

# Final Addendum to Initial Environmental Examination

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Project No: 51137-003  
April 2023

Bangladesh: Dhaka and Western Zone Transmission Grid  
Expansion Project

Addendum – 3 (Package 3 and 4)

Prepared by Power Grid Company of Bangladesh Ltd. (PGCB) for the Asian Development Bank  
for People's Republic of Bangladesh.

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# **Addendum to Initial Environmental Examination Bangladesh: Dhaka and Western Zone Transmission Grid Expansion Project**

## **Transmission Lines:**

**Kushtia- Meherpur 132 kV double circuit transmission line**

**Domar-Hatibandha 132 kV double circuit transmission line**

**Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission line**



**FINAL REPORT**

**ADDENDUM -3**

**MARCH 2023**

**EQMS CONSULTING LIMITED**

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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
UPI	Union Parishad Institutions

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**WEIGHTS AND MEASURES**

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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

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## 1. INTRODUCTION

This report is addendum to the original IEE report<sup>1</sup> that was approved by ADB in July 2019. The addendum is only in respect of three lines; Kushtia- Meherpur 132 kV double circuit transmission line, Domar-Hatibandha 132 kV double circuit transmission line and Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission line. 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 as applicable for the project. As per PGCB, the construction activities (piling and soil tests) in the Kushtia- Meherpur 132 kV double circuit transmission line started in July 2022 and both Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission line started recently in August 2022.

In order to prepare this addendum 3, 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 for Kushtia-Meherpur 132 kV double circuit transmission line, Domar-Hatibandha 132 kV double circuit transmission line and Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission lines are described in this report.

### 1.1 Background

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

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

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

<sup>2</sup> Power Grid Company of Bangladesh Ltd. PGCB at a glance.

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.

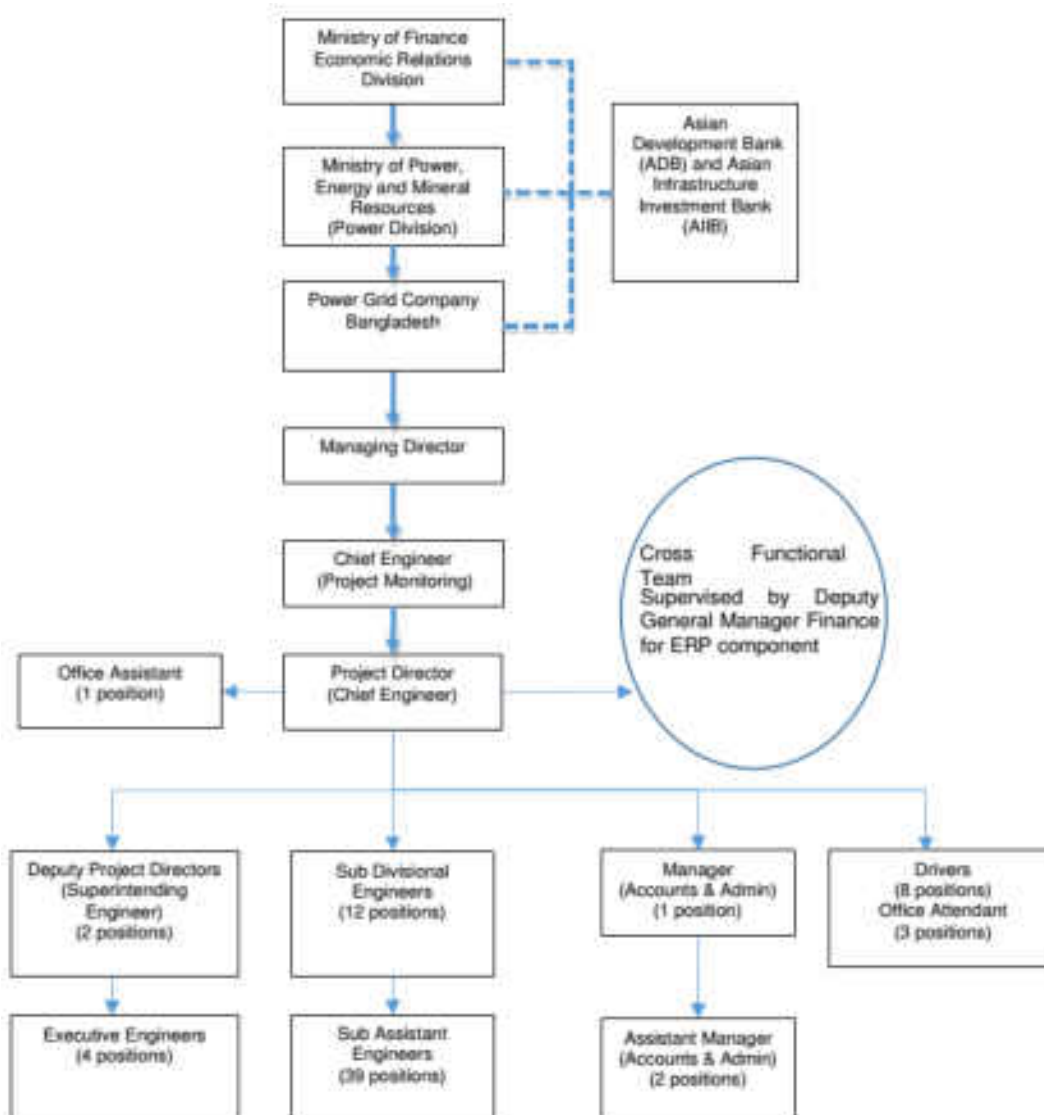
**Component 1: Transmission system in Greater Dhaka expanded.** The project will construct and commission substations with a total capacity of 4,450 MVA and 40 km of transmission lines in Greater Dhaka.

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

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

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.

## 2. ADMINISTRATIVE AND LEGAL FRAMEWORK

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.

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	<ul style="list-style-type: none"> <li>• Ensuring sustainable development through reducing human pressure on nature and natural resources.</li> <li>• Considering environmental protection as an integral part of the development programs planned to meet the need of the present and future generations.</li> <li>• Making natural resources extraction, use, environmental conservation, etc. to be based on science.</li> <li>• Considering environmental impacts and risks in extracting and using natural resources.</li> <li>• Evaluating the economic contribution of ecosystem services simultaneously to that of natural resources.</li> <li>• 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.</li> <li>• 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.</li> <li>• Encouraging sustainable use of new and renewable resources.</li> <li>• Enhancing long-term poverty alleviation and food security through conserving biological diversity.</li> <li>• Realizing compensation from persons and institutes those who are liable to environmental pollution through applying polluter pay principle.</li> <li>• Including environmental conservation and preservation in all national policies and ensuring implementation of the environment policy at both government and nongovernment levels.</li> <li>• Giving priority to preventive measures over curative measures in environmental conservation.</li> <li>• Including adaptation and mitigation programs in all development projects to address adverse impacts of climate change.</li> <li>• Ensure sustainable utilization of ecosystem goods and services.</li> <li>• Implementation of the 3R principle in the utilization of resources.</li> </ul>

Policies	Description/ Applicability of Acts
	<ul style="list-style-type: none"> <li>• 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.</li> <li>• Ensuring considerations of climate change and challenges of calamities in all kinds of infrastructure projects.</li> <li>• Reducing all SLCP (Short-Lived climate pollutants) that are harmful to health and the environment.</li> <li>• Taking development programs considering sustainable production and consumption as an integral part of environmental conservation to meet the need of present and future generations.</li> <li>• Allocating necessary funds to all areas of environmental conservation, preservation, and control.</li> <li>• Taking up programs in favor of a flourishing environment-friendly economy</li> </ul>
National Environment Management Action Plan, 1995	<ul style="list-style-type: none"> <li>• Identification of key environmental issues affecting Bangladesh;</li> <li>• Identification of actions necessary to halt or reduce the rate of environmental degradation;</li> <li>• Improvement of the natural environment;</li> <li>• Conservation of habitats and biodiversity;</li> <li>• Promotion of sustainable development; and</li> <li>• Improvement of the quality of life of the people.</li> </ul>
The National Biodiversity Strategy and Action Plan, 2004	<ul style="list-style-type: none"> <li>• Conserve and restore the biodiversity of the country for the wellbeing of the present and future generations;</li> <li>• Ensure that long-term food, water, health, and nutritional securities of the people are met through conservation of biological diversity;</li> <li>• Maintain and improve environmental stability of ecosystems;</li> <li>• Ensure preservation of the unique biological heritage of the nation for the benefit of the present and future generations;</li> <li>• Guarantee the safe passage and conservation of globally endangered migratory species, especially birds and mammals in the country; and</li> <li>• Stop introduction of invasive alien species, genetically modified organisms, and living modified organisms.</li> </ul>
<b>Environment and Social Related Legislations in Bangladesh</b>	
The Environment Conservation Act, 1995 and Subsequent Amendments	<ul style="list-style-type: none"> <li>• Declaration of Ecologically Critical Areas (ECAs);</li> <li>• Obtaining an Environmental Clearance Certificate (ECC);</li> <li>• Regulation with respect to vehicles emitting smoke harmful to the environment;</li> <li>• Regulation of development activities from an environmental perspective;</li> <li>• Promulgation of standards for quality of air, water, noise, and soils in different areas and for different purposes;</li> <li>• Promulgation of acceptable limits for discharging and emitting waste; and</li> <li>• Formulation of environmental guidelines relating to control and mitigation of environmental pollution, conservation, and improvement of the environment.</li> </ul>



Policies	Description/ Applicability of Acts
The Environment Conservation Rules, 1997 and Subsequent Amendments	<ul style="list-style-type: none"> <li>• The NEQS for ambient air, surface water, groundwater, drinking water, industrial effluents, emissions, noise, and vehicular exhaust;</li> <li>• 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;</li> <li>• Procedure for obtaining ECC;</li> <li>• Requirements for undertaking IEE and EIA's as well as formulating EMP according to categories of industries/development projects/activities; and</li> <li>• Procedure for damage-claim by persons affected or likely to be affected due to polluting activities or activities causing hindrance to normal civic life.</li> </ul>
Noise Pollution (Control) Rules, 2006	<ul style="list-style-type: none"> <li>• According to the Rules, motor honking within a 100-meter radius of a hospital, school, and office is prohibited.</li> <li>• 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.</li> <li>• The rules stipulate safety and precautionary measures in workplaces, designated authorities for allowing noise-generating appliances.</li> </ul>
EIA Guidelines for Industry, 2021	<p>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.</p>
Air Pollution (Control) Rules 2022	<p>The Rules are regarded as subordinate regulations of the Bangladesh Environment Conservation Act, 1995 and its main provisions are as follows.</p> <ul style="list-style-type: none"> <li>• The Rules stipulate environmental air quality standards (general standards), emission standards for vehicles, emission standards applicable to industries or projects, and odor standards</li> <li>• 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.</li> <li>• 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.</li> <li>• In order to control air pollution from motor vehicles, the regulatory authority for motor vehicles (<a href="http://www.brta.gov.bd/">http://www.brta.gov.bd/</a>) 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.</li> <li>• 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.</li> <li>• Local government organizations, construction management authorities, and other relevant organizations shall comply with the standards and</li> </ul>

Policies	Description/ Applicability of Acts
	<p>control methods specified in the Rules and follow the work procedures recommended in the National Air Quality Management Plan.</p> <p>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.</p>

**Table 2-2: Relevant National Environmental Regulations**

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

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

Regulation	Brief Description	Remarks
Immovable property Act, 2017	acquired (including houses, trees, and standing crops,); and (ii) any other impacts caused by such acquisition.	
Environment Conservation Rules 1997	has promulgated the Environment Conservation Rules 1997 under the ECA 1995 to evaluate, review the Environmental Impact Assessment (EIA) of various projects and activities, and procedures are established for approval.	Transmission line will comply with this rule.
Grid Code 2019	The Grid Code specifies criteria, guidelines, basic rules, procedures, responsibilities, standards, and obligations for the operation, maintenance, and development of the Electricity Transmission System of Bangladesh to ensure transparent, non-discriminatory, and economic access and use of the Grid, whilst maintaining a safe, reliable and efficient operation of the same to provide a quality and secure electricity supply as reasonably as practicable.	Transmission line will ensure the compliance of this grid code.
Hazardous Waste (e-waste) Management Rules, 2021	<p>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.</p> <p>The main provisions of this regulation are as follows.</p> <ul style="list-style-type: none"> <li>• 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.</li> <li>• Registered manufacturers, recyclers, etc. shall obtain environmental clearance in accordance with the Bangladesh Environmental Protection Rules, 1997.</li> </ul>	Transmission line will ensure compliance with relevant provisions of this rules.

Regulation	Brief Description	Remarks
	<ul style="list-style-type: none"> <li>• Manufacturers have to establish individual or joint collection centers and set aside funds for the management of the Waste Electrical and Electronic Equipment (WEEE).</li> <li>• 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.</li> <li>• 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).</li> <li>• 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.</li> <li>• 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.</li> </ul>	
Solid Waste Management Regulations 2021	<p>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.</p> <p>The main provisions of the Regulations are as follows.</p> <ul style="list-style-type: none"> <li>• When recovering resources from waste, the principles of management that consider the</li> </ul>	Transmission line will ensure compliance with relevant provisions of this regulations.

Regulation	Brief Description	Remarks
	<p>waste hierarchy, such as the 3Rs, segregation, and reduction, must be followed at all stages from waste generation to final disposal.</p> <ul style="list-style-type: none"> <li>• Responsibilities of waste generators, consumers, and users:                             <ul style="list-style-type: none"> <li>— Dispose of waste in accordance with the regulations of authorities including local government.</li> <li>— Dispose of waste separately.</li> <li>— Do not dump, store, or burn waste outdoors.</li> </ul> </li> <li>• Responsibilities of manufacturers and importers of products                             <ul style="list-style-type: none"> <li>— 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.</li> <li>— Determine work plans and implementation procedures for recycling and disposal.</li> <li>— Ensure that EPR is properly implemented.</li> <li>— Submit an annual report to the Department of Environment (DOE) on the amount of plastic recycled.</li> <li>— Raise public awareness of proper waste management.</li> </ul> </li> </ul>	

### 3. PROJECT DESCRIPTION

This addendum is only in respect of three lines; (i) Kushtia- Meherpur 132 kV double circuit transmission line, (ii) Domar-Hatibandha 132 kV double circuit transmission line and (iii) Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission line.

Domar-Hatibandha route and Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission line were finalized during original IEE (ref: Table 6.1 of the original IEE, <https://www.adb.org/projects/documents/ban-51137-003-iee>) after the detailed route survey and analysis. Kushtia- Meherpur 132 kV double circuit transmission line route analysis was not completed during the original IEE. However, after the detailed route survey and analysis, this route was finalized with minimal deviation from the first, second and third stage surveys (ref: Table 6.1 of the original 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**

SN	Subproject	Final Alignment				Original Routes
		Size/Length	Upazilla	District	Division	Size/Length
1.	<b>Kushtia-Meherpur 132 kV double circuit transmission line</b>	43.68 km; 24 angle towers; 122 suspension towers.	Gangni, Kushtia Sadar, Mirpur, Alamdanga	Meherpur, Chuadanga and Kushtia	Khulna	48.0 km; 30 angle towers; 115 suspension towers.
2.	<b>Domar-Hatibandha 132 kV double circuit transmission line</b>	35 km; 39 angle towers; 60 suspension towers	Domar, Dimla and Hatibandha	Nilphamari and Lalmonirhat	Rangpur	35 km; 56 angle towers; 50 suspension towers
3.	<b>Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission line</b>	49.5 km; 42 angle towers; 125 suspension towers	Bagerhat Sadar, Kachua, Pirojpur Sadar, Kawkhali, and Bhandaria	Bagerhat and Pirojpur	Khulna and Barishal	49.5 km; 55 angle towers; 94 suspension towers

#### 3.1 Site Details

##### 3.1.1 Location of the Project Site

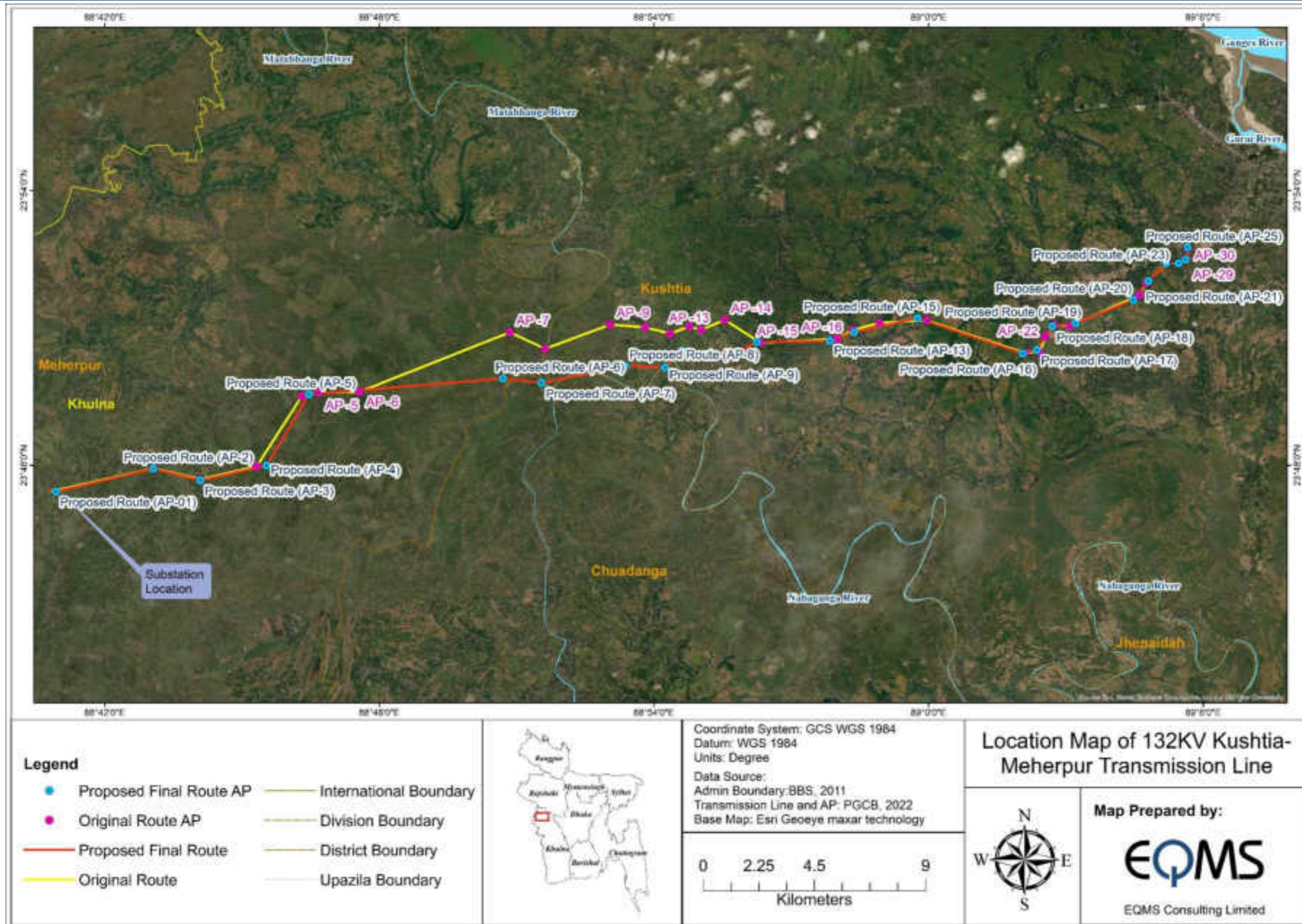
This addendum is only in respect of three lines; (i) Kushtia- Meherpur 132 kV double circuit transmission line, (ii) Domar-Hatibandha 132 kV double circuit transmission line and (iii) Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission line. These alignments comprise three administrative divisions and

seven districts of Bangladesh: four in Khulna division (Bagerhat, Chuadanga, Kushtia and Meherpur), two in Rangpur division (Lalmonirhat and Nilphamari) and one in Barishal division (Pirojpur). 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 Kushtia- Meherpur 132 kV alignment covers Gangni, Kushtia Sadar, Mirpur Upazilla under Meherpur and Kushtia districts respectively and Alamdanga of Chuadanga district. Domar-Hatibandha 132 kV double circuit transmission line covers Domar, Dimla and Hatibandha Upazilla under Nilphamari and Lalmonirhat districts respectively. Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission line covers Bagerhat Sadar, Kachua, Pirojpur Sadar, Kawkhali, and Bhandaria under Bagerhat and Pirojpur districts respectively. The final alignments have been deviated minimally from the original IEE. As per the EMP requirement, PGCB to avoid housing or school structures directly underneath the line. As per the confirmation from PGCB and on ground site visits, there are no housing or school structures directly lies underneath these final routes of the contractor. The major waterbodies covered in the final routes are rivers and gher, however, the transmission line will not pose any risk to these wetlands as well as seasonal habitats of wildlife and birds.

The coordinates of the final alignments and elevation details are given in **Annex A**.

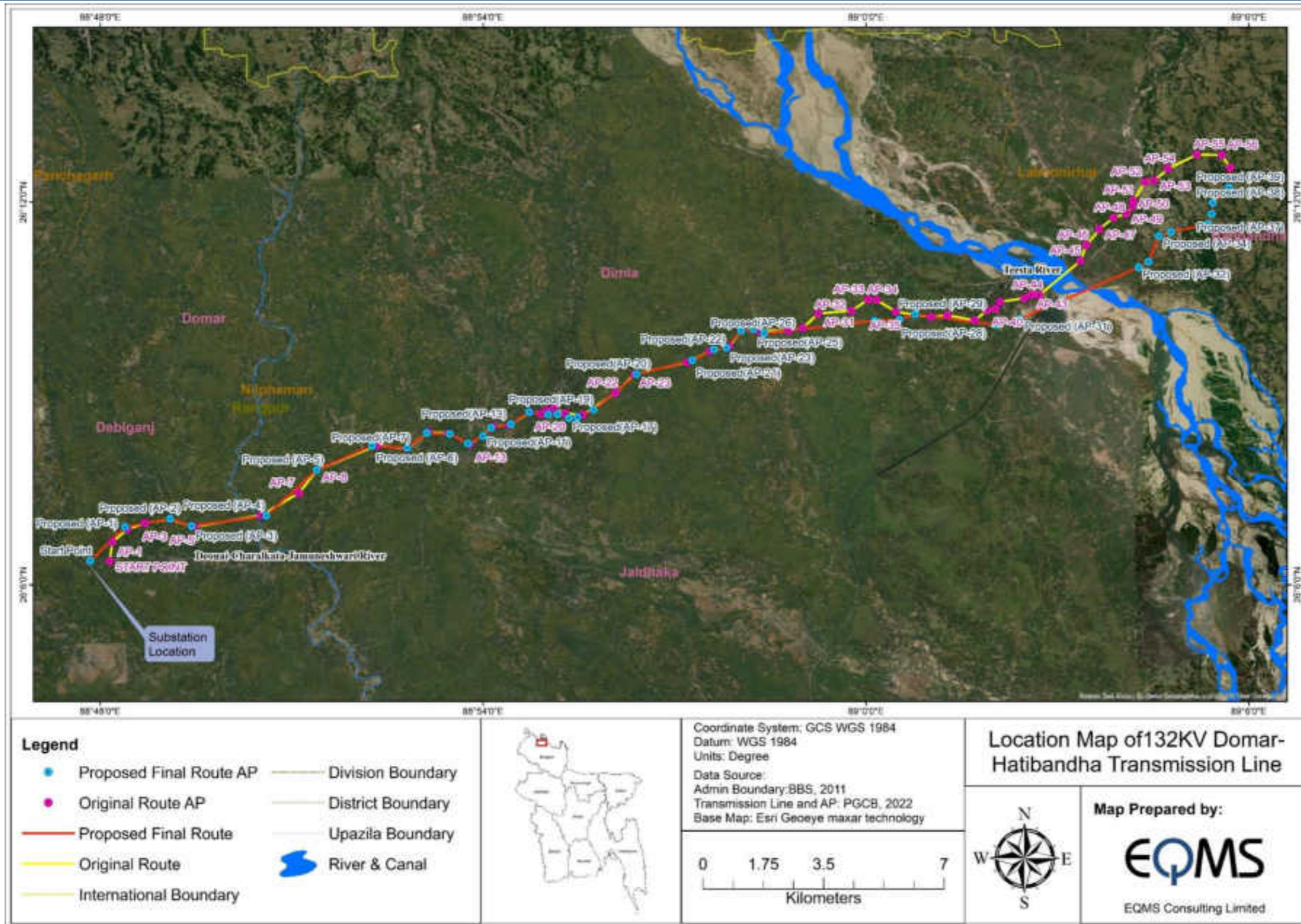


Figure 3-1: Proposed Route of the Transmission Lines



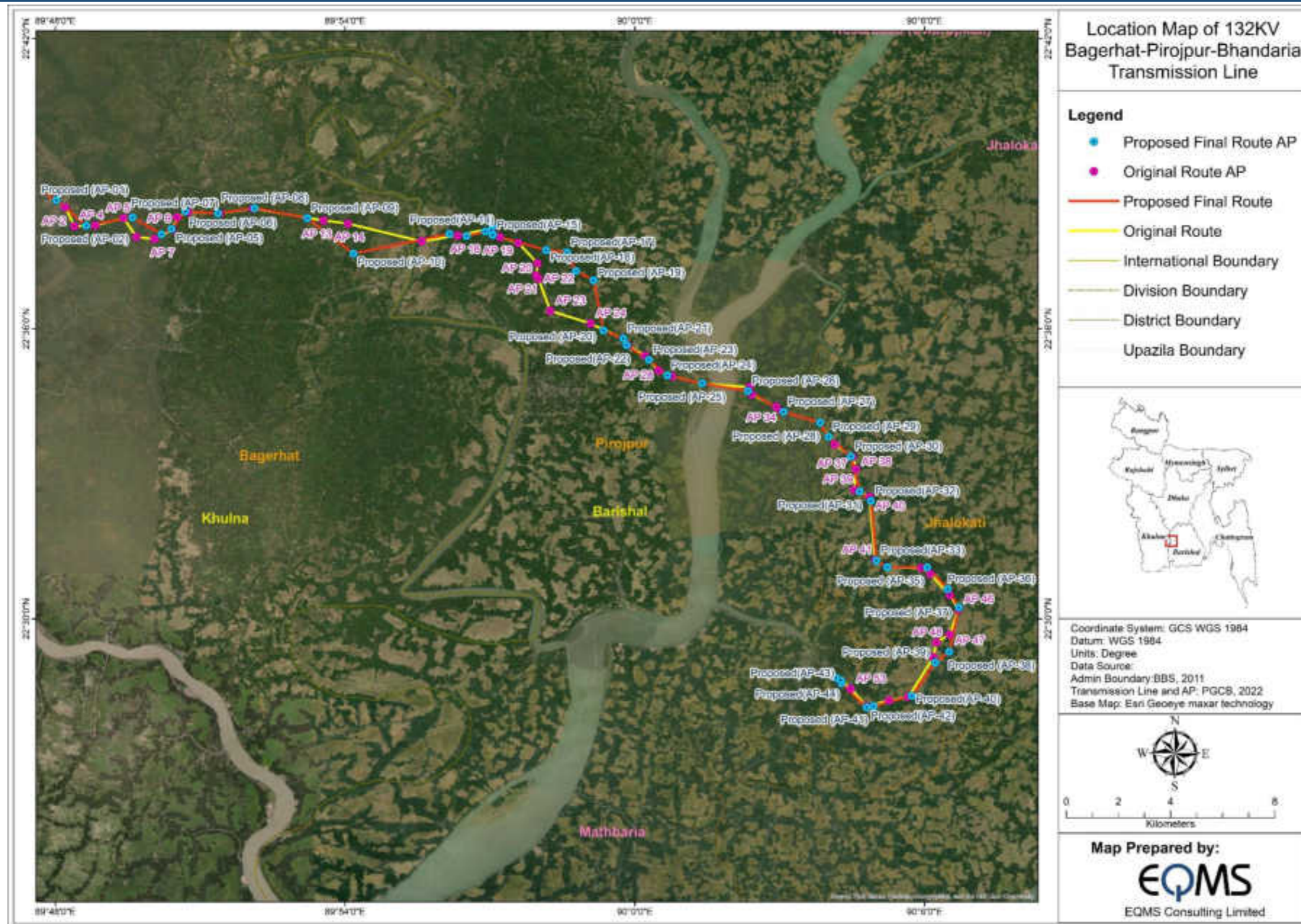
Kushtia- Meherpur





Domar-Hatibandha





Bagerhat-Pirojpur-Bhandaria

Source: Final routes provided by PGCB, 2022



## 4. ENVIRONMENTAL AND SOCIAL BASELINE

This section describes the existing environmental and social baseline status of proposed overhead transmission lines (Kushtia- Meherpur 132 kV double circuit transmission line, Domar-Hatibandha 132 kV double circuit transmission line and Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission line).

### 4.1 Methodology

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.

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.

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.

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

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.

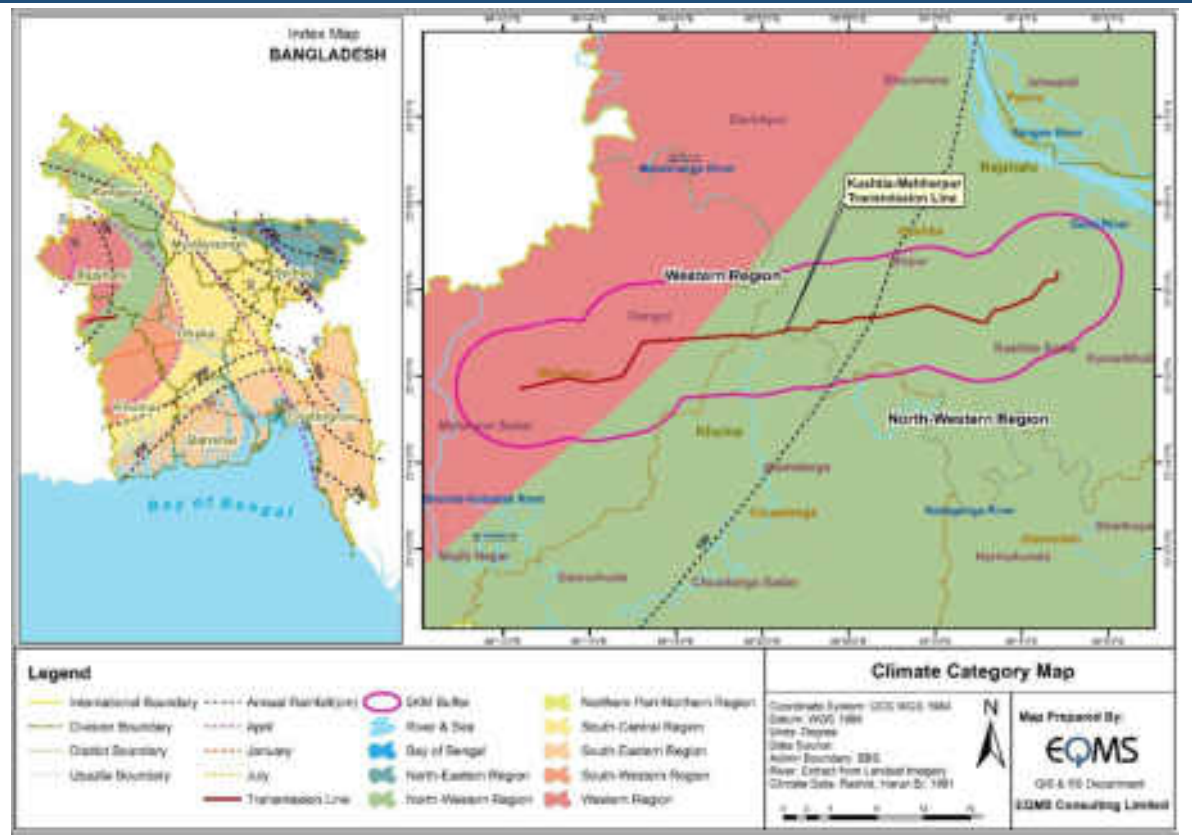
Three distinct seasons can be recognized in Bangladesh: the post-monsoon season from November to February; the pre-monsoon hot season from March to May, and the rainy monsoon season which lasts from June through to October. The month of March may also be considered as the spring season, and the period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

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.

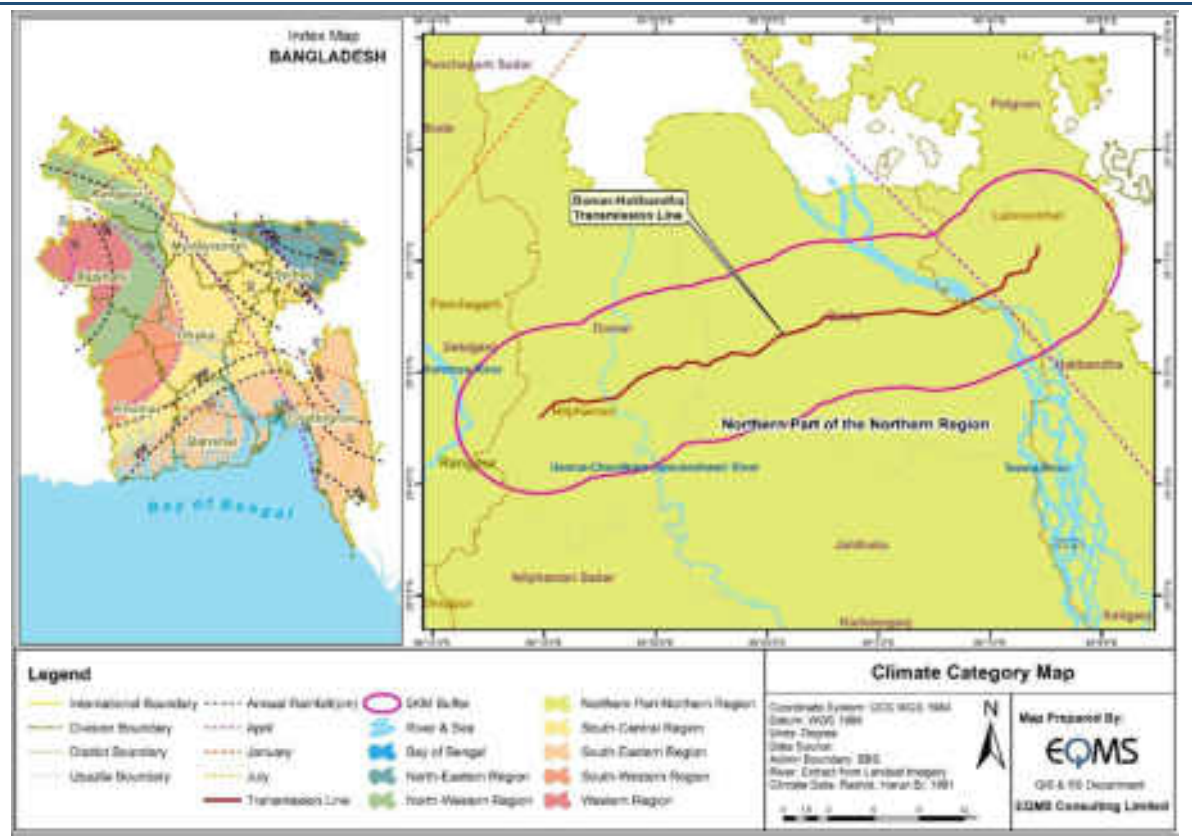
The pre-monsoon hot season (March-May) is characterized by high temperatures and the occurrence of thunderstorms. April is the hottest month when mean temperatures range from 27°C in the east and south to 31°C in the west-central part of the country. In the western part, summer temperatures sometimes 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 Kushtia- Meherpur, Damar-Hatibandha and Bagerhat-Pirojpur-Bhandaria transmission line route.

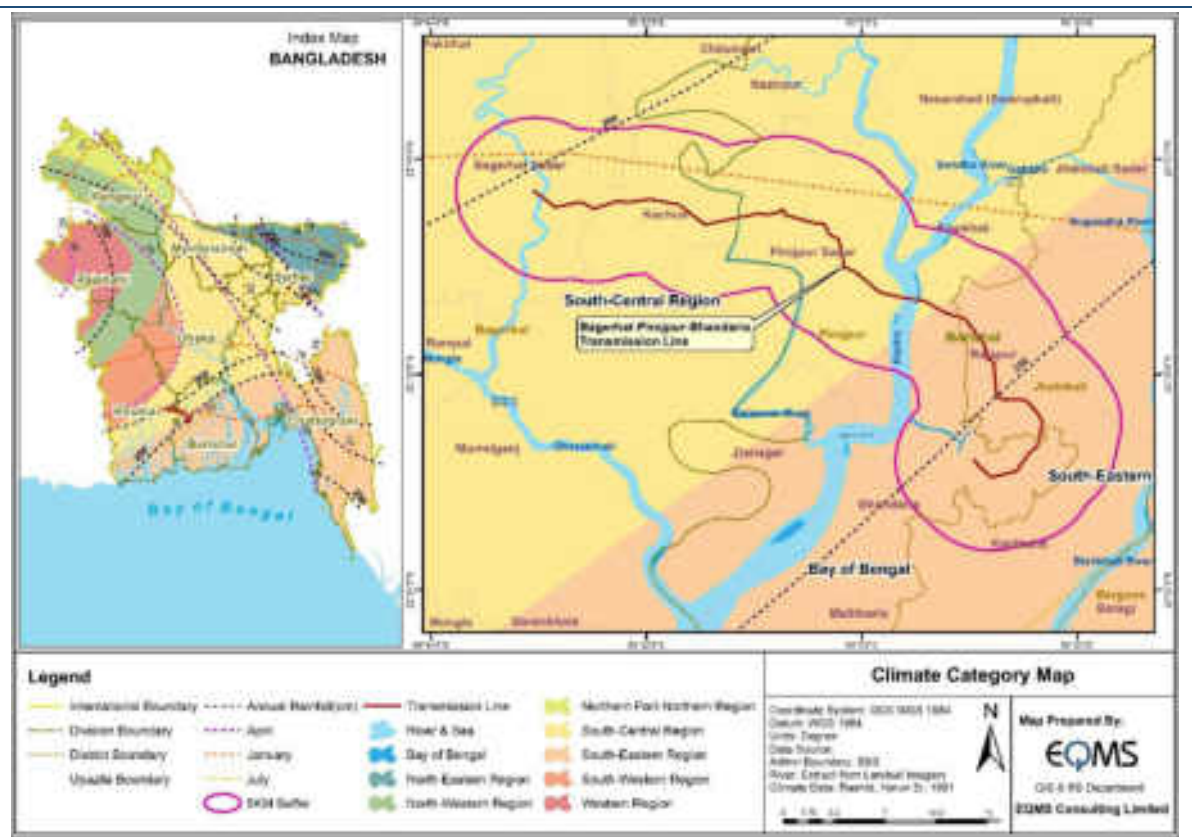
**Figure 4-1: Climatic Zones of Kushtia- Meherpur, Damar-Hatibandha and Bagerhat-Pirojpur-Bhandaria**



Climate Category of Kushtia- Meherpur



Climate Category of Domar-Hatibandha



Climate Category of Bagerhat-Pirojpur-Bhandaria

Source: Rashid, Haroun Er, 1991.

### 4.2.1.1 Climate at Kushtia

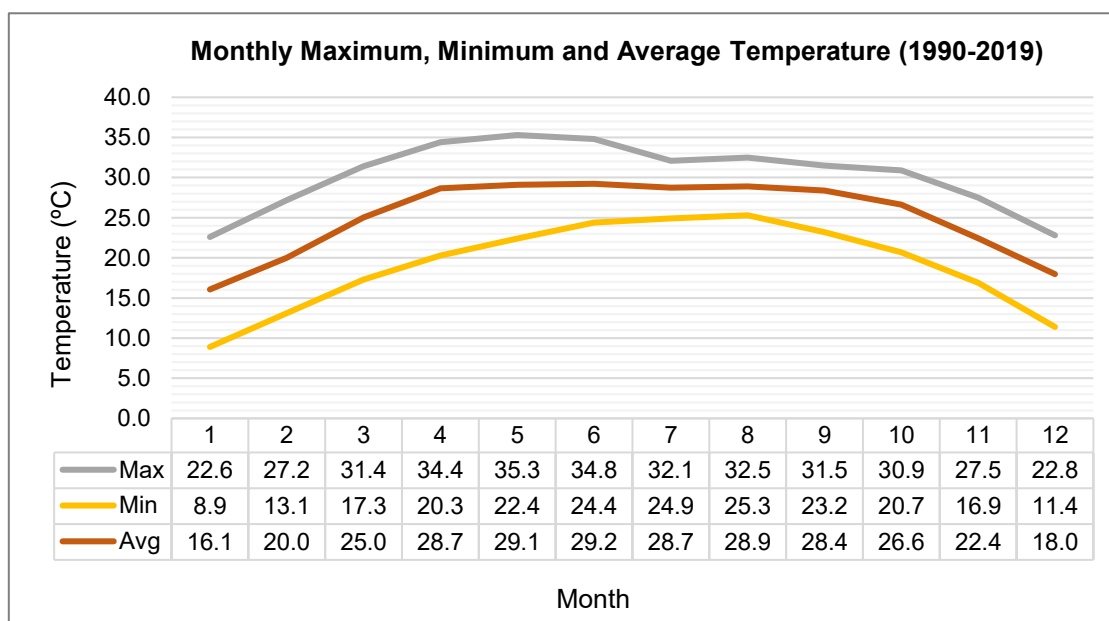
The source of climate data is Bangladesh Meteorological Department (BMD). The climate data was collected from nearby BMD station. For Kushtia to Meherpur alignments, data was collected from Chuadanga BMD station, which has the coverage for all the districts crossed within this route. The average annual temperature is 25°C in Kushtia and Meherpur. About 1460 mm of precipitation falls annually. The least amount of rainfall occurs in January. The average in this month is 6.1 mm. With an average of 298 mm, the most precipitation falls in July. The temperatures are highest on average in June, at around 29°C. January has the lowest average temperature of the year. It is 16°C. The variation in the precipitation between the driest and wettest months is 292 mm. During the year, the average temperatures vary by 13 °C.

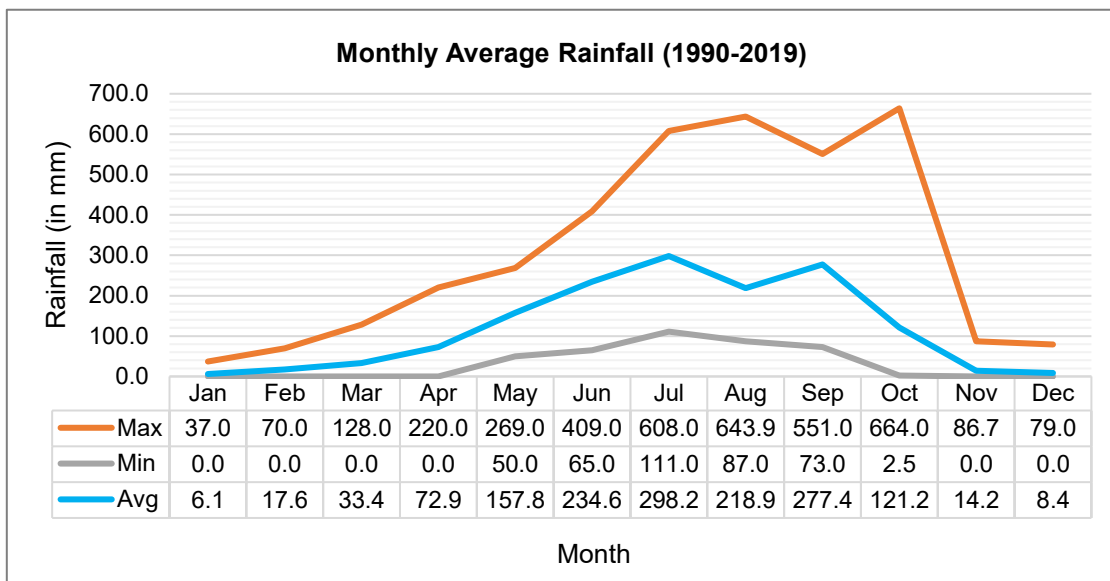
**Table 4-1: Average temperature and rainfall at Kushtia by month**

Average	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
<b>Avg. Temperature (°C)</b>	16.1	20.0	25.0	28.7	29.1	29.2	28.7	28.9	28.4	26.6	22.4	18.0
<b>Avg. Rainfall (mm)</b>	6.1	17.6	33.4	72.9	157.8	234.6	298.2	218.9	277.4	121.2	14.2	8.4

Source: Bangladesh Meteorological Department (BMD)

**Figure 4-2: Distribution of Rainfall & Temperature at Kushtia**





Source: Bangladesh Meteorological Department (BMD)

#### 4.2.1.2 Climate at Domar and Hatibandha

The source of climate data is Bangladesh Meteorological Department (BMD). The climate data was collected from nearby BMD station. For Domar to Hatibandha alignments, data was collected from Dinajpur BMD station, which has the coverage for all the districts crossed within this route. The average annual temperature is 24.7 °C in Dinajpur. About 1897 mm of precipitation falls annually. The least amount of rainfall occurs in December. The average in this month is 5 mm. With an average of 377 mm, the most precipitation falls in July. The temperatures are highest on average in August, at around 29.2°C. January has the lowest average temperature of the year. It is 15.7°C. The variation in the precipitation between the driest and wettest months is 372 mm. During the year, the average temperatures vary by 13.5 °C.

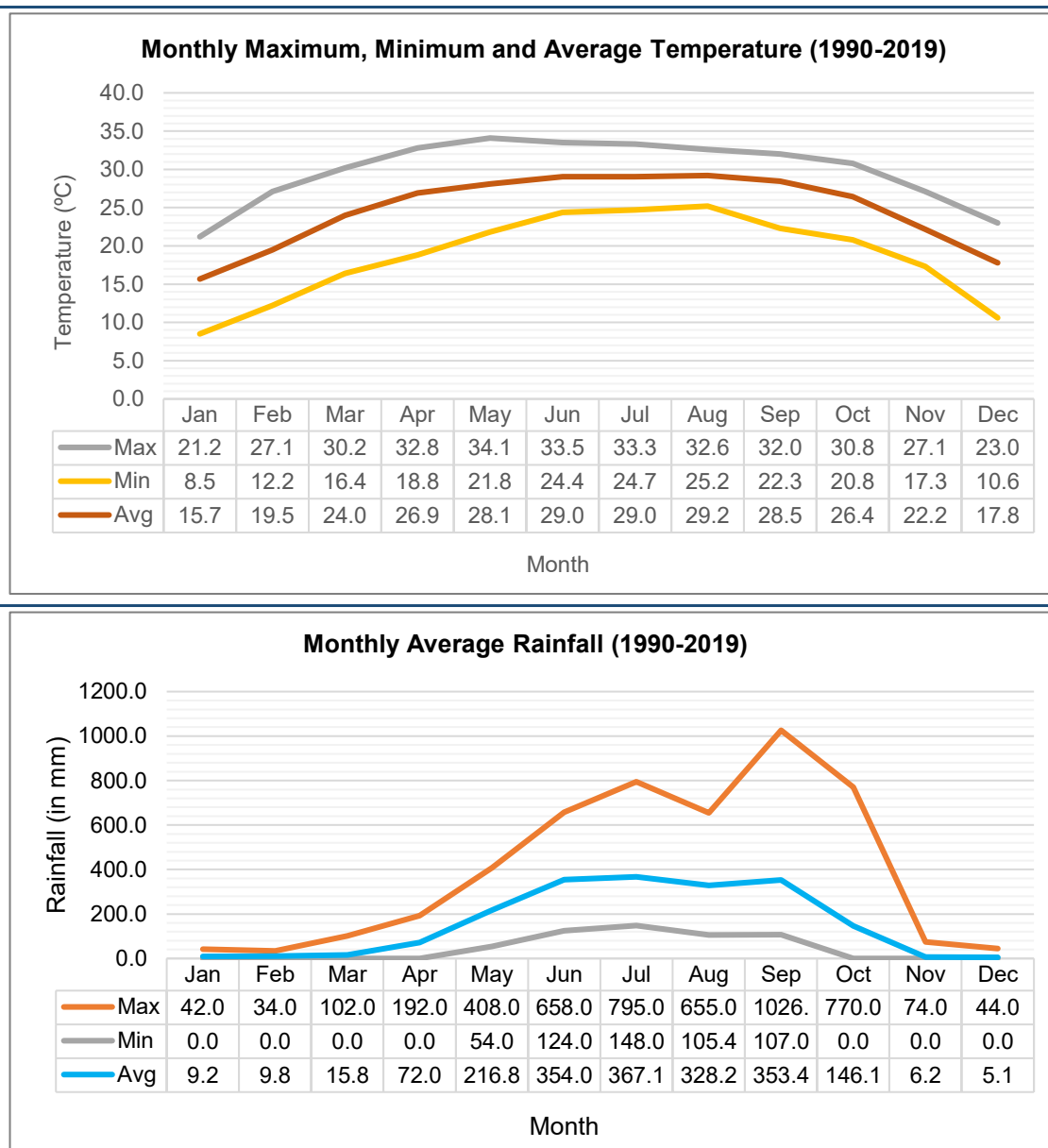
**Table 4-2: Average temperature and rainfall at Domar and Hatibandha by month**

Average	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
<b>Avg. Temperature</b>	15.7	19.5	24.0	26.9	28.1	29.1	29.1	29.2	28.5	26.4	22.2	17.8
<b>Avg. Rainfall</b>	8.5	10.5	15.8	76.4	209.4	355.3	377.4	331.4	353.4	148.4	6.2	5.1

Source: Bangladesh Meteorological Department (BMD)



**Figure 4-3: Distribution of Rainfall & Temperature at Domar and Hatibandha**



Source: Bangladesh Meteorological Department (BMD)

**4.2.1.3 Climate at Bagerhat and Pirojpur**

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

For Pirojpur and Bhandaria alignment data was collected from Barisal BMD station, which have the coverage for all the districts crossed within this route. For Pirojpur and Bhandaria alignment, average

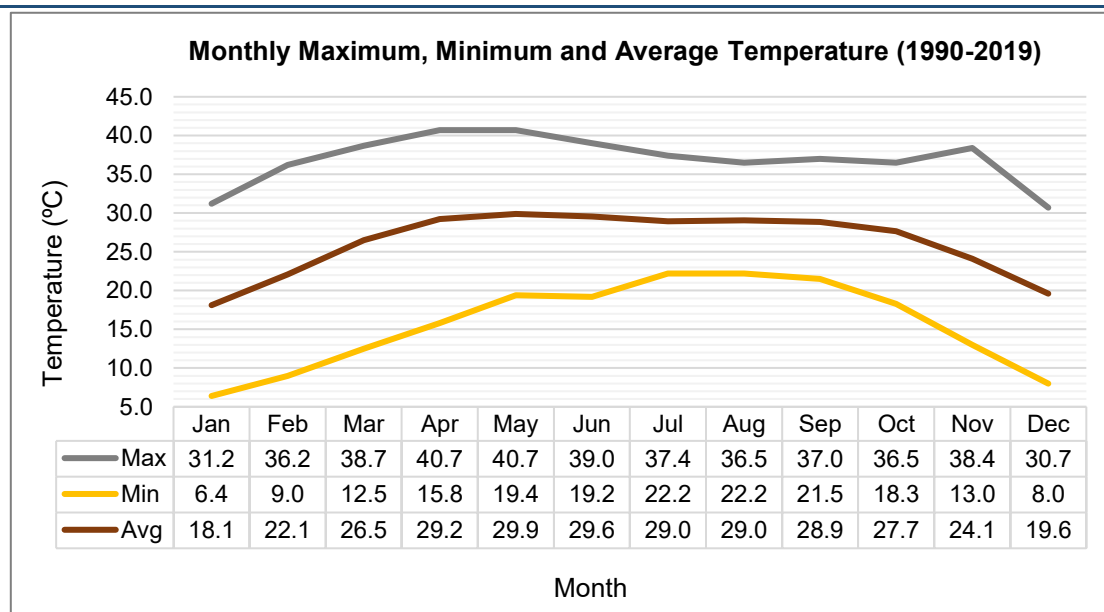
annual temperature is 25.6 °C in Barisal. About 2059 mm of precipitation falls annually. The least amount of rainfall occurs in December. The average in this month is 6.1 mm. With an average of 428 mm, the most precipitation falls in July. The temperatures are highest on average in May, at around 29 °C. January has the lowest average temperature of the year. It is 17.7°C. The variation in the precipitation between the driest and wettest months is 422 mm. During the year, the average temperatures vary by 11.3°C.

