.9	50.3	1.7

Source: Population and Housing Census, BBS, 2011

4.4.3.2 Electricity

Electricity is an important indicator for measuring the quality of life. In the study area, on average 91.3% 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

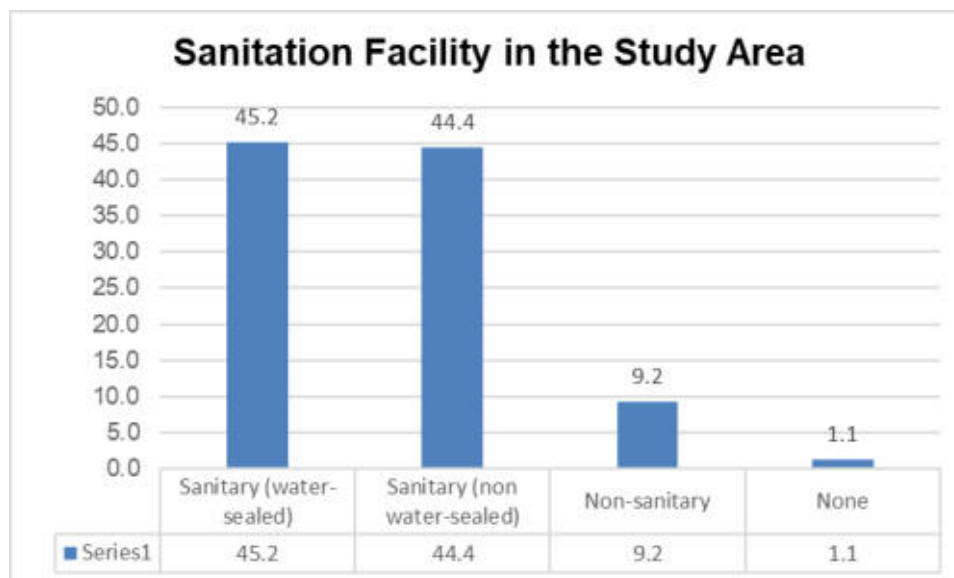


Source: Population and Housing Census, BBS, 2011

4.4.3.3 Sanitation

In the study area, households that use water-sealed sanitary latrine and non-water-sealed sanitary latrine facility are 45.2% and 44.4% respectively. Whereas around 9.2% households avail non-sanitary facilities. The rest 1.1% of 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

4.4.3.4 Health Care Facility

According to the District Statistics (2011), there are 620 Private Hospitals in kaliganj, Khilkhhet, Badda Rampura Upazila with 1719 MBBS/FCPS doctors in the study area. Also, 1042 diagnostic centers are found in the proposed study area.

4.4.3.5 Solid Waste

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.

4.4.4 Economy and Employment

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 31.7% males and 10.0% females. Furthermore, a sizable proportion of the study area's population (53% male and 67.9% female) is employed in the service sector. In addition, the industrial sector employs 15.3% men and 22.1% women. The following **Table 4-27** shows the employment status of the project area.

Table 4-27: Employment status of the Study Area

Upazila	Population Aged 7+, not attending school but employed			Field of Activity					
				Agriculture		Industry		Service	
	Total	Male	Female	Male	Female	Male	Female	Male	Female
Kaliganj Substation	2728	2599	129	80.8	26.4	7.3	17.1	12.0	56.6
Purbachal Substation	2065	1911	154	54.9	22.1	6.7	7.8	38.4	70.1
Rampura-Bashundhara 132kV Underground Cable Line	2127	1961	166	51.4	13.9	10.4	10.8	38.3	75.3
	11417	7841	3576	3.5	1.0	18.6	24.4	77.9	74.6
	4165	2890	1275	24.5	5.6	29.2	49.0	46.3	45.4
	16778	11596	5182	4.5	1.1	29.0	44.8	66.5	54.1
	1032	407	625	2.5	0.0	6.1	1.1	91.4	98.9
Study Area	40312	29205	11107	31.7	10.0	15.3	22.1	53.0	67.9

Source: Population and Housing Census, BBS, 2011

4.4.5 Traffic and Transport

According to the District Statistics (2011), in Kaliganj, Khilket, Badda and Rampura Upazila total metalled road is 1870 km and there is 133 km semi metalled road. In these upazilas total unmetalled (kacha) road is 950km. There is total 370 railway stations and 45 Bus stands in the study area. 4 steamer or launch station found in these upazilas. Water way in monsoon is 738 km and Water way round the year is 40km found in the area. The following **Table 4-28** shows the traffic and transportation status of the project area.

