



Bangladesh Inland Water Transport Authority (BIWTA)

Ministry of Shipping

Government of the People's Republic of Bangladesh

**Consultancy Services for Environmental and Social Impact Assessment
(ESIA) and Resettlement Action Plan (RAP) preparation of Landing
Stations/Launch Ghats and Passenger River Terminal**

of

The Bangladesh Regional Waterway Transport Project-1

(IDA Credit No:5842-BD, Contract No: BRWTP-S6A)

Volume II:
Annexure

Submitted by



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Annexure 01

Terms of Reference (ToR)

**Terms of Reference (ToR) of
Consultancy Services for Environmental & Social Impact Assessment
and Resettlement Action Plan (RAP) preparation of
Landing Stations/Launch Ghats and Passenger River Terminal**

The Project at a Glance

Title of the Project	Bangladesh Regional Waterway Transport Project1 (BRWTP-1)
Implementing Organization	Bangladesh Inland Water Transport Authority (BIWTA), Ministry of Shipping (MoS)
Funding source(s)	IDA (Cr. No.: 5842-BD)
Package Name of Consultancy Services	Environmental & Social Impact Assessment and Resettlement Action Plan (RAP) preparation of Landing stations/ Launch Ghats and Passenger River Terminal
Package Number	BRWTP-S6A
Assignment duration	12 (Twelve) months
Market Approach	Open-National
Procurement Method	QCBS
Type of Contract	Lump-Sum
Location of assignment	Within project area in Bangladesh
Contracting Entity	Project Director, BRWTP-I Project, BIWTA

A. Background

The Bangladesh Inland Water Transport Authority (BIWTA) is implementing the ‘Bangladesh Regional Inland Water Transport Project 1’, which involves investments in development of Inland Water Transport (IWT) routes and infrastructure between Dhaka – Chittagong IWT Corridor, including branches to Ashuganj, Narayanganj and Barisal. The World Bank is financing the Project. Key components of this proposed project include:

Improved Services at Priority Inland Waterway Landing Stations/Launch Ghats and Passenger River Terminal. This sub-component includes works to improve fifteen river landings on the Dhaka-Chittagong route and connecting routes. BIWTA has carried out an Environmental and Social Impact Assessment (ESIA) for Component 1, and an Environmental Management Framework (EMF) and Social Management Framework (RPF) for Component 2. The present ToR has been prepared for (a) the detailed Environmental and Social Impact Assessment (ESIA) and (b) Resettlement Action Plan (RAP) studies for 15 (fifteen) landing stations/launch ghats and 01 (one) passenger river terminal at Chandpur under the project.

B. Project Overview

Locations of the proposed sites for the landing stations/launch ghats and passenger river terminal, are given in Table- 1. Description of existing and proposed facilities at the landing stations/launch ghats and passenger river terminal, are given in Table 1.

Table 1: Details of existing and proposed facilities at the landing stations/launch ghats and passenger river terminal

Landing Station/ Launch Ghat	Existing Facilities	Proposed Facilities
Bhairab Bazar	Established in 2004. Daily about 300 to 400 passengers use this launch ghat. Existing facilities include two pontoons and one gangway.	The proposed facilities include: • Pontoons-length 36.50 (m) @3 width 9.75 (m) • Steel Spud-12 Nos • Steel Gangway- length 14.0 (m) width 3.0 @2 (m) • Jetty- length 30/20 (m) width 3.0 (m) @2 level (+) 5.0 (m) • Passenger waiting sheed-180m² • Passenger Platform- 300 (sqm) • Cargo Platform- 665 (sqm) • New access road- length 160.0 (m) width 6.0 (m) • Upgrade access road- width 6 (m) • HWL- (+) 5.90 (m) • Road- Top level (+) 6.30 (m) embankment height (+) 1.14 (m)
Alubazar	This is a ferry terminal established in 2001. Daily traffic include 3 launches, 4 ferries and 15 local boats. Daily weight of goods transported is 20 t. Existing facilities include: shore connection seri (gangplank) -1, pontoon -1, steel jetty, ferry ghat with pontoon.	The proposed facilities include: • Pontoons-length 30.50 (m) width 7.562 (m) • Steel Spud-04 Nos • Steel Gangway- length 14.0 (m) width 1.20 (m) • Jetty- length 10.00 (m) width 1.80 (m) level (+) 3.50 (m) • Passenger waiting sheed-600m² • Parking yard – 600m² • New access road- width 6.0 (m) • Upgrade access road- length 273.0 (m) width 6 (m) • Bank protection -1300 (sqm) • Dredging area- 28000 (sqm) volume 100000 (m³). • HWL- (+) 4.00 (m) • Road- Top level (+) 4.80 (m) embankment height (+) 1.64 (m)
Horina	This is a ferry terminal established in 2001. Daily traffic includes 2 launches and 4 ferries. Approximate daily weight of goods transported is 15 t. Existing facilities include a ferry ghat with a pontoon	The proposed facilities include: • Pontoons-length 30.50 (m) width 7.562 (m) • Steel Spud-04 Nos • Steel Gangway- length 14.0 (m) width 1.20 (m) • Jetty- length 30.00 (m) width 1.80 (m) level (+) 4.00 (m) • Passenger waiting sheed-600m² • Parking yard – 1200m² • New access road- length 350.0 (m) width 6.0 (m) • Upgrade access road- width 6 (m) • HWL- (+) 4.00 (m) • Road- Top level (+) 5.30 (m) embankment height (+) 1.14 (m)

Hijla	The average daily traffic at this launch ghat is 150 passengers and 10 boats. Approximate daily weight of goods transported is 3t. Existing facilities include a shore connection seri (gangplank) and a pontoon	The proposed facilities include: • Pontoons-length 30.50 (m) width 7.562 (m) • Steel Spud-04 Nos • Steel Gangway- length 14.0 (m) width 1.20 (m) • Jetty- length 15.00 (m) width 1.80 (m) level (+) 4.00 (m) • Passenger waiting sheed-600m² • Parking yard – 600m² • New access road- length 95.0 (m) width 6.0 (m) • Upgrade access road- length 175.0 (m) width 6 (m) • Bank protection -1800 (sqm) • HWL- (+) 2.40 (m) • Road- Top level (+) 3.70 (m) embankment height (+) 0.54 (m)
Ilisha (Bhola)	The average daily traffic at this launch ghat is 251 passengers and 12 vessels. Approximate daily weight of goods transported is 19t. Existing facilities include 2 shore connection seris (gangplank) and a pontoon	The proposed facilities include: • Pontoons-length 36.50 (m) @2 width 9.75 (m) • Steel Spud-08 Nos • Steel Gangway- length 14.0 (m) width 3.0 (m) @2 • Jetty- length 60.00 (m) @2 width 3.00 (m) @2 level (+) 3.80 (m) • Passenger waiting sheed-600m² • Parking yard – 1800m² • New access road- width 6.0 (m) • Upgrade access road- length 290/20 (m) width 6 (m) • HWL- (+) 3.30 (m) • Road- Top level (+) 5.10 (m) embankment height (+) 0.94 (m)
Moju Chowdhury	A ferry ghat established in 2008. Daily traffic is 2 ferries, 2 sea trucks and a launch. Approximate daily weight of goods transported is 20t. Existing facilities include a shore connection seris (gangplank), a pontoon, and a passenger waiting shed (55 m ²)	The proposed facilities include: • Pontoons-length 30.50 (m) width 7.562 (m) • Steel Spud-04 Nos • Steel Gangway- length 14.0 (m) width 1.20 (m) • Jetty- length 5.00 (m) width 1.80 (m) level (+) 3.80 (m) • Passenger waiting sheed-600m² • Parking yard – 1200m² • New access road- width 6.0 (m) • Upgrade access road- length 40.0 (m) width 6.0 (m) • Dredging area-12400 (sqm) volume 5000.0 (m³) • HWL- (+) 2.40 (m) • Road- Top level (+) 5.10 (m) embankment height (+) 1.94 (m)
Laharhat	The average daily traffic at this launch ghat is 277 passengers and 13 vessels. Approximate daily weight of goods transported is 21 t. Existing facilities include: • Passenger waiting shed : 125 m² • Parking yard : 3375.00 m²	The proposed facilities include: • Pontoons-length 30.50 (m) width 7.562 (m) • Steel Spud-04 Nos • Steel Gangway- length 14.0 (m) width 1.20 (m) • Jetty- length 5.00 (m) width 1.80 (m) level (+) 3.50 (m) • Passenger waiting sheed-600m² • Parking yard – 600m²

	• Toilet complex: 75.00 m² • Access road: 2000.00 m² • Deep tube-well: 01 No • Shore connection seri (gangplank)- 01 - Pontoons- 01	• New access road- width 6.0 (m) • Upgrade access road- length 86.0 (m) width 6 (m) • Bank protection -3300 (sqm) • HWL- (+) 2.40 (m) • Road- Top level (+) 3.70 (m) embankment height (+) 0.54 (m)
Bankerhat (Beduria)	The average daily traffic at this launch ghat is 81 passengers and 13 vessels. Approximate daily weight of goods transported is 6 t. Existing facilities include a shore connection seri (gangplank) and a pontoon	The proposed facilities include: • Pontoons-length 36.50 (m) width 9.75 (m) • Steel Spud-04 Nos • Steel Gangway- length 14.0 (m) width 1.20 (m) • Jetty- length 10.00 (m) width 1.80 (m) level (+) 2.50 (m) • Passenger waiting shed-600m² • Parking yard – 1200m² • New access road- length 120.0 (m) width 6.0 (m) • Upgrade access road- width 6 (m) • Bank protection -1800 (sqm) • HWL- (+) 2.40 (m) • Road- Top level (+) 2.80 (m) embankment height (+) 1.64 (m) Access road: 2000 m² • Deep tube-well: 01 No • Bank Protection-150 m • Ferry Ghat
Daulatkhan	The average daily traffic at this launch ghat is 1000 passengers and 4 vessels. Approximate daily weight of goods transported is 730 t. Existing facilities include a 22 m jetty and 1 pontoon	The proposed facilities include: • Pontoons-length 36.50 (m) width 9.75 (m) • Steel Spud-04 Nos • Steel Gangway- length 14.0 (m) width 1.20 (m) • Jetty- length 175.00 (m) width 1.80 (m) level (+) 5.00 (m) • Passenger waiting shed-600m² • Parking yard – 1200m² • New access road- width 6.0 (m) • Upgrade access road- length 80.0 (m) width 6.0 (m) • HWL- (+) 2.80 (m) • Road- Top level (+) 4.10 (m) embankment height (+) 1.44 (m)
Tojumuddin	The average daily traffic at this launch ghat is 307 passengers and 4 vessels. Approximate daily weight of goods transported is 23 t. Existing facilities include 2 shore connection series (gangplank) and a pontoon	The proposed facilities include: • Pontoons-length 36.50 (m) width 9.75 (m) • Steel Spud-04 Nos • Steel Gangway- length 14.0 (m) width 1.20 (m) • Jetty- length 80.00 (m) width 1.80 (m) level (+) 3.30 (m) • Passenger waiting shed-600m² • Parking yard – 1200m² • New access road- width 6.0 (m) • Upgrade access road- length 185.0 (m) width 6 (m) • HWL- (+) 2.60 (m) • Road- Top level (+) 4.60 (m) embankment height (+) 1.44 (m)

Monpura	The average daily traffic at this launch ghat is 207 passengers and 2 vessels. Approximate daily weight of goods transported is 9.5 t. Existing facilities include: • Pontoons-1 • Seri (gangplank) - 02 • Transit shed • RCC Jetty 625.00 M	The proposed facilities include: • Pontoons-length 36.50 (m) width 9.75 (m) • Steel Spud-04 Nos • Steel Gangway- length 14.0 (m) width 1.20 (m) • Jetty- length 145.00 (m) width 1.80 (m) level (+) 6.00 (m) • Passenger waiting shed-600m² • Parking yard – 600m² • New access road- length 740.0 (m) width 6.0 (m) • Upgrade access road- width 6 (m) • HWL- (+) 2.60 (m) • Road- Top level (+) 3.90 (m) embankment height (+) 1.74 (m)
Boddarhat	The average daily traffic at this RCC Jetty is 150 passengers 2 launch and 10 local boats. Approximate daily weight of goods transported is 30 t. Existing facilities include: • RCC Jetty: 750m • Waiting shed: 60 m² • Parking yard: 200 m²	The proposed facilities include: • Pontoons-length 30.50 (m) width 7.562 (m) • Steel Spud-04 Nos • Steel Gangway- length 14.0 (m) width 1.20 (m) • Jetty- length 55.00 (m) width 1.80 (m) level (+) 6.00 (m) • Passenger waiting shed-600m² • Parking yard – 600m² • New access road- width 6.0 (m) • Upgrade access road- length 100.0 (m) width 6 (m) • HWL- (+) 2.90 (m) • Road- Top level (+) 4.20 (m) embankment height (+) 1.04 (m)
Tomuruddin	The average daily traffic at this launch ghat is 600 passengers 2 launches, a sea truck and 6 local boats. Approximate daily weight of goods transported is 18 t. Existing facilities include: Steel Jetty (28m): 1Nos Spud: 2 Nos Pontoon: 1Nos	The proposed facilities include: • Pontoons-length 36.50 (m) width 9.75 (m) • Steel Spud-04 Nos • Steel Gangway- length 14.0 (m) width 3.00 (m) • Jetty- length 40.00 (m) width 3.0 (m) level (+) 3.40 (m) • Passenger waiting shed-200m² • Passenger Platform- 400.0 (sqm) • Cargo Platform- 600.0 (sqm) • New access road- width 6.0 (m) • Upgrade access road- length 245.0 (m) width 6 (m) • Dredging area-34910.0 (sqm) volume 50000.0 (m³) • HWL- (+) 2.60 (m) • Road- Top level (+) 3.90 (m) embankment height (+) 0.74 (m)
Nolchira	Proposed locations are greenfield sites.	The proposed facilities include: • Pontoons-length 36.50 (m) @2 width 9.75 (m) • Steel Spud-08 Nos • Steel Gangway- length 14.0 (m) width 3/1.20 (m) • Jetty- length 100.0 (m) @2 width 3/1.80 (m) level (+) 4.00 (m) • Passenger waiting shed-600m² • Parking yard – 600m² • New access road- width 6.0 (m)

		• Upgrade access road- length 250.0 (m) width 6 (m) • HWL- (+) 3.00 (m) • Road- Top level (+) 5.30 (m) embankment height (+) 1.14 (m)
Motirhat Launch Ghat/ Landing Station	Proposed locations are greenfield sites.	The proposed facilities include: • Pontoons-length 30.50 (m) width 7.562 (m) • Steel Spud-04 Nos • Steel Gangway- length 14.0 (m) width 1.20 (m) • Jetty- length 15.00 (m) width 1.80 (m) level (+) 3.80 (m) • Passenger waiting shed-600m² • Parking yard – 1200m² • New access road- length 85.0 (m) width 6.0 (m) • Upgrade access road- length 106.0 (m) width 6 (m) • Bank protection -4000 (sqm) • Filled area- 18100.0 (sqm) volume 40000.0 (m³) • Dredging area- 108550.0 (sqm) volume 350000.0 (m³) • HWL- (+) 2.10 (m) • Road- Top level (+) 3.40 (m) embankment height (+) 0.24 (m)
Chandpur Passenger River Terminal	Proposed locations are passenger River terminal.	The proposed facilities include: • Wide Bitumine Road -7 (m) • Drive way- 4 (m) • Minibus Parking- 4 nos. • Rickshaw Parking- 22 nos. • Terminal Building (G+3)- (75 m*20 m) • Pontoons-5 nos. • Linkspan- 3 nos. • Elevated Walkway- 263 (m)

C. ESIA and RAP Studies

The proposed study is being commissioned to assess environmental and social consequences of the proposed developments including their pre-construction, construction, and operation and maintenance phases, and to ensure that land acquisition and involuntary resettlement required for the project are carried out in line with the World Bank's Operational Policies (OP 4.12) as well as compliance with applicable national regulations on environment and social aspects. The proposed study is aimed at screening and assessing the proposed developments against adverse environmental and social impacts and recommending, where necessary, appropriate mitigation and enhancement measures, and course of action for implementation. The study will also provide recommendations on gender and disability sensitive design, including aspects of terminal design and management that reduce specific barriers that women and physically disabled face in using the facilities. These include but are not limited to issues of safety, lighting, drinking water facilities, separate toilets and waiting areas. The ESIA and RAP will need to follow the framework provided in the EMF and RPF prepared for the Bangladesh Regional Inland Water Transport Project 1 (see last paragraph of section A); comply with the World Bank safeguards requirements given in different operational policies (a list of applicable policies are provided at end of this document). The ESIA will also comply with the national environmental requirements defined through Bangladesh Environmental Conservation Act, 1995 and subsequent regulations and guidelines including latest ECR 2023.

The ESIA will take into account the natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, physical cultural resources and gender aspects and for physically disabled people for Landing Stations/Ghats design); climate change and its implications, and also induced impacts as well as the cumulative impacts of other development projects in the area. The ESIA will consider natural and social aspects in an integrated way. It will also take into account the country's overall policy framework, national legislation, and institutional capabilities related to the environment and social aspects; and obligations of the country, pertaining to project activities, under relevant international environmental treaties and agreements.

D. Specific Tasks for the Consultant - ESIA

To complete the ESIA study or studies, the consultant will carry out the following tasks:

1. Review the Project details

Review the proposed developments and their geographic, ecological, social, and temporal context, including any offsite investments that may be required. Work closely with BIWTA and its design consultants to identify the need for any additional land requirements for proposed developments, including associated facilities or other directly related investments. Review the ESIA for Component 1 and EMF and RPF studies for investments in Component 2 ([Click Here](#) on BIWTA website). Define 'project influence area' on the basis of the project scope and extent. Review the shapes of river channels within the influence area and how they change over time.

2. Review of the Legislative and Regulatory Framework

Review the policy, legal and administrative framework within which the ESIA is carried out. Review the national environmental requirements, including updated version of ECR 2023. Identify relevant international environmental agreements to which the country is a party. Review the country's resettlement and rehabilitation policies. Also review the WB OPs and their triggering status for the Project. Also state the policy requirements as applicable to the proposed investments, and actions taken / planned in response to each OP triggered.

Review existing systems on grievance management and citizen's feedback within BIWTA, and suggest measures for strengthening to ensure access to community and timely response during both construction and operation phases of the proposed subprojects.

3. Scoping

Scoping is the first step of the ESIA and is essentially the process of identifying the significant issues relating to the proposed action and of determining the issues to be addressed in the ESIA. The key tasks include: i) carry out reconnaissance field visits; ii) carry out stakeholder mapping, hold initial stakeholder consultations, and develop a stakeholder participation plan for the completion of the studies; iii) identify the key aspects to be studied during the detailed ESIA, iv) finalize ESIA ToRs in consultation with the stakeholders for approval of DoE if required; v) prepare work plan for the subsequent ESIA tasks; and vi) prepare the Scoping Statement compiling the process and outcome of the scoping tasks described above. Review the definition of project influence area and revise if necessary. Facilitate, on behalf of BIWTA, the obtaining of DoE's approval of the final TORs for ESIA, if required.

4. Project Planning and Analysis of Alternatives

Provide input to the BIWTA and its design consultants for inclusion of waste collection and treatment facilities (ship related waste management), land use planning, climate change adaptation and resilience, last mile connectivity, female and physically disabled friendly facilities (such as separate toilets, waiting areas and ticket counters, inspection areas, adequate lighting and safety features, etc.), relocation of public facilities and access roads to public facilities to be incorporated in the project planning and design. In addition to these, study integrating the resettlement aspects into the design process, for e.g. provision for building of shops and facilities (that affected people can be given priority to occupy) in the designs.

In close collaboration with the Design Consultants, systematically compare feasible alternatives to the proposed project location, design, and operation - including the "without project" situation - in terms of their potential environmental and social impacts; and state the basis for selecting the particular project design.

5. Detailed Baselines Studies and Analysis

Review relevant physical, biological, and socio-economic conditions of the study area, including any changes anticipated before the project commences. Also identify current and proposed development activities within the project area but not directly connected to the project. Also analyze the trends in the key environmental and social parameters of the area. Data should be relevant to decisions about project location, design, operation, or mitigatory measures.

Review the primary and secondary data collected during the preparation stage of the Project by the IWM ESIA team, and presented in EMF and RPF reports, and collect additional data if required on the following aspects:

Physical Environment. The data on physical environment should cover, inter alia:

- physiography,
- climate,
- geology and seismology,
- soils,
- hydrology and river dynamics, including annual and seasonal peak discharges, recurrence intervals and flood levels for various peak discharges (including at minimum for 5, 10, and 100- year flood events as well as historic maximum discharge), annual and seasonal low-flow discharges and recurrence intervals including historic minimum discharge, etc.
- groundwater,
- vulnerability of area to flooding and storm surges,
- river morphology, including erosion and sedimentation / sediment deposition patterns, currents and bathymetry
- soil quality,
- river bed sediment quality, in areas where dredging may be required and/or construction activities may disturb sediments, such as piling works (including the presence of contaminants, pollutants or heavy metals such as PCBs, POPs, hydrocarbons, and heavy metals such as arsenic, cadmium, nickel, mercury, etc.).
- water quality, in particular including major ions, TSS, TDS, DO, BOD, NO₃, pH, etc.,
- ambient air quality and noise.

Characterize the baseline status of each parameter, and discuss trends underway independent of the project which could change baseline conditions over the life of the project, including trends in land use changes and climate change.

Biological Environment. The data on biological environment should cover, inter alia:

- natural habitats and ecosystems;
- flora - trees, grasses, others;
- fauna mammals, birds including migratory birds, reptiles, amphibians, insects, fish, dolphin, and red- listed species;
- biodiversity including carrying capacity;
- protected and non-protected areas including hunting, poaching, illegal fishing;
- wetlands;

- fish;
- benthic flora and fauna; and
- others as identified by the consultant or required by the PIU.

The trends underway independent of the project which could change baseline conditions over the life of the project, including trends in land use changes and climate change, should also be covered.

Socio-Economic Baseline. The socioeconomic baseline should identify and characterize all affected households as well as general socioeconomic aspects of the area of influence of each project investment location. This shall include using mobile application to geo-tag all affected households with photographs of household members and the asset(s) affected, prepare maps of affected households and communities, and describe their present socioeconomic conditions, mobility, livelihoods, gender and vulnerability based on household surveys of all directly and indirectly affected households, and consultations with communities and key stakeholders. The data will also cover:

- population and demography;
- use of land, river and natural resources in the project area including for agriculture, fishing, livestock, grazing;
- other economic activities e.g. sand quarrying / extraction, trade, services;
- existing river traffic (both commercial and recreational) and navigation routes, etc; existing traffic patterns on access routes;
- social infrastructure and services including education, health, communications, others;
- economic activities;
- identification of direct and indirect beneficiaries;
- access and security;
- community organizations;
- vulnerable groups and poverty situation;
- gender aspects;
- Labor influx and and Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH)
- Grievance Redressal Mechanism (GRM)
- Universal access for design and facilities for physically disabled persons;
- recreation areas;
- cultural heritage and cultural property;
- Common propriert resources (CPR), e.g. cultural practices, graveyards and monuments; and
- others as identified by the consultant.

6. Stakeholder Consultations

The consultants need to identify all the stakeholders; both direct and indirect, and carry out a detailed stakeholder analysis and identify key stakeholders at each site. Continued consultations are required during the project preparation with the affected communities and relevant stakeholders. In addition, at least two major consultation meetings are to be held at the project sites (the first one during the initial stages of ESIA study and the second one after preparation of draft ESIA report) with the affected communities and businesses as well as other relevant stakeholders including boat owner associations, commuters, auto-rickshaw unions, women, institutional stakeholders and local non-governmental organizations, etc. Consultation methodologies should also include Focus Group Discussions (FGD) and key informant interviews, which shall be briefly documented using mobile application and geo-tagged, to complement larger consultation events and ensure social inclusion of the consultation process. FGD should include in particular different user groups of the future terminals, including specific FDGs with women only, as well as with stakeholders with physical disabilities. All consultations shall be fully documented, including with photolog, and included in an annex to the final ESIA

report. Documentation should include dates and locations of consultation events, stakeholder groups consulted, information shared and issues raised, and how feedback received will be taken into account in the analysis and design of the project including implementation mechanisms of the ESIA/ESMP and RAP.

7. Environmental Impact Assessment

Predict and assess the project's likely positive and negative impacts, in quantitative terms to the extent possible, associated with Project sitting, design, construction, and operation. This analysis will require in depth interpretation, particularly on impacts related with in stream construction activities such as piling, bank protection works and dredging (on aquatic ecology and river erosion); disposal of dredge spoils; management of solid and liquid waste (from ships and cargo activities); water and sanitation; air and noise quality; site remediation and disposal of contaminated soils where the site is currently being used for metal scrap business, ship breaking and fabrication facilities; occupational health and safety issues; river traffic and on-land traffic impacts, emergency management; and traffic safety issues associated with terminal development and ongoing use. Predict the impacts and mitigation measures due to construction of breakwaters, RCC piles and sheet piles. Analyze the morphology of river channels within the influence area and how they change over time due to construction of proposed facilities and the increased traffic movement.

Explore opportunities for environmental enhancement. Identify and estimate the extent and quality of available data, key data gaps, and uncertainties associated with predictions, and specify topics that do not require further attention.

8. Social Impact Assessment

Assess the impacts of land acquisition (if any) and land use change (even if it is government land) on the livelihoods of the affected people and their socioeconomic conditions through detailed census surveys, and identify the options for resettlement of affected people and restoration of their livelihoods through focused consultation with affected groups. Assess the impact of proposed developments on the access to public facilities, community health and safety, gender and employment.

The social research and census surveys should cover the squatters living in the proposed development areas owned by BIWTA. There are common property resources to be considered during the assessment in all sites (e.g. mentioned 16 sites). A robust socio-economic baseline of all these affected people will form the backbone of this assessment. The assessment should not limit the surveys to the impacts cited here, but list all the direct and indirect impacts due to the proposed project. All socio-economic survey should be carried out using mobile device for real time data collection.

The social impact assessment will cover the directly affected people and affected communities to formulate development strategies in order to assist in determining project impacts on the social, economic, cultural, and livelihood activities of affected communities. This will establish a social baseline against which changes resulting from the intervention can be measured in the future. A socio-economic survey of the area to analyze the demographic, socio-economic, cultural and other social relations and stakeholder needs to be conducted. Local tenure and property rights arrangements, which may include usufruct or customary rights to the land or other resources taken for the project including common property resources needs to be assessed.

9. Cumulative and Induced Impacts

Consider and assess the cumulative impacts of other development projects in the area (on-going and planned). In particular, review the projects and facilities associated with IWT and consider and assess any potential interaction of impacts of those projects with those of proposed facilities.

10. Environmental and Social Management Plan (ESMP)

Prepare ESMP complete with mitigation plan, compliance monitoring plan, effects monitoring plan, institutional arrangements, training needs, documentation and communication protocol, grievance redressal mechanism, cost of implementing ESMP, and mechanism to integrate ESMP with the Project (e.g., through design changes, contractual clauses, etc.). Prepare environmental code of practices (ECoPs) with standard mitigation measures and best management practices to address the impacts associated with both during construction and operation phases of the proposed facilities. Describe in details who will (a) implement the environmental mitigation activities; (b) carry out environmental monitoring; (c) supervise environmental mitigation and monitoring; (d) design, implement and apply the environmental management information system (EMIS); and (e) prepare monthly/ quarterly progress reports on environmental management. Include measures for emergency response to accidental events (such as entry of raw sewage or toxic wastes into the river, collision of boats, flooding of facilities, etc.). Provide an itemized budget for implementing the ESMP, as well as descriptions of minimum qualifications for key personnel responsible for its implementation. Prepare a detailed plan, including schedule and necessary budget, to monitor the implementation of mitigating measures and the impacts of the project during construction and operation (e.g., emissions thresholds and ambient levels of pollutants where these may be detrimental to human health, soil erosion, etc.). Provide guidance for reporting and enforcement and conducting environmental audits. The ESMP should be divided into two sections: one encompassing the requirements of the civil works contractors (in a format that can be annexed easily to the bid packages), and one for all other aspects of environmental and social management during construction and operational phases.

11. Resettlement Action Plan (RAP)

A stand-alone site specific Resettlement Action Plan (RAP) shall also be prepared for all the sites, in accordance with World Bank OP 4.12 on Involuntary Resettlement, as well as applicable Bangladeshi land acquisition, resettlement and rehabilitation laws, regulations and guidelines. Depending on the impacts, the RAP will also include a livelihood restoration plan.

Aside from the RAP (described below), the social management plan should be delivered as a stand-alone section of the ESIA and should include, among other aspects: (i) Social mitigation and enhancement measures for the proposed investments, ii) Grievance Redressal Mechanism (GRM) including gender based violence (GBV) response GRM, iii) Monitoring protocol, and iv) Strategies and plans for a) Community consultation and engagement, b) Women engagement, c) Small, ethnic and vulnerable communities development, d) Communication plan and e) Capacity building.

In preparation of the RAP and any other social management plan, the tasks to be performed are as below (but not limited):

- To photograph the affected / displaced family with the affected assets and number each asset; to prepare videography of the entire affected area including the affected land and assets.
- To conduct census survey of all PAPs residing/using the corridor of impact to collect an inventory of types and extent of losses of each affected household, family composition and details on age and sex of all the members of the household, income and expenditure levels and occupational patterns, vulnerability status, legal ownership status (private, traditional and customary ownership, lease), asset ownership status and skills possessed. Prepare a fact sheet and attach the photograph of each project-affected person/family.
- Assess in detail all the adverse impacts and categories each type of losses specific to the project area.
- To conduct Focus Group Discussions (FGD) on the preliminary designs options such on location, accessibility, facilities, safety and others and integrate the outputs in the technical design with that of the mitigation measures proposed.

- To carry out public consultations with different project affected social groups about their options and rights pertaining to resettlement and with other stakeholders like NGOs, District Administration, etc., and provide a plan for continuous public consultation during implementation.
- Identification of key formal and informal institutions operating at village, upazila and regional levels and assessment of their role in community decision making processes as these affect project activities.
- To carry out market survey and focus group discussion with different social groups including women and vulnerable to prepare socially, technically and economically feasible income generations schemes including skill upgradation plans.
- To determine the legal framework of private land, customary and traditional laws governing land tenure, usufruct rights, leasehold and land acquisition, or transfer plans for the total project including for tree plantation, if any, according to the revenue records (including acquisition for temporary purposes).
- Based on draft detailed designs conduct field verification and consultation to identify locations for further minimization of social impacts if any, and integrate with final designs.
- To establish the legal status of the affected people and carry out joint verification with the revenue department and implementing agency, of the project affected area to prepare land acquisition plans and provide specific details on the gaps between physical ownership and revenue records; identify land allotted to affected people by government departments and other agencies, if any.
- Modify and update database of project affected persons on a user friendly platform.
- To finalize estimate of land required for resettlement and for economic rehabilitation.
- To identify the land and prepare a plan for relocation in consultation with the project displaced people with different social groups including women and local administration.
- To prepare a plan that ensures the host population will not be adversely impacted and plan for consultation on the impact on resources and infrastructure with increase in population of the host areas.
- Based on project RPF policy provides an appropriate action plan for additional support for the vulnerable, and other action plans if necessary.
- To determine the impact on community assets/cultural property and prepare a management plan for relocation and restoration in consultation.
- To develop terms of reference for Implementing NGOs, external evaluation consultants, and for any other study identified for impact evaluation.
- To assess institutional capacity and propose the institutional arrangement for implementation of RAP, addressing grievances, and ensuring gender equity, and identify the roles and responsibilities of each agency.
- To identify various formal and informal institutions that may provide support for the implementation of RAP.
- To develop a training program on Resettlement and Rehabilitation (R&R), based on the assessment of the capacity of the implementing agency.
- To develop monitoring indicators and formats for physical and financial progress, process monitoring and impact evaluation and indicators to for other stakeholders and finalize the same.
- To prepare an implementation schedule synchronized with time frame of civil works, and ensure that no civil works will begin until people are fully compensated and adequately rehabilitated.
- Conduct risk assessment for proposed mitigation measures.
- To develop detailed budget based on the based on the outcomes of study.
- Develop a mobile based as well as web based interactive application for monitoring, grievance redressal and feedback, which can be used by the community including PAPs, during preparation and implementation.

E. Deliverables

The deliverables to be submitted are:

- **Draft Inception Report:** The Draft Inception Report which will be submitted within 4 (four) weeks from the date of contract signing. A Workshop will be arranged before finalization of the Inception Report. Report shall include inter-alia, appropriate methodology, detailed action plan for data collection, sampling, timeline, roles and responsibilities of experts of the particular assignment;
- **Final Inception Report:** The Final Inception Report which will be submitted within 1 (one) week from the completion of the workshop feedback. Report shall include inter-alia, appropriate methodology, detailed action plan for data collection, sampling, timeline, roles and responsibilities of experts of the particular assignment;
- **Draft Final Report:** Draft final ESIA Reports including Environmental and Social Management Plans (ESMP), Emergency Response Plan (ERP), Labor Management Procedure (LMP), Stakeholder Engagement Plan (SEP) along with Annexes & RAP with adequate measures for compensation, relocation, livelihoods restoration, grievance redresses and budgetary provisions etc. in English written in a form that is understandable and accessible to a layman audience. Separate Stakeholder consultation meeting/Workshop will be arranged i.e. one for initial stage of RAP and ESIA preparation and another for draft Final RAP and ESIA. The Consultant will make a presentation of the draft report to the Client and comments/feedback received from the presentation will be incorporated in the final report;
- **Final Report:** The final report which will be submitted within seven days after the findings dissemination workshop based on the draft final report. 15 (Fifteen color printed book binding copies of the Final Report shall be submitted to the Client along with one in soft preferably in CD/USB flash. Final ESIA and RAP will be in English. Executive Summary (a summary of the ESIA/ESMP and RAP reports), written in a form that is understandable and accessible to a layman audience, will be in both English and Bangla.

F. Assignment Duration

The assignment is expected to be completed within 12 months. The inception report should be submitted within 4 weeks. The draft final ESIA and RAP reports along with management plans should be submitted at the end of the 11th month.

G. Study Team

The proposed core team for the ESIA and RAP studies is given below. The man months shown are initial estimates only for core skill areas, and may not be inclusive of all required skills and team members necessary to complete the studies. The consultant is responsible to make a determination on the required staffing to complete the assignment, and is free to employ whatever resources are required.

S.No	Key Specialists	Man Months
1	Team Leader cum Environmental Safeguard Expert–experience on ESIA's, including one or more in accordance with World Bank or other international lender standards; previous experience on one or more ESIA's for ports or terminals is strongly preferred.	12
2	Environmental Engineer–National expertise on management and remediation of contaminated soils and sediments, preferably with relation to port or terminal development	12
3	Ecologist –National expertise on river ecology and preferably prior knowledge of the ecology of the relevant rivers under study.	9
4	Resettlement Specialist-National experience in preparation of SIA and RAPs	12
5	Resettlement Manager 02 persons @ 6 months– National experience in preparation of SIA and RAPs	(6*2)=12
6	Stakeholder Engagement and Consultation Expert – 02 persons @ 9 months - National experience in engaging communities in preparation of RAPs; preferably 1 female and 1 male	(9*2)=18
7	Gender and SEA/SH Expert–National experience in gender mainstreaming in the preparation of RAPs and the management of social issues in infrastructure projects generally; preferably female	9
Total		84

Note:

List of Key Experts and estimated person-month shown above is indicative and for reference only. The Consultant is responsible to review the required services and may propose own requirements for the Key Experts/Non-Key Experts and other support staff (e.g.: Interviewers, Data Entry Operators, Data Enumerators, IT Technician/Software Developer, etc. and necessary budget to be included in the budgetary provision) required to complete the proposed services in a satisfactory level. However, for evaluation purpose, only the Key Experts shown above will be considered.

The roles and responsibilities outlined below are considered the core responsibilities. However, the consultant firm(s) is (are) still required to deliver all aspects of the scope of works.

1. Team Leader cum Environmental Safeguard Expert

Education: Master's in Biological Science/Geological Science /Environmental Science/ BSc. Engineering (Civil/Water Resources) from a reputed Public University.

Experience: At least 15 years relevant professional experience with minimum 3 years as a Team Leader. Experience on ESIA's and RAP, including two or more in accordance with World Bank or other international lender standards. Should have prior experience as team leader/Project manager of an ESIA's and RAP study for any similar projects. His/ Her role and responsibilities include, but not limited to:

- Lead and coordinate the activities of the team
- Coordinate activities with PIU and design consultants
- Has overall responsibility for all deliverables

2. Environmental Engineer; Education: Master's in Environmental Science / BSc.

Engineering (Civil/Water Resources) from a reputed university.

Experience: At least 10 years relevant professional experience. National with expertise in particular on environmental management of dredging, management and/or remediation of

contaminated soils and sediments, preferably with relation to port or terminal developments. His/Her role and responsibilities include, but not limited to:

- Conduct environmental baseline surveys
- Provide key technical inputs on issues related to pollution, contamination of proposed project activities
- Review environmental requirements (such as waste management, sewerage and effluent treatment facilities, etc s) of designs
- Develop mitigation measures in consultative manner
- Identify potential ecological enhancement measures such as energy efficiency measures, green technologies, etc.
- Develop EMP
- Provide cost estimates and BOQ items for the environmental management aspects for all relevant aspects
- Participate in stakeholder consultations
- Provide any other required necessary support to Team Leader and PIU

3. Ecologist

Education: Master's in Biology, Zoology or similar field.

Experience: At least 8 years relevant professional experience, with expertise on river ecology, and preferably prior knowledge of the ecology of the relevant rivers under study. His/Her role and responsibilities include, but not limited to:

- Screening of ecological issues as required forby selected sites of the project
- Conduct flora and fauna survey and baseline analyses and identify ecological sensitive areas in and around project areas. Ecological impact analyses, including indirect and cumulative effects
- Develop alternative design options and mitigation measures in consultative manner
- Identify potential ecological enhancement measures
- Provide input to development of EMP
- As required, provide cost estimates and BOQ items for the environmental management aspects for all relevant aspects Participate in stakeholder consultations
- Provide any other required necessary support to Team Leader and PIU

4. Resettlement Specialist (01 Person)

Education: Master's in Social Science, Anthropology or similar field,

Experience: 10 years of professional experience in prepartion of SIA & RAP and involuntary resettlement issues, including in accordance with World Bank or other international lender standards. Previous experience in the implementation of water resource/river/costal engineering and management project, in particular inland water transport project would be a plus .

The Expert will assist the study mainly by assessing the social impact risks and preparing social management plans (including Resettlement Action Plans) for the proposed intervention construction of passenger terminal and landing stations/launch ghats in proposed location. Her/his major responsibilities shall include but not necessarily be limited to the following:

- Identifying both social risks including potential issues of labour influx, and opportunities in connection with project interventions;
- Identifying the views and interests of the local peoples, in connection with their present socio economic activities.

- Analysis of land requirements of different interventions in relation to the present land use patterns in the study areas, and determination of compliant solutions.
- Consultation with local people about the potential scenarios, in coordination with the Community Engagement and Gender Experts.
- Liaise with design consultants to ensure disabled and other vulnerable group aspects are included in the tender documents.
- Participate focus group discussions with local people.
- Develop RAP in consultation with local administration and stakeholders.
- Attend meeting as and when required by the designated representative of BIWTA.
- Assist in preparation and submission of deliverables of the study.

5. **Resettlement Manager (02 Persons)**

Education: Master's in Social Science, Anthropology or similar field,

Experience: 10 years of professional experience with SIAs and involuntary resettlement issues, including in accordance with World Bank or other international lender standards. Previous experience in the implementation of water resource/river/costal engineering and management project, in particular inland water transport project would be a plus .

The Expert will assist the study mainly by assessing the social impact risks and preparing social management plans (including Resettlement Action Plans) for the proposed intervention construction of ferry ghat, passenger terminal, vessel shelter, cargo terminal in proposed location. Her/his major responsibilities shall include but not necessarily be limited to the following:

- Identifying both social risks including potential issues of labour influx, and opportunities in connection with project interventions.
- Identifying the views and interests of the local peoples, in connection with their present socio economic activities.
- Analysis of land requirements of different interventions in relation to the present land use patterns in the study areas, and determination of compliant solutions.
- Consultation with local people about the potential scenarios, in coordination with the Community Engagement and Gender Experts.
- Liaise with design consultants to ensure disabled and other vulnerable group aspects are included in the tender documents.
- Participate focus group discussions with local people.
- Assist to develop RAP in consultation with local administration and stakeholders.
- Attend meeting as and when required by the designated representative of BIWTA.

6. **Community Engagement Expert (2 persons)**

Education: Masters in Sociology, Anthropology or similar field

Experience: 5 years' experience with engaging communities in preparation of SIAs and RAPs. Previous experience with World Bank or ADB supported projects including other donor-supported projects of similar nature would be an asset. Preferably 1 female and 1 male . Her/his major responsibilities shall include but not necessarily be limited to the following:

- Develop a communication strategies and plans in the context of delivering the assignment.
- Work with Social Development and Resettlement Specialist identifying both social risks and opportunities in connection with project interventions.
- Work closely with Social Development and Resettlement Specialist to identify socio-economic and socio-cultural baseline.
- Arrange and participate focus group discussions with local people and consultations with other stakeholders.
- Assist in preparation and submission of deliverables of the study.