**Table 4-3: Average temperature and rainfall at Bagerhat and Pirojpur by month**

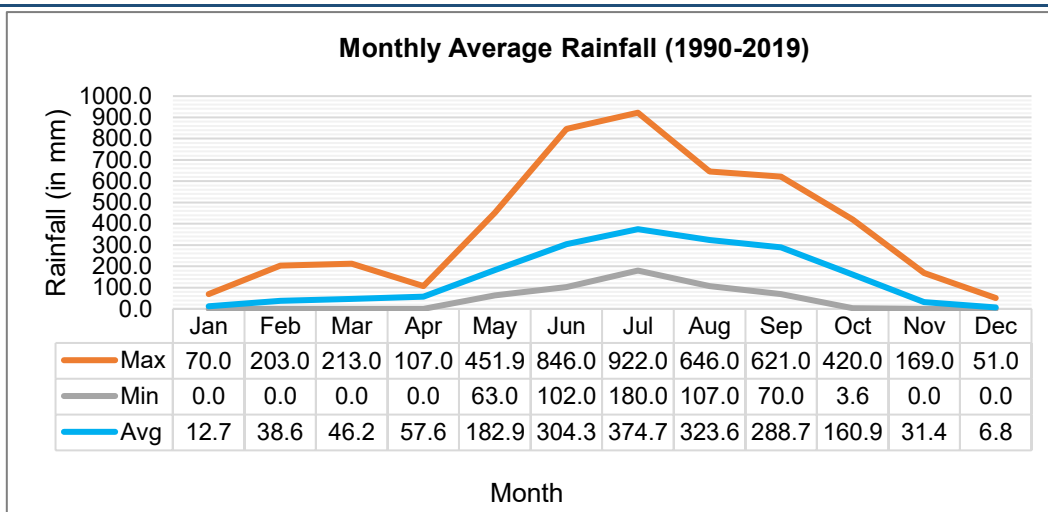
Average	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
<b>Average temperature and rainfall at Bagerhat by month</b>												
<b>Avg. Temperature</b>	18.1	22.1	26.5	29.2	29.9	29.6	29.0	29.0	28.9	27.7	24.1	19.6
<b>Avg. Rainfall</b>	12.7	38.6	46.2	57.6	182.9	304.3	374.7	323.6	288.7	160.9	31.4	6.8
<b>Average temperature and rainfall at Pirojpur by month</b>												
<b>Avg. Temperature</b>	17.7	21.6	25.9	28.5	29.0	28.8	28.3	28.5	28.3	27.2	23.6	19.2
<b>Avg. Rainfall</b>	9.8	21.6	50.5	99.5	215.5	383.3	428.0	325.8	286.3	195.6	37.1	6.1

Source: Bangladesh Meteorological Department (BMD)

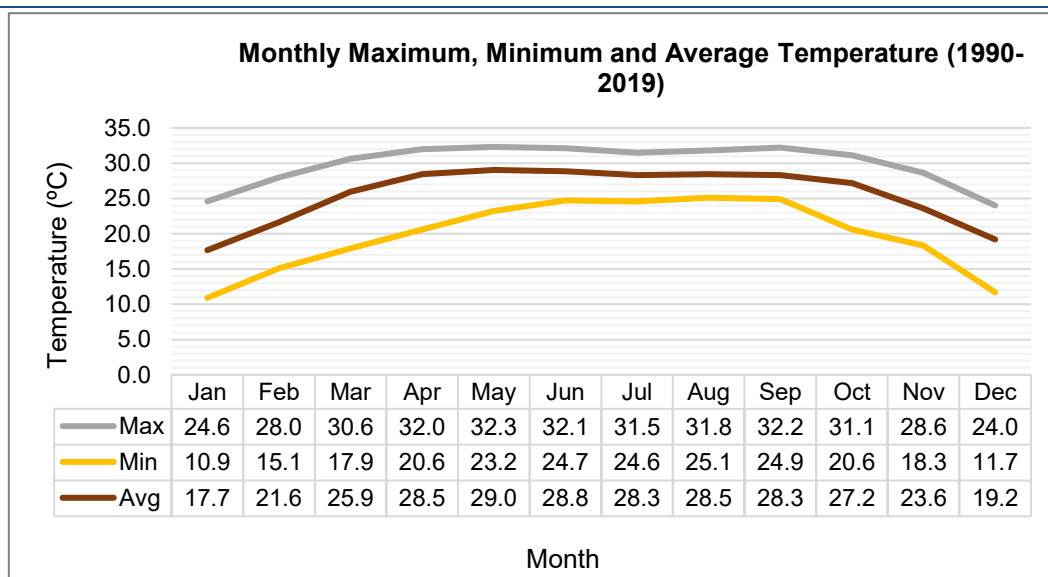
**Figure 4-4: Distribution of Rainfall & Temperature at Bagerhat and Pirojpur**



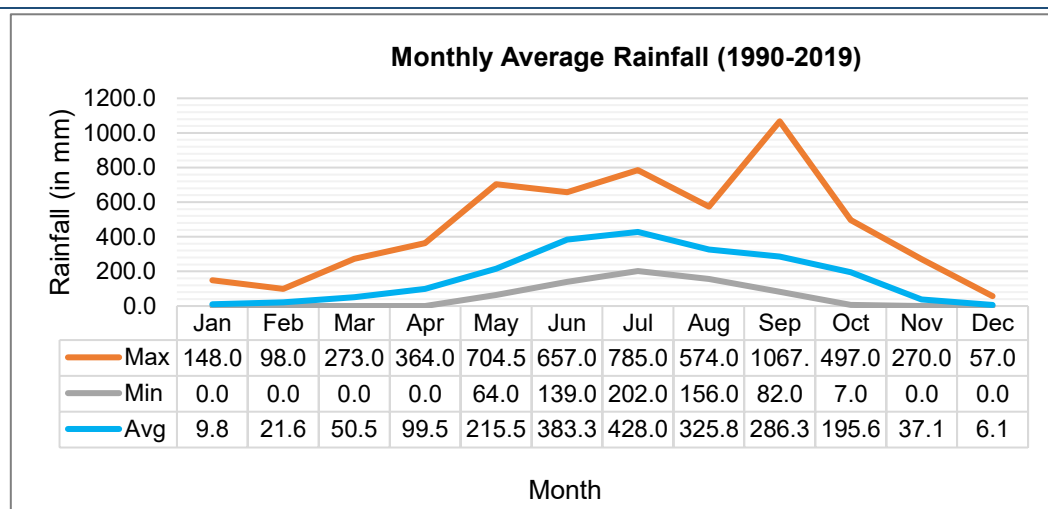
**Bagerhat**



### Bagerhat



### Pirojpur- Bhandaria



### Pirojpur- Bhandaria

Source: Bangladesh Meteorological Department (BMD)

## 4.2.2 Water Quality

### 4.2.2.1 Surface Water

Overhead transmission lines in Dhaka and Western zone cross 31 rivers. Kushtia- Meherpur 132 kV double circuit transmission line crosses Kajla river, Mathavanga river, Pangashi river, Sagar River. The width of these rivers is more than 100 m (Table 4-4) during monsoon. Domar-Hatibandha 132 kV double circuit transmission line crosses Jamuneswari River, Cheka Dara River, Buri Teesta River, Nautara River; Teesta River and the average width of these rivers are more than 100 m. Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission line crosses Bhairab River, Balaswar River, Katcha River, Goroyar River and Pana River.

**Table 4-4: Name of rivers and transmission lines**

No.	Overhead Transmission Line	Names and Widths of River
1.	Kushtia- Meherpur 132 kV double circuit transmission line	Line crosses 4 rivers, 7 canals, and two ponds along the length of the line. Rivers are Kajla river, Mathavanga river, Pangashi river, Sagar River. The average width of the rivers is 50m.
2.	Domar-Hatibandha 132 kV double circuit transmission line	Line crosses 6 rivers and 4 canals along the length of the line. Rivers are Jamuneswari River, Cheka Dara River, Buri Teesta River, Nautara River; Teesta River. The average width of the rivers is more than 100m.
3.	Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission line	Line crosses 5 rivers and 15 canals along the length of the line. Rivers are Bhairab River, Balaswar River, Katcha River, Goroyar River and Pana River. The average width of the rivers is more than 50m.

#### 4.2.2.1.1 Surface Water Sampling Methods

To determine the quality of surface water, 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.

The samples have been analyzed for parameters covering bacteriological and physio-chemical characteristics which include certain heavy metals and trace elements. Surface water samples has been collected as grab water sample in a standard sampling bottle and 250 ml sterilized clean PET bottle to complete physio-chemical and bacteriological tests respectively. The samples have been analyzed as per standard procedure/method given in Standard Method for Examination of Drinking Water Edition 20, published by APHA as well as using on site field test kit. Details of the sampling procedures are shown in **Table 4-5**.

**Table 4-5: Analysis Method for Surface Water Samples**

Sl. No.	Parameters	Unit	Analysis Method
1.	Biochemical Oxygen Demand (BOD)	mg/L	5 days Incubation
2.	Chemical Oxygen Demand (COD)	mg/L	Closed Reflux Method
3.	Dissolved Oxygen (DO)	mg/L	Hanna Combo Meter

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

Sources: Information Taken from EQMS Wet Laboratory

The quality of surface water was compared with the standards for Inland Surface Water, Environment Conservation Rules (ECR) and 1997-Schedule 3 whereas the groundwater was compared with the Drinking Water Standard ECR Schedule-3, 1997. The standards have been presented along with the monitoring results of surface water for comparison.

#### 4.2.2.1.2 Surface Water Sampling Locations

The monitoring team has observed various source of water throughout the transmission line. The alignment will not traverse areas that are protected by the GoB but will cross some cannels and ponds. There are some small cannels, ponds, gher were observed in the project sites. Five surface water samples were collected for surface water quality monitoring during the month of June 2022 for Kushtia-Meherpur and July 2022 for Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria alignments. The samples were collected from nearby water bodies of the alignment (**Table 4-6**). The analyzed results for surface water were compared to Bangladesh Standards (ECR, 1997) Guidelines. Results of inland surface water analysis are presented in **Table 4-8**.

**Table 4-6: Surface Water Sampling Location**

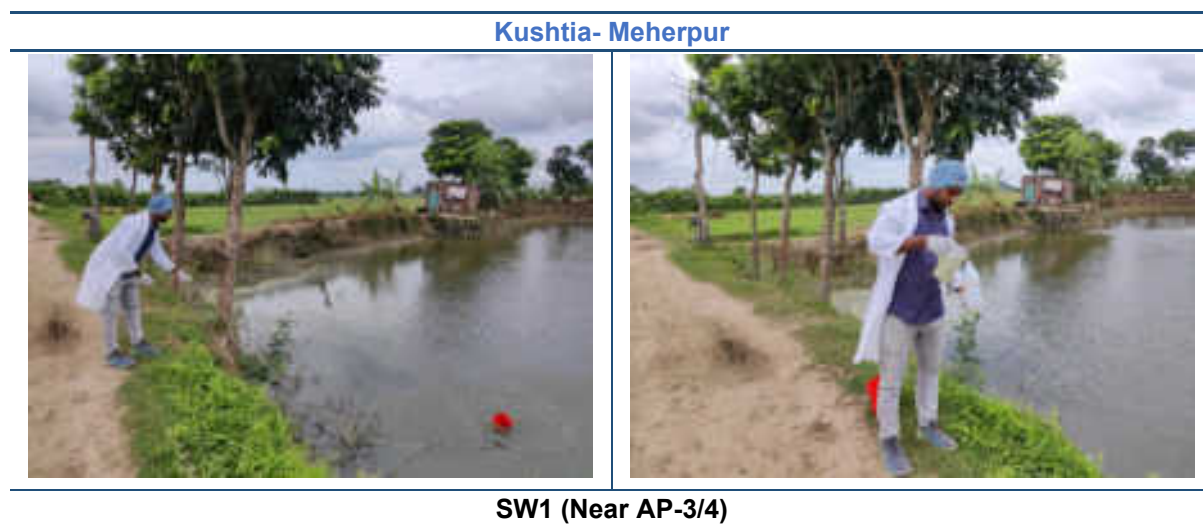
Sl. No.	Code	Sampling Location	GPS Coordinate	Type of Source	Sampling Time	Sampling Date
<b>Kushtia- Meherpur</b>						
1.	SW1	AP-3/4	23°47'48.22"N 88°44'43.08"E	Gher	09:44 AM	05.06.2022
2.	SW2	AP-10/2	23°50'28.11"N 88°55'2.46"E	River	10:37 AM	05.06.2022
3.	SW3	AP-13/5	23°50'50.50"N 88°58'28.08"E	River	11:38 AM	06.06.2022
4.	SW4	AP-16	23°50'25.86"N	Canal	01:05 PM	06.06.2022

Sl. No.	Code	Sampling Location	GPS Coordinate	Type of Source	Sampling Time	Sampling Date
			89° 2'20.89"E			
5.	SW5	AP-07	23°49'45.04"N 88°51'37.34"E	River	11:27 AM	06.06.2022
<b>Domar-Hatibandha</b>						
6.	SW6	T- 2/4	26° 7'5.02"N 88°50'36.10"E	Pond	-	02.08.2022
7.	SW7	T- 16/2	26°8'40.13"N 88°54'51.72"E	Pond	-	02.08.2022
8.	SW8	T- 20/2	26°8'39.93"N 88°55'8.82"E	Pond	-	02.08.2022
9.	SW9	T- 25/2	26°8'41.48"N 88°55'37.57"E	Pond	-	02.08.2022
10.	SW10	T- 37/4	26°11'39.27"N 89° 5'21.46"E	Pond	-	02.08.2022
<b>Bagerhat-Pirojpur-Bhandaria</b>						
11.	SW11	T-2/4	22°38'18.04"N 89°49'12.79"E	Khal	N/A	30.07.2022
12.	SW12	T-16/2	22°37'35.88"N 89°58'26.68"E	Khal	N/A	30.07.2022
13.	SW13	T-20/0	22°36'0.16"N 89°59'22.25"E	Pond	N/A	30.07.2022
14.	SW14	T-25/2	23°29'06.6"N 90°17'29.3"E	Khal	N/A	30.07.2022
15.	SW15	T-37/4	22°28'13.48"N 90° 5'7.13"E	Khal	N/A	30.07.2022

Source: Environmental Monitoring Report- June and July 2022.

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

**Table 4-7: Pictures of Sampling Location**







**SW2 (AP-10/2)**



**SW3 (AP-13/5)**



**SW4 (AP-16)**



**SW5 (AP-07)**

**Domar-Hatibandha**





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**Bagerhat-Pirojpur-Bhandaria**

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**T-2/4 (22°38'18.04"N 89°49'12.79"E)**



**T-16/2 (22°37'35.88"N 89°58'26.68"E)**



**T-20/2 (22°36'0.16"N 89°59'21.25"E)**



**T-25/2 (23°29'06.6"N 90°17'29.3"E)**



**T-37/4 (22°28'13.48"N 90° 5'7.13"E)**

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Source: Environmental Monitoring Report- June and July 2022.

#### 4.2.2.1.3 Result Analysis

The analyzed results for surface water were compared to Rule 12, Schedule-3 (A), Bangladesh Standards (ECR, 1997). Results of inland surface water analysis are presented in Table 4-8.

**Table 4-8: Surface Water Analysis Result**

Parameters		Concentration												
		BOD	COD	DO	EC	pH	Salinity	T	Hardness	TDS	NH <sub>3</sub> -N	PO <sub>4</sub>	TPH	Total Coliform
Unit		mg/L	mg/L	mg/L	µS/cm	--	ppt	°C	mg/L	mg/L	mg/L	mg/L	mg/L	n/100 ml
<b>Kushtia- Meherpur</b>														
SW1	Baseline (Jun. 2022)	0.2	21	6.1	509	7.46	0.27	24.5	151	290	0.84	1.9	1.4	11
SW2	Baseline (Jun. 2022)	0.5	18	6	240	7.97	0.10	23.9	167	120	0.13	2.2	1.9	14
SW3	Baseline (Jun. 2022)	1.1	10	6.2	390	7.24	0.17	24.1	182	190	0.02	1.7	1.3	12
SW4	Baseline (Jun. 2022)	2.5	23	4.1	470	7.42	0.21	24.7	198	230	2.89	14	2.4	34
SW5	Baseline (Jun. 2022)	1.2	14	6.1	800	7.72	1.05	23.8	143	400	0.58	2.4	1.8	22
<b>Domar-Hatibandha</b>														
SW6	Baseline (July. 2022)	5.9	11.4	7.5	1251.5	7.1	2.6	28.5	293	46	1.42	0.6	5	88
SW7	Baseline (July. 2022)	5.5	10.7	9.1	762.3	7.5	2.2	27.7	304	34	0.98	0.84	4.2	106
SW8	Baseline (July. 2022)	6	8.5	8.9	427.4	6.7	1.7	26.3	323	40	0.93	0.72	5.8	95
SW9	Baseline (July. 2022)	5.7	10.2	7.8	652	6.6	3.5	28.6	323	79	1.32	1.2	5.3	108

Parameters		Concentration												
		BOD	COD	DO	EC	pH	Salinity	T	Hardness	TDS	NH <sub>3</sub> -N	PO <sub>4</sub>	TPH	Total Coliform
SW10	Baseline (July. 2022)	5.8	12.3	7.9	1021	6.9	2.9	28.3	306	55	1.16	0.93	4.7	79
<b>Bagerhat-Pirojpur-Bhandaria</b>														
SW11	Baseline (July. 2022)	4.8	8.8	7	1021.5	8.2	2.4	27.5	316	419	0.93	0.4	4.7	56
SW12	Baseline (July. 2022)	3.8	7.5	8.1	942	8.2	3.5	27.2	294	282	1.43	0.62	4.6	134
SW13	Baseline (July. 2022)	5.5	9.2	9	963.6	7.9	2.3	26.8	362	177	1.34	0.81	4.3	108
SW14	Baseline (July. 2022)	4.7	7.9	8.2	1042	7.6	3.1	27.4	310	184	0.94	0.78	5	75
SW15	Baseline (July. 2022)	5.4	11.8	7.5	942.3	7.4	3.2	28.3	372	195	0.89	0.73	4.2	133
Bangladesh Standards*		50	200	6	-	6.5-8.5	--	20-30	200-500	1000	-	8	-	<200

Source: Environmental Monitoring Report-June and July 2022.

NB: \*Rule 12, Schedule-3 (A), ECR.1997, Bangladesh

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

#### 4.2.2.1.4 Discussion

The surface water samples have been taken from nearby pond and khal in Kushtia- Meherpur, Domar- Hatibandha and Bagerhat-Pirojpur-Bhandaria alignments. According to tasted result the tested parameters remain under the Bangladesh standard.

- **Biological Oxygen Demand (BOD):** Biological Oxygen Demand is the quantity of oxygen required by bacteria and other microorganisms during the biochemical degradation and transformation of organic matter present in water under aerobic conditions. BOD<sub>5</sub> is an index of the biodegradable organics present. Biological oxygen demanding wastes consume the dissolved oxygen from water. In Kushtia - Meherpur transmission line, the average value of BOD<sub>5</sub> varied from 0.2 to 2.5 mg/L which is lower than the limit of standard. For Domar- Hatibandha and Bagerhat-Pirojpur-Bhandaria double circuit transmission line, the average value of BOD<sub>5</sub> varied from 5.5 to 6 mg/L and 3.8 to 5.5 mg/L respectively. In all the locations, the average value of BOD<sub>5</sub> was found within the limits of national standards.
- **Chemical Oxygen Demand (COD):** The chemical oxygen demand is commonly used to indirectly measure the number of organic compounds in water. Most applications of COD determine the number of organic pollutants found in surface water (e.g., lakes and rivers) or wastewater, making COD a useful measure of water quality. In Kushtia - Meherpur transmission line, the average value of COD varied from 10- 23 mg/L, whereas, in Domar- Hatibandha and Bagerhat-Pirojpur-Bhandaria double circuit transmission line, the average value of COD varied from 8.5 to 12.3 mg/L and 7.5- 11.8 mg/L respectively.
- **Dissolved Oxygen (DO):** The presence of sufficient DO in water is a positive sign of a healthy water body but the deficiency of DO is a signal of pollution. DO for all the samples of surface water are remained above 5 which recommended by DoE.
- **Electrical Conductivity (EC):** The electrical conductivity (EC) is usually used for indicating the total concentration of the ionized constituents of water. The values of EC of the surface water of the Kushtia– Meherpur varies from 240 to 800  $\mu\text{s}/\text{cm}$  which indicates the very lower amount of ionization. The values of EC of the surface water of the Domar– Hatibandha varies from 428 to 1252  $\mu\text{s}/\text{cm}$  which indicates the medium amount of ionization. Similarly, the values of EC of the surface water of the Bagerhat-Pirojpur-Bhandaria varies from 942 to 1042  $\mu\text{s}/\text{cm}$  which indicates the medium amount of ionization.
- **pH:** The pH of surface water may continuously be fluctuating depending on the seasonal variation. pH amount fluctuating between the range of neutral nature. It's also noticeable that all the samples of surface water remain between the standard of Bangladesh. There have no construction wastes thrown into the surface water body.
- **Salinity:** The salinity level of surface water may continuously be fluctuating depending on the seasonal variation. Salinity level in Kushtia– Meherpur fluctuating between the range of 0.10 to 1.05 ppt. Salinity level in Domar– Hatibandha fluctuating between the range of 1.7 to 3.5 ppt. Salinity level in Bagerhat-Pirojpur-Bhandaria fluctuating between the range of 2.3 to 3.5 ppt. It is noticeable that all the samples of surface water contained a moderate amount of salinity.
- **Temperature (T):** Temperature for all the surface water samples were found within the Bangladesh standard. Seasonal variation is completely responsible for decreasing the temperatures.
- **Hardness:** Hardness is a measure of divalent salts, or positively charged ions, particularly calcium ( $\text{Ca}^{2+}$ ) and magnesium ( $\text{Mg}^{2+}$ ), in water. Total hardness is the sum of the concentrations of  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$ , expressed in ppm calcium carbonate. The tested report shows the Hardness values in Kushtia– Meherpur were found ranges from 143 to 198 mg/L. The Hardness values in Domar– Hatibandha ranges from 293 to 323 mg/L. The Hardness values in Bagerhat-Pirojpur-Bhandaria ranges from 294 to 372 mg/L.
- **Total Dissolved Solid (TDS):** The high number of suspended dissolved solids in water increases the water density; it influences the osmoregulation of freshwater organisms and reduces the solubility of gases. TDS in Kushtia- Meherpur transmission line ranges from 120- 400 mg/L. TDS in

Domar- Hatibandha and Bagerhat-Pirojpur-Bhandaria transmission line ranges from 34 to 79 mg/L and 177 to 419 mg/L respectively. High tide and low tide, sand absorption, or the effluent with suspended particles, such as stormwater from the bathroom, sprayed water runoff contained sand particles, etc. can be responsible for fluctuating TDS.

- **Ammoniacal nitrogen (NH<sub>3</sub>-N):** NH<sub>3</sub>-N is a measure for ammonia, a toxic pollutant often found in surface water, landfill leachate and other liquid organic waste products. It can also be used as a measure of the health of water in natural bodies such as rivers or lakes, or in man-made water reservoirs. The term is used widely in waste treatment and water purification systems. Ammonia can directly poison humans and upset the equilibrium of water systems. All the surface water samples of Kushtia– Meherpur show very low values of ammonia.
- **Phosphate (PO<sub>4</sub><sup>3-</sup>):** Phosphate is also called Phosphate ion or **Orthophosphate**. It is a trivalent inorganic anion and a conjugate base of hydrogen phosphate. All the surface water samples of Kushtia– Meherpur, Domar- Hatibandha and Bagerhat-Pirojpur-Bhandaria show very low values of Phosphate.
- **Total petroleum hydrocarbons (TPH):** TPH is a term used to describe a large family of several hundred chemical compounds that originally come from crude oil; the main and most specific part of these compounds are non-polar and slightly polar hydrocarbons. These compounds are harmful to humans and animals. So, detection and control of TPH in water is very essential. The tested results show that the sample from all locations of Kushtia– Meherpur ranges from 1.3 to 2.4 mg/L, Domar- Hatibandha ranges from 4.2 to 5.8 mg/L and Bagerhat-Pirojpur-Bhandaria ranges from 4.2 to 5 mg/L.
- **Total coliform:** In Kushtia– Meherpur, Domar- Hatibandha and Bagerhat-Pirojpur-Bhandaria double circuit transmission line, the average value of total coliform varied from 11- 34 per 100ml, 79-108 per 100ml and 56-134 per 100 ml water respectively.

#### 4.2.2.2 Ground Water

##### 4.2.2.2.1 Ground Water Sampling Methods

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

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

**Table 4-9: Analysis Method for Ground Water Samples**

Sl. No.	Parameter	Unit	Analysis Method
1.	Biochemical Oxygen Demand (BOD)	mg/L	5 days Incubation
2.	Chemical Oxygen Demand (COD)	mg/L	Closed Reflux
3.	Dissolved Oxygen (DO)	mg/L	Ion electrode
4.	Electrical Conductivity (EC)	µS/cm	Ion electrode
5.	pH	--	Ion electrode
6.	Salinity	ppt	Ion electrode
7.	Temperature (T)	°C	Ion electrode



Sl. No.	Parameter	Unit	Analysis Method
8.	Hardness	mg/L	Colorimetric
9.	TDS	mg/L	Ion electrode
10.	Manganese (Mn)	mg/L	Photometric method
11.	Iron (Fe)	mg/L	Photometric method
12.	Arsenic (As)	mg/L	Photometric method
13.	Total Coliform	n/100 ml	AFNOR approved method compared to ISO 4832 method
14.	Fecal Coliform	n/100 ml	AFNOR approved method compared to NF V08-017 method.
15.	TPH	mg/L	Gravimetric method

Sources: Information Taken from EQMS Laboratory

#### 4.2.2.2.2 Ground-Water Sampling Locations

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

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

Sl. No.	Code	Sampling Location	GPS Coordinate	Type of Source	Sampling Time	Sampling Date
<b>Kushtia- Meherpur</b>						
1.	GW1	AP 3/3	23°47'52.83"N 88°44'42.19"E	Deep Tube-Well	09:33 PM	05.06.2022
2.	GW2	AP 5/1	23°49'24.02"N 88°46'37.07"E	Deep Tube-Well	10:30 AM	05.06.2022
3.	GW3	AP 9/0	23°50'7.95"N 88°54'15.19"E	Deep Tube-Well	09:22 AM	06.06.2022
4.	GW4	AP 15/1	23°50'27.56"N 89° 2'7.86"E	Deep Tube-Well	12:31 PM	06.06.2022
5.	GW5	AP 19/2	23°51'52.29"N 89° 4'38.99"E	Deep Tube-Well	05:06 PM	06.06.2022
<b>Domar-Hatibandha</b>						
6.	GW6	T-4/0	26° 7'5.02" N 88°50'36.10" E	Deep Tube-Well	-	02.08.2022
7.	GW7	T-14/1	26°8'44.07" N 88°54'50.24" E	Deep Tube-Well	-	02.08.2022

Sl. No.	Code	Sampling Location	GPS Coordinate	Type of Source	Sampling Time	Sampling Date
8.	GW8	T-16/0	26°8'39.33" N 88°55'10.77" E	Deep Tube-Well	-	02.08.2022
9.	GW9	T-18/ 1	26°8'42.17" N 88°55'35.72" E	Deep Tube-Well	-	02.08.2022
10.	GW10	T-36/0	26°11'39.27" N 89° 5'21.46" E	Shallow Deep water	-	02.08.2022

**Bagerhat-Pirojpur-Bhandaria**

11.	GW11	T-2/4	22°38'18.4"N 89°49'17.2"E	Deep Tube-Well	-	30.07.2022
12.	GW12	T-16/2	22°37'35.8" N 89°58'26.6" E	Deep Tube-Well	-	30.07.2022
13.	GW13	T-20/0	22°35'59.0" N 89°59'21.4" E	Deep Tube-Well	-	30.07.2022
14.	GW14	T-25/2	22°34'11.5" N 90°3'21.9" E	Deep Tube-Well	-	30.07.2022
15.	GW15	T-37/4	22°28'14.6" N 90°5'6.6" E	Deep Tube-Well	-	30.07.2022

Source: Environmental Monitoring Report-June and July 2022.

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

**4.2.2.2.3 Sampling Photographs**

**Kushtia- Meherpur**



**GW1 (Near AP 3/3)**



**GW2 (Near AP 5/1)**



**GW3 (Near AP 9/0)**





**GW4 (Near AP 15/1)**



**GW5 (AP 19/2)**

**Domar-Hatibandha**



**Bagerhat-Pirojpur-Bhandaria**



**T-2/4 (22°38'18.4"N 89°49'17.2"E)**



**T-16/2 (22°37'35.8" N 89°58'26.6" E)**



**T-20/2 (22°35'59.0"N 89°59'21.4" E)**



**T-25/2 (22°34'11.5" N 90°3'21.9" E)**



**T-37/4 (22°28'14.6" N 90°5'6.6" E)**

Source: Environmental Monitoring Report- June and July 2022.

**4.2.2.2.4 Ground-Water Quality Analysis Results**

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

**Table 4-11: Ground Water Quality Analysis Results.**

Parameters		Concentration														
		BOD	COD	DO	EC	pH	Salinity	T	Hardness	TDS	Mn	Fe	As	TC	FC	TPH
Unit		mg/L	mg/L	mg/L	µS/cm	--	ppt	°C	mg/L	mg/L	mg/L	mg/L	mg/L	n/100 ml	n/100 ml	
<b>Kushtia- Meherpur</b>																
GW1	Baseline (Jun. 2022)	<0.1	<1	6.0	730	7.59	0.38	22.7	128	370	0.07	0.033	0.01	0	0	BDL*
GW2	Baseline (Jun. 2022)	<0.1	<1	6.1	720	7.60	0.33	23.2	117	360	0.02	0.01	00	0	0	BDL*
GW3	Baseline (Jun. 2022)	<0.1	<1	6.2	660	7.75	0.33	23.5	134	330	0.01	0.54	0.01	0	0	BDL*
GW4	Baseline (Jun. 2022)	<0.1	<1	6.0	620	7.71	0.30	23.1	109	310	0.02	0.55	0.01	0	0	BDL*
GW5	Baseline (Jun. 2022)	<0.1	<1	6.2	680	7.68	0.29	23.4	91	340	0.05	0.07	00	0	0	BDL*
<b>Domar-Hatibandha</b>																
GW6	Baseline (Aug. 2022)	0.01	2.3	--	0.8	7.2	0.3	26.2	291.3	310	0.08	0.14	0	0	0	2.3

Parameters		Concentration														
		BOD	COD	DO	EC	pH	Salinity	T	Hardness	TDS	Mn	Fe	As	TC	FC	TPH
Unit		mg/L	mg/L	mg/L	µS/cm	--	ppt	°C	mg/L	mg/L	mg/L	mg/L	mg/L	n/100 ml	n/100 ml	
GW7	Baseline (Aug. 2022)	0.03	1.8	-	0.2	6.8	0.1	27.4	321.2	283	0.07	0.07	0	0	0	2.1
GW8	Baseline (Aug. 2022)	0.01	2.6	-	0.2	7.1	0.5	26.8	362.3	305	0.1	0	0	0	0	3.2
GW9	Baseline (Aug. 2022)	0.04	2.5	-	0.3	7.6	0.3	27.2	323	294	0.09	0.12	0	0	0	2.6
GW10	Baseline (Aug. 2022)	0.07	2.7	-	0.5	7.3	0.2	26.3	375.6	289	0.05	0.22	0	0	0	3.3
<b>Bagerhat-Pirojpur-Bhandaria</b>																
GW11	Baseline (July. 2022)	0.05	3.1	-	3.1	7.8	0.2	27.2	287.7	323	0.08	0.8	0	0	0	3.1
GW12	Baseline (July. 2022)	0.02	2.2	-	3.5	8.5	0.4	26.4	336.4	312	0.1	0.17	0	0	0	2.1
GW13	Baseline (July. 2022)	0.06	2.1	-	4.9	8.2	0.5	27.8	313.5	283	0.08	0.11	0	0	0	3.4

Parameters		Concentration														
		BOD	COD	DO	EC	pH	Salinity	T	Hardness	TDS	Mn	Fe	As	TC	FC	TPH
Unit		mg/L	mg/L	mg/L	µS/cm	--	ppt	°C	mg/L	mg/L	mg/L	mg/L	mg/L	n/100 ml	n/100 ml	
GW14	Baseline (July. 2022)	0.04	2.7	-	3.7	7.4	0.5	26.2	345.3	312	0	0.08	0	0	0	2.3
GW15	Baseline (July. 2022)	0.08	3.2	-	3.5	8	0.3	27.3	296.3	392	0.002	0.81	0.04	0	0	3.6
Bangladesh Standards*		0.2	4	6	-	6.5-8.5	-	20-30	200-500	1000	0.1	0.3 – 1.0	0.1	0	0	-

Source: Environmental Monitoring Report-June 2022.

NB: \*Rule 12, Schedule-3(B), ECR.1997, Bangladesh

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



#### 4.2.2.2.5 Discussion

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 construction period. If any impact will observe in the future, the proper initiative will be taken immediately.

- **Biological Oxygen Demand (BOD):** BOD level of 1-2 ppm is very good. implies that, not much organic waste present in the water supply. The tested result shows the value of BOD for all the locations of Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria are less than 0.1 mg/L, which indicated the good condition of the tested samples.
- **Chemical Oxygen Demand (COD):** Chemical oxygen demand is commonly used to indirectly measure the number of organic compounds in water. The tested values of ground water samples of all locations of Kushtia- Meherpur remain within 1 mg/L which is under the national standard of ECR 1997. The tested values of ground water samples of all locations of Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria ranges from 1.8 to 2.7 mg/L and 2.1 to 3.1 mg/L respectively, which are under the national standard of ECR 1997.
- **Dissolved Oxygen (DO):** Dissolved oxygen is necessary to many forms of life including fish, invertebrates, bacteria, and plants. In Kushtia- Meherpur DO for almost all the samples of ground water are ranges from 6.0 to 6.2 mg/L.
- **Electrical Conductivity (EC):** The electrical conductivity (EC) is usually used for indicating the total concentration of the ionized constituents of water. In Kushtia- Meherpur transmission line, the EC of the ground water varied from 620 to 730  $\mu\text{s}/\text{cm}$ . In Domar- Hatibandha and Bagerhat-Pirojpur-Bhandaria double circuit transmission line, the EC of the ground water varied from 0.2 to 0.8  $\mu\text{s}/\text{cm}$  and 3.1 to 4.9  $\mu\text{s}/\text{cm}$  respectively.
- **pH:** pH for all locations varied from 6.8 to 8.5 and the water quality shows the basic or neutral state which can be no harm to consume. Besides, the change of pH in every location may be occurred for different sources.
- **Salinity:** In the southwestern coastal region of Bangladesh, options for drinking water are limited by groundwater salinity. Recently, aquaculture ponds in areas with a thin surface clay layer have increased the salinity in the underlying shallow aquifers. The tested samples salinity fluctuating between the range of 0.3 to 0.5 ppt. It's also noticeable that all the samples of ground water contained a moderate amount of salinity.
- **Temperature (T):** Temperature for all the ground water samples of Kushtia- Meherpur were found within the ECR 1997 standard. Seasonal variation is completely responsible for decreasing the temperatures.
- **Hardness:** Hardness is a measure of divalent salts, or positively charged ions, particularly calcium ( $\text{Ca}^{2+}$ ) and magnesium ( $\text{Mg}^{2+}$ ), in water. Total hardness is the sum of the concentrations of  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$ , expressed in ppm calcium carbonate. The tested report shows the Hardness value in Kushtia- Meherpur were found ranges from 91 to 134 mg/L, Domar- Hatibandha ranges from 291 to 376 mg/L and Bagerhat-Pirojpur-Bhandaria ranges from 296 to 346 mg/L which are below the ECR 1997 Standard for all locations.
- **Total Dissolved Solid (TDS):** Total Dissolved Solids (TDS) data can be used to identify the presence of currently undeveloped fresh or brackish groundwater at depth that may require protection. TDS of the ground water of Kushtia- Meherpur ranges from 310 to 370 mg/L, Domar- Hatibandha ranges from 283 to 310 mg/L and Bagerhat-Pirojpur-Bhandaria ranges from 283 to 392 mg/L in this study period which are within the ECR 1997 Standard limit.
- **Manganese (Mn):** Manganese occurs naturally in rocks and soil layers. Human body needs some manganese to stay healthy, but too much can be harmful. Manganese is an element essential to the proper functioning of both humans and other animals, as it is required for the functioning of many cellular enzymes. Manganese of the ground water in Kushtia- Meherpur alignment ranges

from 0.01 to 0.07 mg/L. Whereas, Manganese concentration of the ground water in Domar-Hatibandha and Bagerhat- Pirojpur- Bhandaria alignments were found ranges between 0.05- 0.1 and 0.002- 0.1 mg/L respectively which is within from ECR 1997 Standard limit.

- **Iron (Fe):** Iron (Fe) is usually very much available in any bank side of a river or lowland area. The project site is situated not only on the bankside but also in a low land area. Iron level at all tested samples were found within the ECR 1997 value.
- **Arsenic (As):** Arsenic in surface water is recorded in compliance with the ECR 1997 standard of 0.05 mg/L in all water samples of the project site. Every sample of water tested found within the standard level and have no arsenic contamination in the study area.
- **Total Coliform (TC):** There have been no bacteriological activities shown in the drinking water sources during the baseline study. So, the water is safe to drink depending on the biological parameters.
- **Fecal Coliform (FC):** The presence of fecal coliform bacteria in aquatic environments indicates that the water has been contaminated with the fecal material of humans or other animals. At the time this occurred, the source water may have been contaminated by pathogens or disease-producing bacteria or viruses which can also exist in fecal material. The drinking water results for all locations shows zero fecal coliform values in water samples. Hence, the water is free from any pathogenic contamination and is safe to drink.
- **Total petroleum hydrocarbons (TPH):** TPH is a term used to describe a large family of several hundred chemical compounds that originally come from crude oil; the main and most specific part of these compounds are non-polar and slightly polar hydrocarbons. These compounds are harmful to humans and animals. So, detection and control of TPH in water is very essential. The tested results of all ground water sample ware below detection limit (<0.05mg/L).

### 4.2.3 Air Quality

The subprojects are located in rural areas of Bangladesh. This section identifies the status of the ambient air quality in three alignments: Kushtia- Meherpur 132 kV double circuit transmission line, Domar-Hatibandha 132 kV double circuit transmission line and Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission line. 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 (PM<sub>10</sub>, PM<sub>2.5</sub>), CO, SO<sub>x</sub> and NO<sub>x</sub> 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

The existing ambient air quality of the both the alignments have been monitored during the construction period of the project. The ambient status of major air pollutants viz. Particulate Matter (SPM, PM<sub>10</sub>, and PM<sub>2.5</sub>), Gaseous substances (NO<sub>x</sub>, SO<sub>2</sub>, O<sub>3</sub> and CO) and Lead has been assessed.

Haz-Scanner™ (HIM 6000)/Lata Envirotech APM 250 has been used to monitor the ambient air quality. The particulate and gaseous samples have been monitored and analysed as per the procedures specified in Table 4-12.

**Table 4-12: Methodology for the Analysis of Ambient Air Quality.**

Sl. No.	Parameters	Analysis Procedure
1.	SPM	Particulates Sensor Light Scattering Nephotometer/ Gravimetric
2.	PM <sub>10</sub>	Particulates Sensor Light Scattering Nephotometer/ Gravimetric
3.	PM <sub>2.5</sub>	Particulates Sensor Light Scattering Nephotometer/ Gravimetric

Sl. No.	Parameters	Analysis Procedure
4.	SO <sub>2</sub>	High Sensitivity Electrochemical/ West-Geake
5.	NO <sub>x</sub>	High Sensitivity Electrochemical/ Jacob & Hochheiser
6.	O <sub>3</sub>	High Sensitivity Electrochemical/ Ozone meter
7.	Pb	AAS

Sources: Information Taken from EQMS Laboratory

**Table 4-13: Air Sample Collection Time and Data Converted Time**

Sl. No.	Parameters	Sample Collection time (Hr.)	Conversion Time (Hr.)
1.	SPM	8	-
2.	PM <sub>10</sub>	24	24
3.	PM <sub>2.5</sub>	24	24
4.	SO <sub>2</sub>	24	24
5.	NO <sub>x</sub>	24	24
6.	CO	8	-
7.	O <sub>3</sub>	8	8
8.	Pb	8	24

Sources: Information Taken from EQMS Laboratory

#### 4.2.3.2 Air Quality Monitoring Locations

The objective of the surrounding air quality observing system was to set up the standard encompassing air quality in the study area. The profile of the Project is mainly rural and urban mixed with two major river confluences. The major sources of air pollution noted within the study area include vehicular movement and domestic emissions apart from the existing infrastructure. Ambient air quality has been monitored in the project activities. The location details are as follows Table 4-14. Besides, the monitoring locations map is attached in the annex section for more clarification.

Air quality monitoring samples has been monitored for a defined time interval and from different sampling points within project areas (Table 4-14) of Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria Air quality analysis results are shown in Table 4-16. Monitoring photos are shown in Table 4-15.

**Table 4-14: Air Quality Measurement Locations and Descriptions**

SL No	Sample ID	GPS Coordinate	Location Details	Date & Time	Location Setting
<b>Kushtia- Meherpur</b>					
1.	AQ1	23°47'51.28"N 88°44'41.88"E	AP 3/3	01.06.2022 08:32 AM	Agricultural and Residential Area
2.	AQ2	23°49'44.50"N 88°46'40.81"E	AP 5/1	02.06.2022 09:53 AM	Institutional Area
3.	AQ3	23°50'8.75"N 88°54'12.71"E	AP 9/0	03.06.2022 11:17 AM	Agricultural and Commercial Area
4.	AQ4	23°50'27.29"N 89° 2'10.86"E	AP 15/1	04.06.2022 02:26 PM	Agricultural Area



SL No	Sample ID	GPS Coordinate	Location Details	Date & Time	Location Setting
5.	AQ5	23°51'50.06"N 89° 4'42.54"E	AP 19/2	05.06.2022 04:35 PM	Agricultural and Residential Area
<b>Domar-Hatibandha</b>					
6.	AQ6	26° 7'5.02"N 88°50'36.10"E	T-4/0	01.08.2022	Agricultural and Residential Area
7.	AQ7	26°8'41.67" N 88°54'51.22" E	T-14/ 1	01.08.2022	Agricultural and Residential Area -
8.	AQ8	26°8'40.19" N 88°55'9.43" E	T-16/0	01.08.2022	Agricultural Area
9.	AQ9	26°8'48.83" N 88°55'24.87" E	T-18/ 1	01.08.2022	Agricultural Area
10.	AQ10	26°11'39.27"N 89° 5'21.46"E	T-36/0	01.08.2022	Agricultural and Residential Area
<b>Bagerhat-Pirojpur-Bhandaria</b>					
11.	AQ11	22°38'18.52" N 89°49'14.51" E	T-2/4	29.07.2023	-
12.	AQ12	22°37'35.88" N 89°58'26.68" E	T-16/2	29.07.2023	-
13.	AQ13	22°35'59.05" N 89°59'21.40" E	T-20/0	29.07.2023	-
14.	AQ14	22°34'11.54" N 90°3'21.99" E	T-25/2	29.07.2023	-
15.	AQ15	22°28'14.65" N 90°5'6.60" E	T-37/4	29.07.2023	-

Source: Environmental Monitoring Report-July 2022. Scope-E: 132 kV Double Circuit Domar-Hatibandha Transmission Line, Scope-F: 132 kV Double Circuit Bagerhat-Pirojpur-Bhandaria Transmission Line.

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

**Table 4-15 Air Quality Monitoring Pictures**

**Kushtia- Meherpur**



AQ1 (Near AP 3/3)



AQ2 (Near AP 5/1)



AQ3 (Near AP 9/0)



AQ4 (Near AP 15/1)



AQ5 (AP 19/2)

**Domar-Hatibandha**



**Bagerhat- Pirojpur- Bhandaria**





T-2/4 (22°38'18.51515" N 89°49'14.51374" E)



T-16/2 (22°37'35.88128" N 89°58'26.67796" E)



T-20/2 (22°35'59.05054" N 89°59'21.39803" E)



T-25/2 (22°34'11.53934" N 90°3'21.98689" E)



T-37/4 (22°28'14.6473" N 90°5'6.60091" E)

Source: Environmental Monitoring Report-June and July 2022. Scope-E: 132 kV Double Circuit Domar-Hatibandha Transmission Line, Scope-F: 132 kV Double Circuit Bagerhat-Pirojpur-Bhandaria Transmission Line

#### 4.2.3.3 Analysis Results

Among all the parameters of ambient air, SPM, CO, Pb and O<sub>3</sub> had been taken for 8 hours and the rest of the parameters were taken on a 24-hourly basis. O<sub>3</sub> has been measured for Kushtia-Meherpur alignment. For Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria, O<sub>3</sub> will be measured during quarterly monitoring. Both particulate and gaseous samples had been analyzed as per the proper procedures. Analysis results of every location are briefly mentioned in the following Table 4-16.

**Table 4-16: Air Quality Analysis Results**

Sl. No.	Code	Period	Ambient Air Pollution Concentration in $\mu\text{g}/\text{m}^3$							CO ppm
			PM <sub>2.5</sub>	PM <sub>10</sub>	SO <sub>x</sub>	NO <sub>x</sub>	SPM	O <sub>3</sub>	Pb	
<b>Kushtia- Meherpur</b>										
1.	AQ1	Baseline (Jun. 2022)	28.6	55.2	17.8	22.7	106.5	16.3	BDL***	0.3
2.	AQ2	Baseline (Jun. 2022)	32.8	67.1	21.6	29.3	127.3	19.6	BDL***	0.8
3.	AQ3	Baseline (Jun. 2022)	48.5	77.8	36.1	41.6	158.4	22.7	BDL***	1.1
4.	AQ4	Baseline (Jun. 2022)	52.4	83.5	25.2	33.5	172.6	18.9	BDL***	1.02
5.	AQ5	Baseline (Jun. 2022)	34.6	52.7	16.6	25.4	124.7	14.7	BDL***	0.7
<b>Domar-Hatibandha</b>										
6.	AQ6	August. 2022	14	21	5.2	8.2	29	-	0	0.6
7.	AQ7	August. 2022	13	20	5.5	8.9	26	-	0	1.2
8.	AQ8	August. 2022	11	18	3.4	7.8	24	-	0	0.7
9.	AQ9	August. 2022	15	22	8.8	13.4	29	-	0	1.9
10.	AQ10	August. 2022	10	15	6.2	9.5	22	-	0	0.9
<b>Bagerhat-Pirojpur-Bhandaria</b>										
11.	AQ11	July. 2022	24	31	7.3	13.1	47	-	0	2.7



Sl. No.	Code	Period	Ambient Air Pollution Concentration in µg/m <sup>3</sup>						CO ppm	
			PM <sub>2.5</sub>	PM <sub>10</sub>	SO <sub>x</sub>	NO <sub>x</sub>	SPM	O <sub>3</sub>		Pb
12.	AQ12	July. 2022	27	41	4.2	14.2	59	-	0	2.1
13.	AQ13	July. 2022	36	47	6.8	9.8	67	-	0	1.3
14.	AQ14	July. 2022	32	41	10.1	12.6	58	-	0	1.1
15.	AQ15	July. 2022	37	48	8.3	11	64	-	0	2.4
Duration (hours)			24	24	24	24	8	8	8	8
*Bangladesh Standard			65	150	365	100 (Annual)	200	157	0.5	9
**IFC/WHO Standard			25	50	20	40 (Annual)	-	100	-	-

Source: Environmental Monitoring Report-June and July 2022.

\*According to ECR 1997 and Subsequent amendment 19<sup>th</sup> August 2005; vide S.R.O. No.220-Law/2005

\*\*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

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

#### 4.2.3.4 Discussion

**Particulate Matter (PM<sub>2.5</sub>):** The result of particulate matter under 2.5 micron has been under the BD standard (ECR 1997) level but cross IFC/WHO standard in June and July 2022 for Kushtia- Meherpur and Bagerhat-Pirojpur-Bhandaria alignments respectively. Vehicle movement on local Road in dry season and dry surface is the main reason to cross the standard (IFC/WHO).

**Particulate Matter (PM<sub>10</sub>):** The result of particulate matter under 10 microns has been under the BD standard (ECR 1997) level but cross IFC/WHO standard in June and July 2022 in Kushtia- Meherpur alignments. Vehicle movement on local Road in dry season and dry surface is the main reason to cross the standard (IFC/WHO).

**Sulphur Dioxide (SO<sub>2</sub>):** In Kushtia- Meherpur line, SO<sub>2</sub> concentration has been recorded in the range of 16.6 to 36.1 µg/m<sup>3</sup>. During the monitoring period, the maximum SO<sub>2</sub> concentration has been reported at AQ3 as 36.1 µg/m<sup>3</sup> in June 2022. SO<sub>2</sub> concentrations at 3 locations in Kushtia-Meherpur line exceeded the IFC/WHO standard level, however, rest of monitoring locations have been reported well below ECR 1997 and IFC/WHO standard level.

In Domar- Hatibandha and Bagerhat-Pirojpur-Bhandaria transmission line, SO<sub>2</sub> concentration has been recorded in the range of 3.4 to 8.8 µg/m<sup>3</sup> and 4.2 to 10.1 µg/m<sup>3</sup> in July 2022. SO<sub>2</sub> concentrations at all the monitoring locations have been reported well below ECR 1997 and IFC/WHO standard level.

**Oxides of Nitrogen (NO<sub>x</sub>):** NO<sub>x</sub> concentration for all location of Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria alignments have been recorded as under the standard of ECR'97 and IFC/WHO standard.

**Suspended Particulate Matter (SPM):** The ambient air quality has been monitored in June and July 2022 in Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria alignments. SPM concentration for all location has been recorded as under the standard of ECR'97.

**Carbon Monoxide (CO):** The ambient air quality has been monitored in June and July 2022 in Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria alignments. Carbon Monoxide concentration for all location has been recorded as under the standard of ECR'97.

**Oxone (O<sub>3</sub>):** 8 hourly concentrations of O<sub>3</sub> has been recorded within the range of 14.7-22.7 µg/m<sup>3</sup> in Kushtia- Meherpur during June 2022. During the monitoring period, the maximum concentration of O<sub>3</sub> has been reported in AQ3 as 22.7 µg/m<sup>3</sup>. O<sub>3</sub> concentration for all location has been recorded within the standard of Air Pollution (Control) Rules-2022 and IFC/WHO standard for air quality.

#### 4.2.4 Noise Level Monitoring Methods

This section identifies the status of the ambient noise level in three alignments: Kushtia- Meherpur 132 kV double circuit transmission line, Domar-Hatibandha 132 kV double circuit transmission line and Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission line. The ambient noise level has been measured within the project area for one hour a daytime 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 Environment Conservation Rules (ECR), 1997- Schedule 4 and Noise Pollution Control Rules, 2006. The SLM has been oriented towards the facility of interest for each measurement taken. The SLM has been calibrated before the noise monitoring survey is carried out. The sound level has been recorded in form of A-weighted equivalent continuous sound pressure level (L<sub>Aeq</sub>) values with the use of A-weighting filters in the noise measuring instrument.

**Table 4-17: Noise Level Standards/ Guidelines**

Sl. No.	Category of Area/Receptor	Bangladesh*		IFC-WHO**	
		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 Bangladesh National Ambient Noise Standards have been taken from Schedule 4 (Standards for Sound) of the Environmental Conservation Rules, 1997 amended October 7, 2006; \*\*Guidelines values are for noise levels measured out of doors. Source: Guidelines for Community Noise, World Health Organization (WHO), 1999; As per IFC EHS noise level guidelines, Noise impacts should not exceed the levels presented in the above table.

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

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

#### 4.2.4.1 Noise Level Monitoring Locations

Noise levels were recorded at five locations in three lines in the study area. Noise levels were recorded in the form of sound pressure levels using a digital sound level meter. Detail list of noise level sampling location are given in

Table 4-18. Noise level was measured at every location at different time. The sound level is recorded in form of A-weighted equivalent continuous sound pressure level (Leq) values with the use of A-weighting filters in the noise measuring instrument.

**Table 4-18: Sensitive Noise Locations and Descriptions of Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria**

Sl. No.	Code	Location	GPS Coordinates	Sampling Date	Category
<b>Kushtia- Meherpur</b>					
1.	NL-1	AP 3/3	23°47'51.28"N 88°44'41.88"E	01.06.2022	Residential Area
2.	NL-2	AP 5/1	23°49'44.50"N 88°46'40.81"E	02.06.2022	Silent Area
3.	NL-3	AP 9/0	23°50'8.75"N 88°54'12.71"E	03.06.2022	Commercial Area
4.	NL-4	AP 15/1	23°50'27.29"N 89° 2'10.86"E	04.06.2022	Silent Area
5.	NL-5	AP 19/2	23°51'50.06"N 89° 4'42.54"E	05.06.2022	Mixed Area
<b>Domar-Hatibandha</b>					
6.	NL-6	T-4/0	26° 7'5.02"N	01.08.2022	Residential Area

Sl. No.	Code	Location	GPS Coordinates	Sampling Date	Category
			88°50'36.10"E		
7.	NL-7	T-14/ 1	26°8'41.67" N 88°54'51.22" E	01.08.2022	Residential Area
8.	NL-8	T-16/0	26°8'40.19" N 88°55'9.43" E	01.08.2022	Residential Area
9.	NL-9	T-18/ 1	26°8'48.83" N 88°55'24.87" E	01.08.2022	Residential Area
10.	NL-10	T-36/0	26°11'39.27"N 89° 5'21.46"E	01.08.2022	Residential Area
<b>Bagerhat-Pirojpur-Bhandaria</b>					
11.	NL-11	T-2/4	22°38'18.52" N 89°49'14.51" E	29.07.2022	Residential Area
12.	NL-12	T-16/2	22°37'35.88" N 89°58'26.68" E	29.07.2022	Residential Area
13.	NL-13	T-20/0	22°35'59.05" N 89°59'21.40" E	29.07.2022	Residential Area
14.	NL-14	T-25/2	22°34'11.54" N 90°3'21.99" E	29.07.2022	Residential Area
15.	NL-15	T-37/4	22°28'14.65" N 90°5'6.60" E	29.07.2022	Residential Area

Source: Environmental Monitoring Report-June -August 2022.

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

**Table 4-19 Noise level Monitoring Pictures.**

**Kushtia- Meherpur**



NL1: (Near AP 3/3)



NL2: (Near AP 5/1)



NL3: (Near AP 9/0)



NL4: (Near AP 15/1)





NL5: (AP 19/2)

**Domar-Hatibandha**



**Bagerhat-Pirojpur-Bhandaria**



T-2/4 (22°38'18.51515" N 89°49'14.51374" E)



T-16/2 (22°37'35.88128" N 89°58'26.67796" E)



T-20/2 (22°35'59.05054" N 89°59'21.39803" E)

Source: Environmental Monitoring Report-July 2022. Scope-E: 132 kV Double Circuit Domar-Hatibandha Transmission Line, Scope-F: 132 kV Double Circuit Bagerhat-Pirojpur-Bhandaria Transmission Line

#### 4.2.4.2 Analysis Results

An electronic and auto-recorded noise meter has been used to conduct the study. The recorded noise levels summary monitoring results are shown in Table 4-20.

**Table 4-20: Noise Level Monitoring Results**

Sl. No.	Code	Period	Ambient Noise Level [dB(A)]		ECR'97 Standard		IFC/WHO Standard	
			Leq <sub>day</sub>	Leq <sub>night</sub>	Day	Night	Day	Night
<b>Kushtia- Meherpur</b>								
1.	NL-1	Jun.2022	56.9	37.8	55	45	55	45
2.	NL-2	Jun.2022	50.7	34.7	50	40	55	45
3.	NL-3	Jun.2022	63.4	46.2	70	60	70	60
4.	NL-4	Jun.2022	53.7	36.4	50	40	55	45
5.	NL-5	Jun.2022	59.3	38.9	60	50	-	-
<b>Domar-Hatibandha</b>								
6.	NL-6	July. 2022	45.3	35.2	55	45	55	45
7.	NL-7	July. 2022	49.5	37.4	55	45	55	45
8.	NL-8	July. 2022	44.3	34.2	55	45	55	45
9.	NL-9	July. 2022	47.8	39.3	55	45	55	45
10.	NL-10	July. 2022	46.7	36.9	55	45	55	45
<b>Bagerhat-Pirojpur-Bhandaria</b>								
11.	NL-11	July. 2022	45.5	37.6	55	45	55	45
12.	NL-12	July. 2022	47.1	38.2	55	45	55	45
13.	NL-13	July. 2022	49.4	39.1	55	45	55	45
14.	NL-14	July. 2022	48.6	36.5	55	45	55	45
15.	NL-15	July. 2022	43.3	38.8	55	45	55	45

Source: Environmental Monitoring Report-June and July 2022.

**Note:**

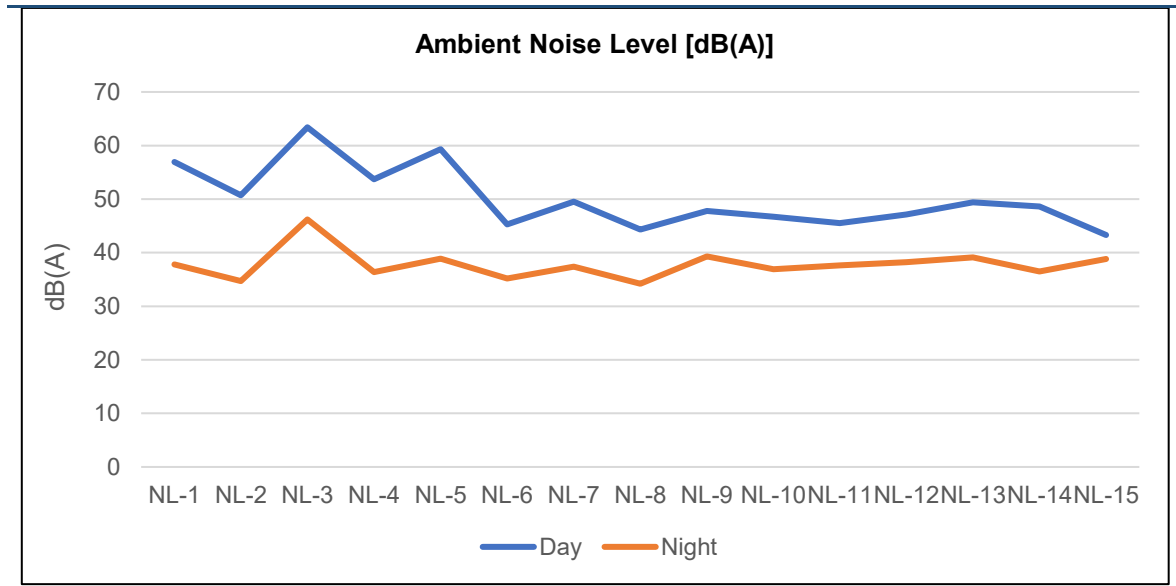
\* According to ECR 1997 and Subsequent amendment on 2006

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

#### **4.2.4.3 Discussion**

According to Bangladesh Environmental Quality Standard ECR'97 categorizations, the current monitoring location falls into Commercial area (NL3), Silent zone (NL2 and NL4) and Residential Area (NL1 and NL6- NL15). The daytime noise level at most of the locations are found within the national standards (Figure 4-5).