Table 4-28: 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
Kaliganj	276	29	417	14	720	28	1	0	4

Dhaka Mettropolition (Khilkhet, Badda, Rampura)	1594	104	533	356	18	12	8	4	41
Total	1870	133	950	370	738	40	9	4	45

5. IMPACT ASSESSMENT AND EVALUATION

117. 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.

118. Section 5 of the original IEE (Table 5-3 of the original IEE) remains applicable for impact evaluation of the project.

119. This section evaluates additional potential impacts based on activities that will be involved in construction and operation phase of the one proposed Underground Cable Line: (i) Rampura-Bashundhara 132kV Underground Cable Line (package 2), and two substations; (i) 400/230 kV GIS Substation at Fuldigram, Boktarpur, Kapasia Road, Kaliganj, Gazipur (Package 5) and (ii) 400/230/132 KV GIS Substation at Purbachal (Package 6).

5.1 Impact Assessment Methodology

120. 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

121. 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.

122. 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-5

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-5
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 topsoils 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	Medium	Moderate	Moderate Adverse	Same as previous

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-5
	changed.				
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 Underground Cable 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/ lake 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	Baseline were found well within the limits of national standards for cable line. Except PM _{2.5} and PM ₁₀ Baseline results were

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-5
					found well within the limits of national standards for two substation.
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	Baseline 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	Except the values of DO, BOD, and COD Rampura and Bashundhara Cable line area and DO and BOD in two substations Baseline 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

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-5
Soil	During construction, topsoil 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
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					

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-5
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 will be initiated due to underground cabling activities.
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 is not available for this Underground cable line
Land price	Value of land may be temporarily affected.	Medium	Moderate	Moderate Adverse	Same as previous

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-5
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.
Road/ river/ canal/ lake 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
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	Low	Minor	Minimal Adverse ¹⁴	Same as previous

¹⁴ 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

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-5
	(negligible) of SF6				
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
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					

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-5
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 Underground Cable 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 Underground Cable 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 Underground Cable Line and between towers may affect land value.	Medium	Moderate	Moderate Adverse	Same as previous
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);	Medium	Minor	Moderate Adverse	- Same as previous - As per the final

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-5
	There is public and scientific concern over the potential health effects associated with exposure to EMF.				alignment and confirmation from PGCB, there are no housing or school structures underground cabling route. 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.
Road/ river/ canal/ lake 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- 5

5.3.1 Terrestrial Resources (Flora and Fauna)

5.3.1.1 Clearing of Vegetation during Construction Phase

123. As per the original IEE, 2019, 350 (>5 m in height) big trees were estimated to be affected by Underground Cable Line, where no trees were felled during the land development of two substations. Therefore, the impact for two substation is negligible. However, as per the primary survey during this addendum, about 288 trees (213 trees were found more than 5m in height) were found among that about 220 trees were assumed to get uprooted in 5 m buffer of both side of the underground cable line alignment. The comparison of tree count is given in Table 5-2. Also, tree count survey picture and outcome are given in **Appendix E**.

Table 5-2: Comparison of tree count

SN	Sub-projects	Counted during original IEE, 2019*	Counted during Addendum-5, 2024*
1.	Rampura- Bashundhara 132kV Underground Cable Line	350 (>5 m in height)	Overall, 288 trees were found among that about 220 trees were assumed to be uprooted
2.	400/230 kV GIS Substation at Kaliganj, Gazipur	10	7

*Source: <https://www.adb.org/projects/documents/ban-51137-003-iee> and EQMS Survey May 2024

124. Most of the trees in the RoW of the underground cable line need to be uprooted but still the number of trees that need to be uprooted have not been fixed yet as most of the trees were found in 5m buffer zone rather than the exact alignment. Therefore, the impact will be only moderately significant. Underground cable line alignment falls beside the road network, 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.

125. 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

126. The construction of civil works such as underground cable line and two substations pose 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.

127. During construction poor management in availability of utilities; site selection for construction work camps, storage area selection of stockpile and excavated soil storage area and disposal areas; and site selection for equipment lay-down and storage area, land filling materials may induce the health risk of workers as well as environmental pollution and contamination.