7. Gender and GBV Expert

Education: Master's in Sociology, Social Science, Gender Studies or similar field

Experience: Minimum 10 years' experience in gender including 2 years experience in GBV mainstreaming in the preparation of RAPs and the management of social issues in infrastructure projects generally; preferably female. Previous experience with World Bank or ADB supported projects including other donor- supported projects of similar nature would be an asset. Her/his major responsibilities shall include but not necessarily be limited to the following:

- Preparation of Gender and GBV Action Plan
- Develop strategies and plans for women's engagement
- Develop gender sensitive measures and indicators for incorporation into management plan
- Liaise with design consultants to ensure gender sensitive aspects are included in tender documents
- Participate in focus group discussions with local people and consultations with other stakeholders.
- Assist in preparation and submission of deliverables of the study

H. Applicable World Bank Policies and Procedures

Operational Policies (OP) /Bank Procedures (BP) that are expected to be applicable to the proposed ESIA study are the following:

OP / BP 4.01 Environmental Assessment

OP / BP 4.04 Natural Habitats

OP 4.11 Physical Cultural Resources

OP / BP 4.12 Involuntary Resettlement

OP / BP 7.50 Projects on International Waterways

BP 17.50 Disclosure of Operational Information

The consultants will also make use of and follow applicable thresholds and standards outlined in the WBG Environmental, Health, and Safety (EHS) Guidelines, including both General EHS Guidelines as well as EHS Guidelines for Ports, Harbors and Terminals (available for download at <http://www.ifc.org/wps/wcm/connect/9e558c00488556ebba4fa6a6515bb18/Final%2B-%2BPorts%252C%2BHarbors%2Band%2BTerminals.pdf?MOD=AJPERES&id=1323152828015>).

I. Proposed/Indicative Structure of ESIA Report (Report should be combined consist of both Environment and Social aspects)

The suggested and indicative contents of the ESIA report are given below. The consultant however will be required to confirm this structure with DoE during the scoping phase. (Need to be confirmed with DoE).

Executive Summary

Concise discusses significant findings and recommended actions.

1. Introduction

Overview

Background of the project

Objective of ESIA

Approach to work

Area/Corridor of Impact

Composition study team

2. Legal and administrative framework

GoB requirements (legislation; guidelines and rules; policies; international treaties signed by Pakistan; national and provincial authorities; environmental procedures), their applicability, and compliance status for the Project.

World Bank requirements (operational Policies and safeguard requirements; and WBG Environmental Health guidelines) and their triggering and compliance status for the Project.

3. Project description

Need and purpose of project

Project location

Salient features

Description of project components

Construction activities

Construction machinery, materials and other supplies (including estimated numbers/quantities)

Waste generation and disposal (including estimated quantities)

Manpower requirements

Operation and maintenance (supplies; waste generation and management; manpower requirements; others).

4. Baseline description/analysis

Study area

Physical environment

Biological environment

Social and economic environment

Cultural aspects (cultural heritage; archaeology; and other objects of special interest, e.g. graveyards, monuments).

5. Project alternatives

Without project alternative

Site Options

Design Options

Other temporary and permanent facilities

6. Climate Change

Climate Change

Risk of flooding

7. Public Consultation and Information Disclosure

Scoping sessions

Focused group discussions

Public consultations

Information disclosure

8. Potential environmental impacts and their mitigations

Impact assessment, prediction, and characterization method.

Impacts during construction phase

Impacts during operational phase

Impacts during decommissioning phase.

9. Potential social impacts and their mitigations

Resettlement and compensation

Impacts and their mitigations during construction phase

Impacts and their mitigations during operational phase.

10. Cumulative and Induced Impacts

Cumulative impacts of on-going and planned projects in the area and on Indus River

Induced impacts of the Project.

11. Environmental Management Plan (EMP)

Types of impacts and their mitigations
Mitigation measures
Environmental Code of Practices
Monitoring Plan
Communication and documentation
Cost of EMP
Integration with Project (contract clauses, others)
Grievance redressal.
Institutional strengthening

REFERENCES

ANNEXES

- Flora and fauna list
- Documentation on public consultations
- Environmental Code of Practices, etc.

J. Proposed/Indicative RAP Report

The suggested and indicative contents of RAP report are given below:

Executive Summary: Concisely discusses significant social findings and recommended mitigation measures and actions.

1. Introduction

Overview
Background of the project
Objective of RAP and key tasks
Approach and methodology
Area/Corridor of Impact
Composition study team

2. Legal and administrative framework

GoB requirements (legislation; guidelines and rules; policies; international treaties signed by Bangladesh; national and provincial authorities; social procedures), their applicability, and compliance status for the Project.
World Bank requirements (operational Policies and safeguard requirements; and WBG Environmental Health guidelines) and their triggering and compliance status for the Project.

3. Project description

Need and purpose of project
Project location
Salient features
Description of project components
Construction activities
Construction machinery, materials and other supplies (including estimated numbers/quantities)
Waste generation and disposal (including estimated quantities)
Manpower requirements (including temporary labor force)
Operation and maintenance (supplies; waste generation and management; manpower requirements; others).

4. Baseline description/analysis

Study area
Demographic Profile
Socio-economic profile
Socio-economic analysis based on primary data
Cultural aspects (cultural heritage; archaeology; and other areas or objects of special interest, e.g. graveyards, monuments).

5. Stakeholder Analysis

Stakeholders at different levels

Stakeholder expectations
Overall issues emerged during consultations

6. Public Consultation and Information Disclosure

Stakeholder consultations
Focused group discussions
Public consultations
Information disclosure

7. Potential social impacts and their mitigations

Impacts
Risks and Assumptions
Issues of significance
Resettlement and compensation
Impacts and their mitigations during construction phase
Impacts and their mitigations during operational phase.
Conclusion and Recommendation

K. Resettlement Action Plan (RAP) as an annexure

1. Introduction

1. Brief Introduction of the sub-project
2. Description of Component(s) that cause land acquisition/alienation and resettlement
3. Overall Estimates of Land Acquisition and R&R

2. Measures to Minimize Resettlement

1. Description of Efforts Made for Minimizing Displacement
2. Description of the Results of these Efforts
3. Description of Mechanisms to Minimize Displacement and Loss of Livelihood/Income during Implementation

3. Census and Socio-Economic Surveys

1. Provide the results of the census and socio-economic surveys
2. Identify all categories of impacts and the extent of impact on each affected

4. Consultation and involvement of PAPs

1. Describe various Stakeholders
2. Summarize process of consultation on the results of socio-economic surveys
3. Describe the need and mechanisms to conduct updates to socio-economic surveys
4. Describe how this process of consultation would be continued through implementation and monitoring
5. Describe the plan for disseminating information to Project Affected Persons

5. Entitlement Framework

1. Provide a definition of PAFs and PAPs together with their categorization based on impacts
2. Describe R&R entitlements for each category of impact
3. Describe method of valuation used for affected land, structures and other assets
4. Using Entitlement Matrix, present a table of all PAFs/PAPs and their losses/ impacts and entitlements

6. Relocation (if applicable)

1. Does the Project need community relocation sites? If yes, have they been inspected and accepted by PAPs?
2. Have the Project Affected Persons agreed to the strategy for housing replacement? Will new housing be constructed/allocated? If PAPs are to construct houses, explain if compensation entitlement for housing is sufficient to help them construct houses.
3. List of proposed sites along with number of affected families to be relocated
4. Describe respective mechanisms for (i) procuring/acquiring/alienating; (ii) developing and (iii) allotting resettlement sites
5. Provide detailed description of arrangements for development of resettlement sites including provision of social infrastructure describe the feasibility studies conducted to determine the suitability of the development of sites.

6. Income Restoration

1. Are the compensation entitlements sufficient to restore income streams for each category of impact? If not, what additional economic rehabilitation measures are necessary?
2. Briefly spell out the restoration strategies for each category of impacts, and describe institutional, financial and technical arrangements/aspects involved
3. Describe the process of consultation with PAPs to finalize strategies for income restoration
4. How do strategies for restoration vary with the area/locality of impact
5. If income restoration involves change in livelihoods or other economic activities allow substantial amount of time for capacity building, accessing institutional funds/ credits/ markets, preparation and implementation. Work out the rate of returns for each of the economic activities opted by the entitled person.
6. How are the risks of impoverishment proposed to be addressed?
7. Explain the main institutional and other risks for effective implementation of plans for restoration of livelihood
Describe the process for monitoring the effectiveness of income restoration activities

7. Institutional Arrangements

1. Describe institution(s) responsible for: (a) delivery of each item/activity in the entitlement policy; (b) implementation of resettlement and rehabilitation programs and (c) coordination of all other activities as described in the Rehabilitation Action Plan
2. State how coordination issues will be addressed in cases where resettlement and rehabilitation are spread over a number of institutional/departamental jurisdictions
3. Indicate the agency that will coordinate all implementing agencies – do they have the necessary mandate and the resources
4. Describe the external (non-Project) institutions/departments involved in the process of resettlement and restoration of income such as land development, land allocation, credit, training for capacity building and the mechanisms in place to ensure adequate cooperation and performance of these institutions/departments
5. Describe the results of the institutional capacity assessment and give the institutional development plans including staffing schedule and training requirements
6. Discuss institutional capacity for, and commitment to, resettlement and rehabilitation

8. Monitoring and Evaluation

1. Describe the internal monitoring process
2. Define key monitoring indicators for resettlement, rehabilitation and participation and provide a list of these indicators which would be used for internal monitoring
3. Describe institutional (including financial) arrangement
4. Describe frequency of reporting and contents of reports
5. Describe the process for integrating feedback from internal monitoring into implementation
6. Describe financial arrangements for external monitoring including process for awarding and maintenance of contracts for the entire duration of R&R
7. Describe the methodology for external monitoring
8. Describe frequency of external reporting and its contents

9. Redress of Grievances

1. Describe the structure and process of grievances mechanisms at various levels including step- by-step process for registering and addressing grievances and provide specific details regarding registering complaints, discussing them with PAPs, response time, communication modes etc.
2. Describe the mechanism for appeal
3. Describe the provision, if any, to enable PAPs to approach civil courts in case these provisions fail.

10. Implementation Schedule

1. List the chronological steps in implementation of R&R Action Plan including identification of agencies responsible for each activity along with a brief explanation of each activity

2. A month-wise implementation schedule (Gantt chart) of activities to be taken as part of R&R Action Plan
3. Description of the linkage between R&R implementation and initiation of civil works for each of the Project component

11. Costs and Budgets

1. Clear statement of financial responsibility and authority
2. List the sources of funds for R&R and describe the flow of funds
3. Indicate if costs of R&R are included in the overall Project costs
4. Identify R&R costs, if any, to be funded by the WB
5. Provide a cost-wise, item-wise budget estimate for the entire R&R costs including administrative expenses, monitoring and evaluation and contingencies
6. Describe the specific mechanisms to adjust cost estimates by *inflation* factor
7. Describe provisions to account for different types of contingencies

L. Conclusion and Recommendation

M. Documentation on public consultation



N. Institutional Arrangements

The Consultant, throughout the assignment, will work closely with the Client's Representative(s) who will take regular feedback and make decisions associated with the assignments.

O. Facilities to be provided by the Consultant

During the Assignment period, the Consultant shall provide all the facilities for their staff and other logistical requirements on their own to fulfil their obligations. These will also include support staff and well furnished office facilities within close vicinity of PIU, BIWTA, office equipment and supplies, required equipment (including computers, professional cameras, cell phones with ODK app to all the interviewers) as well as equipments & materials for field data collection, vehicles, and communications as required. A full-time vehicle (Sedan car) with driver shall be deployed for the concerned PIU members for the whole contract tenure.

P. Facilities to be provided by the Client

The Client as an Employer will provide the Consultant with all available studies and reports and data relevant to the services. The Client will provide access to the related government offices and information required for the study and shall provide assistance where the Consultant, for the purpose of executing these services, needs to coordinate with other government agencies, and non-government agencies. The Client will also participate in all stakeholder consultation events as and when required.

Annexure 02

ESIA Approach & Methodology

ESIA Approach & Methodology

The main focus of the ESIA has been to collect baseline data and to anticipate environmental impacts, both positive and negative that may result from the project as well as their potential magnitude, reversibility, period of occurrence, nature, etc. The approach and methodology followed to complete the ESIA study is divided into several tasks elaborated in subsequent sections

Task 1: Review of the Scopes of ESIA and Legislative and Regulatory Framework

Scoping has been undertaken to identify the potential Area of Influence (AOI) for the project. The AOI has been identified depending on the nature and intensity of the impact from the project activities during the ESIA report preparation. Scoping has also helped in developing and selecting alternatives to the proposed action and in identifying the issues to be considered in an ESIA.

The review process has involved the assessment of environment related regulatory requirements for the proposed project. Any gaps in the project information that is deemed essential for determining impacts/risks and also as a requirement to comply with the applicable environment related regulations has been sought. Review of the Legislative and Regulatory Framework has included:

- ✓ Review the policy, legal and administrative framework within which the ESIA has been carried out.
- ✓ Review the national environmental requirements, including updated version of ECR 2023. Identification of relevant international environmental agreements to which the country is a party.
- ✓ Review the country's resettlement and rehabilitation policies.
- ✓ Review the WB OPs and their triggering status for the Project. Also review the policy requirements as applicable to the proposed investments, and actions taken/ planned in response to each OP triggered has been stated.
- ✓ Review existing systems on grievance management and citizen's feedback within BIWTA and suggest measures for strengthening to ensure access to community and timely response during both construction and operation phases of the proposed subprojects.

The project related information that has been collected from the client includes:

- ✓ Geographical co-ordinates of the project site.

Task 2: Project Description

Review the proposed developments and their geographic, ecological, social, and temporal context, including any offsite investments that may be required. Work closely with BIWTA and its design consultants to identify the need for any additional land requirements for proposed developments, including associated facilities or other directly related investments. Review the ESIA for Component 1 (Dredging of Dhaka-Chittagong-Ashuganj IWT Corridor) and EMF and RPF studies for investments in Component 2. Project influence area has been defined on the basis of the project scope and extent. The shapes of river channels within the influence area and how they change over time, has been reviewed.

Task 3: Environmental and Social Baseline Conditions

Extensive field visits have been conducted to collect primary and secondary data to ensure establishment of proper baseline information. Review relevant physical, biological, and socio-economic conditions of the study area, including any changes anticipated before the project commences. Identification of current and proposed development activities within the project area but not directly connected to the project. Also analyzing the trends in the key environmental and social parameters of the area. Data shall be relevant to decisions about project location, design, operation, or mitigatory measures. Details of baseline data collection is provided in **Table 1.1**.

(a) Primary Baseline Data Collection

Table 1.1: Baseline Data Collection

SL. No.	Attribute	Parameters	Details
1.	Ambient Air	SPM, SO ₂ , NO _x , CO, PM _{2.5} and PM ₁₀	13 samples from 13 locations (1 from each location).
2.	Ambient Noise	Noise levels in dB(A)	26 samples (one from nearest receptor and another from the project site) from 13 location (2 from each location) for day and night.
3.	Surface Water	Temperature, pH, TDS, TSS, Turbidity, EC, DO, BOD ₅ , COD, Cr, Cd, Pb, NO ₃ , Salinity, CL ⁻ , Sulfates, Phosphates, Oil and Grease	13 samples from 13 locations (1 from each location).
4.	Ground water	Temperature, pH, DO, TDS, Nitrate, SO ₄ , Phosphate, Ca, Mg, As, Fe, TC and FC	13 samples from 13 locations (1 from each location).
5.	Soil	pH, Fe, Cu, Zn, Mn, Ca ²⁺ , Mg ²⁺ , So ₄ ⁻ and Salinity	13 samples from 13 locations (1 from each location).
6.	River bed Sediment	pH, Salinity, TSS, TDS, Fe, As, Cu, Ni, Cd, Cr, Zn and Mn	13 samples from 13 locations (1 from each location).
7.	Ecology	Existing terrestrial and aquatic flora and fauna	Primary and Secondary data collection during the study period
8.	Traffic study	Existing condition of the road and river traffic of the project site	Primary data collection during the study period
9.	Meteorological Data	Rainfall, Humidity, Temperature and Wind speed	Secondary data collection during the study period

❖ **Physical Environment**

- Ambient Air;
- Noise;
- Soil quality;
- River bed sediment quality;
- Water quality- both surface and ground water.

❖ **Biological Environment**

- Baseline condition of within the AOI;
- Floral and faunal diversity in the AOI;
- Existence of any endangered, vulnerable species.

❖ **Social Environment:** The socioeconomic baseline should identify and characterize all affected households as well as general socioeconomic aspects of the area of influence of each project location. This shall include using mobile application to geo-tag all affected households with photographs of household members and the asset(s) affected and describe their present socioeconomic conditions, mobility, livelihoods, gender and vulnerability based on household surveys of all directly and indirectly affected households and consultations with communities and key stakeholders. The data has also covered:

- ✓ Population and demography;
- ✓ Use of land, river and natural resources in the project area including for agriculture, fishing, livestock, grazing;
- ✓ Existing traffic;
- ✓ Social infrastructure and services including education, health, communications, others;
- ✓ Economic activities;
- ✓ Identification of direct and indirect beneficiaries;

- ✓ Access and security;
- ✓ Community organizations;
- ✓ Vulnerable groups and poverty situation;
- ✓ Gender aspects;
- ✓ Labor influx and Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH);
- ✓ Grievance Redressal Mechanism (GRM);
- ✓ Cultural heritage and cultural property;
- ✓ Common Property Resources (CPR), e.g. Cultural practices, graveyards and monuments;
- ✓ Others as identified by the consultant.

The social research and census surveys have covered the squatters living in the proposed development areas owned by BIWTA. Common property assessment has been conducted during the study in all sites (e.g. mentioned 13 sites).

❖ **Stakeholder Consultation**

Key Informant Interview (KII), Focus Group Discussion (FGD) and Public Consultation has been carried out for any individual or group who is potentially affected by the proposed project directly or indirectly. The consultant has been conducted in and around the project site.

- I. **Focus Group Discussion (FGD):** Any individual or group who is potentially affected by the proposed project directly or indirectly. The consultations have been conducted FGDs in different locations in and around the project area.
- II. **Key Informant Interview (KII):** The survey team have been interviewed project related govt. stakeholders to know their point of view and comments about the project implementation.
- III. **Public Consultation:** Consultations with different stakeholders to know their point of view, opinions, concerns or suggestions about the project implementation.

b) Secondary Baseline Data Collection

Readily available secondary information has been collected for following aspects:

❖ **Physical Environment**

- ✓ Physiography;
- ✓ Climate;
- ✓ Geology and seismology;
- ✓ Soils;
- ✓ Hydrology and river dynamics, recurrence intervals and flood levels for various peak discharges (including at minimum for 5, 10 and 100-year flood events) discharge, water level data etc.
- ✓ Surface and Ground water;
- ✓ Flooding and cyclone;
- ✓ River morphology, erosion and sedimentation, bathymetry.

❖ **Social Environment**

- ✓ Population and demography status of project upazila;
- ✓ Housing condition;
- ✓ Religion;
- ✓ Literacy rate;
- ✓ Marital status;
- ✓ Source of drinking water and sanitation;
- ✓ Electricity facility;
- ✓ Cultural heritage.

❖ Biological Environment

- ✓ Natural habitats and ecosystems;
- ✓ Terrestrial Flora - trees, grasses, others and Aquatic Flora;
- ✓ Terrestrial Fauna - mammals, birds including migratory birds, reptiles, amphibians, dolphin and red-listed species;
- ✓ Fishes.

c) Geographical Information Systems (GIS)

Geographical Information Systems (GIS) has been used as a specialized analysis and presentation tool. Before commencing field investigations, spatial analysis of satellite imagery and present administrative areas and other boundaries/ constraints has been considered for the environmental assessments. For example, forest areas, water bodies, infrastructures, roads and urban areas and the alignment would be identified. A land sat 8 images has been used to understand the Existing land use Pattern around the project area. It also supports more detailed on-ground survey, particularly spatial features that may be directly or indirectly influenced by project activities.

Task 4: Alternative Analysis

Systematically compared feasible alternatives to the proposed project location, design, and operation - including the "without project" situation in terms of their potential environmental and social impacts; and state the basis for selecting the particular project design.

Task 5: Impact Assessment and Mitigation Measures

Impact identification and assessment starts with scoping and continues through the remainder of the impact assessment process (IAP). The anticipated changes enhancing the baseline conditions, with respect to air, noise, water, ecology and land environments or potential deterioration of human health, ecology and cultural baseline conditions of the study area was assessed and predicted using prediction tools as per the following description in **Figure 1.1**.

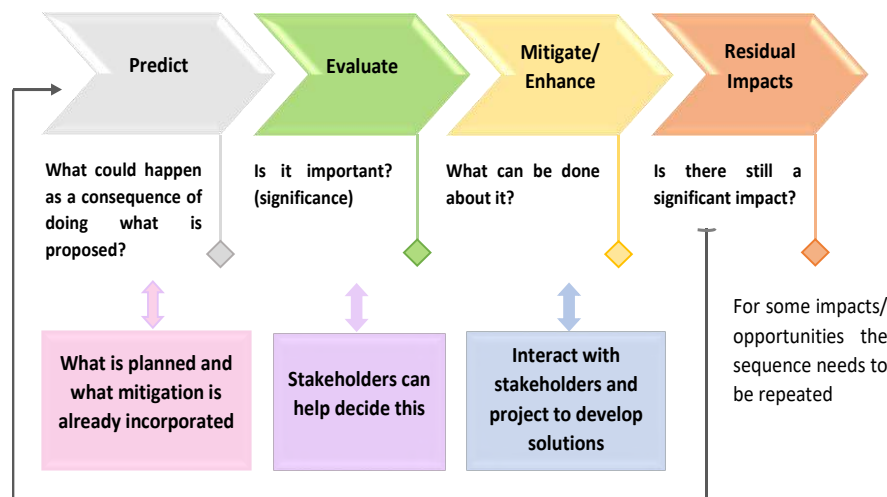


Figure 1.1: Impact Assessment Process for the ESIA Study

The aim of this task is to identify and assess potential impacts on various environmental components due to the proposed project. Based on baseline data collected for the study area, information on type and quantity of emission of pollutants and surveys of the study area, ESIA team has identified and predicted potential impacts due to the proposed project on the surrounding environment during construction and operation stages of the project.

Task 6: Environmental and Social Management Plan (ESMP)

Requirements and details of the control measures have been suggested in the EMP for implementation by Client during construction and operation phases of the Project. The EMP comprises of the following aspects based on the impacts assessed for the project:

- ✓ An itemized budget for implementing the ESMP. A detailed plan, including schedule and necessary budget, to monitor the implementation of mitigating measures and the impacts of the project during construction and operation (e.g., emissions thresholds and ambient levels of pollutants where these may be detrimental to human health, soil erosion, etc.);
- ✓ Provide guidance for reporting and enforcement and conducting environmental audits.

Task 7: Monitoring Evaluation

A tentative monitoring plan has been provided, covering the type of monitoring to be done during construction and operation phase, their frequency and tentative costing has been mentioned.

Task 8: Stakeholder Consultation

- ✓ The consultants have been identified all the stakeholders; both direct and indirect, and carry out a detailed stakeholder analysis and identify key stakeholders at each site. Continued consultations are required during the project preparation with the affected communities and relevant stakeholders;
- ✓ Focus Group Discussion (FGD) with several groups of people i.e.; community people, local farmer, local labor, businessman, women group etc. has been conducted;
- ✓ Key Informant Interview (KII) with different govt. officials;
- ✓ Public Consultation with different stakeholders to know their point of view, opinions, concerns or suggestions about the project implementation;
- ✓ Stakeholder consultation has been completed with the intent of collecting baseline information on the environmental and social conditions and sensitivities, developing a better understanding of the potential impacts, informing the public of the proposed project and to gain an understanding of the perspectives/concerns of the stakeholders;
- ✓ Information gathered has been used for formulating mitigation measures and environmental and social management plans.

Task 9: Emergency Response Plan (ERP)

A structured Emergency Response Plan (ERP) has been prepared to recover from emergencies that could harm people, property, the environment, or business operations. It is essential for minimizing damage and ensuring safety during crises such as natural disasters, accidents, health outbreaks or other unexpected events.

Task 9: Grievance Redress Mechanism

A grievance redress mechanism and procedures will be set up to provide opportunity for project affected persons (PAPs), labors and community to settle their complaints and grievances amicably. A grievances redress procedures and mechanism will be established to ensures that project affected persons are provided with the appropriate compensations for the affected structures, trees, crops, fish on government land, all administrative measures and for any other project relevant issues are in line with the law.

Tasks 10: Reporting

An ESIA report has been prepared upon completion of the above tasks as per the prescribed format and list of abbreviations has also been provided. Based on one set of consolidated comments of Client and lender, this ESIA report will be finalized.

Annexure 03

Meteorological Data

Meteorological Data

1. Rainfall

1.1 Barishal Meteorological Station

Total monthly rainfall values of Barishal Station from 2015 - 2023 is shown in **Figure 1.1**. The maximum Monthly Total Rainfall is recorded as 785 mm in July in 2015. Maximum rainfall was seen occurred in the month of June to August. In June rainfall varies from 148 – 641 mm, in July 185 – 785 mm and August 189 – 620 mm.

Table 1.1: Monthly Total Rainfall in Barishal (2015 - 2023)

Year	Total Rainfall in mm											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	3	24	18	135	72	641	785	254	352	128	19	3
2016	1	31	8	51	438	318	497	574	286	55	92	0
2017	0	0	59	364	118	505	550	342	228	387	14	57
2018	0	0	9	139	259	331	294	189	82	110	1	4
2019	0	64	29	95	139	148	454	255	238	190	365	12
2020	54	2	5	178	272	327	310	453	408	278	5	0
2021	0	1	1	0	50	404	379	296	244	277	1	66
2022	4	33	0	6	208	289	185	331	278	476	0	1
2023	0	0	41	17	170	199	192	620	332	303	225	4

(Bangladesh Meteorological Department)

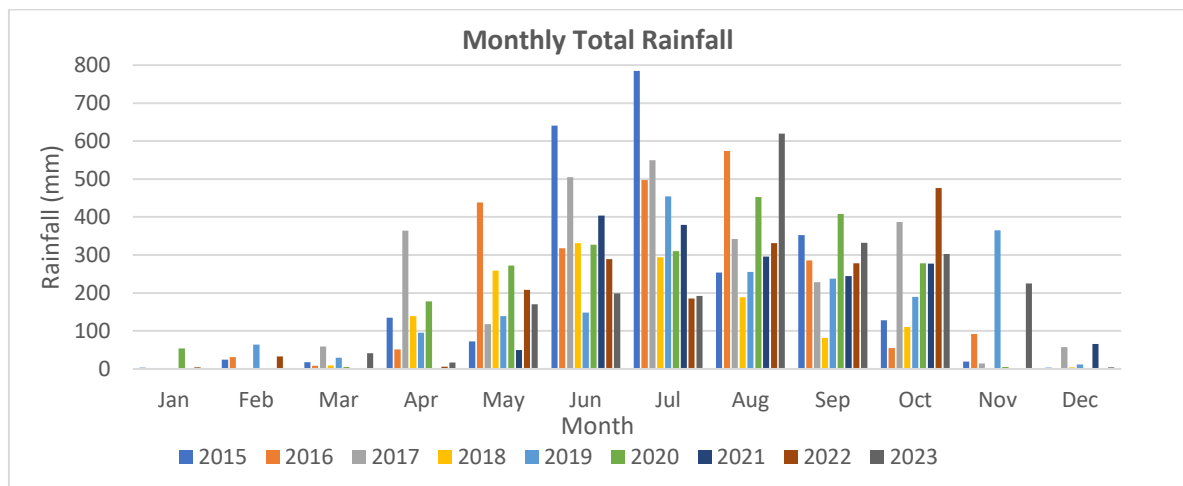


Figure 1.1: Monthly Total Rainfall data of Barishal (2015 - 2023)

1.2 Bhola Metrological Station

Total monthly rainfall values of Bhola Station are shown in **Figure 1.2**. The maximum Monthly Total Rainfall is recorded as 743 mm in July, 2015. Maximum rainfall was seen occurred in the month of June to August. In June rainfall varies from 147 – 707 mm, in July 140 – 743 mm and August 185 – 647 mm.

Table 1.2: Monthly Total Rainfall in Bhola (2015 - 2023)

Year	Total Rainfall in mm											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	1	10	42	96	76	707	743	416	372	178	6	2
2016	2	31	24	34	473	328	378	567	277	173	173	0
2017	0	0	130	315	99	385	551	395	274	238	17	93
2018	0	0	2	107	300	393	286	185	124	115	0	1
2019	0	57	44	93	146	147	407	362	268	94	259	18
2020	63	2	3	283	191	387	392	430	286	346	15	0

Year	Total Rainfall in mm											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2021	0	1	0	2	77	654	402	363	197	240	2	67
2022	7	23	0	38	199	324	140	289	252	415	0	3
2023	0	0	73	40	202	299	181	647	311	249	252	7

(Bangladesh Meteorological Department)

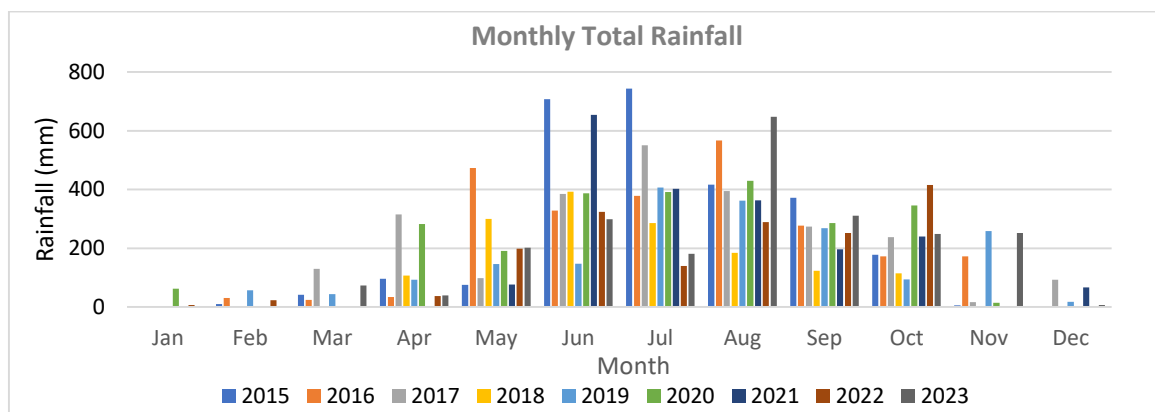


Figure 1.2: Monthly Total Rainfall data of Bhola (2015 - 2023)

1.3 Hatiya Metrological Station

Total monthly rainfall values of Hatiya Station are shown in **Figure 1.3**. The maximum Monthly Total Rainfall is recorded as 1281 mm in July, 2015. Maximum rainfall was seen occurred in the month of June to August. In June rainfall varies from 344 – 900 mm, in July 303 – 1281 mm and August 291 – 846 mm.

Table 1.3: Monthly Total Rainfall in Hatiya (2015 - 2023)

Year	Total Rainfall in mm											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	14	7	65	243	107	900	1281	471	619	585	52	16
2016	4	34	50	40	314	430	984	637	348	589	238	0
2017	0	0	136	379	192	553	1170	691	650	420	3	41
2018	0	0	1	73	394	616	736	291	226	309	7	5
2019	0	48	31	39	162	344	1000	509	297	209	175	8
2020	47	6	8	245	312	664	546	758	584	408	85	0
2021	1	0	0	2	170	953	795	801	322	169	0	67
2022	5	13	0	69	291	558	303	449	167	342	5	8
2023	0	0	65	54	239	564	490	846	495	307	133	5

(Bangladesh Meteorological Department)

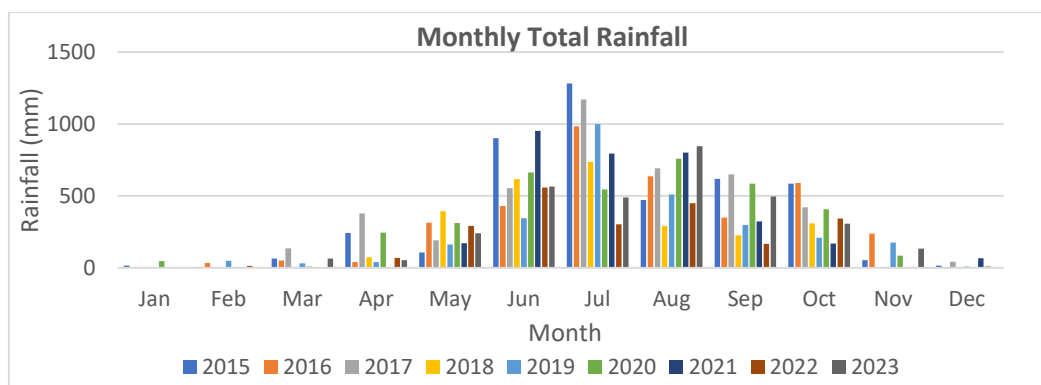


Figure 1.3: Monthly Total Rainfall data of Hatiya (2015 - 2023)

1.4 Madaripur Metrological Station

Total monthly rainfall values of Madaripur Station are shown in **Figure 1.4**. The maximum Monthly Total Rainfall is recorded as 569 mm in July, 2015. Maximum rainfall was seen occurred in the month of June to August. In June rainfall varies from 182 – 427 mm, in July 87 – 569 mm and August 192 – 477 mm.

Table 1.4: Monthly Total Rainfall in Madaripur (2015 - 2023)

Year	Total Rainfall in mm											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	9	21	20	153	127	389	569	246	301	37	0	5
2016	3	84	14	65	364	182	423	422	295	71	60	0
2017	0	0	105	312	212	417	471	477	264	422	17	45
2018	0	1	1	143	378	413	457	212	168	69	9	10
2019	0	134	89	71	143	212	310	354	214	171	113	4
2020	22	0	20	165	305	250	273	247	194	133	10	0
2021	0	0	1	42	166	427	357	192	139	81	27	113
2022	18	58	0	27	339	324	87	204	380	437	0	0
2023	0	0	117	122	163	255	178	473	252	125	106	38

(Bangladesh Meteorological Department)

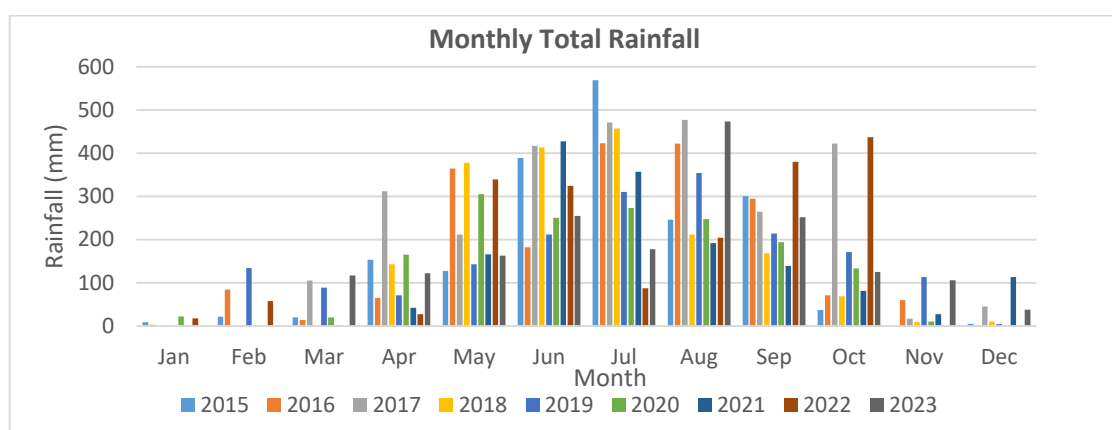


Figure 1.4: Monthly Total Rainfall data of Madaripur (2015 - 2023)

1.5 Maijdi Court Metrological Station

Total monthly rainfall values of Maijdi Court Station are shown in **Figure 1.5**. The maximum Monthly Total Rainfall is recorded as 994 mm in July, 2017. Maximum rainfall was seen occurred in the month of June to August. In June rainfall varies from 266 – 693 mm, in July 177 – 994 mm and August 314 – 606 mm.

Table 1.5: Monthly Total Rainfall in Maijdi Court (2015 - 2023)

Year	Total Rainfall in mm											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	1	3	32	174	117	693	978	464	571	165	0	11
2016	2	32	83	63	467	304	564	528	340	285	170	0
2017	0	36	194	318	288	522	994	606	439	415	13	77
2018	0	2	1	162	406	519	705	327	164	101	0	1
2019	0	64	45	134	291	266	729	474	423	243	201	4
2020	82	4	9	201	219	492	742	547	335	420	47	0
2021	0	0	0	6	158	639	551	449	233	212	0	92
2022	20	10	0	99	330	334	205	314	239	352	0	0
2023	0	0	93	19	186	403	177	593	436	174	124	22

(Bangladesh Meteorological Department)

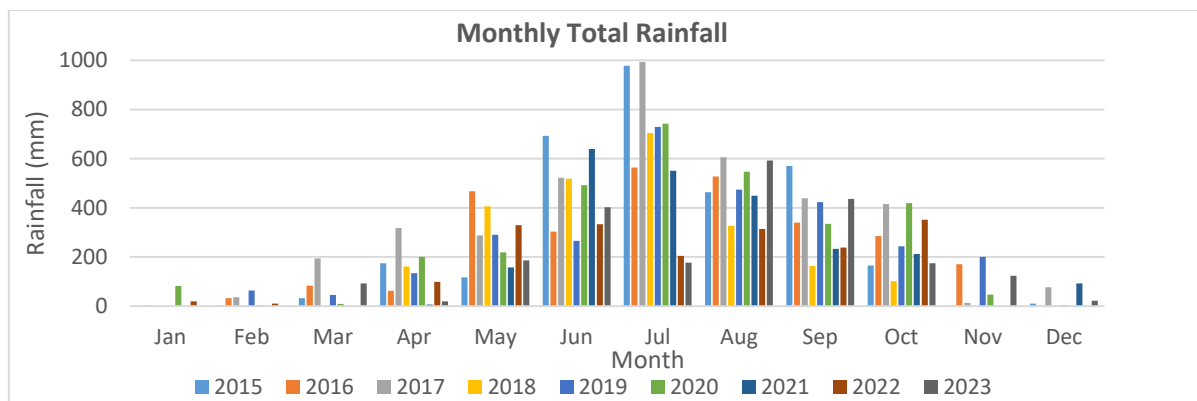


Figure 1.5: Monthly Total Rainfall data of Maijdi Court (2015 - 2023)

1.6 Dhaka Metrological Station

Total monthly rainfall values of Dhaka Station are shown in **Figure 1.6**. The maximum Monthly Total Rainfall is recorded as 623 mm in July, 2015. Maximum rainfall was seen occurred in the month of June to August. In June rainfall varies from 168 – 546 mm, in July 51 – 623 mm and August 130 – 544 mm.

Table 1.6: Monthly Total Rainfall in Dhaka (2015 - 2023)

Year	Total Rainfall in mm											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	3	17	4	166	185	375	623	395	346	51	0	1
2016	3	13	55	55	212	212	405	171	138	76	25	0
2017	0	2	100	228	188	414	584	544	381	412	6	33
2018	0	20	3	309	392	366	354	141	76	45	13	13
2019	1	115	39	212	231	242	383	223	161	188	37	5
2020	21	1	30	127	301	271	404	285	140	300	40	0
2021	0	0	3	39	216	546	333	249	141	166	27	153
2022	12	20	14	106	217	168	51	130	282	297	0	4
2023	0	2	74	30	145	363	244	474	413	326	32	57

(Bangladesh Meteorological Department)

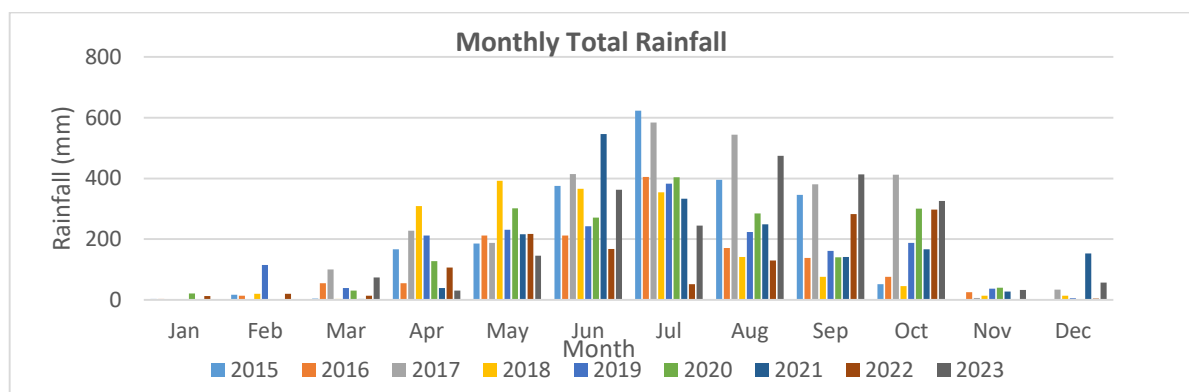


Figure 1.6: Monthly Total Rainfall data of Dhaka (2015 - 2023)

2. Relative Humidity

2.1 Barishal Metrological Station

The monthly average relative humidity from year 2015 to 2023 is shown in **Figure 2.1**. Average Monthly Relative Humidity (maximum) for an average year is recorded as 93% in July, 2017 and the minimum value is 65% in April, 2023.

Table 2.1: Average Monthly Relative Humidity of Barishal (2015 - 2023)

Year	Monthly Average Humidity in %											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	82	79	72	85	80	85	91	89	88	86	84	83
2016	82	80	76	78	80	84	90	89	89	86	85	85
2017	80	75	81	81	79	87	93	92	91	87	83	86
2018	80	76	74	78	85	86	88	85	84	84	82	82
2019	78	77	74	77	79	83	88	84	87	86	85	84
2020	85	75	70	78	80	88	87	88	87	87	82	83
2021	81	75	73	73	78	90	88	88	86	86	82	84
2022	83	77	73	79	83	86	82	84	87	85	81	83
2023	82	72	69	65	69	77	78	82	81	79	76	82

(Bangladesh Meteorological Department)

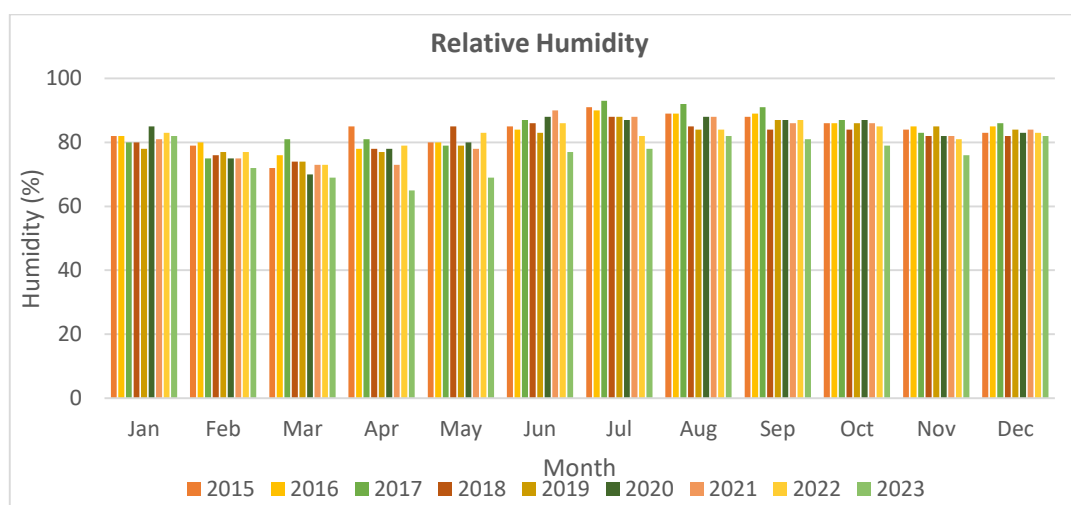


Figure 2.1: Average Monthly Relative Humidity of Barishal (2015 - 2023)

2.2 Bhola Metrological Station

The monthly average relative humidity from year 2015 to year 2023 is shown in **Figure 2.2**. Average Monthly Relative Humidity (maximum) for an average year is recorded as 90% in July, 2015 and the minimum value is 69% in March, 2020.