**Figure 4-5: Noise level of Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria**

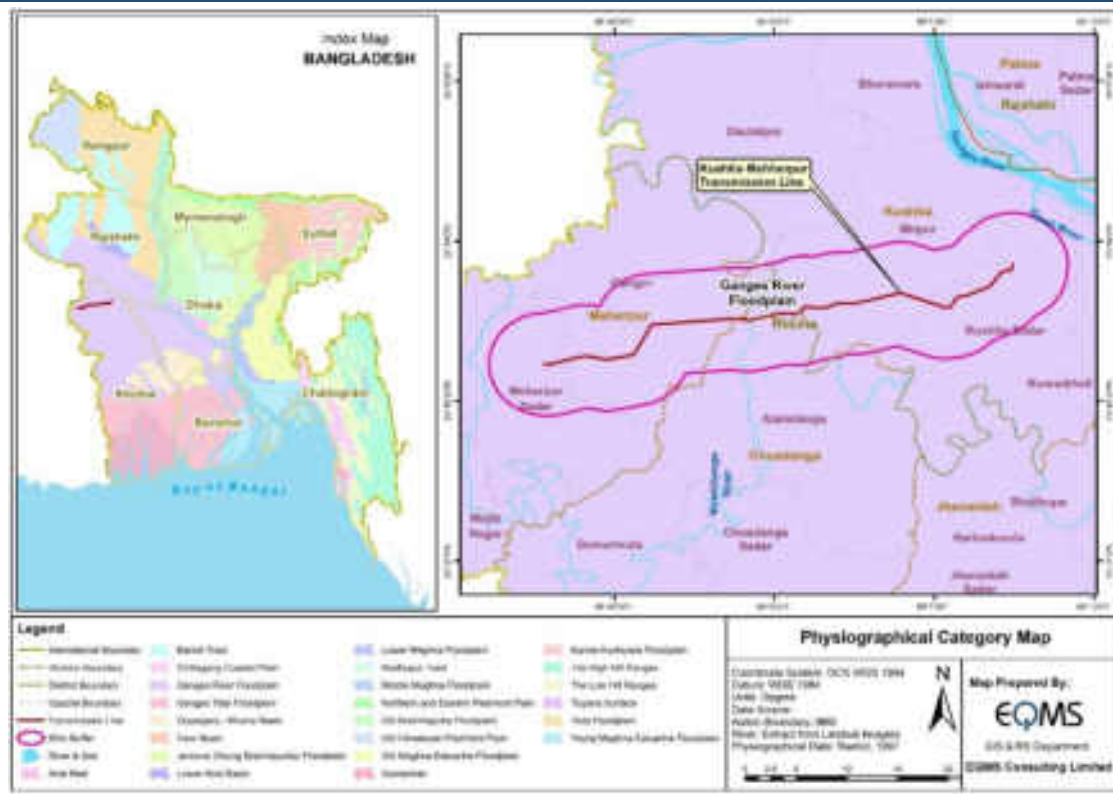


#### 4.2.5 Physiographic Features

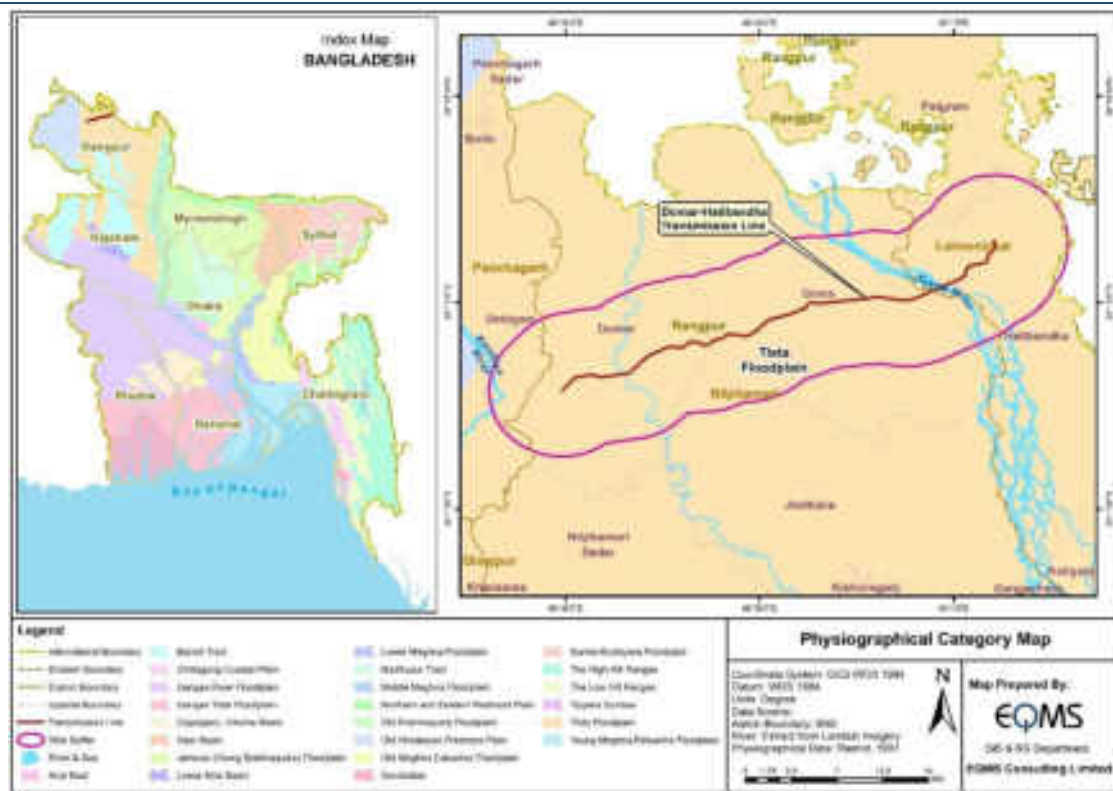
In the context of physiography, Bangladesh is classified into three distinct regions: (a) floodplains; (b) terraces; and (c) hills each having distinguishing characteristics of its own. Further, the physiography of the country has been divided into 24 sub regions and 54 units. The physiography of 5km buffer of Kushtia- Meherpur route fall in Ganges River Floodplain and Ganges Tidal Floodplain, Domar-Hatibandha fall in Tista Floodplain and Bagerhat-Pirojpur-Bhandaria route fall in Ganges Tidal Floodplain. Figure 4-6 shows the physiographic condition of Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria.



**Figure 4-6: Physiographic Map of Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria**

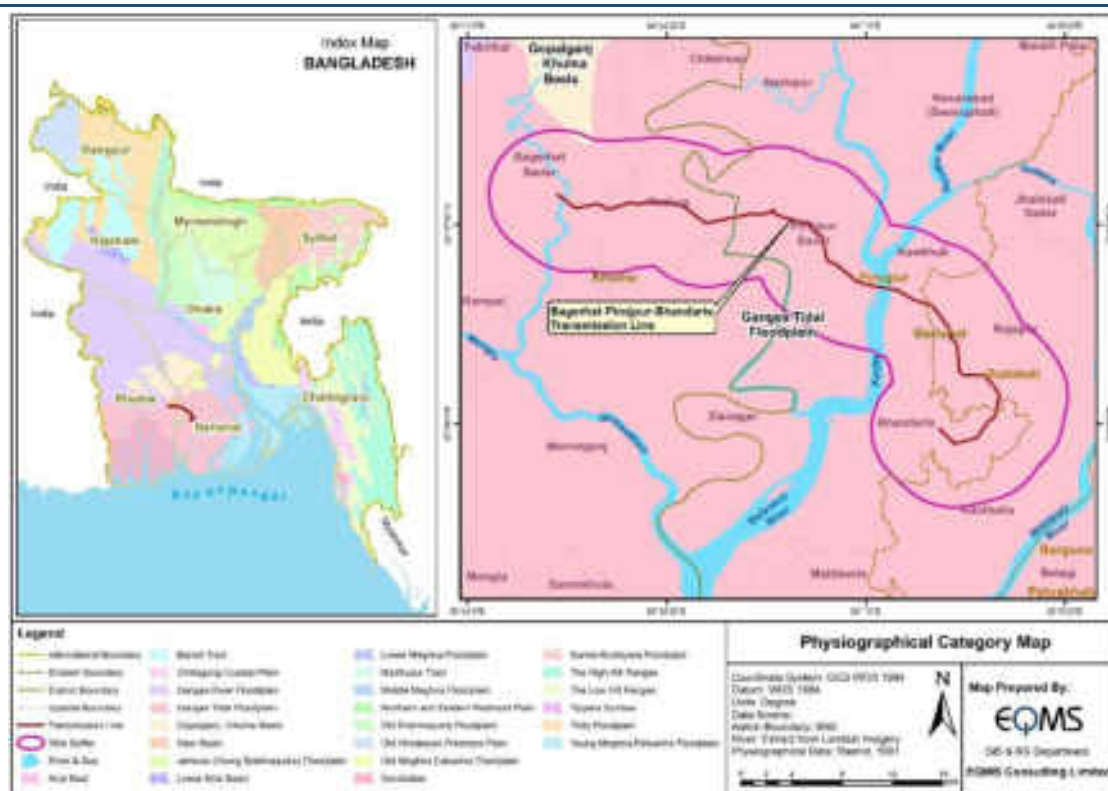


**Kushtia- Meherpur**



**Domar-Hatibandha**





Bagerhat-Pirojpur-Bhandaria

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

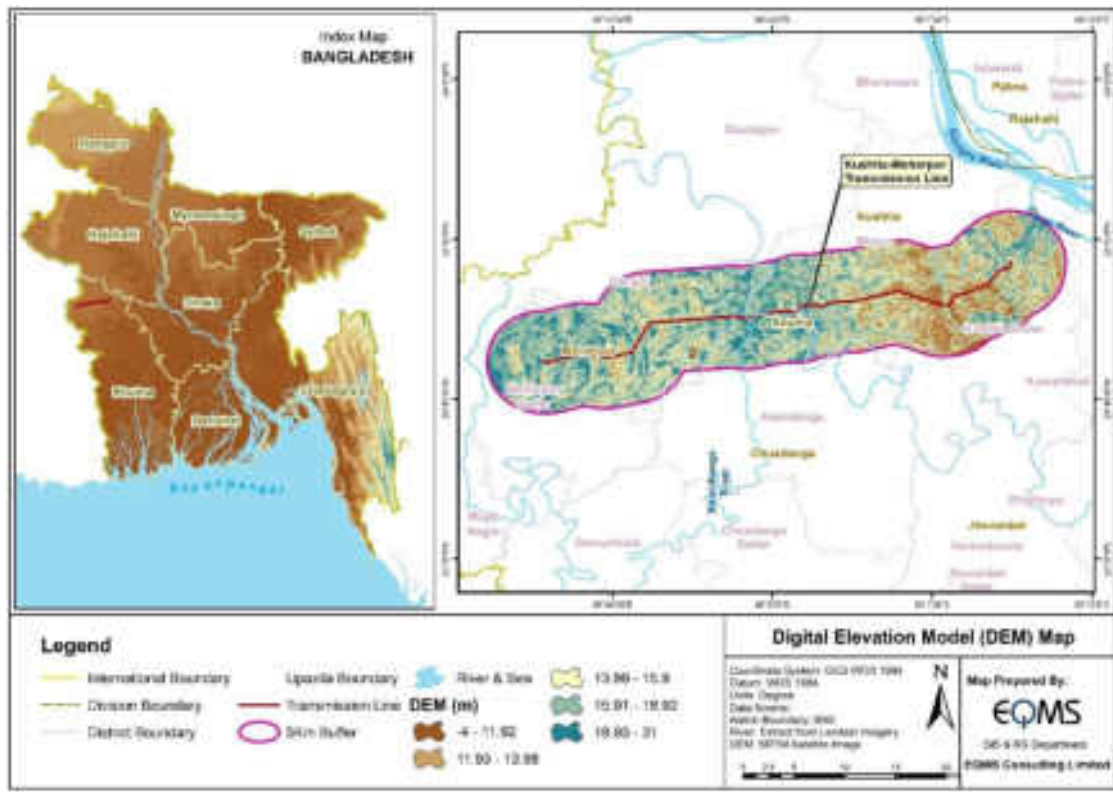
#### 4.2.6 Topography

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.

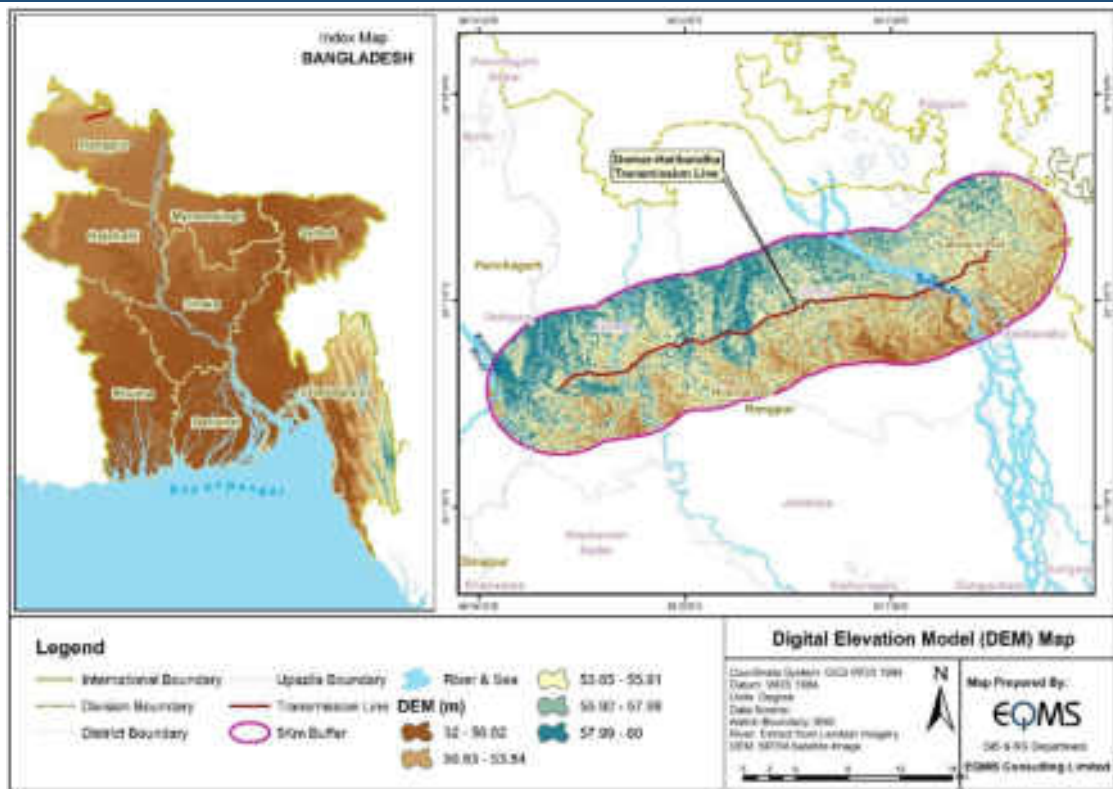
The country has a considerable topographic diversity. It has three distinctive features: (i) a broad alluvial plain subject to frequent flooding; (ii) a slightly elevated relatively older plain; and (iii) a small hill region drained by flashy rivers. The south is a highly irregular deltaic coastline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

The average elevation of Kushtia- Meherpur alignment is 11.2m. The average elevation of Domar-Hatibandha alignment is 47.6m. The average elevation of Bagerhat-Pirojpur-Bhandaria alignment is 5.2m. The topographic map of these alignments is shown in Figure 4-7.

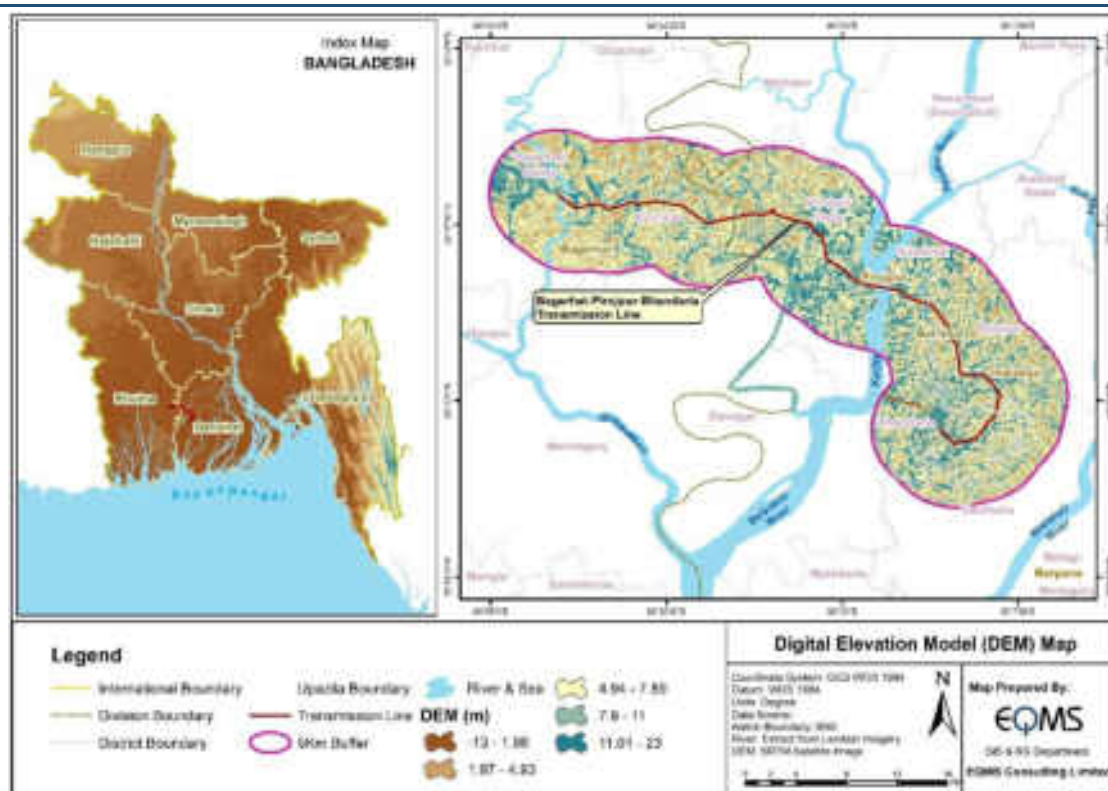
Figure 4-7: Topography of Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria



Kushtia- Meherpur



Domar-Hatibandha



Bagerhat-Pirojpur-Bhandaria

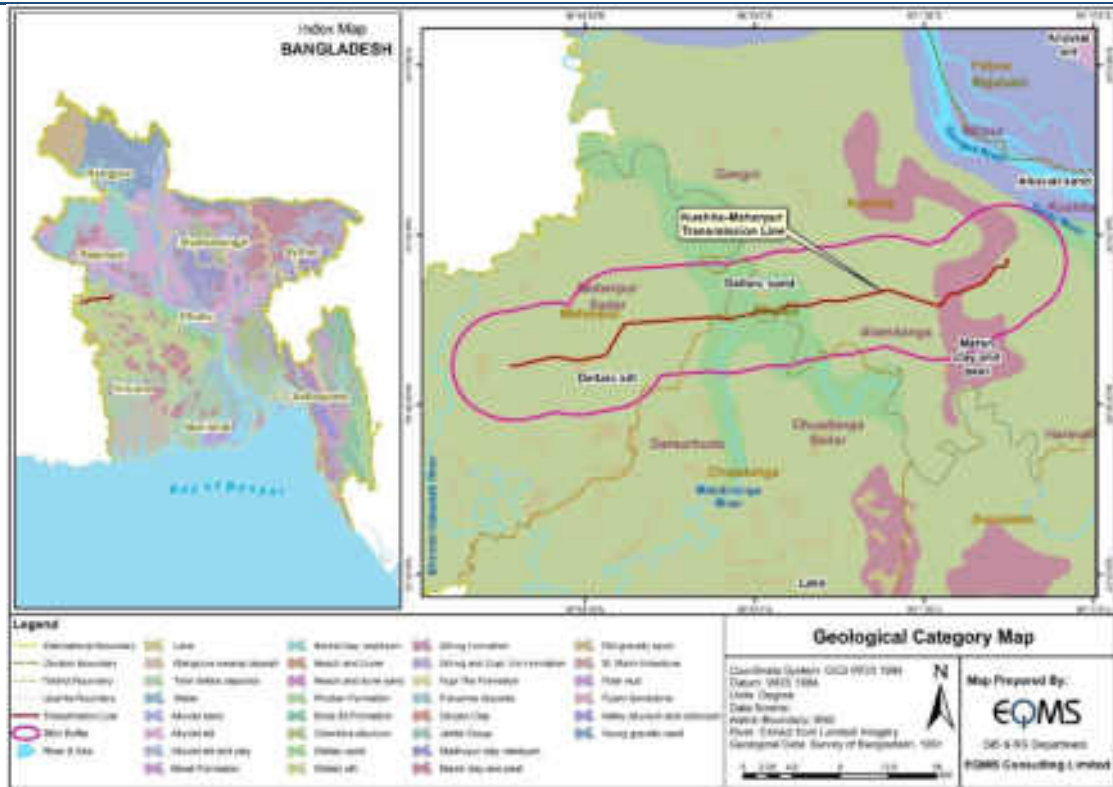
Source: SRTM Satellite Image

#### 4.2.7 Geology

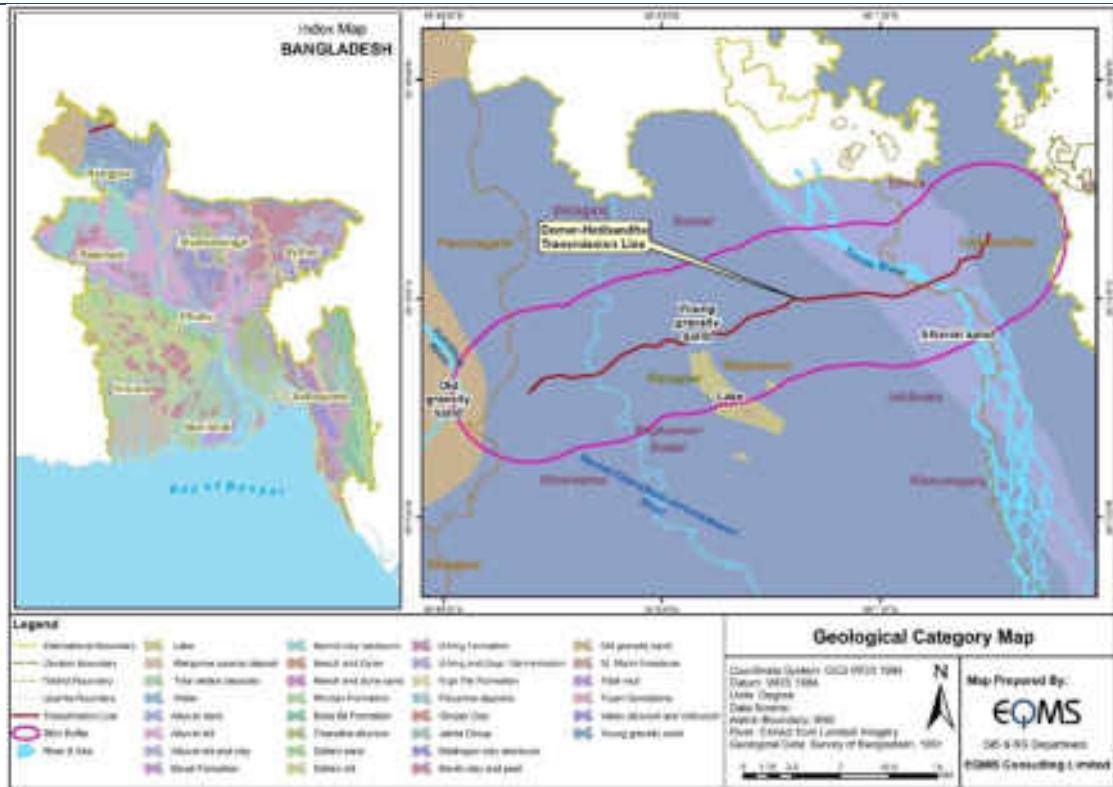
Bangladesh is situated to the east of the Indian sub-continental plate. Nearly 85% of Bangladesh is underlain by deltaic and alluvial deposits of the Ganges, Brahmaputra, and Meghna River systems. The project area consists of Holocene alluvial deposits in the floodplain and predominantly consisting of fine sand, silts and clay. The site is on deep Cenozoic deposits that overlie Precambrian basement rock. The Precambrian rocks form the basement of all geological formations of the Bengal Basin and shield areas. The materials deposited are a mixture of sediments transported by the old Brahmaputra and by the Jamuna (Brahmaputra) River. The generalized geological features of the project area are shown in the geological map of Bangladesh. As per the geological category map of Bangladesh, the majority of the 5 km buffer of Kushtia- Meherpur route falls under deltaic sand category, Domar-Hatibandha route falls under young gravelly sand categories (Figure 4-8). A portion of the Domar-Hatibandha alignment falls under the geological category of Alluvial sand. As per the geological category map, the majority of the 5 km buffer of Bagerhat-Pirojpur-Bhandaria route falls under tidal deltaic deposits categories (Figure 4-8).



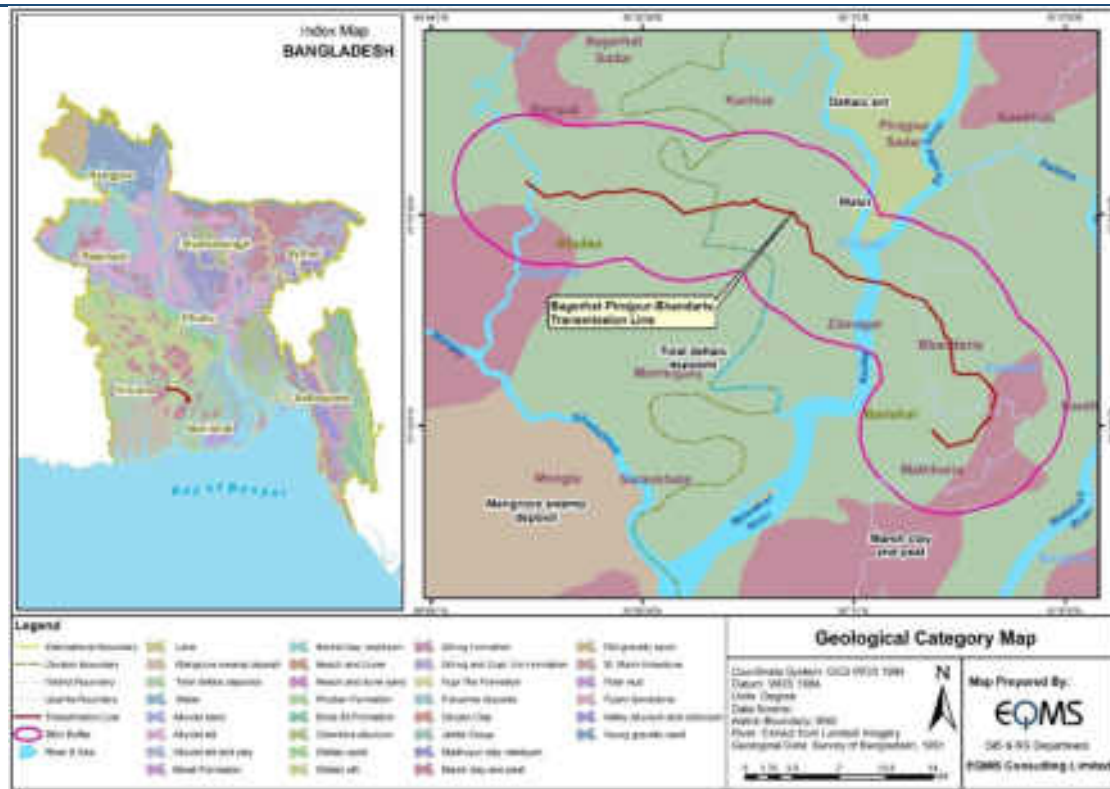
Figure 4-8: Geology of Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria



Kushtia- Meherpur



Domar-Hatibandha



Bagerhat-Pirojpur-Bhandaria

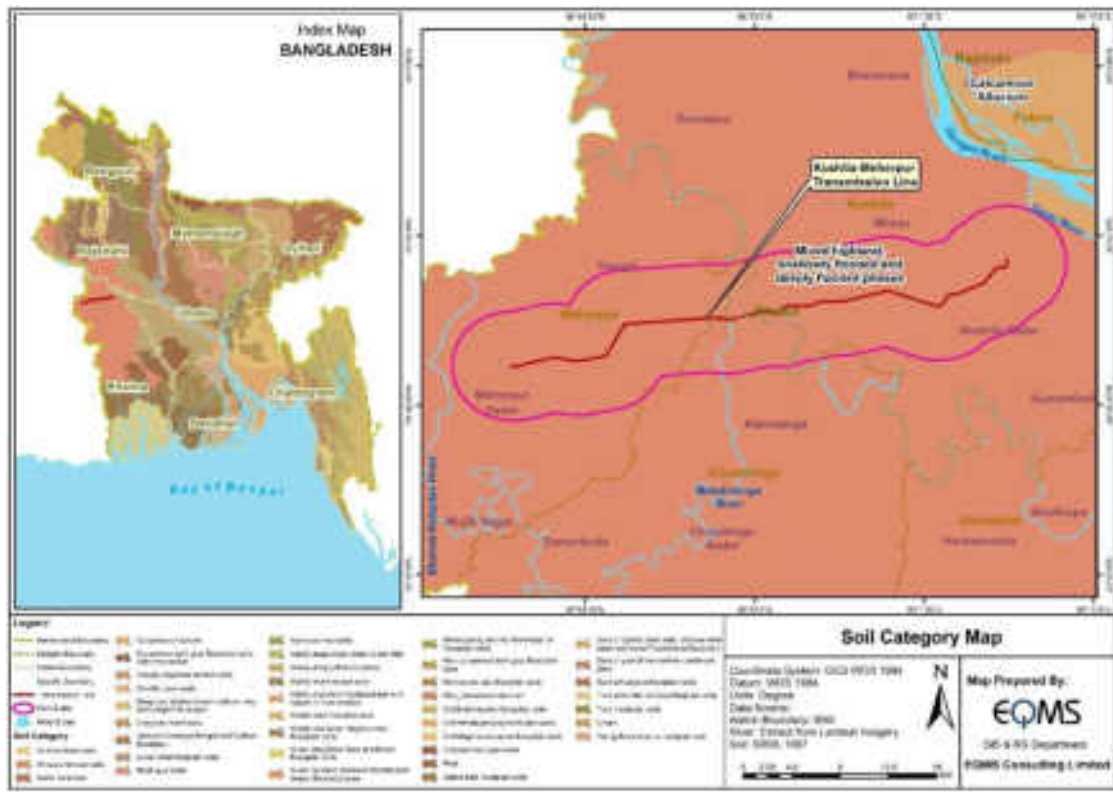
Source: Survey of Bangladesh

#### 4.2.8 Soil

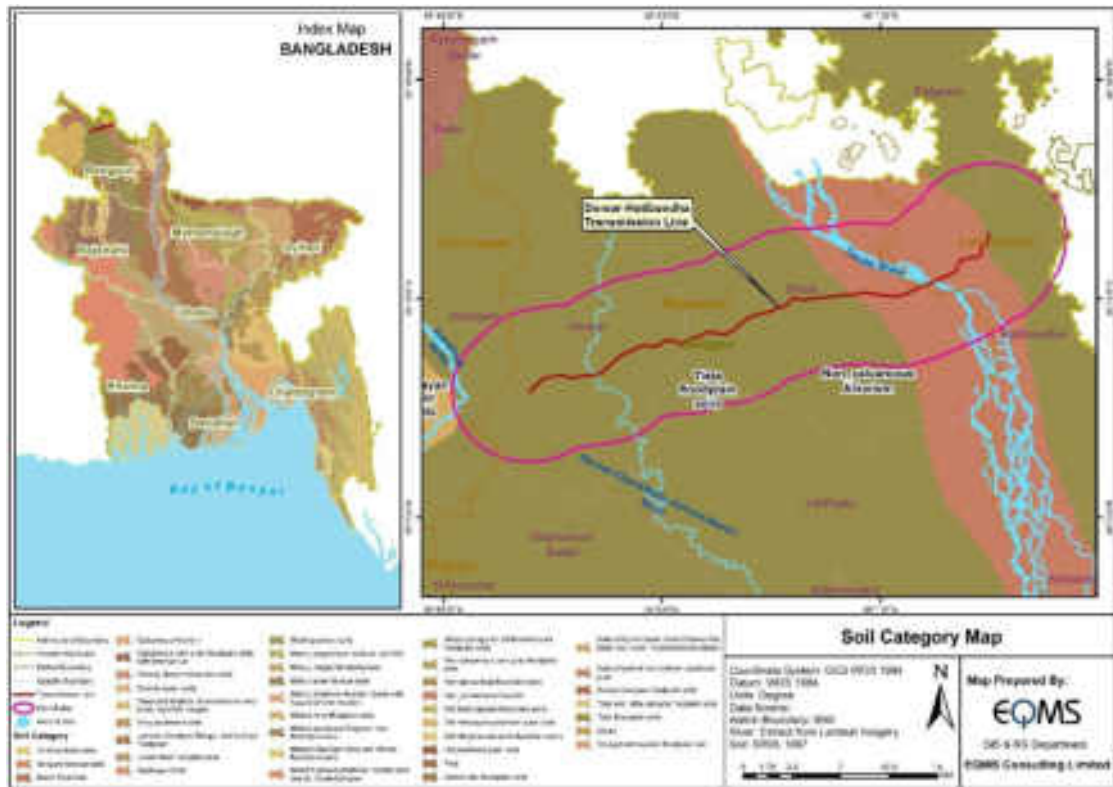
The project areas fall into seven different soil formation zones (Figure 4-9). The general soil types of 500m buffer of Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria route include the following: mixed highland, shallow flooded and deeply flooded phase (Kushtia- Meherpur), Tista floodplain soil and in the north (Domar-Hatibandha) and Non-saline tidal floodplain (Bagerhat-Pirojpur-Bhandaria). The soil category of Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria is shown in Figure 4-9.



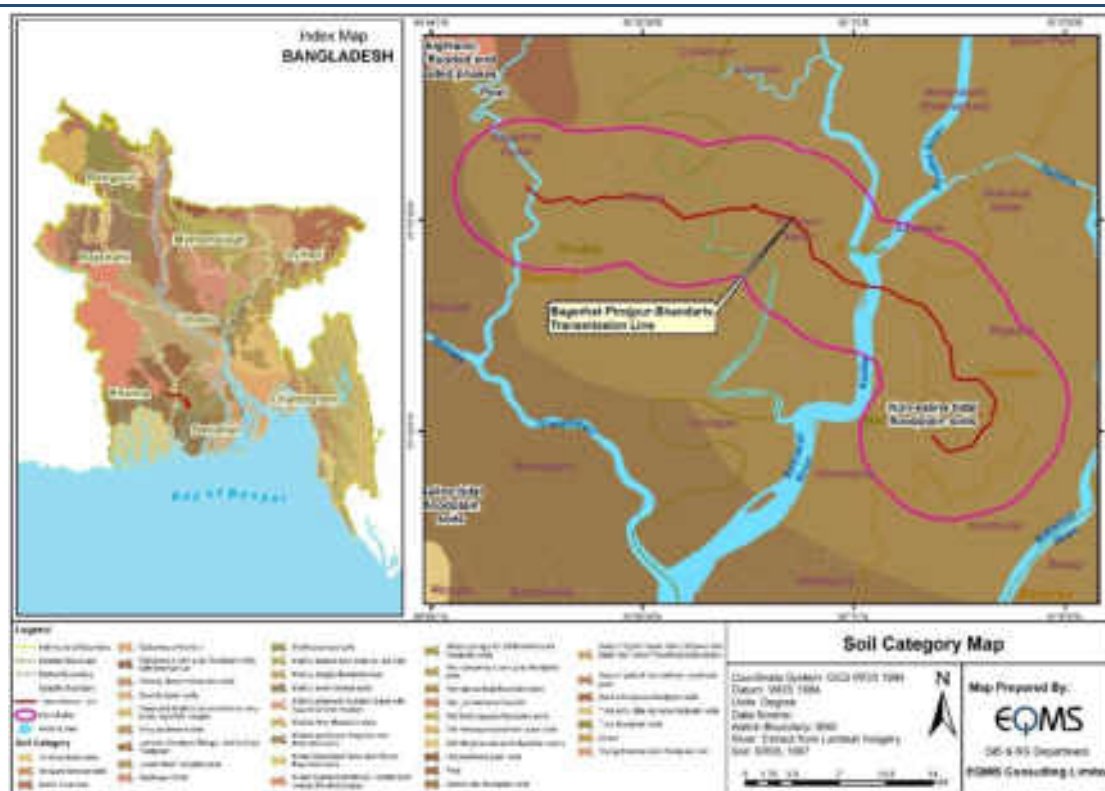
Figure 4-9: Soil Category of Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria



Kushtia- Meherpur



Domar-Hatibandha



Bagerhat-Pirojpur-Bhandaria

Source: Soil Resource Development Institute (SRDI)

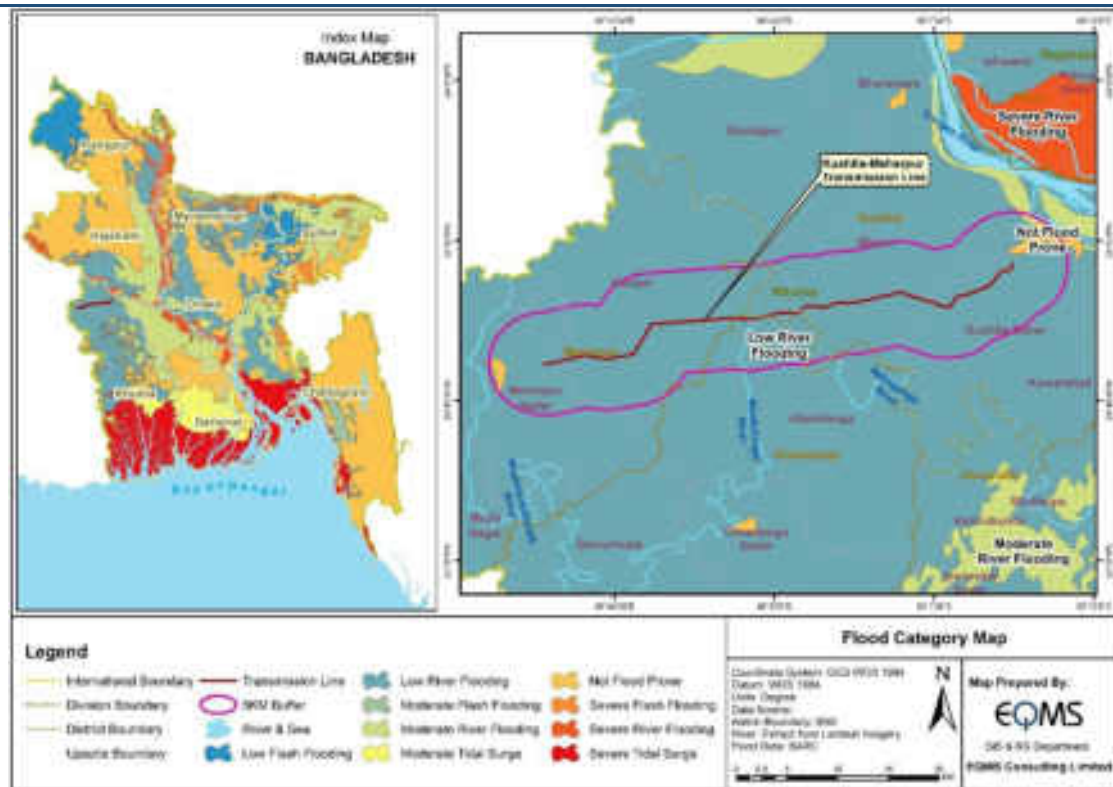
#### 4.2.9 Flood prone areas

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 km<sup>2</sup> (around 18%) of the country is flooded<sup>3 4</sup>. As per the flood category map, Kushtia- Meherpur alignments fall under low river flooding zone. The flood category map of Domar-Hatibandha alignment shows that majority of the 5km buffer of the route is prone to moderate tidal surge and partially in severe river flooding zone. As per the flood category map, Bagerhat-Pirojpur-Bhandaria alignments fall under moderate tidal surge and partially in severe tidal surge zone. Figure 4-10 represents flood prone areas Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria.

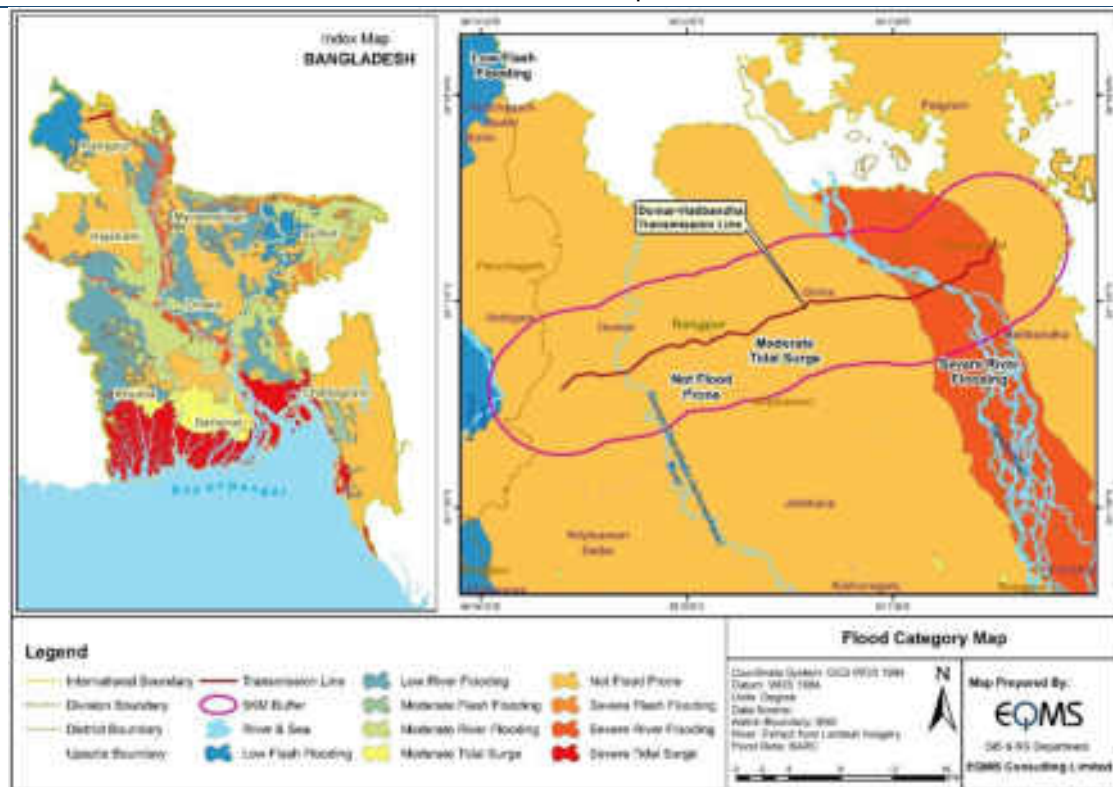
<sup>3</sup> [http://en.banglapedia.org/index.php?title=Bangladesh Soil](http://en.banglapedia.org/index.php?title=Bangladesh_Soil)

<sup>4</sup> Bangladesh Agricultural Research Council (BARC)/GIS Project, BGD/95/006

Figure 4-10: Flood Prone Category of Kushtia- Meherpur, Domar-Hatibandha and Bagerhat- Pirojpur-Bhandaria

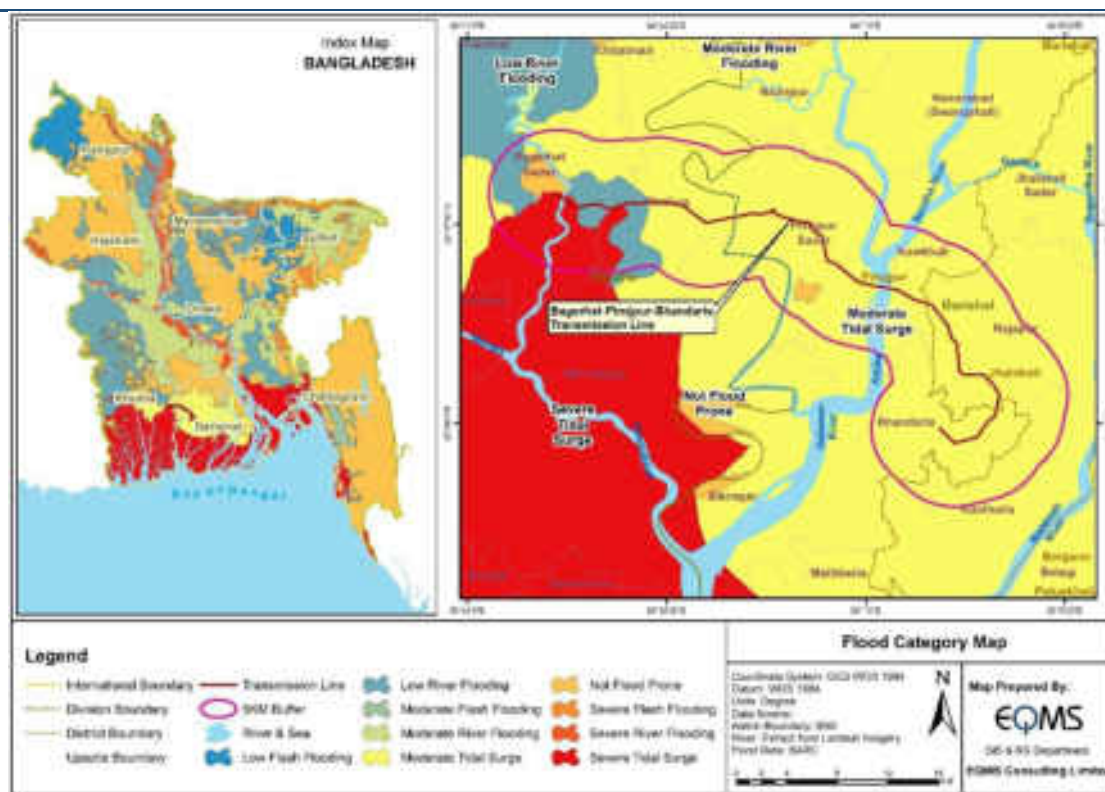


Kushtia- Meherpur



Domar-Hatibandha





Bagerhat-Pirojpur-Bhandaria

Source: Bangladesh Agricultural Research Council (BARC)

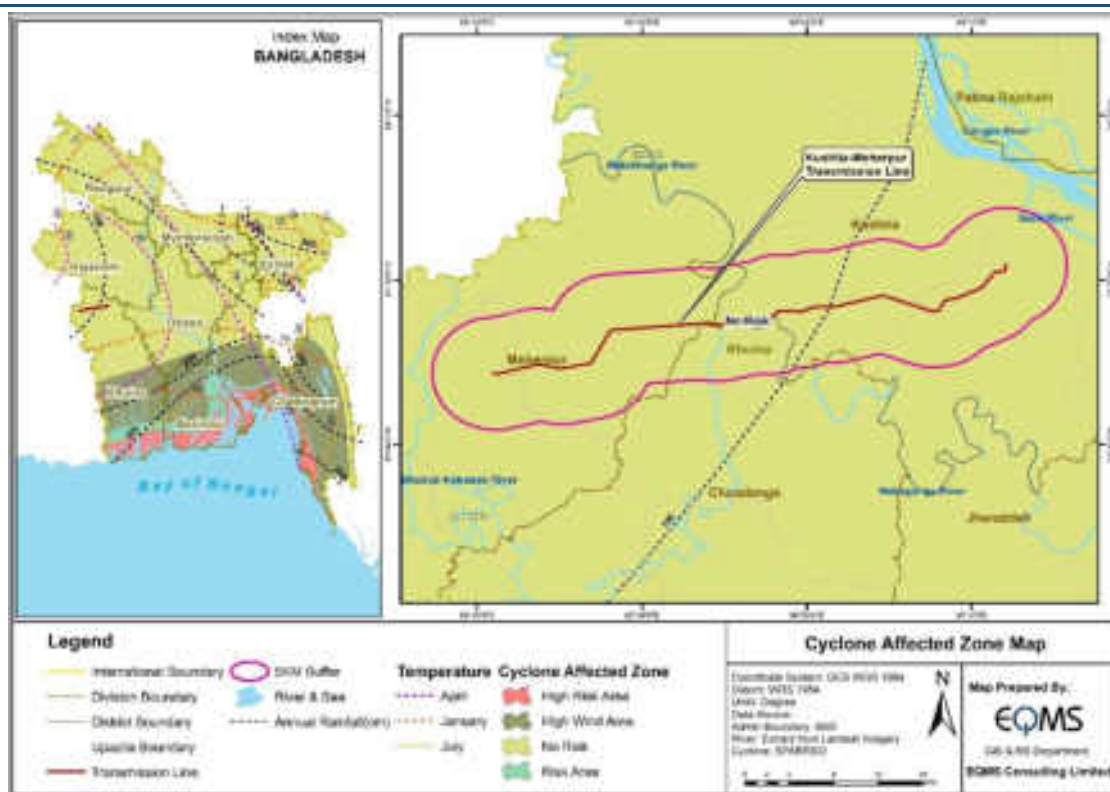
#### 4.2.10 Cyclones

Bangladesh coast is one of the most cyclone prone areas of the world due to its geographical location and funnel shaped coast of the Bay of Bengal. Most of the damage occurs in the coastal regions of Khulna, Patuakhali, Barisal, Noakhali and Chattogram and the offshore islands of Bhola, Hatiya, Sandwip, Manpura, Kutubdia, Maheshkhali, Nijhum Dwip, Urir Char and other newly formed islands. Figure 4-11 shows cyclone affected area map of Bangladesh.

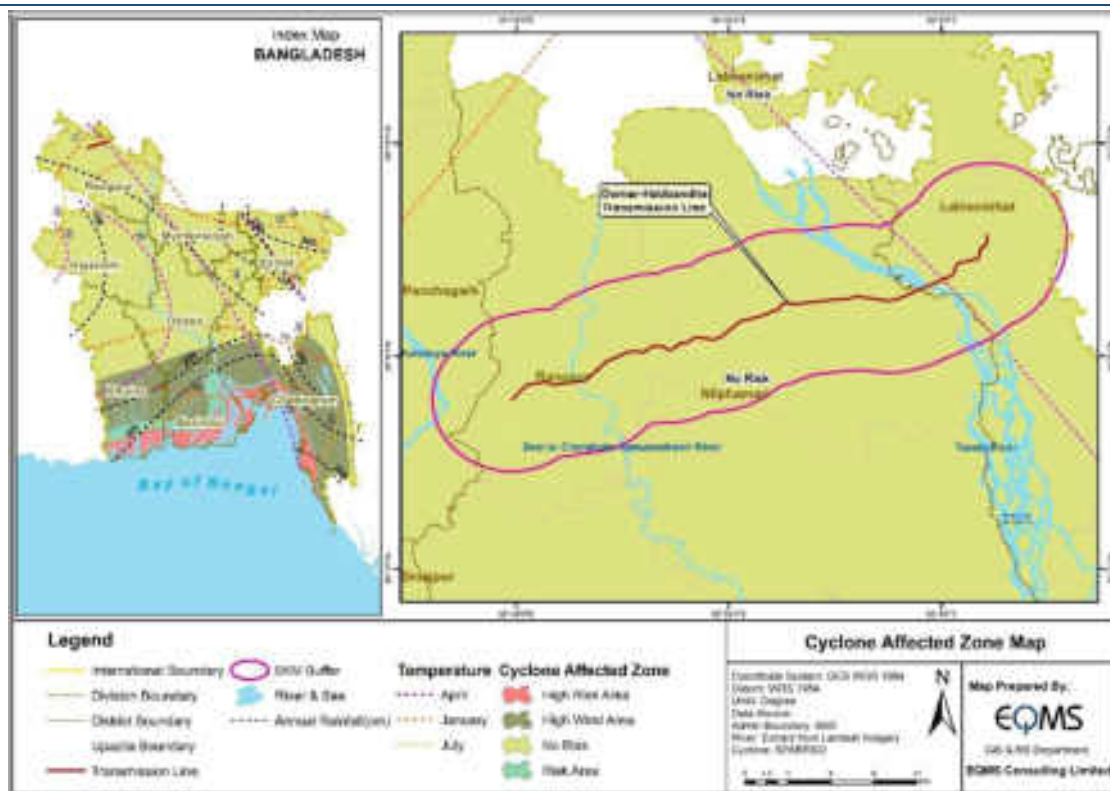
Devastating cyclones and associated storm surges hit the coastal zones almost every year and are usually accompanied by high-speed winds, sometimes reaching 250 km/hr. or more and with 3 m to 10 m high waves, causing extensive damage to life, property and livestock. These cyclones usually occur in two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

As per the cyclone affected zone map, majority of the Kushtia- Meherpur and Domar-Hatibandha route fall under no risk area. Whereas Bagerhat-Pirojpur-Bhandaria route fall in high wind area zone regarding cyclone hazard. Figure 4-11 shows the cyclone affected zone map of the Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria routes.