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

129. 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 Underground Cable 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

- Management of utilities should be maintained in a way that reduces the consumption of resources and generation of wastes (solid and liquid). 3R policy should be applied to reduce waste generation in the highest possible amount.
- Site selection for construction work camps and equipment lay-down and storage area should be established in a safe and well designated area with proper barricade and boundary that might not cause any risk of accidents and hindrance of movements
- Site selection of storage area of stockpile and excavated soil should be maintained with proper boundary that prevent piling mud and soil runoff to the nearest water bodies and cultivated land.
- Stockpile and excavated soil should be removed or dumped properly and immediately after the construction activities so that it might not contaminate water and topsoil.

5.3.3 Impact due to Canal/ Lake Crossing

130. Rampura- Bashundhara 132kV Underground Cable Line crosses two canal and one lake in the length of the line. As per PGCB and observation from survey, no disturbance will occur to the benthic zone of canals and lake during the project life cycle. Moreover, 500 m radius of two substation location there is no river boundaries. Therefore, no significant impact is expected due to construction of substations and underground cable lines at the river crossings. However, additional mitigation measures have been incorporated in the EMP.

5.3.4 Land Loss

131. A substantial loss of land of 32.05 acres is anticipated for the proposed two 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 two substation locations. Moreover, most of the substation location is not agricultural land. Overall anticipated impact on land for construction of substation are cumulatively low.

132. For the underground cable line, there is no Resettlement Plan (RP) needs to be prepared in conjunction with the IEE to determine the land ownership, affected structures, trees, and crops to determine the compensation. Therefore, the impact on land for underground cable lines is negligible.

5.3.5 Environmental and Social Sensitive Receptors

In underground cable lines no environmental and social sensitive receptor were found in 100 m buffer area. Underground cable lines will not pose any major impact on existing canal portions as the cable will pass through the tunneling of pipe. Therefore, the impact of the underground cable line on environmental and social receptors is very low.

6. ENVIRONMENTAL MANAGEMENT PLAN

133. 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.

134. 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.

135. 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.

136. The additional mitigation measures under this addendum for Rampura- Bashundhara 132kV Underground Cable Line (package 2) and two substations, 400/230 kV GIS Substation at Fuldigram, Boktarpur, Kapasia Road, Kaliganj, Gazipur and 400/230 kV GIS Substation at Mothbari, Kaliganj, Gazipur. under Packages 5 and 6 respectively are incorporated in the Table 6-1 and Table 6-2.

Table 6-1: Mitigation Measures for the Impacts of Rampura- Bashundhara 132kV Underground Cable Line of during Addendum-5

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Supervision Agency
(a) Pre-construction/ Construction Stage				
Tree cutting, Clearing of vegetation	220 trees (>5 m in height) were expected to be directly affected by uprooting along the RoW of Rampura-Bashundhara 132kV Underground Cable 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
		- 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.		
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 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	Contractor	DSC/ PGCB

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Supervision Agency
		their use by workers. • Safety signs as needed at the project 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 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/---		

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Supervision Agency
		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. • 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)	Contractor	DSC/ PGCB

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Supervision Agency
		- 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 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.	Contractor	DSC/ PGCB

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Supervision Agency
		• 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.		
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 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	Contractor	DSC/ PGCB

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Supervision Agency
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 two substations during Addendum-5

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Super-vision Agency
(a) Preconstruction/Construction Stage				
Land acquisition/ requisition	Loss of 32.05 acres of land for the construction of two 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
Topsoil	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 two substation lands	Contractor	DSC/ PGCB
Cutting of trees/ Clearing of vegetation	Lands selected for the construction of two substations are paddy fields, including small extents of marshy lands and waterbodies. There were no trees found during the survey of Purbachal substation site. 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

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Supervision Agency
Fauna (Wildlife)	Disturbance of wildlife due to project activities such as earthworks, moving of project equipment and transports, especially during nighttime.	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 guidelines and WHO noise guidance whichever is more stringent on noise. Project workers should not disturb or kill any wildlife. Fishing is not allowed.	DC Contractor	DSC/ PGCB
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.	Contractor	DSC/ PGCB

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Super- vision Agency
		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.		
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).	Contractor	DSC/ PGCB

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Super- vision Agency
		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). 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.	Contractor	DSC/ PGCB

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Supervision Agency
		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.		
		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

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Supervision Agency
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. Just after completion of the construction, hand over the camp sites to the owners as in earlier condition.	Contractor	DSC/ PGCB
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.	Contractor	DSC/ PGCB

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Super- vision Agency
		Avoid stockpiling of materials, especially at the roadsides, that could disturb traffic movement.		
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. 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.	Contractor	DSC/ PGCB
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	Contractor	DSC/ PGCB

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Super- vision Agency
		access to site reflecting national and EHS Guideline requirements.		
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. 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.	Contractor	DSC/ PGCB
		Prior to starting work, a toolbox 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.		