Table 2.2: Average Monthly Relative Humidity of Bhola (2015 - 2023)

Year	Monthly Average Humidity in %											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	82	78	73	79	80	86	90	89	88	87	84	84
2016	85	81	81	80	82	85	88	87	86	86	82	82
2017	77	72	77	79	76	82	85	85	84	83	82	86
2018	81	77	75	76	85	86	87	86	85	84	82	82
2019	77	78	74	76	79	82	88	85	87	86	85	84
2020	83	74	69	79	79	87	87	88	86	86	83	84
2021	82	76	75	75	78	89	88	88	87	86	81	84
2022	84	78	72	79	82	86	84	85	87	85	81	85
2023	84	77	77	76	80	86	84	89	88	86	85	86

(Bangladesh Meteorological Department)

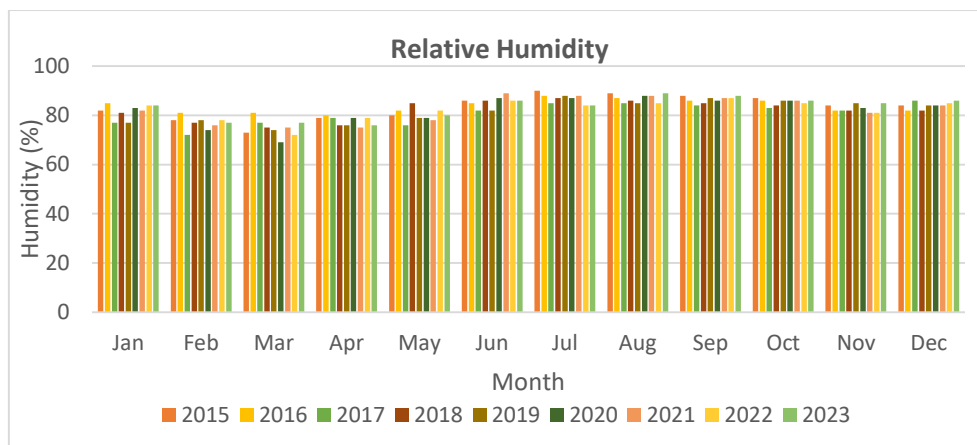


Figure 2.2: Average Monthly Relative Humidity of Bhola (2015 - 2023)

2.3 Hatiya Metrological Station

The monthly average relative humidity from year 2015 to year 2023 is shown in **Figure 2.3**. Average Monthly Relative Humidity (maximum) for an average year is recorded as 94% in July, 2020 and the minimum value is 73% in March, 2015.

Table 2.3: Average Monthly Relative Humidity of Hatiya (2015 - 2023)

Year	Monthly Average Humidity in %											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	82	80	75	83	84	88	92	89	89	88	85	83
2016	83	84	83	85	86	85	91	89	89	90	87	83
2017	79	77	81	85	84	88	94	89	91	89	86	89
2018	83	83	80	81	87	89	90	87	88	89	80	82
2019	79	81	80	81	83	85	91	89	89	89	87	85
2020	85	80	77	84	83	90	92	91	91	89	85	84
2021	82	77	78	77	82	91	90	90	89	89	83	85
2022	85	78	73	80	82	89	86	88	89	86	83	84
2023	81	80	78	78	82	89	86	91	89	89	86	85

(Bangladesh Meteorological Department)

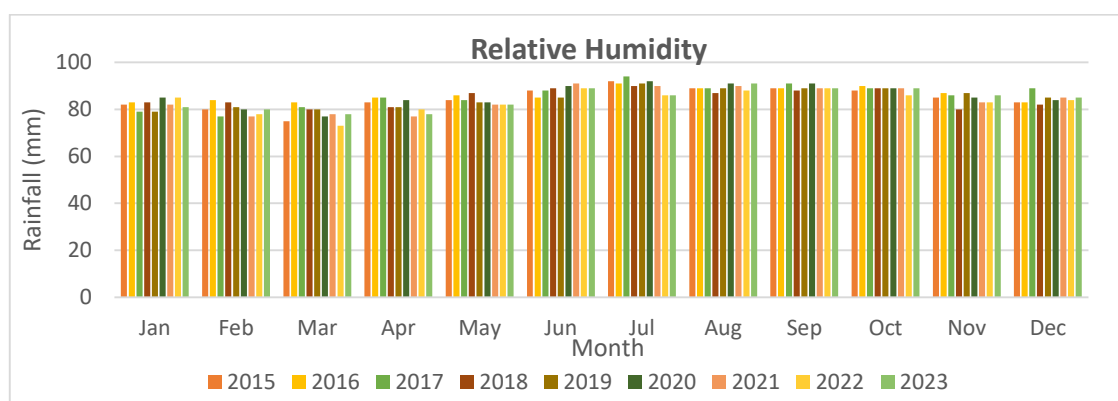


Figure 2.3: Average Monthly Relative Humidity of Hatiya (2015 - 2023)

2.4 Madaripur Metrological Station

The monthly average relative humidity from year 2015 to year 2023 is shown in **Figure 2.4**. Average Monthly Relative Humidity (maximum) for an average year is recorded as 88% in July and the minimum value is 68% in March, 2020.

Table 2.4: Average Monthly Relative Humidity of Madaripur (2015 - 2023)

Year	Monthly Average Humidity in %											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	83	78	69	79	80	84	88	86	85	83	80	82
2016	83	79	75	78	81	83	87	85	85	83	82	83
2017	78	73	77	79	79	85	87	85	86	84	79	84
2018	80	76	72	78	84	87	87	84	84	82	81	83
2019	77	74	73	76	78	83	86	84	85	84	82	82
2020	84	73	68	75	79	85	85	84	85	84	78	80
2021	80	74	70	69	76	87	85	86	85	85	81	83
2022	83	78	72	77	80	85	81	82	85	84	82	82
2023	82	77	75	72	77	84	84	88	86	83	81	84

(Bangladesh Meteorological Department)

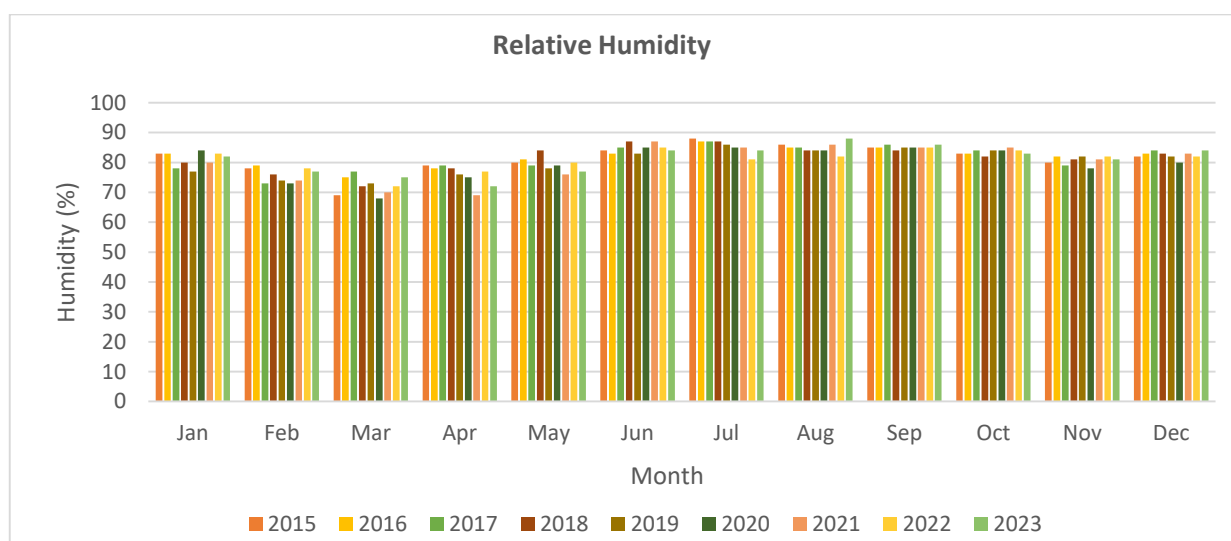


Figure 2.4: Average Monthly Relative Humidity of Madaripur (2015 - 2023)

2.5 Majdi Court Metrological Station

The monthly average relative humidity from year 2015 to year 2023 is shown in **Figure 2.5**. Average Monthly Relative Humidity (maximum) for an average year is recorded as 85% in July, 2020 and the minimum value is 52% in March, 2015.

Table 2.5: Average Monthly Relative Humidity of Majdi Court (2015- 2023)

Year	Monthly Average Humidity in %											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	79	74	68	78	78	85	90	87	87	84	82	81
2016	81	80	76	79	81	83	89	85	86	85	84	84
2017	75	73	79	82	79	85	89	85	88	84	79	84
2018	78	76	74	77	84	86	88	84	84	81	78	79
2019	71	74	74	76	78	83	87	85	86	84	85	83
2020	84	72	68	78	78	86	86	86	85	84	80	80
2021	76	69	71	70	75	88	86	87	84	82	76	81
2022	81	75	70	80	82	85	81	82	87	83	80	82
2023	80	76	77	75	79	87	83	88	87	82	80	80

(Bangladesh Meteorological Department)

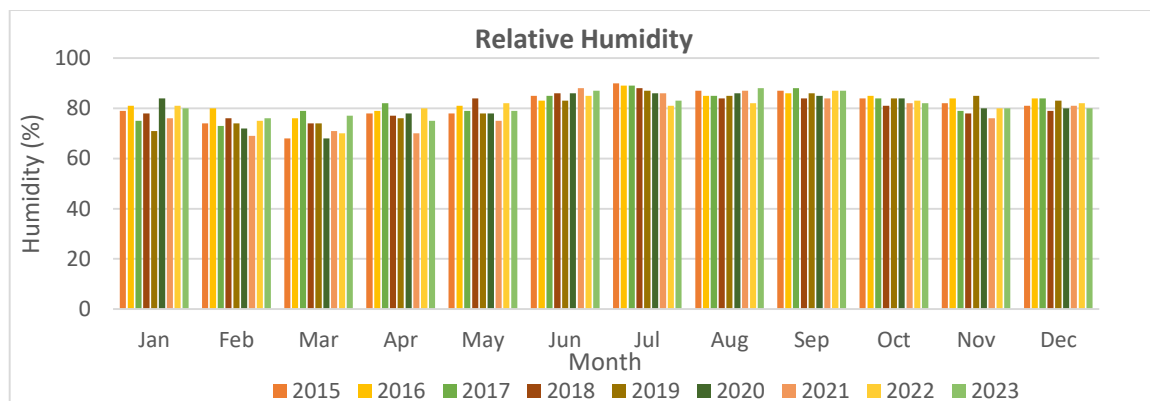


Figure 2.5: Average Monthly Relative Humidity of Maijdi Court (2015-2023)

2.6 Dhaka Metrological Station

The monthly average relative humidity from year 2015 to year 2023 is shown in **Figure 2.6**. Average Monthly Relative Humidity (maximum) for an average year is recorded as 85% in July, 2020 and the minimum value is 52% in March, 2015.

Table 2.6: Average Monthly Relative Humidity of Dhaka (2015 - 2023)

Year	Monthly Average Humidity in %											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	70	63	52	68	71	77	81	79	78	73	69	68
2016	68	63	59	72	74	75	82	77	82	74	73	72
2017	62	57	67	72	73	80	83	83	82	79	67	76
2018	68	61	59	69	79	81	81	78	77	72	68	66
2019	59	63	61	69	73	78	82	79	80	78	74	74
2020	76	59	57	72	80	81	85	84	81	81	69	73
2021	72	60	57	60	69	83	82	83	80	77	68	72
2022	71	62	55	72	75	79	74	75	80	73	63	69
2023	72	61	61	55	64	77	75	82	79	73	67	73

(Bangladesh Meteorological Department)

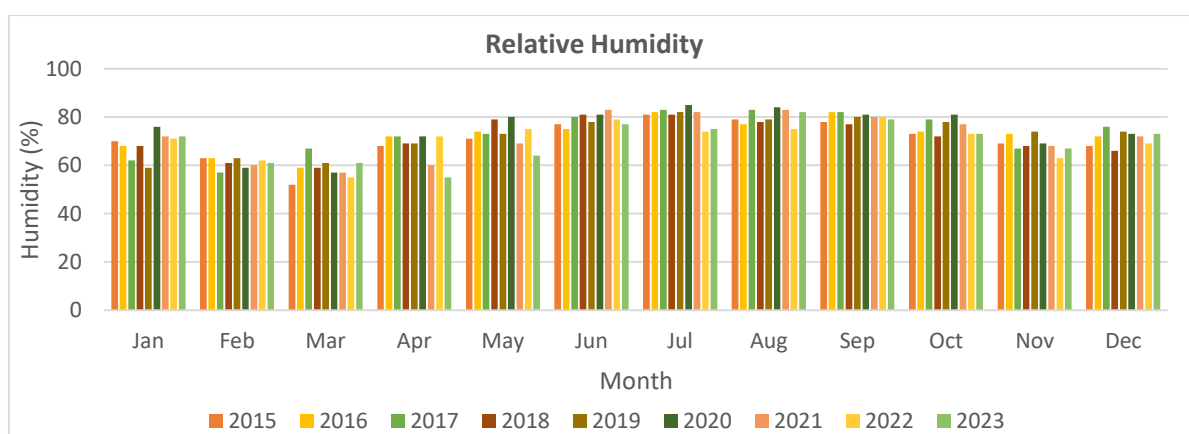


Figure 2.6: Average Monthly Relative Humidity of Dhaka (2015 – 2023)

3. Wind Speed

3.1 Barishal Meteorological Station

According to Bangladesh Meteorological Department the average wind speed from 2015 to 2023 is shown in **Figure 3.1**. The wind speed in December, 2021 is the highest, which is 6 km/h and Dec, 2016 is the lowest (1.7km/hr).

Table 3.1: Monthly Prevailing Wind Speed and Direction in Barishal (2015 - 2023)

Year	Wind Speed in Knots with Direction											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	1.9NW	3.3NW	2.2NW	2.9S	2.6S	3S	2.9S	4.3S	3S	3.5SSE	3ESE	2.3NW
2016	2.2NW	2SSW	2.6S	3.8S	3.8S	2.8S	2.7S	5SE	3S	3.6SE	4.9N	1.7NW
2017	3.1N	4.5S	3.9S	4.1S	2.9S	3.5S	3S	3S	2.8S	3.4SE	2NW	2NW
2018	2.7NW	2.5NW	2.6SSW	4.4S	3.8S	3.3S	3.2S	4.2SE	3.1S	3.2E	2.1SSW	1.8NW
2019	1.9NW	2.2NW	2.4S	3.6S	4.2S	3.3S	2.7S	3.6E	3.8E	2NW	2N	1.8NW
2020	2.4NW	2.2NW	2.5NW	3.3S	5.3S	2.8S	2.9S	3.1S	2.9S	2.8E	2E	1.9N
2021	2.2NW	2.1NW	3.3S	2.7S	2.5S	2.8S	2.7S	2.6S	3.2ESE	2.7S	2NW	6E
2022	2.3NW	3.2NW	4S	3.5S	3.5S	2.9S	3.1ESE	3.5E	2.8S	2S	2NW	2NW
2023	2.3NW	2.7NW	2.5S	3.3S	2.8S	2.9S	3.2ESE	2.2S	2.4SSE	2.4S	3N	2.2N

(Bangladesh Meteorological Department)

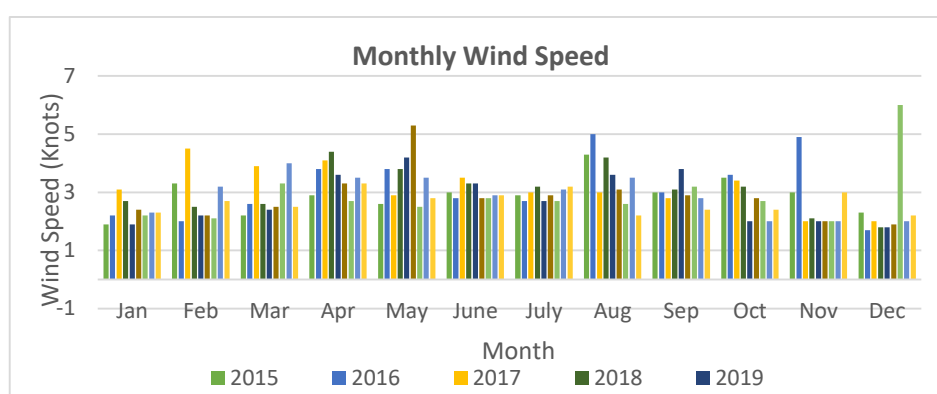


Figure 3.1: Monthly Prevailing Wind Speed of Barishal (2015 - 2023)



Figure 3.2: Monthly wind speed distribution at Barishal

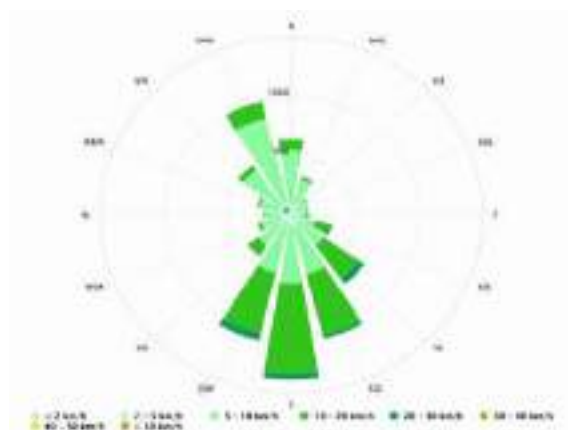


Figure 3.3 Wind Rose Diagram of Barishal

3.2 Bhola Meteorological Station

According to Bangladesh Meteorological Department the average wind speed from 2015 to 2023 is shown in **Figure 3.4**. The wind speed in April, 2019 is the highest, which is 6.5 km/h and Dec, 2016 is the lowest (1.0km/hr).

Table 3.2: Monthly Prevailing Wind Speed and Direction in Bhola (2015 - 2023)

Year	Wind Speed in Knots with Direction											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	1.3NW	1.4 NW	1.5NW	2SE	1.6S	1.6SE	1.2SE	1.4SE	1.3SE	1.3SE	1.2NE	1.2NW
2016	1.1NW	1.5SW	1.2SW	2.1SE	1.7SE	1.7SE	1.8SE	2.8SE	1.8SE	1.5SE	1.4NE	1NW
2017	1.6NW	1.2NE	1.8SE	2.5SE	1.8SE	2.3SE	1.7SE	2.2SE	2.1SE	5SE	1.4NE	1.6NE
2018	2.6NW	2.5NE	2.5SW	3.3SW	2.8SE	3.2SE	3.7SE	3.5NE	2.2SE	1.4NNW	1.9NNW	2.5NNW
2019	2NNW	2.6NNW	3.5NNW	6.5SSE	5.5S	2.9SE	2.5SE	3ESE	3.2ESE	1.9NNE	1.7NNE	1.8NNE
2020	1.9NW	2.2NW	2.9NNW	2.1SE	3SE	2.1SE	2.3SE	3SE	2.2SE	2SE	1.8NW	2.1NW
2021	2.4NW	2NW	2.6NE	3.8SSE	4SE	2.7SE	3SE	2.3SE	3.5SE	2.4S	2NE	2.4NNW
2022	2.2NE	3.6WSW	2.6SE	4SE	3.4SE	3.3SE	3.4SE	4.1SE	2.8SE	3.2NE	2.2W	2.4W
2023	2.4W	3.2W	2.8SE	2.6SE	3.1SE	3.2SE	3.1SE	2.8SE	2.7SE	2.5SE	2.3NE	2.2NE

(Bangladesh Meteorological Department)

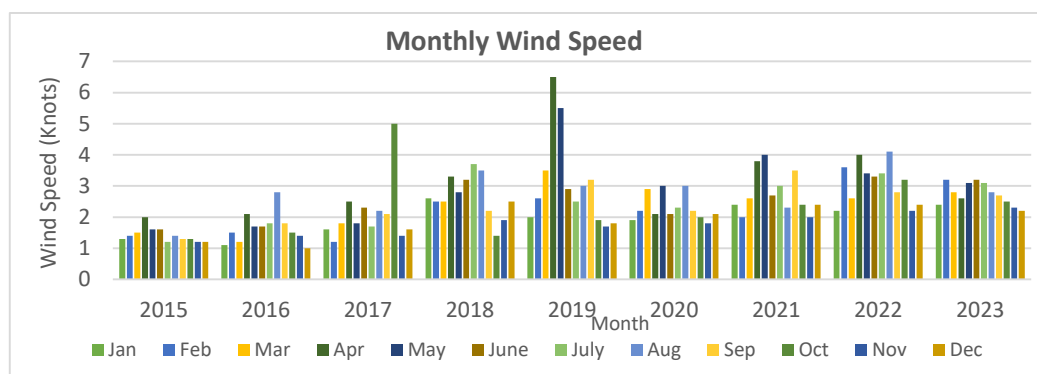


Figure 3.4: Monthly Prevailing Wind Speed of Bhola (2015 - 2023)

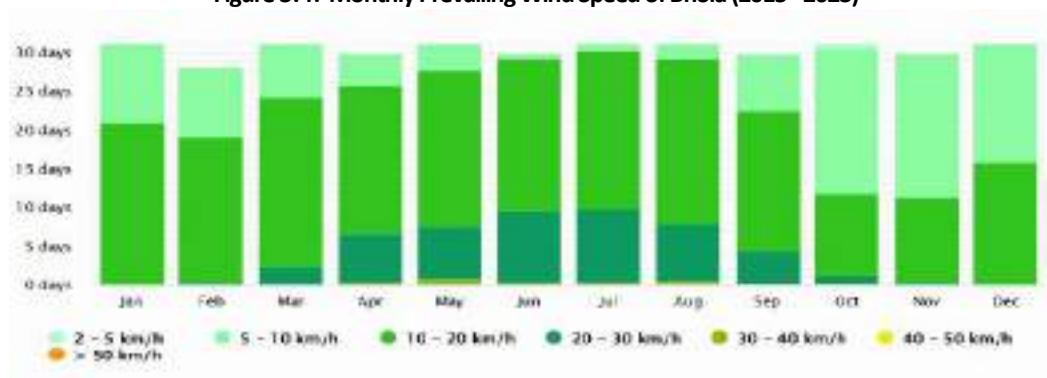


Figure 3.5: Monthly wind speed distribution at Bhola

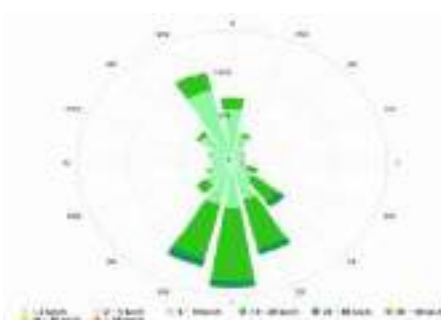


Figure 3.6: Wind Rose Diagram of Bhola

3.3 Hatiya Meteorological Station

According to Bangladesh Meteorological Department the average wind speed from 2015 to 2023 is shown in **Figure 3.7**. The wind speed in October, 2022 is the highest, which is 4.3 km/h and Nov – Dec shows the lowest (1.0km/hr).

Table 3.3: Monthly Prevailing Wind Speed and Direction in Hatiya (2015 - 2023)

Year	Wind Speed in Knots with Direction											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	1.2 NW	1.1NW	1.5N	2.3S	1.8S	2.1S	1.6S	2.1S	1.8S	2.8E	1.1N	1.3N
2016	1.2N	2.1S	1.5S	3.8S	2.1S	1.8S	1.7S	3S	1.2S	1.4S	1.3N	1N
2017	1.1N	1.4S	2.1S	2.9S	1.5S	2.6S	1.4S	1.7S	1.1S	2S	1.2N	1N
2018	1.5N	1.3N	1.3S	1.5S	1.6S	1.9S	2.2S	2.7S	1.8S	1N	1.1N	1.6N
2019	1.1N	1.9N	1.5S	2.3S	2.3S	1.6S	2S	2.1S	1.9S	1.1S	1.1N	1.7NW
2020	1.3N	1.3N	1.1S	1.6S	2.5S	2S	1.6S	2.6S	1.9S	4.3SE	1.2N	1.4N
2021	1.4N	2.6NNW	2.1S	1.3S	2.4S	2.5S	1.8S	1.5S	2.6S	1.8SE	1N	1.4N
2022	2.2NNW	1.5N	1.9S	3.4S	3S	2S	1.7S	2.7S	1.6S	3.4S	1.2N	1.5N
2023	1.6N	1.6N	2.6NNW	1.6S	2.4S	2.8S	3.2S	2S	2.2S	1.1N	1.2N	2.9NNW

(Bangladesh Meteorological Department)

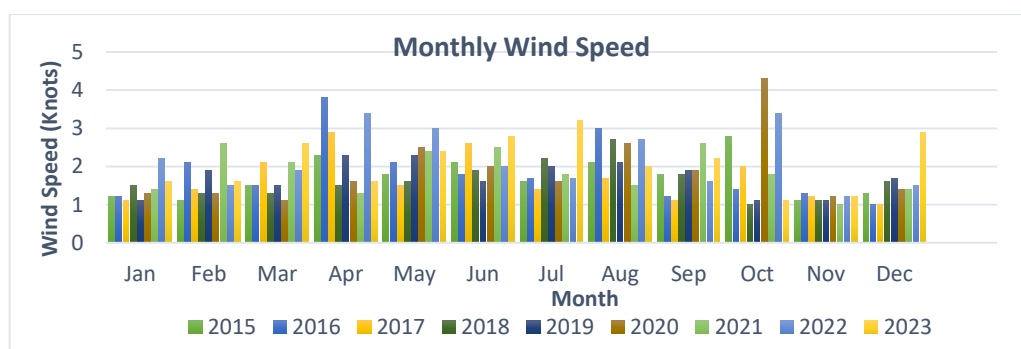


Figure 3.7: Monthly Prevailing Wind Speed of Hatiya (2015 - 2023)

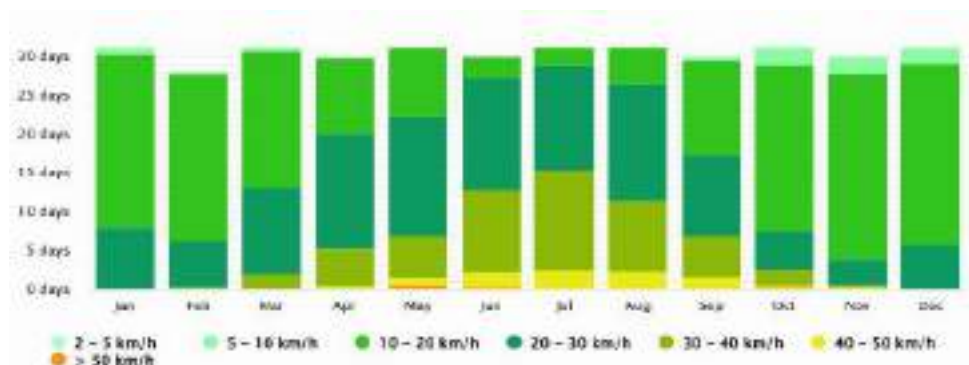


Figure 3.8: Monthly wind speed distribution at Hatiya

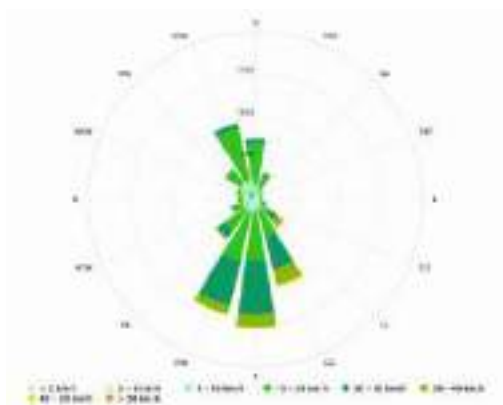


Figure 3.9: Wind Rose Diagram of Hatiya

3.4 Madaripur Meteorological Station

According to Bangladesh Meteorological Department the average wind speed from 2015 to 2023 is shown in **Figure 3.10**. The wind speed in April, 2023 is the highest, which is 8.0 km/h and lowest during the dry season.

Table 3.4: Monthly Prevailing Wind Speed and Direction in Madaripur (2015 - 2023)

Year	Wind Speed in Knots with Direction											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	1.8N	1.5N	1.9S	2.1S	2.3S	2S	2.4S	2.1SE	1.8S	1.8S	1.9N	1.6N
2016	1.5N	1.8S	1.9S	2.2S	2S	1.8S	1.7S	3.1S	1.6SE	1.5SE	2NE	1.1N
2017	1.2N	1.7S	1.7S	1.9S	1.6S	2S	1.6S	1.6S	1.4S	1.6S	1.1N	1.6N
2018	1.9N	2S	1.8S	1.9S	2.2S	2S	2.1S	2.2S	2.5SE	2SE	2N	2N
2019	2.3N	2.5N	2E	2.7SW	4SW	2S	2.2S	3.2S	2.5SE	0CLM	5.2SE	0CLM
2020	1N	2NNE	1NW	1.9S	2.6S	3S	1S	2.6E	0CLM	2.5SE	0CLM	0CLM
2021	0CLM	0CLM	2S	0CLM	4.4SE	0CLM	2.6S	1SE	2SE	0CLM	0CLM	0CLM
2022	0CLM	0CLM	2.5S	2.2S	2.2S	0CLM	3S	3.9SE	0CLM	6.8NE	0CLM	0CLM
2023	2N	2.3S	0CLM	8WNW	2.5NE	3S	0CLM	2ESE	0CLM	3SE	5.2NE	0CLM

(Bangladesh Meteorological Department)

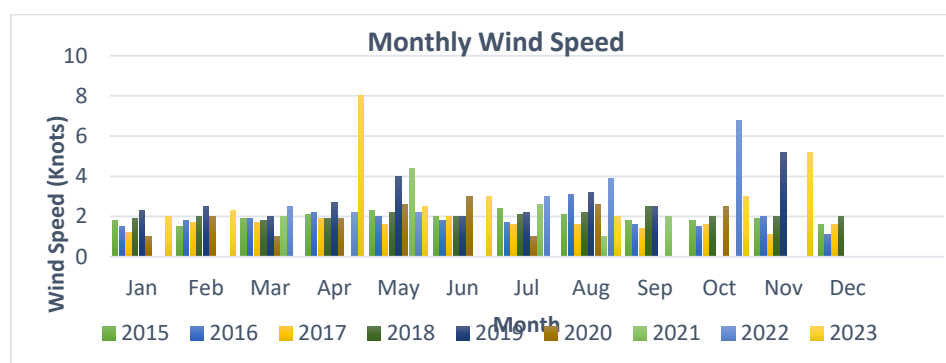


Figure 3.10: Monthly Prevailing Wind Speed of Madaripur (2015 - 2023)

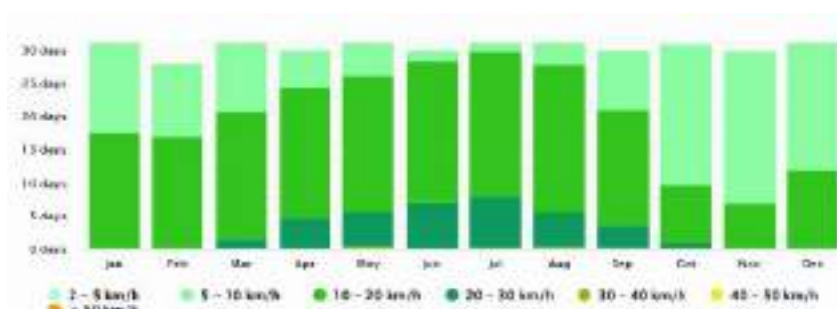


Figure 3.11: Monthly wind speed distribution at Madaripur

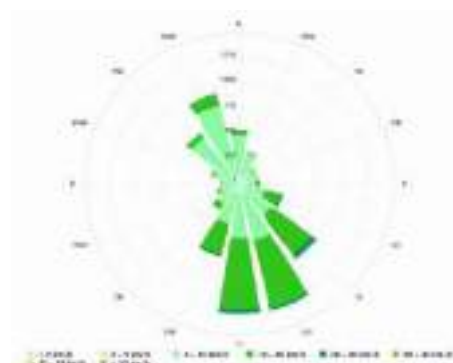


Figure 3.12: Wind Rose Diagram of Madaripur

3.5 Maijdi Court Meteorological Station

According to Bangladesh Meteorological Department the average wind speed from 2015 to 2023 is shown in **Figure 3.13**. The wind speed in August, 2022 is the highest, which is 4.9 km/h and Dec, 2023 is the lowest (1.7km/hr).

Table 3.4: Monthly Prevailing Wind Speed and Direction in Maijdi Court (2015 - 2023)

Year	Wind Speed in Knots with Direction											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	3.5NW	3NW	3.9NW	3.7S	3.7S	3.5S	4SE	4.1SE	3.2SE	3.1SE	2.5N	2.9NW
2016	3NW	3.7SE	3.4SE	4.2S	3.2SE	3.3SE	3.6SE	4.6SE	3.2SE	3.5SE	3.8N	2.9NW
2017	3.2NW	2.8NW	3.7SE	4.4SE	3.2SE	4.7SE	3.4S	3S	2.6S	4.3SE	3.5NW	2.4N
2018	3NW	2S	2.3S	2.2S	3.4S	3S	4SE	3.8SE	4SE	3.5SE	3.2NE	3.6NW
2019	3.2NW	3.8NW	3.3SE	3.3S	3.6S	3.2S	3.4S	4.5SE	4.2SE	2.7NW	1.9N	2.8NW
2020	3NW	3NW	2.9NW	3.1S	4.1S	3.7S	3.4S	4.2S	3.1S	2.8SE	2.8NW	2.2NW
2021	2.5NW	2.6NW	3.4S	3.2S	4.4SE	3.8SE	3.8SE	2.9SE	3.4SE	2.5NE	2.1NW	3.9NW
2022	2.5NW	2.9NW	3.5S	3.2S	3.1S	3.6S	3.9SE	4.9SE	3.4SE	4.2NE	2.7NW	2NW
2023	3.3NW	2.7SE	3.8SE	3.6NW	3.8SE	3.8SE	3.6SE	3.6SE	4SE	3.6SE	2NW	1.7NW

(Bangladesh Meteorological Department)

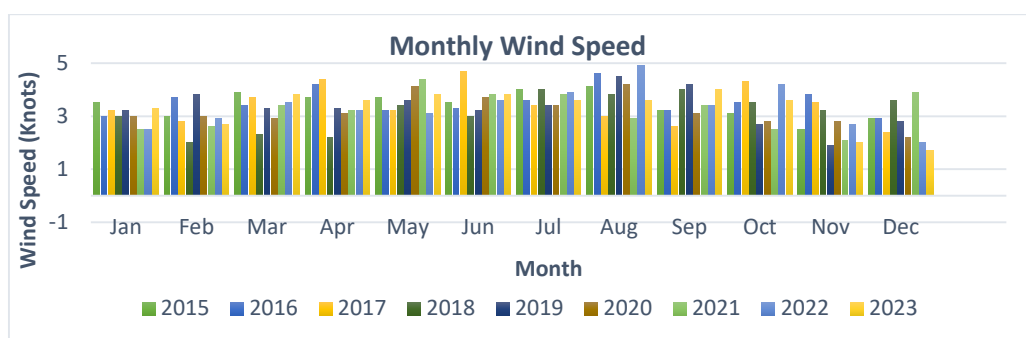


Figure 3.13: Monthly Prevailing Wind Speed of Maijdi Court (2015 - 2023)

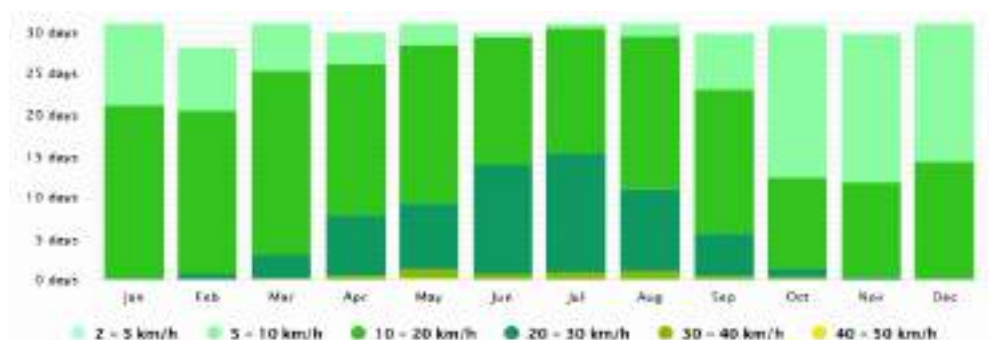


Figure 3.14: Monthly wind speed distribution at Maijdi

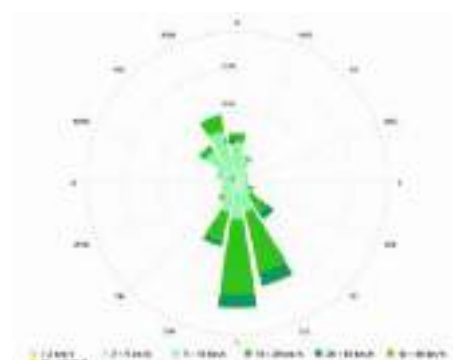


Figure 3.15: Wind Rose Diagram of Maijdi

3.6 Dhaka Meteorological Station

According to Bangladesh Meteorological Department the average wind speed from 2015 to 2023 is shown in **Figure 3.16**. The wind speed in April, 2021 is the highest, which is 8.1 km/h and Dec, 2022 is the lowest (1.7km/hr).

Table 3.6: Monthly Prevailing Wind Speed and Direction in Dhaka (2015 - 2023)

Year	Wind Speed in Knots with Direction											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	2.2W	2.4W	2.2W	2.5S	2.3S	2.6S	2.4E	2.7S	3SE	1.9S	2.5N	2.1W
2016	2.7W	2.6W	2.3S	3S	3.6S	2.4S	2.3S	2.8E	2.1S	2W	2.5NE	2W
2017	2.2NW	2.3S	2.5S	3.1S	2.5S	2.4S	2S	2.2S	2.2S	3.3E	2.4E	2NW
2018	2.2W	2.3W	2.4S	3.2E	3.7S	3.9S	3.5S	3.6S	3.3S	3.3N	3.2WNW	3.7NE
2019	3.1NW	3.2W	3.7W	5.1S	3.9S	3.8S	3.7S	3.6S	3.3S	2.9NE	3.5ENE	2.6W
2020	2.5W	2.5W	2.8W	2.6S	3.5S	3.0S	3.0S	3.0S	2.4S	2ENE	3.1E	2.3W
2021	2.6W	2.9W	2.5S	3.7E	3.6S	3.8S	3.2S	3.6S	3.7S	3.4N	3.7WNW	3.9NE
2022	2.4NW	3.1S	5.1W	8.1E	7.3S	7.1S	7.07E	6.2S	4.3S	2.4NE	1.8WNW	1.7W
2023	2.3 W	2.6W	2.9NNW	3.2WSW	2.6S	2.6S	2.4S	2.4S	2.7S	2.3ENE	3.1ENE	2.9NNW

(Bangladesh Meteorological Department)

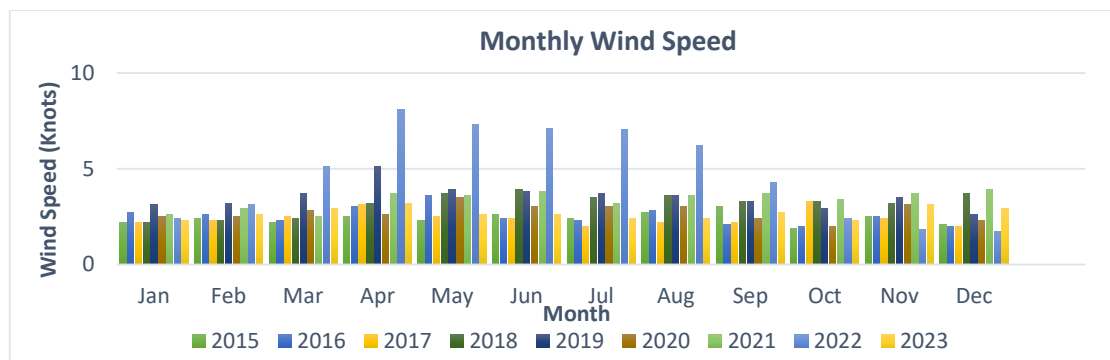


Figure 3.16: Monthly Prevailing Wind Speed of Dhaka (2015 - 2023)

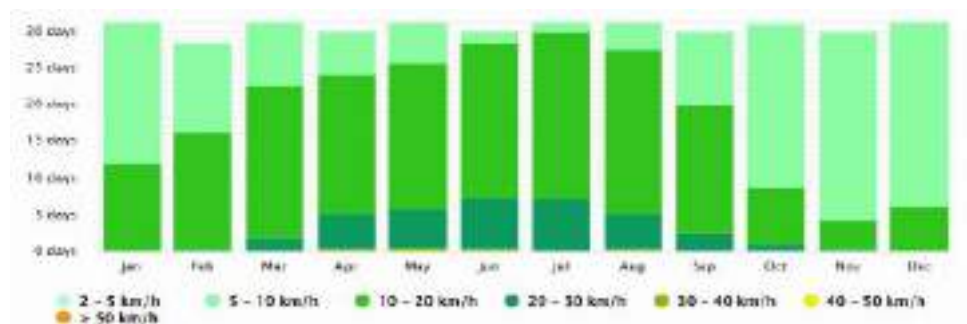


Figure 3.17: Monthly wind speed distribution at Dhaka

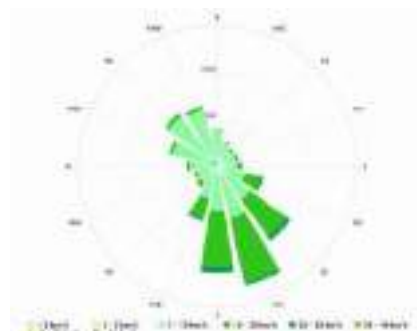


Figure 3.18: Wind Rose Diagram of Dhaka

4. Ambient Temperature

4.1 Barishal Meteorological Station

Figure 4.1 - Figure 4.3 shows the monthly average, maximum and minimum temperature in degree Celsius for the period 2015 to 2023. The monthly average Dry Bulb Temperature (maximum) is 30°C in April, 2016 and (minimum) is 16.2°C in Jan, 2018.