Figure 4-11: Cyclone affected zone map of the Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria

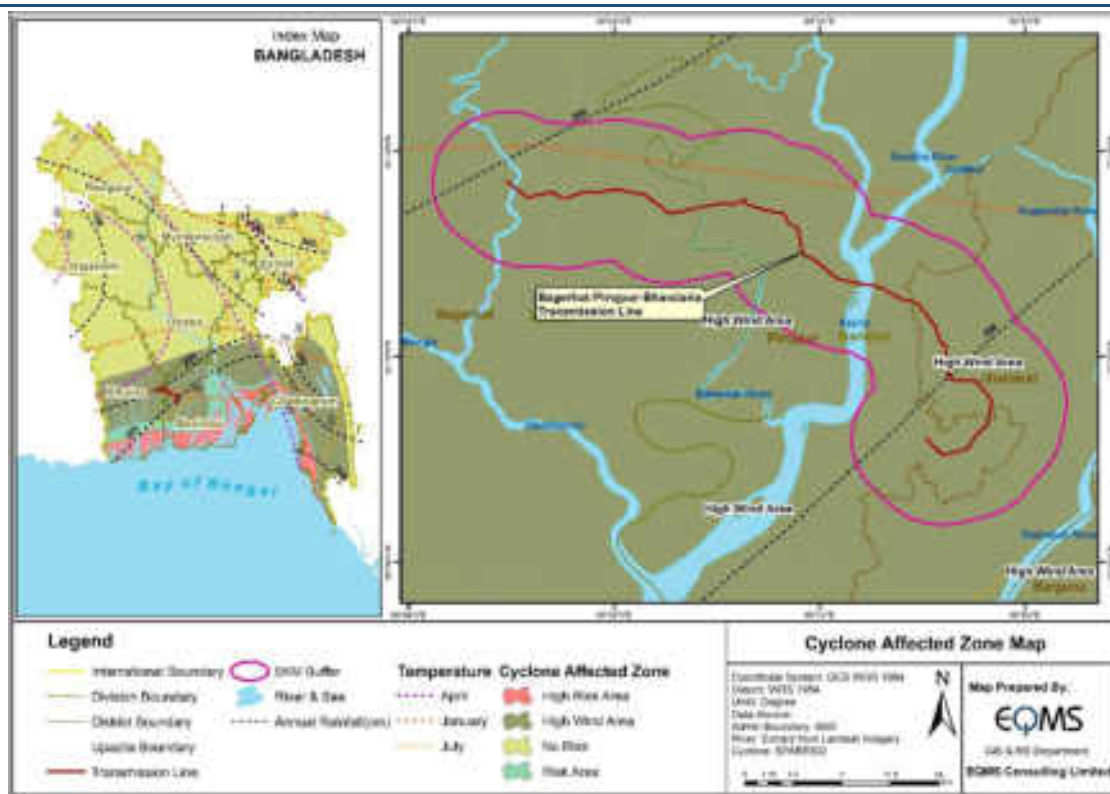


Kushtia- Meherpur



Domar-Hatibandha





Bagerhat-Pirojpur-Bhandaria

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

#### 4.2.11 River Erosion

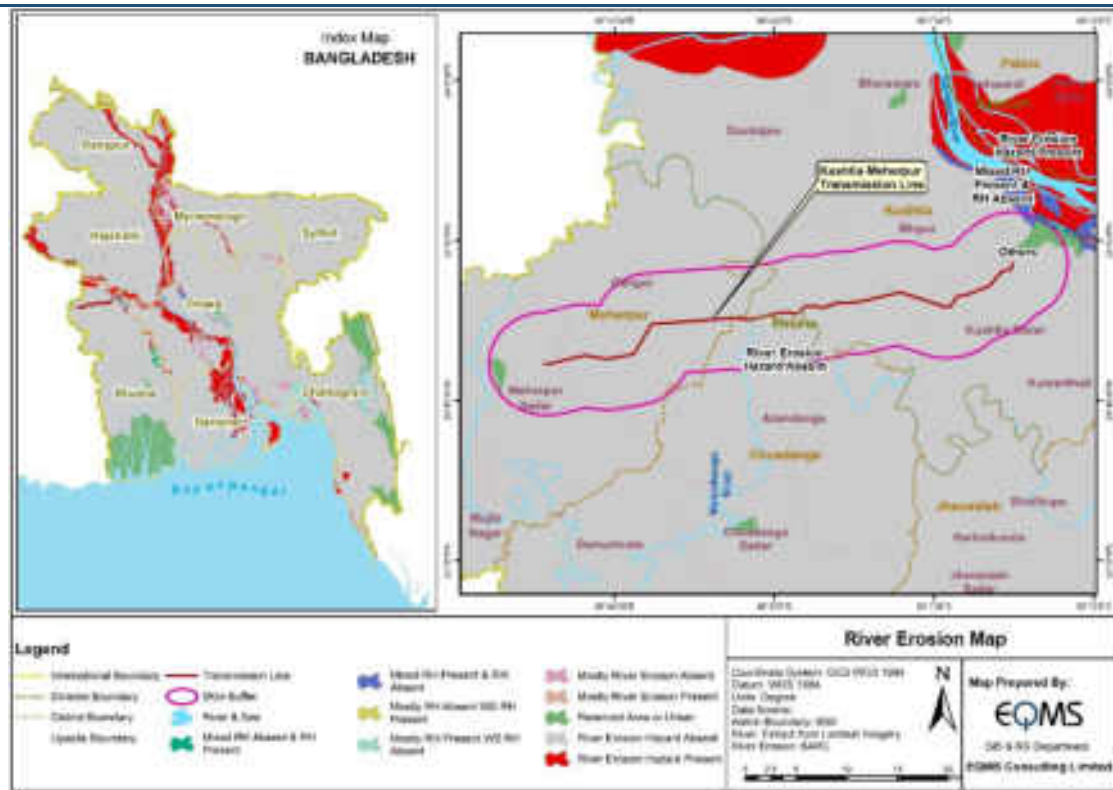
During the monsoon, extensive riverbank spills and riverbank erosion are typical. Riverbank erosion mainly occurs due to the braided nature of rivers in Bangladesh, and is further aggravated by heavy rainfall, particularly upstream, and increased water flow. Most recently, due to climate change, the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

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

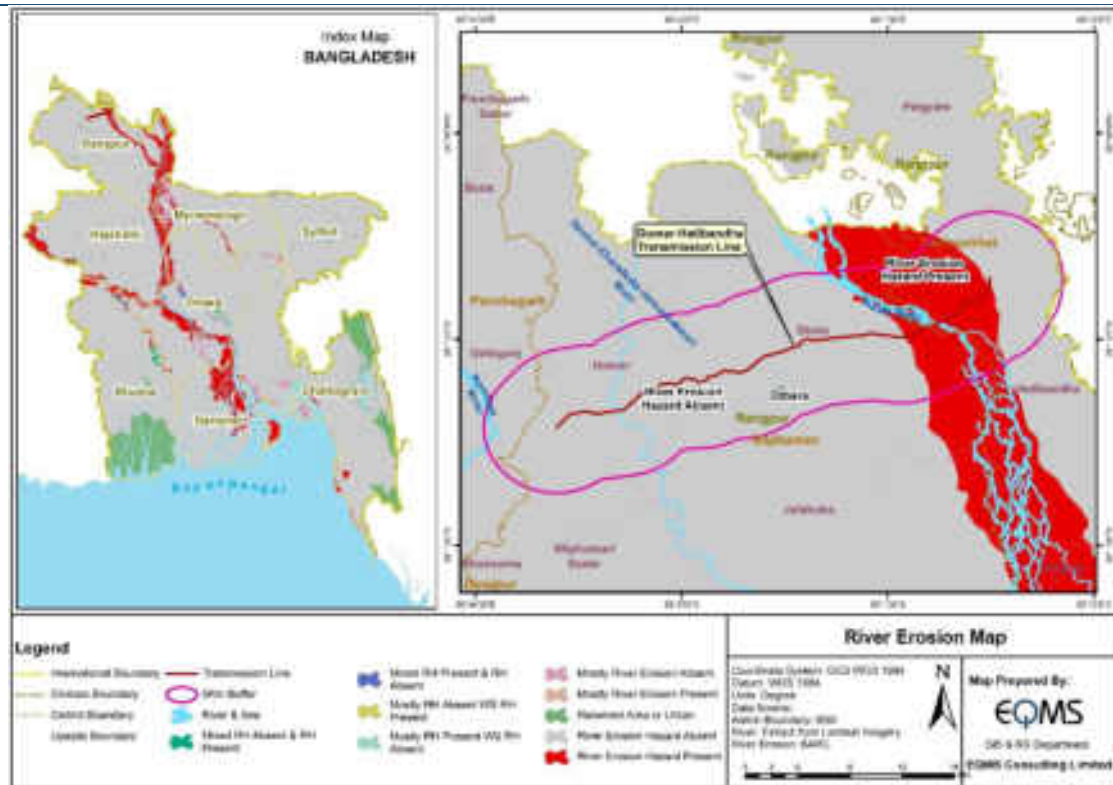
According to the Bangladesh Water Development Board (BWDB) the most erosion prone districts are Bogra, Sirajganj, Kurigram, Lalmonirhat, Gaibandha and Rangpur, in the country's north, and Chandpur, Manikganj, Rajbari Shariatpur, and Faridpur in Dhaka zone, with Tangail and Jamalpur in Mymensingh zone,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

As per river erosion map, river erosion hazard is absent in majority of the Kushtia- Meherpur, Damar-Hatibandha and Bagerhat-Pirojpur-Bhandaria route. However, in Damar-Hatibandha alignment river erosion hazard is present in minor portion of the alignment. The river erosion map of Kushtia- Meherpur, Damar-Hatibandha and Bagerhat-Pirojpur-Bhandaria routes is shown in Figure 4-12.

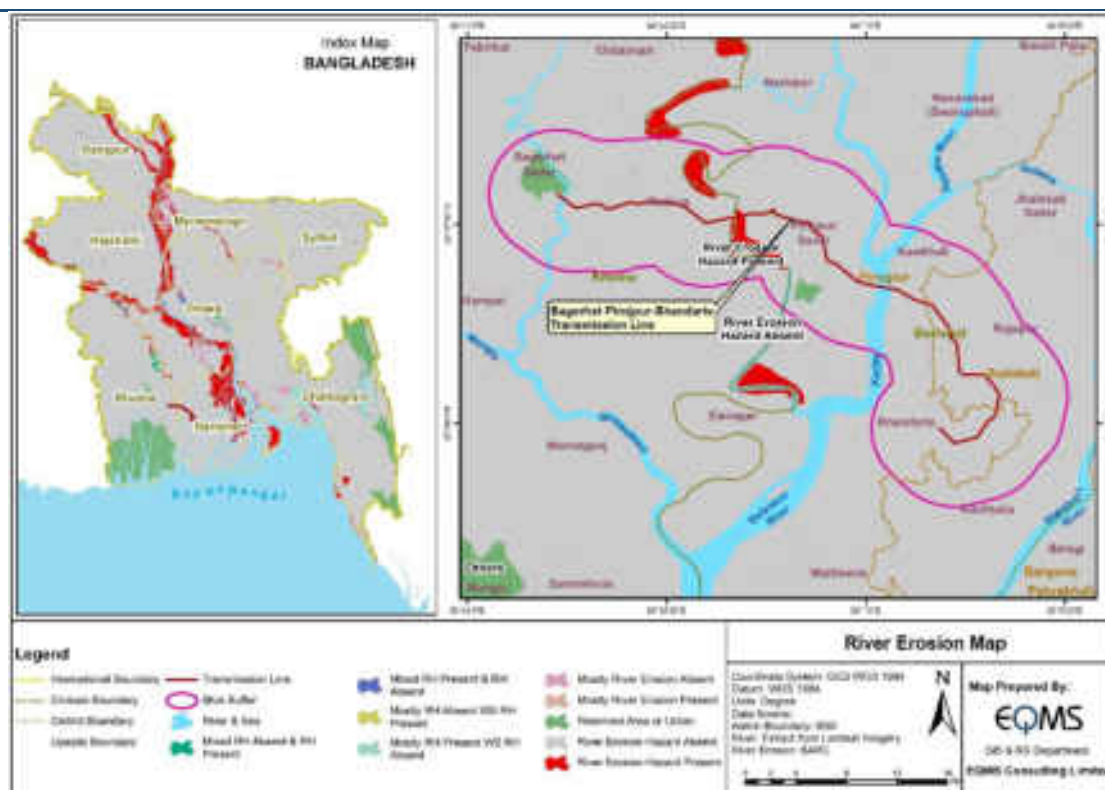
Figure 4-12: River erosion map of Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria.



Kushtia- Meherpur



Domar-Hatibandha



Bagerhat-Pirojpur-Bhandaria

Source: Bangladesh Agricultural Research Council (BARC)

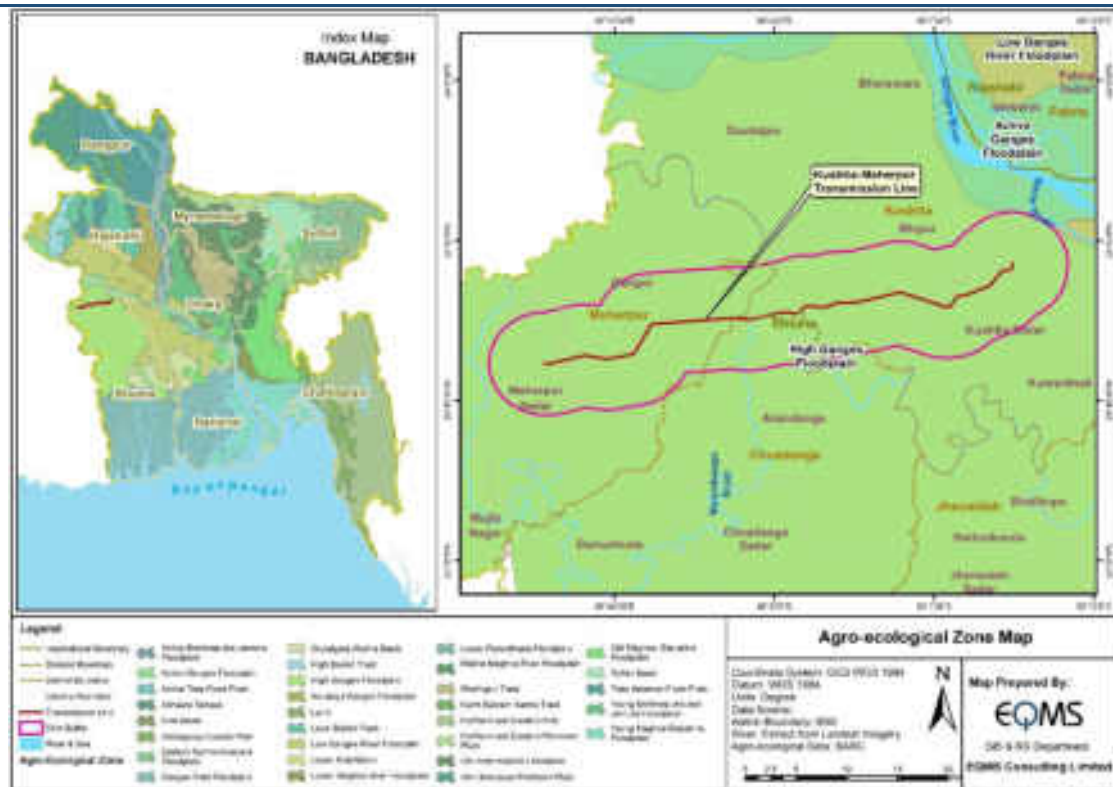
In case of Domar-Hatibandha TL, the river crossing portion was previously located in the upstream of Teesta barrage. Bangladesh Water Development Board (BWDB) has requested to relocate the river crossing portion to 500m downstream of the Teesta barrage. Hence the span has changed although it's still within the maximum allowable limit of ACCC conductor. It is confirmed by PGCB that there will be no towers in the riverbed.

#### 4.2.12 Agro-ecological zones of Bangladesh

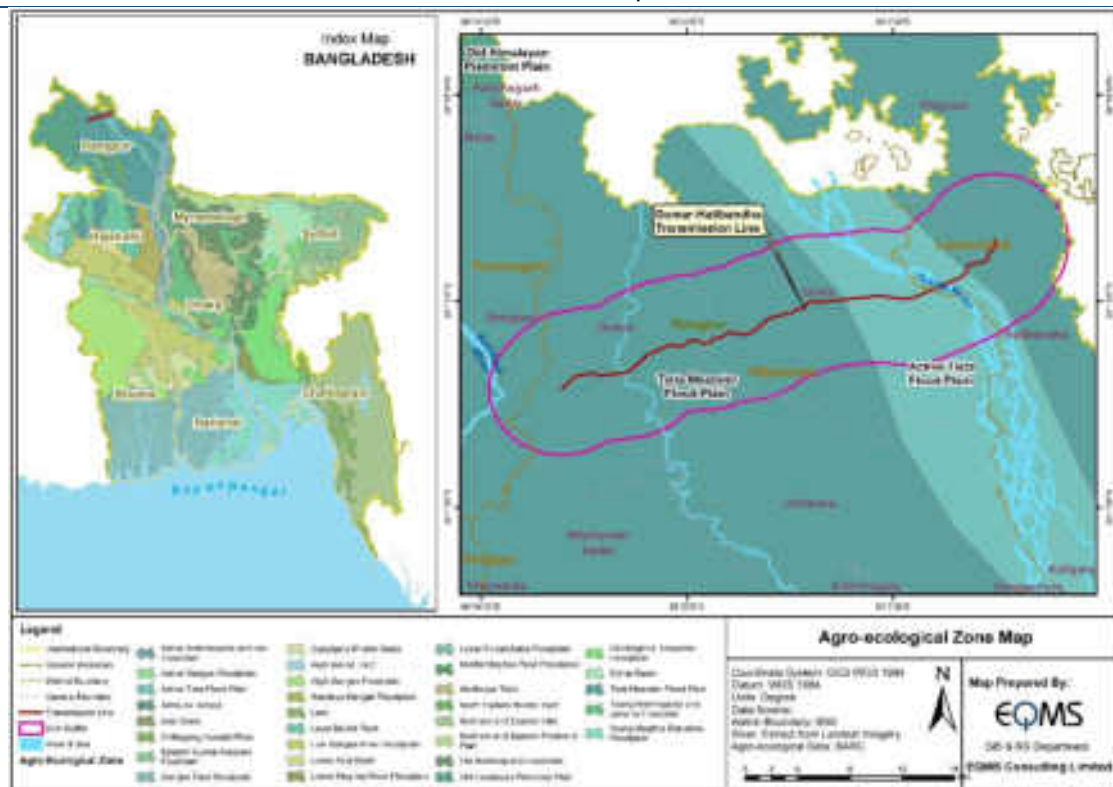
The agro-ecological zones of Bangladesh have been identified based on four elements including physiography, soils, land levels in relation to flooding, and agro-climatology. Bangladesh has been tentatively divided into 30 agro-ecological zones. These 30 zones have been further subdivided into 88 agro-ecological sub-regions, which have been further subdivided into 535 agro-ecological units. Kushtia- Meherpur transmission line alignment falls in the High Ganges Floodplain zone. On the other hand, Domar-Hatibandha route fall in the Tista Meander Floodplain and Active Tista Floodplain zone. Bagerhat-Pirojpur-Bhandaria route fall in the Ganges Floodplain and partially in High Ganges Floodplain zone. The Agro-ecological zone of Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria has been shown in Figure 4-13.



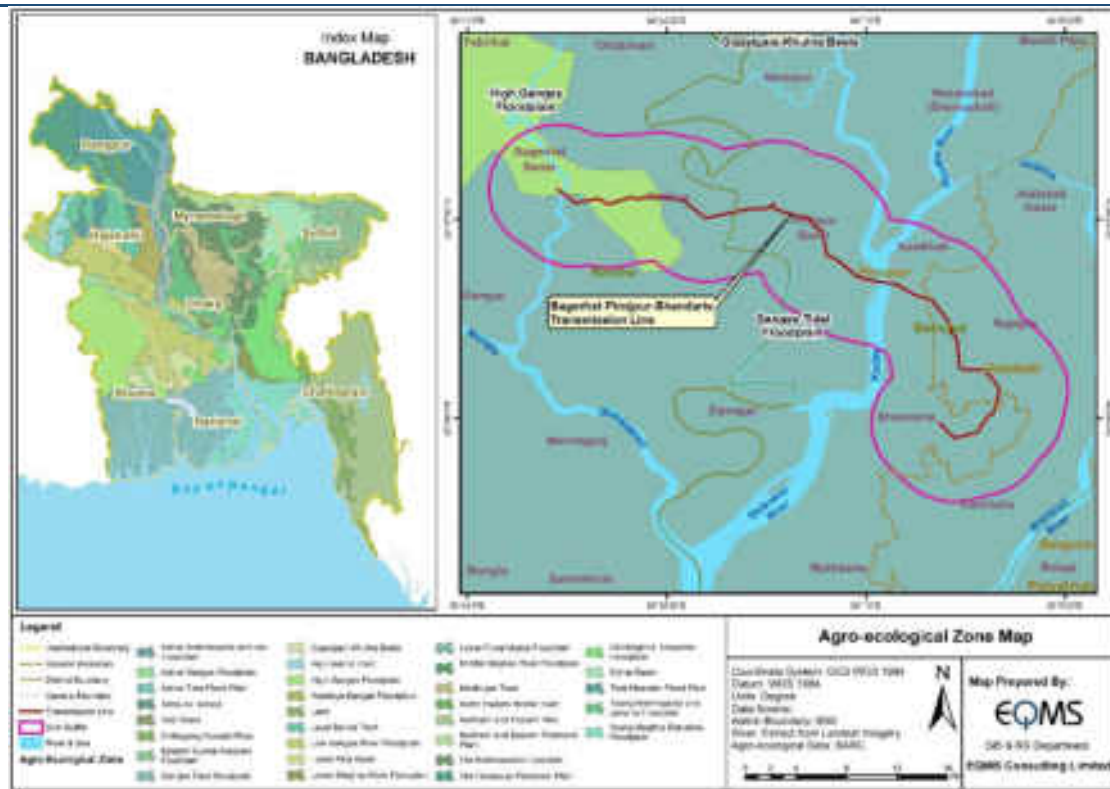
Figure 4-13: Agro-ecological zone of Kushtia- Meherpur, Domar-Hatibandha and Bagerhat- Pirojpur-Bhandaria



Kushtia- Meherpur



Domar-Hatibandha



Bagerhat-Pirojpur-Bhandaria

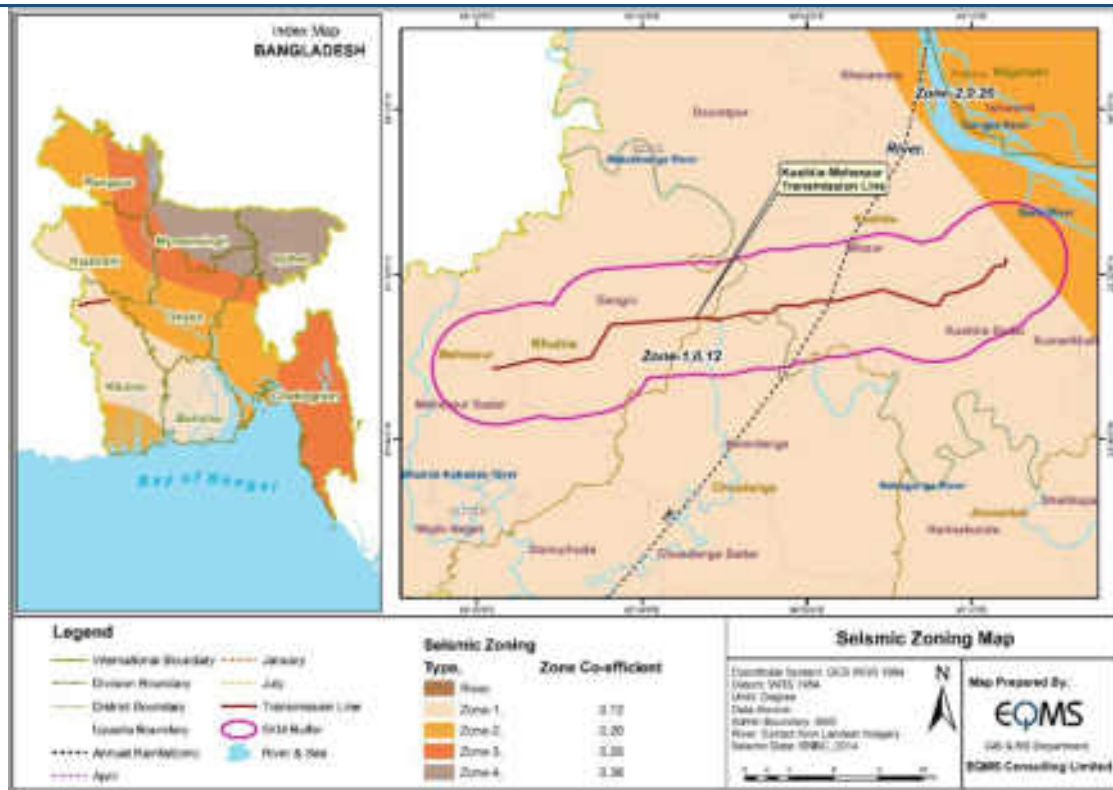
Source: Bangladesh Agricultural Research Council (BARC)

#### 4.2.13 Seismic zones of Bangladesh

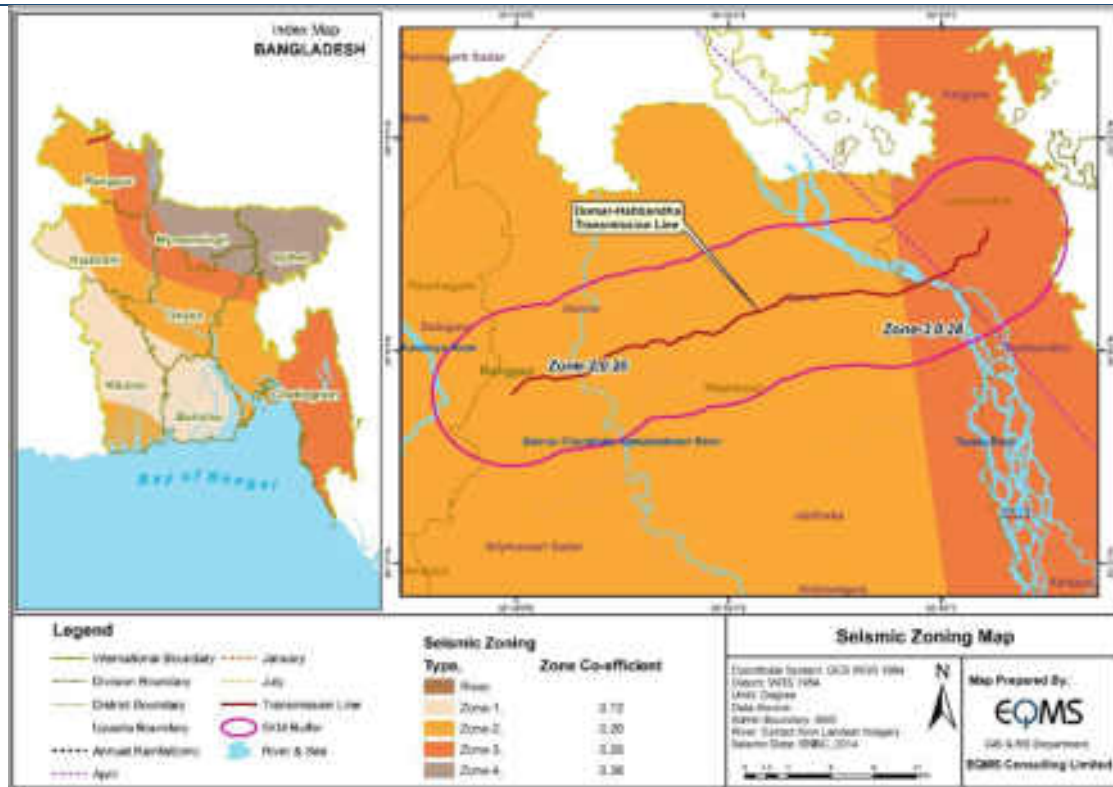
Bangladesh can be affected by moderate to strong earthquake events due to its proximity to the collision boundary of the Northeast moving Indian plate and the Eurasian Plate. Strong historical earthquakes with magnitude greater than 7.0 (Richter scale) have affected parts of Bangladesh in the last 150 years; some of them had their epicenters within the country. As per Bangladesh National Building Code (BNBC) seismic zoning map, Kushtia- Meherpur and Bagerhat-Pirojpur-Bhandaria alignment falls into Zone-1 having the coefficient of 0.12. Domar-Hatibandha alignment fall in the Zone-2, which has the zoning coefficient of 0.20. The seismic zoning map of Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria has been shown in Figure 4-14.



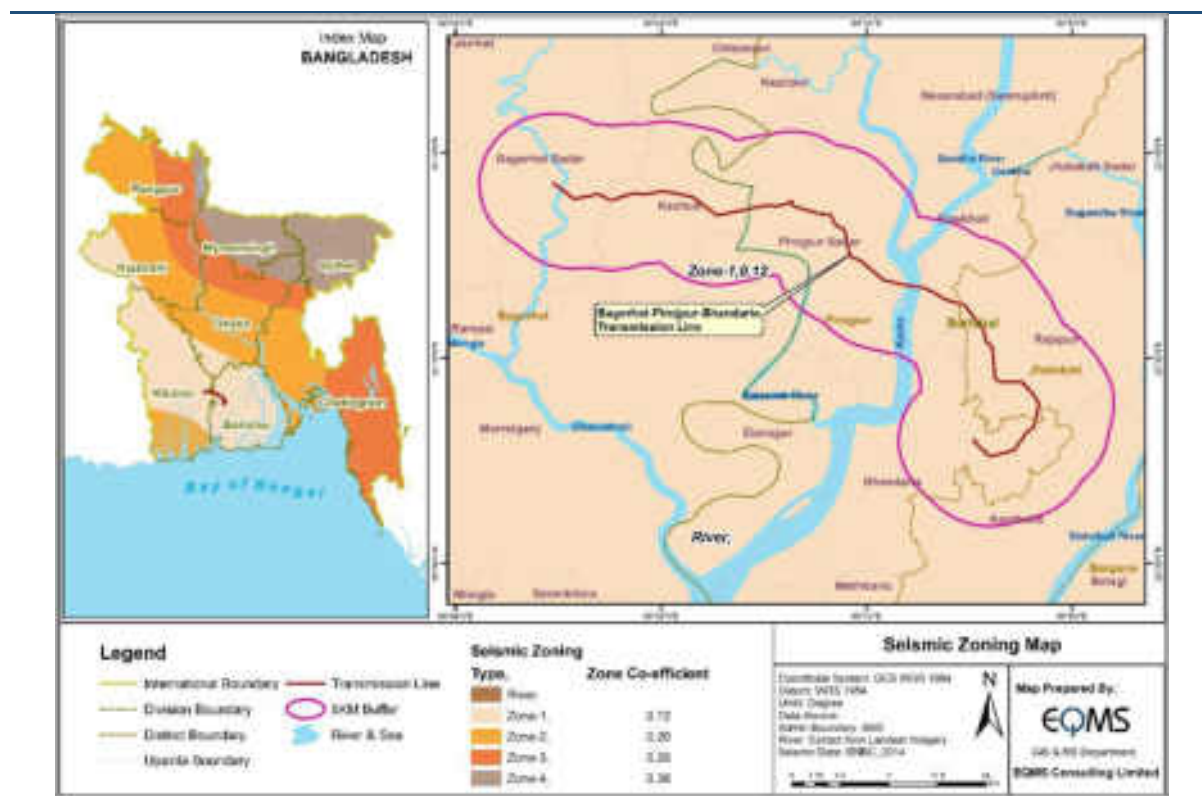
Figure 4-14: Seismic zoning of Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria



Kushtia- Meherpur



Domar-Hatibandha



Bagerhat-Pirojpur-Bhandaria

Source: Bangladesh National Building Code (BNBC)

## 4.2.14 Land Use Interpretation of the Study Area

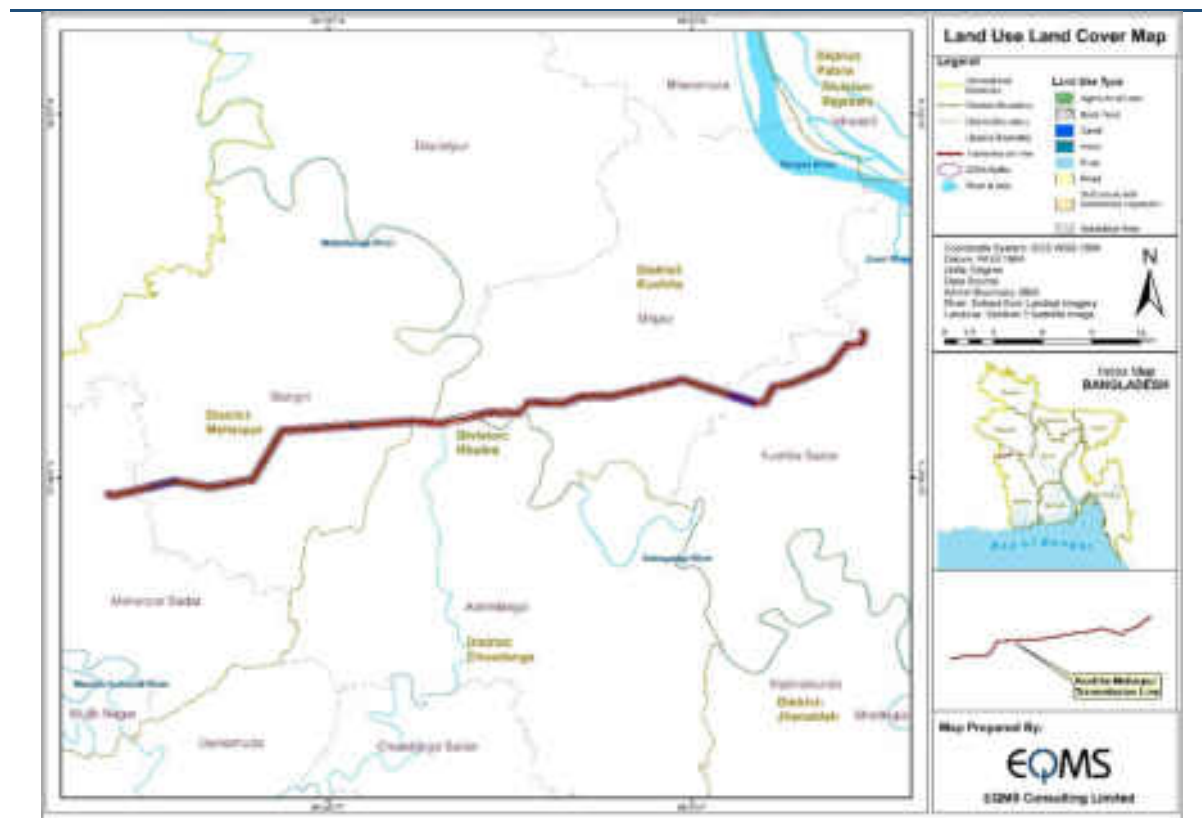
### 4.2.14.1 Kushtia- Meherpur

The predominant land use-land cover of 500 m buffer (250m each side of the alignment) of Kushtia-Meherpur route includes agriculture land (78.94 %) and settlement and homestead vegetation (9.76 %). Other category land-use and land cover in the study area includes pond (5.58 %) and canals (4.42 %), road (0.41), etc. During the survey, no settlements were found beneath the proposed transmission line route. The major waterbodies covered are ponds and canal, however, the transmission line will not pose any risk to seasonal habitats/ wetlands and birds. The land use of the study area is presented in Table 4-21 and Figure 4-15.

**Table 4-21: Land Use Pattern for Kushtia- Meherpur Route**

Type	Area (Acres)	Percentage
Agricultural Land	4644.76	78.94
Brick Field	45.64	0.78
Canal	260.14	4.42
Pond	328.57	5.58
River	3.92	0.07
Road	24.37	0.41
Settlement with homestead vegetation	574.48	9.76
Substation Area	2.12	0.04
<b>Total</b>	<b>5883.99</b>	<b>100.00</b>

**Figure 4-15: Land Use Map of Kushtia- Meherpur Route**



Source: GIS Mapping and Interpretation of Satellite imagery by EQMS

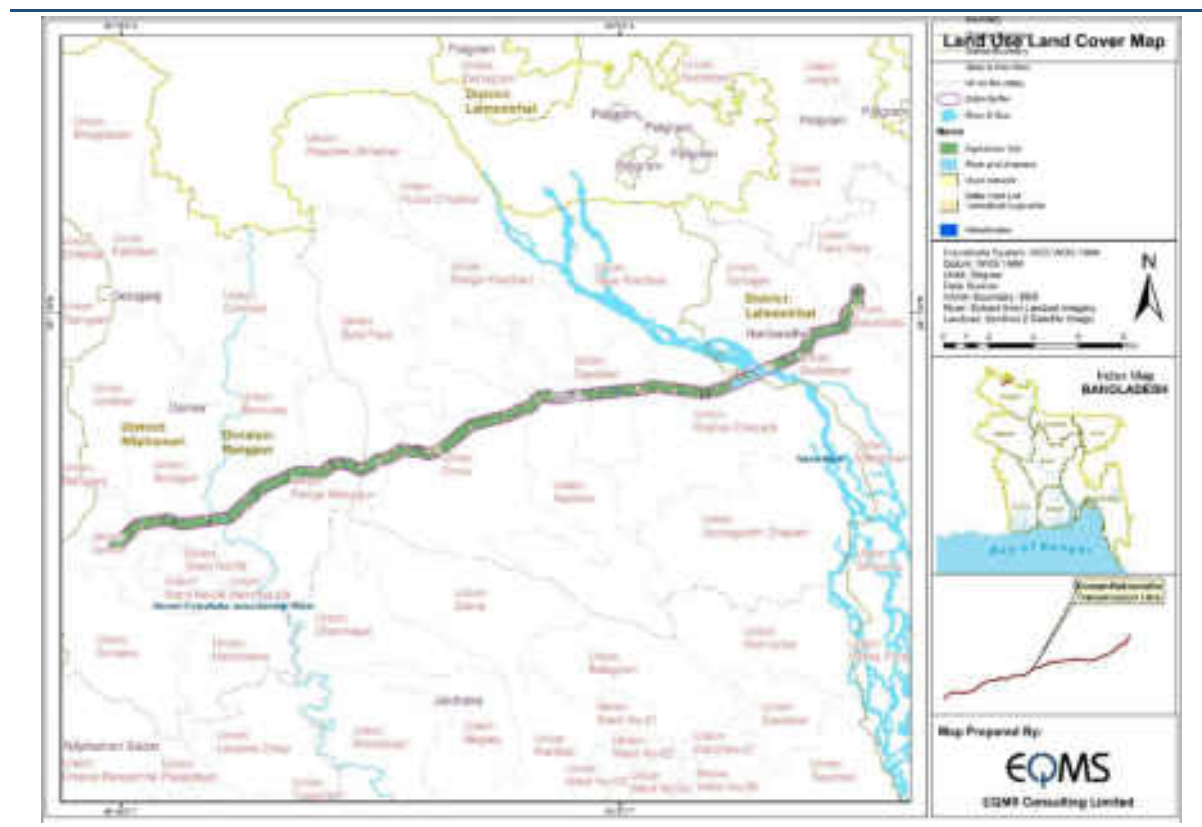
**4.2.14.2 Domar to Hatibandha**

The significant land use-land cover of 500 m buffer (250m each side of the alignment) of Domar to Hatibandha route includes agriculture land (75.24 %) and settlement and homestead (18.21%). Other category land-use and land cover in the study area includes river and channels (4.95 %) and waterbody (0.81 %) etc. During the survey, no settlements were found beneath the proposed transmission line route. The 132 kV transmission line will not pose any risk to seasonal habitats/wetlands and birds. The land use of the study area is presented in Table 4-21 and Figure 4-16.

**Table 4-22: Land Use Pattern for Domar to Hatibandha route**

Type	Area (Acres)	Percentage
Agriculture field	3267.71	75.24
River and channels	215.19	4.95
Road network	33.96	0.78
Settlement and homestead vegetation	790.99	18.21
Waterbodies	35.29	0.81
<b>Total</b>	<b>4343.13</b>	<b>100.00</b>

**Figure 4-16: Land Use Map of Domar to Hatibandha route**



Source: GIS Mapping and Interpretation of Satellite imagery by EQMS

#### 4.2.14.3 Bagerhat-Pirojpur-Bhandaria

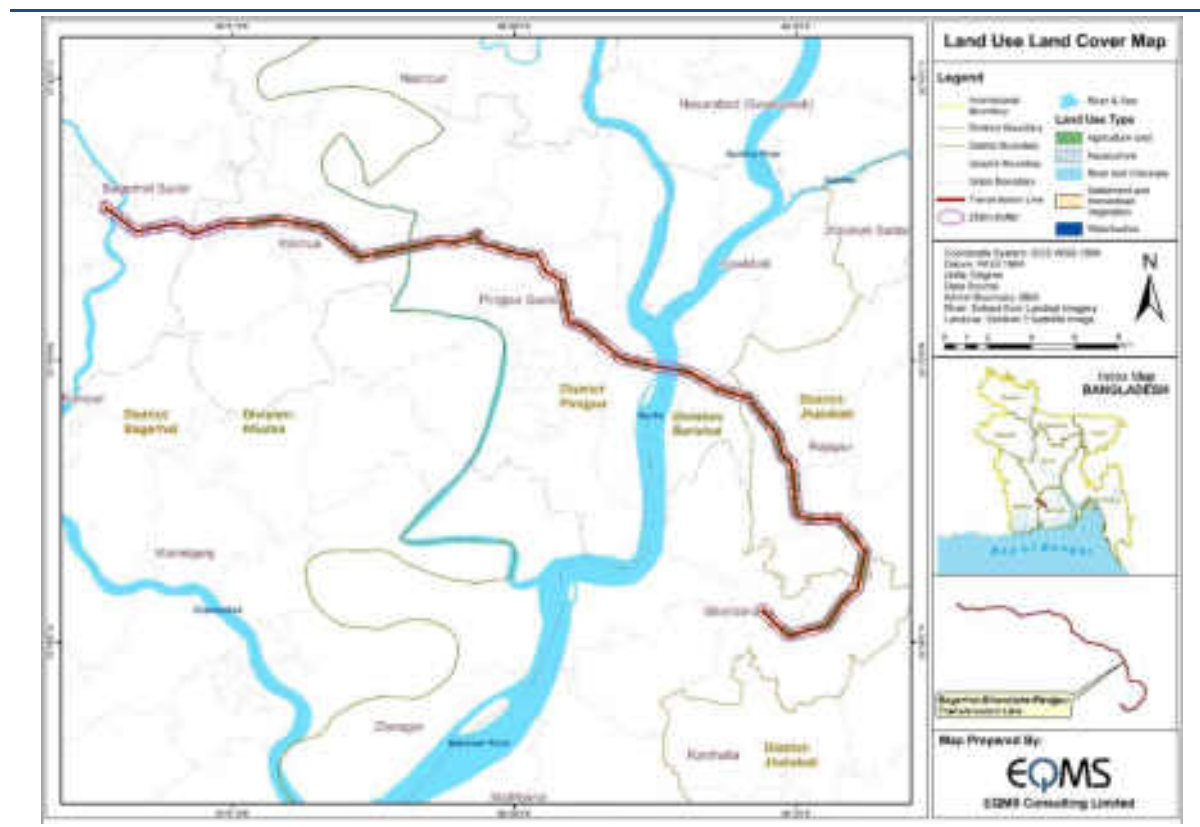
The significant land use-land cover of 500 m buffer (250m each side of the alignment) of Bagerhat-Pirojpur-Bhandaria route includes agriculture land (47.76 %) and settlement and homestead vegetation (42.56 %). Other category land-use and land cover in the study area includes aquaculture (6.55 %) and river and channels (0.20%) etc. During the survey, no settlements were found beneath the proposed transmission line route. The 132 kV transmission line will not pose any risk to seasonal habitats/wetlands and birds. The land use of the study area is presented in Table 4-21 and Figure 4-16.

**Table 4-23: Land Use Pattern for Bagerhat-Pirojpur-Bhandaria route**

Type	Area (Acres)	Percentage
Agriculture land	2919.91	47.76
Settlement and Homestead Vegetation	2602.25	42.56
Aquaculture	400.51	6.55
River and Channels	179.16	2.93
Waterbodies	12.12	0.20
<b>Total</b>	<b>6113.94</b>	<b>100.00</b>



**Figure 4-17: Land Use Map of Bagerhat-Pirojpur-Bhandaria route**



Source: GIS Mapping and Interpretation of Satellite imagery by EQMS

### 4.3 Bio-Ecological Zones

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

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

#### 4.3.1 Diversity of Floral and Faunal Species

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

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



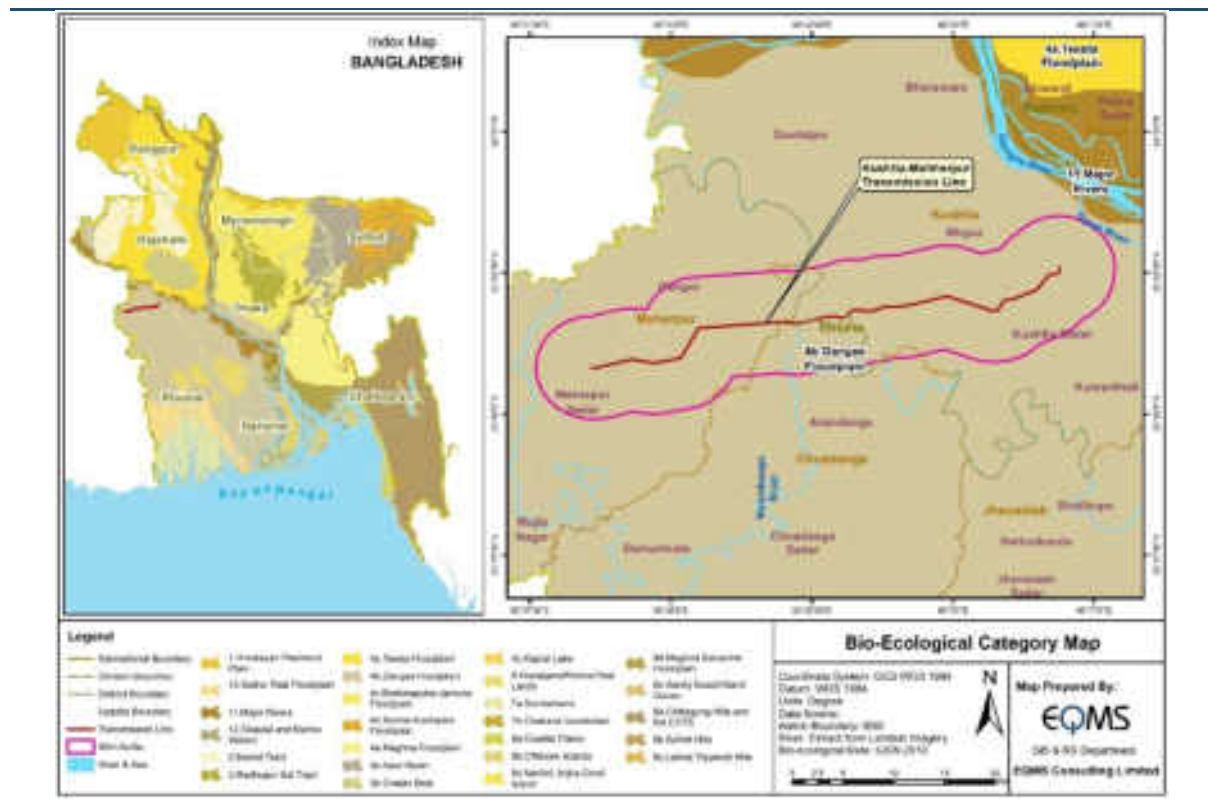
transmission line. Different size of bamboo must be cleared in the ROW as it is considered the fastest growing species.

As per EQMS Survey 2022, In Domar- Hatibandha transmission line, the number of trees estimated in the 12 m clearing width of the line was 152 (>5 m in height). The common trees are Eucalyptus, Acacia, Litchi, Margosa, Samanea saman (Renty Korol) and Mahogany. The number of trees in the clearing width which are less than 5 m in height was 192.

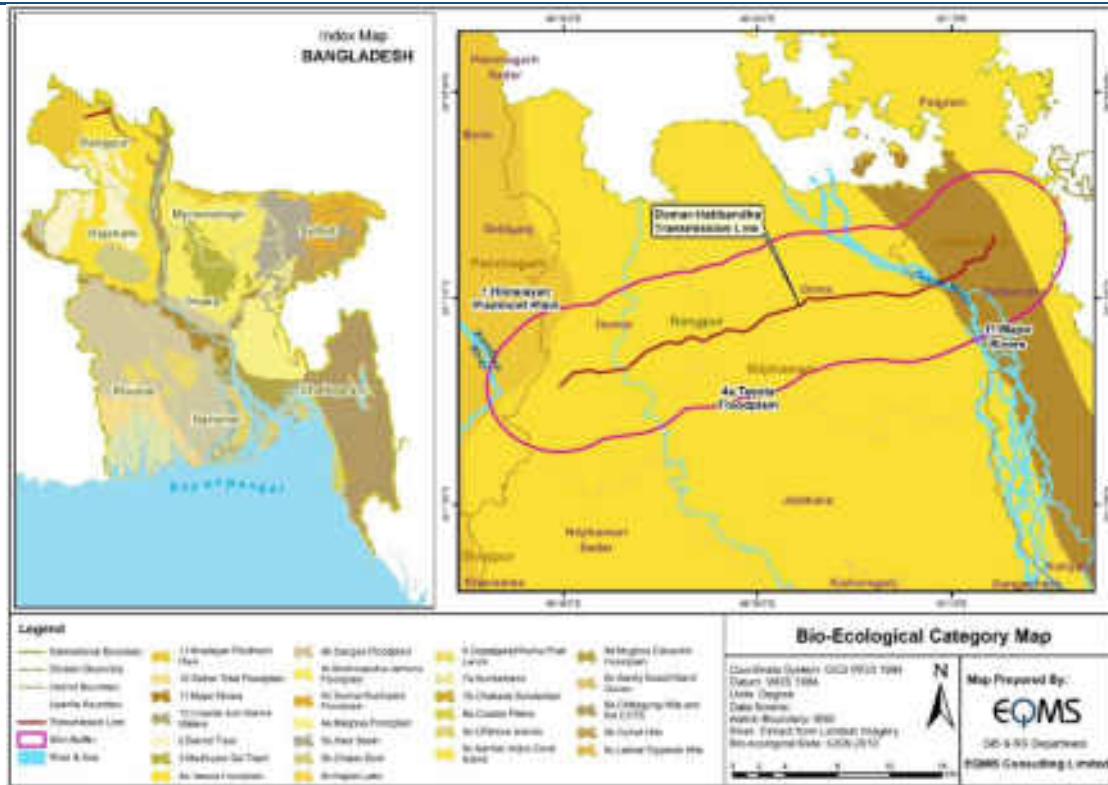
The trees which are greater than 5 m in height found in the direct impact zone (12 m clearing width) of the Bagerhat-Pirojpur-Bhandaria transmission Line is 474 excluding bamboo and banana trees. The trees less than 5 m in height recorded at 70 within the direct impact zone. The common tree species are Eucalyptus, Mahogany, Margosa, Palmyra, and Dalbergia (Shisu).

No IUCN Red listed threatened species were recorded during site visit walkover. Major waterbodies covered in the alignments are rivers and gher. The proposed transmission line will not pose any risk to seasonal habitats/wetlands and birds. Bio-ecological Zones of Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria is shown in Figure 4-18.

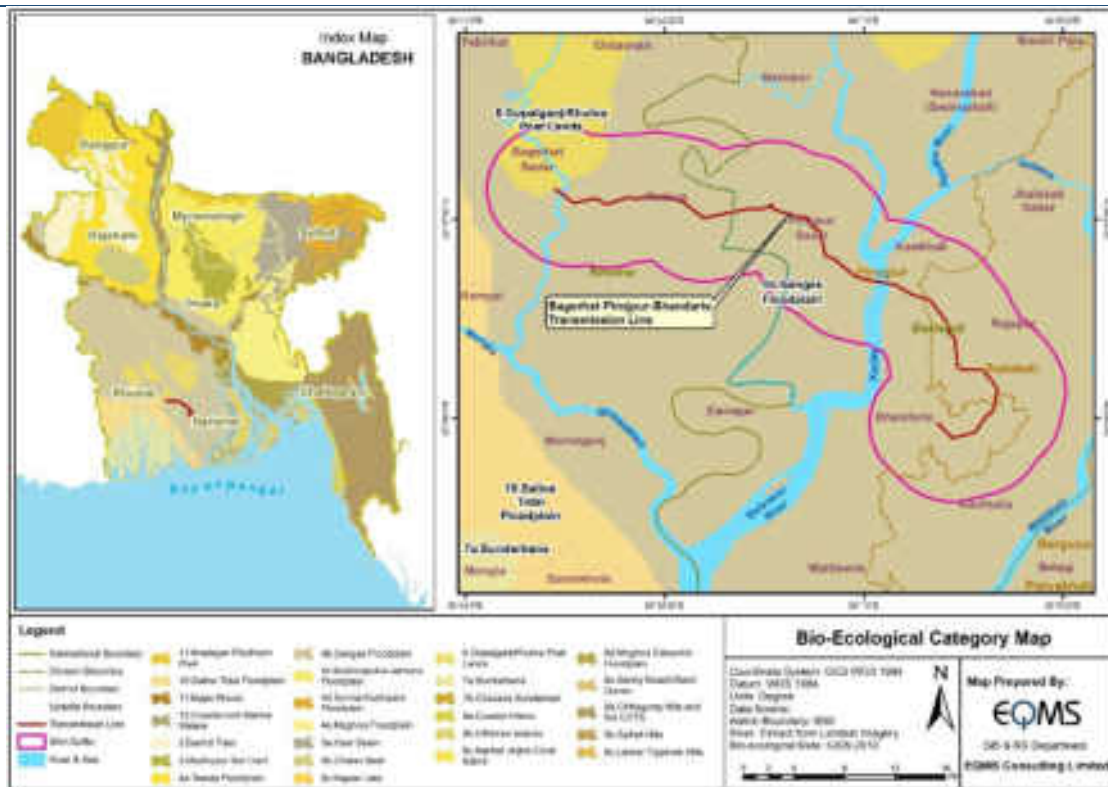
**Figure 4-18: Bio-ecological Zones of Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria**



Kushtia- Meherpur



Domar-Hatibandha



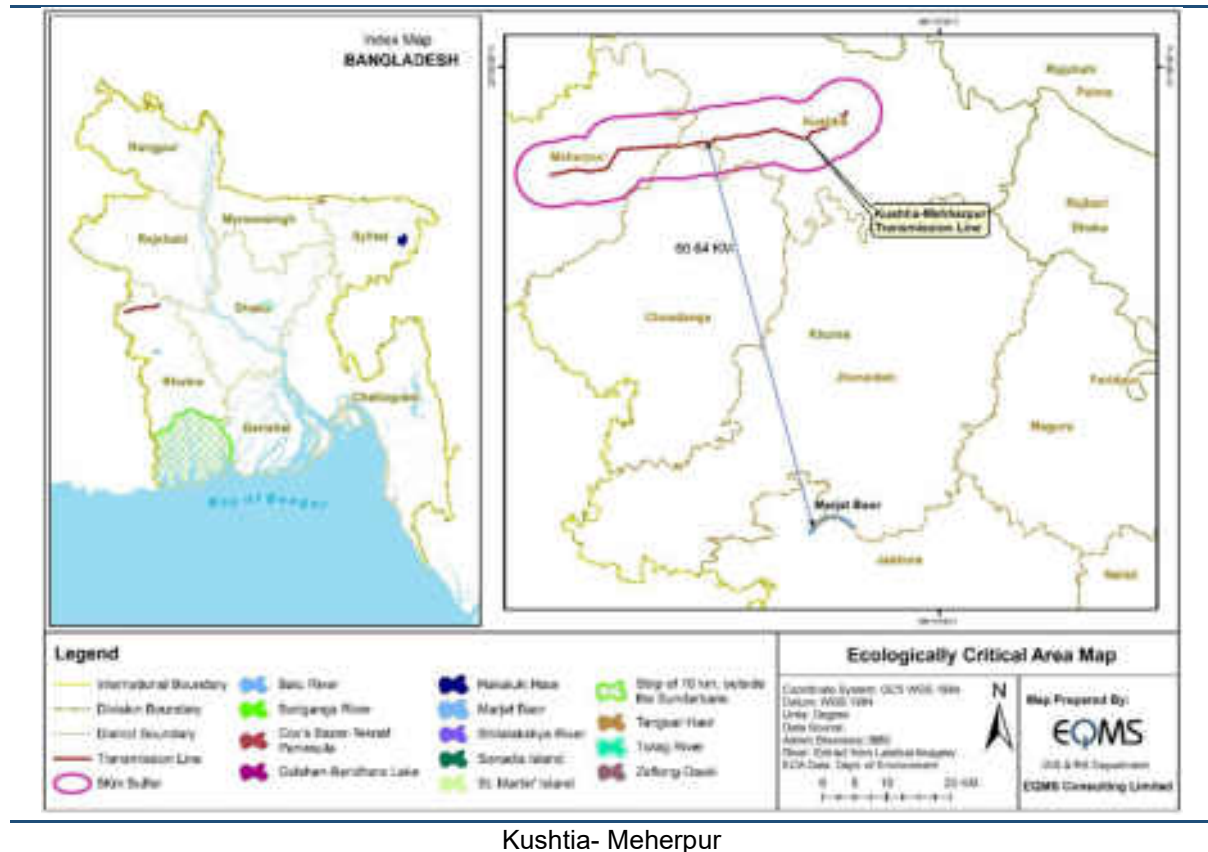
Bagerhat-Pirojpur-Bhandaria

Source: International Union for Conservation of Nature (IUCN)

### 4.3.2 Ecologically Critical Area (ECA)

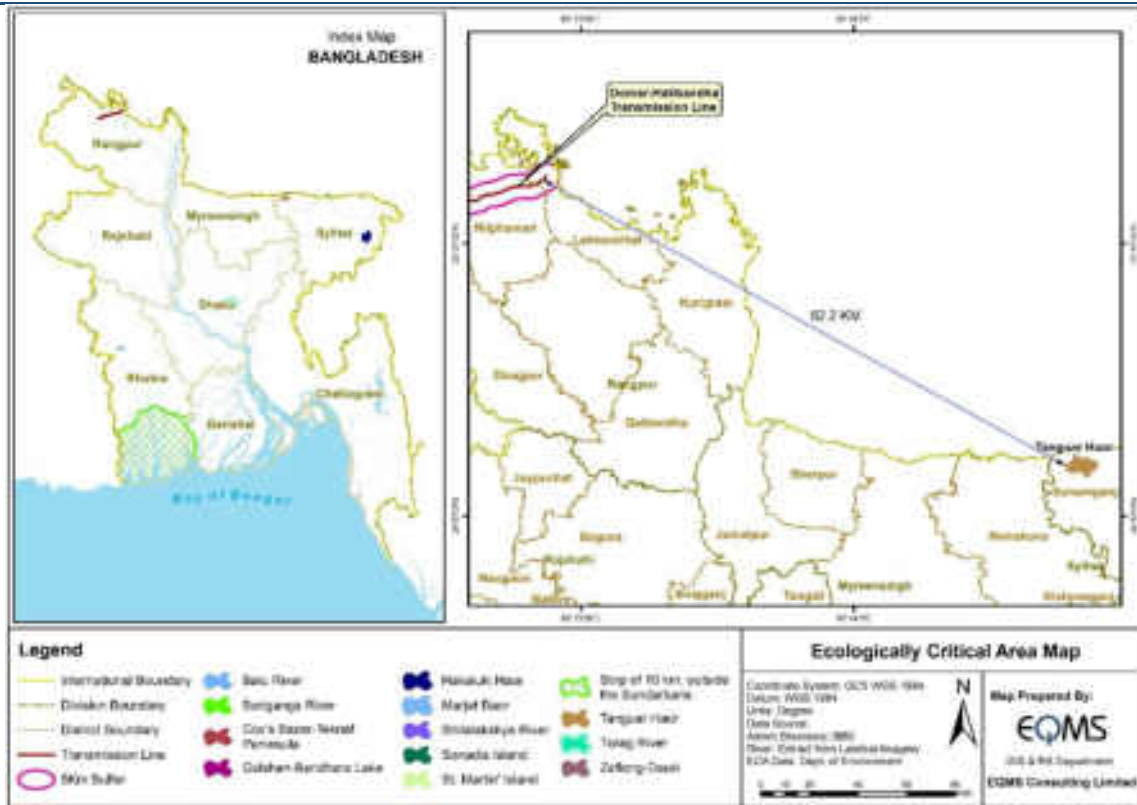
The nearest ECA from the Kushtia- Meherpur alignment is Marjat Baor which is 60.64 km away from the route. ECA Tanguar haor is 62.2 km away from the Domar-Hatibandha route. The nearest ECA from the Bagerhat-Pirojpur-Bhandaria alignment is strip of 10 km outside the Sundarbans 18.1 km away from the line. The ECAs near transmission lines of Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria is shown in Figure 4-19.