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Super- vision Agency
		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.		
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 Underground Cable 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
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Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Super-vision Agency
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. Generators should be placed in the closed rooms. operational H&S risk assessment to be undertaken.	PGCB	PGCB
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

137. The environmental and social monitoring plan for Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj and Purbachal Substations subprojects has been incorporated in Table 6-3 and Table 6-4.

Table 6-3: Environmental Monitoring Plan for Rampura- Bashundhara 132kV Underground Cable Line During Addendum 5

Environmental Issues/Parameters	Monitoring Parameters	Standards/ Guidelines	Means of Monitoring	Frequency	Location	Implement ation Agency	Supervision Agency	Update until Addendum-5
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 Cable lines	DC	DSC/PGC B	Same as previous
Uprooting 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 Cable lines	FD	DSC/PGC B	Same as previous
Ambient Air Quality Parameters	SPM, PM10, PM2.5, SOx, NOx, CO (8hr) & Pb-24hr monitoring	DoE standards	Sampling/ laboratory analysis	Before construction, then quarterly	At representative Underground Cable construction sites	Contractor	PGCB	Monitoring conducted for Rampura-Bashundhara 132kV Underground Cable Line, Kaliganj and Purbachal Substations.
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	Same as previous
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	Same as previous
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	Same as previous
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	Same as previous
Traffic congestion/ Road Accident	Checking road crossing points, roads adjacent to towers.	BRTA	Inspection	Regular	At road/railway crossing points and roads adjacent to Cable line	Contractor	DSC/PGC B	Same as previous
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

Environmental Issues/Parameters	Monitoring Parameters	Standards/Guidelines	Means of Monitoring	Frequency	Location	Implementation Agency	Supervision Agency	Update until Addendum-5
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/PGCB	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 underground cable line construction sites and crossing of roads	Contractor	DSC/PGCB	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 Underground Cable Line	FD	Inspection	Once every year and as directed by the Relevant engineer of PGCB	Along the underground cable Lines	PGCB	PGCB	Same as previous
EMF	Checking of clearance of Underground Cable 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 underground cable lines pass over	PGCB	PGCB	Same as previous
Short circuit/ accident	Safety	DoE guidelines	Inspection	Regular	Along the underground cable line	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 underground cable line	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 underground cable line	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 = Underground Cable Line.

Table 6-4: Environmental Monitoring Plan for Kaliganj and Purbachal Substations Subprojects During Addendum 5

Environmental Parameters	Issues/	Monitoring Parameters	Standards/ Guidelines	Means of Monitoring	Frequency	Location	Implementation Agency	Supervision Agency
Preconstruction ¹⁵/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

¹⁵ 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

138. As per the original IEE, 2019, a significant number of big trees were estimated to be cleared in Underground Cable Line, where no trees were felled during the land development of two substations. However, as per the primary survey during this addendum, about 288 trees (213 trees were found more than 5m in height) were found among that about 220 trees were assumed to get uprooted in 5 m buffer of both side of the underground cable line alignment. Most of the trees in the RoW of the underground cable line need to be uprooted but still the number of trees that need to be uprooted have not been fixed yet as many trees were found in 5m buffer zone rather than the exact alignment. The study assuming that 220 trees can be uprooted which is found mostly between one to four meter (1-4m) buffer of the alignment 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-5, 2024*
1.	Rampura- Bashundhara 132kV Underground Cable Line	350 (>5 m in height)	Overall, 288 trees were found among that about 220 trees were assumed to be uprooted
2.	400/230 kV GIS Substation at Kaliganj, Gazipur	10	7

*Source: <https://www.adb.org/projects/documents/ban-51137-003-iee> and EQMS Survey May 2024

139. Tree Plantation Plan for Rampura- Bashundhara 132kV Underground Cable Line and Kaliganj, and Substations mentioned below **Table 6-6**. Although the number of trees that need to be uprooted have not been fixed yet as most of the trees were found in 5m buffer zone rather than the exact alignment. But the study assuming that 220 trees can be uprooted which is found mostly between one to four meter (1- 4m) buffer of the alignment.