Table 4.1: Monthly average Dry Bulb Temperature in degree Celsius of Barishal (2015 - 2023)

Year	Monthly Average Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	18.3	21.6	25.2	27.9	30.0	28.8	27.8	28.6	28.5	27.2	23.9	19.9
2016	18.1	23.7	27.1	30.0	29.0	29.3	28.3	28.7	28.8	27.7	23.2	20.1
2017	18.1	22.0	25.0	28.2	30.0	29.1	28.3	28.9	28.5	27.2	23.5	20.1
2018	16.2	22.2	26.5	27.6	28.0	29.1	28.8	29.0	29.3	26.5	23.1	18.1
2019	17.5	20.7	25.3	28.2	30.2	29.8	28.9	29.2	28.4	26.9	23.8	18.5
2020	17.5	19.5	25.1	27.4	28.8	28.8	28.9	28.8	29.0	28.4	23.5	18.6
2021	18.2	20.9	27.0	29.2	29.5	28.1	28.8	28.8	28.7	28.2	23.1	19.5
2022	17.9	19.7	25.9	29.2	28.9	29.1	29.4	29.1	28.6	27.1	23.3	19.4
2023	18.0	22.1	25.1	28.9	28.9	29.5	29.6	28.5	28.7	27.3	24.0	20.2

(Bangladesh Meteorological Department)

Table 4.2: Monthly Maximum Temperature in degree Celsius of Barishal (2015 - 2023)

Year	Monthly Maximum Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	31.0	32.8	34.9	35.3	36.7	36.6	35.4	33.6	35.5	35.3	31.6	29.7
2016	28.0	34.3	35.6	37.5	37.2	35.5	34.2	34.8	34.2	34.5	33.6	30.4
2017	30.0	31.7	33.4	35.2	37.0	36.2	34.2	34.8	36.2	35.0	33.5	29.2
2018	27.4	33.4	35.0	35.4	35.5	35.5	36.5	35.0	36.0	35.5	32.5	28.8
2019	31.0	33.0	35.2	36.6	36.5	36.4	35.2	35.2	35.2	35.0	32.4	30.5
2020	30.6	32.1	36.2	36.7	36.2	35.5	35.7	36.8	36.1	35.8	33.5	30.5
2021	30.8	34.2	36.7	38.8	38.3	35.5	35.3	35.2	35.6	36.3	32.6	31.3
2022	29.2	32.0	36.4	36.2	36.0	35.4	35.8	36.6	35.6	34.7	33.5	30.5
2023	30.0	33.6	34.7	39.5	38.2	37.6	35.0	36.3	36.3	34.5	34.4	31.5

(Bangladesh Meteorological Department)

Table 4.3: Monthly Minimum Temperature in degree Celsius of Barishal (2015 - 2023)

Year	Monthly Minimum Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	10.0	9.1	14.3	19.7	21.5	24.2	24.0	24.6	24.4	20.7	16.0	10.4
2016	7.6	12.3	18.6	18.4	21.4	23.0	24.5	23.6	24.5	21.5	15.9	12.7
2017	7.6	12.4	15.0	20.3	21.0	23.2	24.8	25.2	24.0	18.3	14.2	13.0
2018	6.7	12.0	15.5	19.5	20.2	23.8	25.5	25.2	24.8	16.6	14.8	6.5
2019	8.2	8.8	11.5	20.0	22.2	23.4	24.0	25.3	23.5	20.2	15.5	10.2
2020	9.4	8.5	14.9	18.0	20.6	24.5	25.3	24.5	25.2	23.6	13.2	9.0
2021	9.4	7.4	17.7	18.6	22.0	23.7	23.6	24.8	24.4	22.1	14.1	9.9
2022	9.4	10.2	15.0	22.0	21.2	22.0	25.3	24.8	24.4	19.8	15.0	10.4
2023	8.4	11.0	16.3	20.5	19.8	23.7	24.4	24.8	24.6	19.8	16.8	12.0

(Bangladesh Meteorological Department)

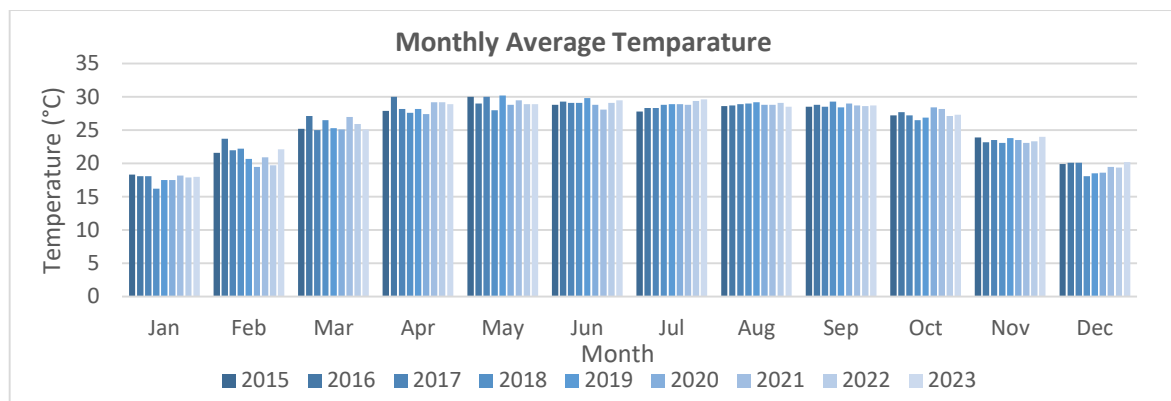


Figure 4.1: Monthly Ambient Average Temperature of Barishal (2015 - 2023)

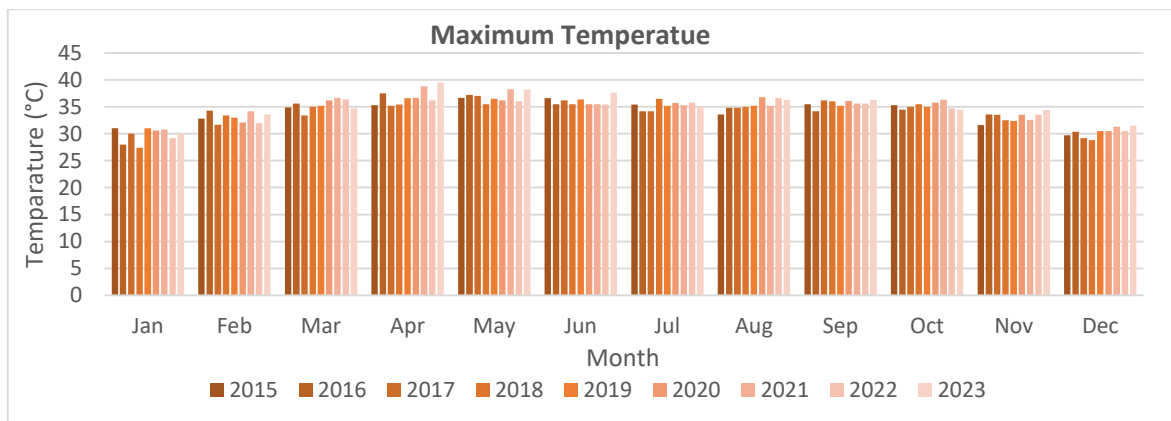


Figure 4.2: Monthly Maximum Temperature of Barishal (2015 - 2023)

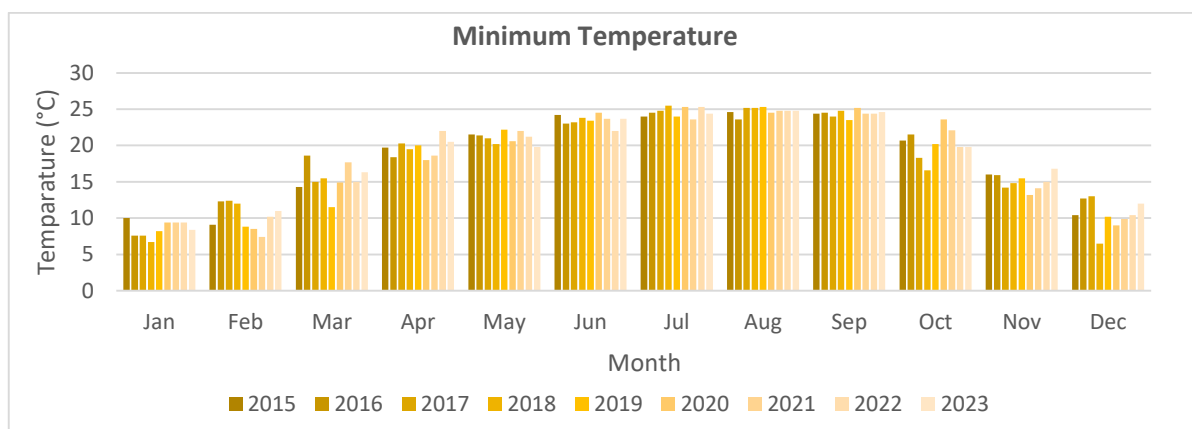


Figure 4.3: Monthly Minimum Temperature of Barishal (2015 - 2023)

4.2 Bhola Meteorological Station

Figure 4.4- Figure 4.6 shows the monthly average, maximum and minimum temperature in degree Celsius for the period 2015 to 2023. The monthly average Dry Bulb Temperature (maximum) is 30.3°C in May, 2019 and (minimum) is 16.8°C in Jan, 2018.

Table 4.4: Monthly average Dry Bulb Temperature in degree Celsius of Bhola (2015 - 2023)

Year	Monthly Average Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	18.5	21.4	25.1	27.9	29.8	28.8	28.0	28.7	28.7	27.3	23.8	20.0
2016	18.2	23.6	27.0	29.9	28.8	29.2	28.4	28.7	28.9	27.9	23.3	20.3
2017	18.3	22.2	25.0	28.2	30.0	28.7	28.3	28.8	28.6	27.3	23.8	20.4
2018	16.8	22.4	26.8	27.8	28.0	29.2	28.9	29.0	29.4	26.8	23.5	18.7
2019	18.2	21.1	25.6	28.5	30.3	30.0	28.9	29.3	28.6	27.4	24.3	19.0

Year	Monthly Average Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2020	18.0	20.1	25.5	27.5	29.1	28.9	29.1	28.9	29.2	28.7	24.0	18.9
2021	18.6	21.2	27.1	29.2	29.5	28.1	28.9	29.0	28.8	28.5	23.5	19.9
2022	18.2	20.0	26.2	29.3	29.1	29.2	29.5	29.3	28.9	27.5	23.9	19.7
2023	18.3	22.4	25.3	29.2	29.2	29.7	30.0	28.9	29.1	27.9	24.5	20.6

(Bangladesh Meteorological Department)

Table 4.5: Monthly Maximum Temperature in degree Celsius of Bhola (2015 - 2023)

Year	Monthly Maximum Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	30.0	32.7	35.2	35.3	35.7	35.6	34.7	33.5	36.0	35.0	32.7	29.4
2016	27.8	33.4	35.3	36.2	37.5	35.2	34.6	34.8	34.5	36.0	34.5	31.0
2017	30.5	32.4	33.7	35.5	37.8	37.0	34.8	36.6	36.4	35.4	33.4	29.0
2018	27.5	34.6	35.0	34.8	35.2	35.2	37.2	35.3	37.3	36.5	33.0	28.7
2019	31.0	31.8	36.0	37.0	36.0	36.0	35.0	36.0	35.9	35.0	32.5	30.8
2020	30.3	31.6	36.7	36.4	36.2	35.4	34.9	36.0	36.8	36.3	34.0	30.6
2021	31.8	32.4	36.9	38.4	38.1	35.7	34.7	34.8	36.0	36.8	32.0	31.5
2022	28.8	32.0	36.7	35.4	35.8	35.0	35.9	36.9	36.4	35.1	34.2	31.2
2023	30.4	34.0	35.2	39.2	38.9	37.4	36.6	36.6	36.0	34.6	34.8	32.0

(Bangladesh Meteorological Department)

Table 4.6: Monthly Minimum Temperature in degree Celsius of Bhola (2015 - 2023)

Year	Monthly Minimum Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	10.0	9.6	13.8	20.5	21.8	23.3	23.3	25.0	24.0	20.5	16.4	10.2
2016	8.0	12.0	18.5	18.8	20.8	24.0	24.8	23.4	24.8	21.3	16.2	13.0
2017	7.5	12.4	15.0	21.0	20.4	20.4	22.7	24.0	22.0	18.8	14.8	13.3
2018	8.4	13.0	17.0	20.4	20.0	23.4	25.2	25.2	24.7	18.5	15.2	7.5
2019	9.0	9.8	12.3	19.6	22.0	21.5	22.8	25.3	23.6	20.8	16.8	11.0
2020	9.8	9.5	15.5	19.4	20.9	24.0	25.0	25.0	24.8	23.0	14.0	9.5
2021	9.8	8.1	18.2	19.2	22.0	23.5	23.0	25.0	24.8	22.0	14.2	11.0
2022	10.0	10.3	15.5	21.0	21.2	22.4	25.0	24.6	24.5	20.0	15.5	11.0
2023	9.0	11.8	16.0	20.4	21.0	23.8	24.5	25.0	24.3	20.5	17.0	11.7

(Bangladesh Meteorological Department)

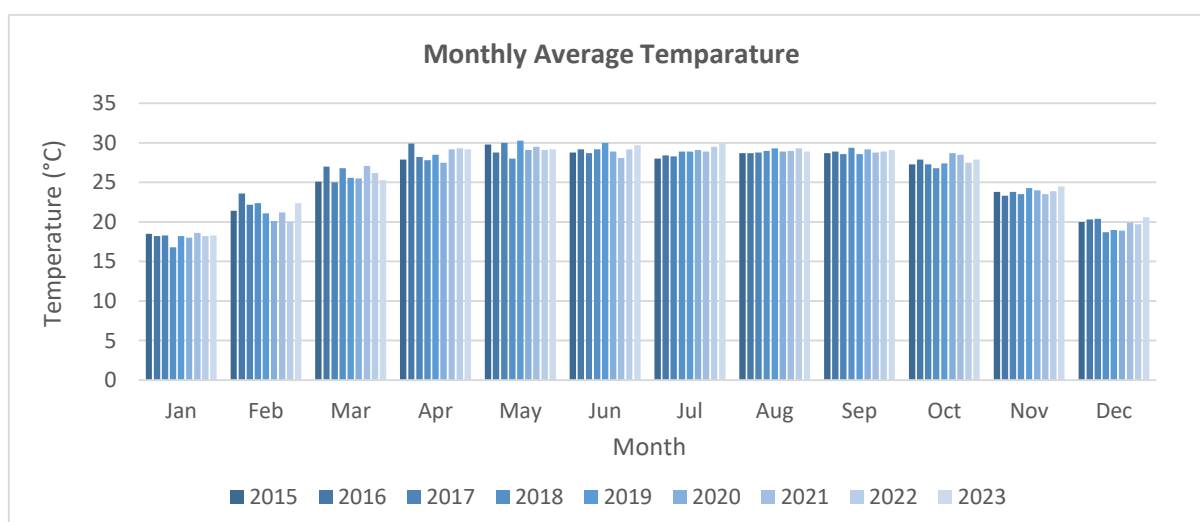


Figure 4.4: Monthly Ambient Average Temperature of Bhola (2015 - 2023)

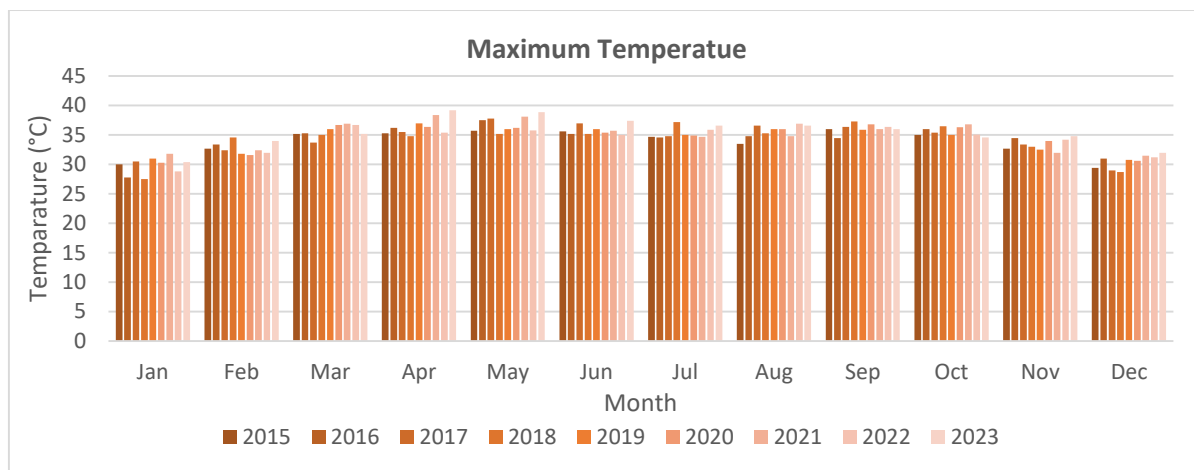


Figure 4.5: Monthly Maximum Temperature of Bhola (2015 - 2023)

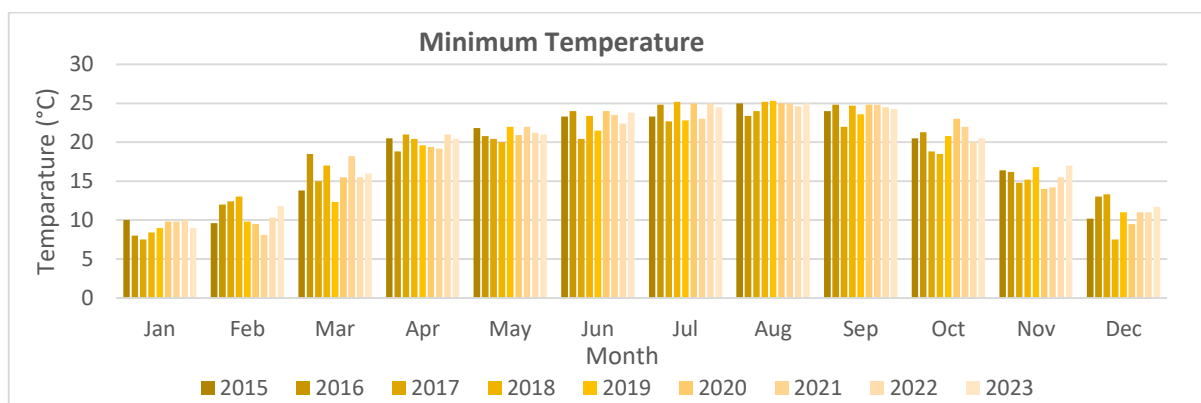


Figure 4.6: Monthly Minimum Temperature of Bhola (2015 - 2023)

4.3 Hatiya Meteorological Station

Figure 4.7- Figure 4.9 shows the monthly average, maximum and minimum temperature in degree Celsius for the period 2015 to 2023. The monthly average Dry Bulb Temperature (maximum) is 29.5°C in May, 2015 and (minimum) is 17.7°C in Jan, 2018.

Table 4.7: Monthly average Dry Bulb Temperature in degree Celsius of Hatiya (2015 - 2023)

Year	Monthly Average Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	19.3	21.6	25.6	27.7	29.5	28.6	27.8	28.6	28.8	27.2	24.3	20.6
2016	18.9	23.6	27.0	29.3	28.8	29.0	28.1	28.5	28.6	27.8	23.7	21.2
2017	19.3	22.5	24.7	27.8	29.6	28.9	28.1	28.6	28.3	27.5	24.4	21.0
2018	17.7	22.4	26.2	27.7	28.1	28.7	28.4	28.7	28.7	26.7	23.5	19.6
2019	18.9	21.4	25.3	28.2	29.8	29.6	28.4	28.8	28.5	27.4	24.3	19.4
2020	18.5	20.2	25.4	27.4	28.8	28.7	28.8	28.5	28.5	28.6	24.3	19.8
2021	19.5	21.5	26.8	28.8	29.2	27.8	28.4	28.5	28.6	28.3	24.2	20.6
2022	19.1	20.3	26.4	28.9	28.9	28.7	29.1	28.8	28.6	27.8	24.3	20.8
2023	19.6	22.2	25.3	28.9	28.9	29.1	29.4	28.4	28.9	27.6	24.6	21.2

(Bangladesh Meteorological Department)

Table 4.8: Monthly Maximum Temperature in degree Celsius of Hatiya (2015 - 2023)

Year	Monthly Maximum Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	30.0	31.5	35.0	35.2	35.7	35.5	33.5	33.2	35.3	34.2	31.8	29.8
2016	27.5	32.3	35.0	35.0	36.0	34.2	33.8	34.0	33.4	34.0	34.4	30.8
2017	29.5	31.5	33.3	34.8	37.2	36.2	33.4	34	35.4	35.0	33.0	30.7
2018	27.5	32.7	34.7	34.6	35.6	34.0	36.2	33.5	35.5	35.0	32.2	29.5

Year	Monthly Maximum Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2019	30.2	32.0	35.0	37.1	35.6	37.7	34.5	36.0	35.2	35.0	31.7	30.2
2020	30.0	31.8	36.0	35.0	36.5	34.0	34.0	35.1	34.7	35.0	32.7	31.0
2021	30.6	31.6	36.6	38.0	37.2	34.3	34.4	34.0	34.5	35.6	33.5	31.5
2022	29.0	32.0	35.3	35.2	34.8	34.0	34.5	35.7	34.5	34.5	33.4	30.6
2023	30.0	33.0	34.6	38.2	38.0	37.2	34.7	34.0	35.0	34.0	33.0	30.7

(Bangladesh Meteorological Department)

Table 4.9: Monthly Minimum Temperature in degree Celsius of Hatiya (2015 - 2023)

Year	Monthly Minimum Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	9.3	8.1	13	19.2	21.2	23.2	23.5	24.8	24.4	19.8	15.9	9.9
2016	7.7	11.5	17.3	18.1	20.7	23.2	24.8	23.0	23.5	20.9	15.6	13.0
2017	7.5	11.7	14.3	20.4	21.2	22.3	24.4	24.6	24.4	18.2	14.3	13.0
2018	6.5	12.1	15.8	19.3	20.2	23.6	25.0	25.0	25.0	17.0	14.6	6.6
2019	8.8	9.3	11.5	19.0	21.3	22.8	24.2	24.8	23.3	20.0	16.3	10.4
2020	9.5	9.6	15.0	18.3	20.3	24.3	25.0	25.0	25.6	23.0	13.8	9.6
2021	9.4	7.8	17.1	18.6	21.5	23.3	23.8	20.3	24.8	21.8	14.3	10.8
2022	9.3	9.8	13.4	20.3	20.3	22.3	25.6	25.0	24.5	19.7	15.3	10.8
2023	11.5	13.1	17.3	20.0	21.5	24.0	25.0	25.0	24.8	21.6	17.0	13.5

(Bangladesh Meteorological Department)

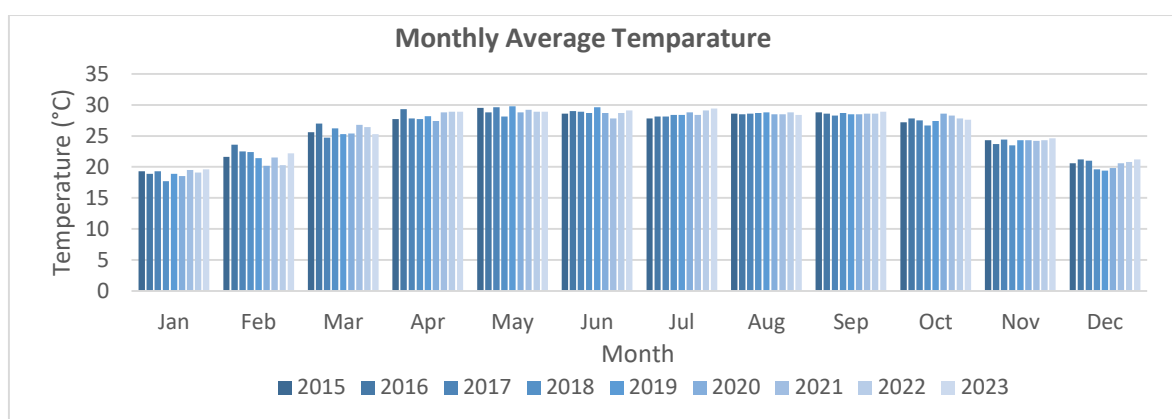


Figure 4.4: Monthly Ambient Average Temperature of Hatiya (2015 - 2023)

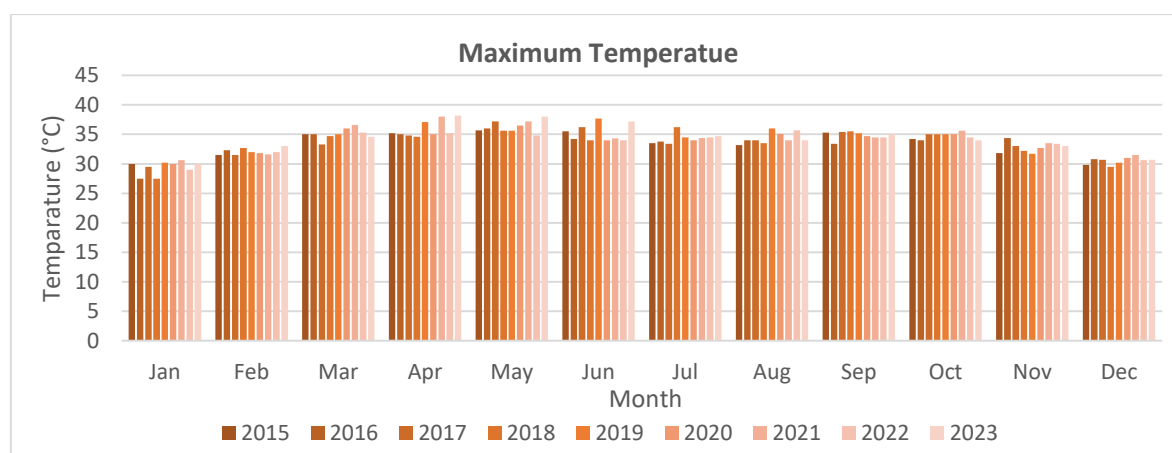


Figure 4.5: Monthly Maximum Temperature of Hatiya (2015 - 2023)

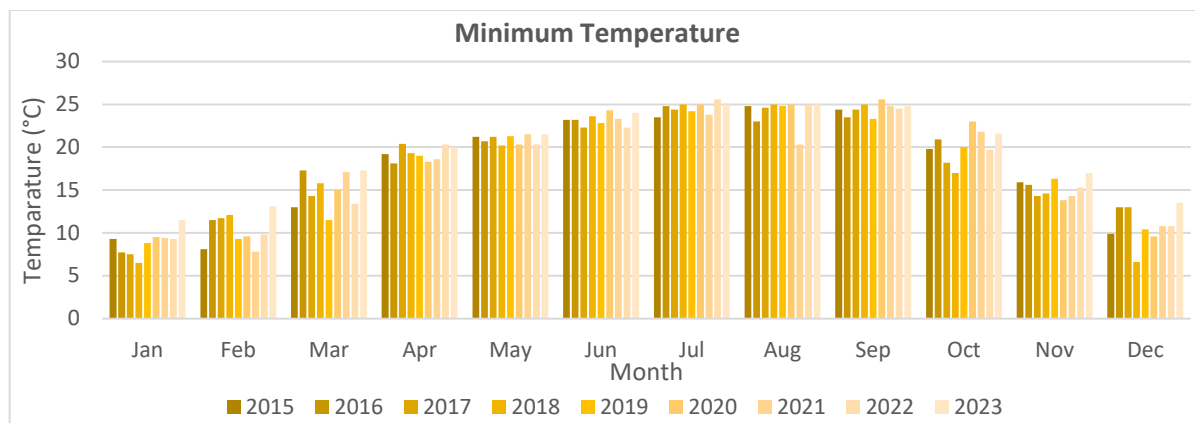


Figure 4.6: Monthly Minimum Temperature of Hatiya (2015 - 2023)

4.4 Madaripur Meteorological Station

Figure 4.7 - Figure 4.9 shows the monthly average, maximum and minimum temperature in degree Celsius for the period 2015 to 2023. The monthly average Dry Bulb Temperature (maximum) is 30°C in April, 2017 and May, 2019 and (minimum) is 16.1°C in Jan, 2018.

Table 4.10: Monthly average Dry Bulb Temperature in degree Celsius of Madaripur (2015 - 2023)

Year	Monthly Average Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	17.9	21.3	25.1	27.5	29.6	29.0	28.1	28.9	28.8	27.3	23.8	19.6
2016	17.7	23.3	26.5	30.0	28.5	29.4	28.6	28.9	29.0	28.0	23.3	20.0
2017	18.1	21.7	24.7	27.9	29.6	29.0	28.7	29.1	29.1	27.6	23.7	20.1
2018	16.1	21.8	26.5	27.4	27.7	29.4	29.0	29.4	29.4	26.6	23.3	18.3
2019	17.7	20.5	24.9	28.0	30.0	29.7	29.0	29.4	28.7	27.3	24.0	18.6
2020	18.9	21.0	26.0	27.6	29.3	29.1	29.2	28.9	29.3	29.1	24.9	20.1
2021	18.3	21.1	27.4	29.8	29.5	28.2	28.9	29.1	29.0	28.3	23.0	19.8
2022	17.9	19.4	26.3	29.5	28.8	29.2	29.7	29.4	28.8	27.2	23.4	19.6
2023	17.8	22.0	25.3	28.8	28.8	29.5	29.9	28.6	29.0	27.6	24.0	20.0

(Bangladesh Meteorological Department)

Table 4.11: Monthly Maximum Temperature in degree Celsius of Madaripur (2015 - 2023)

Year	Monthly Maximum Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	30.0	32.2	35.1	35.1	36.6	36.7	35.7	35.2	36.3	34.7	32.5	29.5
2016	27.6	34.0	34.7	38.0	37.0	36.0	35	35.7	35.0	35.2	34.7	30.5
2017	30.2	32.0	33.5	35.5	36.9	36.6	35.2	35.8	35.8	35.5	34	29.2
2018	26.7	32.2	35.0	35.5	36.0	36.6	36.2	35.8	36.4	35.5	32.5	28.7
2019	30.8	32.3	35.0	37.0	36.7	36.5	36.0	35.0	35.9	34.5	31.9	30.8
2020	28.7	31.0	36.1	36.6	36.2	36.1	36.0	36.4	35.5	35.5	33.5	29.2
2021	29.3	33.0	37.0	39.6	37.8	36.3	35.0	34.5	35.0	34.8	31.0	29.8
2022	27.0	30.5	36.0	36.8	36.8	35.7	35.5	36.3	35.3	34.6	32.0	29.5
2023	28.5	32.2	34.2	39.2	38.0	38.0	36.5	36.0	35.3	35.1	33.5	31.2

(Bangladesh Meteorological Department)

Table 4.12: Monthly Minimum Temperature in degree Celsius of Madaripur (2015 - 2023)

Year	Monthly Minimum Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	11.4	12.8	15.0	19.5	20.1	23.2	23.6	23.8	24.0	20.3	17.5	11.5
2016	10.0	13.3	19.5	18.2	21.3	22.8	24.5	24.0	25.3	22.8	17.6	14.9
2017	11.3	14.2	16.0	20.0	21.0	22.8	24.8	25.2	24.0	19.1	17.1	14.2
2018	9.5	14.4	17.5	19.4	20.8	23.6	24.8	25.4	25.0	20.8	17.4	11.8

Year	Monthly Minimum Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2019	12.0	13.2	13.2	17.9	17.9	22.3	24.4	25.0	23.7	21.5	18.2	12.2
2020	11.6	11.3	17.0	20.4	20.7	24.0	25.0	25.5	25.8	23.6	17.5	11.4
2021	10.4	12.3	16.8	19.7	21.1	22.6	25.2	26.0	26.0	24.8	18.4	13.9
2022	16.0	17.0	22.0	26.0	26.0	27.0	27.0	27.0	26.0	24.0	20.0	18.0
2023	8.8	11.0	16.1	19.5	20.7	24.8	24.8	25.3	24.8	20.0	16.2	12.0

(Bangladesh Meteorological Department)

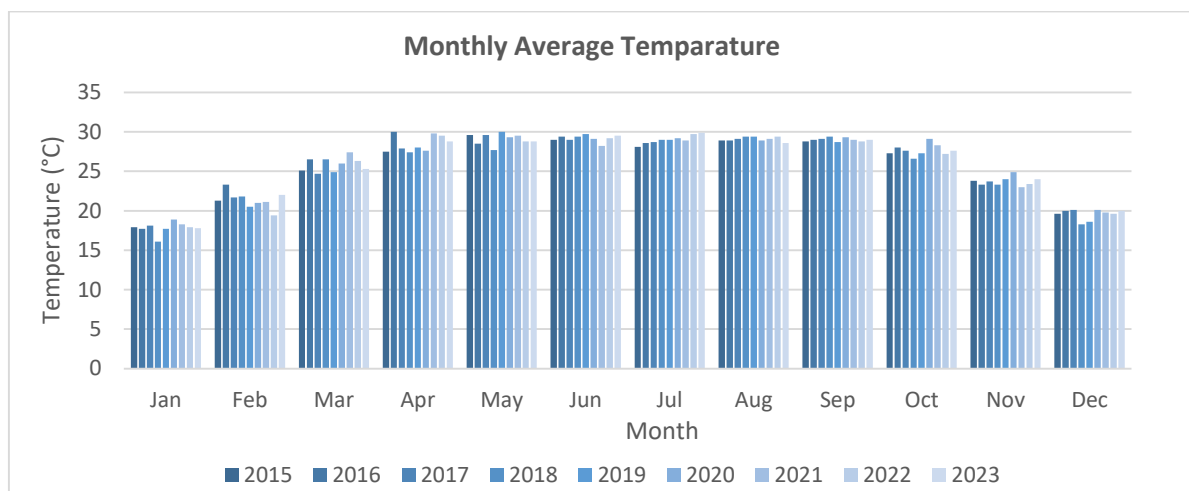


Figure 4.7: Monthly Ambient Average Temperature of Madaripur (2015 - 2023)

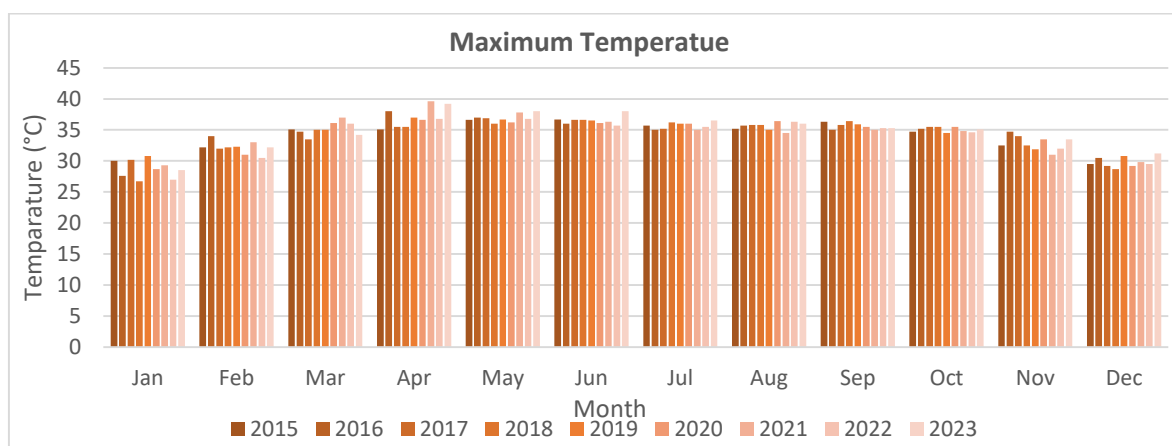


Figure 4.8: Monthly Maximum Temperature of Madaripur (2015 - 2023)

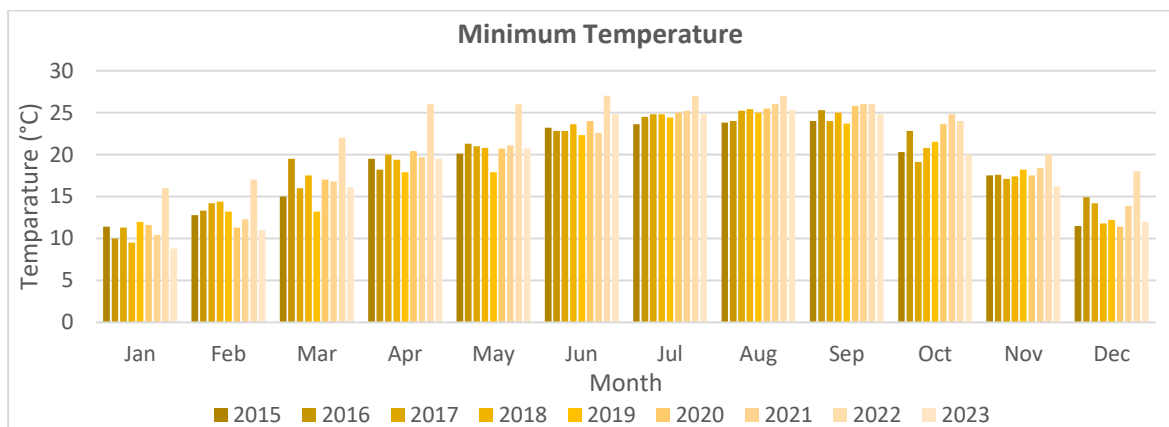


Figure 4.9: Monthly Minimum Temperature of Madaripur (2015 - 2023)

4.5 Majdi Court Meteorological Station

Figure 4.10 - Figure 4.12 shows the monthly average, maximum and minimum temperature in degree Celsius for the period 2015 to 2023. The monthly average Dry Bulb Temperature (maximum) is 30.4°C in April, 2020 and (minimum) is 17.6°C in Jan, 2020.