**Figure 4-19: ECAs near transmission lines of Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria**

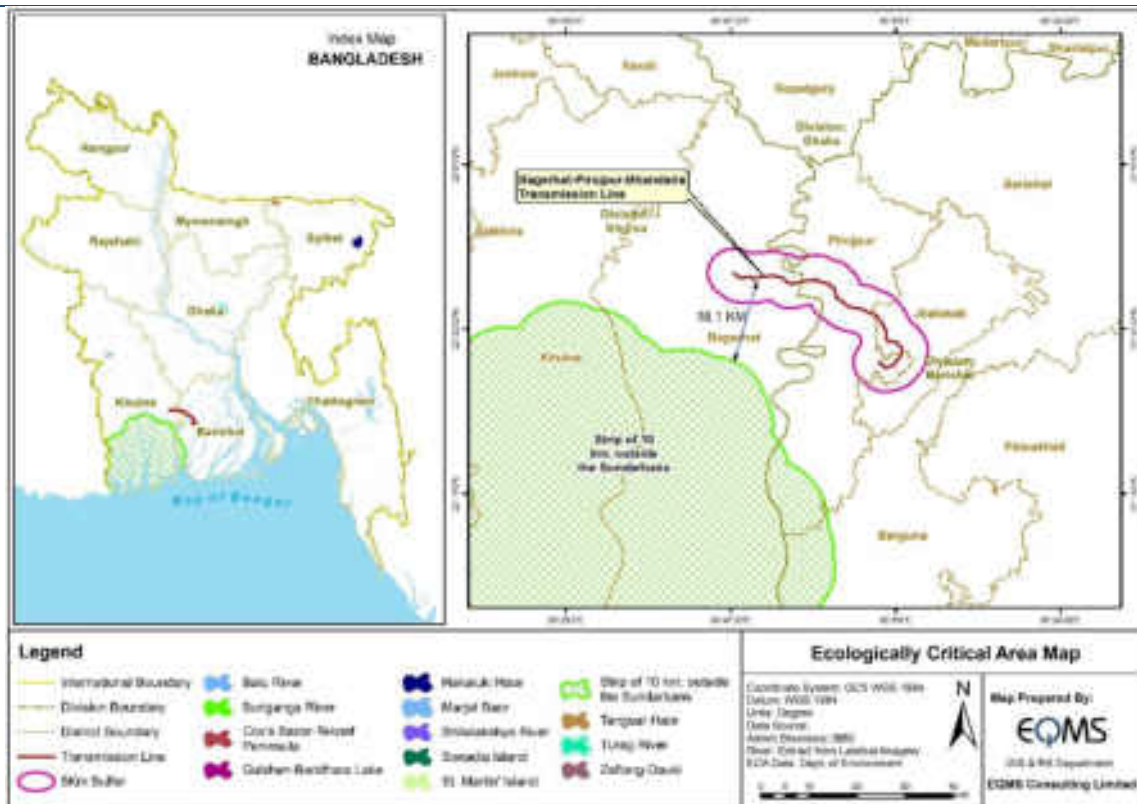


Kushtia- Meherpur





Domar-Hatibandha



Bagerhat-Pirojpur-Bhandaria

Source: Department of Environment (DOE)

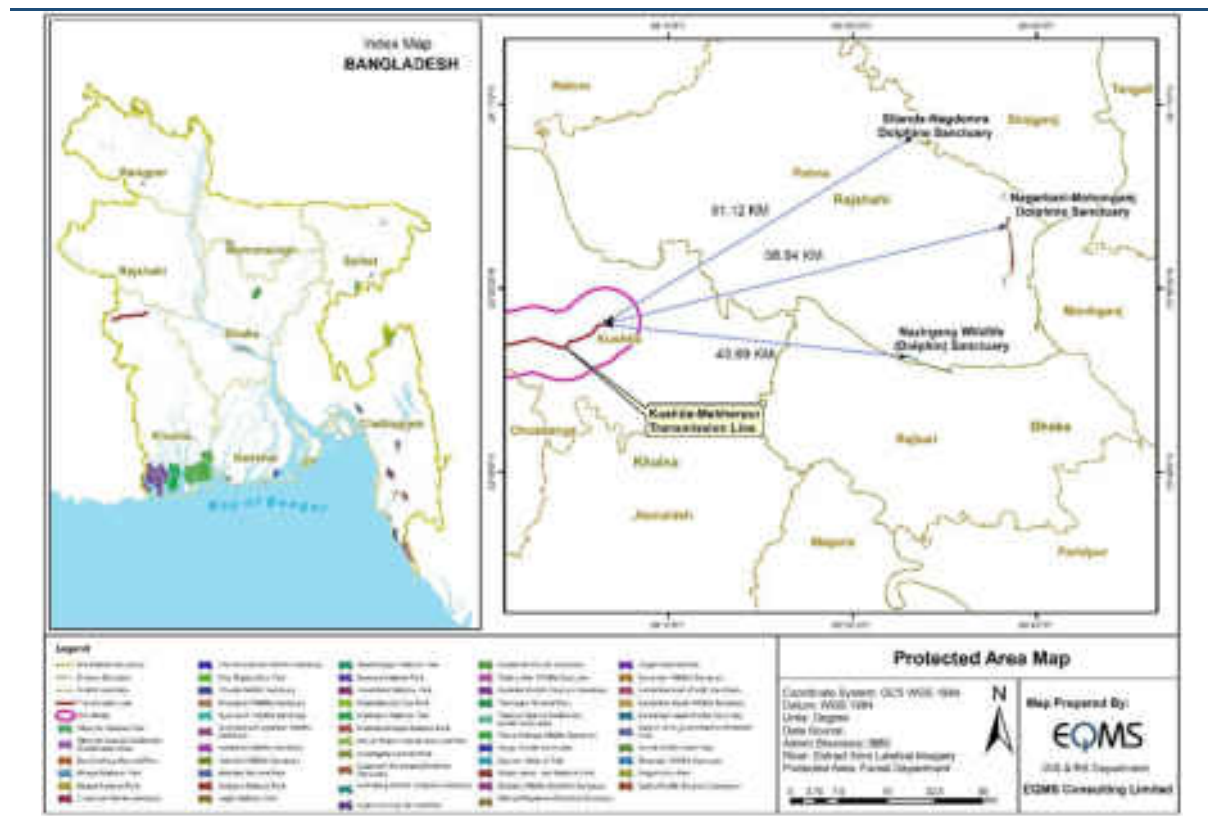


### 4.3.3 Protected Areas

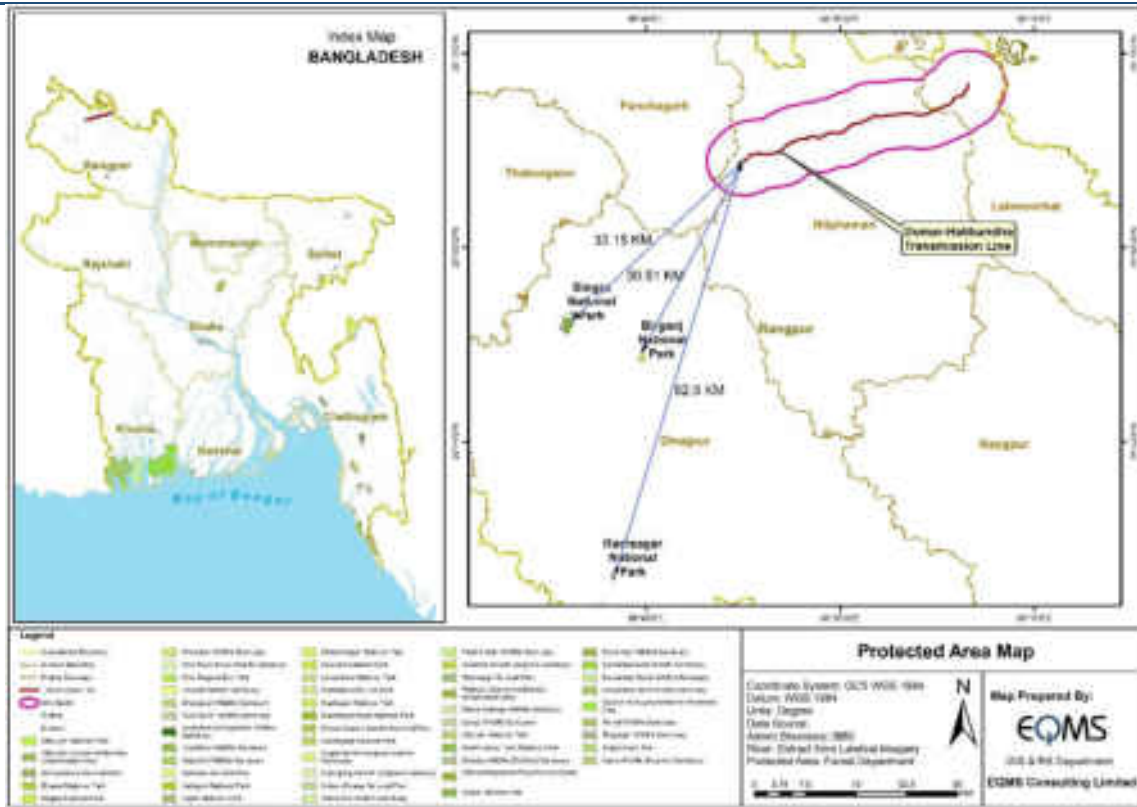
The nearest protected areas that are situated in the North-East corner from Kushtia- Meherpur transmission line are: Silanda- Nagdemra Dolphin Sanctuary (51.12 km), Nagarbari- Mohonganj Dolphin Sanctuary (58.64 km) and Nazirgang Wildlife Sanctuary (43.69 km). The nearest protected area from Domar-Hatibandha route is Birganj National Park (30.51 km). The nearest protected area from Bagerhat-Pirojpur-Bhandaria route is Pankhali Wildlife (Dolphin) Sanctuary (25.6 km) and Chandpai Wildlife Sanctuary (30.5km).

During the site visit and consultation with PGCB, it has been confirmed that no tower will be constructed in the river. It was also confirmed that the original route crossed the river, however, no TL tower was scheduled there as well. As a result, no significant impact is anticipated due to the construction of the alignments.

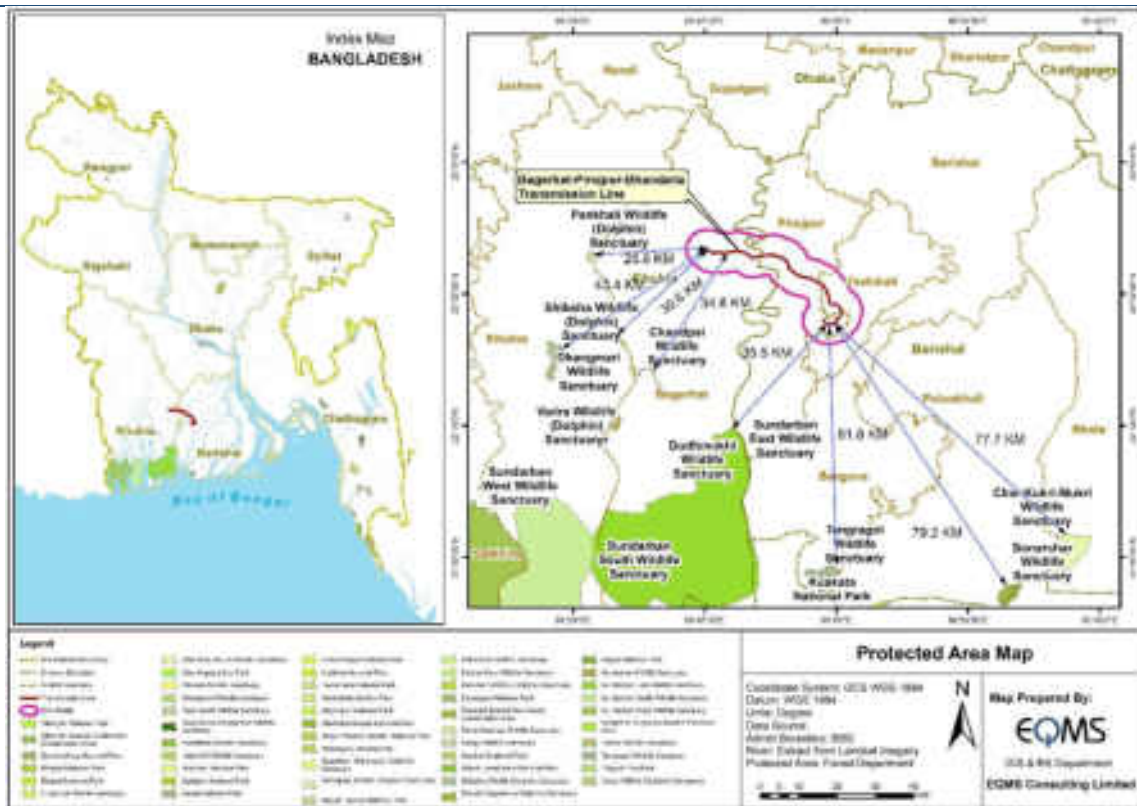
**Figure 4-20: Protected areas near transmission lines of Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria**



Kushtia- Meherpur



Domar-Hatibandha



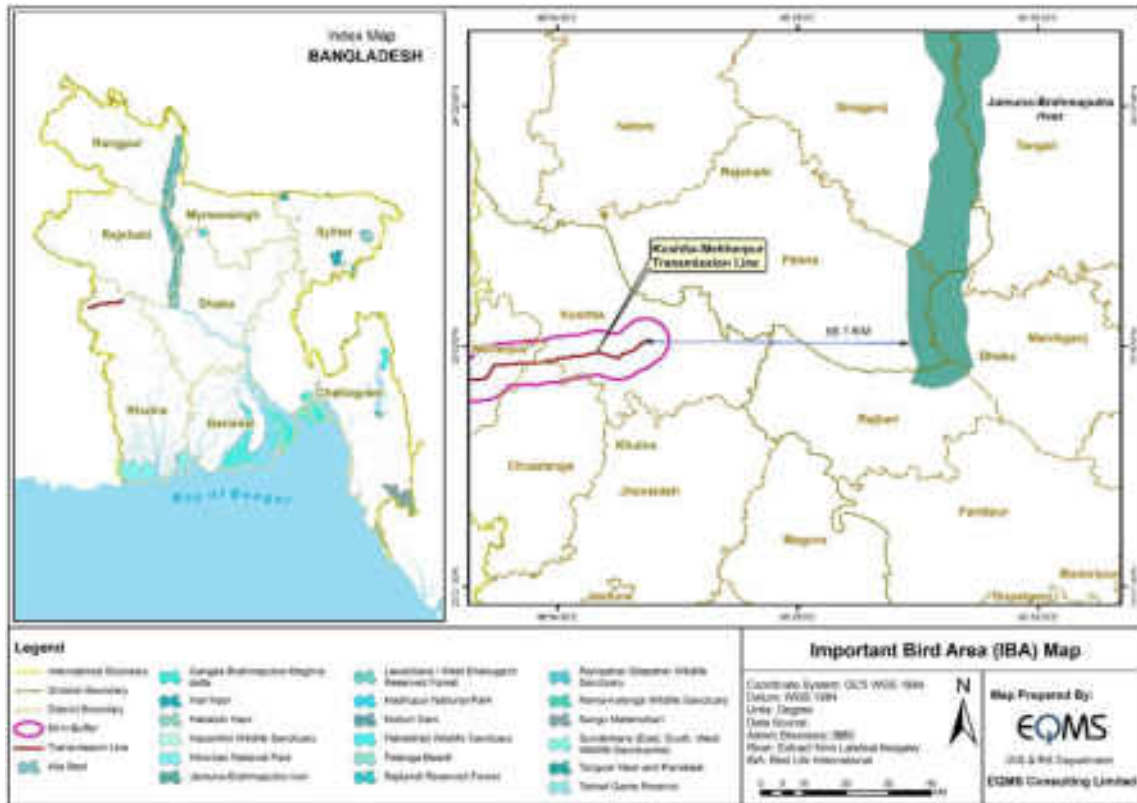
Bagerhat-Pirojpur-Bhandaria

Source: Forest Department (FD)

### 4.3.4 Important Bird Areas

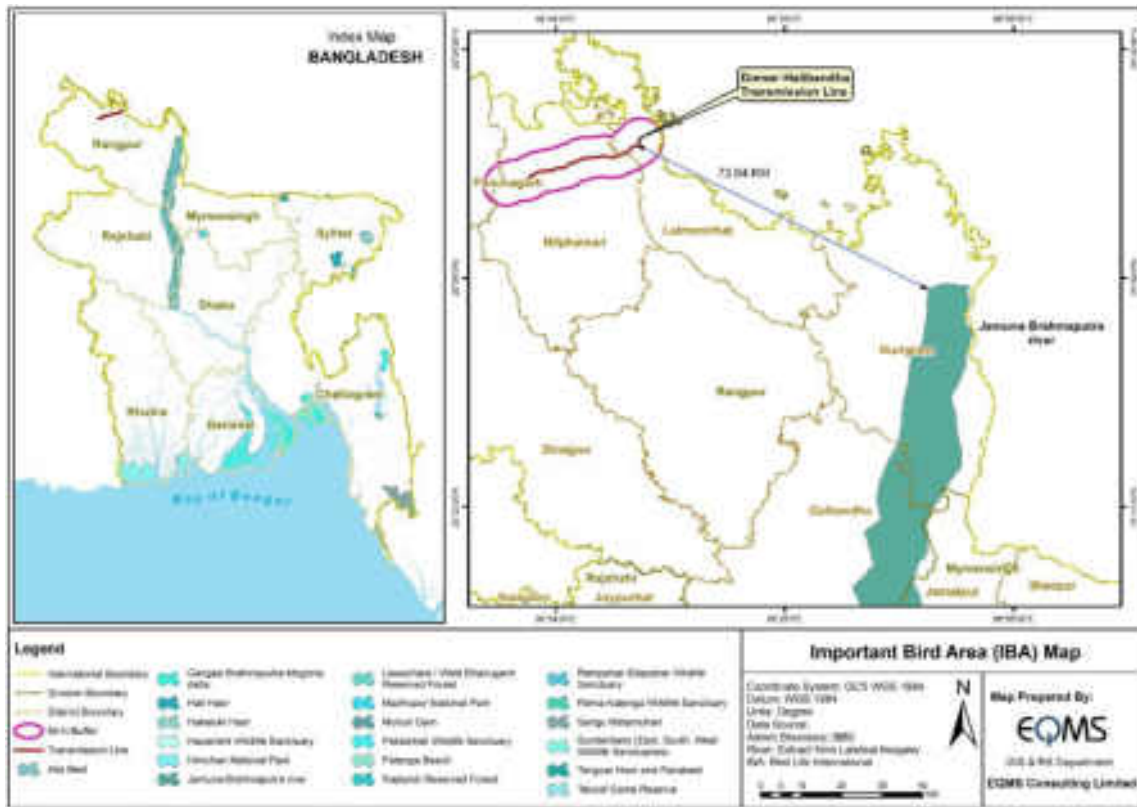
Bangladesh’s Important Bird Areas (IBAs) cover less than 4% of the total land area of the country, reflecting the great reduction and fragmentation of natural habitats. However, additional sites are likely to be added to this preliminary list of IBAs in the future. Of the 20 IBAs in Bangladesh, 11 support globally threatened species, 10 have biome-restricted species and nine qualify as IBAs because they hold large congregations of water birds. Ten IBAs (53%) contain examples of terrestrial forest ecosystems, which together cover all significant areas of forest known to remain in Bangladesh. They include the Indo- Malayan tropical dry forests in Madhupur National Park (IBA 1) to the north of Dhaka, three IBAs in north-eastern Bangladesh where Indochinese tropical moist forest is the dominant biome, and six IBAs in the Chattogram hill tracts in the south-east of the country, where Indochinese tropical moist forest and Sino-Himalayan subtropical forest are the main habitats. The nearest IBA, the Jamuna – Brahmaputra River is located at 56.1 km away from the Kushtia- Meherpur route and about 73.64 km away from the Domar-Hatibandha route. The nearest IBA, Ganges- Brahmaputra- Jamuna Delta is located at 43.3 km away from the Bagerhat-Pirojpur-Bhandaria route. Figure 4-21 shows the transmission alignments and the nearest IBAs.

**Figure 4-21: Project locations and nearest Bird Staging Areas (IBA) in Bangladesh**

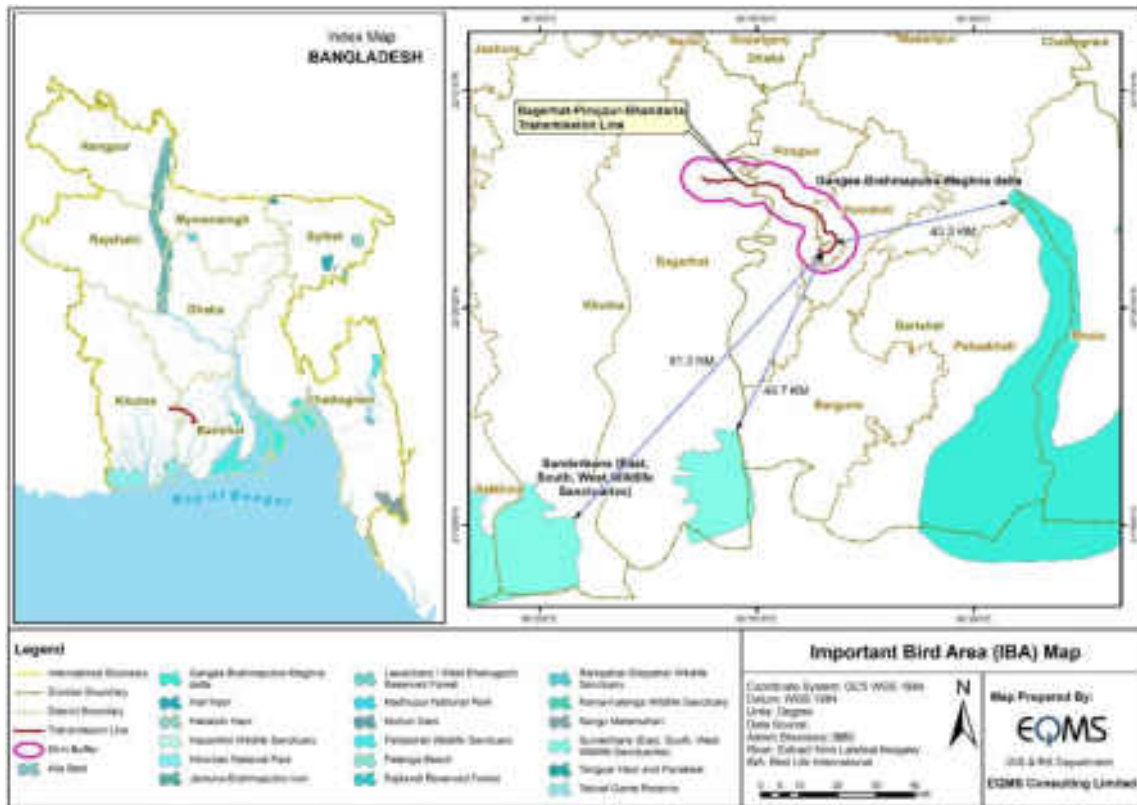


Kushtia- Meherpur





Domar-Hatibandha



Bagerhat-Pirojpur-Bhandaria

Source: BirdLife International



## 4.4 Socio- economic Information and Profile

### 4.4.1 Kushtia to Meherpur

#### 4.4.1.1 Introduction

A total of 117 HHs comprising 474 people will be affected by the project with average HH size 4.05 which is slightly higher than the national average (4.0)<sup>5</sup> according to BBS (2022). The socio-economic profile of the 117 affected HHs is presented in following **Table 4-24**.

**Table 4-24: General Profile of Affected Population**

1	Number of total affected households	117
2	Number of total populations	474
3	Average HH size	4.05

Source: Socioeconomic Survey, EQMS, July 2022

#### 4.4.1.2 Demographic Profile of Affected HHs

Demographic profile of the affected households has been analyzed as part of socioeconomic profile of the project area. This comprises of gender profile and age-sex distribution of the PAPs. In the study area, about 117 households (HHs) were surveyed with a total population of that will be influenced by the implementation of the proposed project. The average sex ratio is 121.5 (National average 98.04) and the average household size is 4.05. **Table 4-25** shows the demographic profile in the project area.

**Table 4-25: Demographic Profile of Affected Households**

District Name	Upazilla	Total HHs	Total Pop	Sex Ratio	Avg. HH Size
Meherpur	Gangni	45	173	121.8	3.84
Chuadanga	Alamdanga	10	49	122.7	4.90
Kushtia	Bettipara	3	12	200.0	4.00
	Kushtia Sadar	17	63	133.3	3.71
	Mirpur	42	177	113.3	4.21
Totals		117	474	121.5	4.05

Source: Socioeconomic Survey, EQMS, July 2022

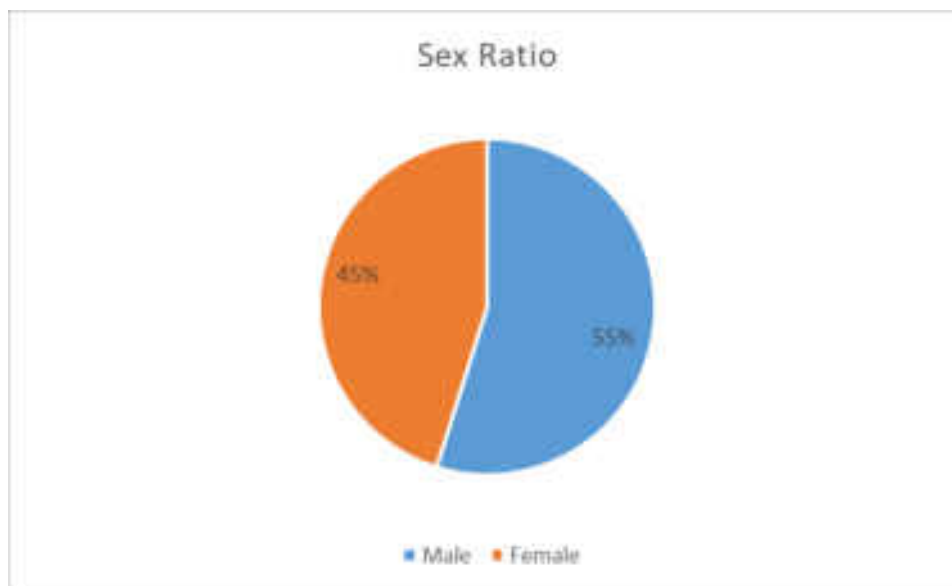
#### 4.4.1.3 Sex Profile of Affected Populations

Sex profile of the affected populations is shown in **Figure 4-22**. From the sex profile, we can find out that the percentage of male populations (55%) is higher than that of the females (45%) in the project area. The overall male female ratio of the project area is 100:121.5 (the national ratio is 100:98.04)

<sup>5</sup> Population and Housing Census Preliminary Report August 2022

which implies that the project area is quite different from the corresponding national condition with a higher male population.

**Figure 4-22: Sex Profile of Affected Populations**

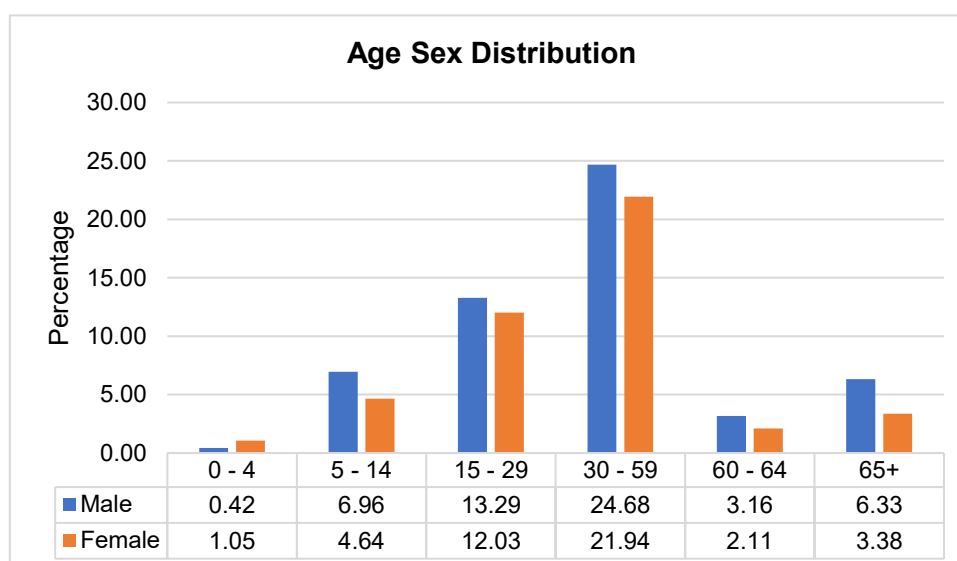


Source: Socioeconomic Survey, EQMS, August 2022

**4.4.1.4 Age and Sex Distribution of Affected Population**

The survey findings indicate that population percentage increases respectively from the age group of 5-14 years. According to the age group distribution, the most prominent one is 30-59 years, which comprises of 24.68% of the total male population and 21.94% of the total female population. The numbers of affected persons steadily decrease at age limit 60-64 years. The steady decline in the number of populations after this age limit can be considered significant for low life expectancy in the region. **Figure 4-23** presents age-sex distribution of the affected Populations.

**Figure 4-23: Age Sex Distribution of the PAPs**



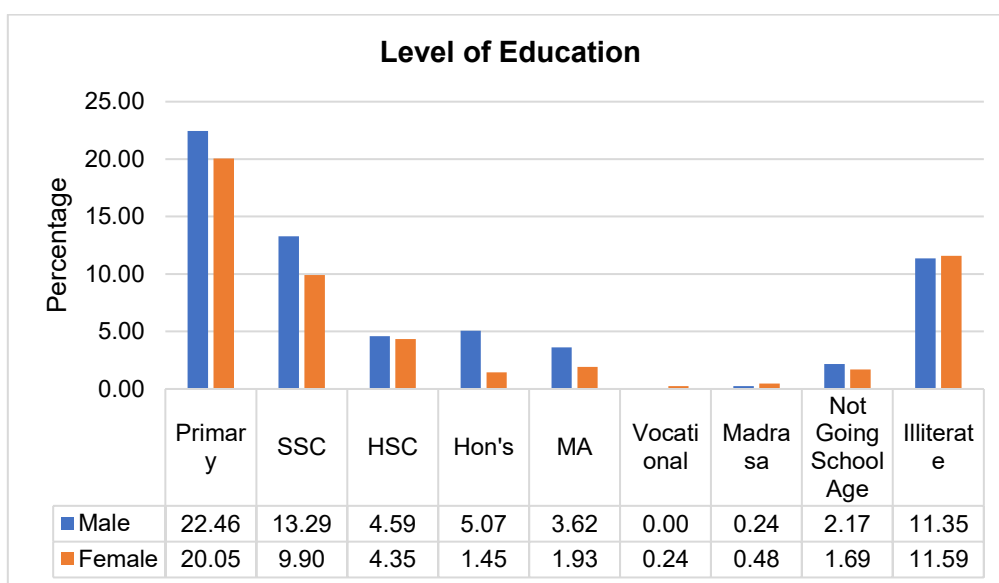
Source: Socioeconomic Survey, EQMS, July 2022

#### 4.4.1.5 Level of Education of the PAPs

The table demonstrates that primary and secondary level enrolment is high in the area. It also indicates that higher education rate is comparatively higher among male population. Furthermore, illiteracy is slightly high among female population. Education level of the affected population is presented in the below **Figure 4-24**.

As per the consultation and site visit, there were no educational institutions under the transmission lines. Survey team found Khorompur Government Promary School, Purba Malshadha Primary School, Lutfunnesa Maddhomik College, Raypur High School, Arshed Ali Maktob and Rajarpara Hemayetpur Govt Primary School are distanced from the line approximately 500 meters. During consultation and socio-economic survey, consultants found that the proposed project will not hamper the regular activities of these educational institution.

**Figure 4-24: Level of Education of the PAPs**

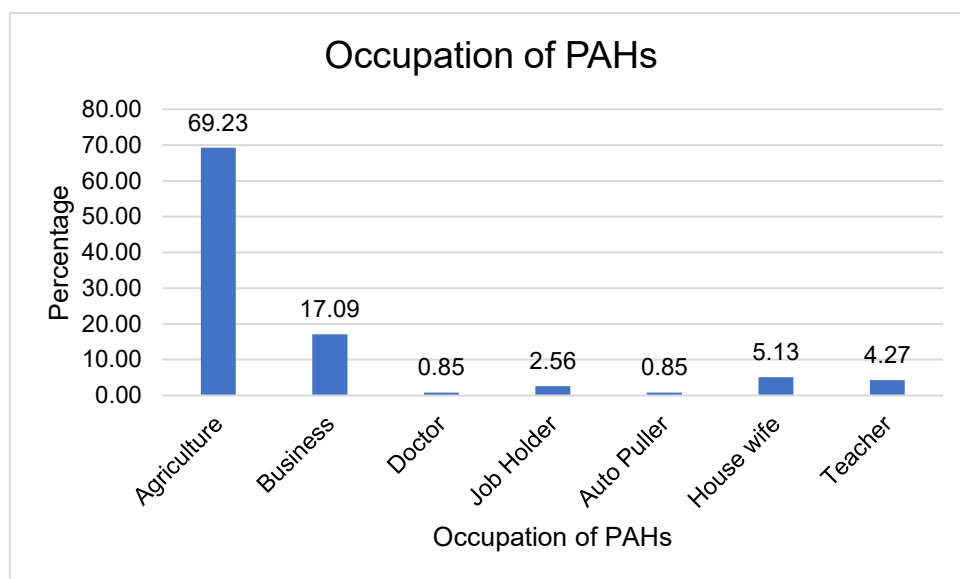


Source: Socioeconomic Survey, EQMS, July 2022

#### 4.4.1.6 Primary Occupation of PAHs

According to the census of the affected households 69.23% HHs primary occupation is agriculture. There will not be any impact on their income as compensation will be paid for the entire construction period and after construction period; affected HHs will be able to use land as usual. Based on the income level, their socio-economic condition is better than rest of the population in that region. In addition to Agriculture, the other significant occupations are business, service, teaching etc.

**Figure 4-25: Occupation of PAH**

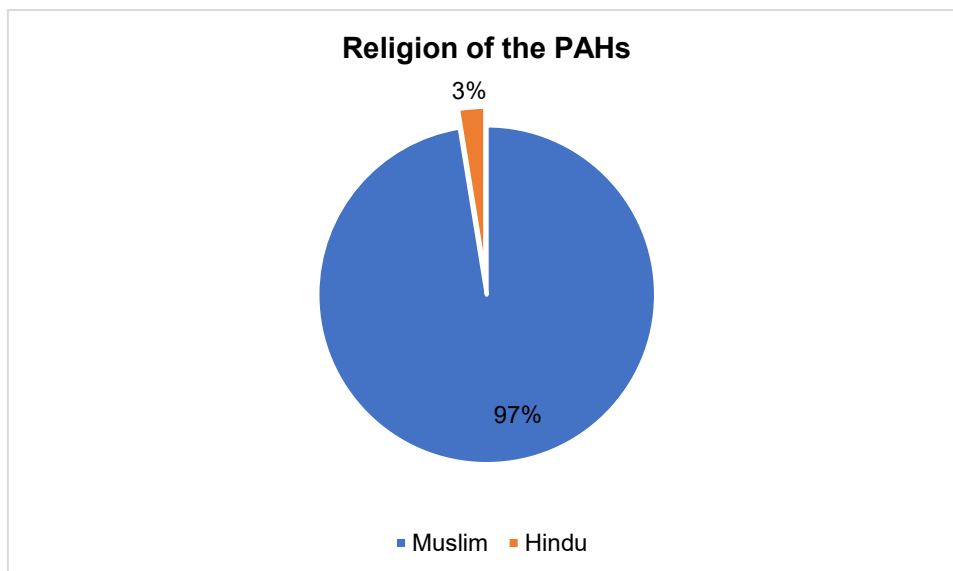


Source: Socioeconomic Survey, EQMS, July 2022

**4.4.1.7 Religion of the Affected Households**

The religious background of the affected HHs is presented in **Figure 4-26**, revealing that 97% of affected household are Muslim. On the other hand, only 3% of the affected households are Hindu in religion in this project area.

**Figure 4-26: Religion of PAHs**



Source: Socioeconomic Survey, EQMS, July 2022

**4.4.1.8 Income of the Affected HH**

The average monthly incomes of 41.03% households are Tk 10,000 to 20,000. Another 20.51% have monthly incomes ranging from Tk 20,000 to Tk 30,000. Households receiving monthly incomes between Tk 30,000 to Tk 40,000 are 10.26%. Monthly incomes of the below 10,000 are 25.64%. Around only 2.56% of households earn more than 40000 per month. As per the official poverty line of Bangladesh,



households earning an annual income of less than Tk 65000 are considered those living below the poverty line. **Table 4-26** shows the monthly income range of the affected households.

**Table 4-26: Monthly Income of the AHHs**

Income Range	Frequency	Percent (%)
Below 10000	30	25.64
10000 - 20000	48	41.03
20000 - 30000	24	20.51
30000 - 40000	12	10.26
40000 - 50000	2	1.71
Above 50000	1	0.85
Total	117	100.00

Source: Socioeconomic Survey, EQMS, July 2022

#### **4.4.1.9 Basic Amenities at Household Level**

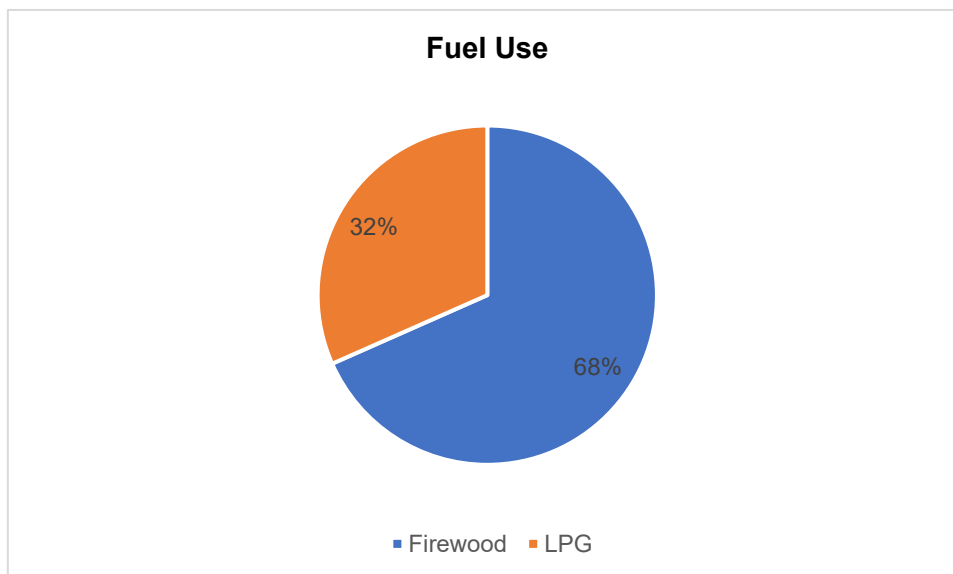
##### **4.4.1.9.1 Energy Use of PAHs**

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

##### **4.4.1.9.2 Fuel Sources of PAHs**

Firewood is the main source of energy used by most of the households (68%) for cooking and boiling purposes followed by 32% using liquefied petroleum gas, particularly by people living closer to urban areas. Below **Figure 4-27** shows the source of fuel of the affected area.

**Figure 4-27: Fuel Source of PAHs**



Source: Socioeconomic Survey, EQMS, July 2022

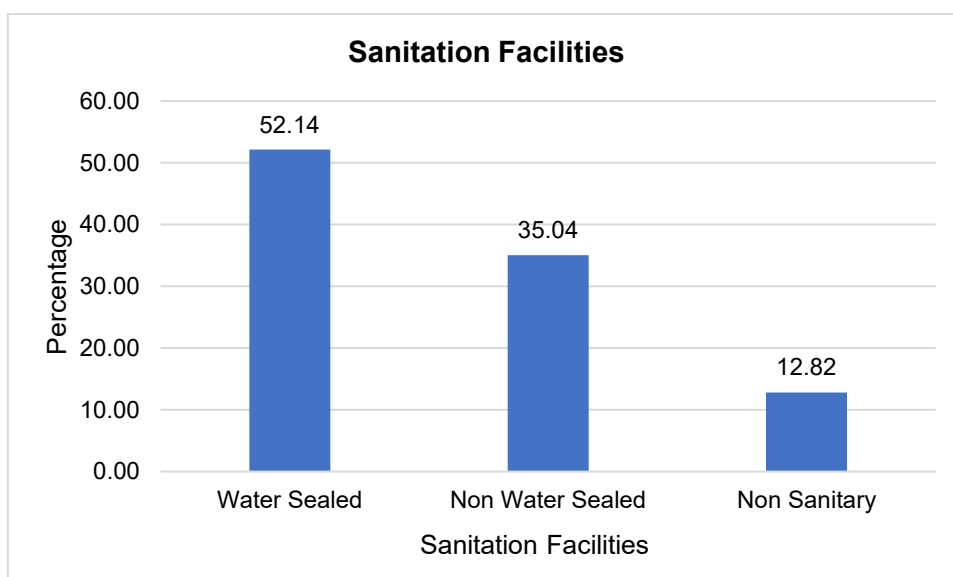
**4.4.1.9.3 Water Source of AHs**

The source of drinking water is tube-well where about all (100%) people use tube-well water. The uses of river water for the domestic purposes were not recorded during the census. During the site visit and consultation with the local community, landowners, and the women group; no tube wells (shallow/deep) were identified under the transmission line /in the ROW.

**4.4.1.9.4 Sanitation Facilities of AHs**

About 52.14% and 35.04% of households use water sealed and non-water-sealed sanitary latrine facility, respectively, whereas only about 12.82% households use non-sanitary facilities. The following **Figure 4-28** shows sanitation facility of the project area.

**Figure 4-28: Sanitation Facilities of the AHs**



Source: Socioeconomic Survey, EQMS, July 2022

#### 4.4.1.10 Transportation and Communications

Road condition of the project area is shown in **Table 4-27**. All of these internal communication roads are metaled roads. A total of 449.43 km roads of the study area are metaled road. During the survey it has been observed that the proposed transmission towers will not interfere with the roads and local transportation systems.

**Table 4-27: Road Condition of the Project Area**

Upazilla	Unmetalled Road (km)	Metaled Road (km)	Total (km)
Gangni	0.00	71.79	71.79
Mirpur	0.00	142.25	142.25
Alamdanga	0.00	118.10	118.10
Kushtia Sadar	0.00	117.29	117.29
<b>Total</b>	<b>0.0</b>	<b>449.43</b>	<b>449.43</b>

Source: LGED Database

The transmission line will cross the internal roads communication such as the Gangni Road, Hemayetpur - Chandpur Road, Ayelchara Road and Kaburhat Road. Most of these internal communication roads are Semi metaled and Metaled roads. The proposed transmission line from Kushtia to Meherpur crosses a river named Kajla River. No towers will be constructed in the river. The average distance between the towers will be 200m in this river crossing.

#### 4.4.1.11 Common Property Resources

##### 4.4.1.11.1 Religious Institution

No religious institutions were found under the transmission line/ in ROW during the site visit and socio-economic survey. Some religious institutions such as Mosque and Mandir are located within the 500 meters radius from the proposed transmission line, however, they will not be hampered due to the construction of transmission line.

##### 4.4.1.11.2 Hat - Bazar

There are some local markets such as Gopalnogor Hat, Morka Bazar, Kursha Bazar, Majhi hat, Foysal New Market and Muntaj ali Super Market in the nearest location of proposed transmission line. The regular activities of local market will not be hampered for the construction of transmission tower.

#### 4.4.1.12 Physical Cultural Resources

According to ADB SPS 2009<sup>6</sup>, physical cultural resources are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance.

As per socio-economic survey and consultations during site visits, no physical cultural resources were found within the RoW and 500 m area of influence of Kushtia-Meherpur 132 kV double circuit transmission line alignments.

<sup>6</sup> <https://www.adb.org/sites/default/files/institutional-document/32056/safeguard-policy-statement-june2009.pdf>

#### **4.4.1.13 Health Services**

There are around 87 private hospitals in the project area. Among these, 7 in Gangni, 37 in Mirpur, 8 in Alamdanga and 35 in Kushtia Sadar. Moreover, there are also 53 diagnostic centers in these areas. These private hospitals and diagnostic centers usually provide health care support to the people of the project area. 107 specialized doctors are engaged to provide health care services in these areas. Moreover, there are Community Clinics for every 6000 people of the study area, Upazilla Health Complexes in every Upazilas and Sadar Hospitals is in Kushtia Sadar. A few people also access healthcare service from local pharmacy or local general medical practitioners for normal diseases like cold and fever. For any major health complications, people of the studied areas access services from District level general hospitals otherwise they tend to seek services from Upazilla health complex and private clinics.

#### **4.4.1.14 Role of Women and Gender Issues**

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

Despite strong pressures from the families to dissuade women finding employment, they take a lead role in livestock farming and take care of the feeding of their cattle, goats and poultry. Home gardening is another important economic activity of women, produce of which is used for both household consumption and marketing. Other forms of economic activities conducted by women include agricultural labor work, dressmaking, handicraft-making, employment in apparel industries etc. Educated women are employed in both government and private sector jobs. Women's earnings are mainly used for children's education and clothing, to supplement the households' consumption needs, and to repay the past debts. Some women would also save some money to be used in emergencies or for their children's future. In some communities, however, it has been reported that women must hand over their earnings to husbands or else get prior consent of the husband to spend their earnings. Women also participate in the activities of NGOs like BRAC and Grameen Bank to access micro-credit which they would use to buy cattle, goats and poultry.

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

#### **4.4.1.15 Indigenous people**

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

### **4.4.2 Domar to Hatibandha**

#### **4.4.2.1 Introduction**

The socio-economic profile of the affected HHs is presented following demographic profile of the HHs. A total of 95 HHs comprising 428 people will be affected by the project with average HH size 4.6 which



is higher than the national average (4.06) according to BBS (2016). Below Table 4-28 shows the general profile of the affected people.

**Table 4-28 General Profile of Affected Population**

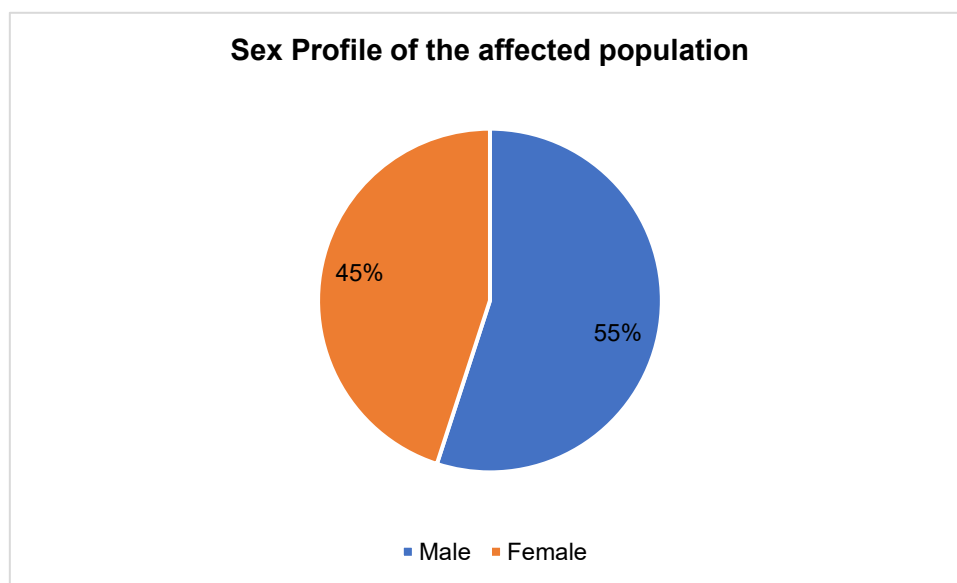
1	Number of total affected households	95
2	Number of total populations	428
3	Average HH size	4.6

Source: EQMS census and IOL survey, August-September 2022

#### 4.4.2.2 Demographic Information

Demographic profile of the affected community has been analyzed as part of socioeconomic profile of the project area. This comprises of age-sex distribution of the PAPs. Sex profile of the affected HHs is shown in **Figure 4-29**. Data shows that the percentage of male populations is higher than the females in the project area. The overall male to female ratio of the project area is 100: 122 (the national ratio is 100:100.27) which implies that the project area is different from the corresponding national condition with a higher female population.

**Figure 4-29 Sex Profile of the affected population**



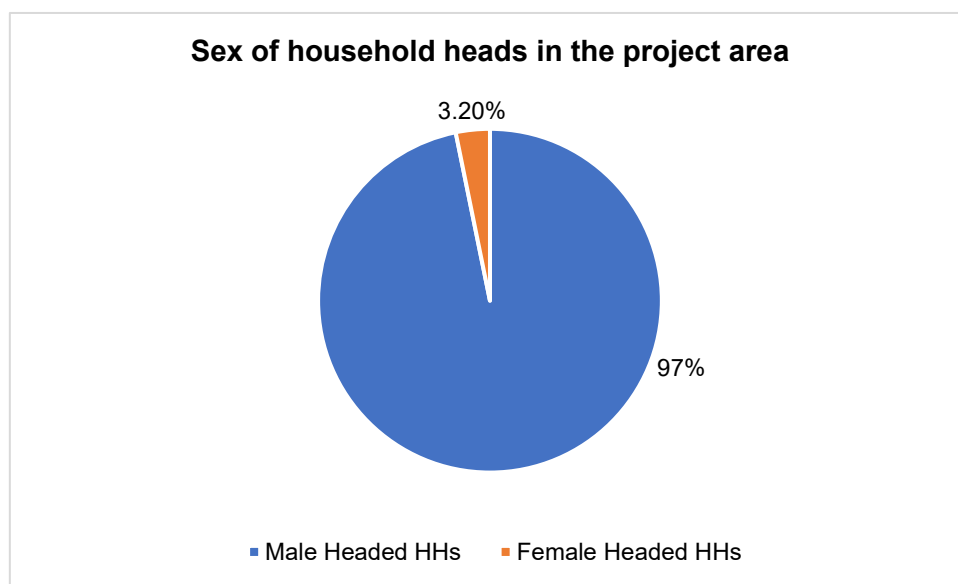
Source: EQMS census and IOL survey, August-September 2022

#### 4.4.2.3 Sex of HHs Heads

Only 3% of the HHs are female headed, while the remaining 97% are male headed HHs against 98% male headed HHs in national level (BBS, 2011). However, the general scenario in Bangladesh is similar as most of the HHs are headed by male. Below Figure 4-30 shows the HHs gender distribution in the project area.