Table 6-6: Tree Plantation Plan for Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations

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
Mehogoni	<i>Swietenia macrophylla</i>	2	6	Homestead Forest and Government Forest	PGCB
Jackfruit	<i>Artocarpus heterophyllus</i>	3	9	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
Coconut	<i>Cocos nucifera</i>	76	228	Homestead Forest and Government Forest	PGCB
Bakul	<i>Mimusops elengi</i>	39	117	Homestead Forest and Government Forest	PGCB
Krishnachura	<i>Delonix regia</i>	98	294	Homestead Forest and Government Forest	PGCB
Grand Total Trees		220	660		

6.3 Budget For EMP

140. Budget for EMP implementation for Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations are mentioned in Table 6-7 and Table 6-8. EMP/IEE implementation along with necessary budget allocation is already included in the contract document (Appendix I).

Table 6-7: Budget for EMP implementation Cost for Rampura- Bashundhara 132kV Underground Cable Line.

Item	Qty	Rate	Total Amount (BDT)
Tree planting (three times of trees removed for project interventions)	660 seedlings/ saplings to be planted in home gardens and govt. lands, maintenance for three years	40 Taka per seedlings/ saplings	26,400
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
Waste management and dust suppression	Underground cable line alignment	Lump sum	36,400
Drainage Management	Underground cable line alignment	Lump sum	27,300
Traffic Management	Underground cable line alignment	Lump sum	13,650

OHS	Underground cable line alignment	Lump sum	50,050
Community Health and Safety	Underground cable line alignment	Lump sum	31,850
Total Cost			321,650

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

Item	Qty	Rate	Total Amount (BDT)
Voluntary Tree plantation (No trees were felled for this two substation subprojects)	7 seedlings/ saplings to be planted in home gardens and govt. lands, maintenance for three years	40 Taka per seedlings/ saplings	1,260
Environmental Quality			
Surface Water	8 samples/Annual	8000	32,000
Ground Water	8 samples/ Annual	12000	48,000
Air	8 samples/ Annual	6000	24,000
Noise	5 samples/ Annual	1200	12,000
Environmental Health and Safety			
Waste management and dust suppression	2 Substation locations	Lump sum	62,500
Drainage Management	2 Substation locations	Lump sum	46,250
Traffic Management	2 Substation locations	Lump sum	25,000
OHS	2 Substation locations	Lump sum	40,000
Community Health and Safety	2 Substation locations	Lump sum	21,250
Total Cost			312,260

7. GRIEVANCE REDRESS MECHANISM

141. 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-5 no grievance has been reported with respect to environmental and social issues.

8. PUBLIC CONSULTATION AND DISCLOSURE

142. The public consultations were conducted Rampura- Bashundhara 132kV Underground Cable Line, Kaliganj, and Purbachal Substations in March 2024 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, Underground Cable 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.

143. 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

144. 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 Underground Cable Lines.

145. 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 (Under Cable Line and Substations)

SN	Name of Underground Cable Line/Substation	Venue	No. of Male (M)/ Female(F)		Total Participants	Date
			M	F		
1.	Rampura-Bashundhara 132kV Underground Cable Line, Kaliganj and Purbachal Substations	Badda Link Road	6	2	8	April 2024
		Madani Avenue	5		5	
2.	Kaliganj Substations	Boktarpur bazar	7	5	12	March 2024
3.		Khaikara	4	4	8	March 2024
4.	Purbachal Substations	Mothbari bazar	5	3	8	March 2024
5.		Nagari	6	4	10	March 2024

8.1.1 Summary of Focus Group Discussion with Local Community and Affected Persons (Underground Cable 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. Underground Cable Line
- 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 Underground Cable Line, natural forest will be affected. A huge amount of deforestation might be happened for covering the Underground Cable 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.
- 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

146. This addendum report to original IEE¹⁶ study has been conducted based on the final surveyed alignments of the Underground Cable Line route ; ((i) Rampura- Bashundhara 132kV Underground Cable Line (package 2), and two substations; (i) 400/230 kV GIS Substation at Fuldigram, Boktarpur, Kapasia Road, Kaliganj, Gazipur (Package 5) and (ii) 400/230/132 KV GIS Substation at Purbachal (Package 6)), 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.

147. Rampura- Bashundhara 132kV Underground Cable Line is estimated at 9 km by the PGCB. 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 of the underground cable line. The major waterbodies covered are canals and lakes, however, the underground cable 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 are to be cut in this alignment than the original route.

148. In two 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.

149. 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.

¹⁶ <https://www.adb.org/projects/documents/ban-51137-003-iee>