Table 4.13: Monthly average Dry Bulb Temperature in degree Celsius of Majdi Court (2015 - 2023)

Year	Monthly Average Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	19.7	22.1	25.9	28.0	29.9	28.9	28.0	28.9	28.9	27.9	24.7	20.5
2016	18.9	24.0	27.2	30.0	28.8	29.6	28.3	29.0	29.1	28.1	23.9	21.1
2017	20.1	23.3	25.2	28.0	29.9	29.2	28.8	29.1	29.3	27.7	24.7	21.2
2018	18.1	22.9	26.8	27.7	27.6	28.9	28.6	29.2	29.4	27.0	24.4	19.9
2019	19.7	21.6	25.5	28.5	30.3	30.0	28.8	29.5	28.8	27.8	25.1	19.7
2020	17.6	23.0	25.5	30.4	28.3	29.5	28.5	29.5	28.7	28.2	25.2	20.5
2021	19.6	21.9	27.2	29.4	29.5	27.9	28.6	28.7	29.1	28.6	24.4	20.8
2022	19.2	20.7	26.7	29.0	28.7	28.8	29.6	29.3	28.6	28.0	25.1	20.9
2023	19.5	22.7	25.4	29.2	28.9	29.1	29.7	28.6	29.2	28.0	25.2	21.5

(Bangladesh Meteorological Department)

Table 4.14: Monthly Maximum Temperature in degree Celsius of Majdi Court (2015 - 2023)

Year	Monthly Maximum Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	30.5	32.4	35.2	35.4	36.8	36.4	35.2	34.0	35.6	35.2	31.5	28.0
2016	27.0	33.8	35.0	36.6	37.8	35.5	34.2	34.5	35.5	35.0	34.0	28.5
2017	30.1	31.5	33.8	35.7	37.2	36.8	35.0	35.3	35.2	35.2	34.0	29.5
2018	27.6	33.7	34.6	36.0	35.6	35.3	36.7	34.4	37.0	35.6	33.4	28.7
2019	30.2	32.2	35.2	36.8	37.1	36.2	37.0	36.0	35.5	34.4	32.6	30.5
2020	29.5	31.6	36.3	36.5	36.5	35.2	36.0	36.2	36.0	35.5	33.2	31.2
2021	30.5	32.2	37.0	38.5	38.6	35.4	35.3	34.4	36.0	36.4	32.6	30.4
2022	28.5	31.2	35.5	35.5	36.5	35.3	35.3	36.2	35.8	34.0	33.0	30.5
2023	29.5	33.0	34.0	39.0	39.0	37.6	36.5	35.5	35.8	33.6	33.8	30.5

(Bangladesh Meteorological Department)

Table 4.15: Monthly Minimum Temperature in degree Celsius of Majdi Court (2015 - 2023)

Year	Monthly Minimum Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	12.8	12.6	15.0	20.0	21.0	22.0	24	23.5	24.8	23.0	19.0	12.6
2016	10.4	13.5	20.2	18.0	20.5	23.0	24	24.2	24.0	23.0	18.4	15.5
2017	10.5	14.3	16.5	20.4	21.4	23.5	25	24.6	23.5	18.8	17.0	15.4
2018	9.8	14.9	17.7	19.5	20.3	21.3	25	24.0	25.0	21.2	16.5	10.4
2019	12.2	12.0	14.0	18.5	22.4	22.6	24	25.2	24.0	22.6	19.5	13.0
2020	12.2	11.5	17.0	19.6	21.0	24.0	25.5	24.0	25.0	23.5	16.5	13.0
2021	12.6	11.3	19.6	19.9	21.6	23.5	24.0	25.0	25.0	23.5	17.2	13.6
2022	12.0	12.0	16.6	20.0	22.0	23.3	24.8	24.6	24.4	21.4	18.2	13.6
2023	11.6	13.5	17.4	21.0	21.0	23.7	25.4	25.4	24.6	22.4	19.0	14.9

(Bangladesh Meteorological Department)

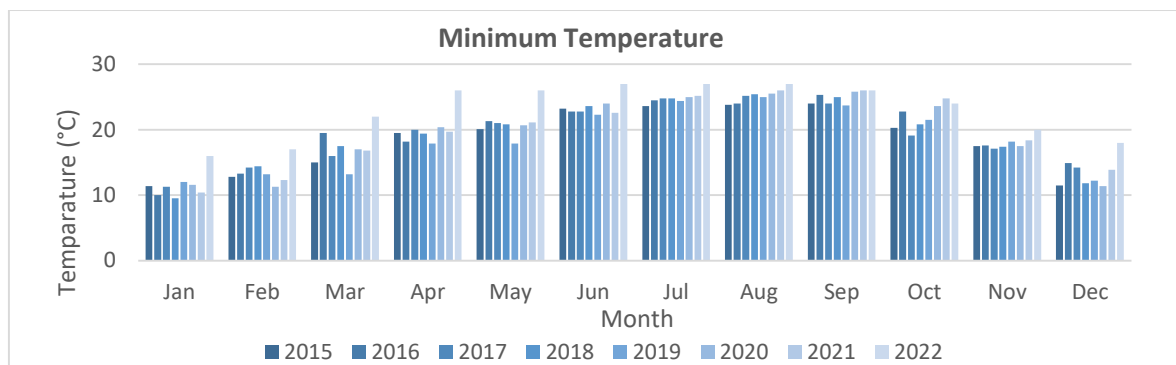


Figure 4.10: Monthly Ambient Average Temperature of Majidi Court (2015 - 2023)

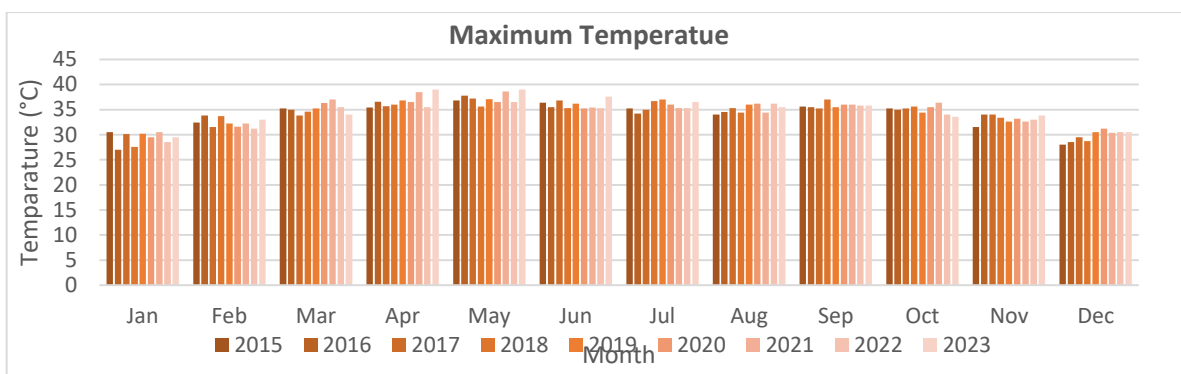


Figure 4.11: Monthly Maximum Temperature of Majidi Court (2015 - 2023)

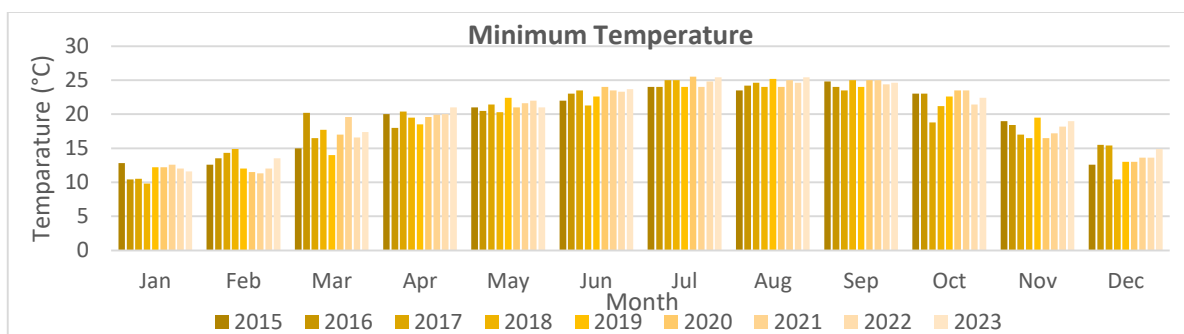


Figure 4.12: Monthly Minimum Temperature of Majidi Court (2015 - 2023)

4.6 Dhaka Meteorological Station

Figure 4.13 - Figure 4.15 shows the monthly average, maximum and minimum temperature in degree Celsius for the period 2015 to 2023. The monthly average Dry Bulb Temperature (maximum) is 34.0°C in April, 2022 and (minimum) is 17.5°C in Jan, 2018.

Table 4.16: Monthly average Dry Bulb Temperature in degree Celsius of Dhaka (2015 - 2023)

Year	Monthly Average Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	19.1	22.4	26.3	27.9	29.7	29.3	28.4	29.2	29.0	27.7	24.5	20.4
2016	18.9	24.0	27.3	30.4	28.5	29.9	28.8	29.6	29.0	28.6	24.2	21.6
2017	20.1	23.3	25.2	28.0	29.9	29.2	28.8	29.1	29.3	27.7	24.7	21.2
2018	17.5	23.2	27.3	27.3	27.6	29.4	29.3	29.8	29.8	27.3	24.2	20.3
2019	20.2	22.0	26.0	28.3	29.8	29.9	29.3	29.9	29.1	27.6	24.9	19.3
2020	17.6	23.0	25.5	30.4	28.3	29.5	28.5	29.5	28.7	28.2	25.2	20.5
2021	18.2	21.0	24.9	31.2	29.1	30.1	29.9	30.1	31.2	19.4	24.8	19.9
2022	23.0	24.0	32.0	34.0	31.0	31.0	32.0	31.0	30.0	29.0	27.0	25.0
2023	19.1	23.3	26.6	30.2	29.9	30.1	30.6	29.3	29.8	28.4	25.8	21.7

(Bangladesh Meteorological Department)

Table 4.17: Monthly Maximum Temperature in degree Celsius of Dhaka (2015 - 2023)

Year	Monthly Maximum Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	29.9	32.2	36.4	35.5	36.4	36.5	35.5	34.7	36.5	35.5	32.9	30.3
2016	27.6	34.0	34.8	39.0	37.0	36.0	34.6	36.1	34.7	36.0	34.5	31.0
2017	30.2	32.0	33.6	36.5	37.0	36.1	35.8	34.2	36.0	36.5	33.2	29.4
2018	26.8	33.6	34.6	36.5	36.3	35.6	37.6	36.5	36.5	36.1	32.8	28.9
2019	31.3	32.0	35.1	37.1	36.6	36.6	35.7	36.4	36.3	35.2	32.7	31.5
2020	29.6	32.0	36.6	38.0	37.0	36.6	35.5	36.5	36.1	35.7	33.2	29.5
2021	31.1	30.5	35.9	37.8	36.4	37.0	36.7	37.2	35.9	36.4	31.8	28.7
2022	27.0	30.0	38.0	40.0	35.0	33.0	35.0	34.0	33.0	32.0	32.0	30.0
2023	29.6	33.3	34.9	40.6	39.8	38.7	37.1	36.8	37.3	35.0	34.3	31.7

(Bangladesh Meteorological Department)

Table 4.18: Monthly Minimum Temperature in degree Celsius of Dhaka (2015 - 2023)

Year	Monthly Minimum Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	11.4	12.8	15.0	19.5	20.1	23.2	23.6	23.8	24	20.3	17.5	11.5
2016	10.0	13.3	19.5	18.2	21.3	22.8	24.5	24.0	25.3	22.8	17.6	14.9
2017	11.3	14.2	16.0	20	21.0	22.8	24.8	25.2	24.0	19.1	17.1	14.2
2018	9.5	14.4	17.5	19.4	20.8	23.6	24.8	25.4	25.0	20.8	17.4	11.8
2019	12.0	13.2	13.2	17.9	17.9	22.3	24.4	25.0	23.7	21.5	18.2	12.2
2020	11.6	11.3	17.0	20.4	20.7	24.0	25.0	25.5	25.8	23.6	17.5	11.4
2021	10.4	12.3	16.8	19.7	21.1	22.6	25.2	26.0	26.0	24.8	18.4	13.9
2022	16.0	17.0	22.0	26.0	26.0	27.0	27.0	27.0	26.0	24.0	20.0	18.0
2023	11.5	13.8	19.2	19.9	20.7	23.2	24.8	25.4	24.6	22.0	18.1	14.2

(Bangladesh Meteorological Department)

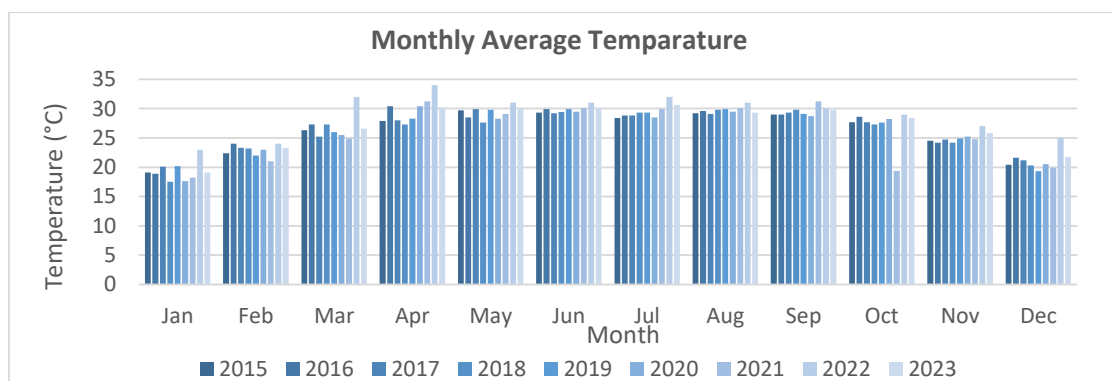


Figure 4.13: Monthly Ambient Average Temperature of Dhaka (2015 - 2023)

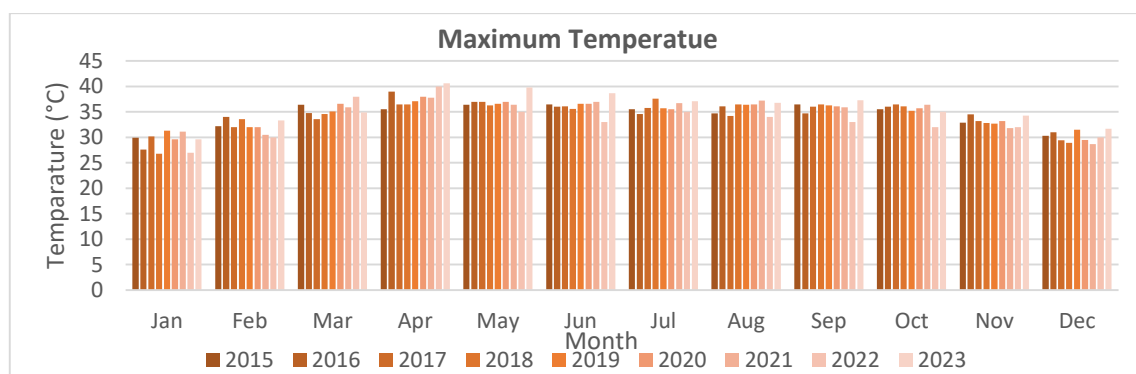


Figure 4.14: Monthly Maximum Temperature of Dhaka (2015 - 2023)

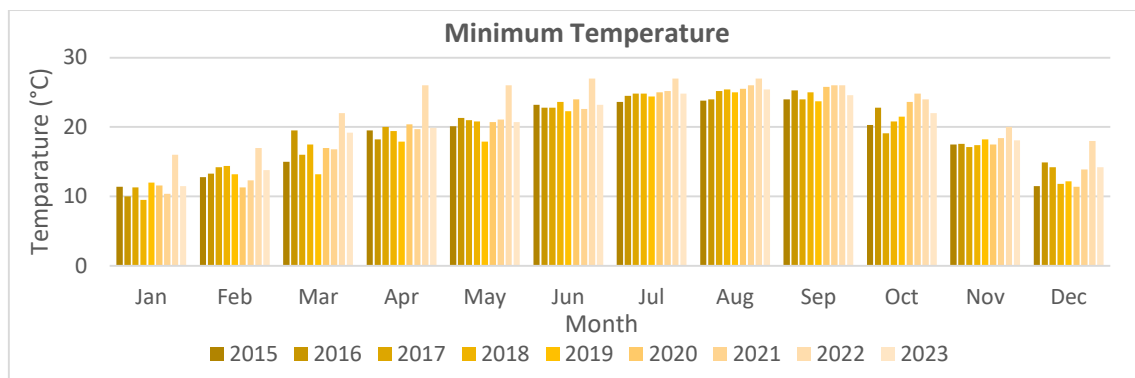


Figure 4.15: Monthly Minimum Temperature of Dhaka (2015 – 2023)

Annexure 4

Analytical Test Report

Annexure 4 (a)

Air Quality Test Report

AECL LABORATORY ANALYSIS REPORT
AMBIENT AIR QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Bhairab Bazar

=====

Description of Sample : Ambient Air
Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)
Sampling date : 1st – 27th March, 2025
Reporting date : 15th April, 2025

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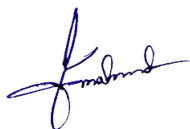
Description of Analysis

SN	Parameters	Method	Test Duration (hours)	Unit	AQ1	DoE Standard	IFC Standard
1.	PM _{2.5}	Gravimetric	24	µg/m ³	56.23	65	75
2.	PM ₁₀	Gravimetric	24	µg/m ³	79.11	150	150
3.	SPM	Gravimetric	24	µg/m ³	139.84	NF	NF
4.	SO ₂	West-Geake	24	µg/m ³	7.44	80	125
5.	NO _x	Jacob and Hochheiser	24	µg/m ³	9.15	80	200
6.	CO	CO/O ₃ Meter	1	ppm	2	20	NF

(NF – not found, DoE – Department of Environment)

1. Fine Particulate Matter (PM _{2.5})	4. Oxides of Nitrogen (NO _x)
2. Respirable Dust Content (PM ₁₀)	5. Oxides of Sulfur (SO ₂)
3. Suspended Particulate Matter (SPM)	6. Carbon Monoxide (CO)

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.



Md. Faisal Bin Mahmud
Sr. Chemist



Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
AMBIENT AIR QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Alubazar

=====

Description of Sample : Ambient Air
Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)
Sampling date : 1st – 27th March, 2025
Reporting date : 15th April, 2025

=====

Description of Analysis

SN	Parameters	Method	Test Duration (hours)	Unit	AQ1	DoE Standard	IFC Standard
1.	PM _{2.5}	Gravimetric	24	µg/m ³	46.01	65	75
2.	PM ₁₀	Gravimetric	24	µg/m ³	72.52	150	150
3.	SPM	Gravimetric	24	µg/m ³	119.22	NF	NF
4.	SO ₂	West-Geake	24	µg/m ³	1.88	80	125
5.	NO _x	Jacob and Hochheiser	24	µg/m ³	2.15	80	200
6.	CO	CO/O ₃ Meter	1	ppm	1	20	NF

(NF – not found, DoE – Department of Environment)

1. Fine Particulate Matter (PM _{2.5})	4. Oxides of Nitrogen (NO _x)
2. Respirable Dust Content (PM ₁₀)	5. Oxides of Sulfur (SO ₂)
3. Suspended Particulate Matter (SPM)	6. Carbon Monoxide (CO)

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer

AECL LABORATORY ANALYSIS REPORT
AMBIENT AIR QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Hijla

=====

Description of Sample : Ambient Air
Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)
Sampling date : 1st – 27th March, 2025
Reporting date : 15th April, 2025

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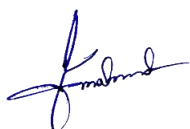
Description of Analysis

SN	Parameters	Method	Test Duration (hours)	Unit	AQ1	DoE Standard	IFC Standard
1.	PM _{2.5}	Gravimetric	24	µg/m ³	33.14	65	75
2.	PM ₁₀	Gravimetric	24	µg/m ³	60.43	150	150
3.	SPM	Gravimetric	24	µg/m ³	98.51	NF	NF
4.	SO ₂	West-Geake	24	µg/m ³	1.28	80	125
5.	NO _x	Jacob and Hochheiser	24	µg/m ³	1.37	80	200
6.	CO	CO/O ₃ Meter	1	ppm	1	20	NF

(NF – not found, DoE – Department of Environment)

1. Fine Particulate Matter (PM _{2.5})	4. Oxides of Nitrogen (NO _x)
2. Respirable Dust Content (PM ₁₀)	5. Oxides of Sulfur (SO ₂)
3. Suspended Particulate Matter (SPM)	6. Carbon Monoxide (CO)

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.



Md. Faisal Bin Mahmud
Sr. Chemist



Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
AMBIENT AIR QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Laharhat

=====

Description of Sample : Ambient Air
Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)
Sampling date : 1st – 27th March, 2025
Reporting date : 15th April, 2025

=====

Description of Analysis

SN	Parameters	Method	Test Duration (hours)	Unit	AQ1	DoE Standard	IFC Standard
1.	PM _{2.5}	Gravimetric	24	µg/m ³	54.18	65	75
2.	PM ₁₀	Gravimetric	24	µg/m ³	80.87	150	150
3.	SPM	Gravimetric	24	µg/m ³	139.22	NF	NF
4.	SO ₂	West-Geake	24	µg/m ³	5.16	80	125
5.	NO _x	Jacob and Hochheiser	24	µg/m ³	6.51	80	200
6.	CO	CO/O ₃ Meter	1	ppm	1.5	20	NF

(NF – not found, DoE – Department of Environment)

1. Fine Particulate Matter (PM _{2.5})	4. Oxides of Nitrogen (NO _x)
2. Respirable Dust Content (PM ₁₀)	5. Oxides of Sulfur (SO ₂)
3. Suspended Particulate Matter (SPM)	6. Carbon Monoxide (CO)

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
AMBIENT AIR QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Ilisha

=====

Description of Sample : Ambient Air
Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)
Sampling date : 1st – 27th March, 2025
Reporting date : 15th April, 2025

=====

Description of Analysis

SN	Parameters	Method	Test Duration (hours)	Unit	AQ1	DoE Standard	IFC Standard
1.	PM _{2.5}	Gravimetric	24	µg/m ³	35.37	65	75
2.	PM ₁₀	Gravimetric	24	µg/m ³	63.48	150	150
3.	SPM	Gravimetric	24	µg/m ³	94.76	NF	NF
4.	SO ₂	West-Geake	24	µg/m ³	1.22	80	125
5.	NO _x	Jacob and Hochheiser	24	µg/m ³	1.93	80	200
6.	CO	CO/O ₃ Meter	1	ppm	1	20	NF

(NF – not found, DoE – Department of Environment)

1. Fine Particulate Matter (PM _{2.5})	4. Oxides of Nitrogen (NO _x)
2. Respirable Dust Content (PM ₁₀)	5. Oxides of Sulfur (SO ₂)
3. Suspended Particulate Matter (SPM)	6. Carbon Monoxide (CO)

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer

AECL LABORATORY ANALYSIS REPORT
AMBIENT AIR QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Bankerhat (Beduria)

=====

Description of Sample : Ambient Air
Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)
Sampling date : 1st – 27th March, 2025
Reporting date : 15th April, 2025

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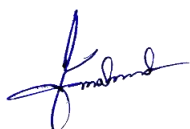
Description of Analysis

SN	Parameters	Method	Test Duration (hours)	Unit	AQ1	DoE Standard	IFC Standard
1.	PM _{2.5}	Gravimetric	24	µg/m ³	30.47	65	75
2.	PM ₁₀	Gravimetric	24	µg/m ³	63.21	150	150
3.	SPM	Gravimetric	24	µg/m ³	95.16	NF	NF
4.	SO ₂	West-Geake	24	µg/m ³	9.38	80	125
5.	NO _x	Jacob and Hochheiser	24	µg/m ³	1.01	80	200
6.	CO	CO/O ₃ Meter	1	ppm	0.5	20	NF

(NF – not found, DoE – Department of Environment)

1. Fine Particulate Matter (PM _{2.5})	4. Oxides of Nitrogen (NO _x)
2. Respirable Dust Content (PM ₁₀)	5. Oxides of Sulfur (SO ₂)
3. Suspended Particulate Matter (SPM)	6. Carbon Monoxide (CO)

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.



Md. Faisal Bin Mahmud
Sr. Chemist



Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
AMBIENT AIR QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Daulatkhan

=====

Description of Sample : Ambient Air
Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)
Sampling date : 1st – 27th March, 2025
Reporting date : 15th April, 2025

=====

Description of Analysis

SN	Parameters	Method	Test Duration (hours)	Unit	AQ1	DoE Standard	IFC Standard
1.	PM _{2.5}	Gravimetric	24	µg/m ³	49.22	65	75
2.	PM ₁₀	Gravimetric	24	µg/m ³	71.23	150	150
3.	SPM	Gravimetric	24	µg/m ³	125.28	NF	NF
4.	SO ₂	West-Geake	24	µg/m ³	2.17	80	125
5.	NO _x	Jacob and Hochheiser	24	µg/m ³	3.09	80	200
6.	CO	CO/O ₃ Meter	1	ppm	1	20	NF

(NF – not found, DoE – Department of Environment)

1. Fine Particulate Matter (PM _{2.5})	4. Oxides of Nitrogen (NO _x)
2. Respirable Dust Content (PM ₁₀)	5. Oxides of Sulfur (SO ₂)
3. Suspended Particulate Matter (SPM)	6. Carbon Monoxide (CO)

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer

AECL LABORATORY ANALYSIS REPORT
AMBIENT AIR QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Tojumuddin

=====

Description of Sample : Ambient Air
Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)
Sampling date : 1st – 27th March, 2025
Reporting date : 15th April, 2025

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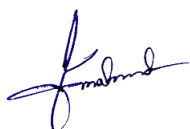
Description of Analysis

SN	Parameters	Method	Test Duration (hours)	Unit	AQ1	DoE Standard	IFC Standard
1.	PM _{2.5}	Gravimetric	24	µg/m ³	34.76	65	75
2.	PM ₁₀	Gravimetric	24	µg/m ³	64.14	150	150
3.	SPM	Gravimetric	24	µg/m ³	105.28	NF	NF
4.	SO ₂	West-Geake	24	µg/m ³	1.88	80	125
5.	NO _x	Jacob and Hochheiser	24	µg/m ³	2.01	80	200
6.	CO	CO/O ₃ Meter	1	ppm	1	20	NF

(NF – not found, DoE – Department of Environment)

1. Fine Particulate Matter (PM _{2.5})	4. Oxides of Nitrogen (NO _x)
2. Respirable Dust Content (PM ₁₀)	5. Oxides of Sulfur (SO ₂)
3. Suspended Particulate Matter (SPM)	6. Carbon Monoxide (CO)

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.



Md. Faisal Bin Mahmud
Sr. Chemist



Shanjana Haider
Chief Operating Officer

AECL LABORATORY ANALYSIS REPORT
AMBIENT AIR QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Monpura

=====

Description of Sample : Ambient Air
Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)
Sampling date : 1st – 27th March, 2025
Reporting date : 15th April, 2025

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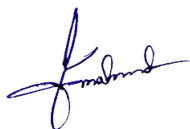
Description of Analysis

SN	Parameters	Method	Test Duration (hours)	Unit	AQ1	DoE Standard	IFC Standard
1.	PM _{2.5}	Gravimetric	24	µg/m ³	30.61	65	75
2.	PM ₁₀	Gravimetric	24	µg/m ³	61.29	150	150
3.	SPM	Gravimetric	24	µg/m ³	96.34	NF	NF
4.	SO ₂	West-Geake	24	µg/m ³	1.01	80	125
5.	NO _x	Jacob and Hochheiser	24	µg/m ³	1.23	80	200
6.	CO	CO/O ₃ Meter	1	ppm	0.5	20	NF

(NF – not found, DoE – Department of Environment)

1. Fine Particulate Matter (PM _{2.5})	4. Oxides of Nitrogen (NO _x)
2. Respirable Dust Content (PM ₁₀)	5. Oxides of Sulfur (SO ₂)
3. Suspended Particulate Matter (SPM)	6. Carbon Monoxide (CO)

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.



Md. Faisal Bin Mahmud
Sr. Chemist



Shanjana Haider
Chief Operating Officer

AECL LABORATORY ANALYSIS REPORT
AMBIENT AIR QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Moju Chowdhury

=====

Description of Sample : Ambient Air
Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)
Sampling date : 1st – 27th March, 2025
Reporting date : 15th April, 2025

=====

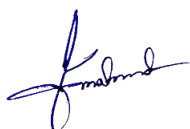
Description of Analysis

SN	Parameters	Method	Test Duration (hours)	Unit	AQ1	DoE Standard	IFC Standard
1.	PM _{2.5}	Gravimetric	24	µg/m ³	58.22	65	75
2.	PM ₁₀	Gravimetric	24	µg/m ³	80.79	150	150
3.	SPM	Gravimetric	24	µg/m ³	134.25	NF	NF
4.	SO ₂	West-Geake	24	µg/m ³	8.76	80	125
5.	NO _x	Jacob and Hochheiser	24	µg/m ³	10.12	80	200
6.	CO	CO/O ₃ Meter	1	ppm	2	20	NF

(NF – not found, DoE – Department of Environment)

1. Fine Particulate Matter (PM _{2.5})	4. Oxides of Nitrogen (NO _x)
2. Respirable Dust Content (PM ₁₀)	5. Oxides of Sulfur (SO ₂)
3. Suspended Particulate Matter (SPM)	6. Carbon Monoxide (CO)

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.



Md. Faisal Bin Mahmud
Sr. Chemist



Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
AMBIENT AIR QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Boddarhat

=====

Description of Sample : Ambient Air
Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)
Sampling date : 1st – 27th March, 2025
Reporting date : 15th April, 2025

=====

Description of Analysis

SN	Parameters	Method	Test Duration (hours)	Unit	AQ1	DoE Standard	IFC Standard
1.	PM _{2.5}	Gravimetric	24	µg/m ³	50.46	65	75
2.	PM ₁₀	Gravimetric	24	µg/m ³	74.28	150	150
3.	SPM	Gravimetric	24	µg/m ³	109.55	NF	NF
4.	SO ₂	West-Geake	24	µg/m ³	1.00	80	125
5.	NO _x	Jacob and Hochheiser	24	µg/m ³	1.65	80	200
6.	CO	CO/O ₃ Meter	1	ppm	0.5	20	NF

(NF – not found, DoE – Department of Environment)

1. Fine Particulate Matter (PM _{2.5})	4. Oxides of Nitrogen (NO _x)
2. Respirable Dust Content (PM ₁₀)	5. Oxides of Sulfur (SO ₂)
3. Suspended Particulate Matter (SPM)	6. Carbon Monoxide (CO)

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
AMBIENT AIR QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Motirhat

=====

Description of Sample : Ambient Air

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st – 27th March, 2025

Reporting date : 15th April, 2025

=====

Description of Analysis

SN	Parameters	Method	Test Duration (hours)	Unit	AQ1	DoE Standard	IFC Standard
1.	PM _{2.5}	Gravimetric	24	µg/m ³	36.19	65	75
2.	PM ₁₀	Gravimetric	24	µg/m ³	69.55	150	150
3.	SPM	Gravimetric	24	µg/m ³	108.93	NF	NF
4.	SO ₂	West-Geake	24	µg/m ³	2.02	80	125
5.	NO _x	Jacob and Hochheiser	24	µg/m ³	2.24	80	200
6.	CO	CO/O ₃ Meter	1	ppm	1	20	NF

(NF – not found, DoE – Department of Environment)

4. Fine Particulate Matter (PM _{2.5})	4. Oxides of Nitrogen (NO _x)
5. Respirable Dust Content (PM ₁₀)	5. Oxides of Sulfur (SO ₂)
6. Suspended Particulate Matter (SPM)	6. Carbon Monoxide (CO)

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
AMBIENT AIR QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Tomuruddin

=====

Description of Sample : Ambient Air
Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)
Sampling date : 1st – 27th March, 2025
Reporting date : 15th April, 2025

=====

Description of Analysis

SN	Parameters	Method	Test Duration (hours)	Unit	AQ1	DoE Standard	IFC Standard
1.	PM _{2.5}	Gravimetric	24	µg/m ³	30.19	65	75
2.	PM ₁₀	Gravimetric	24	µg/m ³	63.34	150	150
3.	SPM	Gravimetric	24	µg/m ³	107.27	NF	NF
4.	SO ₂	West-Geake	24	µg/m ³	9.44	80	125
5.	NO _x	Jacob and Hochheiser	24	µg/m ³	8.21	80	200
6.	CO	CO/O ₃ Meter	1	ppm	1	20	NF

(NF – not found, DoE – Department of Environment)

1. Fine Particulate Matter (PM _{2.5})	4. Oxides of Nitrogen (NO _x)
2. Respirable Dust Content (PM ₁₀)	5. Oxides of Sulfur (SO ₂)
3. Suspended Particulate Matter (SPM)	6. Carbon Monoxide (CO)

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer

Annexure 4 (b)

Noise Quality Test Report



AECL LABORATORY ANALYSIS REPORT
AMBIENT NOISE QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Bhairab Bazar

.....

Description of Sample : Ambient Noise

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st – 27th March, 2025

Reporting date : 16th April, 2025

.....

Description of Analysis

SN	Site ID with coordinates		Concentration present (LA _{eq}) dBA.					
			Day Time			Night Time		
			Minimum	Maximum	Leq	Minimum	Maximum	Leq
01	NL-1	24° 2'36.79"N 90°59'19.35"E	44.6	78.3	55.2	40.1	62.5	44.6
02	NL-2	24° 2'33.94"N 90°59'18.62"E	43.3	79.4	56.1	39.7	63.2	45.1
DoE (Bangladesh) Standard for Commercial area			70			60		
IFC/International Standard for Industrial, commercial			70			70		

Note: This noise data was usually accomplished by – CEM Sound Level Meter (Model – DT 8850)

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
AMBIENT NOISE QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : AluBazar

.....

Description of Sample : Ambient Noise

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st – 27th March, 2025

Reporting date : 16th April, 2025

.....

Description of Analysis

S N	Site ID with coordinates		Concentration present (LA _{eq}) dBA.					
			Day Time			Night Time		
			Minimum	Maximum	L _{eq}	Minimum	Maximum	L _{eq}
01	NL-1	23°11'1.16"N 90°34'38.25"E	40.5	72.1	48.6	38.1	58.1	42.3
02	NL-2	23°10'59.27"N 90°34'44.74"E	41.4	75.3	50.1	37.4	60.2	43.5
DoE (Bangladesh) Standard for Commercial area			70			60		
IFC/International Standard for Industrial, commercial			70			70		

Note: This noise data was usually accomplished by – CEM Sound Level Meter (Model – DT 8850)

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
AMBIENT NOISE QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Hijla

=====

Description of Sample : Ambient Noise

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st – 27th March, 2025

Reporting date : 16th April, 2025

=====

Description of Analysis

S N	Site ID with coordinates		Concentration present (LA _{eq}) dBA.					
			Day Time			Night Time		
			Minimum	Maximum	Leq	Minimum	Maximum	Leq
01	NL-1	22°54'40.93"N 90°31'30.57"E	38.2	60.1	44.2	36.1	58.1	40.1
02	NL-2	22°54'43.55"N 90°31'32.49"E	39.7	62.4	45.2	38.3	63.1	41.4
DoE (Bangladesh) Standard for Residential area			55			45		
IFC/International Standard for Residential; institutional; educational			55			45		

Note: This noise data was usually accomplished by – CEM Sound Level Meter (Model – DT 8850)

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
AMBIENT NOISE QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Laharhat

=====

Description of Sample : Ambient Noise

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st – 27th March, 2025

Reporting date : 16th April, 2025

=====

Description of Analysis

S N	Site ID with coordinates		Concentration present (LA _{eq}) dBA.					
			Day Time			Night Time		
			Minimum	Maximum	L _{eq}	Minimum	Maximum	L _{eq}
01	NL-1	22°41'19.58"N 90°29'19.90"E	42.1	76.4	49.1	40.0	67.7	44.6
02	NL-2	22°41'20.51"N 90°29'19.32"E	41.4	78.5	51.2	39.5	63.1	43.5
DoE (Bangladesh) Standard for Commercial area			70			60		
IFC/International Standard for Industrial, commercial			70			70		

Note: This noise data was usually accomplished by – CEM Sound Level Meter (Model – DT 8850)

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
AMBIENT NOISE QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Ilisha

=====

Description of Sample : Ambient Noise

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st – 27th March, 2025

Reporting date : 16th April, 2025

=====

Description of Analysis

S N	Site ID with coordinates		Concentration present (LA _{eq}) dBA.					
			Day Time			Night Time		
			Minimum	Maximum	Leq	Minimum	Maximum	Leq
01	NL-1	22°46'43.43"N 90°38'57.62"E	40.7	66.0	43.8	38.3	58.6	41.4
02	NL-2	22°46'43.95"N 90°38'59.98"E	41.1	68.9	44.1	39.6	60.3	42.1
DoE (Bangladesh) Standard for Mixed area			60			50		
IFC/International Standard for Residential; institutional; educational			55			45		

Note: This noise data was usually accomplished by – CEM Sound Level Meter (Model – DT 8850)

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
AMBIENT NOISE QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal
Project Location : Bankerhat (Beduria)

.....
Description of Sample : Ambient Noise
Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)
Sampling date : 1st – 27th March, 2025
Reporting date : 16th April, 2025
.....

Description of Analysis

SN	Site ID with coordinates		Concentration present (LA _{eq}) dBA.					
			Day Time			Night Time		
			Minimum	Maximum	Leq	Minimum	Maximum	Leq
01	NL-1	22°40'42.70"N 90°34'34.74"E	39.2	60.4	43.1	36.8	56.6	39.1
02	NL-2	22°40'44.03"N 90°34'31.92"E	40.1	62.8	43.9	37.2	59.2	40.1
DoE (Bangladesh) Standard for Mixed area			60			50		
IFC/International Standard for Residential; institutional; educational			55			45		

Note: This noise data was usually accomplished by – CEM Sound Level Meter (Model – DT 8850)

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
AMBIENT NOISE QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Daulatkhan

=====

Description of Sample : Ambient Noise

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st – 27th March, 2025

Reporting date : 16th April, 2025

=====

Description of Analysis

S N	Site ID with coordinates		Concentration present (LA _{eq}) dBA.					
			Day Time			Night Time		
			Minimum	Maximum	L _{eq}	Minimum	Maximum	L _{eq}
01	NL-1	22°36'9.84"N 90°45'3.59"E	41.3	78.8	50.2	40.1	69.2	45.1
02	NL-2	22°36'11.59"N 90°45'6.27"E	40.1	77.2	48.3	38.6	67.3	44.5
DoE (Bangladesh) Standard for Commercial area			70			60		
IFC/International Standard for Industrial, commercial			70			70		

Note: This noise data was usually accomplished by – CEM Sound Level Meter (Model – DT 8850)

Comment: According to the Department of Environment (Noise Pollution Control Rules, 2006), the standard for ambient noise level for Mixed area is 60 and 50 decibels at day & night time respectively. The results were found within the limit as per DoE Standards.