<sup>7</sup> BBS (2018) Women and Men in Bangladesh: Facts and Figures 2018, available at [http://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/b343a8b4\\_956b\\_45ca\\_872f\\_4cf9b2f1a6e0/Women%20and%20men%20in%20Bangladesh-Facts%20and%20figures%202018.pdf](http://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/b343a8b4_956b_45ca_872f_4cf9b2f1a6e0/Women%20and%20men%20in%20Bangladesh-Facts%20and%20figures%202018.pdf)

**Figure 4-30 Sex of household heads in the project area**

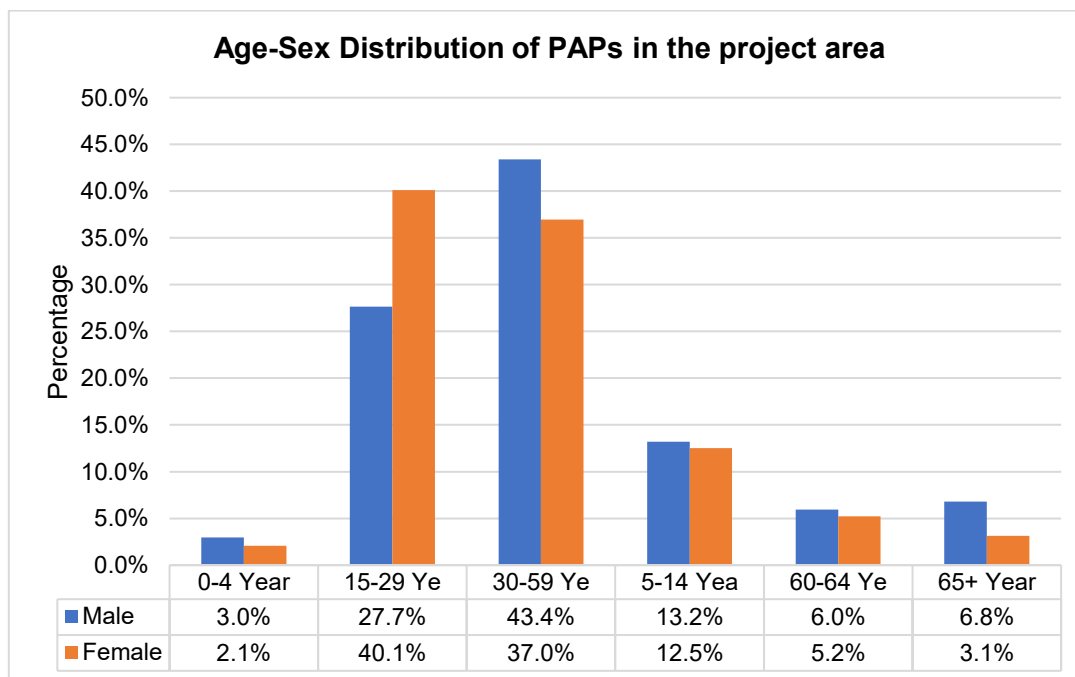


Source: EQMS census and IOL survey, August-September 2022

**4.4.2.4 Age Distribution of Affected Population**

Figure 4-31 to the below presents age-sex distribution of the affected Populations. The survey findings show that the highest percentage of population belongs to the age group of '30-35 years' followed by '15-29 years' which indicates most of the studied population belongs to working age categories. However, 6.8% of the affected people aged 65 and above which is slightly higher than the national average of 5% (World Bank 2019)<sup>8</sup>.

**Figure 4-31 Age-Sex Distribution of PAPs in the project area**



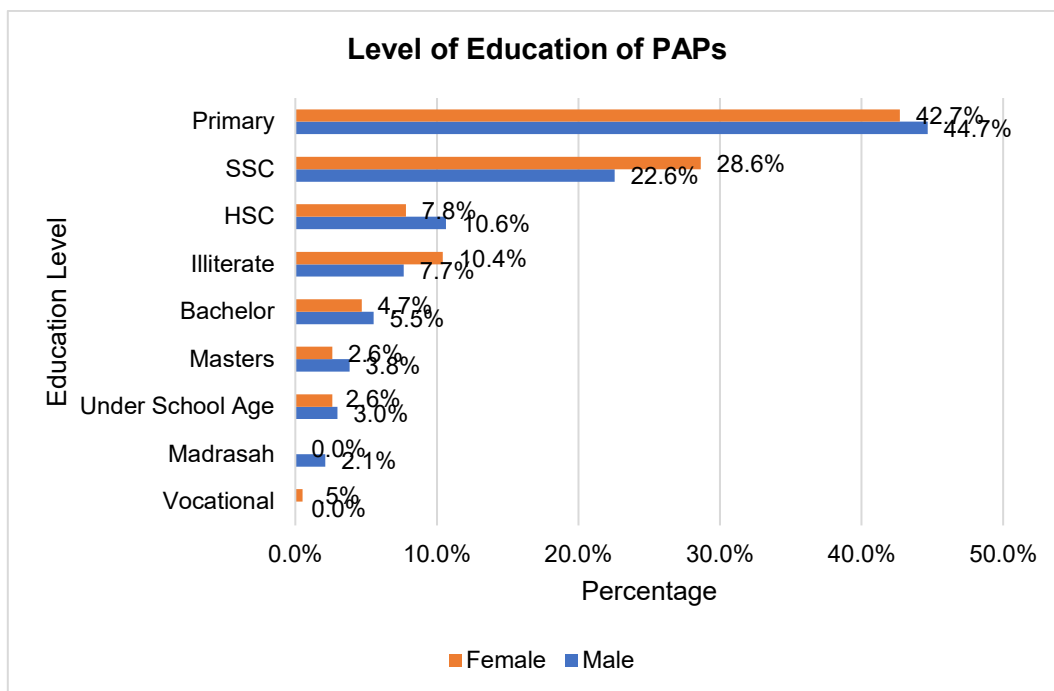
Source: EQMS census and IOL survey, August-September 2022

<sup>8</sup> Population ages 65 and above (% of total population) - Bangladesh | Data (worldbank.org)

#### 4.4.2.5 Level of Education of PAPs

Education level of the affected population is presented in the **Figure 4-32**. The table demonstrates that primary and secondary level enrolment is high in the area. It also indicates that specifically secondary level education is higher among female population while tertiary education (e.g., Bachelor and Masters) is higher among male population.

**Figure 4-32: Level of Education of PAPs**

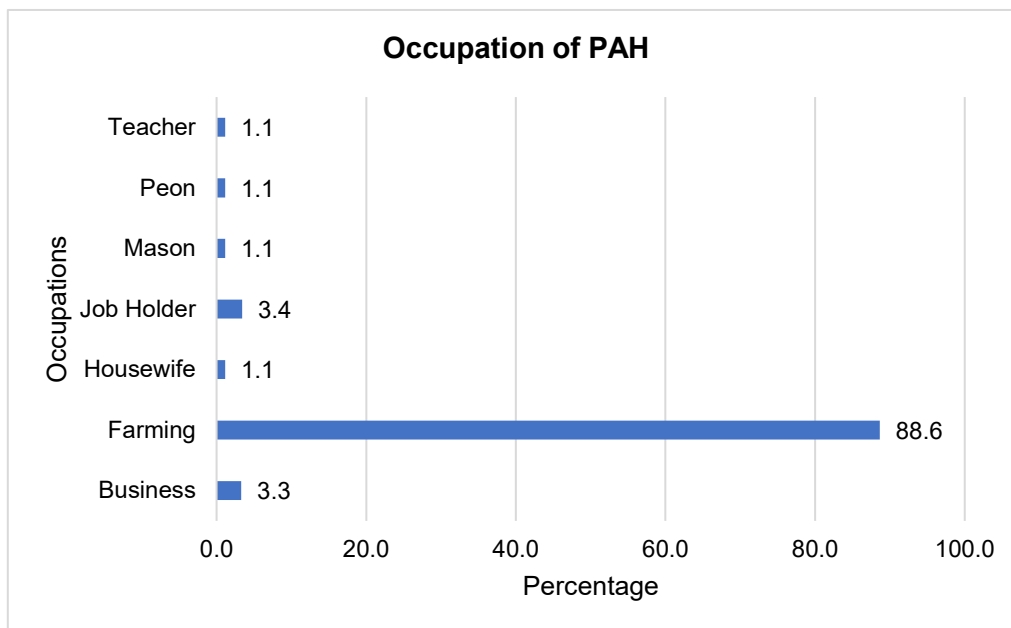


Source: EQMS census and IOL survey, August-September 2022

#### 4.4.2.6 Primary Occupation of PAHs

According to the census of the affected households, agriculture is the main source of household income. Data shows that 88.6% HHs' primary occupation is farming. Some households also depend on some other occupations such as business, service, mason, etc. There will not be any significant adverse impact on their income as compensation will be paid for the entire season. After construction of the tower, affected HHs will be able to use land as usual. Below Figure 4-33 shows the details about the occupation of the PAH.

**Figure 4-33 Occupation of PAH (%)**

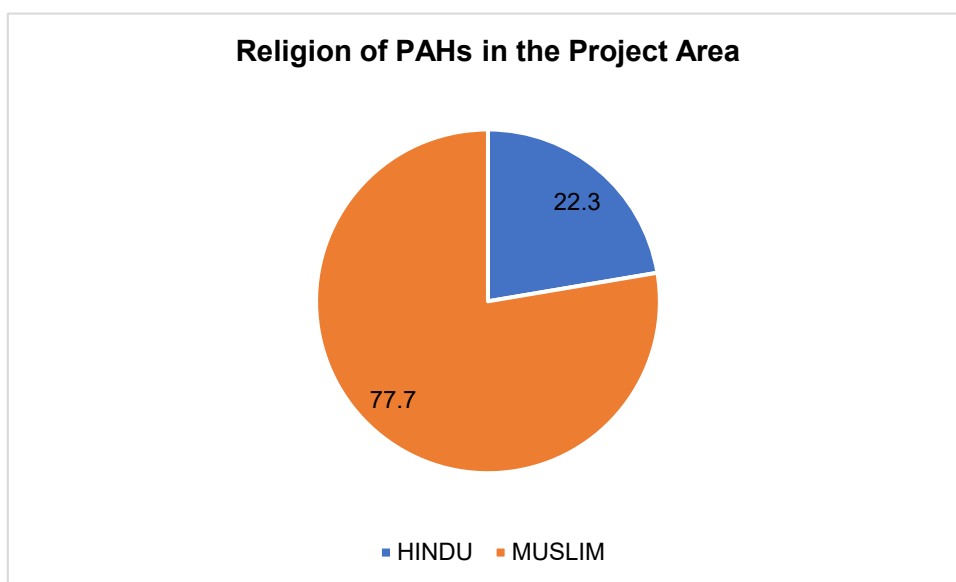


Source: EQMS census and IOL survey, August-September 2022

**4.4.2.7 Religion of PAHs**

The religious background of the affected HHs is presented in Figure 4-34 revealing that most of the population of affected household are Muslim (77.7%). On the other hand, 22.3% of the affected households are Hindu in religion. Although both Muslim and Hindu people are living in the same areas, there is a community harmony among them. No religious discrimination or conflict mentioned or observed during the study.

**Figure 4-34 Religion of PAHs in the Project Area (%)**



Source: EQMS census and IOL survey, August-September 2022

**4.4.2.8 Income of Affected HH**

The average monthly incomes of the highest (53.2%) of the studied households are Tk 10,000 to 20,000 followed by Tk 20,001 to Tk 30,000 (22.3%). As per the official poverty line of Bangladesh, households



earning an annual income of less than Tk 65000 are considered those living below the poverty line. Table 4-29 shows the monthly income of the AHHs.

**Table 4-29 Monthly Income of the PAHs**

Income Range	Frequency	Percent (%)
Below 10000	7	7.4
10001 - 20000	50	53.2
20001 - 30000	21	22.3
30001 - 40000	10	10.6
40001 - 50000	5	5.3
Above 50000	2	1.1
Total	95	100

Source: EQMS census and IOL survey, August-September 2022

#### 4.4.2.9 Expenses of Affected HHs

Among the studied households, a balance between household average monthly income and expenditure has been recorded during the census and survey. Like the average monthly income, the average monthly expenditure of 50.0% households is Tk 10,000 to 20,000 followed by Tk 20,001 to Tk 30,000 (26.6%). However, a lowest percentage of the households (2.1%) reported to have a monthly average expenditure of above Tk 50000. **Table 4-30** shows the monthly income range of the affected households.

**Table 4-30: Monthly Expenditure of the AHHs**

Expense Range	Frequency	Percent (%)
Below 10000	10	10.6
10001 - 20000	47	50.0
20001 - 30000	25	26.6
30001 - 40000	5	5.3
40001 - 50000	5	5.3
Above 50000	3	2.1
Total	95	100

Source: Socioeconomic Survey, EQMS, August-September 2022

#### 4.4.2.10 Basic Amenities at Household Level

##### 4.4.2.10.1 Energy Use of PAHs

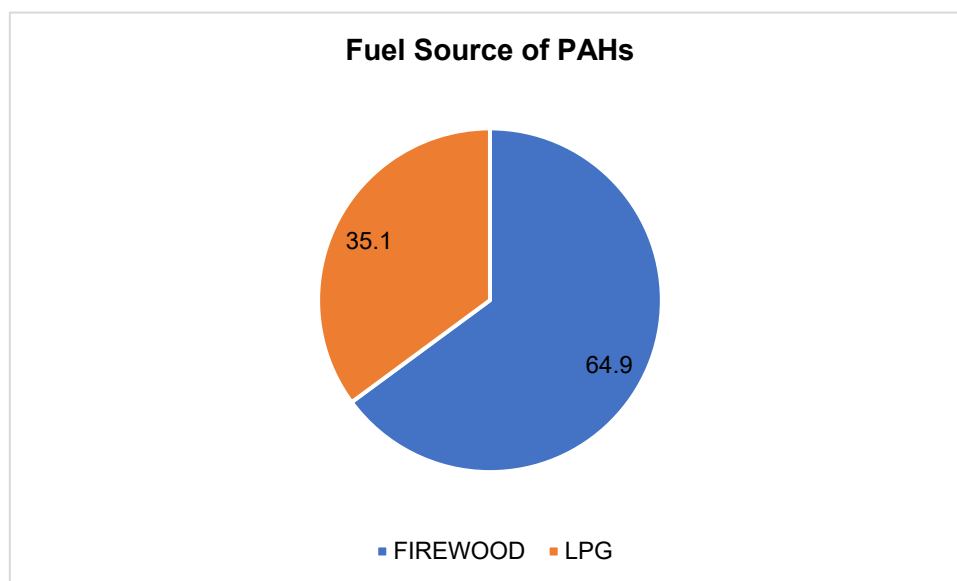
Electricity is the main source of lighting for all studied households except one household which uses Solar energy as their household’s lighting sources. However, some households use multiple and combined energy sources for domestic purposes.

Households in the project affected areas experience moderate load shedding which interrupts their regular household and productive activities. Although load shedding adversely affects the irrigation supply for vegetable cultivation, it has reduced during Boro season. Moreover, lifting water for household consumption, children’s study, etc. are significantly interrupted by load shedding. Local small industries like rice mills, workshop, construction works also face challenges due to load shedding. During.

##### 4.4.2.10.2 Fuel Source of PAHs

Firewood is the main source of energy used by most of the households (64%) for cooking and boiling purposes followed by 35.1% using liquefied petroleum gas, particularly by people living closer to urban areas. Those households which use firewood, usually collect the wood from trees of homestead areas, own garden, or buy from local areas. On the other hand, people purchase LPG cylinder from local market. In some areas, seller provide the cylinder to door to door as their commercial service. Below Figure 4-35 shows the fuel source of PAHs.

**Figure 4-35 Fuel Source of PAHs (%)**



Source: EQMS census and IOL survey, August-September 2022

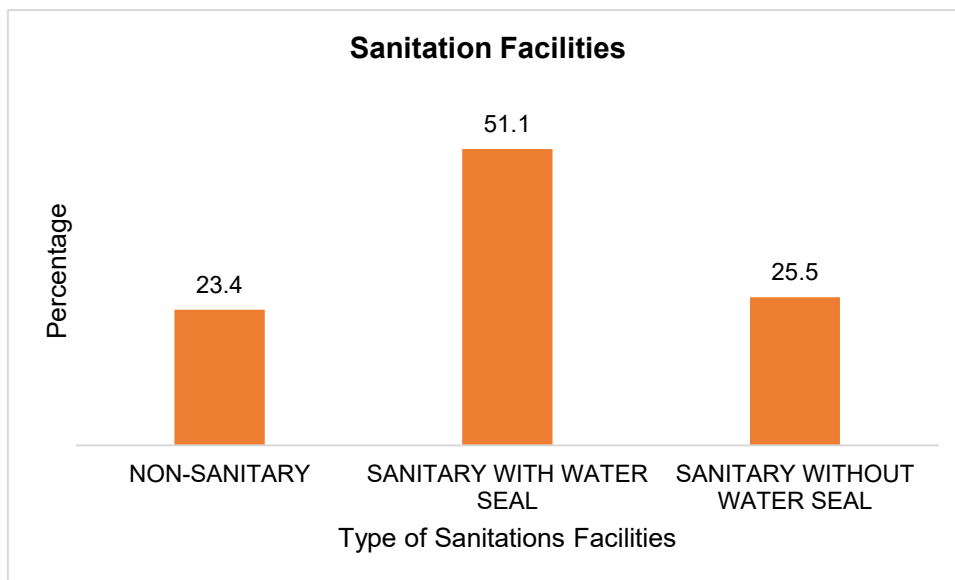
##### 4.4.2.10.3 Water Source of AHs

Ground water is the only source of drinking water in the studied areas where about 74.5% of affected household use tube-well and rest 25.5% use deep tube-well to access the drinking water. The uses of river water for the domestic purposes were not recorded during the census. During the site visit and consultation with the local community, landowners, and the women group; no tube wells (shallow/deep) were identified under the transmission line /in the ROW.

#### 4.4.2.10.4 Sanitation Facilities of PAHs

About 51.1% and 25.5% of households use water sealed and non-water-sealed sanitary latrine facility respectively, whereas only about 23.4% households use non-sanitary facilities. The following Figure 4-36 shows sanitation facility of the project area.

Figure 4-36 Sanitation Facilities of PAHs (%)



Source: EQMS census and IOL survey, August-September 2022

#### 4.4.2.11 Transportation and Communications

Road condition of the project area is shown in **Table 4-31**. A total of 257.79 km roads of the study area are metalled road and 18.74 km of road are unmetalled road. During the survey it has been observed that the proposed transmission towers will not interfere with the roads and local transportation systems.

Table 4-31: Road Condition of the Project Area

Upazilla	Unmetalled Road (km)	Metaled Road (km)	Total (km)
Domar	7.07	104.19	111.26
Dimla	11.67	84.01	95.68
Hatibandha	0.00	69.59	69.59
<b>Total</b>	<b>18.74</b>	<b>257.79</b>	<b>276.53</b>

Source: LGED Database

#### 4.4.2.12 Common Property Resources

##### 4.4.2.12.1 Religious Institution

No religious institutions were found under the transmission line/ in ROW during the site visit and socio-economic survey. Some religious institutions such as Mosque and Mandir are located within the 500 meters radius from the proposed transmission line, however, they will not be hampered due to the construction of transmission line.

#### **4.4.2.12.2 Hat - Bazar**

There are some local markets such as Ambari Hat, Domar Hat, Babur Hat, Satibari Hat, Hatibandha Hat and Barakhata Hat in the nearest location of proposed transmission line. The regular activities of local market will not be hampered for the construction of transmission tower.

#### **4.4.2.13 Physical Cultural Resources**

According to ADB SPS 2009<sup>9</sup>, physical cultural resources are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance.

As per socio-economic survey and consultations during site visits, no physical cultural resources were found within the RoW and 500 m area of influence of Domar-Hatibandha 132 kV double circuit transmission line alignments.

#### **4.4.2.14 Health and Services**

Affected households access healthcare services from both government and non-government hospitals and facilities. There are two Sadar Hospital namely Nilphamari General Hospital and Lalmonirhat General Hospital; three Upazilla health complex namely Domar Upazilla Health Complex, Dimla Upazilla Health Complex and Hatibandha Upazilla Health Complex; and 18 private hospitals and clinics/diagnosis centers in the project areas. Of 18 private hospitals and diagnosis centers, 5 hospitals and diagnosis centers are in Domar Upazilla, 7 in Dimla and rest 5 are situated in Hatibandha Upazilla. These private hospitals and diagnostic centers usually provide health care support to the people of the project area. More than 100 specialized doctors are engaged to these government and non-government hospitals and diagnosis centers to provide health care services. A few people also access healthcare service from local pharmacy or local general medical practitioners for normal diseases like cold and fever. For any major health complications, people of the studied areas access services from District level general hospitals otherwise they tend to seek services from Upazilla health complex and private clinics.

#### **4.4.2.15 Role of Women and Gender Issues**

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

Despite strong pressures from the families to dissuade women finding employment, they take a lead role in livestock farming and take care of the feeding of their cattle, goats and poultry. Home gardening is another important economic activity of women, produce of which is used for both household consumption and marketing. Other forms of economic activities conducted by women include agricultural labor work, dressmaking, handicraft-making, employment in apparel industries etc. Educated women are employed in both government and private sector jobs. Women's earnings are mainly used for children's education and clothing, to supplement the households' consumption needs, and to repay the past debts. Some women would also save some money to be used in emergencies or for their children's future. In some communities, however, it has been reported that women must hand over their earnings to husbands or else get prior consent of the husband to spend their earnings. Women also participate in the activities of NGOs like BRAC and Grameen Bank to access micro-credit which they would use to buy cattle, goats, and poultry.

Household level decision-making is largely vested with the husband. A few instances of joint decision making by both men and women were reported. Women also perform a significant role in managing

<sup>9</sup> <https://www.adb.org/sites/default/files/institutional-document/32056/safeguard-policy-statement-june2009.pdf>

household assets despite the key immovable assets like land and house are owned by men. Physical assets such as land and jewelry received by women as part of their dowry remain in her possession but on some occasions, they are transferred to the ownership of men as part of matrimonial agreements. Women are discouraged from participating in social and political activities mostly by their male counterparts. However, many women struggle to change this situation.

#### 4.4.2.16 Indigenous Peoples

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

### 4.4.3 Bagerhat- Pirojpur- Bhandaria

#### 4.4.3.1 Introduction

The socio-economic profile of the affected HHs is presented following demographic profile of the HHs. A total of 122 HHs comprising 489 people will be affected by the project with average HH size 4.00 which is lower than the national average (4.3) according to BBS (2011). Below **Table 4-32** shows the general profile of affected population.

**Table 4-32: General Profile of Affected Population**

1	Number of total affected households	122
2	Number of total populations	489
3	Average HH size	4.00

Source: Socioeconomic Survey, EQMS, August 2022

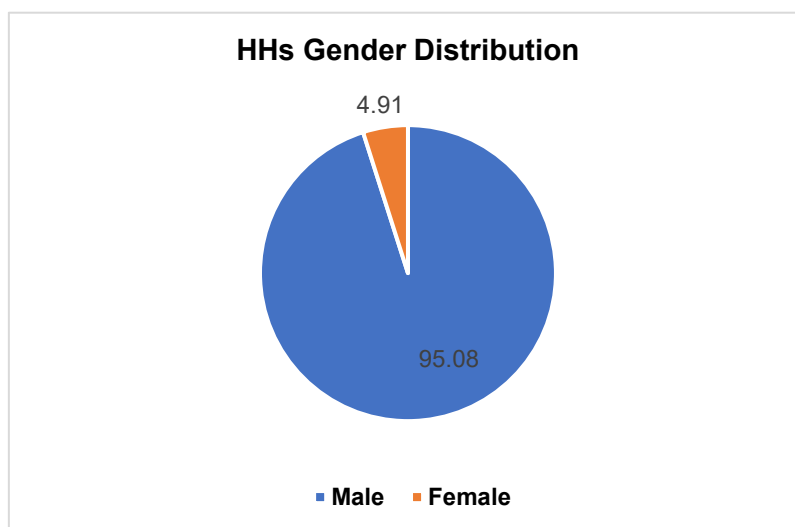
#### 4.4.3.2 Demographic Information

Demographic profile of the affected community has been analyzed as part of socioeconomic profile of the project area. This comprises of gender profile and age-sex distribution of the PAPs. Precisely, only 4.91% of the HHs are female headed, while the remaining 95.08% are male headed HHs against 88% male headed HHs in national level (BBS, 2011)<sup>10</sup>. However, the general scenario in Bangladesh is similar as most of the HHs are headed by male. Below **Figure 4-37** shows the household's gender distribution of the project area.

**Figure 4-37: HHs Gender Distribution in the project area**

<sup>10</sup> POPULATION AND HOUSING CENSUS 2011, Socio-Economic and Demographic Report, National Series, Volume - 4





Source: Socioeconomic Survey, EQMS, August 2022

#### 4.4.3.3 Population distribution by gender

Population distribution by gender is shown in Table. From the **Table 4-33**, we can find out that the percentage of male populations is higher than the females in the project area. The overall male female ratio of the project area is 100:112.98 (the national ratio is 100:99.68) which implies that the project area is different from the corresponding national condition with a higher female population.

**Table 4-33: Population distribution by gender**

Male No	%	Female No	%	Total
279	57.05	210	42.94	489

Source: Socioeconomic Survey, EQMS, August 2022

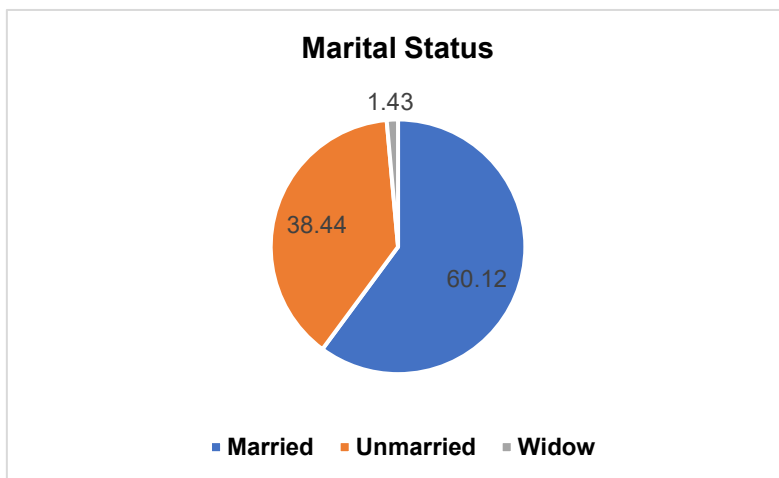
#### 4.4.3.4 Marital Status

Marital status of the people from surveyed households are distributed by married, unmarried and widow as the survey did not find any separated person during the survey. Among 489 people a total 294 people were found married, 188 people unmarried and 7 widow. **Table 4-34** shows the distribution of marital status among surveyed people from the affected households.

**Table 4-34: Marital Status**

Married No	%	Unmarried No	%	Widow No	%	Total
294	60.12	188	38.44	7	1.43	489

**Figure 4-38 Marital Status**

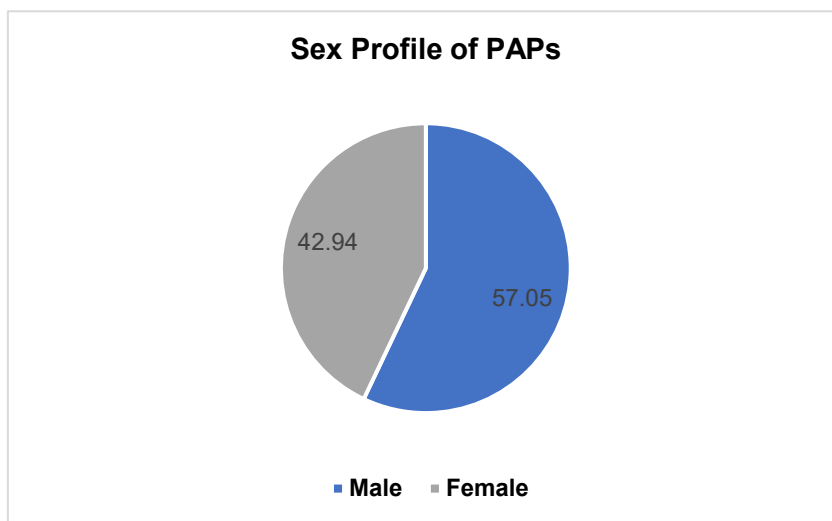


Source: Socioeconomic Survey, EQMS, August 2022

**4.4.3.5 Sex Profile of the Affected Populations**

Sex profile of the affected HHs is shown in **Figure 4-39**. From the sex profile, we can find out that the percentage of male populations is higher than the females in the project area. The overall male female ratio of the project area is 100:112.98 (the national ratio is 100:99.68) which implies that the project area is different from the corresponding national condition with a higher female population.

**Figure 4-39: Sex Profile of the PAPs**

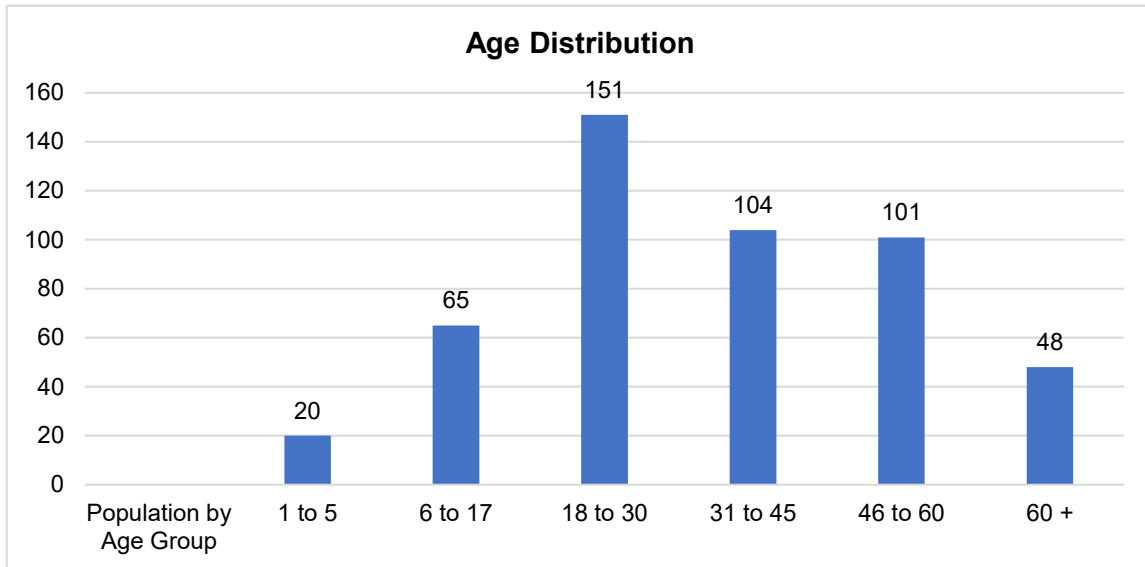


Source: Socioeconomic Survey, EQMS, August 2022

**4.4.3.6 Age Distribution**

Population distribution by age group from the survey shows that, highest number of populations from age group 18-30 and second highest population group from 31-45 while lowest age group 1-5.

**Figure 4-40: Age Distribution of the PAPs**



Source: Socioeconomic Survey, EQMS, August 2022

#### 4.4.3.7 Education status of PAPs

Education status of the affected population is presented in the below **Table 4-35**. The table demonstrates that primary and secondary level enrolment is high in the area. It also indicates that higher education rate is high among female population. Furthermore, illiteracy is high among male population. HH members whose age is 5 years and above are counted in this analysis.

**Table 4-35: Level of Education of PAPs**

Level of Education	Female		Male	
	Count	%	Count	%
Primary	81	16.56	82	16.76
SSC	59	12.06	75	15.33
HSC	19	3.88	40	8.17
Hon's or Equivalent	18	3.68	30	6.33
MA or Equivalent	9	1.84	20	4.05
Islamic Education (Madrasa)	1	0.20	9	1.84
Vocational	0	0	2	0.40
Not School Going Age	7	1.43	9	1.84
Illiterate	16	3.27	12	2.45
Total	279	42.92	210	57.17

Source: Socioeconomic Survey, EQMS, August 2022

#### 4.4.3.8 Primary Occupation of PAHs

According to the census of the affected households 25.97% HHs primary occupation is agriculture. There will not be any impact on their income as compensation will be paid for the entire season and after one season; affected HHs will be able to use land as usual. Based on the income level, their socio-economic condition is better than rest of the population in that region. In addition to Agriculture, the other significant occupations are service, business, retired person etc.

**Table 4-36: Occupation of PAH**

Name of Occupation	Male	Female	Total	Percentage
Agriculture	84	43	127	25.97
Teacher	6	2	8	1.63
Service	35	3	38	7.77
Business	35	3	38	7.77
Household work	0	88	88	17.99
Day labor	4	0	4	0.81
Doctor	1	0	1	0.20
Unemployed	3	1	4	0.81
Children	9	7	16	3.27
Student	83	56	139	28.42
Elder person	10	6	16	3.27
Expatriate	4	0	4	0.81
Driver	4	0	4	0.81
Disable	1	1	2	0.41

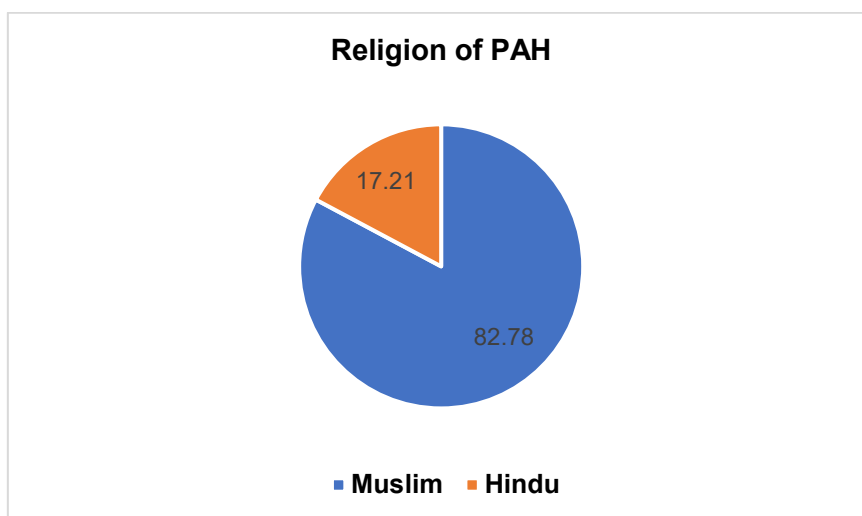
Name of Occupation	Male	Female	Total	Percentage
Total	279	210	489	100

Source: Socioeconomic Survey, EQMS, August 2022

#### 4.4.3.9 Religion of PAHs

The religious background of the affected HHs is presented in **Figure 4-41** revealing that most of the population of affected household are Muslim (82.78%). On the other hand, (17.21%) of the affected households are Hindu in religion in this project area. Therefore, there is no opportunity for religious discrimination through this project.

**Figure 4-41: Religion of PAHs in the Project Area**

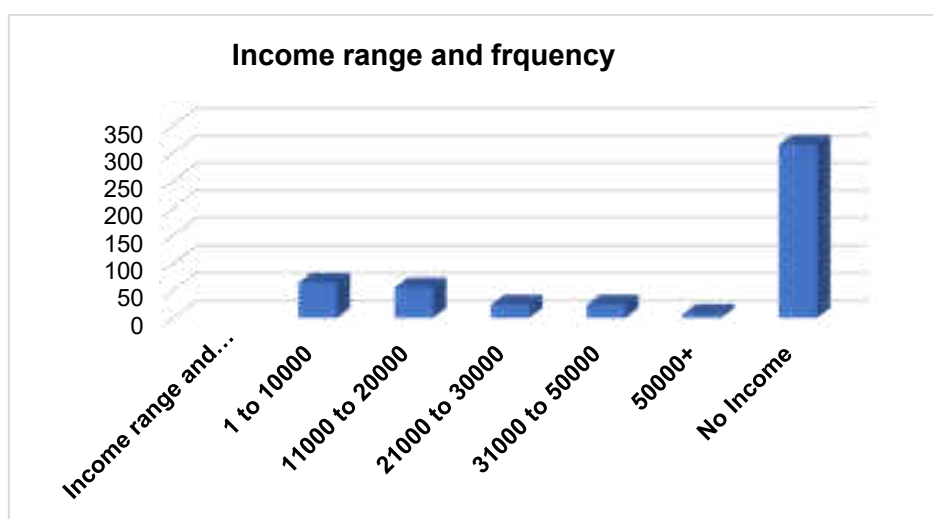


Source: Socioeconomic Survey, EQMS, August 2022

#### 4.4.3.10 Income of Affected HH

Income of the affected household as per the employment status from survey data found was presented in the **Figure 4-42**, where it is seen that majority of the people found with zero income and most of the people belongs to 0-10 thousand income range and 11-20 thousand income range.

**Figure 4-42: Monthly Income of the AHHs**



Source: Socioeconomic Survey, EQMS, August 2022



#### 4.4.3.11 Basic Amenities at Household Level

##### 4.4.3.11.1 Energy Use of PAHs

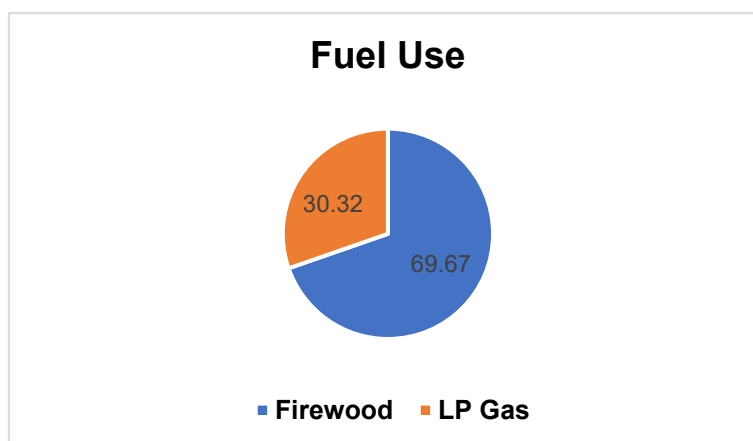
The main source of lighting is electricity for 100% grid connected households. Households also use multiple and combined energy sources for domestic purposes such as kerosine.

Project Affected Households in the project areas experience frequent load shedding which deprives them regular supply of electricity throughout the day. Load shedding is extensive and continues for several hours in night and daytime. It adversely affects in irrigating of cultivation fields and irregular supply of water, children’s studies at nighttime, and women in watching television programs. Sleep at nighttime is also difficult for them as they cannot operate fans during summer seasons. In spite of irregular and limited power supply, households lament over having to pay high electricity bills.

##### 4.4.3.11.2 Fuel Source of PAP

More than fifty percent households’ main source of energy is firewood (69.67%) for cooking and boiling purposes, almost 30.32% using liquefied petroleum gas.

**Figure 4-43: Fuel Source of PAHs**



Source: Socioeconomic Survey, EQMS, August 2022

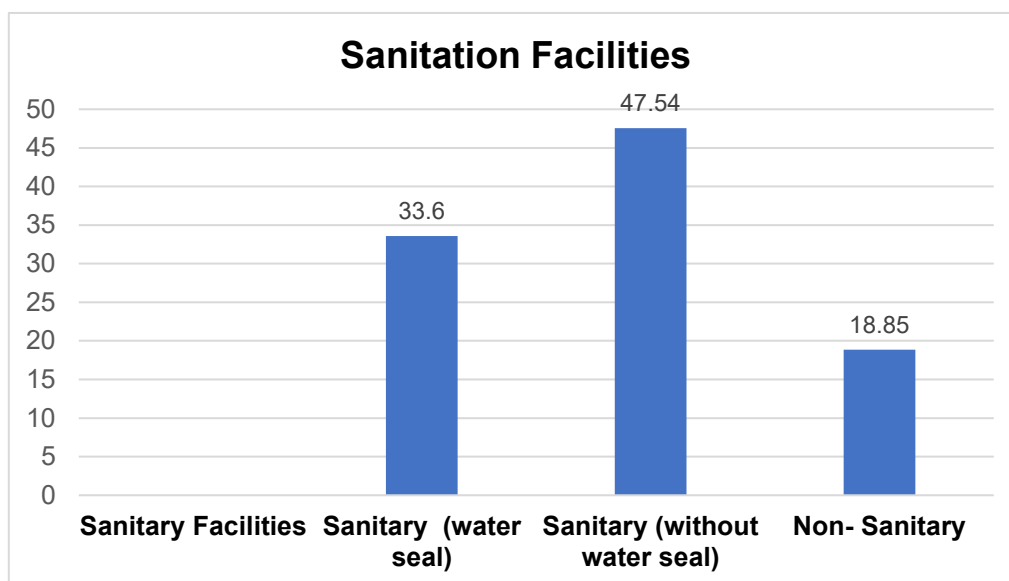
##### 4.4.3.11.3 Water Source of PAHs

The major source of drinking water is tube-well where about 56.55% households use tube-wells water and 31.14% people have access to deep tube-well water and only 12.29% households have access of supply water. The uses of river water for the domestic purposes were not recorded during the census. However, river water used in domestic animals bathing and for the irrigation. During the site visit, no deep tube wells/ shallow tube wells were found underneath the proposed alignment.

##### 4.4.3.11.4 Sanitation Facilities of PAHs

About 33.60% and 47.54% of households use water sealed and non-water-sealed sanitary latrine facility, respectively, whereas only 18.85% households use non-sanitary facilities. The following **Figure 4-44** shows sanitation facility of the project area.

Figure 4-44: Sanitation Facilities of AHs



Source: Socioeconomic Survey, EQMS, August 2022

#### 4.4.3.12 Transportation and Communications

Road condition of the project area is shown in **Table 4-37**. A total of 385.37 km roads of the study area are metalled road and 7.32 km of road are unmetalled road. During the survey it has been observed that the proposed transmission towers will not interfere with the roads and local transportation systems.

**Table 4-37: Road Condition of the Project Area**

Upazilla	Unmetalled Road (km)	Metaled Road (km)	Total (km)
Bagerhat Sadar	0.00	80.39	80.39
Kachua	0.10	48.29	48.39
Pirojpur Sadar	0.00	42.89	42.89
Kawkhali	0.86	41.88	42.74
Bhandaria	0.00	99.55	99.55
Rajapur	6.36	72.37	78.72
<b>Total</b>	<b>7.32</b>	<b>385.37</b>	<b>392.68</b>

Source: LGED Database

#### 4.4.3.13 Common Property Resources

##### 4.4.3.13.1 Religious Institution

No religious institutions were found under the transmission line/ in ROW during the site visit and socio-economic survey. Some religious institutions such as Mosque and Mandir are located within the 500 meters radius from the proposed transmission line, however, they will not be hampered due to the construction of transmission line.

#### **4.4.3.13.2 Hat - Bazar**

There are some local markets such as Jatrapur Hat, Kandapara Hat, Badhal Hat, Kachua Hat, Hular Hat, Panchpara Hat, Kawkhali Hat, Bhandaria Bazar, Kapalir Hat, Bagri Hat (H.Q) and Balarzore Hat in the nearest location of proposed transmission line. The regular activities of local market will not be hampered for the construction of transmission tower.

#### **4.4.3.14 Physical Cultural Resources**

According to ADB SPS 2009<sup>11</sup>, physical cultural resources are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance.

As per socio-economic survey and consultations during site visits, no physical cultural resources were found within the RoW and 500 m area of influence of Bagerhat- Pirojpur- Bhandaria 132 kV double circuit transmission line alignments.

#### **4.4.3.15 Health and Services**

No chronic illnesses are reported from the subproject affected areas. However, incidence of water borne diseases and skin ailments were frequently reported during consultations. People approach multiple institutions for medical care and treatment. Upazilla health Complex or Community Clinic are accessed for their medical and health needs. Despite the presence of several health and medical service institutions, access to them from rural distance from the households varies from 2 km to 5 km across the project affected areas. Medical services at private clinics are expensive and unaffordable to many families. Government hospitals in local areas lack enough medicine, diagnostic facilities and staff. Patients must wait in long queues. For serious illnesses, people go to Barishal for treatment. People sometimes travel more than 100 km to get their medical tests and reports.

#### **4.4.3.16 Role of Women and Gender Issues**

Women are not very much engaged in multiple activities due to stick *parda protha* in the project affected areas. Mainly they played a vital role in household management such as household cooking, cleaning, fetching water, feeding children, helping in children's studies and looking after the in-laws (particularly those living in extended families), women across the project areas also make a significant contribution to the household economy.

Women take a lead role in livestock farming and take care of the feeding of their cattle, goats, poultry and duck. Home gardening and vegetable production is another important economic activity of women, produce of which is used for both household consumption and marketing. Other forms of economic activities conducted by women include dressmaking, handicraft-making, employment in apparel industries etc. Educated women are employed in both government and private sector jobs. Women's earnings are mainly used for children's education and clothing, to supplement the households' consumption needs, and to repay the past debts. Some women would also save some money to be used in emergencies or for their children's future. In some communities, however, it has been reported that women must hand over their earnings to husbands or else get prior consent of the husband to spend their earnings. Women also participate in the activities of NGOs like ASA, BRAC, and Grameen Bank to access micro-credit which they would use to buy cattle, goats and poultry.

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

<sup>11</sup> <https://www.adb.org/sites/default/files/institutional-document/32056/safeguard-policy-statement-june2009.pdf>

Women are discouraged from participating in social and political activities mostly by their male counterparts. However, many women struggle to change this situation.

#### **4.4.3.17 Indigenous Peoples**

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

## 5. IMPACT ASSESSMENT AND EVALUATION

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

The section 5 of the original IEE (Table 9.3 of the original IEE) remains as applicable for impact evaluation of the project.

This section evaluates additional potential impacts based on activities that will be involved in construction and operation phase of the three proposed transmission lines: (i) Kushtia- Meherpur 132 kV double circuit transmission line, (ii) Domar-Hatibandha 132 kV double circuit transmission line and (iii) Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission line and compares them with the original IEE.

### 5.1 Impact Assessment Methodology

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

### 5.2 Impact Identification

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

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



**Table 5-1: Potential environmental impacts on the IECs during the Phases and Comparison with Addendum-3**

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-3
<b>Pre-construction Stage</b>					
<b>Physical Environment</b>					
Ambient air quality	Vehicular emissions: dust from excavation works, land clearing, and material stockyards may affect ambient air quality.	Medium	Minor	Minor Adverse	Same as previous
Ambient noise	Noise level may increase due to mobilization of vehicles and unloading of materials.	Medium	Minor	Minor Adverse	Same as previous
Quality of surface and groundwater	The quality of surface water of the water bodies close to the project construction sites may deteriorate if erosion products and silt reach water bodies, especially during rains	Medium	Moderate	Moderate Adverse	Same as previous
Soil	During the pre-construction period, site clearance work will be done accordingly. Site clearance will impact the fertile top soils that are enriched with nutrients	Low	Minor	Minimal Adverse	Same as previous
<b>Land and Agricultural Resources</b>					
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
<b>Fisheries Resources</b>					
Fish habitat	Fish habitat quantity and quality will be changed.	Medium	Moderate	Moderate Adverse	Same as previous

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-3
Fish production	Production reduced due to waterbody loss	Low	Minor	Minimal Adverse	Same as previous
<b>Socioeconomic Resources</b>					
Land price	Reduced near RoW and substation lands, increase away from transmission lines and substations due to availability of electricity	Low	Minor	Minimal Adverse	Same as previous
Employment opportunities	Temporary or minimal opportunities at this stage.	Medium	Moderate	Moderate Beneficial	Same as previous
Human health and safety	Ensure proper Health and safety for workers involved for site clearance. Road traffic safety with number of trucks for fill import.	Low	Minor	Minimal Adverse	Same as previous
Road/ river/ canal/ water body crossings	Minimal impacts	Low	Minor	Minimal adverse	Same as previous
PCRs	Proper chance find procedures will also be implemented in case of a chance find.	Low	Minor	Minimal Adverse	Same as previous
<b>Construction Stage</b>					
<b>Physical Environment</b>					
Ambient air quality	Suspended particulate matter from excavation works and land clearing, including vehicular emissions, may affect workers and community.	Medium	Moderate	Moderate Adverse	Monitoring results were found well within the limits of national standards for both the alignments.

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-3
Ambient noise	<p>Mobilization of heavy equipment and machinery, use of construction vehicles, transport of materials, pile driving, and construction activities may increase ambient noise level.</p> <p>Exposure to high level ambient noise may cause anxiety and disturbance to workers and community.</p>	Medium	Moderate	Moderate Adverse	Monitoring results were found well within the limits of national standards.
Quality of surface and groundwater	Potential for siltation due to construction works near pond or river.	Medium	Moderate	Moderate Adverse	Monitoring results were found well within the limits of national standards.
Riverbank erosion	Potential erosion due to ground movements along the riverbank.	Medium	Major	Moderate Adverse	Same as previous
Soil	<p>During construction, top soil at the tower footings may be eroded during excavation.</p> <p>Construction wastes like metal scraps and wooden packing material, and polythene may create a disturbance to the surrounding land, settlements, and the communities;</p> <p>Domestic wastes from labor camp.</p>	Medium	Major	Moderate Adverse	Same as previous
<b>Land and Agricultural Resources</b>					
Land use	Would be partially impacted as agricultural land may be permanently lost due to the tower footings.	Medium	Moderate	Moderate Adverse	Same as previous

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-3
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
<b>Fisheries Resources</b>					
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
<b>Terrestrial Resources (Flora and Fauna)</b>					
Terrestrial vegetation	Vegetation clearing/ tree cutting is required at the tower footings and RoW.	Medium	Moderate	Medium Adverse	In these three alignments, tree cutting due to tower footings and RoW will be less than the

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-3
					previous count
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
<b>Socioeconomic Resources</b>					
Compensation for crop damage	Standing crops at the tower footings and RoW may be damaged.	Medium	Moderate	Moderate Adverse	Crop compensation status has been incorporated in the updated RAP
Land price	Value of land may be temporarily affected.	Medium	Moderate	Moderate Adverse	Same as previous
Temporary employment opportunity	Both technical and non-technical laborers will be required	Medium	Moderate	Moderate Beneficial	Same as previous
Human health and safety	The safety and health of the public may be impacted due to the hazards created during the construction period, e.g., movement of heavy equipment, vehicles, and machineries. Damages to structure within RoW. Workers may be exposed to occupational health risks and safety hazards, mostly working with electricity and working at height.	Medium	Minor	Minor Adverse	Moderate Adverse.  Occupational health risk observed in both the alignments due to lack of general safety requirements and precautions while working at these three construction sites
Road/ river/ canal/ water body crossings	Road use for construction activities as haulage of construction materials, spoil, and equipment, river bank and Soil erosion	Medium	Moderate	Moderate Adverse	Same as previous



IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-3
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
<b>Operation Stage</b>					
<b>Physical-Chemical Environment</b>					
Ambient air quality	Climate change from fugitive emission (negligible) of SF6	Low	Minor	Minimal Adverse <sup>12</sup>	Same as previous
Ambient noise	Noise in the form of buzzing or humming can often be heard around transformers or power lines producing corona. Outside of RoW will be negligible.	Low	Minor	Minimal Adverse	Same as previous
Quality of surface and groundwater	Transformer oil spill and leakage	Low	Minor	Minimal Adverse	Same as previous
Riverbank erosion	No or minimal impact	Low	Minor	Minimal Adverse	Same as previous
Soil/Land contamination	Potential for spill or improper disposal of mineral oil used as insulating oil in transformers. No use of PCB or PCB-containing material will be allowed.	Low	Minor	Minimal Adverse	Same as previous
<b>Land and Agricultural Resources</b>					

<sup>12</sup> Due to high global warming potential, SF6 may contribute to the man-made greenhouse-effect, if it is released into the atmosphere. However in electrical switchgear the SF6 gas is always used in gas-tight compartments, greatly minimizing leakage. This makes the real impact on greenhouse effect negligible. As per ECOFYS, Sina Wartmann, Dr. Jochen Harnisch, June 2005, "Reductions of SF6 Emissions from High and Medium Voltage Equipment in Europe" study, the contribution to the greenhouse effect in Europe is estimated to 0.05 %.

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-3
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
<b>Fisheries Resources</b>					
Fish habitat	No change expected	Low	Minor	Minimal Adverse	Same as previous
Fish production	No change expected	Low	Minor	Minimal Adverse	Same as previous
<b>Terrestrial Resources (Flora and Fauna)</b>					
Terrestrial vegetation	Restriction of vegetation height below the transmission line.	Low	Minimal	Minimal Adverse	Same as previous
Wildlife habitat and their disturbance	Natural forest, Protected areas or ecologically sensitive areas are not present in the proposed substation lands or along the transmission line routes	Low	Minimal	Minimal Adverse	Same as previous
<b>Socioeconomic Resources</b>					
Compensation	Ongoing permanent loss of land at the tower footings (but occurred at the construction stage).	Medium	Moderate	Moderate Adverse	Same as previous

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-3
Land price	No land value at the tower footings (compensation already paid); development restrictions below the transmission line and between towers may affect land value.	Medium	Moderate	Moderate Adverse	Same as previous
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	<ul style="list-style-type: none"> <li>• Occupational and community safety risks (project maintenance);</li> <li>• There is public and scientific concern over the potential health effects associated with exposure to EMF.</li> </ul>	Medium	Minor	Moderate Adverse	<ul style="list-style-type: none"> <li>• Same as previous</li> <li>• As per the final alignment and confirmation from PGCB, there are no housing or school structures directly lies underneath these three lines.</li> <li>• PGCB confirms that consultations with the nearby residents undertaken to discuss the health and safety implications, with education program</li> </ul>

IECs/Issues	Potential Impacts	Sensitivity	Magnitude	Significance Prior to Mitigation	Potential Impacts during Addendum-3
					for residents and communities on how to minimize the risks involved.
Road/ river/ canal/ water body crossings	No disturbances to vehicular traffic	Low	Minor	Minimal Adverse	Same as previous
Regional and national development	Availability of a stable and reliable power supply may improve productivity and national development.	Medium	Moderate	Moderate Beneficial	Same as previous

## 5.3 Potential Impacts during Addendum- 3

### 5.3.1 Terrestrial Resources (Flora and Fauna)

#### 5.3.1.1 Clearing of Vegetation during Construction Phase

As per the original IEE, 2019, a significant number of big trees were estimated to be cleared in Kushtia-Meherpur transmission line, in the Domar-Hatibandha alignments and in the RoW of the Bagerhat-Pirojpur-Bhandaria transmission line. However, as per the primary survey of EQMS during this addendum, the total number of trees to be cut were counted less. The comparison of tree count is given in Table 5-2 .

**Table 5-2: Comparison of tree count**

SN	Sub-projects	Counted during original IEE, 2019*	Counted during Addendum-3, 2022*
1.	Kushtia- Meherpur 132 kV double circuit transmission line	717 (>5 m in height)	674 (>5 m in height)
2.	Domar-Hatibandha 132 kV double circuit transmission line	1,187 (>5 m in height)	152 (>5 m in height)
3.	Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission line	12,674 (>5 m in height)	474 (>5 m in height)

\*Source: <https://www.adb.org/projects/documents/ban-51137-003-iee> and EQMS Survey 2022

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

#### **Mitigation Measures**

- Vegetation clearance should be minimum within the designated areas.
- Indigenous vegetation in areas that will not be impacted by the project shall not be disturbed.
- Workers should be aware of the importance of natural resources and should not unnecessarily clear any area or break branches, twigs, flowers, etc. of adjacent vegetation.
- Crops and plant health monitoring should be conducted.
- Soil contamination by fuel and chemical storages shall be minimized by siting them on an impervious base within an embanked area and secured by fencing;
- Site clearance, piling, excavation and construction should not be carried out during rainy season and scheduled accordingly to avoid extreme weather events as heavy rainfall and high winds to minimize erosion and run-off;
- Workers should be aware of the importance of natural resources and should not unnecessarily clear any area or break branches, twigs, flowers, etc. of adjacent vegetation.
- Nighttime work should be limited, and lights at night should not disrupt the movement of nocturnal wildlife.
- Signage for speed limit, limiting sirens and horns, awareness for biodiversity conservation, etc. should be provided.
- Disturbance to wildlife should be monitored regularly.