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
AMBIENT NOISE QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Tojumuddin

=====

Description of Sample : Ambient Noise

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st – 27th March, 2025

Reporting date : 16th April, 2025

=====

Description of Analysis

SN	Site ID with coordinates		Concentration present (LA _{eq}) dBA.					
			Day Time			Night Time		
			Minimum	Maximum	Leq	Minimum	Maximum	Leq
01	NL-1	22°25'59.44"N 90°50'53.20"E	38.5	65.5	45.7	36.5	59.1	40.8
02	NL-2	22°26'0.73"N 90°50'51.82"E	39.3	64.8	44.2	36.0	60.2	41.2
DoE (Bangladesh) Standard for Mixed area			60			50		
IFC/International Standard for Residential; institutional; educational			55			45		

Note: This noise data was usually accomplished by – CEM Sound Level Meter (Model – DT 8850)

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
AMBIENT NOISE QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Monpura

=====

Description of Sample : Ambient Noise

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st – 27th March, 2025

Reporting date : 16th April, 2025

=====

Description of Analysis

S N	Site ID with coordinates		Concentration present (LA _{eq}) dBA.					
			Day Time			Night Time		
			Minimum	Maximum	Leq	Minimum	Maximum	Leq
01	NL-1	22°19'15.35"N 90°59'15.99"E	38.9	60.2	43.3	35.4	55.0	40.4
02	NL-2	22°19'13.38"N 90°59'15.62"E	37.2	56.0	42.4	36.3	56.4	39.8
DoE (Bangladesh) Standard for Residential area			55			45		
IFC/International Standard for Residential; institutional; educational			55			45		

Note: This noise data was usually accomplished by – CEM Sound Level Meter (Model – DT 8850)

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
AMBIENT NOISE QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Moju Chowdhury

=====

Description of Sample : Ambient Noise

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st – 27th March, 2025

Reporting date : 16th April, 2025

=====

Description of Analysis

SN	Site ID with coordinates		Concentration present (LA _{eq}) dBA.					
			Day Time			Night Time		
			Minimum	Maximum	L _{eq}	Minimum	Maximum	L _{eq}
01	NL-1	22°52'26.51"N 90°46'56.85"E	42.6	75.8	48.9	40.2	65.1	42.2
02	NL-2	22°52'27.52"N 90°47'1.56"E	41.9	78.4	50.2	41.2	68.7	43.8
DoE (Bangladesh) Standard for Commercial area			70			60		
IFC/International Standard for Industrial, commercial			70			70		

Note: This noise data was usually accomplished by – CEM Sound Level Meter (Model – DT 8850)

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
AMBIENT NOISE QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Boddarhat

=====

Description of Sample : Ambient Noise

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st – 27th March, 2025

Reporting date : 16th April, 2025

=====

Description of Analysis

S N	Site ID with coordinates		Concentration present (LA _{eq}) dBA.					
			Day Time			Night Time		
			Minimum	Maximum	Leq	Minimum	Maximum	Leq
01	NL-1	22°39'29.14"N 90°54'12.89"E	41.7	60.2	45.3	38.4	64.1	42.1
02	NL-2	22°39'30.38"N 90°54'13.88"E	40.0	63.7	44.7	39.1	63.8	41.7
DoE (Bangladesh) Standard for Residential area			55			45		
IFC/International Standard for Residential; institutional; educational			55			45		

Note: This noise data was usually accomplished by – CEM Sound Level Meter (Model – DT 8850)

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
AMBIENT NOISE QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Motirhat

=====

Description of Sample : Ambient Noise

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st – 27th March, 2025

Reporting date : 16th April, 2025

=====

Description of Analysis

SN	Site ID with coordinates		Concentration present (LA _{eq}) dBA.					
			Day Time			Night Time		
			Minimum	Maximum		Minimum	Maximum	
01	NL-1	22°48'55.82"N 90°47'2.87"E	40.5	62.6	43.2	36.7	59.3	40.2
02	NL-2	22°48'59.53"N 90°47'0.04"E	39.3	64.4	44.1	37.5	62.3	41.6
DoE (Bangladesh) Standard for Mixed area			60			50		
IFC/International Standard for Residential; institutional; educational			55			45		

Note: This noise data was usually accomplished by – CEM Sound Level Meter (Model – DT 8850)

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
AMBIENT NOISE QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Tomuruddin

=====

Description of Sample : Ambient Noise

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st – 27th March, 2025

Reporting date : 16th April, 2025

=====

Description of Analysis

SN	Site ID with coordinates		Concentration present (LA _{eq}) dBA.					
			Day Time			Night Time		
			Minimum	Maximum	Leq	Minimum	Maximum	Leq
01	NL-1	22°17'38.79"N 91°4'26.99"E	41.7	74.8	45.5	38.4	68.7	43.7
02	NL-2	22°17'37.33"N 91°4'28.92"E	40.9	70.4	44.3	38.7	66.7	42.7
DoE (Bangladesh) Standard for Commercial area			70			60		
IFC/International Standard for Industrial, commercial			70			70		

Note: This noise data was usually accomplished by – CEM Sound Level Meter (Model – DT 8850)

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer

Annexure 4 (c)

Surface Water Quality Test Report



AECL LABORATORY ANALYSIS REPORT
SURFACE WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Bhairab Bazar

=====

Description of Sample : Surface Water Quality

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st- 27th March, 2025

Reporting date : 23rd April, 2025

=====

Description of Analysis

Name of the Parameter	Concentration Present	Unit	DoE Standards according to ECR, 2023	Method of analysis
Temperature	22.3	°C	-	Mercury filled thermometer
pH	8.2	-	6.5-8.5	pH meter
TDS	148	mg/l	1000	TDS meter
TSS	14	mg/l	NF	Gravimetric Method
BOD	0.6	mg/l	≤ 6	SM 5210B (23rd Edition), SM 5210D (23rd Edition) & USEPA 405.1:1974
COD	20	mg/l	50	Closed Reflex Method (CRM)
Dissolved Oxygen (DO)	5.5	mg/l	≥5	USEPA 360.1:1971, SM 4500-O (23rd Edition)
Turbidity	31.5	NTU	NF	Turbidity meter
Salinity	0.15	%	NF	Multimeter
Electrical Conductivity (EC)	202	μS/cm	2250	USEPA 120.1:1982
Oil & Grease	<5.0	Mg/l	NF	APHA 5520.B

(ECR – Environment Conservation Rules, 2023; DoE – Department of Environment; NF – Not Found;
USEPA – U. S. Environmental Protection Agency; SM – Standard Methods set by National Environmental Method Index, United States)

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
SURFACE WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Alubazar

=====

Description of Sample : Surface Water Quality

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st- 27th March, 2025

Reporting date : 23rd April, 2025

=====

Description of Analysis

Name of the Parameter	Concentration Present	Unit	DoE Standards according to ECR, 2023	Method of analysis
Temperature	26.7	°C	-	Mercury filled thermometer
pH	8.4	-	6.5-8.5	pH meter
TDS	184	mg/l	1000	TDS meter
TSS	9	mg/l	NF	Gravimetric Method
BOD	0.5	mg/l	≤ 6	SM 5210B (23rd Edition), SM 5210D (23rd Edition) & USEPA 405.1:1974
COD	15	mg/l	50	Closed Reflex Method (CRM)
Dissolved Oxygen (DO)	5.8	mg/l	≥5	USEPA 360.1:1971, SM 4500-O (23rd Edition)
Turbidity	30.3	NTU	NF	Turbidity meter
Salinity	0.18	%	NF	Multimeter
Electrical Conductivity (EC)	266	μS/cm	2250	USEPA 120.1:1982
Oil & Grease	<5.0	Mg/l	NF	APHA 5520.B

(ECR – Environment Conservation Rules, 2023; DoE – Department of Environment; NF – Not Found; USEPA – U. S. Environmental Protection Agency; SM – Standard Methods set by National Environmental Method Index, United States)

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
SURFACE WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Hijla

=====

Description of Sample : Surface Water Quality

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st- 27th March, 2025

Reporting date : 23rd April, 2025

=====

Description of Analysis

Name of the Parameter	Concentration Present	Unit	DoE Standards according to ECR, 2023	Method of analysis
Temperature	22.5	°C	-	Mercury filled thermometer
pH	8.0	-	6.5-8.5	pH meter
TDS	255	mg/l	1000	TDS meter
BOD	0.9	mg/l	≤ 6	SM 5210B (23rd Edition), SM 5210D (23rd Edition) & USEPA 405.1:1974
Dissolved Oxygen (DO)	5.1	mg/l	≥ 5	USEPA 360.1:1971, SM 4500-O (23rd Edition)
Electrical Conductivity (EC)	207	µS/cm	2250	USEPA 120.1:1982
Oil & Grease	<5.0	Mg/l	NF	APHA 5520.B

(ECR – Environment Conservation Rules, 2023; DoE – Department of Environment; NF – Not Found;
USEPA – U. S. Environmental Protection Agency; SM – Standard Methods set by National Environmental Method Index, United States)

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
SURFACE WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Laharhat

=====

Description of Sample : Surface Water Quality

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st- 27th March, 2025

Reporting date : 23rd April, 2025

=====

Description of Analysis

Name of the Parameter	Concentration Present	Unit	DoE Standards according to ECR, 2023	Method of analysis
Temperature	27.8	°C	-	Mercury filled thermometer
pH	8.8	-	6.5-8.5	pH meter
TDS	678	mg/l	1000	TDS meter
TSS	12	mg/l	NF	Gravimetric Method
BOD	1.0	mg/l	≤ 6	SM 5210B (23rd Edition), SM 5210D (23rd Edition) & USEPA 405.1:1974
COD	47	mg/l	50	Closed Reflex Method (CRM)
Dissolved Oxygen (DO)	5.9	mg/l	≥5	USEPA 360.1:1971, SM 4500-O (23 rd Edition)
Turbidity	78.5	NTU	NF	Turbidity meter
Salinity	0.14	%	NF	Multimeter
Electrical Conductivity (EC)	305	μS/cm	2250	USEPA 120.1:1982
Oil & Grease	<5.0	Mg/l	NF	APHA 5520.B

(ECR – Environment Conservation Rules, 2023; DoE – Department of Environment; NF – Not Found;
USEPA – U. S. Environmental Protection Agency; SM – Standard Methods set by National Environmental Method Index, United States)

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
SURFACE WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Ilisha

=====

Description of Sample : Surface Water Quality

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st- 27th March, 2025

Reporting date : 23rd April, 2025

=====

Description of Analysis

Name of the Parameter	Concentration Present	Unit	DoE Standards according to ECR, 2023	Method of analysis
Temperature	22.2	°C	-	Mercury filled thermometer
pH	8.1	-	6.5-8.5	pH meter
TDS	245	mg/l	1000	TDS meter
TSS	15	mg/l	NF	Gravimetric Method
BOD	0.7	mg/l	≤ 6	SM 5210B (23rd Edition), SM 5210D (23rd Edition) & USEPA 405.1:1974
COD	31	mg/l	50	Closed Reflex Method (CRM)
Dissolved Oxygen (DO)	5.7	mg/l	≥5	USEPA 360.1:1971, SM 4500-O (23 rd Edition)
Turbidity	66.7	NTU	NF	Turbidity meter
Salinity	6.76	%	NF	Multimeter
Electrical Conductivity (EC)	234	µS/cm	2250	USEPA 120.1:1982
Oil & Grease	<5.0	Mg/l	NF	APHA 5520.B

(ECR – Environment Conservation Rules, 2023; DoE – Department of Environment; NF – Not Found;
USEPA – U. S. Environmental Protection Agency; SM – Standard Methods set by National Environmental Method Index, United States)

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
SURFACE WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Bankerhat (Beduria)

=====

Description of Sample : Surface Water Quality

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st- 27th March, 2025

Reporting date : 23rd April, 2025

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Description of Analysis

Name of the Parameter	Concentration Present	Unit	DoE Standards according to ECR, 2023	Method of analysis
Temperature	26.7	°C	-	Mercury filled thermometer
pH	8.4	-	6.5-8.5	pH meter
TDS	209	mg/l	1000	TDS meter
TSS	6	mg/l	NF	Gravimetric Method
BOD	0.9	mg/l	≤ 6	SM 5210B (23rd Edition), SM 5210D (23rd Edition) & USEPA 405.1:1974
COD	28	mg/l	50	Closed Reflex Method (CRM)
Dissolved Oxygen (DO)	5.0	mg/l	≥5	USEPA 360.1:1971, SM 4500-O (23rd Edition)
Turbidity	29.1	NTU	NF	Turbidity meter
Salinity	0.86	%	NF	Multimeter
Electrical Conductivity (EC)	221	μS/cm	2250	USEPA 120.1:1982
Oil & Grease	<5.0	Mg/l	NF	APHA 5520.B

(ECR – Environment Conservation Rules, 2023; DoE – Department of Environment; NF – Not Found;
USEPA – U. S. Environmental Protection Agency; SM – Standard Methods set by National Environmental Method Index, United States)

Md. Faisal Bin Mahmud
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AECL LABORATORY ANALYSIS REPORT
SURFACE WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Daulatkhan

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Description of Sample : Surface Water Quality

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st- 27th March, 2025

Reporting date : 23rd April, 2025

=====

Description of Analysis

Name of the Parameter	Concentration Present	Unit	DoE Standards according to ECR, 2023	Method of analysis
Temperature	24.2	°C	-	Mercury filled thermometer
pH	7.9	-	6.5-8.5	pH meter
TDS	266	mg/l	1000	TDS meter
BOD	1.0	mg/l	≤ 6	SM 5210B (23rd Edition), SM 5210D (23rd Edition) & USEPA 405.1:1974
Dissolved Oxygen (DO)	5.8	mg/l	≥ 5	USEPA 360.1:1971, SM 4500-O (23rd Edition)
Electrical Conductivity (EC)	227	μS/cm	2250	USEPA 120.1:1982
Oil & Grease	<5.0	Mg/l	NF	APHA 5520.B

(ECR – Environment Conservation Rules, 2023; DoE – Department of Environment; NF – Not Found; USEPA – U. S. Environmental Protection Agency; SM – Standard Methods set by National Environmental Method Index, United States)

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Shanjana Haider
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AECL LABORATORY ANALYSIS REPORT
SURFACE WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Tojumuddin

=====

Description of Sample : Surface Water Quality

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st- 27th March, 2025

Reporting date : 23rd April, 2025

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Description of Analysis

Name of the Parameter	Concentration Present	Unit	DoE Standards according to ECR, 2023	Method of analysis
Temperature	28.3	°C	-	Mercury filled thermometer
pH	8.1	-	6.5-8.5	pH meter
TDS	258	mg/l	1000	TDS meter
TSS	7	mg/l	NF	Gravimetric Method
BOD	0.8	mg/l	≤ 6	SM 5210B (23rd Edition), SM 5210D (23rd Edition) & USEPA 405.1:1974
COD	46	mg/l	50	Closed Reflex Method (CRM)
Dissolved Oxygen (DO)	5.4	mg/l	≥5	USEPA 360.1:1971, SM 4500-O (23rd Edition)
Turbidity	16.8	NTU	NF	Turbidity meter
Salinity	1.64	%	NF	Multimeter
Electrical Conductivity (EC)	244	μS/cm	2250	USEPA 120.1:1982
Oil & Grease	<5.0	Mg/l	NF	APHA 5520.B

(ECR – Environment Conservation Rules, 2023; DoE – Department of Environment; NF – Not Found; USEPA – U. S. Environmental Protection Agency; SM – Standard Methods set by National Environmental Method Index, United States)

Md. Faisal Bin Mahmud
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AECL LABORATORY ANALYSIS REPORT
SURFACE WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Monpura

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Description of Sample : Surface Water Quality

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st- 27th March, 2025

Reporting date : 23rd April, 2025

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Description of Analysis

Name of the Parameter	Concentration Present	Unit	DoE Standards according to ECR, 2023	Method of analysis
Temperature	25.5	°C	-	Mercury filled thermometer
pH	8.3	-	6.5-8.5	pH meter
TDS	239	mg/l	1000	TDS meter
TSS	13	mg/l	NF	Gravimetric Method
BOD	0.7	mg/l	≤ 6	SM 5210B (23rd Edition), SM 5210D (23rd Edition) & USEPA 405.1:1974
COD	219	mg/l	50	Closed Reflex Method (CRM)
Dissolved Oxygen (DO)	5.9	mg/l	≥5	USEPA 360.1:1971, SM 4500-O (23rd Edition)
Turbidity	21.7	NTU	NF	Turbidity meter
Salinity	10.15	%	NF	Multimeter
Electrical Conductivity (EC)	256	μS/cm	2250	USEPA 120.1:1982
Oil & Grease	<5.0	Mg/l	NF	APHA 5520.B

(ECR – Environment Conservation Rules, 2023; DoE – Department of Environment; NF – Not Found;
USEPA – U. S. Environmental Protection Agency; SM – Standard Methods set by National Environmental Method Index, United States)

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
SURFACE WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Moju Chowdhuruy

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Description of Sample : Surface Water Quality

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st- 27th March, 2025

Reporting date : 23rd April, 2025

=====

Description of Analysis

Name of the Parameter	Concentration Present	Unit	DoE Standards according to ECR, 2023	Method of analysis
Temperature	25.6	°C	-	Mercury filled thermometer
pH	8.5	-	6.5-8.5	pH meter
TDS	214	mg/l	1000	TDS meter
TSS	18	mg/l	NF	Gravimetric Method
BOD	0.8	mg/l	≤ 6	SM 5210B (23rd Edition), SM 5210D (23rd Edition) & USEPA 405.1:1974
COD	39	mg/l	50	Closed Reflex Method (CRM)
Dissolved Oxygen (DO)	6.0	mg/l	≥5	USEPA 360.1:1971, SM 4500-O (23rd Edition)
Turbidity	39.1	NTU	NF	Turbidity meter
Salinity	0.28	%	NF	Multimeter
Electrical Conductivity (EC)	212	µS/cm	2250	USEPA 120.1:1982
Oil & Grease	<5.0	Mg/l	NF	APHA 5520.B

(ECR – Environment Conservation Rules, 2023; DoE – Department of Environment; NF – Not Found; USEPA – U. S. Environmental Protection Agency; SM – Standard Methods set by National Environmental Method Index, United States)

Md. Faisal Bin Mahmud
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AECL LABORATORY ANALYSIS REPORT
SURFACE WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Boddarhat

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Description of Sample : Surface Water Quality

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st- 27th March, 2025

Reporting date : 23rd April, 2025

=====

Description of Analysis

Name of the Parameter	Concentration Present	Unit	DoE Standards according to ECR, 2023	Method of analysis
Temperature	23.7	°C	-	Mercury filled thermometer
pH	7.9	-	6.5-8.5	pH meter
TDS	245	mg/l	1000	TDS meter
BOD	0.7	mg/l	≤ 6	SM 5210B (23rd Edition), SM 5210D (23rd Edition) & USEPA 405.1:1974
Dissolved Oxygen (DO)	5.2	mg/l	≥ 5	USEPA 360.1:1971, SM 4500-O (23rd Edition)
Electrical Conductivity (EC)	210	µS/cm	2250	USEPA 120.1:1982
Oil & Grease	<5.0	Mg/l	NF	APHA 5520.B

(ECR – Environment Conservation Rules, 2023; DoE – Department of Environment; NF – Not Found;
USEPA – U. S. Environmental Protection Agency; SM – Standard Methods set by National Environmental Method Index, United States)

Md. Faisal Bin Mahmud
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Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
SURFACE WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Motirhat

=====

Description of Sample : Surface Water Quality

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st- 27th March, 2025

Reporting date : 23rd April, 2025

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Description of Analysis

Name of the Parameter	Concentration Present	Unit	DoE Standards according to ECR, 2023	Method of analysis
Temperature	24.9	°C	-	Mercury filled thermometer
pH	8.2	-	6.5-8.5	pH meter
TDS	252	mg/l	1000	TDS meter
TSS	8	mg/l	NF	Gravimetric Method
BOD	0.9	mg/l	≤ 6	SM 5210B (23rd Edition), SM 5210D (23rd Edition) & USEPA 405.1:1974
COD	37	mg/l	50	Closed Reflex Method (CRM)
Dissolved Oxygen (DO)	5.9	mg/l	≥5	USEPA 360.1:1971, SM 4500-O (23rd Edition)
Turbidity	49.7	NTU	NF	Turbidity meter
Salinity	10.4	%	NF	Multimeter
Electrical Conductivity (EC)	233	μS/cm	2250	USEPA 120.1:1982
Oil & Grease	<5.0	Mg/l	NF	APHA 5520.B

(ECR – Environment Conservation Rules, 2023; DoE – Department of Environment; NF – Not Found; USEPA – U. S. Environmental Protection Agency; SM – Standard Methods set by National Environmental Method Index, United States)

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Tomuruddin

=====

Description of Sample : Surface Water Quality

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st– 27th March, 2025

Reporting date : 23rd April, 2025

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Description of Analysis

Name of the Parameter	Concentration Present	Unit	DoE Standards according to ECR, 2023	Method of analysis
Temperature	27.1	°C	-	Mercury filled thermometer
pH	8.4	-	6.5-8.5	pH meter
TDS	229	mg/l	1000	TDS meter
BOD	0.9	mg/l	≤ 6	SM 5210B (23rd Edition), SM 5210D (23rd Edition) & USEPA 405.1:1974
Dissolved Oxygen (DO)	5.1	mg/l	≥5	USEPA 360.1:1971, SM 4500-O (23rd Edition)
Electrical Conductivity (EC)	265	μS/cm	2250	USEPA 120.1:1982
Oil & Grease	<5.0	Mg/l	NF	APHA 5520.B

(ECR – Environment Conservation Rules, 2023; DoE – Department of Environment; NF – Not Found; USEPA – U. S. Environmental Protection Agency; SM – Standard Methods set by National Environmental Method Index, United States)

Md. Faisal Bin Mahmud
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Shanjana Haider
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ENVIRONMENTAL ENGINEERING LABORATORY



BRTC No. : 1103-49509 /24-25/CE; Dt: 16/4/2025

Ref. No.: AECL/Lab/2025/04/108; Dt: 15/4/2025

Sent by : Mr. Shahriar Ibrin Bashir, Assistant Consultant (EIA)

Adroit Environment Consultants Ltd

Project : Analysis of Surface Water

Sample Id : TR-SW 13

Source: Surface Water

Date of Test : 16/4/2025 - 23/4/2025

Location: Tomuruddin, Noskhali

TEST REPORT (PHYSICAL/ CHEMICAL/ BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Inland Surface Water use for Fisheries (ECR 2023)	Method of analysis	Minimum Detection Limit (MDL)
1	Nitrate (NO3)	mg/l	1.33	Not mentioned	SM 4500-NO3-N-F	---
2	---	---	---	---	---	---
3	---	---	---	---	---	---
4	---	---	---	---	---	---
5	---	---	---	---	---	---
6	---	---	---	---	---	---
7	---	---	---	---	---	---
8	---	---	---	---	---	---
9	---	---	---	---	---	---
10	---	---	---	---	---	---

Comments : 1. Sample was supplied by CLIENT

2. Sample was received in unsealed condition.

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/package.

Countersigned by:

Prof. Dr. Moazzem Hossain

Test-in-Charge, Dept. of Civil Engg., BUET, Dhaka-1000

Test Performed By:

Dr. Rowshan Mamtaz

Professor, Dept. of Civil Engg., BUET, Dhaka-1000



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ENVIRONMENTAL ENGINEERING LABORATORY



BRTC No. : 1103-49509 /24-25/CE; Dt: 16/4/2025

Ref. No.: AECL/Lab/2025/04/107; Dt: 15/4/2025

Sent by : Mr. Shahriar Iqbal Basher, Assistant Consultant (EIA)

Adroit Environment Consultants Ltd

Project : Analysis of Surface Water

Sample Id : DK-SW 12

Source: Surface Water

Date of Test : 16/4/2025 - 23/4/2025

Location: Daulatkhan, Bhola

TEST REPORT (PHYSICAL/ CHEMICAL/ BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Inland Surface Water use for Fisheries (ECR 2023)	Method of analysis	Minimum Detection Limit (MDL)
1	Nitrate (NO ₃)	mg/l	1.77	Not mentioned	SM 4500-NO ₃ -N-F	---
2	---	---	---	---	---	---
3	---	---	---	---	---	---
4	---	---	---	---	---	---
5	---	---	---	---	---	---
6	---	---	---	---	---	---
7	---	---	---	---	---	---
8	---	---	---	---	---	---
9	---	---	---	---	---	---
10	---	---	---	---	---	---

Comments : 1. Sample was supplied by CLIENT

2. Sample was received in unsealed condition.

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/package.

Countersigned by:

Handwritten Signature

Prof. Dr. Noazzem Hossain

Test-in-Charge, Dept. of Civil Engg., BUET, Dhaka-1000



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Test Performed By:

Handwritten Signature

Dr. Rowshan Mamtaz

Professor, Dept. of Civil Engg., BUET, Dhaka-1000

19/05/25





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ENVIRONMENTAL ENGINEERING LABORATORY



BRTC No. : 1103-49509 /24-25/CE; Dt: 16/4/2025

Ref. No.: AECL/Lab/2025/04/106; Dt: 15/4/2025

Sent by : Mr. Shahriar Ibne Bashir, Assistant Consultant (EIA)

Adroit Environment Consultants Ltd

Project : Analysis of Surface Water

Sample Id : BD-SW 11

Source: Surface Water

Date of Test : 16/4/2025 - 23/4/2025

Location: Baddarhat, Lakshmipur

TEST REPORT (PHYSICAL/ CHEMICAL/ BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

SL No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Inland Surface Water use for Fisheries (ECR 2023)	Method of analysis	Minimum Detection Limit (MDL)
1	Nitrate (NO3)	mg/l	1.77	Not mentioned	SM 4500-NO3-N-F	---
2	---	---	---	---	---	---
3	---	---	---	---	---	---
4	---	---	---	---	---	---
5	---	---	---	---	---	---
6	---	---	---	---	---	---
7	---	---	---	---	---	---
8	---	---	---	---	---	---
9	---	---	---	---	---	---
10	---	---	---	---	---	---

Comments : 1. Sample was supplied by CLIENT
2. Sample was received in unsealed condition.

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/pack

Countersigned by:

Prof. Dr. Moazzem Hossain

Test-in-Charge, Dept. of Civil Engg., BUET, Dhaka-1000



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Test Performed By:

Rowshan Mamtaz

19/05/25

Dr. Rowshan Mamtaz

Professor, Dept. of Civil Engg., BUET, Dhaka-1000





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BRTC No. : 1103-49509 /24-25/CE; Dt: 16/4/2025

Ref. No.: AECL/Lab/2025/04/106; Dt: 15/4/2025

Sent by : Mr. Shahriar Ibne Bashar, Assistant Consultant (EIA)

Adroit Environment Consultants Ltd

Project : Analysis of Surface Water

Sample Id : HJ-SW 10

Source: Surface Water

Date of Test : 16/4/2025 - 23/4/2025

Location: Hija, Barishal

TEST REPORT (PHYSICAL/ CHEMICAL/ BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Inland Surface Water use for Fisheries (ECR 2023)	Method of analysis	Minimum Detection Limit (MDL)
1	Nitrate (NO3)	mg/l	1.33	Not mentioned	SM 4500-NO3-N-F	---
2	---	---	---	---	---	---
3	---	---	---	---	---	---
4	---	---	---	---	---	---
5	---	---	---	---	---	---
6	---	---	---	---	---	---
7	---	---	---	---	---	---
8	---	---	---	---	---	---
9	---	---	---	---	---	---
10	---	---	---	---	---	---

Comments : 1. Sample was supplied by CLIENT
2. Sample was received in unsealed condition.

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/pack

Countersigned by:

Prof. Dr. Moazzem Hossain
Test-in-Charge, Dept. of Civil Engg., BUET, Dhaka-1000



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Test Performed By:

Rowshan Mamtaz

Dr. Rowshan Mamtaz
Professor, Dept. of Civil Engg., BUET, Dhaka-1000

19/05/25





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BRTC No. : 1103-49509 /24-25/CE; Dt: 16/4/2025

Ref. No.: AECL/Lab/2025/04/103; Dt: 15/4/2025

Sent by : Mr. Shahriar Ibne Bashir, Assistant Consultant (EIA)

Adroit Environment Consultants Ltd

Project : Analysis of Surface Water

Sample Id : MC-SW 9

Source: Surface Water

Date of Test : 15/4/2025 - 23/4/2025

Location: Moju Chowdhury, Lakshmipur

TEST REPORT (PHYSICAL/ CHEMICAL/ BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Inland Surface Water use for Fisheries (ECR 2023)	Method of analysis	Minimum Detection Limit (MDL)
1	Chloride (Cl ⁻)	mg/l	1750.00	Not mentioned	SM 4500-Cl ⁻	1
2	Nitrate (NO ₃ ⁻)	mg/l	1.33	Not mentioned	SM 4500-NO ₃ -N-F	---
3	---	---	---	---	---	---
4	---	---	---	---	---	---
5	---	---	---	---	---	---
6	---	---	---	---	---	---
7	---	---	---	---	---	---
8	---	---	---	---	---	---
9	---	---	---	---	---	---
10	---	---	---	---	---	---

Comments : 1. Sample was supplied by CLIENT

2. Sample was received in unsealed condition.

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/pack

Countersigned by:

Prof. Dr. Moazzem Hossain

Test-in-Charge, Dept. of Civil Engg., BUET, Dhaka-1000



EGNTJPJD

Test Performed By:

Rowshan Mamtaz

19/05/25

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BRTC No. : 1103-49509 /24-25/CE; Dt: 16/4/2025

Ref. No.: AECL/Lab/2025/04/102; Dt: 15/4/2025

Sent by : Mr. Shahriar Ibne Bashir, Assistant Consultant (EIA)

Adroit Environment Consultants Ltd

Project : Analysis of Surface Water

Sample Id : TJ-SW 8

Source: Surface Water

Date of Test : 16/4/2025 - 23/4/2025

Location: Tojmoddin, Bhola

TEST REPORT (PHYSICAL/ CHEMICAL/ BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Inland Surface Water use for Fisheries (ECR 2023)	Method of analysis	Minimum Detection Limit (MDL)
1	Chloride (Cl ⁻)	mg/l	5900.00	Not mentioned	SM 4500-Cl ⁻	1
2	Nitrate (NO ₃)	mg/l	2.66	Not mentioned	SM 4500-NO ₃ -N-F	---
3	---	---	---	---	---	---
4	---	---	---	---	---	---
5	---	---	---	---	---	---
6	---	---	---	---	---	---
7	---	---	---	---	---	---
8	---	---	---	---	---	---
9	---	---	---	---	---	---
10	---	---	---	---	---	---

Comments : 1. Sample was supplied by CLIENT
2. Sample was received in unsealed condition.

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/pack

Countersigned by:

AA

Prof. Dr. Moazzem Hossain

Test-in-Charge, Dept. of Civil Engg., BUET, Dhaka-1000



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Test Performed By:

Rowshan Mamta

Dr. Rowshan Mamta

Professor, Dept. of Civil Engg., BUET, Dhaka-1000

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BRTC No. : 1103-49509 /24-25/CE; Dt: 16/4/2025

Ref. No.: AECL/Lab/2025/04/101; Dt: 15/4/2025

Sent by : Mr. Shahriar Ibne Bashir, Assistant Consultant (EIA)

Adroit Environment Consultants Ltd

Project : Analysis of Surface Water

Sample Id : MP-SW 7

Source: Surface Water

Date of Test : 16/4/2025 - 23/4/2025

Location: Monpara, Bhola

TEST REPORT (PHYSICAL/ CHEMICAL/ BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Inland Surface Water use for Fisheries (ECR 2023)	Method of analysis	Minimum Detection Limit (MDL)
1	Chloride (Cl ⁻)	mg/l	9500.00	Not mentioned	SM 4500-Cl	1
2	Nitrate (NO ₃)	mg/l	3.09	Not mentioned	SM 4500-NO ₃ -N-F	---
3	---	---	---	---	---	---
4	---	---	---	---	---	---
5	---	---	---	---	---	---
6	---	---	---	---	---	---
7	---	---	---	---	---	---
8	---	---	---	---	---	---
9	---	---	---	---	---	---
10	---	---	---	---	---	---

Comments : 1. Sample was supplied by CLIENT
2. Sample was received in unsealed condition.

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/pack

Countersigned by:

Prof. Dr. Moazzem Hossain

Test-in-Charge, Dept. of Civil Engg., BUET, Dhaka-1000



jtx2Mg7AL

Test Performed By:

Rowshan Mamtaz
19/05/25

Dr. Rowshan Mamtaz

Professor, Dept. of Civil Engg., BUET, Dhaka-1000





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ENVIRONMENTAL ENGINEERING LABORATORY



BRTC No. : 1103-49509 /24-25/CE; Dt: 16/4/2025

Ref. No.: AECL/Lab/2025/04/100; Dt: 15/4/2025

Sent by : Mr. Shahriar Ibrin Bashir, Assistant Consultant (EIA)

Adroit Environment Consultants Ltd

Project : Analysis of Surface Water

Sample Id : IL-SW 6

Source: Surface Water

Date of Test : 15/4/2025 - 23/4/2025

Location: Ilisha, Bhola

TEST REPORT (PHYSICAL/ CHEMICAL/ BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Inland Surface Water use for Fisheries (ECR 2023)	Method of analysis	Minimum Detection Limit (MDL)
1	Chloride (Cl ⁻)	mg/l	18.00	Not mentioned	SM 4500-Cl-	1
2	Nitrate (NO ₃)	mg/l	2.21	Not mentioned	SM 4500-NO ₃ -N-F	---
3	---	---	---	---	---	---
4	---	---	---	---	---	---
5	---	---	---	---	---	---
6	---	---	---	---	---	---
7	---	---	---	---	---	---
8	---	---	---	---	---	---
9	---	---	---	---	---	---
10	---	---	---	---	---	---

Comments : 1. Sample was supplied by CLIENT

2. Sample was received in unsealed condition.

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/pack

Countersigned by:

Prof. Dr. Moazzem Hossain

Test-In-Charge, Dept. of Civil Engg., BUET, Dhaka-1000



Test Performed By:

Dr. Rowshan Mamtaz

Professor, Dept. of Civil Engg., BUET, Dhaka-1000





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BRTC No. : 1103-49509 /24-25/CE; Dt: 16/4/2025

Ref. No.: AECL/Lab/2025/04/099; Dt: 15/4/2025

Sent by : Mr. Shahriar Ibne Bashar, Assistant Consultant (EIA)

Adroit Environment Consultants Ltd

Project : Analysis of Surface Water

Sample Id : LH-SW 5

Source: Surface Water

Date of Test : 16/4/2025 - 23/4/2025

Location: Laharhat, Barishal

TEST REPORT (PHYSICAL/ CHEMICAL/ BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Inland Surface Water use for Fisheries (ECR 2023)	Method of analysis	Minimum Detection Limit (MDL)
1	Chloride (Cl ⁻)	mg/l	53.00	Not mentioned	SM 4500-Cl ⁻	1
2	Nitrate (NO ₃)	mg/l	1.77	Not mentioned	SM 4500-NO ₃ -N-F	—
3	—	—	—	—	—	—
4	—	—	—	—	—	—
5	—	—	—	—	—	—
6	—	—	—	—	—	—
7	—	—	—	—	—	—
8	—	—	—	—	—	—
9	—	—	—	—	—	—
10	—	—	—	—	—	—

Comments : 1. Sample was supplied by CLIENT

2. Sample was received in unsealed condition.

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/pack

Countersigned by:

Prof. Dr. Moazzem Hossain

Test-in-Charge, Dept. of Civil Engg., BUET, Dhaka-1000



LtCj2rdAF

Test Performed By:

Rowshan Mantaz

Dr. Rowshan Mantaz

Professor, Dept. of Civil Engg., BUET, Dhaka-1000

19/05/25





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BRTC No. : 1103-49509 /24-25/CE; Dt: 16/4/2025

Ref. No.: AECL/Lab/2025/04/098; Dt: 15/4/2025

Sent by : Mr. Shahriar Ibrah Basha, Assistant Consultant (EIA)

Adroit Environment Consultants Ltd

Project : Analysis of Surface Water

Sample Id : BH-SW 4

Source: Surface Water

Date of Test : 16/4/2025 - 23/4/2025

Location: Bankerhat, Bhola

TEST REPORT (PHYSICAL/ CHEMICAL/ BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Inland Surface Water use for Fisheries (ECR 2023)	Method of analysis	Minimum Detection Limit (MDL)
1	Chloride (Cl ⁻)	mg/l	375.00	Not mentioned	SM 4500-Cl ⁻	1
2	Nitrate (NO ₃)	mg/l	1.33	Not mentioned	SM 4500-NO ₃ -N-F	—
3	—	—	—	—	—	—
4	—	—	—	—	—	—
5	—	—	—	—	—	—
6	—	—	—	—	—	—
7	—	—	—	—	—	—
8	—	—	—	—	—	—
9	—	—	—	—	—	—
10	—	—	—	—	—	—

Comments : 1. Sample was supplied by CLIENT

2. Sample was received in unsealed condition.

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/pack

Countersigned by:

Prof. Dr. Moazzem Hossain

Test-in-Charge, Dept. of Civil Engg., BUET, Dhaka-1000



hJPJS7mBJ

Test Performed By:

Rowshan Mamta

Dr. Rowshan Mamta

Professor/Dept. of Civil Engg., BUET, Dhaka-1000

19/05/25





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BRTC No. : 1103-49509 /24-25/CE; Dt: 16/4/2025

Ref. No.: AECL/Lab/2025/04/104; Dt: 15/4/2025

Sent by : Mr. Shahriar Ibne Bashar, Assistant Consultant (EIA)

Adroit Environment Consultants Ltd

Project : Analysis of Surface Water

Sample Id : MH-SW 1

Source: Surface Water

Date of Test : 16/4/2025 - 23/4/2025

Location: Motirhat, Lakshmipur

TEST REPORT (PHYSICAL/ CHEMICAL/ BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Inland Surface Water use for Fisheries (ECR 2023)	Method of analysis	Minimum Detection Limit (MDL)
1	Chloride (Cl ⁻)	mg/l	975.00	Not mentioned	SM 4500-Cl ⁻	1
2	Nitrate (NO ₃)	mg/l	1.33	Not mentioned	SM 4500-NO ₃ -N-F	—
3	—	—	—	—	—	—
4	—	—	—	—	—	—
5	—	—	—	—	—	—
6	—	—	—	—	—	—
7	—	—	—	—	—	—
8	—	—	—	—	—	—
9	—	—	—	—	—	—
10	—	—	—	—	—	—

Comments : 1. Sample was supplied by CLIENT
2. Sample was received in unsealed condition.

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/pack

Countersigned by:

Prof. Dr. Moazzem Hossain

Test-in-Charge, Dept. of Civil Engg., BUET, Dhaka-1000



dbRJBQAH

Test Performed By:

Rowshan Mamtaz
19/05/25

Dr. Rowshan Mamtaz

Professor, Dept. of Civil Engg., BUET, Dhaka-1000





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BRTC No. : 1103-49509 /24-25/CE; Dt: 16/4/2025

Ref. No.: AECL/Lab/2025/04/096; Dt: 15/4/2025

Sent by : Mr. Shahriar Ibrn Bashir, Assistant Consultant (EIA)

Adroit Environment Consultants Ltd

Project : Analysis of Surface Water

Sample Id : BB-SW 2

Source: Surface Water

Date of Test : 16/4/2025 - 23/4/2025

Location: Bhalrab Bazar, Kishoreganj

TEST REPORT (PHYSICAL/ CHEMICAL/ BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Inland Surface Water use for Fisheries (ECR 2023)	Method of analysis	Minimum Detection Limit (MDL)
1	Chloride (Cl ⁻)	mg/l	9.00	Not mentioned	SM 4500-Cl-	1
2	Nitrate (NO ₃)	mg/l	1.77	Not mentioned	SM 4500-NO ₃ -N-F	---
3	---	---	---	---	---	---
4	---	---	---	---	---	---
5	---	---	---	---	---	---
6	---	---	---	---	---	---
7	---	---	---	---	---	---
8	---	---	---	---	---	---
9	---	---	---	---	---	---
10	---	---	---	---	---	---

Comments : 1. Sample was supplied by CUENT
2. Sample was received in unsealed condition.

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/pack

Countersigned by:

Prof. Dr. Moazzem Hossain

Test-in-Charge, Dept. of Civil Engg., BUET, Dhaka-1000



GfndLQMjDt

Test Performed By:

Rowshan Mamta

19/05/25

Dr. Rowshan Mamta

Professor, Dept. of Civil Engg., BUET, Dhaka-1000





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BRTC No. : 1103-49509 /24-25/CE; Dt: 16/4/2025

Ref. No.: AECL/Lab/2025/04/097; Dt: 15/4/2025

Sent by : Mr. Shahriar Ibrah Basha, Assistant Consultant (EIA)

Adroit Environment Consultants Ltd

Project : Analysis of Surface Water

Sample Id : AB-SW 3

Source: Surface Water

Date of Test : 16/4/2025 - 23/4/2025

Location: Ali Bazar, Shariatpur

TEST REPORT (PHYSICAL/ CHEMICAL/ BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Inland Surface Water use for Fisheries (ECR 2023)	Method of analysis	Minimum Detection Limit (MDL)
1	Chloride (Cl ⁻)	mg/l	1400.00	Not mentioned	SM 4500-Cl-	1
2	Nitrate (NO ₃)	mg/l	2.21	Not mentioned	SM 4500-NO ₃ -N-F	---
3	---	---	---	---	---	---
4	---	---	---	---	---	---
5	---	---	---	---	---	---
6	---	---	---	---	---	---
7	---	---	---	---	---	---
8	---	---	---	---	---	---
9	---	---	---	---	---	---
10	---	---	---	---	---	---

Comments : 1. Sample was supplied by CLIENT

2. Sample was received in unsealed condition.

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/package

Countersigned by:

Prof. Dr. Noazzem Hossain

Test-in-Charge, Dept. of Civil Engg., BUET, Dhaka-1000



KWgJYmQR

Test Performed By:

Rowshan Mamtaz

Dr. Rowshan Mamtaz

Professor Dept. of Civil Engg., BUET, Dhaka-1000





Government of the People's Republic of Bangladesh
Office of the Chief Chemist
Department of Public Health Engineering
Central Lab, 38-39, Mohakhali C/A, Dhaka-1212
Phone: 88-02-9681927, Fax: 88-02-9682003, Email: wqmac_central_lab@yahoo.com



Lab Memo: 1004/ CC, DPHE, CL, Dhaka

Date: 20-04-2025

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2025040080	Sample Receiving date: 19-03-2025
Ref. Memo No: AECL/2025/Nill & Dated: 19-03-2025	Sample Source: Surface Water
Sent by: Sharjana Haider, Chief Operating Officer, Adroit Environment Consultants Ltd, Dhaka	Dist: Barisal, Upa: Hizla
Care Taker: Adroit Environment Consultants Ltd. (SW-01)	Union: Bara Jalia, Vill.: Lokkipur
Sample Collection date:	Date of Testing: 19/03/2025-20/04/2025

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Chemical Oxygen Demand (COD)	4.0	4	mg/L	CRM	4.0
2	Chloride	150-600	50	mg/L	Titrimetic	-
3	Phosphate	6.0	0.63	mg/L	UVS	0.10
4	Salinity	-	0.20	%	Multimeter	-
5	Total Suspended Solid (TSS)	10	2	mg/L	Gravimetric Method	-
6	Turbidity	10	13.7	NTU	Turbidity Meter	-

Comments:

Sample was collected & supplied by client.

N.B: AAS - Atomic Absorption Spectrophotometer, UVS - UV-Visible Spectrophotometer, CRM-Closed Reflex Methods, LOQ - Limit of Quantitation.

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	 20.04.2025	1.) Name: Mita Sarker Designation: Senior Chemist	 20.04.2025
2.) Name: Taslima Akhter Designation: Sample Analyzer	 20.04.2025	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	 20.04.2025

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Department of Public Health Engineering
Central Lab, 38-39, Mohakhali C/A, Dhaka-1212
Phone: 88-02-9681927, Fax: 88-02-9682003, Email: wgmisc_central_lab@yahoo.com



Lab Memo: 1004/ CC, DPHE, CL, Dhaka

Date: 20-04-2025

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2025040081	Sample Receiving date: 19-03-2025
Ref. Memo No: AECU/2025/NII & Dated: 19-03-2025	Sample Source: Surface Water
Sent by Shanjana Haider, Chief Operating Officer, Adroit Environment Consultants Ltd, Dhaka	Dist Lakshmpur, Upa Ramgati
Care Taker: Adroit Environment Consultants Ltd. (SW-02)	Union Char Alexandar, VII: Boddarhat
Sample Collection date:	Date of Testing: 19/03/2025-20/04/2025

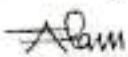
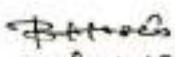
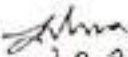
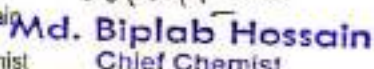
LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Chemical Oxygen Demand (COD)	4.0	40	mg/L	CRM	4.0
2	Chloride	150-600	3800	mg/L	Titrimetric	-
3	Phosphate	6.0	2.1	mg/L	UVS	0.10
4	Salinity	-	6.56	%	Multimeter	-
5	Total Suspended Solid (TSS)	10	13	mg/L	Gravimetric Method	-
6	Turbidity	10	58.1	NTU	Turbidity Meter	-

Comments:

Sample was collected & supplied by client.

N.B: AAS - Atomic Absorption Spectrophotometer, UVS - UV-Visible Spectrophotometer, CRM-Closed Reflex Methods, LOQ - Limit of Quantitation.

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	 20.04.2025	1.) Name: Mita Sarker Designation: Senior Chemist	 20.04.2025
2.) Name: Taslima Akhter Designation: Sample Analyzer	 20.04.2025	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	 Md. Biplab Hossain Chief Chemist

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Lab Memo: 1004/ CC, DPHE, CL, Dhaka

Date: 20-04-2025

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2025040082	Sample Receiving date: 19-03-2025
Ref. Memo No: AECL/2025/Nill & Dated: 19-03-2025	Sample Source: Surface Water
Sent by:Shanjana Haider ,Chief Operating Officer , Adroit Environment Consultants Ltd, Dhaka.	Dist:Bhola, Upa:Daulat Khan
Care Taker: Adroit Environment Consultants Ltd. (SW-03)	Union:Bhabanipur, Vill.:Kalia
Sample Collection date:	Date of Testing: 19/03/2025-20/04/2025

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Chemical Oxygen Demand (COD)	4.0	44	mg/L	CRM	4.0
2	Chloride	150-600	1000	mg/L	Titrimetic	-
3	Phosphate	6.0	1.6	mg/L	UVS	0.10
4	Salinity	-	1.80	%	Multimeter	-
5	Total Suspended Solid (TSS)	10	4	mg/L	Gravimetric Method	-
6	Turbidity	10	18.7	NTU	Turbidity Meter	-

Comments:

Sample was collected & supplied by client.

N.B: AAS - Atomic Absorption Spectrophotometer, UVS - UV-Visible Spectrophotometer, CRM-Closed Reflex Methods, LOQ - Limit of Quantitation.

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	 20.04.2025	1.) Name: Mita Sarker Designation: Senior Chemist	 20.04.2025
2.) Name: Taslima Akhter Designation: Sample Analyzer	 20.04.2025	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	 20.04.2025

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Central Laboratory Mohakhali, Dhaka



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Office of the Chief Chemist
Department of Public Health Engineering
Central Lab, 38-39, Mohakhali C/A, Dhaka-1212
Phone: 88-02-9881927, Fax: 88-02-9882003, Email: wqmsc_central_lab@yahoo.com



Lab Memo: 1004/ CC, DPHE, CL, Dhaka

Date: 20-04-2025

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2025040083	Sample Receiving date: 19-03-2025
Ref. Memo No: AECL/2025/Nill & Dated: 19-03-2025	Sample Source: Surface Water
Sent by:Shanjana Haider ,Chief Operating Officer , Adroit Environment Consultants Ltd, Dhaka.	Dist:Noakhali, Upa:Hatia
Care Taker: Adroit Environment Consultants Ltd. (SW-04)	Union:Tameruddin, Vill.:Tomoroddi Launch
Sample Collection date:	Date of Testing: 19/03/2025-20/04/2025

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Chemical Oxygen Demand (COD)	4.0	308	mg/L	CRM	4.0
2	Chloride	150-600	8900	mg/L	Titrimetic	-
3	Phosphate	6.0	0.90	mg/L	UVS	0.10
4	Salinity	-	13.30	%	Multimeter	-
5	Total Suspended Solid (TSS)	10	17	mg/L	Gravimetric Method	-
6	Turbidity	10	20.6	NTU	Turbidity Meter	-

Comments:

Sample was collected & supplied by client.

N.B: AAS - Atomic Absorption Spectrophotometer, UVS - UV-Visible Spectrophotometer, CRM-Closed Reflex Methods, LOQ - Limit of Quantitation.

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	 20.04.2025	1.) Name: Mita Sarker Designation: Senior Chemist	 20/04/2025
2.) Name: Taslima Akhter Designation: Sample Analyzer	 20.04.2025	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	 20/04/2025 Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka

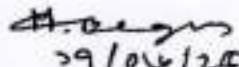
গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
কৃষি মন্ত্রণালয়
মৃত্তিকা সম্পদ উন্নয়ন ইনস্টিটিউট
বিভাগীয় গবেষণাগার, ঢাকা
মৃত্তিকা ভবন, কৃষি খামার সড়ক, ঢাকা-১২১৫।

প্রাপক:

মোঃ মেহেদী হাসান আপন
অ্যাড্ভেইট এনভায়রনমেন্ট কনসালটেন্ট লিমিটেড
বাসা -০১, রোড-১৬
সেক্টর-৭, উত্তরা, ঢাকা।

প্রেরিত ভূপৃষ্ঠস্থ পানি নমুনার বিশ্লেষিত ফলাফল

ক্রমিক নম্বর	লোকেশন	ল্যাব নম্বর	উপাদানের নাম				
			ফসফেট	সালফেট	লেড	ক্যাডমিয়াম	ক্রোমিয়াম
			সহজ্জলভ্য		মোট		
			(ppm)				
১.	ভৈরব	৯৭১০	০.৩০	১.৩২	০.০২	০.০৬	০.৬৯
২.	আলুবারজার	৯৭১১	০.১০	৭.৫৪	০.০৪	০.০৫	০.৩১
৩.	বাকেরহাট	৯৭১২	০.০৬	১৪.৬২	০.০৭	০.০৫	০.২৩
৪.	লাহরহাট	৯৭১৩	০.০৭	৬.৮২	০.০৪	০.০৪	০.৩০
৫.	ইলিশা	৯৭১৪	০.০৪	৫.৩৬	০.০৬	০.০৫	০.৩৩
৬.	মনপুরা	৯৭১৫	২.১৫	৯০.১৫	০.০৫	০.০৬	০.৩৩
৭.	তজুমদ্দিন	৯৭১৬	০.০৬	৮০.০৩	০.০৭	০.০৩	০.৩৯
৮.	মজু চৌধুরী	৯৭১৭	০.০৭	৩৯.১০	০.০৩	০.০৬	০.৫৩
৯.	মতিরহাট	৯৭১৮	০.০৪	২৪.৯৬	০.০৩	০.০৫	০.৬২


১৭/০৬/২৫
(ড. মাসুদা বেগম)
উপস্থিত বৈজ্ঞানিক কর্মকর্তা
ফোন : ০২-৪১০২৫০৬৬।

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
কৃষি মন্ত্রণালয়
মৃত্তিকা সম্পদ উন্নয়ন ইনস্টিটিউট
বিভাগীয় গবেষণাগার, ঢাকা
মৃত্তিকা ভবন, কৃষি খামার সড়ক, ঢাকা-১২১৫।

প্রাপকঃ

মোঃ মেহেদী হাসান আপন
অ্যাড্ভেইট এনভায়রনমেন্ট কনসালটেন্ট লিমিটেড
বাসা -০১, রোড-১৬
সেক্টর-৭, উত্তরা, ঢাকা।

প্রেরিত ভূপৃষ্ঠস্থ পানি নমুনার বিশ্লেষিত ফলাফল

ক্রমিক নম্বর	লোকেশন	ল্যাব নম্বর	উপাদানের নাম			
			সালফেট	লেড	ক্যাডমিয়াম	ক্রোমিয়াম
			সহজলভ্য	মোট		
			(ppm)			
১.	হিজলা	৯৭২৮	৭.২৪	০.০৩	০.০৪	০.৫০
২.	বন্দারহাট	৯৭২৯	৭৭.১৫	০.০২	০.০৬	০.৬২
৩.	দউলতঘান	৯৭৩০	৩৭.২৬	০.০৫	০.০৬	০.৫৯
৪.	তমুকদিন	৯৭৩১	৩.৪৫	০.০৪	০.০৪	০.৬৫


১৭/০৬/২৫
(ড. মাসুদা বেগম)
উর্ধ্বতন বৈজ্ঞানিক কর্মকর্তা
ফোন : ০২-৪১০২৫০৬৬।

Annexure 4 (d)

Ground Water Quality Test Report



AECL LABORATORY ANALYSIS REPORT
GROUND WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal
Project Location : Bhairab Bazar

Description of Sample : Ground Water Quality
Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)
Sampling date : 1st– 27th March, 2025
Reporting date : 27th April, 2025

Description of Analysis

Name of the Parameter	Concentration Present	DoE (Bangladesh) Standard according to ECR, 2023	WHO Standard	Unit	Method of analysis
	GW 1				
Temperature	24.4	20 - 30	-	°C	Mercury filled thermometer
pH	6.93	6.5 – 8.5	6.5 – 8.5	mg/l	pH Meter
TDS	195	1000	1000	mg/l	TDS Meter
DO	4.8	NF	NF	mg/l	USEPA 360.1:1971, SM 4500-O (23rd Edition)
TC	0	0	0	CFU/ 100 ml	ISO 9308-1:2014, USEPA 9132:1986
FC	0	0	0	CFU/ 100 ml	SM 9222 (23rd Edition), Membrane Filtration

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
GROUND WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Alubazar

=====

Description of Sample : Ground Water Quality

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st– 27th March, 2025

Reporting date : 27th April, 2025

=====

Description of Analysis

Name of the Parameter	Concentration Present	DoE (Bangladesh) Standard according to ECR, 2023	WHO Standard	Unit	Method of analysis
	GW 1				
Temperature	23.5	20 - 30	-	°C	Mercury filled thermometer
pH	7.02	6.5 – 8.5	6.5 – 8.5	mg/l	pH Meter
TDS	304	1000	1000	mg/l	TDS Meter
DO	5.1	NF	NF	mg/l	USEPA 360.1:1971, SM 4500-O (23rd Edition)
TC	0	0	0	CFU/ 100 ml	ISO 9308-1:2014, USEPA 9132:1986
FC	0	0	0	CFU/ 100 ml	SM 9222 (23rd Edition), Membrane Filtration

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
GROUND WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Hijla

=====

Description of Sample : Ground Water Quality

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st– 27th March, 2025

Reporting date : 27th April, 2025

=====

Description of Analysis

Name of the Parameter	Concentration Present	DoE (Bangladesh) Standard according to ECR, 2023	WHO Standard	Unit	Method of analysis
	GW 1				
Temperature	25.2	20 - 30	-	°C	Mercury filled thermometer
pH	6.87	6.5 – 8.5	6.5 – 8.5	mg/l	pH Meter
TDS	282	1000	1000	mg/l	TDS Meter
DO	6.2	NF	NF	mg/l	USEPA 360.1:1971, SM 4500-O (23rd Edition)
TC	0	0	0	CFU/ 100 ml	ISO 9308-1:2014, USEPA 9132:1986
FC	0	0	0	CFU/ 100 ml	SM 9222 (23rd Edition), Membrane Filtration

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
GROUND WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal
Project Location : Laharhat

=====

Description of Sample : Ground Water Quality
Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)
Sampling date : 1st– 27th March, 2025
Reporting date : 27th April, 2025

=====

Description of Analysis

Name of the Parameter	Concentration Present	DoE (Bangladesh) Standard according to ECR, 2023	WHO Standard	Unit	Method of analysis
	GW 1				
Temperature	22.9	20 - 30	-	°C	Mercury filled thermometer
pH	6.87	6.5 – 8.5	6.5 – 8.5	mg/l	pH Meter
TDS	311	1000	1000	mg/l	TDS Meter
DO	5.7	NF	NF	mg/l	USEPA 360.1:1971, SM 4500-O (23rd Edition)
TC	0	0	0	CFU/ 100 ml	ISO 9308-1:2014, USEPA 9132:1986
FC	0	0	0	CFU/ 100 ml	SM 9222 (23rd Edition), Membrane Filtration

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
GROUND WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Ilisha

=====

Description of Sample : Ground Water Quality

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st– 27th March, 2025

Reporting date : 27th April, 2025

=====

Description of Analysis

Name of the Parameter	Concentration Present	DoE (Bangladesh) Standard according to ECR, 2023	WHO Standard	Unit	Method of analysis
	GW 1				
Temperature	23.3	20 - 30	-	°C	Mercury filled thermometer
pH	6.06	6.5 – 8.5	6.5 – 8.5	mg/l	pH Meter
TDS	300	1000	1000	mg/l	TDS Meter
DO	6.0	NF	NF	mg/l	USEPA 360.1:1971, SM 4500-O (23rd Edition)
TC	0	0	0	CFU/ 100 ml	ISO 9308-1:2014, USEPA 9132:1986
FC	0	0	0	CFU/ 100 ml	SM 9222 (23rd Edition), Membrane Filtration

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
GROUND WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal
Project Location : Bankerhat (Beduria)

=====

Description of Sample : Ground Water Quality
Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)
Sampling date : 1st– 27th March, 2025
Reporting date : 27th April, 2025

=====

Description of Analysis

Name of the Parameter	Concentration Present	DoE (Bangladesh) Standard according to ECR, 2023	WHO Standard	Unit	Method of analysis
	GW 1				
Temperature	22.6	20 - 30	-	°C	Mercury filled thermometer
pH	5.55	6.5 – 8.5	6.5 – 8.5	mg/l	pH Meter
TDS	288	1000	1000	mg/l	TDS Meter
DO	5.5	NF	NF	mg/l	USEPA 360.1:1971, SM 4500-O (23rd Edition)
TC	0	0	0	CFU/ 100 ml	ISO 9308-1:2014, USEPA 9132:1986
FC	0	0	0	CFU/ 100 ml	SM 9222 (23rd Edition), Membrane Filtration

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer

AECL LABORATORY ANALYSIS REPORT
GROUND WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Daulatkhan

=====

Description of Sample : Ground Water Quality

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st– 27th March, 2025

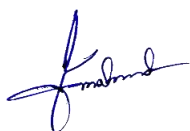
Reporting date : 27th April, 2025

=====

Description of Analysis

Name of the Parameter	Concentration Present	DoE (Bangladesh) Standard according to ECR, 2023	WHO Standard	Unit	Method of analysis
	GW 1				
Temperature	26.8	20 - 30	-	°C	Mercury filled thermometer
pH	6.02	6.5 – 8.5	6.5 – 8.5	mg/l	pH Meter
TDS	311	1000	1000	mg/l	TDS Meter
DO	5.4	NF	NF	mg/l	USEPA 360.1:1971, SM 4500-O (23rd Edition)
TC	0	0	0	CFU/ 100 ml	ISO 9308-1:2014, USEPA 9132:1986
FC	0	0	0	CFU/ 100 ml	SM 9222 (23rd Edition), Membrane Filtration

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.



Md. Faisal Bin Mahmud
Sr. Chemist



Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
GROUND WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal

Project Location : Tojumuddin

=====

Description of Sample : Ground Water Quality

Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)

Sampling date : 1st– 27th March, 2025

Reporting date : 27th April, 2025

=====

Description of Analysis

Name of the Parameter	Concentration Present	DoE (Bangladesh) Standard according to ECR, 2023	WHO Standard	Unit	Method of analysis
	GW 1				
Temperature	24.9	20 - 30	-	°C	Mercury filled thermometer
pH	7.13	6.5 – 8.5	6.5 – 8.5	mg/l	pH Meter
TDS	293	1000	1000	mg/l	TDS Meter
DO	5.9	NF	NF	mg/l	USEPA 360.1:1971, SM 4500-O (23rd Edition)
TC	0	0	0	CFU/ 100 ml	ISO 9308-1:2014, USEPA 9132:1986
FC	0	0	0	CFU/ 100 ml	SM 9222 (23rd Edition), Membrane Filtration

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
GROUND WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal
Project Location : Monpura

=====

Description of Sample : Ground Water Quality
Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)
Sampling date : 1st– 27th March, 2025
Reporting date : 27th April, 2025

=====

Description of Analysis

Name of the Parameter	Concentration Present	DoE (Bangladesh) Standard according to ECR, 2023	WHO Standard	Unit	Method of analysis
	GW 1				
Temperature	26.6	20 - 30	-	°C	Mercury filled thermometer
pH	7.29	6.5 – 8.5	6.5 – 8.5	mg/l	pH Meter
TDS	317	1000	1000	mg/l	TDS Meter
DO	6.7	NF	NF	mg/l	USEPA 360.1:1971, SM 4500-O (23rd Edition)
TC	0	0	0	CFU/ 100 ml	ISO 9308-1:2014, USEPA 9132:1986
FC	0	0	0	CFU/ 100 ml	SM 9222 (23rd Edition), Membrane Filtration

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
GROUND WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal
Project Location : Moju Chowdhury

=====

Description of Sample : Ground Water Quality
Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)
Sampling date : 1st– 27th March, 2025
Reporting date : 27th April, 2025

=====

Description of Analysis

Name of the Parameter	Concentration Present	DoE (Bangladesh) Standard according to ECR, 2023	WHO Standard	Unit	Method of analysis
	GW 1				
Temperature	23.3	20 - 30	-	°C	Mercury filled thermometer
pH	6.53	6.5 – 8.5	6.5 – 8.5	mg/l	pH Meter
TDS	202	1000	1000	mg/l	TDS Meter
DO	4.9	NF	NF	mg/l	USEPA 360.1:1971, SM 4500-O (23rd Edition)
TC	0	0	0	CFU/ 100 ml	ISO 9308-1:2014, USEPA 9132:1986
FC	0	0	0	CFU/ 100 ml	SM 9222 (23rd Edition), Membrane Filtration

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
GROUND WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal
Project Location : Boddarhat

=====

Description of Sample : Ground Water Quality
Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)
Sampling date : 1st– 27th March, 2025
Reporting date : 27th April, 2025

=====

Description of Analysis

Name of the Parameter	Concentration Present	DoE (Bangladesh) Standard according to ECR, 2023	WHO Standard	Unit	Method of analysis
	GW 1				
Temperature	24.2	20 - 30	-	°C	Mercury filled thermometer
pH	6.88	6.5 – 8.5	6.5 – 8.5	mg/l	pH Meter
TDS	222	1000	1000	mg/l	TDS Meter
DO	6.0	NF	NF	mg/l	USEPA 360.1:1971, SM 4500-O (23rd Edition)
TC	0	0	0	CFU/ 100 ml	ISO 9308-1:2014, USEPA 9132:1986
FC	0	0	0	CFU/ 100 ml	SM 9222 (23rd Edition), Membrane Filtration

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
GROUND WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal
Project Location : Motirhat

=====

Description of Sample : Ground Water Quality
Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)
Sampling date : 1st– 27th March, 2025
Reporting date : 27th April, 2025

=====

Description of Analysis

Name of the Parameter	Concentration Present	DoE (Bangladesh) Standard according to ECR, 2023	WHO Standard	Unit	Method of analysis
	GW 1				
Temperature	25.6	20 - 30	-	°C	Mercury filled thermometer
pH	7.17	6.5 – 8.5	6.5 – 8.5	mg/l	pH Meter
TDS	301	1000	1000	mg/l	TDS Meter
DO	5.2	NF	NF	mg/l	USEPA 360.1:1971, SM 4500-O (23rd Edition)
TC	0	0	0	CFU/ 100 ml	ISO 9308-1:2014, USEPA 9132:1986
FC	0	0	0	CFU/ 100 ml	SM 9222 (23rd Edition), Membrane Filtration

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



AECL LABORATORY ANALYSIS REPORT
GROUND WATER QUALITY TEST REPORT

Project Name : Consultancy Services for Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Preparation of Landing Stations/Launch Ghats and Passenger River Terminal
Project Location : Tomuruddin

=====

Description of Sample : Ground Water Quality
Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)
Sampling date : 1st– 27th March, 2025
Reporting date : 27th April, 2025

=====

Description of Analysis

Name of the Parameter	Concentration Present	DoE (Bangladesh) Standard according to ECR, 2023	WHO Standard	Unit	Method of analysis
	GW 1				
Temperature	25.8	20 - 30	-	°C	Mercury filled thermometer
pH	7.23	6.5 – 8.5	6.5 – 8.5	mg/l	pH Meter
TDS	332	1000	1000	mg/l	TDS Meter
DO	6.4	NF	NF	mg/l	USEPA 360.1:1971, SM 4500-O (23rd Edition)
TC	0	0	0	CFU/ 100 ml	ISO 9308-1:2014, USEPA 9132:1986
FC	0	0	0	CFU/ 100 ml	SM 9222 (23rd Edition), Membrane Filtration

Comment: From the aforementioned results it is discernible that all the parameters are inside the allowable limits.

Md. Faisal Bin Mahmud
Sr. Chemist

Shanjana Haider
Chief Operating Officer



BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY (BUET)

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ENVIRONMENTAL ENGINEERING LABORATORY



BRTC No. : 1103-49510/24-25/CE Dt: 15/4/2025

Ref. No. : ARCL/Lab/202504/109; Dt: 15/4/2025

Sent by : Mr. Shahriar Iqbal Bashor, Assistant Consultant (EIA)

Adroit Environment Consultants Ltd

Project : Analysis of Ground Water

Sample ID : BS-GW 1

Source: Ground Water

Date of Test : 15/4/2025 - 27/4/2025

Location: Dhairab Bazar, Kishoreganj

TEST REPORT (PHYSICAL/CHEMICAL/BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Drinking Water (BSR 2023)	WHO Guideline Values, 2022	Method of analysis	Minimum Detection Limit (MDL)
1	Chloride (Cl ⁻)	mg/l	593.30	250 (1000 Coastal Area)	250	SM 4500-Cl-	1
2	Nitrate (NO ₃ ⁻)	mg/l	4.97	45	50	SM 4500-NO ₃ -N.F	—
3	Arsenic (As)	mg/l	2.21	0.05	0.05	SM 3113 B	0.001
4	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—
6	—	—	—	—	—	—	—
7	—	—	—	—	—	—	—
8	—	—	—	—	—	—	—
9	—	—	—	—	—	—	—
10	—	—	—	—	—	—	—

a. Health based guideline, b. Guideline based on BMR concentrations

Comments : 1. Sample was supplied by CLIENT
2. Sample was received in a sealed condition.

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/pack.

Countersigned by:

Prof. Dr. Maszumi Hossain
Teacher-in-Charge, Dept. of Civil Engg., BUET, Dhaka-1000



Test Performed by:

Rowshan Marfat 03/05/25

Dr. Rowshan Marfat
Professor, Dept. of Civil Engg., BUET, Dhaka-1000





BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY (BUET)

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ENVIRONMENTAL ENGINEERING LABORATORY



BRTC No.: 1183-49510/24-25/CE; Dt: 16/4/2025

Ref. No.: AEC/Lab/2025/04/118; Dt: 16/4/2025

Sent by: Mr. Shahria Isha Bashir, Assistant Consultant (EIA)

Admit Environment Consultants Ltd

Project: Analysis of Ground Water

Sample id: AG-GW 1

Source: Ground Water

Date of Test: 16/4/2025 - 27/4/2025

Location: Ali Bazar, Sherolpur

TEST REPORT (PHYSICAL/CHEMICAL/BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Drinking Water (BSR 2023)	WHO Guideline Values, 2022	Method of analysis	Minimum Detection Limit (MDL)
1.	Chloride (Cl ⁻)	mg/l	35.00	250 (1000 Coastal Area)	250	SM 4500-Cl-	1
2.	Nitrate (NO ₃ ⁻)	mg/l	1.77	45	50	SM 4500-NO ₃ -MUT	—
3.	Arsenic (As)	mg/l	0.012	0.05	0.01	SM 3113.0	0.001
4.	—	—	—	—	—	—	—
5.	—	—	—	—	—	—	—
6.	—	—	—	—	—	—	—
7.	—	—	—	—	—	—	—
8.	—	—	—	—	—	—	—
9.	—	—	—	—	—	—	—
10.	—	—	—	—	—	—	—

1. Total dissolved solids, 2. Sulfate based on the concentration

Comments: 1. Sample was supplied by CLIENT

2. Sample was received in unsealed condition.

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/pack.

Counter signed by:

Prof. Dr. Moazzam Hossain

Test in Charge, Dept. of Civil Engg., BUET, Dhaka-1000



Test Performed by:

Rowshan Hossain
03/05/25
Dr. Rowshan Hossain
Professor, Dept. of Civil Engg., BUET, Dhaka-1000





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ENVIRONMENTAL ENGINEERING LABORATORY



BRTC No.: 1183-49598 (24-15KCE, Dt: 15/03/2025)

Ref. No.: ABCL/Lab/2025/01117, Dt: 15/03/2025

Sent by: Mr. Shahriar Iqbal Basher, Assistant Consultant (EIA)

Address: Environment Consultants Ltd

Project: Analysis of Ground Water

Sample Id: HJ-GW 1

Source: Ground Water

Date of Test: 15/03/2025 - 27/03/2025

Location: Hills, Barisal

TEST REPORT (PHYSICAL/CHEMICAL/BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Drinking Water (ECR 2023)	WHO Guideline Values, 2022	Method of analysis	Minimum Detection Limit (MDL)
1	Nitrate (NO3)	mg/l	1.32	45	50	SM 4503-NO3-N-F	—
2	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—
6	—	—	—	—	—	—	—
7	—	—	—	—	—	—	—
8	—	—	—	—	—	—	—
9	—	—	—	—	—	—	—
10	—	—	—	—	—	—	—

a. result based guideline, b. guideline based on other considerations

Comments: 1. Sample was supplied by CLIENT
2. Sample was received in unsealed condition.

Important Notes: Samples are supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/pack.

Countersigned by:

Prof. Dr. Nazim Hossain
Techno Charge, Dept. of Civil Engg., BUET, Dhaka-1000



41038AGB7

Test Performed by:

Rakha Hossain

03/05/25

Dr. Rakshan Marfat

Professor, Dept. of Civil Engg., BUET, Dhaka-1000





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ENVIRONMENTAL ENGINEERING LABORATORY



BRTC No.: 1103-45516/24-29CE, Dt: 16/4/2025

Ref. No.: AECL/Lab/2025/04/12, Dt: 15/4/2025

Sent by: Mr. Shahriar Iqbal Basher, Assistant Consultant (EIA)
Adroit Environment Consultants Ltd

Project: Analysis of Ground Water

Sample No.: LH-GW1

Source: Ground Water

Date of Test: 10/4/2025 - 27/4/2025

Location: Labortat, Barishal

TEST REPORT (PHYSICAL/CHEMICAL/BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Drinking Water (BSR 2023)	WHO Guidelines Volume, 2022	Method of analysis	Minimum Detection Limit (MDL)
1	Chloride (Cl ⁻)	mg/l	18.89	250 (1000 Caustic Alum)	250	SM 4500-Cl-	1
2	Nitrate (NO ₃ ⁻)	mg/l	1.97	45	50	SM 4500-NO ₃ -F	---
3	Ammonia (NH ₄ ⁺)	mg/l	<MDL	0.05	0.01	SM 3113-B	0.001
4	---	---	---	---	---	---	---
5	---	---	---	---	---	---	---
6	---	---	---	---	---	---	---
7	---	---	---	---	---	---	---
8	---	---	---	---	---	---	---
9	---	---	---	---	---	---	---
10	---	---	---	---	---	---	---

4. Health based guideline, 5. Guideline based on other considerations

- Comments:
1. Sample was supplied by CLIENT
 2. Sample was received in unsealed condition.

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. We recommend that samples are sent in a secure and sealed envelope.

Consented by:

Prof. Dr. Moazzem Hossain
Test-in-Charge, Dept. of Civil Engg., BUET, Dhaka-1000



Test Performed by:

Dr. Ravshan Mamtaz
Professor, Dept. of Civil Engg., BUET, Dhaka-1000





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ENVIRONMENTAL ENGINEERING LABORATORY



BRTC No: 1703-45010/24-25/CE, Dt: 18/04/2025

Ref. No.: AEC/Lab/2025/24/113, Dt: 19/04/2025

Sent by: Mr. Shahria Iqbal Bashir, Assistant Consultant (DIA)

Adroit Environment Consultants Ltd

Project: Analysis of Ground Water

Sample ID: R-GW 1

Source: Ground Water

Date of Test: 18/04/2025 - 27/04/2025

Location: Faka, Dhaka

TEST REPORT (PHYSICAL/CHEMICAL/BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Drinking Water (ECR 2023)	WHO Guideline Value, 2012	Method of analysis	Minimum Detection Limit (MDL)
1	Chloride (Cl ⁻)	mg/l	355.89	250 (1000 Coastal Area)	250	SM 4500-Cl ⁻	1
2	Nitrate (NO ₃ ⁻)	mg/l	1.77	45	50	SM 4500-NO ₃ -H.F	—
3	Arsenic (As)	mg/l	0.026	0.05	0.01	SM 2113 B	0.001
4	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—
6	—	—	—	—	—	—	—
7	—	—	—	—	—	—	—
8	—	—	—	—	—	—	—
9	—	—	—	—	—	—	—
10	—	—	—	—	—	—	—

a. Health based guideline, b. Guideline based on other considerations

Comments: 1. Sample was supplied by CLIENT
2. Sample was received in a sealed condition

Important Note: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. We recommended that samples are sent in a secure and sealed cover/pack.

Consented by:

Prof. Dr. Maszzen Hossain
Test-in-Charge, Dept. of Civil Engg., BUET, Dhaka-1000



Test Performed by:

Rowshan Hossain
03/05/25
Dr. Rowshan Hossain
Professor, Dept. of Civil Engg., BUET, Dhaka-1000





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ENVIRONMENTAL ENGINEERING LABORATORY



BRTC No.: 1183-49510 (24-25CE); Dt: 16/4/2025

Ref. No.: AEQU/Lab/2025/04/11; Dt: 16/4/2025

Sent by: Mr. Shahriar Ibrahima, Assistant Consultant (QA)

Adroit Environmental Consultants Ltd

Project: Analysis of Ground Water

Sample Id: BH-GW 1

Source: Ground Water

Date of Test: 10/4/2025 - 27/4/2025

Location: Baranail, Dhaka

TEST REPORT (PHYSICAL/CHEMICAL/BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameter	Unit	Concentration (Present)	Bangladesh Standard for Drinking Water (ECR 2823)	WHO Guideline Values, 2022	Method of analysis	Minimum Detection Limit (MDL)
1	Chloride (Cl ⁻)	mg/l	183.00	250 (1000 Coasts Area)	250	SM 4500-Cl	1
2	Nitrate (NO ₃)	mg/l	1.65	45	50	SM 4500-NO ₃ -R-F	—
3	Arsenic (As)	mg/l	0.020	0.05	0.01	SM 3113 B	0.001
4	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—
6	—	—	—	—	—	—	—
7	—	—	—	—	—	—	—
8	—	—	—	—	—	—	—
9	—	—	—	—	—	—	—
10	—	—	—	—	—	—	—

A: Health based guideline, B: Guideline based on other consideration

- Comments:
1. Sample was supplied by CLIENT
 2. Sample was received in untreated condition.

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed container.

Counter signed by:

Prof. Dr. Mazzeen Hossain
 Testis-Charge, Dept. of Civil Engg., BUET, Dhaka-1000



Test Performed by:

Rowshan Hossain
 Dr. Rowshan Hossain 03/05/25
 Professor, Dept. of Civil Engg., BUET, Dhaka-1000





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ENVIRONMENTAL ENGINEERING LABORATORY



BRTC No.: 1103-42510 (24-25)CE; Dt: 16/10/2025

Ref. No.: AECL/Lab/2025/04/116; Dt: 16/10/2025

Sent by: Mr. Shahriar Rino Saitar, Assistant Consultant (E/W)

Adrol Environment Consultants Ltd

Project: Analysis of Ground Water

Sample Id: DK-GW 1

Source: Ground Water

Date of Test: 15/10/2025 - 27/10/2025

Location: Daulatkhola, Dhaka

TEST REPORT (PHYSICAL/CHEMICAL/ BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Drinking Water (BSR 2025)	WHO Guideline Values, 2022	Method of analysis	Minimum Detection Limit (MDL)
1	Nitrate (NO3)	mg/l	2.25	45	50	DR4500-NO3-N-F	—
2	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—
6	—	—	—	—	—	—	—
7	—	—	—	—	—	—	—
8	—	—	—	—	—	—	—
9	—	—	—	—	—	—	—
10	—	—	—	—	—	—	—

A: Health based guideline, B: Guideline based on other considerations

- Comments: 1. Sample was supplied by CLIENT
2. Sample was received in unsealed condition.

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed container.

Countersigned by:

Prof. Dr. Maszsum Hossain
Testin-Charge, Dept of Civil Engg., BUET, Dhaka-1000



Test Performed by:

Rouba Hossain
03/05/25
Dr. Roushan Mantaz
Professor, Dept of Civil Engg., BUET, Dhaka-1000





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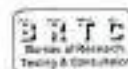
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ENVIRONMENTAL ENGINEERING LABORATORY



BRTC No. : 1103-0310/24-25/CE; Dt: 19/4/2025

Ref. No.: AECL/Lab/2025/04115; Dt: 15/4/2025

Sent by : Mr. Shahin Rone Sohar, Assistant Consultant (EIA)

Adroit Environment Consultants Ltd

Project : Analysis of Ground Water

Sample Id : TJ-GW-1

Source: Ground Water

Date of Test : 19/4/2025 - 27/4/2025

Location: Tejgaon, Dhaka

TEST REPORT (PHYSICAL/CHEMICAL/BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Drinking Water (BSR 2022)	WHO Guideline Values, 2022	Method of analysis	Minimum Detection Limit (MDL)
1	Chloride (Cl ⁻)	mg/l	70.06	250 (1000 Coastal Area)	250	SM 4500-Cl ⁻	1
2	Nitrate (NO ₃ ⁻)	mg/l	1.77	45	50	SM 4500-NO ₃ -H-F	—
3	Arsenic (As)	mg/l	<0.01	0.05	0.01	SM 3113-B	0.001
4	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—
6	—	—	—	—	—	—	—
7	—	—	—	—	—	—	—
8	—	—	—	—	—	—	—
9	—	—	—	—	—	—	—
10	—	—	—	—	—	—	—

1. Health based guideline, 2. Guideline based on other considerations

Comments : 1. Sample was supplied by CLIENT

2. Sample was received in unsealed condition

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/pack.

Courtesyed by:

Prof. Dr. Rowshan Manna

Test-In-Charge, Dept. of Civil Engg., BUET, Dhaka-1000



NR 38107

Test Performed by:

Dr. Rowshan Manna

Professor, Dept. of Civil Engg., BUET, Dhaka-1000





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ENVIRONMENTAL ENGINEERING LABORATORY



BRTC No.: 1903-45618/24-29CE; Dt: 19/4/2025

Ref. No.: AECLab/202504/154; Dt: 19/4/2025

Sent by: Mr. Shahriar Isha Bashor, Assistant Consultant (EIA)

Adick Environment Consultants Ltd

Project: Analysis of Ground Water

Sample No.: MP-OW 1

Source: Ground Water

Date of Test: 19/4/2025 - 27/4/2025

Location: Mongura, Shela

TEST REPORT (PHYSICAL/CHEMICAL/BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

SL No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Drinking Water (BSR 2023)	WHO Guideline Values, 2022	Method of analysis	Minimum Detection Limit (MDL)
1	Chloride (Cl ⁻)	mg/l	6.90	250 (1000 Coastal Area)	250	SV-4500-CL	1
2	Nitrox (NO ₃)	mg/l	5.43	45	50	SM 4500-NO ₃ -N/P	—
3	Arsenic (As)	mg/l	<MDL	0.05	0.03	SN 2113-B	0.001
4	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—
6	—	—	—	—	—	—	—
7	—	—	—	—	—	—	—
8	—	—	—	—	—	—	—
9	—	—	—	—	—	—	—
10	—	—	—	—	—	—	—

a. Method based guidelines, b. Guidelines based on other considerations

Comments: 1. Sample was supplied by CLIENT
2. Sample was received in unsealed condition.

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples received. It is recommended that samples are sent in a secure and sealed cover/pack.

Confirmed by:

Prof. Dr. Mostafiz Hossain
Task-in-Charge, Dept. of Civil Engg., BUET, Dhaka-1000



Test Performed by:

Rowshan Hossain
03/05/25
Dr. Rowshan Hossain
Professor, Dept. of Civil Engg., BUET, Dhaka-1000





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BRTC No. : 1180-49510/24-25CE; Dt: 15/4/2025

Ref. No.: AECL/En/2025/04/116; Dt: 15/4/2025

Sent by : Mr. Shahria Rone Bashat, Assistant Consultant (EIA)

Adria (Environment) Consultants Ltd

Project : Analysis of Ground Water

Sample ID : BGC-GW 1

Source: Ground Water

Date of Test : 15/4/2025 - 27/4/2025

Location: Maja Chowdhary, Lakshimpur

TEST REPORT (PHYSICAL/CHEMICAL/BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Drinking Water (BSR 1923)	WHO Guideline Values, 2022	Method of analysis	Minimum Detection Limit (MDL)
1	Chloride (Cl)	mg/l	268.86	250 (1000 Coastal Area)	250	SM 4500-Cl	1
2	Nitrate (NO3)	mg/l	4.43	45	50	SM 4500-NO3-MF	—
3	Arsenic (As)	mg/l	0.01	0.05	0.01	SM 3113-B	0.001
4	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—
6	—	—	—	—	—	—	—
7	—	—	—	—	—	—	—
8	—	—	—	—	—	—	—
9	—	—	—	—	—	—	—
10	—	—	—	—	—	—	—

a. Health-based guideline, b. Guideline based on other considerations

Comments : 1. Sample was supplied by CUENT

2. Sample was received in unsealed condition.

Important Notice: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed container.

Counter signed by:

Prof. Dr. Moazzem Hossain
 Test-in-Charge, Dept. of Civil Engg., BUET, Dhaka-1000



Test Performed by:

Rowshan Hossain
 03/05/25
 Dr. Rowshan Hossain
 Professor, Dept. of Civil Engg., BUET, Dhaka-1000





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BETC No.: 1183-49516 (24-35)CE; Dt: 16/4/2025

Ref. No.: JECU/01/2025/04/118; Dt: 15/4/2025

Sent by: Mr. Shahria Rana Bashir, Assistant Consultant (EW)

Adroit Environment Consultants Ltd

Project: Analysis of Ground Water

Sample Id: BD-GW-1

Source: Ground Water

Date of Test: 16/4/2025 - 27/4/2025

Location: Baddahat, Lakshimpur

TEST REPORT (PHYSICAL/CHEMICAL/BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Drinking Water (BS 2022)	WHO Guideline Value, 2022	Method of analysis	Maximum Detection Limit (MDL)
1	Total (TDS)	mg/l	2.86	45	50	GB (GBS) (CO) (F)	---
2	---	---	---	---	---	---	---
3	---	---	---	---	---	---	---
4	---	---	---	---	---	---	---
5	---	---	---	---	---	---	---
6	---	---	---	---	---	---	---
7	---	---	---	---	---	---	---
8	---	---	---	---	---	---	---
9	---	---	---	---	---	---	---
10	---	---	---	---	---	---	---

a. Health based guideline; b. Guideline based on other consideration

- Comments: 1. Sample was supplied by CLIENT
 2. Sample was received in treated condition.

Important Notice: Samples as supplied to us have been tested in our laboratory. BETC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/pack.

Countersigned by:

Prof. Dr. Moazzam Hossain
 Test in Charge, Dept. of Civil Engg., BUET, Dhaka-1000



Test Performed by:

Roufika Hossain
 03/05/25
 Dr. Roufika Hossain
 Professor, Dept. of Civil Engg., BUET, Dhaka-1000





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ENVIRONMENTAL ENGINEERING LABORATORY



BRTC No.: 1103-45519/24-25CE; Dt: 16/4/2025

Ref. No.: AED/Lab782594/21; Dt: 15/4/2025

Sent by: Mr. Shahvir Iqbal Bashor, Assistant Consultant (EIA)

Adrol Environment Consultants Ltd

Project: Analysis of Ground Water

Sample Id: MH-GW 1

Source: Ground Water

Date of Test: 09/4/2025 - 27/4/2025

Location: Mafhat, Lakhimpur

TEST REPORT (PHYSICAL/CHEMICAL/BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

SL No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Drinking Water (BSR 2023)	WHO Guideline Values, 2012	Method of analysis	Minimum Detection Limit (MDL)
1	Chloride (Cl ⁻)	mg/l	135.68	250 (1000 Coastal Area)	250	SM 4500-Cl	1
2	Nitrate (NO ₃ ⁻)	mg/l	8.85	45	50	SM 4500-NO ₃ -N-F	—
3	Arsenic (As)	mg/l	0.04	10.00	0.01	SM 5113-B	0.001
4	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—
6	—	—	—	—	—	—	—
7	—	—	—	—	—	—	—
8	—	—	—	—	—	—	—
9	—	—	—	—	—	—	—
10	—	—	—	—	—	—	—

A: Health based guideline, B: Nutrient based or other considerations

Comments: 1. Sample was supplied by CLIENT
2. Sample was received in unsealed condition.

Important Notice: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. We recommended that samples are sent in a secure and sealed container.

Consentified by:

Prof. Dr. Nazim Hossain
Test-in-Charge, Dept. of Civil Engg., BUET, Dhaka-1000



bb-3721gJ3

Test Performed by:

Roufika Hossain

Dr. Roufika Hossain 03/05/25
Professor, Dept. of Civil Engg., BUET, Dhaka-1000





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ENVIRONMENTAL ENGINEERING LABORATORY



BRTC No.: 1103-49510 (24-25/05); Dt: 16/4/2025

Ref. No.: AECLE-2025/04/129; Dt: 15/4/2025

Sent by: Mr. Shahriar Iqbal Bashir, Assistant Consultant (EW)

Adroit Environment Consultants Ltd

Project: Analysis of Ground Water

Sample ID: TR-GW-1

Source: Ground Water

Date of Test: 18/4/2025 - 27/4/2025

Location: Taramanikur Hospital

TEST REPORT (PHYSICAL/CHEMICAL/ BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Drinking Water (BSR 2023)	WHO Guideline Values, 2022	Method of analysis	Minimum Detection Limit (MDL)
1	Alkalinity (MCO)	mg/l	3.69	45	50	SI/4900 HCO3-M-F	---
2	---	---	---	---	---	---	---
3	---	---	---	---	---	---	---
4	---	---	---	---	---	---	---
5	---	---	---	---	---	---	---
6	---	---	---	---	---	---	---
7	---	---	---	---	---	---	---
8	---	---	---	---	---	---	---
9	---	---	---	---	---	---	---
10	---	---	---	---	---	---	---

a. Health based guideline, b. Guideline based on other conditions

- Comments: 1. Sample was supplied by CLIENT
2. Sample was received in unsealed condition.

Important Note: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed coverpack.

Counter signed by:

Prof. Dr. Maszsum Hossain
Test-in-Charge, Dept. of Civil Engg., BUET, Dhaka-1000



LJ8TE4ZZY

Test Performed by:

Roushan Hossain

03/05/25

Dr. Roushan Hossain

Professor, Dept. of Civil Engg., BUET, Dhaka-1000





Government of the People's Republic of Bangladesh
Office of the Chief Chemist
Department of Public Health Engineering
Central Lab, 38-39, Mohakhali C/A, Dhaka-1212
Phone: 88-02-9881927, Fax: 88-02-9882003, Email: wqmsc_central_lab@yahoo.com



Lab Memo: 1004/ CC, DPHE, CL, Dhaka

Date: 20-04-2025

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2025040084	Sample Receiving date: 19-03-2025
Ref. Memo No: AECL/2025/Nil & Dated: 19-03-2025	Sample Source: Ground Water
Sent by: Sharjana Haider, Chief Operating Officer, Adroit Environment Consultants Ltd, Dhaka.	Dist: Barisal, Upa: Hizla
Care Taker: Adroit Environment Consultants Ltd. (GW-01)	Union: Bara Jalia, Vill: Lakkhipur
Sample Collection date:	Date of Testing: 19/03/2025-20/04/2025

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.001	mg/L	AAS	0.001
2	Calcium (Ca)	75	30	mg/L	AAS	0.17
3	Chloride	150-600	70	mg/L	Titrimetic	-
4	Iron (Fe)	0.3-1	0.24	mg/L	AAS	0.05
5	Magnesium (Mg)	30-35	5.5	mg/L	AAS	0.05
6	Phosphate	6.0	0.84	mg/L	UVS	0.10

Comments:

Sample was collected & supplied by client.

N.B: AAS - Atomic Absorption Spectrophotometer, UVS - UV-Visible Spectrophotometer, CRM-Closed Reflex Methods, LOQ - Limit of Quantitation.