- Rescue, rehabilitation and relocation should be done for terrestrial fauna of those forests when necessary.
- A detailed migratory bird survey needs to be conducted along the transmission line focused on the major river crossings to confirm the findings of the IEE that it does not have a significant impact on their route and staging.

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**

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

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

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***

- 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 for 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 for 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.

### **5.3.3 Impact due to River Crossing**

Kushtia- Meherpur 132 kV double circuit transmission line crosses four rivers (Kajla, Mathavanga, Pangashi, Sagar), 7 canals, and two ponds along the length of the line. As per PGCB and observation from survey, no towers will be constructed in the rivers, canals and other waterbodies. Similarly, Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission line crosses five rivers, 15 canals and

one Khal. During the survey it has been confirmed that no towers will be constructed in the rivers, canals and other waterbodies.

In case of Domar-Hatibandha 132 kV double circuit transmission line crosses six rivers, four canals, and 28 roads in its entire length. The proposed alignment crosses the Teesta River near the Teesta Barrage at Dimla Upazilla of Nilphamari. The river crossing portion was previously located in the upstream of the Barrage. Bangladesh Water Development Board (BWDB) has requested to relocate the river crossing portion to 500m downstream of the Teesta barrage. Hence the span has changed although it is still within the maximum allowable limit of ACCC conductor. As per PGCB, in this water crossing, the distance between the transmission towers will be about 980m. It is confirmed by PGCB that there will be no towers in the riverbed. Therefore, no significant impact is expected due to construction of transmission line in the river crossings. However, additional mitigation measures have been incorporated in the EMP.

## 6. ENVIRONMENTAL MANAGEMENT PLAN

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.

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.

The section EMP of the original IEE (Table 9.3 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.

The additional mitigation measures under this addendum for Kushtia- Meherpur 132 kV double circuit transmission line, Domar-Hatibandha 132 kV double circuit transmission line and Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission lines are incorporated in the Table 6-1. The environmental and social monitoring plan of the original IEE and update till this addendum has been incorporated in Table 6-2.

**Table 6-1: Mitigation Measures for the Impacts of Transmission Lines of during Addendum-3**

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Supervision Agency
<b>(a) Pre-construction/Construction Stage</b>				
Tree cutting, Clearing of vegetation	1,300 trees (>5 m in height) will be directly affected by cutting and trimming along the RoW of Kushtia- Meherpur 132 kV double circuit transmission line, Domar-Hatibandha 132 kV double circuit transmission line and Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission lines).	<ul style="list-style-type: none"> <li>• Prior to the start of clearing of vegetation, provide adequate compensation to the owners.</li> <li>• Tree cutting and vegetation clearance should be done within the designated areas.</li> <li>• 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.</li> <li>• Trees should be checked by an ecologist for nests and holes before cutting. Active nests, eggs, hatchling must be safeguarded.</li> <li>• Indigenous vegetation in areas that will not be impacted by the project shall not be disturbed.</li> <li>• 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.</li> <li>• Crops and plant health monitoring should be conducted.</li> <li>• 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;</li> </ul>	Contractor	DSC/ PGCB

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Supervision Agency
		<ul style="list-style-type: none"> <li>• 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;</li> <li>• 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.</li> <li>• Nighttime work should be limited, and lights at night should not disrupt the movement of nocturnal wildlife.</li> <li>• Signage for speed limit, limiting sirens and horns, awareness for biodiversity conservation, etc. should be provided.</li> <li>• Disturbance to wildlife should be monitored regularly.</li> <li>• Rescue, rehabilitation and relocation should be done for terrestrial fauna of those forests when necessary.</li> <li>• A detailed migratory bird survey needs to be conducted along the transmission line focused on the major river crossings to confirm the findings of the IEE that it does not have a significant impact on their route and staging.</li> </ul>		
Occupational health and safety (H&S)	Health and safety risks of construction workers.	<ul style="list-style-type: none"> <li>• Site H&amp;S Manager must be engaged on each alignment.</li> <li>• Only permitting trained and certified workers to work with any electrical equipment.</li> <li>• Before access to site granted, contractor to prepare H&amp;S plan based on risk assessment for approval by PGCB following national and EHS guideline</li> </ul>	Contractor	DSC/ PGCB



Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Supervision Agency
		<p>requirements.</p> <ul style="list-style-type: none"> <li>• Safety instruction by the E&amp;H Manager should be provided for the workers and visitors before they will be allowed to access the site.</li> <li>• 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, ear muff and insulating boots, as needed) must be provided to the workers, and ensure their use by workers.</li> <li>• Safety signs as needed at the tower sites.</li> <li>• Provide for the provision of appropriate fire extinguishers and fire response plans and appropriately trained first aid response staff.</li> <li>• 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;</li> <li>• Noise barrier will be installed in areas and equipment with high level noise.</li> <li>• EPC Contractor will provide workers with sanitary facilities, safe drinking water, wash area, adequate water for washing purposes, fire-fighting unit, etc.</li> <li>• 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.</li> </ul>		

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Supervision Agency
		<ul style="list-style-type: none"> <li>• Temporary resting areas to be adequately ventilated and provide comfortable accommodation for construction workers.</li> <li>• Temporary overnight accommodations need to be of sound construction with adequate ventilation, space and beds meeting the labor and H&amp;S requirements of Government of Bangladesh and the ILO guidance on worker accommodation (<a href="https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/multi/documents/publication/wcms_116344.pdf">https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/multi/documents/publication/wcms_116344.pdf</a>)</li> <li>• Doors and security gates need to be provided for worker's camp area</li> <li>• 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.</li> <li>• Group insurance covering all the construction workers to be provided by EPC contractors.</li> <li>• EPC contractors to ensure adequate numbers of EHS staff to cover all active working sites</li> </ul>		
Pollution prevention	Risks to the natural environment within the impact zones of the proposed alignments	<ul style="list-style-type: none"> <li>• 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.</li> <li>• Construction machinery must be in good condition and well maintained.</li> <li>• Oil spill management (e.g., drip tray, spill absorbent kit)</li> </ul>	Contractor	DSC/ PGCB

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Supervision Agency
		<p>to be adopted for all oil or diesel driven engines/generators/machines.</p> <ul style="list-style-type: none"> <li>• All waste awaiting recycling or disposal to be stored in garbage bins or other designated and demarked storage area, not left scattered around.</li> <li>• Separate garbage bins for segregation of waste to be provided and need to be labelled biodegradable, non-biodegradable (recyclable) and non-biodegradable (residual waste)</li> <li>• Waste management register to be maintained at every work site including details on volume of waste disposed by type, means/ method of disposal etc.</li> <li>• Both full and empty barrels to be stored in designated and demarcated storage site with pollution prevention measures in place.</li> <li>• Storage areas to be kept in a tidy manner with labelled locations for different materials to be stored.</li> <li>• 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.</li> <li>• 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</li> </ul>		

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Supervision Agency
<ul style="list-style-type: none"> <li>• Quality of surface and groundwater</li> <li>• Riverbank erosion</li> <li>• Road/ river/ canal/ water body crossings</li> </ul>	<ul style="list-style-type: none"> <li>• Surface Water Pollution</li> <li>• Potential erosion due to ground movements along the riverbank.</li> </ul>	<ul style="list-style-type: none"> <li>• Construction work should be completed within the dry season;</li> <li>• Ensure that minimum water is lost during construction activities and no water remains stagnant at any place;</li> <li>• 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 waste water entering the surrounding water bodies.</li> <li>• All construction vehicles and equipment should be maintained in proper conditions to prevent any leakage.</li> <li>• 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 rain water runoff.</li> </ul>	Contractor	DSC/ PGCB
Community health and safety	Health and safety risks to the community	<ul style="list-style-type: none"> <li>• 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.</li> <li>• 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</li> <li>• 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</li> </ul>	Contractor	DSC/ PGCB

Environmental Issues/ Parameters	Environmental Impacts	Mitigation Measures	Implementation Agency	Supervision Agency
		<p>area etc.</p> <ul style="list-style-type: none"> <li>• 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.</li> <li>• Posting of grievance box outside the worksite so that community people can drop grievance if they have any</li> </ul>		
Gender-Based Violence (GBV)	Risks of violence against women and vulnerable community.	<ul style="list-style-type: none"> <li>• Contractor should prepare and implement the code of conduct on GBV and Sexual Exploitation and Abuse (SEA);</li> <li>• Contractor should conduct GBV/SEA awareness raising program with the workers.</li> </ul>	Contractor	DSC/ PGCB



## 6.1 Environmental Monitoring

Table 6-2: Environmental Monitoring Plan for TL/LILO Line Subprojects

Environmental Issues/Parameters	Monitoring Parameters	Standards/ Guidelines	Means of Monitoring	Frequency	Location	Implementation Agency	Supervision Agency	Update until Addendum-3
<b>Pre-construction/Construction Stage</b>								
Requirement of land	Ensure that PAPs get compensation as per RP	As per RP	Inspection	As per RP	RoW of the TL/LILO lines	DC	DSC/PGCB	Same as previous
Trimming of trees within RoW and clearing vegetation from the tower bases of the TL/LILO lines.	Checking whether proper compensation as mentioned in RP is received by PAPs.	DoE/FD	Inspection	Regular during tree felling and site clearing operations	Trimming of trees within RoW and clearing vegetation from the tower bases of the TL/LILO lines.	FD	DSC/PGCB	Same as previous
Ambient Air Quality Parameters	SPM, PM10, PM2.5, SOx, NOx, CO & Pb-24hr monitoring	DoE standards	Sampling/ laboratory analysis	Before construction, then quarterly	At representative tower construction sites	Contractor	PGCB	Monitoring conducted for three alignments (Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission line) under this addendum.
Noise Pollution	Ambient noise level	DoE standards	Measurement	Regularly during construction at the locations with sensitive receptors and during piling works if any.	At adjacent subproject cultural sites and construction camps	Contractor	DSC/PGCB	Monitoring conducted for three alignments (Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission line) under this addendum.
Pollution due to Wastes	Checking storage, transportation, handling, and disposal of wastes. Wastes from construction sites and camps to be disposed properly at the designated waste dumping sites.	DoE guidelines	Inspection	Regular	Construction sites and camps	Contractor	DSC/PGCB	Monitoring conducted for three alignments (Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission).
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 Sites near towers	Contractor	DSC/PGCB	• Missing parameters for SWQ have been incorporated for all 3 alignments.
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/PGCB	• Missing parameters for GWQ have been incorporated.
Traffic congestion/ Road Accident	Checking road crossing points, roads adjacent to towers.	BRTA	Inspection	Regular	At road/railway crossing points and roads adjacent to towers	Contractor	DSC/PGCB	• Monitoring conducted for three alignments (Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission line) under this addendum.

Environmental Issues/Parameters	Monitoring Parameters	Standards/ Guidelines	Means of Monitoring	Frequency	Location	Implementation Agency	Supervision Agency	Update until Addendum-3
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/PGCB	Same as previous
Physical Cultural Resources	Chance finds procedure to be developed	DoE/IFC guidelines	Inspection	Regular	At construction site	Contractor	DSC/PGCB	Same as previous
Occupational health and safety	Use of PPE, general health, water supply and sanitation. Record of all occupational H&S incidents, any people lost time or fatal must be reported to ADB within 48hrs with corrective action plan.	DoE/IFC guidelines	Inspection	Regular	At construction sites and camps	Contractor	DSC/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 tower construction sites and crossing of roads	Contractor	DSC/PGCB	Same as previous
<b>Operation Stage</b>								
Tree replantation	Replanting of saplings and checking replacement of dead saplings, and watering and fertilizing of saplings for 3 years	FD	Inspection	Quarterly	Access road side slopes	FD	PGCB	Same as previous
Tall trees	Trimming of tall trees under the transmission line	FD	Inspection	Once every year and as directed by the Relevant engineer of PGCB	Along the TL/LILO Lines	PGCB	PGCB	Same as previous
EMF	Checking of clearance of transmission line and tops of houses (for housing structures) and for river crossing clearance from HFL to TL	Australian Standard for the safety of power lines (No BD standard and no device available in BD)	Inspection	As and when required	At populated / housing areas where TL/LILO lines pass over	PGCB	PGCB	Same as previous
Short circuit/ accident	Safety	DoE guidelines	Inspection	Regular	Along the TL/LILO lines	PGCB	PGCB	Same as previous
Occupational and Community Health and Safety	Use of PPE. Record of all occupational and community H&S incidents, any people lost time or fatal must be reported to ADB within 48hrs with corrective action plan.	As required	Inspection	Regular	Along the TL/LILO lines	PGCB	PGCB	Same as previous
Power Supply	Access to electricity in the rural area on priority basis.	DoE/PDB guidelines	Inspection	Whole project period	Along the TL/LILO lines	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 = faecal coliform, Fe = iron, HFL = highest flood level, IFC = International Finance Corporation, LILO = line-in line-out, 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 = personal protective equipment, RoW = right of way, RP = Resettlement Plan, TC = total coliform, TL = transmission line.

## **7. GRIEVANCE REDRESS MECHANISM**

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-3 no grievance has been reported with respect to environmental and social issues.

## 8. PUBLIC CONSULTATION AND DISCLOSURE

The public consultations were conducted in Kushtia- Meherpur in July 2022 and Domar-Hatibandha in August- September 2022 and in Bagerhat-Pirojpur-Bhandaria in July 2022 through stakeholder consultations, and individual meetings during the environmental study of the proposed project in conformity with the DoE's environmental guidelines to achieve the following objectives:

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

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 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
- The 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

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

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

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

SN	Name of Transmission line	Venue	No. of Male (M)/ Female(F)		Total Participants	Date
			M	F		
1.	Kushtia-Meherpur	Majirhat, Mirpur, Kushtia	12	-	12	July 2022
2.		Lombapara, Mirpur, Kushtia	10	-	10	
3.		Kobur Hat, Kushtia Sadar, Kushtia	10	-	10	
4.		Bot Toil, Kushtia Sadar, Kushtia	10	-	10	
5.		Khaja Nagar, Kushtia Sadar, Kushtia	-	6	6	
6.		Juginda, Gangni, Meherpur	10	-	10	
7.		Chitla, Gangni, Meherpur	7	-	7	
8.		Raipur, Gangni, Meherpur	6	-	6	
9.		Hatboyaliya, Alamdanga, Chuadanga	11	-	11	
10.		Pragpur, Alamdanga, Chuadanga	3	2	5	
11.	Domar-Hatibandha	Domar	22	12	34	August-September 2022
12.		Hatibandha	21	12	33	
13.	Bagerhat-Pirojpur-Bhandaria	Pirojpur Sadar	6	0	6	August-September 2022
14.		Bagerhat	14	6	20	
15.		Bhandaria	24	0	24	
16.		Rajapur	7	6	13	

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

- Participants had been informed about the project before through public advertisement. They are appreciated the project after knowing that the objective of the Project is to increase the supply of electricity.
- The major crops grown are vegetables, rice like. Irri and Amon paddy is grown in the region. Rice is cultivated twice in a year. Moreover, Corn is also cultivated a lot in these areas.
- Due to transmission line, natural forest will be affected. A huge amount of deforestation might be happened for covering the transmission line.
- There will be a possibility of some environmental impacts on the area at 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 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 opportunity 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 waiting to engage them in any work including labor.
- Local people want priority to work as labor and employee based on their qualifications during construction phase.

### **8.1.2 Summary of Focus Group Discussion with Women Group**

- Women of the area mostly involved in household works and a few are working outside to assist men in agricultural work.
- Most of the women of the area are illiterate, some are Primarily educated. A very few women have passed S.S.C and H.S.C level.
- Early Marriage is the most common problem faced by the women of the project area.
- Most women are supportive for the proposed project to be implemented at their locality. They think, some agricultural land may be lost, but the nation as well as the project area will be benefited 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 uninterrupted eclectic supply from PGCB.
- Study of local children will be easier after getting uninterrupted eclectic supply.
- Economic activities would be much better.
- There was concern over the possibility 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

This addendum report to original IEE<sup>13</sup> study has been conducted based on the final surveyed alignments of the three transmission line routes: Kushtia- Meherpur, Domar-Hatibandha and Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission, 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.

Kushtia- Meherpur 132 kV transmission line is estimated at 43.5 km by the PGCB. During the field surveys it was observed that the line has some deviations considering less impacts e.g., damage to community structures, tree cutting etc. to the original line route. The final route avoided all the settlements and structures within the RoW. The protected or environmentally sensitive areas, forest, scrublands or wildlife reserves are not found along the line route. There are no springs or deep wells/tubewell other common and individual properties situated underneath this line. During the consultation and site visit of the consultants, it was revealed that there were no physical cultural resources situated within ROW. The major waterbodies covered are rivers and gher, however, the transmission line will not pose any risk to seasonal habitats/wetlands. Due to the slight deviation towards the end for the final route, a smaller number of trees to be cut in this alignment than the original route.

Domar-Hatibandha 132 kV transmission line is estimated at 35 km by the PGCB. During the field surveys it was observed that the line has some deviations considering less impacts e.g., damage to community structures, tree cutting etc. to the original line route. There are no settlements, structures, springs or deep wells/tubewell other common and individual properties situated underneath this line. 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 this line. During the consultation and site visit of the consultants, it was revealed that there were no physical cultural resources situated within ROW. In Domar-Hatibandha alignment, the river crossing portion was previously located in the upstream of Teesta barrage. Bangladesh Water Development Board (BWDB) has requested to relocate the river crossing portion to 500m downstream of the Teesta barrage. Hence the span has changed although it's still within the maximum allowable limit of ACCC conductor. It is confirmed by PGCB that there will be no towers in the riverbed. A smaller number of trees to be cut in this alignment than the original route.

Similarly, the total length of Bagerhat-Pirojpur-Bhandaria 132 kV transmission line is estimated at 49.5 km by the PGCB. During the field surveys it was observed that the line has some deviations considering less impacts e.g., damage to community structures, tree cutting etc. to the original line route. There are no settlements, structures, springs or deep wells/tubewell other common and individual properties situated underneath this line. 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 this line. During the consultation and site visit of the consultants, it was revealed that there were no physical cultural resources situated within ROW. A smaller number of trees to be cut in this alignment than the original route.

A detailed birds survey/migratory birds surveys for these three alignments are suggested to be conducted in order to eliminate any potential threat to their route and staging.

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<sup>13</sup> <https://www.adb.org/projects/documents/ban-51137-003-iee>

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.

# APPENDIX

## APPENDIX A: COORDINATES OF FINAL ALIGNMENTS OF TRANSMISSION AND LILO LINES OF DWZTGEP COMPONENT 2

### Kushtia- Meherpur 132 kV double circuit transmission line

Line Length: 43.68 km

Sl No	Coordinates (Decimal Degrees)		Elevation (m)	Name	Angle
	Latitude	Longitude			
1.	88.682199	23.790406	15	AP-01	27.7
2.	88.715598	23.798255	18	AP-2	22.8
3.	88.734906	23.794951	16	AP-3	20.3
4.	88.758556	23.799316	17	AP-4	48.6
5.	88.774492	23.825942	17	AP-5	55
6.	88.847594	23.831313	20	AP-6	11.2
7.	88.860341	23.829733	14	AP-7	19.4
8.	88.889526	23.836087	13	AP-8	14.1
9.	88.904046	23.835574	18	AP-9	45.6
10.	88.910486	23.841688	17	AP-10	45.7
11.	88.928772	23.840955	16	AP-11	23
12.	88.93888	23.844746	14	AP-12	19.4
13.	88.956545	23.845083	12	AP-13	12.2
14.	88.994729	23.854028	13	AP-15	31
15.	89.03499	23.841069	12	AP-16	26.3
16.	89.039742	23.841755	11	AP-17	51
17.	89.044741	23.850086	14	AP-18	47.4
18.	89.054894	23.852153	11	AP-19	10.8
19.	89.074527	23.860142	13	AP-20	28.7
20.	89.0849	23.872804	13	AP-22	39.7
21.	89.089016	23.873597	16	AP-22/A	21.1
22.	89.090739	23.873285	16	AP-23	37.6



SI No	Coordinates (Decimal Degrees)		Elevation (m)	Name	Angle
	Latitude	Longitude			
23.	89.093679	23.874807	13	AP-24	53.5
24.	89.093995	23.879786	14	End Point	0
25.	89.094359	23.879194	15	Proposed Route (TT-02)	40.2

**Domar- Hatibandha 132 kV double circuit transmission line**

Line Length: 35 km

SI. No	Coordinates (Decimal Degrees)		Elevation (m)	Name	Angle
	Latitude	Longitude			
1.	88.797383	26.106203	55	Start Point	0.00
2.	88.806468	26.115116	52	AP-1	34.12
3.	88.81825	26.11727	56	AP-2	29.33
4.	88.823859	26.11533	52	AP-3	27.20
5.	88.84336	26.118061	51	AP-4	34.16
6.	88.856577	26.129987	55	AP-5	18.44
7.	88.871018	26.1363	54	AP-6	27.00
8.	88.88026	26.135746	57	AP-7	40.99
9.	88.885272	26.139598	56	AP-8	39.55
10.	88.891269	26.139402	55	AP-9	25.48
11.	88.896079	26.136911	54	AP-10	53.52
12.	88.9	26.138827	54	AP-11	19.81
13.	88.902106	26.141011	59	AP-12	35.74
14.	88.907312	26.141971	55	AP-13	22.73
15.	88.912073	26.145112	57	AP-14	40.46
16.	88.917014	26.144505	56	AP-15	7.09
17.	88.919404	26.144509	58	AP-16	18.55
18.	88.922388	26.143513	57	AP-17	25.21
19.	88.924653	26.14378	54	AP-18	17.67
20.	88.928845	26.145692	55	AP-19	15.14

Sl. No	Coordinates (Decimal Degrees)		Elevation (m)	Name	Angle
	Latitude	Longitude			
21.	88.919404	26.144509	58	AP-16	18.55
22.	88.922388	26.143513	57	AP-17	25.21
23.	88.928845	26.145692	55	AP-19	15.14
24.	88.960292	26.161461	55	AP-22	18.44
25.	88.96351	26.161904	55	AP-23	40.79
26.	88.967456	26.166364	55	AP-24	40.25
27.	88.970644	26.166825	50	AP-25	29.91
28.	88.973387	26.165723	54	AP-26	28.72
29.	89.0023	26.168988	54	AP-27	3.70
30.	89.008747	26.169286	54	AP-28	16.56
31.	89.012822	26.170701	53	AP-29	26.59
32.	89.03399	26.167912	55	AP-30	21.50
33.	89.040239	26.169466	52	AP-31	9.47
34.	89.071185	26.182906	56	AP-32	7.36
35.	89.073742	26.184431	55	AP-33	36.52
36.	89.076563	26.191178	56	AP-34	49.44
37.	89.079662	26.19218	55	AP-35	57.20
38.	89.089294	26.194243	56	AP-36	5.73
39.	89.090312	26.196926	54	AP-37	14.77
40.	89.090614	26.199794	54	AP-38	39.75
41.	89.094768	26.203839	54	AP-39	41.94

**Bagerhat-Pirojpur- Bhandaria 132 kV double circuit transmission line**

Line Length: 49.5 km







No	Coordinates (Decimal Degrees)		Elevation (m)	Name	Angle
	Latitude	Longitude			
1	89.797423	22.646848	8	Start Point	0.00
2	89.797623	22.645809	6	AP 1	50.60
3	89.800351	22.644327	4	AP 2	9.52
4	89.810207	22.636623	9	AP 3	47.93
5	89.826085	22.639839	4	AP 4	39.17
6	89.833898	22.635733	4	AP 5	45.12
7	89.848291	22.640242	9	AP 6	20.74
8	89.856078	22.639787	5	AP 7	11.64
9	89.868684	22.641626	4	AP 8	19.08
10	89.886892	22.638161	3	AP 9	26.75
11	89.902837	22.625916	4	AP 10	49.11
12	89.935994	22.632714	4	AP 11	18.63
13	89.941914	22.631982	3	AP 12	21.02
14	89.948347	22.633583	3	AP 13	19.84
15	89.950761	22.6352	3	AP 14	28.38
16	89.95158	22.635277	4	End Point	0.00
17	89.951208	22.634312	4	Start Point	0.00
18	89.951313	22.633745	7	AP 1	30.97
19	89.953088	22.631735	5	AP 2	32.64
20	89.969352	22.627101	5	AP 3	9.90
21	89.976591	22.626339	6	AP 4	58.19
22	89.9797	22.619909	7	AP 5	36.44
23	89.985712	22.616745	9	AP 6	51.03
24	89.98915	22.599409	10	AP 7	56.79







No	Coordinates (Decimal Degrees)		Elevation (m)	Name	Angle
	Latitude	Longitude			
25	89.996012	22.596638	2	AP 8	17.88
26	90.011204	22.583948	7	AP 9	26.59
27	90.023265	22.5811	5	AP 10	4.11
28	90.039019	22.578555	4	AP 11	21.05
29	90.051387	22.571348	5	AP 12	13.73
30	90.063685	22.567705	6	AP 13	36.08
31	90.075521	22.552233	6	AP 14	23.21
32	90.077646	22.543838	4	AP 15	35.70
33	90.081473	22.540617	4	AP 16	44.65
34	90.083362	22.52008	3	AP 17	54.02
35	90.087149	22.517829	7	AP 18	30.42
36	90.100872	22.517756	5	AP 19	46.43
37	90.107942	22.510244	5	AP 20	11.63
38	90.111866	22.503874	6	AP 21	44.02
39	90.108512	22.488603	7	AP 22	40.28
40	90.103682	22.48492	3	AP 23	17.66
41	90.095635	22.47343	5	AP 24	40.73
42	90.080013	22.469457	8	AP 25	57.44
43	90.07126	22.477668	6	AP 26	41.38
44	90.071161	22.478702	6	AP 27	55.82
45	90.069428	22.479651	6	AP 28	70.87
46	90.069548	22.48036	5	End Point	0.00

## APPENDIX B: Photographs of the Existing Environment and Public Consultations

### Existing Environment

#### Kushtia- Meherpur 132 kV double circuit transmission line

 <p>Jul 20, 2022 11:12:18 23°47'41.95572"N 88°44'5.8394"E 35° NE Meherpur District Khulna Division Kushtia- Meherpur AP 3</p>	 <p>Jul 20, 2022 12:01:01 23°47'47.55584"N 88°44'31.03004"E 233° SW Meherpur District Khulna Division Kushtia- Meherpur 3/2</p>
<p><b>AP 3</b></p>	<p><b>TL 3/2</b></p>
 <p>Jul 20, 2022 12:05:51 23°47'47.87531"N 88°44'37.67647"E 96° E Unnamed Road Ganghi Meherpur District Khulna Division Kushtia- Meherpur 3/3</p>	 <p>Jul 20, 2022 12:32:26 23°47'46.41431"N 88°44'47.94168"E 93° E Ganghi Meherpur District Khulna Division Kushtia- Meherpur 3/4</p>
<p><b>TL 3/3</b></p>	<p><b>TL 3/4</b></p>
 <p>Jul 20, 2022 12:37:59 23°47'51.64112"N 88°44'58.49261"E 358° N Meherpur District Khulna Division Kushtia- Meherpur 3/5</p>	 <p>Jul 20, 2022 12:50:33 23°47'53.73406"N 88°45'10.05044"E 287° W Road Dhankhola Meherpur District Khulna Division Kushtia- Meherpur 3/6</p>

<p style="text-align: center;"><b>TL 3/5</b></p>  <p style="text-align: right;">             Jul 19, 2022 15:29:01              23°49'52.15742" N 88°52'3.65322" E              260' W              Kustha- Meherpur              7/3         </p>	<p style="text-align: center;"><b>TL 3/6</b></p>  <p style="text-align: right;">             Jul 19, 2022 15:09:47              23°49'54.93115" N 88°52'16.71911" E              261' W              Kustha- Meherpur              3/3         </p>
<p style="text-align: center;"><b>TL 7/3</b></p>  <p style="text-align: right;">             Jul 19, 2022 16:43:45              23°50'7.64513" N 88°52'11.06795" E              204' SW              Kustha- Meherpur              7/3         </p>	<p style="text-align: center;"><b>TL 7/4</b></p>  <p style="text-align: right;">             Jul 19, 2022 17:37:36              23°50'8.61824" N 88°52'53.45736" E              57' NE              Unnamed Road              Kustha District              Khulna Division              Kustha- Meherpur              8/3         </p>
<p style="text-align: center;"><b>TL 7/9</b></p>  <p style="text-align: right;">             Jul 21, 2022 10:18:33              23°50'26.97284" N 88°55'43.93227" E              255' W              Malhad              Kustha District              Khulna Division              Kustha- Meherpur              AP 11         </p>	<p style="text-align: center;"><b>TL 8/3</b></p>  <p style="text-align: right;">             Jul 21, 2022 10:39:13              23°50'30.17789" N 88°55'50.97137" E              129' SE              Malhad              Kustha District              Khulna Division              Kustha- Meherpur              11/7         </p>
<p style="text-align: center;"><b>AP 11</b></p>	<p style="text-align: center;"><b>TL 11/2</b></p>



 <p>Jul 21, 2022 11:33:47                  23°50'39.54473"N 88°56'9.27463"E                  162' S                  Unnamed Road                  Kushtia District                  Khulna Division                  Kushtia- Meherpur                  11/3</p>	 <p>Jul 21, 2022 12:00:21                  23°50'40.6757"N 88°56'20.33434"E                  250' W                  Kushtia District                  Khulna Division                  Kushtia- Meherpur                  AP 12</p>
<p><b>TL 11/3</b></p>	<p><b>AP 12</b></p>
 <p>Jul 21, 2022 13:14:30                  23°50'41.52383"N 88°56'42.86011"E                  207' SW                  Unnamed Road                  Kushtia District                  Khulna Division                  Kushtia- Meherpur                  12/2</p>	 <p>Jul 21, 2022 13:29:40                  23°50'41.8465"N 88°56'51.76986"E                  155' SE                  Kushtia- Meherpur                  12/3</p>
<p><b>TL 12/2</b></p>	<p><b>TL 12/3</b></p>
 <p>Jul 21, 2022 13:57:53                  23°50'39.49236"N 88°57'5.21694"E                  346' N                  Moan                  কুষ্টিয়া সদর                  কুষ্টিয়া জিলা                  Kushtia- Meherpur                  12/4</p>	 <p>Jul 21, 2022 14:16:55                  23°50'41.83386"N 88°57'12.51922"E                  121' N                  Unnamed Road                  Kushtia District                  Khulna Division                  Kushtia- Meherpur                  12/5</p>
<p><b>TL 12/4</b></p>	<p><b>TL 12/5</b></p>



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**TL 13/6**

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**Domar-Hatibandha 132 kV double circuit transmission line**



**TL 2/5**



**TL 5/8**



**TL 6/1**



**TL 6/4**









**TL 9/2**



**TL 9/3**

**Bagerhat-Pirojpur-Bhandaria 132 kV double circuit transmission line**

	
<b>TL 7/6</b>	<b>AP 08</b>
	
<b>TL 8/1</b>	<b>TL 8/4</b>
	
<b>TL 8/5</b>	<b>TL 8/6</b>





**TL 8/7**



**TL 9/1**



**TL 9/2**



**TL 37/4**

## The Safeguard Consultation Photographs (July- September 2022)

### Kushtia- Meherpur



**Public Consultation -1**



**Public Consultation 2**



**Public Consultation 3**



**Public Consultation 4**



**Public Consultation 5**



**Public Consultation 6**





**Public Consultation 7**



**Public Consultation 8**

**Domar-Hatibandha**



**Public Consultation 1**



**Public Consultation 2**



**Public Consultation 3**



**Public Consultation 4**



**Public Consultation 5**



**Public Consultation 6**



**Public Consultation 7**



**Public Consultation 8**



**Public Consultation 9**



**Public Consultation 10**



**Bagerhat-Pirojpur-Bhandaria**



**Public Consultation 1**



**Public Consultation 2**



**Public Consultation 3**



**Public Consultation 4**



**Public Consultation 5**



**Public Consultation 6**



**Public Consultation 7**



**Public Consultation 8**



**Public Consultation 9**



**Public Consultation 10**



## APPENDIX C: ATTENDANCE OF CONSULTATIONS

### Kushtia- Meherpur

Dhaka-2, Moulvi Jaber Thakurpala Grid Expansion Project

**FOCUS GROUP DISCUSSION  
ATTENDANCE SHEET**

Location:	Raipura, Gungni, Meherpur.		
Date:	21.07.2022	Time:	4:00

Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
1	Asadul Islam	31	Non-Driver	01713-039108	আসাদ
2	Abu Hanif	38	Business	01702-923097	আবু হানিফ
3	Kamruzzaman	43	Farmer	01935-234300	কামরুজ্জামান
4	Jahurul Islam	33	Farmer	01924-145219	জাহুরুল ইসলাম
5	Fazlen Rahman	45	Teacher	01580-703077	ফাজল রহমান
6	Saeed Uddin	36	Farmer	01791-814186	সৈয়দ উদ্দিন
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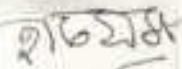
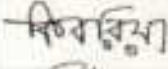
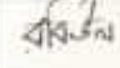
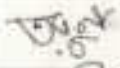
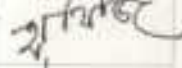
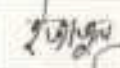
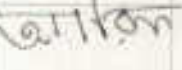
Dhaka &amp; Western Zone Transmission Grid Examination Project

FOCUS GROUP DISCUSSION  
ATTENDANCE SHEET

Location: Chidla, Gorgan, Mchospur

Date: 21.07.2022

Time: 11:00

Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
1	Hasem Ali	32	Farmer	01321-965198	
2	Kibria	37	Farmer	01743-187018	
3	Rabiul	35	Business	01965-309218	
4	Tarun Kanti	31	Auto Driver	01754-228107	
5	Hafizul Islam	34	Farmer	01887-521430	
6	Ejazul Haque	33	Auto Driver	01976-410213	
7	Anisul Islam	39	Business	01732-076907	
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Dhaka & Moulvibazar Zone Transmission Grid Expansion Project

**FOCUS GROUP DISCUSSION  
ATTENDANCE SHEET**

Location: Juginda, Gangan, Mahanpur

Date: 21.07.2022 Time: 9:55

Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
1	Shirazul Islam	35	Daily Labor	01796-410920	
2	Farid	39	Agriculture	01741-965475	
3	Nasir	43	"	01909-107637	
4	Hogon Ali Sheikh	38	"	01329-743253	
5	Amisuzzaman	42	Business	01807-521031	
6	Jannuddin	58	"	01905-349819	
7	Abdur Rahman	39	Agriculture	01774-298708	
8	Ripon Ali	36	"	01952-070586	
9	Hafiz	45	Business	01918-632142	
10	Sayon	37	Driver	01730-854364	
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Dhaka &amp; Western Zone Transmission Grid Expansion Project

FOCUS GROUP DISCUSSION  
ATTENDANCE SHEET



Location:	Khasia Nagon, Kushtia Sadan, Kushtia		
Date:	20-07-2022	Time:	3:45

Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
1	Sathi	32	Housewife	01925-837048	সথি
2	Papi Khatun	35	*	01947-059260	পাপি
3	Amin Nahon	28	*	01767-241982	আমিন
4	Khadiza Begum	30	*	01878-382593	খাদিজা
5	Parvin Sultana	37	*	01956-160371	পারভিন
6	Roshon Ara.	34	*	01736-948159	রশোন
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Dhaka & Western Zone Transmission Grid Expansion Project

**FOCUS GROUP DISCUSSION  
ATTENDANCE SHEET**

Location: <i>Batkhil, Kuchha Saden, Kuchha</i>
Date: <i>10-07-2022</i> Time: <i>10:45</i>

Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
1	<i>Najmul Islam</i>	<i>42</i>	<i>Agriculture</i>	<i>01941176829</i>	<i>বাজমুল ইসলাম</i>
2	<i>Salman</i>	<i>48</i>	<i>Agriculture</i>	<i>01852387935</i>	<i>সালমান</i>
3	<i>Rifotul Islam</i>	<i>45</i>	<i>"</i>	<i>01763-498146</i>	<i>রিফতুল ইসলাম</i>
4	<i>Abdur Rahim</i>	<i>70</i>	<i>—</i>	<i>at</i>	
5	<i>Shahidullah</i>	<i>52</i>	<i>Business</i>	<i>01674-519257</i>	<i>শাহিদুল্লাহ</i>
6	<i>Samiul Islam</i>	<i>55</i>	<i>Agriculture</i>	<i>01515-621368</i>	<i>সামুল ইসলাম</i>
7	<i>Amama</i>	<i>68</i>	<i>"</i>	<i>01417-843580</i>	
8	<i>Sabbir</i>	<i>49</i>	<i>"</i>	<i>01919-065702</i>	<i>সাব্বির</i>
9	<i>Shahadat Ali</i>	<i>51</i>	<i>Auto Driver</i>	<i>01730-065713</i>	<i>শাহাদত আলি</i>
10	<i>Rohab Ali</i>	<i>57</i>	<i>Business</i>	<i>01308-954691</i>	<i>রোহাব আলি</i>
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Dhaka &amp; Western Zone Transmission Grid Expansion Project

**FOCUS GROUP DISCUSSION  
ATTENDANCE SHEET**

Location: Kabinhat, Kushtia Sadar, Kushtia

Date: 20-07-2022



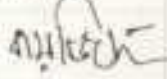

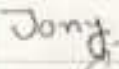
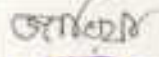


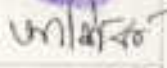
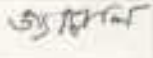
Time: 9:30

Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
1	Abdullah	28	Daily Labor	01721-371535	আব্দুল্লাহ
2	Shafiqul Islam	26	"	01943-593757	শাফিকুল
3	Selim Mia	32	"	01465-715974	সেলিম মিয়া
4	Mukul	39	"	01687-957196	মুকুল
5	Tamim	29	Student	01809-159318	Tamim
6	Reemon	29	Agriculture	01320-371520	রেমন
7	Sejam	33	"	01798-048207	সেজাম
8	Arafat	32	Business	01576-826085	আরাফাত
9	Hurrayun Kabin	62	"	01354-604865	
10	Shahinul Haque	37	Daily Labor	01832-482646	শাহিনুল
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FOCUS GROUP DISCUSSION  
ATTENDANCE SHEET

Location	Lamba para, Mairpur, Kushtia		
Date	19-07-2022	Time	12:30

Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
1	Rajob Ali	65	-	01935-586909	
2	Rafiqul Islam	32	Farmer	01781-139453	
3	Bayezid	38	"	01757-808124	
4	Majnu Rahman	41	"	01979-021675	
5	Jony	28	Student	01768-910564	
6	Janif Hossen	36	Business	01846-697010	
7	Azad Hossain	62	-	-	
8	Firoz Raihan	40	Farmer	01879-041686	
9	Ashiqun Rahman	33	Farmer	01979-028342	
10	Jamal Uddin	34	Farmer	01968-917231	
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FOCUS GROUP DISCUSSION  
ATTENDANCE SHEET

Location: Mejir hat, Mungun, Kishdia

Date: 19-07-2022 Time: 11:15

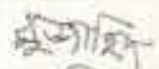
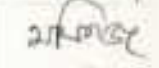
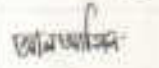
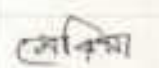

Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
1	Morison Rahman	40	Farmer	01706311585	
2	Kalu	37	"	01928532708	
3	Azmat Ali	32	Auto Driven	01651865031	
4	Jinanul	39	Farmer	01962976192	
5	Md Bulu	42	"	01740754920	
6	Fahim Uddin	38	Van Driven	01795209475	
7	Hamim Ali	34	Farmer	01817421697	
8	Nahid Sarwan	37	"	01984198364	
9	Narafat Hossen	41	Farmer	01939643819	
10	Ismail Hossen	35	"	01715461687	
11	Munmalin	30	Daily Labor	01906310586	
12	Didan Hossen.	36	Business	01773087253	
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Project: B. Westinghouse Transmission Grid Extension-2 (I) (E)

**FOCUS GROUP DISCUSSION  
ATTENDANCE SHEET**

Location: Pargana, Akhondaga, Chudanga




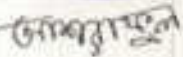
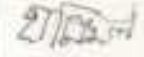



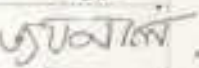


Date: 21-07-2022 Time: 11:35.

Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
1	Muzahidul Islam	35	Farmer	01995-256125	
2	Mafazzal Haque Mafiz	42	"	01917-478325	
3	Al Amin Hossen	21	Student	01706-367219	
4	Menira Sultana	37	Housewife	01723-589436	
5	Selima Akter	24	Housewife	01786-869948	
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Dhaka &amp; Western Zone Transmission Grid Expansion Project

FOCUS GROUP DISCUSSION  
ATTENDANCE SHEET

Location:	Hatbagalya, Alamdanga, Choudanga.
Date:	22-07-2022
Time:	9:45

Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
1	Abdul Momen	45	Farmer	01733-596999	
2	Rumman Ali	43	Farmer	01741-718136	
3	Josafil Islam	58	Farmer	01418-485603	
4	Md. Ashraful	41	Business	01507-379592	
5	Hamdul Islam	43	Farmer	01974-091269	
6	Litor	47	Daily Labor	01730-607025	
7	Muna Karim	41	Driver	01963-930351	
8	Jahangir Alam	46	Business	01785-152570	
9	Joydul Abedin	42	Farmer	01952-829247	
10	Nurul Islam	39	Farmer	01696-263481	
11	Humayun	49	Farmer	01329-596719	
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**Domar- Hatibandha**

**FOCUS GROUP DISCUSSION  
ATTENDANCE SHEET**

Location: পাটিলম (বালু গাঙ্গী, কল্লি গ্রাম, ডুমুরী উপজেলা)  
 Date: 20-08-22 Time: 4:30 PM

Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
1	শ্রী মতি মল্লিকা	60	স্বামী	01723151484	স্বাক্ষরিত
2	স্বামী মল্লিকা	28	"	01714383661	স্বাক্ষরিত
3	স্বামী	28	"	N/A	স্বাক্ষরিত
4	স্বামী মল্লিকা	28	মিস্ত্রী	0177117938	স্বাক্ষরিত
5	স্বামী	90	স্বামী	"	স্বাক্ষরিত
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**FOCUS GROUP DISCUSSION  
ATTENDANCE SHEET**

LOCATION: আলিয়া ১ নং; বাজার, চিমা, গাজীপুর

Date: 02.09.2022 Time: 11:10 AM

Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
1	শ্রী সজ্জা কান্ত	39	কৃষি	01723989266	[Signature]
2	শ্রী সিরিনা কান্ত	62	"	01731437288	[Signature]
3	শ্রী: আব্দুল মুনতাজ চৌধুরী	44	"	N/A	[Signature]
4	শ্রী মনজিল কান্ত	35	"	01733287762	[Signature]
5	শ্রী মুনাজ কান্ত	45	"	01717895523	[Signature]
6	শ্রী: মুন্সার মিনজ	60	কৃষি চলক	N/A	[Signature]
7	শ্রী: মুনাজ কান্ত	52	লাকার	01755190866	[Signature]
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FOCUS GROUP DISCUSSION ATTENDANCE SHEET					
Location: কামিলা (লাটা গ্রাম) রাস্তা বাসী, মেম্বা, মাদারগাতি					
Date: 29-08-22		Time: 4.00 pm			
Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
1	শ্রীমতি রশিমা শ্রীমান	৩৯	কৃষি	০১৭৬০১৫৬৩৯৩	রশিমা
2	নলকান্ত	৬৫	কো শিল্প	০১৭২৩১৫১৮৬১	নলকান্ত
3	শ্রী কামাধীন শ্রীমতি	৪৫	গৃহিণী		
4	শ্রীমতি রতনা কলী	২৫	গৃহিণী	০১৭১৯৪৯৬৬১	রতনা কলী
5	শ্রীমতি সুচিত্রা	৩০	গৃহিণী	০১৭২৩১৫১৮৬১	সুচিত্রা
6	আব্দুল গাফ	২২	ছাত্র	০১৩০৫৬৯৭২২৩	আব্দুল গাফ
7	প্রাণনা	২৫	গৃহিণী		প্রাণনা
8	আব্বাসীয়া কলী	২৫	ছাত্রী	০১৭১৭১৭০৯৯৪	আব্বাসীয়া
9	আব্দুল	৬২	কৃষি	০১৭৩৫৫৯৭১৩	আব্দুল
10	শ্রী আশ্বিনুল হক	৭০	অবসর	০১৭৬০৩৩৪৩৩০	আশ্বিনুল হক
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**FOCUS GROUP DISCUSSION  
ATTENDANCE SHEET**

Location: খন্দা এলাকা, আমা. গাজিয়া, ...  
 Date: 30/08/22 Time: 5:30 PM

Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
1	মাকিমুল হক	০৫	কৃষি	০১৭২২২৫৯২০২	[Signature]
2	শ্রী: নাসিম হোসেন	২০	বিদ্যালয়	০১৭২৩২০৬৫৫৬	নাসিম
3	শ্রী: জাহাঙ্গীর হোসেন	৬০	কৃষি	N/A ০১৭২৩২০৬৫৫৬	শ্রী: জাহাঙ্গীর
4	শ্রী: মুহাম্মদ হোসেন	৪০	কৃষি	০১৭০৯৯৬০১৩	শ্রী: মুহাম্মদ
5	শ্রী: মাহমুদ হোসেন	৬০	কৃষি	০১৩০২১১১০৩২	[Signature]
6	শ্রী: মাহমুদ হোসেন	০০	কৃষি	০১৭০৫২৩৬০৪৩	শ্রী: মাহমুদ
7	শ্রী: মাহমুদ হোসেন	০৬	কৃষি	০১৭৫৫৭০২৫৫৯	শ্রী: মাহমুদ
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**FOCUS GROUP DISCUSSION  
ATTENDANCE SHEET**

Location: ৩৬ (ক) সফি) ৩৩৩ কাস, (সফি, মালদহ)  
 Date: 30/08/22 Time: 11.00 AM

Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
1	মোহাঃ মোহাম্মদ মোহাম্মদ	৩১	স্বত্বী	০১৭৫৪৪৬৯৯৯	মোহাম্মদ
2	মোহাঃ মোহাম্মদ মোহাম্মদ	৪৫	"	০১৪২২৯৪৬১৫৪	মোহাম্মদ
3	মোহাম্মদ মোহাম্মদ	৫০	"	N/A	মোহাম্মদ
4	মোহাম্মদ মোহাম্মদ	৩৫	স্বত্বী	০১৭৭৯২১৫৬৫	মোহাম্মদ
5	মোহাম্মদ মোহাম্মদ	২৫	স্বত্বী	০১৪০১৭৪০৬৭৪৬৪৭	মোহাম্মদ
6	মোহাম্মদ মোহাম্মদ	২৫	"	০১৭৫৪৪৬৯৯৯	মোহাম্মদ
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FOCUS GROUP DISCUSSION  
ATTENDANCE SHEET

Location: দক্ষিণ তিঁতপাড়া ডিমলা, মৌজামারি।

Date: ৩৩/০৫/২২ Time: ১০:৩০

Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
1	মো: আব্বাস আলী	68	কৃষি	০১৫২-৭৬২৬৩১	আব্বাস
2	মো: আব্বাস আলী	52	কৃষি	০১৭৭৩৫২৭২২	আব্বাস
3	মো: হুলাল হোসেন	64	কৃষি	০১৭১-২২২৭৬৫৭	হুলাল
4	মো: আব্বাস আলী	28	ছাত্র	০১৭৭৫১১২০৬	আব্বাস
5	মো: আব্বাস আলী	29	ছাত্র	০১৭৫১২৪০১০৪	আব্বাস
6	মো: বাশিফুল ইসলাম	42	ব্যবসা	০১৭২২-২৫৭৭৭৪	বাশিফুল
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**FOCUS GROUP DISCUSSION  
ATTENDANCE SHEET**

Location	স্বাস্থ্য সেবা, ডিমলা, ময়মনসিংহ			
Date	01/09/22	Time	11:30	

Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
1	শ্রীমতী ইয়াসমিন	25	শ্রমিক	01717621306	[Signature]
2	শ্রীমতী ইয়াসমিন	22	কৃষি	0179601872	[Signature]
3	শ্রীমতী ইয়াসমিন	30	কৃষি	সহ	[Signature]
4	শ্রীমতী	30	সহ	01763402037	[Signature]
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**FOCUS GROUP DISCUSSION  
ATTENDANCE SHEET**

Location: তিতলাজ, ডিমলা, বীরশিবগঞ্জ

Date: 31/08/22 Time: 02:10

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Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
1	কৌমারী সন্দিক	৩৫	স্বামী	০১৭৫৭৪৫৫০১৩	কৌমারী
2	আশা মতি	২৬	"	০১৭৭৩৫২৩২৬	আশা মতি
3	বিনয়িকা	৩৫	"	"	বিনয়িকা
4	বাতিমা খান	৬৫	"	০১৭৫১২৪০১৪	বাতিমা
5	বেগম আফজল হুসেইন	২০	শিক্ষার্থী	"	বেগম
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**FOCUS GROUP DISCUSSION  
ATTENDANCE SHEET**

Location: আদীব সরকার, ডিহালা, নীলফামারি ১

Date: ০১-০৭-২২ Time: ১৬:৫২

Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
1	ইনকাম বানার	৬৫	স্বার্থী	০১৩২২৭১০২১৮	ইনকাম বানার
2	ইনকাম	৫০	৷	N/A	ইনকাম
3	স্বার্থী বানার	৪৫	৷	N/A	স্বার্থী বানার
4	স্বার্থী বানার	৫৫	৷	N/A	স্বার্থী বানার
5	স্বার্থী	৭৫	৷	০১৭৭৬২১৩০৬	স্বার্থী
6	স্বার্থী	৫৫	৷	০১৪৭৭১৭৬৫৫	স্বার্থী
7	স্বার্থী	৪০	৷	N/A	স্বার্থী
8	স্বার্থী	৫৫	৷	N/A	স্বার্থী
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**FOCUS GROUP DISCUSSION  
ATTENDANCE SHEET**

Location: শ্রীমতি মঞ্জুরী সড়ক প্রকল্প, সাতক্ষীরা জেলা  
 Date: ০৯/১০/২২ Time: \_\_\_\_\_

Sl.	Name of Participant	Age	Occupation	Phone Number	Signature
১	শ্রীমতি মঞ্জুরী	২৮	গার্ভ	০১৭০৭৩৩১০৯	
২	শ্রীমতি মঞ্জুরী	৩০	৷	০১৭২৩০৩৩৪৫৭	
৩	শ্রীমতি মঞ্জুরী	২০	গার্ভ	০১৭৪৪৬৩৬১৭৬	
৪	শ্রীমতি মঞ্জুরী	২১	গার্ভ	০১৭০৬৮৪৩৬৬১১	
৫	শ্রীমতি মঞ্জুরী	২৩	গার্ভ	০১৭৪৭৩৩৬৬০	
৬	শ্রীমতি মঞ্জুরী	৪৫	গার্ভ	০১৭৬৭৩১৭৭০	
৭	শ্রীমতি মঞ্জুরী	৩৫	৷	N/A	
৮	শ্রীমতি মঞ্জুরী	২৮	গার্ভ	০১৭০৭৭১৫০০	
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**Bagerhat- Pirojpur- Bhandaria**

**Dhaka & Western Zone Transmission Grid Expansion Project**

**FOCUS GROUP DISCUSSION**

**ATTENDANCE SHEET**

Location: <i>Bahua Rajpur, Thakurga</i>	
Date: <i>03/09/2022</i>	Time: <i>02:00 PM</i>

Sl No	Name of Participants	Age	Occupation	Phone Number	Signature
1	<i>ফারুক</i>	<i>21</i>	<i>শ্রমিক</i>	<i>01710-185497</i>	<i>ফারুক</i>
2	<i>সুজন সুলতান</i>	<i>৬৪</i>	<i>শ্রমিক</i>	<i>01734-305410</i>	<i>সুজন</i>
3	<i>সুজন সুলতান</i>	<i>৬০</i>	<i>শ্রমিক</i>	<i>01157-527311</i>	<i>সুজন</i>
4	<i>সুজন সুলতান</i>	<i>৬০</i>	<i>শ্রমিক</i>	<i>01974-749113</i>	<i>সুজন</i>
5	<i>সুজন সুলতান</i>	<i>৬০</i>	<i>শ্রমিক</i>	<i>01100-830200</i>	<i>সুজন</i>
6	<i>সুজন সুলতান</i>	<i>৬৬</i>	<i>শ্রমিক</i>	<i>01868-63892</i>	<i>সুজন</i>
7	<i>সুজন সুলতান</i>	<i>৬৪</i>	<i>শ্রমিক</i>	<i>01945-914726</i>	<i>সুজন</i>
8	<i>সুজন সুলতান</i>	<i>৬০</i>	<i>শ্রমিক</i>	<i>01923-294908</i>	<i>সুজন</i>
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Dhaka & Western Zone Transmission Grid Expansion Project

FOCUS GROUP DISCUSSION

ATTENDANCE SHEET

Location: সুপার/১০০০০, কামালপুর  
 Date: ০৭/০৮/২০২২ Time: ৫:০০ হি.

Sl No	Name of Participants	Age	Occupation	Phone Number	Signature
1	আব্দুল আলী	৫২	শ্রমিক	০১৬৬-৭০৭৫৭	স্বাক্ষর
2	নূরুজ্জামান	৫৫	শ্রমিক	০১৩৭০-৩০১৩৩	স্বাক্ষর
3	আব্দুল হামিদ	৫৬	শ্রমিক	০১৭৩২-১২৪১২	স্বাক্ষর
4	আব্দুল মালিক	৬২	শ্রমিক	০১৭০১-০১৫০০	স্বাক্ষর
5	আব্দুল হামিদ	৫০	শ্রমিক	০১৭০১-০১৫০০	স্বাক্ষর
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**Dhaka & Western Zone Transmission Grid Expansion Project**

FOCUS GROUP DISCUSSION

ATTENDANCE SHEET

Location: <u>শেখুলিয়া-১, গাজীপুর, মৌলভীবাজার</u>
Date: <u>০২/০৯/২০২২</u> Time: <u>৯-১০</u>

Sl No	Name of Participants	Age	Occupation	Phone Number	Signature
1	<u>শেখুলিয়া-১</u>	<u>৪৫</u>	<u>স্বাধীন</u>	<u>০১৭২৫০০৫৩</u>	<u>[Signature]</u>
2	<u>শেখুলিয়া-১</u>	<u>৫৫</u>	<u>''</u>	<u>০১৭২৫০১৩৬</u>	<u>[Signature]</u>
3	<u>শেখুলিয়া-১</u>	<u>৪৫</u>	<u>স্বাধীন</u>	<u>০১৭৪৬০৩৫৭২</u>	<u>[Signature]</u>
4	<u>শেখুলিয়া-১</u>	<u>৫০</u>	<u>স্বাধীন</u>	<u>০১৭৪৬০৩৫৭২</u>	<u>[Signature]</u>
5	<u>শেখুলিয়া-১</u>	<u>৫৬</u>	<u>স্বাধীন</u>	<u>০১৭৬৭৯৯৭৭</u>	<u>[Signature]</u>
6	<u>শেখুলিয়া-১</u>	<u>৫৫</u>	<u>স্বাধীন</u>	<u>০১৩০৫৩৩৭৭</u>	<u>[Signature]</u>
7	<u>শেখুলিয়া-১</u>	<u>৫০</u>	<u>স্বাধীন</u>	<u>০১৭২৫০১৩৬</u>	<u>[Signature]</u>
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**Dhaka & Western Zone Transmission Grid Expansion Project**

FOCUS GROUP DISCUSSION  
ATTENDANCE SHEET

Location	নগরপৌর উন্নয়ন	
Date	০২/০৬/২০২২	Time: ১২:৩০

Sl No	Name of Participants	Age	Occupation	Phone Number	Signature
1	শ্রী. সফর হাফিজ	৬০	স্বাধীন	-	[Signature]
2	শ্রী. হুমায়ুন কবীর	৬০	স্বাধীন	০১৭১২৭৫৯৯৩৭	[Signature]
3	শ্রী. মমিন	২৫	স্বাধীন	০১৩২০৮৭৩৩৩	[Signature]
4	শ্রী. হামিদুল হক	২৬	স্বাধীন	০১৭৩৫২০৩৩৩৫	[Signature]
5	শ্রী. হুমায়ুন কবীর	২২	স্বাধীন	-	[Signature]
6	শ্রী. আব্দুল হক	২০	স্বাধীন	০১৭৫৫২১৮৭৬২০৭	[Signature]
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**Dhaka & Western Zone Transmission Grid Expansion Project**

FOCUS GROUP DISCUSSION  
ATTENDANCE SHEET

Location: <u>সীতাপুর উপজেলা, ময়মনসিংহ জেলা</u>	Date: <u>০২.০৬.২০২২</u>
Time: <u>১০:৩০ (০২)</u>	

Sl No	Name of Participants	Age	Occupation	Phone Number	Signature
1	<u>সীতাপুর উপজেলা</u> <u>Rumon Islam</u>	<u>৩৫</u>	<u>স্বাধীন</u>	<u>-</u>	<u>[Signature]</u>
2	<u>স্বাঃ সীতাপুর উপজেলা</u>	<u>৫০</u>	<u>স্বাধীন</u>	<u>০১৩০৭৩৭০৬৭</u>	<u>[Signature]</u>
3	<u>স্বাঃ সীতাপুর</u>	<u>৬০</u>	<u>স্বাধীন</u>	<u>০১৭৭-৬৭২৪৭৭</u>	<u>[Signature]</u>
4	<u>স্বাঃ সীতাপুর</u>	<u>৪৫</u>	<u>স্বাধীন</u>	<u>০১৭২৪-৩২৭০০০</u>	<u>[Signature]</u>
5	<u>স্বাঃ সীতাপুর</u>	<u>৬২</u>	<u>স্বাধীন</u>	<u>০১৭৭১১৩৫৫২</u>	<u>[Signature]</u>
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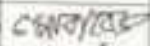







**Dhaka & Western Zone Transmission Grid Expansion Project**

FOCUS GROUP DISCUSSION  
ATTENDANCE SHEET

Location	Saccipur, Bhadaria, Dajpur				
Date	31-08-2022		Time	12:00	

Sl No	Name of Participants	Age	Occupation	Phone Number	Signature
1	Md Mozrok Hossain	65	Agriculture	01766787757	
2	Md Abdul Kalam	55	Agriculture	-	
3	Md Hossain Hossain	52	"	0172525 895	
4	Md Abdul Hakim	72	"	-	
5	Md Babul Kha	50	"	-	
6	Md Abdul Hakim	70	"	-	
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Dhaka & Western Zone Transmission Grid Expansion Project

FOCUS GROUP DISCUSSION

ATTENDANCE SHEET

Location: <u>সিটাজেডাংক সিটাজেডাংক</u>	Date: <u>২০/০৫/২০২২</u>	Time: <u>১১:৩০-১২:৩০</u>
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Sl No	Name of Participants	Age	Occupation	Phone Number	Signature
1	শাহিনা মিল্লাহ	33	শ্রমিক	01744-748653	শাহিনা
2	সুজান্না হোসেন	41	শ্রমিক	01767-96075	সুজান্না
3	সুজান্না হোসেন	46	শ্রমিক	01904-181199	সুজান্না
4	সুজান্না হোসেন	38	শ্রমিক	01695-251168	সুজান্না
5	শাহিনা মিল্লাহ	45	শ্রমিক	01775-011984	শাহিনা
6	শাহিনা মিল্লাহ	37	শ্রমিক	01951-259764	শাহিনা
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Dhaka & Western Zone Transmission Grid Expansion Project

FOCUS GROUP DISCUSSION

ATTENDANCE SHEET

Location: <u>Gopalpur, Kachua, Rajshahi</u>
Date: <u>31/08/2012</u> Time: <u>12:00 PM</u>

Sl No	Name of Participants	Age	Occupation	Phone Number	Signature
1	<u>Sujon</u>	<u>26</u>	<u>শ্রমিক</u>	<u>01721-491577</u>	<u>Sujon</u>
2	<u>মতিজ ফার</u>	<u>৬৫</u>	<u>শ্রমিক</u>	<u>01943-615575</u>	<u>মতিজ</u>
3	<u>কালিম হোসেন</u>	<u>৩২</u>	<u>শ্রমিক</u>	<u>01761-834924</u>	<u>কালিম হোসেন</u>
4	<u>মতিজ হোসেন</u>	<u>৬০</u>	<u>শ্রমিক</u>	<u>01954-724601</u>	<u>মতিজ</u>
5	<u>মতিজ হোসেন</u>	<u>৪২</u>	<u>শ্রমিক</u>	<u>01752-512460</u>	<u>মতিজ</u>
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**Dhaka & Western Zone Transmission Grid Expansion Project**

FOCUS GROUP DISCUSSION

ATTENDANCE SHEET

Location: <u>Angkor Vat, Kishore</u>
Date: <u>2/08/2022</u> Time: <u>3:30-PM</u>

Sl No	Name of Participants	Age	Occupation	Phone Number	Signature
1	সুজিত সান্নি	৬০	শ্রমিক	০১৭১-৬৭১৬০০	[Signature]
2	মোহাম্মদ হোসেন	৬৫	কৃষক	০১৯৯-০৯৯৯৯৯	[Signature]
3	আবুল কালাম	৬৭	শ্রমিক	০১৭৫৫-৩১৩৩৩	[Signature]
4	আবুল কালাম	৬৬	শ্রমিক	০১৫৫-৫৫৫৫৫	[Signature]
5	আবুল কালাম	৬৩	শ্রমিক	০১৭৫৩-১০০৩৩	[Signature]
6	আবুল কালাম	৬২	শ্রমিক	০১৫৫-৯৫৬৭০	[Signature]
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**Dhaka & Western Zone Transmission Grid Expansion Project**

**FOCUS GROUP DISCUSSION**

**ATTENDANCE SHEET**

Location	বাংলাদেশ বিদ্যুৎ কর্পোরেশন, ঢাকা		
Date	১৩/০৬/২০২২	Time	১০:০০-১১:৩০

Sl No	Name of Participants	Age	Occupation	Phone Number	Signature
1	সুমি আক্তা	২৬	ছাত্র	০১৬০-২৫০৭৯	Sumi
2	দেবসনা জাহান	৩৪	শ্রমিক	০১৭১২-৭৭৬৬০	Debnana
3	সাইফা চন্দা	৪২	শ্রমিক	০১৭০৫-৪৬৬৫৭	Saifana
4	আবদুল মজিদ	৬৭	শ্রমিক	০১৭৫৭-১২৩০৫	Abdul Majid
5	সিদ্দিক	৪০	শ্রমিক	০১২৪৫-২১২১৭	Siddik
6	সমরজিৎ মজিদ	৪৫	শ্রমিক	০১৭৭৫-০৭১০৬	Samarjit Majid
7	তাজুল ইসলাম	৬৫	শ্রমিক	০১৭১৪-০১১০৬	Tajul Islam
8	মাহবুব	৬০	শ্রমিক	০১৭৪৩-৫৪২০৬	Mahbub
9	তমি	২২	ছাত্র	০১৭৬১-৩৬৪৫৬	Tomoy
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## APPENDIX D: ENVIRONMENTAL MONITORING (LAB SHEET)

**Kushtia- Meherpur**

Baseline Environmental Monitoring Report  
Design, Supply, Installation, Testing & Commissioning of 230kV & 132kV Transmission Lines in Western Zone on turnkey basis  
Kushtia-Meherpur 132KV Transmission Line (ADS Package 3) under FGCE

### Annex A-1: Air Quality Analysis Reports

SL. No: 001

**EQMS**

Ref: EQMS/Air Quality/2022/011031

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

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

**Transmission Line** : Kushtia-Meherpur 132KV Transmission Line

**Monitoring Activity** : Ambient Air Quality Monitoring

**Monitoring Personnel** : Md. Rajib Hassan Raja  
Assistant Consultant, EQMS

**Monitoring Location** : AQ1: Sishopara, Oshankhola, Garga, Meherpur (Near AP 3/3)


**Monitoring Date** : 1<sup>st</sup> June 2022


**Analysis Date** : 12<sup>th</sup> June 2022


**Description of Analysis** :




Location	GPS Coordinate	Ambient Air Pollutants Concentration (µg/m <sup>3</sup> )							CO
		PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>x</sub>	SPM	O <sub>3</sub>	PH	
AQ1	23°47'31.28"N 88°44'41.88"E	28.8	35.3	17.8	22.7	106.5	14.3	80L	0.271
Duration (hr.)		24	24	24	24	8	8	8	8
ECR, 1997 and amendment in 2005 Standard (Schedule-2)		65	150	365	100 (Annual)	200	157	6.5	9
WHO/WHO Standard		25	30	20	40 (Annual)	-	100	-	-
Method of Analysis: Instrument Use: No. Scans: 100		High Accuracy Nephelometer	High Accuracy Nephelometer	High Accuracy Nephelometer	High Accuracy Photometer	High Accuracy Electrochemical	High Accuracy Electrochemical	AAI	High Accuracy Electrochemical

Note: Regular checking and calibration of the equipment are done by the manufacturers and EQMS personnel to avoid any error. Legend: SPM: Suspended Particulate Matter; PM<sub>10</sub>: Particulate Matter of a diameter of 10 micron or less; PM<sub>2.5</sub>: Particulate Matter of a diameter of 2.5 micron or less; SO<sub>2</sub>: Sulphur Dioxide; NO<sub>x</sub>: Oxides of Nitrogen; O<sub>3</sub>: Ozone; AA: Ambient Air; AQ: Ambient Air Quality; EQMS: Environmental Quality Monitoring System; WHO: World Health Organization.







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Analysed By:   
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Technical Manager  
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A-1



Baseline Environmental Monitoring Report  
Design, Supply, Installation, Testing & Commissioning of 230kV & 132kV Transmission Lines in Western Zone on turnkey basis  
Kushtia-Meherpur 132kV Transmission Line (ADB Package-3) under PGCB

SL No: 002

Ref: EQMS/Env Quality/2022/01802

**EQMS**

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

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

**Transmission Line** : Kushtia-Meherpur 132kV Transmission Line

**Monitoring Activity** : Ambient Air Quality Monitoring

**Monitoring Personnel** : Mr. Rajib Hassan Raji  
Assistant Consultant, EQMS

**Monitoring Location** : AQ2: Bariapukur, Gopai Nagar, Gangri, Meherpur (Near AP 5/1)


**Monitoring Date** : 2<sup>nd</sup> June 2022


**Analysis Date** : 12<sup>th</sup> June 2022


**Description of Analysis** :




Location	GPS Coordinates	Ambient Air Pollutants Concentration (µg/m <sup>3</sup> )							CO ppm
		PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>x</sub>	SPM	O <sub>3</sub>	Pb	
AQ2	22°37'37.97"N 89°13'47.58"E	32.8	67.1	21.6	29.3	127.3	19.6	80L	3.842
Duration (hr.)		24	24	24	24	8	8	8	8
EPA, 1997 and amendment in 2005 Standard (Schedule-2)		65	150	365	100 (Annual)	200	117	0.5	8
WHO Standard		25	50	20	40 (Annual)	-	100	-	-
Method of Analysis Instrument Used Air Sampler:™ HAW 8028		Light Scattering Nephelometer	Light Scattering Nephelometer	Light Scattering Nephelometer	High Sensitivity Electrodeless	High Sensitivity Electrodeless	High Sensitivity Electrodeless	ASL	High Sensitivity Electrodeless

Note: Regular checks and calibration of the equipment are done by the manufacturer and EQMS personnel to avoid any error. Legend: SPM - Suspended Particulate Matter; PM10 - Particulate Matter of a diameter of 10 micron or less; PM2.5 - Particulate Matter of a diameter of 2.5 micron or less; Sulphur Dioxide; NOx - Oxides of Nitrogen; CO - Carbon Monoxide; AAS - Atomic Absorption Spectroscopy; ASD - Asbestos Detection Unit




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Baseline Environmental Monitoring Report  
Design, Supply, Installation, Testing & Commissioning of 230KV & 132KV Transmission Lines in Western Zone on turnkey basis  
Kustia-Meherpur 132KV Transmission Line (ADB Package-3) under PGCB

SL No: 003

Ref: EQMS/Air Quality/2022/01/003

EQMS

### EQMS ENVIRONMENTAL LABORATORY

#### Monitoring Results of Ambient Air Quality

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

**Transmission Line** : Kustia-Meherpur 132KV Transmission Line

**Monitoring Activity** : Ambient Air Quality Monitoring

**Monitoring Personnel** : Mr. Rajib Hossain Raja  
Assistant Consultant, EQMS

**Monitoring Location** : AQ3: Paragpur, Alamdanga, Chuadanga (Near AP 9/2)

**Monitoring Date** : 3<sup>rd</sup> June 2022

**Analysis Date** : 12<sup>th</sup> June 2022

**Description of Analysis** :

Location	GPS Coordinate	Ambient Air Pollutants Concentration (µg/m <sup>3</sup> )							CO
		PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>2</sub>	O <sub>3</sub>	CO	Pb	
AQ3:	22°45'17.80"N 89°53'5.25"E	48.5	77.8	36.1	47.6	158.4	22.7	BDL	1.098
Duration (hr.)		24	24	24	24	8	8	8	8
ECA, 1997 and amendment in 2005 Standard (Schedule-2)		45	150	365	100 (Annual)	200	157	0.5	9
FC/WHO Standard		25	50	20	40 (Annual)	-	180	-	-
Method of Analysis Instrument Use: Nephelometer™ MM 6000		Light Scattering Nephelometer	Light Scattering Nephelometer	Light Scattering Nephelometer	High Sensitivity Electrochemical	High Sensitivity Electrochemical	High Sensitivity Electrochemical	JA1	High Sensitivity Electrochemical

Note: Regular checks and calibration of the equipment are done by the manufacturer and EQMS personnel in every six months. Legend: BDL- Suspected Particulate Matter (PM<sub>10</sub>) detection limit of a diameter of 10 micron or less, PM<sub>2.5</sub>-Particulate Matter of a diameter of 2.5 micron or less, SO<sub>2</sub> Sulphur Dioxide, NO<sub>2</sub> Nitrogen Dioxide, O<sub>3</sub> Ozone, CO Carbon Monoxide, AAQ-Ambient Air Quality, AQ3-Ambient Air Quality, AQ3: Paragpur, Chuadanga.

**Received By:**   
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**Analyzed By:**   
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Baseline Environmental Monitoring Report  
Design, Supply, Installation, Testing & Commissioning of 230kV & 132kV Transmission Lines in Western Zone on turnkey basis  
Kustia-Meherpur 132kV Transmission Line (ADB Package-3) under PGCB

SL No: 004

**EQMS**

Ref: EQMS/Air Quality/2022/01/004

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

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

**Transmission Line** : Kustia-Meherpur 132kV Transmission Line

**Monitoring Activity** : Ambient Air Quality Monitoring

**Monitoring Personnel** : Md. Rajib Hassan Raji  
Assistant Consultant, EQMS

**Monitoring Location** : AQ4: Bagdanga, Pundaha, Kustia (Near AP 15/1)


**Monitoring Date** : 4<sup>th</sup> June 2022


**Analysis Date** : 12<sup>th</sup> June 2022


**Description of Analysis** :




Location	GPS Coordinates	Ambient Air Pollutants Concentration (µg/m <sup>3</sup> )							CO ppm
		PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>x</sub>	SPM	O <sub>3</sub>	Pb	
AQ4	22°44'8.73"N 89°17'41.52"E	52.4	83.5	15.2	33.5	172.6	18.9	NDL	1.017
Duration (hr.)		24	24	24	24	8	8	8	8
ECR, 1997 and amendment in 2005 Standard (Schedule 2)		55	150	365	100 (Annual)	200	157	0.5	9
IPC/WHO Standard		25	30	20	40 (Annual)	-	100	-	-
Method of Analysis Instrument Use: Gas Sampler: TSM 6500		Light Scattering Spectrophotometer	Light Scattering Spectrophotometer	Light Scattering Spectrophotometer	High Sensitivity Spectrophotometer	High Sensitivity Spectrophotometer	High Sensitivity Spectrophotometer	AA3	High Sensitivity Spectrophotometer

Note: Regular checks and calibration of the equipment are done by the manufacturers and EQMS personnel to avoid any error. Legend: SPM Suspended Particulate Matter, PM10 Particulate Matter of a diameter of 10 micron or less, PM2.5 Particulate Matter of a diameter of 2.5 micron or less, O3 Ozone, SO2 Sulfur Dioxide, NOx Oxides of Nitrogen, CO Carbon Monoxide, AAF-Aerosol Absorption Spectrophotometer, ND-Not in Detection Limit

**Received By:**   
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Baseline Environmental Monitoring Report  
Design, Supply, Installation, Testing & Commissioning of 230kV & 132kV Transmission Lines in Western Zone on turnkey basis  
Kushtia-Meherpur 132kV Transmission Line (ADB Package-3) under PGCB

SL. No.: 005

Ref: EQMS/Air Quality/2022/019/93

EQMS

### EQMS ENVIRONMENTAL LABORATORY

#### Monitoring Results of Ambient Air Quality

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

**Transmission Line** : Kushtia-Meherpur 132kV Transmission Line

**Monitoring Activity** : Ambient Air Quality Monitoring

**Monitoring Personnel** : Mr. Rajib Hassan Raju  
Assistant Consultant, EQMS

**Monitoring Location** : AQS: Shimulia, Shariatpur, Kushtia (AP 19/2)

**Monitoring Date** : 07<sup>th</sup> June 2022

**Analysis Date** : 17<sup>th</sup> June 2022

**Description of Analysis** :

Location	GPS Coordinate	Ambient Air Pollutants Concentration (µg/m <sup>3</sup> )							CO ppm
		PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>x</sub>	SPM	O <sub>3</sub>	Pb	
AQS	22°42'43.80"N 89°33'7.72"E	34.6	52.7	16.6	25.4	124.7	14.7	BDL	0.658
Duration (hr.)		24	24	24	24	8	8	8	8
ECR, 1997 and amendment in 2005 Standard (Schedule 2)		63	150	365	130 (Annual)	200	157	5.3	9
IPC/MHO Standard		25	50	20	40 (Annual)	-	100	-	-
Method of Analysis: Instrument Use: Nal Scanner™ NEM 5000		Light Scattering Nephelometer	Light Scattering Nephelometer	Light Scattering Nephelometer	High Sensitivity Photometer	High Sensitivity Photometer	High Sensitivity Electrode	AAS	High Sensitivity Electrode

Note: Regular checking and calibration of the equipment are done by the manufacturer and EQMS personnel to avoid any error. Legend: SPM - Suspended Particulate Matter; PM<sub>10</sub> - Particulate Matter of a diameter of 10 micron or less; PM<sub>2.5</sub> - Particulate Matter of a diameter of 2.5 micron or less; SO<sub>2</sub> - Sulphur Dioxide; NO<sub>x</sub> - Oxides of Nitrogen; O<sub>3</sub> - Carbon Monoxide; AAS - Atomic Absorption Spectroscopy

Received By:



Shaukat Ali  
Senior In-charge  
Consultant  
EQMS Consulting Limited

Analyzed By:



Md. Shalpan  
Technical Manager  
EQMS Consulting Limited

Checked By:



Md. Jehidul Islam  
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Baseline Environmental Monitoring Report  
Design, Supply, Installation, Testing & Commissioning of 230kV & 132kV Transmission Lines in Western Zone on turnkey basis  
Kustia-Meherpur 132kV Transmission Line (ADB Package-3) under PGCB

**Annex A-2: Noise Level Analysis Reports**

EQMS

SL No: 006

Ref: EQMS/Noise Level/2022/181836


**EQMS ENVIRONMENTAL LABORATORY**  
Monitoring Results of Noise Level

**Project Name** : Design, Supply, Installation, Testing & commissioning of 230kV&132kV Transmission Lines in western Zone on Turnkey Basis (ADB Package-3)  
**Transmission Line** : Kustia-Meherpur 132kV Transmission Line  
**Description of Activity** : Noise Level Monitoring  
**Monitoring Personnel** : Md. Rajib Hossain Rajib  
 Assistant Consultant, EQMS  
**Monitoring Date** : 1<sup>st</sup> to 5<sup>th</sup> June 2022  
**Analysis Date** : 12<sup>th</sup> June 2022  
**Description of Analysis** :

Date	Categories	Location	Noise Level [dB (A)]			
			Leq <sub>1h</sub>	Leq <sub>1min</sub>	Leq <sub>5min</sub>	Leq <sub>15min</sub>
NL1	Residential Area	Sirforpara, Dhanshila, Gangri, Meherpur (Near AP 3/2)	56.9	37.8	66.7	54.2
NL2	Silent Area	Bariapukur, Gopal Nagat, Gangri, Meherpur (Near AP 5/1)	50.7	34.7	59.3	31.6
NL3	Commercial Area	Paragpur, Alamtanga, Chaulbanga (Near AP 8/5)	63.4	46.2	75.7	56.3
NL4	Silent Area	Bagdanga, Puradaha, Kustia (Near AP 15/1)	53.7	36.4	59.8	32.4
NL5	Mixed Area	Shimulia, Shorogpur, Kustia (AP 19/2)	56.3	38.6	69.3	35.7

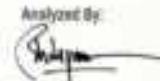
*Noise Pollution (Control) Rules, 2006		
Area	Day [dB (A)]	Night [dB (A)]
Silent Area	50	40
Residential Area	55	45
Mixed Area	60	50
Commercial Area	70	60
Industrial Area	75	70

Received By:



Shahaouddin Ahmed Insan  
Consultant  
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Technical Manager  
EQMS Consulting Limited

Checked By:








Md. Jahidul Islam  
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Baseline Environmental Monitoring Report  
 Design, Supply, Installation, Testing & Commissioning of 230kV & 132kV Transmission Lines in Western Zone on turnkey basis  
 Kushtia-Meherpur 132kV Transmission Line (ADB Package-3) under PGCB

**Annex A-3: Surface Water Analysis Reports**

SL. No: 007

Ref: EQMS/Water Quality/2022/01007

**EQMS WET LABORATORY**  
**Test Results of Surface Water Quality**

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

**Transmission Line** : Kushtia-Meherpur 132KV Transmission Line

**Description of Sample** : Surface Water

**Sample Collector** : Md. Mahabur Rahman, Assistant Consultant, EQMS

**Sampling Location** : SW1: Sishipara, Dhankhula, Ganga, Meherpur (New AP-3/4)  
 SW2: Kumar River, Malhat, Mirpur, Kushtia AP-10/2  
 SW3: Saparkhali River, Basinagar, Mirpur, Kushtia AP-13/5  
 SW4: Barichal Canal, Bagdanga, Alchana, Kushtia AP-16  
 SW5: Mithavanga River, Halbnala, Alamdanga, Chuadanga, AP-07

**Sampling Date** : 5<sup>th</sup> & 6<sup>th</sup> June 2022

**Date of Analysis** : 12<sup>th</sup> June 2022

**Description of Analysis** :

Parameters	Unit	Concentration					Analysis Method	Bangladesh Standards *
		SW1	SW2	SW3	SW4	SW5		
BOD	mg/L	0.2	0.5	1.1	2.5	1.2	5 days incubation	50
COD	mg/L	21	18	10	23	14	Closed Reflux	200
DO	mg/L	6.1	6	6.2	4.1	6.1	Ion electrode	4.5-6
EC	µS/cm	309	340	390	470	500	Ion electrode	1200
pH	-	7.46	7.97	7.34	7.40	7.72	Ion electrode	6.5 - 8.5
Salinity	ppt	0.27	0.1	0.17	0.21	0.05	Ion electrode	-
Temperature (T)	°C	24.5	23.9	24.1	24.7	23.8	Ion electrode	40
Hardness	mg/L	151	167	180	196	143	Colorimetric	-
TDS	mg/L	290	120	190	230	400	Ion electrode	2100

\* The Environment Conservation Rules, 1997 (Schedule 3 (A)), EQMS Accredited Range: ISO 9001:2015, Chemical Supply Standard, ISO Standard 14001, ISO Electrical Conductivity, ISO Total Dissolved Solids.

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Baseline Environmental Monitoring Report  
 Design, Supply, Installation, Testing & Commissioning of 230KV & 132KV Transmission Lines in Western Zone on turnkey basis  
 Kushtia-Meherpur 132KV Transmission Line (ADB Package-3) under PGCB

SL No: 008



Parameters	Unit	Concentrations					Analysis Method	Bangladesh Standards *
		DW1	DW2	DW3	DW4	DW5		
Wt-%	mg/L	0.84	0.13	0.02	2.89	0.58	Gravimetric method	50
PO <sub>4</sub>	mg/L	1.9	2.2	1.7	14	2.4	Photometric Method	-
TPH	mg/L	1.4	1.9	1.3	2.4	1.8	Gravimetric method	-
Total Calcium	g/100 ml	11	14	12	34	22		50

\* The Government of Bangladesh, 1997 (Schedule 3) (ii) SOE Electrical Supply Standard, CSE - Chemical Supply Standard, JIS - Japanese Standard, IEC - Electrical Conductivity, ISO - International Standard.

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 Chemist  
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A-8



Baseline Environmental Monitoring Report  
 Design, Supply, Installation, Testing & Commissioning of 230kV & 132kV Transmission Lines in Western Zone on turnkey basis  
 Kushtia-Meherpur 132kV Transmission Line (ADB Package-3) under PGCB

**Annex A-4: Ground Water Analysis Reports**

SL. No: 009

Ref: EQMS/Water Quality (2022)0108

**EQMS WET LABORATORY**  
**Test Results of Ground Water Quality**

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

**Transmission Line** : Kushtia-Meherpur 132kV Transmission Line

**Description of Sample** : Ground Water

**Sample Collector** : Md. Mahabub Rahman, Assistant Consultant, EQMS

**Sampling Location** : **GW1:** Sathipara, Dhankhula, Gangni, Meherpur (Near AP 3/3)  
**GW2:** Tomohoni, Gopal Nagar, Gangni, Meherpur (Near AP 5/1)  
**GW3:** Paragpur, Alamdanga, Chaudanga (Near AP 9/2)  
**GW4:** Bagtanga, Paradaha, Kuttia (Near AP 15/1)  
**GW5:** Shimulia, Shostipur, Kuttia (AP 18/2)

**Sampling Date** : 5th & 6th June 2022

**Date of Analysis** : 12th June 2022

**Description of Analysis** :

Parameters	Unit	Concentration					Analysis Method	Bangladesh Standards *
		GW1	GW2	GW3	GW4	GW5		
DOC	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	3 days incubation	0.2
COD	mg/L	<1	<1	<1	<1	<1	Closed Reflux	4
DO	mg/L	8	6.1	6.2	6	6.2	Ion electrode	6
EC	µS/cm	730	720	660	620	680	Ion electrode	-
pH	-	7.58	7.6	7.75	7.71	7.68	Ion electrode	6.5 - 8.5
Salinity	ppf	0.38	0.33	0.33	0.3	0.29	Ion electrode	-
Temperature (T)	°C	22.7	23.2	23.5	23.1	23.4	Ion electrode	20 - 30
Hardness	mg/L	128	117	134	108	91	Colorimetric	200 - 500
TDS	mg/L	378	360	338	318	348	Ion electrode	1000
Manganese (Mn)	mg/L	0.07	0.02	0.01	0.02	0.05	Photometric method	0.1

\* No Dissolved Solvent Residue, 100 (Schedule 7 (A)), 100 (Maximum Copper Demand), 100 (Maximum Copper Demand), 10 (Dissolved Solvent Residue, 10 (Dissolved Solvent Residue), 10 (Dissolved Solvent Residue), 100 (Total Dissolved Solids)  
 \*DL - In the direction 0.01 - 0.05 mg/L.

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Baseline Environmental Monitoring Report  
Design, Supply, Installation, Testing & Commissioning of 230kV & 132kV Transmission Lines in Western Zone on turnkey basis  
Kushtia-Meherpur 132kV Transmission Line (ADB Package-3) under PGCB

SL No: 010



Parameter	Unit	Concentration					Analysis Method	Bangladesh Standards*
		GW1	GW2	GW3	GW4	GW5		
Iron (Fe)	mg/L	0.033	0.01	0.54	0.55	0.01	Photometric method	0.3-1.0
Arsenic (As)	mg/L	0.01	0	0.01	0.01	0	Photometric method	0.1
Total Coliform	u/100 ml	0	0	0	0	0	APMOR approved method compared to ISO 4822 method	0
Fecal Coliform	u/100 ml	0	0	0	0	0	APMOR approved method compared to NF V08-017 method	0
TPH	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	Gravimetric method	

\* The Government (Consumer Rules, 1987) Schedule 1 (ii), 400 Maximum Copper Allowed 200 Maximum Copper Allowed, 50 Maximum Copper, 10 Maximum Zinc, 100 Total Suspended Solids  
\*BDL = Below Detectable Limit (0.05mg/L)

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**Environmental Monitoring Report-July 2022**  
**Scope-E: 132 kV Double Circuit Damar-Hatibandha Transmission Line**



Inspection Reference No: IIA 18796



**Reference Standards:**

Parameters	SPM	PM <sub>2.5</sub>	PM <sub>10</sub>	VOC	CHO	NO <sub>x</sub>	SO <sub>x</sub>	CO
ECR, 1997	200 (µg/m <sup>3</sup> )	85 (µg/m <sup>3</sup> )	150 (µg/m <sup>3</sup> )	NYS (µg/m <sup>3</sup> )	NYS (ppm)	100µg/m <sup>3</sup> (0.033 ppm)	30µg/m <sup>3</sup> (0.14 ppm)	9 ppm

**Ambient Air Quality Monitoring Results:**

Sl. No.	Monitoring Area		SPM (µg/m <sup>3</sup> )	PM <sub>2.5</sub> (µg/m <sup>3</sup> )	PM <sub>10</sub> (µg/m <sup>3</sup> )	CO (ppm)	NO <sub>x</sub> (µg/m <sup>3</sup> )	SO <sub>x</sub> (µg/m <sup>3</sup> )	Pb (µg/m <sup>3</sup> )
	Tower ID	Coordinates							
81	T-48	26° 31.02'N 89° 38'34.10"E	28	14	21	0.6	8.2	5.2	0
82	T-141	26° 41.67'N 89° 34' 51.22" E	26	13	20	1.2	8.9	5.5	0
83	T-160	26° 40.19'N 89° 35' 9.41" E	24	11	18	0.7	7.8	5.4	0
84	T-181	26° 48.83'N 89° 35' 24.87" E	29	13	22	1.8	13.4	8.8	0
85	T-368	26° 17' 39.77"N 89° 37' 1.46"E	22	10	15	0.9	9.3	6.2	0

**\*\*Abbreviation & Acronyms:** ECR = Environmental Conservation Rules, 1997; SPM= Suspended Particulate Matter; PM<sub>2.5</sub> = Particulate Matter 2.5; PM<sub>10</sub>= Particulate Matter 10; CO = Carbon monoxide; SO<sub>x</sub> = Oxides of Sulphur; NO<sub>x</sub> = Oxides of Nitrogen; Pb= Lead; NYS= Not Yet Set



<sup>1</sup> E.C.R (1997), "Environmental Conservation Rules, 1997" (amendment 2001), Schedule III, Department of Environment, Gov. of Bangladesh.

**Environmental Monitoring Report-July 2022**  
**Scope-E: 132 kV Double Circuit Damar-Hatibandha Transmission Line**



Registration Reference No. 075/1999



**Ambient Noise Level Monitoring Result (Day)**

Sl. No.	Monitoring Area		Monitoring Status				
			Reference of Relevant Standard		Obtained Result Day, Leq (dBA)	ECR, 1997 Limit	IPC/WB Limit
	ECR, 97 (amend. 2009) (dBA)	IPC/WB Guide Line (dBA)					
01	T-40	26° 75.02'N 88°50'36.10"E	50	55	45.3	✓	✓
02	T-14/I	26°41.67' N 88°54'51.22" E	50	55	49.5	✓	✓
03	T-16/D	26°40.19' N 88°55'9.43" E	50	55	44.5	✓	✓
04	T-18/I	26°48.83' N 88°55'24.87" E	50	55	47.8	✓	✓
05	T-36/D	26°11'39.27"N 89° 52'1.46"E	50	55	46.7	✓	✓

**\*\*Abbreviation and Acronym:** DoE - Department of Environment; ECR - Environmental Conservation Rules; IFC - International Finance Corporation; WB - World Bank; Leq - equivalent continuous sound level; dBA - A-weighted decibel.

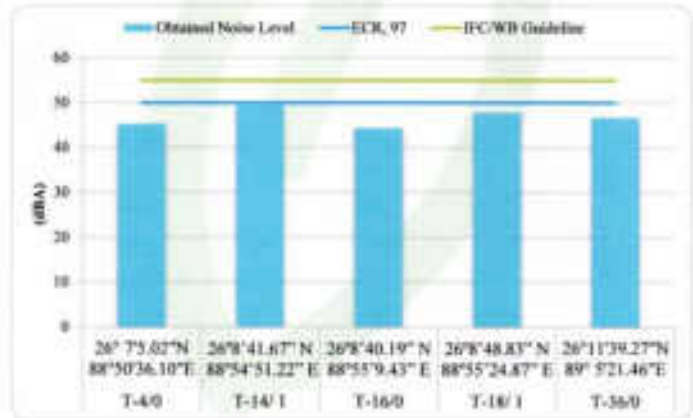


Figure: Ambient Noise Level Monitoring Chart (Day Period)



**Environmental Monitoring Report-July 2022**  
**Scope-E: 132 kV Double Circuit Domar-Hatibandha Transmission Line**



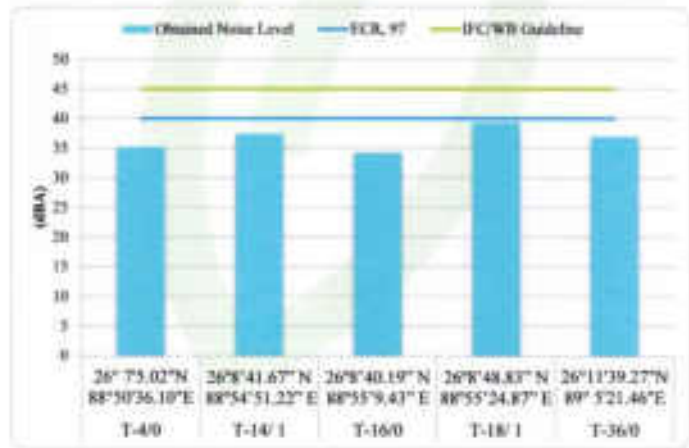
Registration Reference No: 17/19/001



**Ambient Noise Level Monitoring Result (Night)**

Sl. No.	Monitoring Area		Monitoring Status				
	Tower ID	Coordinates	Reference of Relevant Standard		Obtained Result night, Leq (dBA)	ECR, 1997 Limit	IFC/WB Limit
			ECR, 97 (Interim, 2005) (dBA)	IFC/WB Guide Line (dBA)			
01	T-4/0	26° 73.02'N 88°50'36.10"E	40	45	35.2	✓	✓
02	T-14/1	26° 41.67' N 88° 54' 51.22" E	40	45	37.4	✓	✓
03	T-16/0	26° 40.19' N 88° 55' 9.43" E	40	45	34.2	✓	✓
04	T-18/1	26° 48.83' N 88° 53' 24.87" E	40	45	39.3	✓	✓
05	T-36/0	26° 11' 39.27" N 89° 52' 1.46" E	40	45	36.9	✓	✓

\*\*Abbreviations and Acronyms: DoE – Department of Environment; ECR – Environmental Conservation Rules; IFC – International Finance Corporation; WB – World Bank; Leq – equivalent continuous sound level; dBA – A-weighted decibel.



*Figure: Ambient Noise Level Monitoring Chart (Night Period)*



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**Noise Level Monitoring Report**

*Environmental Monitoring Report-August 2022*  
*Scope-E: 132 kV Double Circuit Damar-Hatibandha Transmission Line*



**Analysis Report**

Sl. No.	Point ID	Coordinates	Surface Water Quality Monitoring Result																			
			pH	EC	CO <sub>2</sub>	SO <sub>4</sub>	NO <sub>3</sub>	NO <sub>2</sub>	Fe	Mn	Ca	Mg	Hardness	Chloride	Sulfate	UV	Temperature	Dissolved Oxygen	TSS	SS	DO	
			Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Max	Max	Max	Max	Max	Max	Max
1	1-49	24° 19' 07" N 87° 05' 10" E	7.3	8.0	11.4	2.7	4.3	7.5	8.1	86	86	8.00	17	86	2.4	233.6	24.0	20.0	9	6.0	1.41	
2	1-14	24° 19' 11" N 87° 01' 20" E	7.0	8.0	10.7	2.8	4.7	8.1	80	21	0.00	18	100	2.2	74.2	27.7	20.0	4.2	6.0	0.98		
3	1-10	24° 19' 40" N 87° 02' 04" E	6.7	8	8.0	4.0	5.8	6.9	88	40	0.00	10	90	1.7	477.4	24.2	22.0	5.8	6.70	0.91		
4	1-08	24° 19' 42" N 87° 01' 59" E	6.6	8.7	10.2	3.1	4.7	7.0	72	70	0.00	10	100	1.5	461	24.6	22.0	4.5	4.2	1.31		
5	1-06	24° 19' 27" N 87° 01' 40" E	6.9	8.8	11.2	3.1	5.6	7.9	80	80	0.00	10	70	1.9	103	24.3	20.0	4.7	6.91	1.0		

*Environmental Monitoring Report-August 2022*  
*Scope-E: 132 kV Double Circuit Damar-Hatibandha Transmission Line*

**Annexure-E**



**Analysis Report**

Sl. No.	Point ID	Coordinates	Ground Water Quality Monitoring Result																
			pH	EC	Ca	Mg	Cl	SO <sub>4</sub>	NO <sub>3</sub>	NO <sub>2</sub>	Fe	Mn	Hardness	UV	Temperature	Dissolved Oxygen	TSS	SS	
			Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Max	Max	Max	Max	Max	Max
1	1-49	24° 19' 07" N 87° 05' 10" E	7.2	8.00	8.00	8.8	78	8.14	2.8	0.00	1.8	6.9	24.1	241.2	21.0	0	0	3.0	
2	1-14	24° 19' 11" N 87° 01' 20" E	6.8	8.00	8.07	8.2	26	8.07	8.8	0.62	1.8	6.3	27.6	221.2	20.0	0	0	2.0	
3	1-10	24° 19' 40" N 87° 02' 04" E	7.1	8.00	8.1	8.2	80	6.0	8.8	0.00	1.0	8.8	24.0	242.2	20.0	0	0	3.2	
4	1-08	24° 19' 42" N 87° 01' 59" E	7.6	8.00	8.00	8.5	40	8.12	8.8	0.00	1.8	6.3	27.2	202.0	20.0	0	0	2.8	
5	1-06	24° 19' 27" N 87° 01' 40" E	7.5	8.00	8.00	8.5	110	8.12	8.8	0.07	1.7	8.2	26.0	278.4	20.0	0	0	3.0	

*Environmental Monitoring Report-July 2022*  
*Scope-E: 132 kV Double Circuit Domar-Hatibandha Transmission Line*

**Annexure-E**



**Test Report**

Reference No	ST-1003	Test Name	Soil Quality Test (Chemical Properties)
Sample Receiving Date	02/08/2022	Sample ID	SQ-08-08-08-22
Date of Analysis	03/08/2022 to 04/08/2022	Date of Submission	24/08/2022
Client Name	132 kV Double Circuit Domar-Hatibandha Transmission Line	Sample Type	Soil Sample

**Methodology**

S/N	Soil Quality Parameters	Unit	Bangladesh Standard (ECR'97)	Method of Analysis
1	pH	-	-	Saturated Paste
2	Organic Content (carbon)	%	-	Combustion Method
3	Lead (pb)	mg/kg	-	ICP-MS
4	Chromium (Cr)	mg/kg	-	ICP-AES
5	Cadmium (Cd)	mg/kg	-	ICP-AES
6	Copper	mg/kg	-	ICP-AES
7	Texture	-	-	Visual

**Analysis Report**

Soil Quality Monitoring Result									
S/N	Tower ID	Coordinates	pH	Organic content (Carbon)	Lead (pb)	Chromium (Cr)	Cadmium (Cd)	Copper (Cu)	Soil Texture
			-	%	mg/kg	mg/kg	mg/kg	mg/kg	-
01	T-48	26° 75.07'N 88° 57'36.10"E	6.8	4.8	18.1	12.3	0.49	12.2	Sandy Clay
02	T-44/1	26° 54.83382'N 88° 54'51.26026"E	6.4	3.4	9.4	13.4	0.24	14.4	Loamy Clay
03	T-46/0	26° 50.47118'N 88° 55'53.11"E	6.2	4.2	8.7	14.2	0.32	18.2	Loamy Clay
04	T-18/1	26° 54.43304'N 88° 57'36.85721"E	6.1	4.8	18.5	13.4	0.28	14.5	Sandy Loam
05	T-36/0	26° 11'58.27'N 89° 32'1.46"E	6.8	4.5	8.8	18.5	0.21	12.2	Loamy Clay

No standard limit has been set by National Authority



**Environmental Monitoring Report-July 2022**  
**Scope-F: 132 KV Double Circuit Bagerhat-Pirojpur-Bhandaria Transmission Line**



Inspection Reference No: IEA 10795



**Reference Standards:**

Parameter	SPM	PM <sub>2.5</sub>	PM <sub>10</sub>	VOC	CHO	NO <sub>x</sub>	SO <sub>x</sub>	CO
ECR, 1997 <sup>1</sup>	200 (µg/m <sup>3</sup> )	65 (µg/m <sup>3</sup> )	130 (µg/m <sup>3</sup> )	ATV (µg/m <sup>3</sup> )	ATV (ppm)	100µg/m <sup>3</sup> (0.03 ppm)	200µg/m <sup>3</sup> (0.34 ppm)	0 ppm

**Ambient Air Quality Monitoring Result:**

Sl. No.	Monitoring Area		SPM (µg/m <sup>3</sup> )	PM <sub>2.5</sub> (µg/m <sup>3</sup> )	PM <sub>10</sub> (µg/m <sup>3</sup> )	CO (ppm)	NO <sub>x</sub> (µg/m <sup>3</sup> )	SO <sub>x</sub> (µg/m <sup>3</sup> )	Pb (µg/m <sup>3</sup> )
	Tower ID	Coordinates							
1	T-24	22°38'18.51515" N 89°49'14.51254" E	47	24	31	2.7	33.1	7.3	0
2	T-162	22°37'25.88128" N 89°38'26.67796" E	50	27	41	2.1	14.2	4.2	0
3	T-200	22°33'59.05054" N 89°59'23.39803" E	67	36	47	1.3	9.8	6.8	0
4	T-252	22°34'11.57934" N 90°2'21.98649" E	58	32	41	1.1	12.6	10.1	0
5	T-374	22°28'14.6473" N 90°5'6.60891" E	64	37	48	2.4	11	8.3	0

**\*\*Abbreviations & Acronyms:** ECR - Environmental Conservation Rules; SPM- Suspended Particulate Matter; PM<sub>2.5</sub> - Particulate Matter 2.5; PM<sub>10</sub> - Particulate Matter 10; CO - Carbon monoxide; NO<sub>x</sub> - Oxide of Nitrogen; SO<sub>x</sub> - Oxide of Sulphur; Pb - Lead; ATV - Not for list.



<sup>1</sup> ECR (1997), "Environmental Conservation Rules, 1997" (amendment 2015), Schedule-02, Department of Environment, Govt. of Bangladesh.

**Environmental Monitoring Report-July 2022**  
**Scope-F: 132 KV Double Circuit Bagerhat-Pirojpur-Bhandaria Transmission Line**



Corporate Building No. EN-10208



**Ambient Noise Level Monitoring Result (Day 1)**

Sl. No.	Monitoring Area		Monitoring Status				
	Tower ID	Coordinates	ECR, 97 (convent. 2005) (dBA)	IFC/WB Guide Line (dBA)	Obtained Result (day, Leq) (dBA)	ECR, 1997 Limit	IFC/WB Limit
1	T-24	22°38'18.31313° N 89°49'14.51334° E	50	55	45.5	✓	✓
2	T-162	22°37'25.88128° N 89°58'26.67796° E	50	55	47.1	✓	✓
3	T-269	22°35'59.80094° N 89°59'21.79803° E	50	55	49.4	✓	✓
4	T-252	22°34'11.33934° N 89°21'49.6697° E	50	55	48.6	✓	✓
5	T-374	22°28'14.6473° N 89°56.60261° E	50	55	43.3	✓	✓

\*\*Abbreviations and Acronyms: DoE - Department of Environment; ECR - Environmental Conservation Rules; IFC - International Finance Corporation; WB - World Bank; Leq - equivalent continuous sound level; dBA = A-weighted decibel

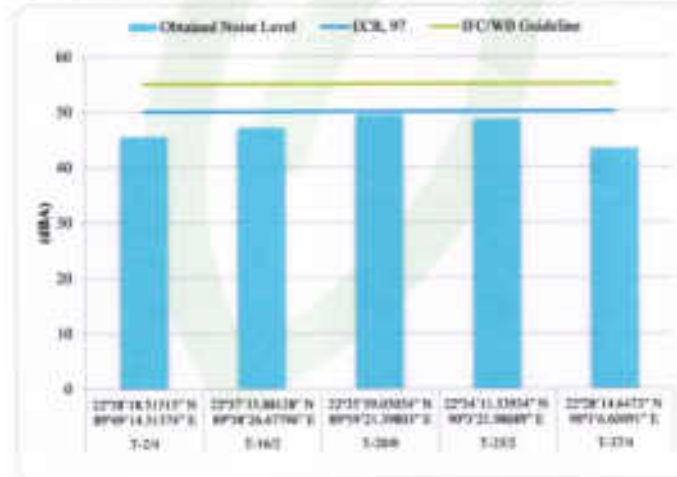


Figure: Ambient Noise Level Monitoring Chart (Day Period)



**Environmental Monitoring Report-July 2022**  
**Scope-F: 132 KV Double Circuit Bagerhat-Pirojpur-Bhandaria Transmission Line**



Inspection Reference No. 476/14022



**Ambient Noise Level Monitoring Result (Night):**

Sl. No.	Monitoring Area		Monitoring Status				
			Reference of Relevant Standard		Obtained Result (night, Leq (dBA))	ECR, 1997 Limit	IFC/WB Limit
	ECR, 97 (amend. 2009) (dBA)	IFC/WB Guide Line (dBA)					
1	T-204	22°18'18.31133° N 89°49'14.51374° E	40	45	37.6	✓	✓
2	T-162	22°17'35.88128° N 89°58'26.67796° E	40	45	38.2	✓	✓
3	T-200	22°35'59.00034° N 89°54'21.38603° E	40	45	39.1	✓	✓
4	T-252	22°34'11.31934° N 89°52'11.98489° E	40	45	36.5	✓	✓
5	T-374	22°28'14.6473° N 89°54.00001° E	40	45	38.8	✓	✓

**\*\*Abbreviations and Acronyms:** *EnvE* – Department of Environment, *ECR* – Environmental Conservation Rules, *IFC* – International Finance Corporation, *WB* – World Bank, *Leq* – equivalent continuous noise level, *dBA* – A-weighted decibel

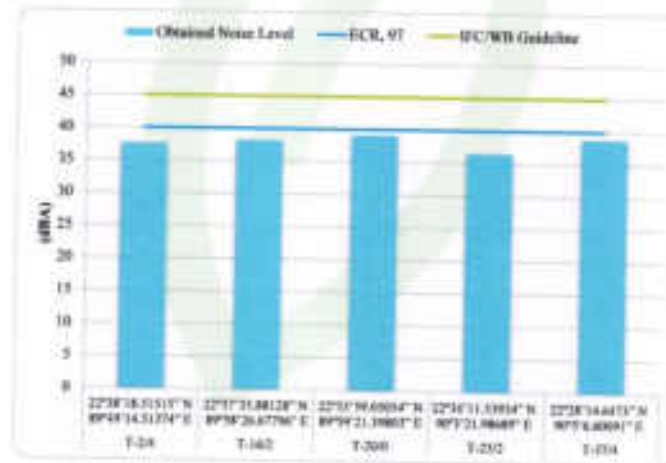


Figure: Ambient Noise Level Monitoring Chart (Night Period)



**Noise Level Monitoring Report**

*Environmental Monitoring Report-August 2022*  
*Scope-F: 132 kV Double Circuit Bagerhat-Pirojpur-Bhandaria Transmission Line*



**Analysis Report**

S. No.	Station ID	Coordinates	Surface Water Quality Monitoring Result																	
			pH	DO	CO <sub>2</sub>	NO <sub>3</sub>	NO <sub>2</sub>	NO <sub>3</sub> -N	NO <sub>2</sub> -N	NO <sub>3</sub> -N	NO <sub>2</sub> -N	NO <sub>3</sub> -N	NO <sub>2</sub> -N	NO <sub>3</sub> -N	NO <sub>2</sub> -N	NO <sub>3</sub> -N	NO <sub>2</sub> -N	NO <sub>3</sub> -N		
			ECW Standard 4.5-8.5	ECW Standard 5-10	ECW Standard 5-10	ECW Standard 5-10	ECW Standard 5-10	ECW Standard 5-10	ECW Standard 5-10	ECW Standard 5-10	ECW Standard 5-10	ECW Standard 5-10	ECW Standard 5-10	ECW Standard 5-10	ECW Standard 5-10	ECW Standard 5-10	ECW Standard 5-10	ECW Standard 5-10	ECW Standard 5-10	
1	14	22°18'00"N 89°42'00"E	8.2	4.8	8.8	5.8	5.5	7.8	7.1	419	0.00	17	36	2.4	102.5	25.0	200	4.7	8.4	0.00
2	1403	22°17'50"N 89°42'00"E	8.2	5.8	7.0	8.3	6.1	6.1	84	90	0.00	16	140	2.0	90.2	27.2	204	4.8	8.02	1.43
3	1404	22°16'30"N 89°42'00"E	7.8	6.4	8.2	3.2	5.1	9.8	41	177	0.00	16	100	2.2	80.6	26.0	202	4.2	8.88	1.20
4	1405	22°16'00"N 89°42'00"E	7.4	4.7	7.8	4.9	4.5	6.1	50	100	0.00	15	70	2.1	100.2	25.4	200	5	8.78	0.84
5	1406	22°16'10"N 89°42'00"E	7.4	5.4	11.8	4.01	5.2	7.8	60	100	0.00	16	100	2.2	90.3	28.3	202	4.2	8.73	0.80

*Environmental Monitoring Report-August 2022*  
*Scope-F: 132 kV Double Circuit Bagerhat-Pirojpur-Bhandaria Transmission Line*



**Analysis Report**

S. No.	Station ID	Coordinates	Ground Water Quality Monitoring Result																
			ECW	ECW	ECW	ECW	ECW	ECW	ECW	ECW	ECW	ECW	ECW	ECW	ECW	ECW	ECW	ECW	
			Standard 4.5-8.5	Standard 5-10	Standard 5-10	Standard 5-10	Standard 5-10	Standard 5-10	Standard 5-10	Standard 5-10	Standard 5-10	Standard 5-10	Standard 5-10	Standard 5-10	Standard 5-10	Standard 5-10	Standard 5-10	Standard 5-10	Standard 5-10
1	14	22°18'00"N 89°42'00"E	7.8	0.00	0.00	3.1	57.5	0.8	10	0.00	3.1	8.2	27.0	107.7	212	0	0	0	0.1
2	1403	22°17'50"N 89°42'00"E	8.2	0.00	0.00	4.9	100	0.11	0.8	0.00	2.7	4.0	27.0	110.0	201	0	0	0	0.4
3	1404	22°16'30"N 89°42'00"E	7.4	0.00	0.00	3.7	80	0.00	0.8	0.00	2.7	6.8	24.2	105.0	212	0	0	0	0.2
4	1405	22°16'00"N 89°42'00"E	8	0.04	0.00	2.2	14	0.01	0.8	0.00	2.2	6.2	27.2	106.0	201	0	0	0	0.0

*Environmental Monitoring Report-July 2022*  
*Scope-F: 132 kV Double Circuit Bagerhat-Pirojpur-Bhandaria Transmission Line*

**Annexure-E**



**Test Report**

Reference No	ST-10034	Test Name	Soil Quality Test (Chemical Properties)
Sample Receiving Date	30/07/2022	Sample ID	SQ-01-05-108-21
Date of Analysis	01/08/2022 to 03/08/2022	Date of Submission	24/08/2022
Client Name	132 kV Double Circuit Bagerhat-Pirojpur-Bhandaria Transmission Line	Sample Type	Soil Sample

**Methodology**

Sl	Soil Quality Parameters	Unit	Bangladesh Standard (ECR'97)	Method of Analysis
1	pH	-	-	Saturated Paste
2	Organic Content (carbon)	%	-	Combustion Method
3	Lead (pb)	mg/kg	-	ICP-MS
4	Chromium (Cr)	mg/kg	-	ICP-AES
5	Cadmium (Cd)	mg/kg	-	ICP-AES
6	Copper	mg/kg	-	ICP-AES
7	Texture	-	-	Visual

**Analysis Report**

Soil Quality Monitoring Result									
Sl No	Tower ID	Co-ordinates	pH	Organic Content (carbon)	Lead (pb)	Chromium (Cr)	Cadmium (Cd)	Copper (Cu)	Texture
			-	%	mg/kg	mg/kg	mg/kg	mg/kg	-
01	T-04	22°08'18.11111° N 89°09'14.01111° E	6.1	8.4	16.3	14.7	6.39	16.7	Sandy Loam
02	T-06/2	22°07'33.80222° N 89°07'26.47778° E	6.3	3.2	14.5	17.3	6.28	26.2	Sandy Clay
03	T-08/0	22°04'36.66667° N 89°02'21.86667° E	6.5	3.3	9.9	14.8	6.63	15.5	Loamy Clay
04	T-25/1	22°04'11.33333° N 89°01'31.86667° E	6.2	3.5	16.5	16.6	6.49	25.6	Sandy Loam
05	T-05/4	22°08'16.66667° N 89°09'46.66667° E	6.4	4.5	8.7	26.1	6.27	17.8	Sandy Clay

No Standard set by National Authority yet