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	 20.04.2025	1.) Name: Mita Sarker Designation: Senior Chemist	 20.04.2025
2.) Name: Taslima Akhter Designation: Sample Analyzer	 20.04.2025	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	 20.04.2025

Md. Biplab Hossain
Chief Chemist
Department of Public Health Engineering
Central Laboratory Mohakhali, Dhaka



Government of the People's Republic of Bangladesh
Office of the Chief Chemist
Department of Public Health Engineering
Central Lab, 38-39, Mohakhali C/A, Dhaka-1212
 Phone: 88-02-9881927, Fax: 88-02-9882003, Email: wqmsc_central_lab@yahoo.com



Lab Memo: 1004/ CC, DPHE, CL, Dhaka

Date: 20-04-2025

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2025040085	Sample Receiving date: 19-03-2025
Ref. Memo No: AECL/2025/NII & Dated: 19-03-2025	Sample Source: Ground Water
Sent by:Shanjana Haider ,Chief Operating Officer , Adroit Environment Consultants Ltd, Dhaka.	Dist:Lakshmipur, Upa:Ramgati
Care Taker: Adroit Environment Consultants Ltd. (GW-02)	Union:Char Alexandar, Vill.:Boddarhat
Sample Collection date:	Date of Testing: 19/03/2025-20/04/2025

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.046	mg/L	AAS	0.001
2	Calcium (Ca)	75	40	mg/L	AAS	0.17
3	Chloride	150-600	160	mg/L	Titrimetic	-
4	Iron (Fe)	0.3-1	0.18	mg/L	AAS	0.05
5	Magnesium (Mg)	30-35	38	mg/L	AAS	0.05
6	Phosphate	6.0	0.92	mg/L	UVS	0.10

Comments:

Sample was collected & supplied by client.

N.B: AAS - Atomic Absorption Spectrophotometer, UVS - UV-Visible Spectrophotometer, CRM-Closed Reflex Methods, LOQ - Limit of Quantitation.

<u>Test Performed by:</u>	<u>Signature</u>	<u>Countersigned/Approved by:</u>	<u>Signature</u>
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	 20.04.2025	1.) Name: Mita Sarker Designation: Senior Chemist	 20/04/2025
2.) Name: Taslima Akhter Designation: Sample Analyzer	 20.04.2025	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	 20/04/2025

Md. Biplab Hossain
 Chief Chemist
 Department of Public Health Engineering
 Central Laboratory Mohakhali, Dhaka



Government of the People's Republic of Bangladesh
Office of the Chief Chemist
Department of Public Health Engineering
Central Lab, 38-39, Mohakhali C/A, Dhaka-1212
Phone: 88-02-9881927, Fax: 88-02-9882003, Email: wqmsc_central_lab@yahoo.com



Lab Memo: 1004/ CC, DPHE, CL, Dhaka

Date: 20-04-2025

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2025040086	Sample Receiving date: 19-03-2025
Ref. Memo No: AECL/2025/Nil & Dated: 19-03-2025	Sample Source: Ground Water
Sent by:Shanjana Haider ,Chief Operating Officer , Adroit Environment Consultants Ltd, Dhaka.	Dist:Bhola, Upa:Daulat Khan
Care Taker: Adroit Environment Consultants Ltd. (GW-03)	Union:Bhabanipur, Vill.:Kalia
Sample Collection date:	Date of Testing: 19/03/2025-20/04/2025

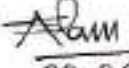
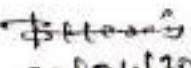
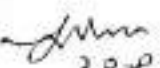
LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.001	mg/L	AAS	0.001
2	Calcium (Ca)	75	22	mg/L	AAS	0.17
3	Chloride	150-600	40	mg/L	Titrimetic	-
4	Iron (Fe)	0.3-1	0.21	mg/L	AAS	0.05
5	Magnesium (Mg)	30-35	14	mg/L	AAS	0.05
6	Phosphate	6.0	0.60	mg/L	UVS	0.10

Comments:

Sample was collected & supplied by client.

N.B: AAS - Atomic Absorption Spectrophotometer, UVS - UV-Visible Spectrophotometer, CRM-Closed Reflex Methods, LOQ - Limit of Quantitation.

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiul Alam Khosru Designation: Sample Analyzer	 20.04.2025	1.) Name: Mita Sarker Designation: Senior Chemist	 20.04.2025
2.) Name: Taslima Akhter Designation: Sample Analyzer	 20.04.2025	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	 20.04.2025 Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka



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Phone: 88-02-9881927, Fax: 88-02-9882003, Email: wqmsc_central_lab@yahoo.com



Lab Memo: 1004/ CC, DPHE, CL, Dhaka

Date: 20-04-2025

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2025040087	Sample Receiving date: 19-03-2025
Ref. Memo No: AECL/2025/Nill & Dated: 19-03-2025	Sample Source: Ground Water
Sent by:Shanjana Haider ,Chief Operating Officer , Adroit Environment Consultants Ltd, Dhaka.	Dist:Noakhali, Upa:Hatiya
Care Taker: Adroit Environment Consultants Ltd. (GW-04)	Union:Tamaruddin, Vill.:Tomoroddi Launch
Sample Collection date:	Date of Testing: 19/03/2025-20/04/2025

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.056	mg/L	AAS	0.001
2	Calcium (Ca)	75	41	mg/L	AAS	0.17
3	Chloride	150-600	170	mg/L	Titrimetic	-
4	Iron (Fe)	0.3-1	0.40	mg/L	AAS	0.05
5	Magnesium (Mg)	30-35	37	mg/L	AAS	0.05
6	Phosphate	6.0	0.72	mg/L	UVS	0.10

Comments:

Sample was collected & supplied by client.

N.B: AAS - Atomic Absorption Spectrophotometer, UVS - UV-Visible Spectrophotometer, CRM-Closed Reflex Methods, LOQ - Limit of Quantitation.

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	 20.04.2025	1.) Name: Mita Sarker Designation: Senior Chemist	 20/04/2025
2.) Name: Taslima Akhter Designation: Sample Analyzer	 20.04.2025	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	 20/04/2025

Md. Biplab Hossain
Chief Chemist
Department of Public Health Engineering
Central Laboratory Mohakhali, Dhaka

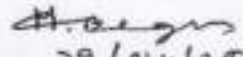
গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
কৃষি মন্ত্রণালয়
মৃত্তিকা সম্পদ উন্নয়ন ইনস্টিটিউট
বিভাগীয় গবেষণাগার, ঢাকা
মৃত্তিকা ভবন, কৃষি খামার সড়ক, ঢাকা-১২১৫।

প্রাপক:

মোঃ মেহেদী হাসান আপন
অ্যাড্রয়েট এনভায়রনমেন্ট কনসালটেন্ট লিমিটেড
বাস -০১, রোড-১৬
সেবুঁর-৭, উত্তরা, ঢাকা।

প্রেরিত ভূগর্ভস্থ পানি নমুনার বিশ্লেষিত ফলাফল

ক্রমিক নম্বর	লোকেশন	ল্যাব নম্বর	উপাদানের নাম				
			ক্যালসিয়াম	ম্যাগনেসিয়াম	সালফেট	ফসফেট	লৌহ
			(ppm)				
১.	ভৈরব	৯৭১৯	২৫	০.০৩	১০.৪৬	০.১৫	০.২১
২.	আলুবাড়ার	৯৭২০	২৯	০.০৩	১.৪২	০.০৭	০.১৬
৩.	বাকেরহাট	৯৭২১	৩৪	০.২৭	০.৮২	০.০৮	০.১৪
৪.	লাহারহাট	৯৭২২	৪০	০.২৭	০.২৮	০.২০	০.১৩
৫.	ইলিশা	৯৭২৩	৩৯	০.০৩	০.৫২	০.০৮	০.২৯
৬.	মনপুরা	৯৭২৪	২৪	০.০৩	১.৬৮	০.১৮	০.১৭
৭.	তজুমদ্দিন	৯৭২৫	৩৭	০.০৩	০.৫৬	০.১৭	০.১২
৮.	মজু চৌধুরী	৯৭১৬	২২	০.০৩	৪.০২	০.১৫	০.১২
৯.	মতিরহাট	৯৭১৭	৩১	০.০৩	৫.৩৩	০.০৮	০.১৯


১৭/০৬/২৫
(ড. মাসুদা বেগম)
উর্ধ্বতন বৈজ্ঞানিক কর্মকর্তা
ফোন : ০২-৪১০২৫০৬৮।

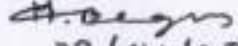
গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
কৃষি মন্ত্রণালয়
মৃত্তিকা সম্পদ উন্নয়ন ইনস্টিটিউট
বিভাগীয় গবেষণাগার, ঢাকা
মৃত্তিকা ভবন, কৃষি খামার সড়ক, ঢাকা-১২১৫।

প্রাপকঃ

মোঃ মেহেদী হাসান আপন
অ্যাডভেইট এনভায়রনমেন্ট কনসালটেন্ট লিমিটেড
বাসা -০১, রোড-১৬
সেক্টর-৭, উত্তরা, ঢাকা।

প্রেরিত ভূগর্ভস্থ পানি নমুনার বিশ্লেষিত ফলাফল

ক্রমিক নম্বর	লোকেশন	ল্যাব নম্বর	উপাদানের নাম
			সালফেট
			সহজলভ্য
			(ppm)
১.	হিজুলা	৯৭৩২	১.৫৫
২.	বদদারহাট	৯৭৩৩	৭০.১৮
৩.	দউলতখান	৯৭৩৪	২.৮৫
৪.	তমুকদিন	৯৭৩৫	৭০.১০


১৭/০৬/২৫
(ড. মাদুদা বেগম)
উর্ধ্বতন বৈজ্ঞানিক কর্মকর্তা
ফোন : ০২-৪১০২৫০৬৬।

Annexure 4 (e)

Soil Test Report

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
কৃষি মন্ত্রণালয়
মৃত্তিকা সম্পদ উন্নয়ন ইনস্টিটিউট
বিভাগীয় গবেষণাগার, ঢাকা
মৃত্তিকা ভবন, কৃষি খামার সড়ক, ঢাকা-১২১৫।

প্রাপক:

মোঃ মেহেদী হাসান আপন
অ্যাড্ভেইট এনভায়রনমেন্ট কনসালটেন্ট লিমিটেড
বাসা -০১, রোড-১৬
সেক্টর-৭, উত্তরা, ঢাকা।

প্রেরিত মৃত্তিকা নমুনার বিশ্লেষিত ফলাফল

ক্রমিক নম্বর	লোকেশ ন	ল্যাব নম্বর	উপাদানের নাম								
			পিএইচ	লবনাক্ততা	ক্যালসিয়াম	ম্যাগনেসিয়াম	সালফেট	তামা	লৌহ	ম্যাঙ্গানিজ	জিংক
					বিনিময়যোগ্য			সহজলভ্য			
					(meq/100g soil)			(ppm)			
১	ভৈরব	৯৬৭৭	৭.২	০.৫৪	১৪.৬২	২.৮৩	১৭৮.৯০	৫.১৩	১৪৬.০৬	৪৬.১৪	১০.১৯


১৭/০৬/২৫
(ড. মাসুদা বেগম)
উর্ধ্বতন বৈজ্ঞানিক কর্মকর্তা
ফোন : ০২-৪১০২৫০৬৬।

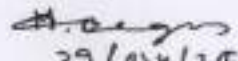
গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
কৃষি মন্ত্রণালয়
মৃত্তিকা সম্পদ উন্নয়ন ইনস্টিটিউট
বিভাগীয় গবেষণাগার, ঢাকা
মৃত্তিকা ভবন, কৃষি খামার সড়ক, ঢাকা-১২১৫।

প্রাপক:

মোঃ মেহেদী হাসান আপন
অ্যাড্ভেইট এনভায়রনমেন্ট কনসালটেন্ট লিমিটেড
বাসা -০১, রোড-১৬
সেক্টর-৭, উত্তরা, ঢাকা।

প্রেরিত মৃত্তিকা নমুনার বিশ্লেষিত ফলাফল

ক্রমিক নম্বর	লোকেশন	ল্যাব নম্বর	উপাদানের নাম								
			পি.এইচ	নবনাক্ততা	ক্যালসিয়াম	ম্যাগনেসিয়াম	সালফেট	তাম্র	লৌহ	ম্যাঙ্গানিজ	জিংক
					বিনিময়যোগ্য			সহজলভ্য			
					(meq/100g soil)			(ppm)			
১	আলুবাড়ার	৯৬৯৪	৭.১	১.৫১	১৫.৯৬	১.৪৫	২৩৫.৮০	১.২৩	৩১.৩২	২০.৩২	১.৩০
২	বাড়েরহাট	৯৬৯৫	৭.২	১.৮৯	১১.২১	৬.৮৩	১০৬.১০	২.৫৮	৫৩.৮৬	৫০.২৯	০.৪৫
৩	লাহারহাট	৯৬৯৬	৭.৬	১.৭৩	১৬.৬৩	০.৪৬	১৪৭.২৫	২.৬৪	৬৮.৮৩	২৪.১২	২.৫৫
৪	ইলিশা	৯৬৯৭	৭.৭	১.৩১	১৩.০৯	৭.১৬	১৪৪.৫০	১.২৬	৬২.০৭	৩৪.৯৪	০.৫৮
৫	মনপুরা	৯৬৯৮	৭.৮	৪.৯৩	১২.৩৭	৬.৬৫	৪৫০.৩৫	৭.০১	৯৬.১৩	৫৪.৭৯	৬.৫৪
৬	তজুমদ্দিন	৯৬৯৯	৭.৬	১.৬৩	৮.৯৪	৭.১২	৩৪৩.৫২	২.০১	৩৫.৪৭	২৯.৭৬	১.৫৬


১৭/০৬/২৫
(ড. মাসুদা বেগম)
উর্ধ্বতন বৈজ্ঞানিক কর্মকর্তা
ফোন : ০২-৪১০২৫০৬৬।

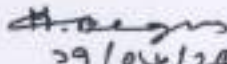
গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
কৃষি মন্ত্রণালয়
মৃত্তিকা সম্পদ উন্নয়ন ইনস্টিটিউট
বিভাগীয় গবেষণাগার, ঢাকা
মৃত্তিকা ভবন, কৃষি খামার সড়ক, ঢাকা-১২১৫।

প্রাপক:

মোঃ মেহেদী হাসান আপন
অ্যাক্সিয়েট এনভায়রনমেন্ট কনসালটেন্ট লিমিটেড
বাসা -০১, রোড-১৬
সেক্টর-৭, উত্তরা, ঢাকা।

প্রেরিত মৃত্তিকা নমুনার বিশ্লেষিত ফলাফল

ক্রমিক নম্বর	লোকেশন	ন্যাব নম্বর	উপাদানের নাম								
			পিএইচ	লবনাক্ততা	ক্যালসিয়াম	ম্যাগনেসিয়াম	সালফেট	তামা	লৌহ	ম্যাঙ্গানিজ	জিংক
					বিনিময়যোগ্য			সহজলভ্য			
					(meq/100g soil)			(ppm)			
১	হিজলা	৯৬৭২	৬.৭	১.৬১	২৮.৩১	২.১৯	১৯৬.৪৫	৪.৩৭	৯৯.৭৪	৭১.৩৫	৯.৫২
২	বন্দারহাট	৯৬৭৩	৬.২	১.৫৬	১১.৫৬	৪.৮৪	১৫৩.১৩	৪.৫৭	৪৮.৬৯	৮৮.২১	০.৬৭
৩	দউলতখান	৯৬৭৪	৭.৩	১.৮৫	১৫.৯৭	১.৯৯	৩২৭.৩০	৩.২৪	৫১.০১	৩৪২.৬	৪.১৭
৪	তমুকদিন	৯৬৭৫	৭.২	৪.৭২	১৪.০৪	৭.০৫	৩৮৫.৭২	২.৮৪	৫৬.৯৬	৪৬.১৭	১.২৭


১৭/০৬/২৫
(ড. মাসুদা বেগম)
উপস্থিত বৈজ্ঞানিক কর্মকর্তা
ফোন : ০২-৪১০২৫০৬৬।

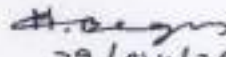
গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
কৃষি মন্ত্রণালয়
মৃত্তিকা সম্পদ উন্নয়ন ইনস্টিটিউট
বিভাগীয় গবেষণাগার, ঢাকা
মৃত্তিকা ভবন, কৃষি খামার সড়ক, ঢাকা-১২১৫।

প্রাপক:

মোঃ মেহেদী হাসান আপন
অ্যাডভোকেট এনভায়রনমেন্ট কনসালটেন্ট লিমিটেড
বাসা -০১, রোড-১৬
সেক্টর-৭, উত্তরা, ঢাকা।

প্রেরিত মৃত্তিকা নমুনার বিশ্লেষিত ফলাফল

ক্রমিক নম্বর	লোকেশ ন	ল্যাব নম্বর	উপাদানের নাম								
			পিএইচ	লবনাক্ততা	ক্যালসিয়াম	ম্যাগনেসিয়াম	সালফেট	জমা	লৌহ	ম্যাঙ্গানিজ	জিংক
					বিনিময়যোগ্য			সহজলভ্য			
					(meq/100g soil)			(ppm)			
১	মজু চৌধুরী	৯৭০০	৮.০	২.৮০	১০.৮৩	৩.১১	১৮২.২০	১.৯৫	১৬.৫৩	৮.৭৩	২.১৯
২	মতিরাহাট	৯৭০১	৮.০	২.১৮	২৪.৯১	২.৪৫	১২১.৩৫	২.৬১	২৮.৬৮	৭.৮৮	১.১৫


২৭/০৬/২৫
(ড. মাসুদা বেগম)
উর্ধ্বতন বৈজ্ঞানিক কর্মকর্তা
ফোন : ০২-৪১০২৫০৬৬।

Annexure 4 (f)

Sediment Test Report

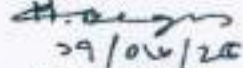
গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
কৃষি মন্ত্রণালয়
মৃত্তিকা সম্পদ উন্নয়ন ইনস্টিটিউট
বিভাগীয় গবেষণাগার, ঢাকা
মৃত্তিকা ভবন, কৃষি খামার সড়ক, ঢাকা-১২১৫।

প্রাপকঃ

মোঃ মেহেদী হাসান আপন
অ্যাড্রয়েট এনভায়রনমেন্ট কনসালটেন্ট লিমিটেড
বাসা -০১, রোড-১৬
সেক্টর-৭, উত্তরা, ঢাকা।

প্রেরিত সেডিমেন্ট নমুনার বিশ্লেষিত ফলাফল

ক্রমিক নম্বর	লোকেশন	ল্যাব নম্বর	উপাদানের নাম											
			পিএইচ	লবনাক্ততা	তামা	লৌহ	ম্যাঙ্গানিজ	জিঙ্ক	ক্যাডমিয়াম	নিকেল	TDS	TSS	আর্সেনিক	ক্রেণিয়াম
					(ppm)									
১.	ভৈরব	৯৬৭৮	৭.৩	১.৩৩	২.০১	২৫.৯১	৩০.৭৩	০.৩২	০.২১	৩০.৩৮	৪২০	৩৬৩	০.৪৯	১৮.৪৫


১৭/০৬/২৫
(ড. মাসুদা বেগম)
উর্দ্ধতন বৈজ্ঞানিক কর্মকর্তা
ফোন : ০২-৪১০২৫০৬৬।

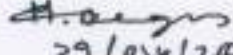
গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
কৃষি মন্ত্রণালয়
মৃত্তিকা সম্পদ উন্নয়ন ইনস্টিটিউট
বিভাগীয় গবেষণাগার, ঢাকা
মৃত্তিকা ভবন, কৃষি বামার সড়ক, ঢাকা-১২১৫।

প্রাপক:

মোঃ মেহেদী হাসান আপন
অ্যাড্ভেইট এনভায়রনমেন্ট কনসালটেন্ট লিমিটেড
বাসা -০১, রোড-১৬
সেক্টর-৭, উত্তরা, ঢাকা।

প্রেসিডে সেন্ডিমেন্ট নমুনার বিশ্লেষিত ফলাফল

ক্রমিক নম্বর	লোকেশন	ল্যাব নম্বর	উপাদানের নাম											
			পি.এইচ	লবনাক্ততা	তামা	লৌহ	ম্যাঙ্গানিজ	জিঙ্ক	ক্যাডমিয়াম	নিকেল	TDS	TSS	আর্সেনিক	ক্রোমিয়াম
					(ppm)									
১.	আলুবাঙ্গার	৯৭০২	৭.৭	২.৪৫	১.৪৭	১৪.৪৫	৩.২০	১.১৯	০.২১	৩৩.১৬	৪৪৯	৩৮৭	০.৫৭	২১.৩৩
২.	বাস্তুরহাট	৯৭০৩	৭.৯	২.৬৯	২.০৫	১৪.০১	৮.১৬	১.০২	০.৬৩	৩১.৪৬	৬৫৭	৫১২	১.৩৩	৩৬.২২
৩.	লাহারহাট	৯৭০৪	৮.৪	২.১৯	৩.২৫	১৬.৪২	৫.৯৩	০.৭৪	০.৩৬	৩৩.৬২	৭১৩	৬৫৪	১.৩৬	৪০.১৭
৪.	ইলিশা	৯৭০৫	৮.২	১.৭৯	২.৩৪	১০.৮৭	৫.২৯	০.৭৪	০.৪২	৩০.৫৪	৬৮৩	৫৪৯	১.২৯	৩৮.২৫
৫.	মনপুরা	৯৭০৬	৮.২	৬.৫৫	২.৭৩	১১.৪২	১১.৩৯	১.১৯	০.২৬	৪০.৪১	১৮১৮	১৫৯৬	৭.৭৭	৭৭.৯৫
৬.	তজুমদ্দিন	৯৭০৭	৮.০	২.১১	২.২৫	৯.৯৭	৮.৯০	১.০৬	০.২৬	২৯.৭৭	১৭৮৩	১৩৪৮	৬.৩৮	৭৫.৯৯
৭.	মজু চৌধুরী	৯৭০৮	৮.২	৩.৮৯	০.৪৪	১৪.১১	৩.২৩	০.৪৮	০.০৫	৩৫.৯৩	৯৮০	৭৮৬	১.৫০	৩১.৫৬
৮.	মতিবহাট	৯৭০৯	৭.৭	৩.৫৫	১.৬৩	১৯.১২	৫.৪৩	০.৭২	০.১০	৩৪.৬৯	৮৭৫	৭৪৫	১.৩৯	২৫.৬৬


 ১৭/০৬/২৫
 (ড. মাসুমা বেগম)
 উর্ধ্বতন বৈজ্ঞানিক কর্মকর্তা
 ফোন : ০২-৪১০২৫০৬৬।

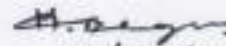
গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
কৃষি মন্ত্রণালয়
মৃত্তিকা সম্পদ উন্নয়ন ইনস্টিটিউট
বিভাগীয় গবেষণাগার, ঢাকা
মৃত্তিকা ভবন, কৃষি খামার সড়ক, ঢাকা-১২১৫।

প্রাপক:

মোঃ মেহেদী হাসান আপন
অ্যাড্ভেইট এনভায়রনমেন্ট কনসালটেন্ট লিমিটেড
বাসা -০১, রোড-১৬
সেক্টর-৭, উত্তরা, ঢাকা।

প্রেরিত সেডিমেন্ট নমুনার বিশ্লেষিত ফলাফল

ক্রমিক নম্বর	লোকেশন	ল্যাব নম্বর	উপাদানের নাম											
			পিএইচ	লবনাক্ততা	তামা	লৌহ	ম্যাঙ্গানিজ	জিঙ্ক	ক্যাডমিয়াম	নিকেল	TDS	TSS	আর্সেনিক	ক্রোমিয়াম
১.	হিজলা	৯৬৭৯	৭.৯	২.১২	১.১০	১৫.২৩	১৬.৪৯	০.৩০	০.৪৭	১৮.৫৩	৫৪৬	৪৮১	০.৯৬	২০.২৯
২.	বন্দারহাট	৯৬৮০	৮.০	৩.১০	২.৯৩	২৮.৭৬	৪৫.৫৩	০.৩২	০.৪২	৩৩.১৬	১০২০	৮৯৩	২.৩৩	৪৫.৪৪
৩.	দউলতখান	৯৬৮১	৮.১	৩.০১	৩.৭৮	৩০.৭১	৫৬.৪৬	৪.১৯	০.০৫	৩৭.৭৮	৭৮৬	৬৩৯	৩.০৩	৫৮.৬৩
৪.	তুমুরদীন	৯৬৮২	৮.০	৬.০৯	৪.৫৮	৪০.৭৩	৮১.২৭	০.৫৩	০.২৬	৪৭.২১	১৬২৬	১১২২	৫.৬২	৬৯.২৩


১৭/০৬/২৫
(ড. মাসুদা বেগম)
উপস্থাপন বৈজ্ঞানিক কর্মকর্তা
ফোন ৮০২-৪১০২৫০৬৬।

Annexure 05

Air Quality Index (AQI) Calculation

Air Quality Index (AQI) Calculation

$$AQI = \frac{I_{(high)} - I_{(low)}}{C_{(high)} - C_{(low)}} \times (C_p - C_{low}) + I_{low}$$

Table 1: AQI Calculation for PM2.5

Pollutant	Location	Concentration (C _p) (µg/m ³)	C _{low}	C _{high}	I _{low}	I _{high}	AQI Formula	Status
PM2.5	Bhairab Bazar Landing Station	56.23	55.5	125.4	151	200	151.5117	UNHEALTHY
	Alubazar Landing Station	46.01	35.5	55.4	101	150	126.8789	UNHEALTHY
	Hijla Landing Station	33.14	9.1	35.4	51	100	95.78935	MODERATE
	Laharhat Landing Station	54.18	35.5	55.4	101	150	146.996	UNHEALTHY
	Ilisha Landing Station	35.37	9.1	35.4	51	100	99.94411	MODERATE
	Bankerhat (Beduria) Landing Station	30.47	9.1	35.4	51	100	90.81483	MODERATE
	Daulatkhan Landing Station	49.22	35.5	55.4	101	150	134.7829	UNHEALTHY
	Tojumuddin Landing Station	34.76	9.1	35.4	51	100	98.8076	MODERATE
	Monpura Landing Station	30.61	9.1	35.4	51	100	91.07567	MODERATE
	Moju Chowdhury Landing Station	58.22	55.5	125.4	151	200	152.9067	UNHEALTHY
	Boddarhat Landing Station	50.46	35.5	55.4	101	150	137.8362	UNHEALTHY
	Motirhat Landing Station	36.19	35.5	55.4	101	150	102.699	UNHEALTHY
	Tomuruddin Landing Station	30.19	9.1	35.4	51	100	90.29316	MODERATE

Table 2: AQI Calculation for PM10

Pollutant	Location	Concentration (C _p) (µg/m ³)	C _{low}	C _{high}	I _{low}	I _{high}	AQI Formula	Status
PM10	Bhairab Bazar Landing Station	79.11	55	154	51	100	62.93323	MODERATE
	Alubazar Landing Station	72.52	55	154	51	100	59.67152	MODERATE
	Hijla Landing Station	60.43	55	154	51	100	53.68758	MODERATE
	Laharhat Landing Station	80.87	55	154	51	100	63.80434	MODERATE
	Ilisha Landing Station	63.48	55	154	51	100	55.19717	MODERATE
	Bankerhat (Beduria) Landing Station	63.21	55	154	51	100	55.06354	MODERATE
	Daulatkhan Landing Station	71.23	55	154	51	100	59.03303	MODERATE
	Tojumuddin Landing Station	64.14	55	154	51	100	55.52384	MODERATE
	Monpura Landing Station	61.29	55	154	51	100	54.11323	MODERATE
	Moju Chowdhury Landing Station	80.79	55	154	51	100	63.76475	MODERATE
	Boddarhat Landing Station	74.28	55	154	51	100	60.54263	MODERATE
	Motirhat Landing Station	69.55	55	154	51	100	58.20152	MODERATE

Pollutant	Location	Concentration (C _p) (µg/m ³)	C_low	C_high	I_low	I_high	AQI Formula	Status
	Tomuruddin Landing Station	63.34	55	154	51	100	55.12788	MODERATE

Table 3: AQI Calculation for SO₂

Pollutant	Location	Concentration (C _p) (µg/m ³)	C_low	C_high	I_low	I_high	AQI Formula	Status
SO ₂	Bhairab Bazar Landing Station	7.44	0	35	0	50	10.62857	GOOD
	Alubazar Landing Station	1.88	0	35	0	50	2.685714	GOOD
	Hijla Landing Station	1.28	0	35	0	50	1.828571	GOOD
	Laharhat Landing Station	5.16	0	35	0	50	7.371429	GOOD
	Ilisha Landing Station	1.22	0	35	0	50	1.742857	GOOD
	Bankerhat (Beduria) Landing Station	1.01	0	35	0	50	1.442857	GOOD
	Daulatkhan Landing Station	2.17	0	35	0	50	3.100000	GOOD
	Tojumuddin Landing Station	1.88	0	35	0	50	2.685714	GOOD
	Monpura Landing Station	1.01	0	35	0	50	1.442857	GOOD
	Moju Chowdhury Landing Station	8.76	0	35	0	50	12.51429	GOOD
	Boddarhat Landing Station	1.00	0	35	0	50	1.428571	GOOD
	Motirhat Landing Station	2.02	0	35	0	50	2.885714	GOOD
	Tomuruddin Landing Station	9.44	0	35	0	50	13.48571	GOOD

Table 4: AQI Calculation for NO_x

Pollutant	Location	Concentration (C _p) (µg/m ³)	C_low	C_high	I_low	I_high	AQI Formula	Status
NO _x	Bhairab Bazar Landing Station	9.15	0	53	0	50	8.632075	GOOD
	Alubazar Landing Station	2.15	0	53	0	50	2.028302	GOOD
	Hijla Landing Station	1.37	0	53	0	50	1.292453	GOOD
	Laharhat Landing Station	6.51	0	53	0	50	6.141509	GOOD
	Ilisha Landing Station	1.93	0	53	0	50	1.820755	GOOD
	Bankerhat (Beduria) Landing Station	1.37	0	53	0	50	1.292453	GOOD
	Daulatkhan Landing Station	3.09	0	53	0	50	2.915094	GOOD
	Tojumuddin Landing Station	2.01	0	53	0	50	1.896226	GOOD
	Monpura Landing Station	1.23	0	53	0	50	1.160377	GOOD
	Moju Chowdhury Landing Station	10.12	0	53	0	50	9.547170	GOOD

Pollutant	Location	Concentration (C _p) (µg/m ³)	C_low	C_high	I_low	I_high	AQI Formula	Status
	Boddarhat Landing Station	1.65	0	53	0	50	1.556604	GOOD
	Motirhat Landing Station	2.24	0	53	0	50	2.113208	GOOD
	Tomuruddin Landing Station	8.21	0	53	0	50	7.745283	GOOD

Table 5: AQI Calculation for CO

Pollutant	Location	Concentration (C _p) (µg/m ³)	C_low	C_high	I_low	I_high	AQI Formula	Status
CO	Bhairab Bazar Landing Station	2	0	4.4	0	50	22.72727	GOOD
	Alubazar Landing Station	1	0	4.4	0	50	11.36364	GOOD
	Hijla Landing Station	1	0	4.4	0	50	11.36364	GOOD
	Laharhat Landing Station	1.5	0	4.4	0	50	17.04545	GOOD
	Ilisha Landing Station	1	0	4.4	0	50	11.36364	GOOD
	Bankerhat (Beduria) Landing Station	0.5	0	4.4	0	50	5.681818	GOOD
	Daulatkhan Landing Station	1	0	4.4	0	50	11.36364	GOOD
	Tojumuddin Landing Station	1	0	4.4	0	50	11.36364	GOOD
	Monpura Landing Station	0.5	0	4.4	0	50	5.681818	GOOD
	Moju Chowdhury Landing Station	2	0	4.4	0	50	22.72727	GOOD
	Boddarhat Landing Station	0.5	0	4.4	0	50	5.681818	GOOD
	Motirhat Landing Station	1	0	4.4	0	50	11.36364	GOOD
	Tomuruddin Landing Station	1	0	4.4	0	50	11.36364	GOOD

Annexure 06

Hydrological Data

Hydrological Data

❖ Upper Meghna

The Meghna has two distinct parts. The Upper Meghna from Kuliarchar to Shatnol is a comparatively small river. The Lower Meghna below Shatnol is one of the largest rivers in the world because of its wide estuary mouth. The Upper Meghna River rises in the north-eastern part of Bangladesh and flows throughout the southeast. The Upper Meghna carries the combined flow of the Surma and the Kusiya Rivers which originate in the Indian hills' northeast of Bangladesh.

Heading downstream, the Upper Meghna River is joined by the Old Brahmaputra at Bhairab Bazar. The Dhaleshwari is another tributary (and another distributary from the Jamuna system) and it joins the Upper Meghna River at Munshiganj on the right bank. The Dhaleshwari River comes down in a brown stream and meets the clear blue-green Meghna. For many kilometers the waters do not seem to mix, for half the river water remains brown and the other half blue-green. The boatmen are fond of pointing out this peculiarity.

Sixteen kilometres from Shatnol, the combined flow of the Ganges and Brahmaputra-Jamuna, known as the padma, meets the Meghna at a 11 km wide confluence in the rainy season near Chandpur. From this point southwards the Meghna is marked as the Lower Meghna, becoming one of the broadest rivers and largest estuaries in the world.

Lower Meghna below Shatnol is one of the largest rivers in the world, because it is the mouth of Ganges-Padma and Brahmaputra-Jamuna rivers. It is a tidal reach carrying almost the entire fluvial discharge of Ganges, Brahmaputra and Upper Meghna river. The net discharge through this river varies from 10,000 cumec in the dry season to 160,000 cumec in the wet season.

Discharge of river water into the Meghna estuary at different seasons is highly skewed. Some of the measurements done during the Meghna Estuary Study project suggest that in an extreme year, discharge through the estuary can be as much as fifteen times during the monsoon season compared to that during the dry season. It reported that in an average year the discharge through the estuary is about 20,000 m³/s during the dry season whereas it is 100,000 m³/s during the monsoon (Alam et al, 2014)

The river water discharge data collected from BWDB for the period from 2011 to 2020 is attached in **Table 1.1**, where the maximum discharge of water inflow is about 15806.47 m³/sec in 2012 and the minimum discharge is 53.02 m³/sec or 190800 tons/hr. in 2015. But the minimum yearly discharge of 53.02 m³/sec was a rare incident. In last 10 years' minimum yearly discharge varied between 3000~5000 m³/sec or 10800000~ 18000000 ton/hr.

Table 1.1: Flow at the Meghna River (m³/s)

Year	Yearly Max Discharge m ³ /s (Wet Season)	Yearly Min Discharge m ³ /s (Dry Season)	Yearly Avg Discharge m ³ /s
2011	7374.54	3538.17	5680.59
2012	15806.47	5207.01	7055.36
2013	8203.16	2684.05	6553.96
2014	9945.33	3327.05	6995.94
2015	9075.58	53.02	6288.00
2016	9966.27	4747.76	7403.43
2017	11025.72	6863.61	8903.37
2018	8597.98	4349.21	6884.53
2019	12910.93	4504.89	8278.60
2020	14198.83	4672.88	9280.42

(Bangladesh Water Development Board)



Figure 1.1: Flow at the Meghna River (m³/s)

Table 1.2: Mean Daily Discharge (MDD) Data of Upper Meghna (Bhairab Bazar) 2021

Day/Moth/Year	Mean Daily Discharge (MDD) (m³/s)	Day/Moth/Year	Mean Daily Discharge (MDD) (m³/s)
01/10/2021	4561.7668	17/10/2021	3513.6659
02/10/2021	4037.9817	18/10/2021	4230.9741
03/10/2021	3974.5683	19/10/2021	4595.4721
04/10/2021	4329.0148	20/10/2021	4461.3329
05/10/2021	4938.7576	21/10/2021	4629.2909
06/10/2021	5150.1498	22/10/2021	4361.9234
07/10/2021	5401.8893	23/10/2021	4069.8606
08/10/2021	5329.4028	24/10/2021	4006.2176
09/10/2021	5585.0643	25/10/2021	4133.9624
10/10/2021	5474.8238	26/10/2021	3911.6147
11/10/2021	5043.9468	27/10/2021	3787.0892
12/10/2021	4731.4278	28/10/2021	3424.6123
13/10/2021	4394.9459	29/10/2021	3336.6063
14/10/2021	3943.0340	30/10/2021	3078.8967
15/10/2021	3756.2461	31/10/2021	2912.3714
16/10/2021	3634.0295		

Bangladesh Water Development Board (BWDB)

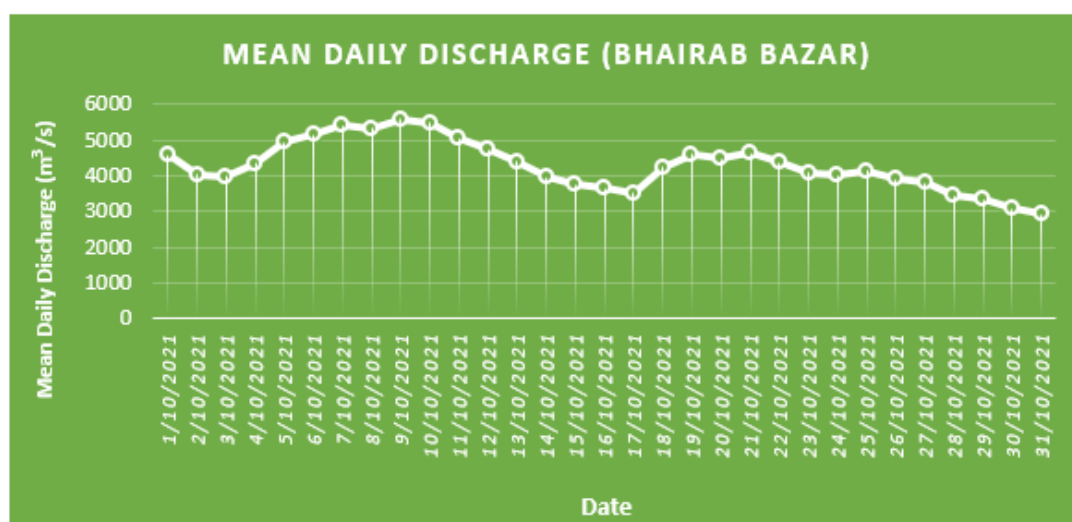


Figure 1.2: Mean Daily Discharge (MDD) Data

❖ Lower Meghna

The Meghna Estuary is a very dynamic estuarine and coastal system. The Lower Meghna conveys the combined flows of the Brahmaputra (called in Bangladesh Jamuna), the Ganges, and the Upper Meghna. The sediment discharge from the Lower Meghna River is the highest and the water discharge, the third highest, of all river systems in the world (Uddin et al., 2015).

The knowledge about the physical processes and morpho-dynamic behavior of the Lower Meghna Estuary is still fairly limited. A complicated interplay between the forces of the river, tide and the waves creates a complex pattern of sediment displacement in the estuary. Large quantities of sediment are transferred continuously towards the shallow coastal region of Bengal. Since almost no sediment is exchanged with the deeper parts of Bay of Bengal, the overall sediment budget is determined by the process of continuous redistribution of sediment in the river system upstream. The hydrodynamic factors that are playing dominant role in morphological development along the coast line of Bangladesh are; enormous volume of river water flow, sediment transport, strong tidal and wind actions, wave, salinity and cyclonic storm surge. The displacement of sediment is a part of a continuous process of the estuarine-landscape striving to achieve dynamic equilibrium between the physical shape (morphology), and the continuously changing river discharge conditions and tidal flows. (Uddin et al., 2015).

Lower Meghna is the combined stream of the Padma and the Meghna (Upper Meghna), reinforced by the Dhaleshwari. All the three rivers are large. The Dhaleshwari-Meghna and the Padma are each 5 km wide at the confluence. The Lower Meghna has several small chars (braid-bars) in it, which create two main channels, of which the large eastern one is 5 to 8 km wide. The western channel is about 2 km in width. Near Muladi the 1.5 km wide Safipur river is an offshoot from the right-bank. Further south, the Lower Meghna shifts into three channels: west to east flowing tentulia (Ilsha) river, the Shahbazpur and the Bamni. The Ilsha is a 5 to 6.5 km wide channel separating Bhola Island from the Barisal mainland.

West of the mouth of the Ilsha is the Rabnabad islands. Shahbazpur Channel, 5 to 8 km wide, separates Bhola from Ramgati and Hatiya islands and at its mouth are the Manpura islands. Bamni now is said to be nonexistent. previously it used to flow between the islands of Ramgati and Char Lakshmi and the Noakhali mainland, and was at times the main outlet for Meghna. The tides and their bores always affected it considerably, and this channel narrowed or widened in an unpredictable manner. After eroding a considerable part of the mainland in the 1940s, it suddenly shoaled to such an extent, just west of Noakhali town, that in winter there was a land bridge from the mainland to Ramgati Island. To make this a permanent feature, a large earthen cross dam was built. To accelerate the accretion of chars, a second cross dam was built linking Noakhali mainland and Char Jabbar which rapidly built up nearly 260 sq km of land.

The lower Meghna River carries a combined flow of water typically 120,000 m³/s, except for extreme flood events. About 85% of the water flow comes from the Ganga, Jamuna and Padma River confluence from the North-West regions, whereas the remaining 15% comes from the upper Meghna River and the North-East regions of Bangladesh. Along the Meghna River estuary, there are a number of deltaic islands which create the highly dynamic and morphologic features in distinct seasons. The river basin sites are generally submerged due to the continuous rainfall for a short duration (i.e., a week) of time but the water is drained away slowly by semidiurnal tides (max. 1.4 m) occurring twice in a day at the downstream area of Chandpur and the Bay of Bengal (Syed et al., 2018).

The Lower Meghna River exhibits high seasonal variations, with an average annual water discharge rate of around 34,600 m³/s, a mean annual flood discharge rate of about 97,000 m³/s, and a tidal range of up to 4 m. The floodplain is characterized by low elevation, less than 5 m above mean sea level, and a very gentle slope, i.e., 5×10^{-3} (Mahmud et al., 2020)

According to the study of IWM, discharge has been measured in the Lower Meghna under a project named as “Detailed Feasibility Study in Connection with Protection of Ramgati and Kamal Nagar Upazila and Adjacent Areas under Laxmipur District from the continuing Erosion of the Meghna River”. The discharge through this river varies

from about 10,000 m³/s in dry season to 160,000 m³/s in the wet season. In general, dry season (October -March) is the calm period in the estuary with weak wind from north and low river discharge. In contrast, monsoon season (June-September) is more vigorous with strong south-westerly wind and large river discharge and also higher mean water level (Alam et al, 2014).

❖ The Estuary

The coastline of Bangladesh is segmented into three parts based on geomorphological characteristics: The Eastern coastal zone, the Central coastal zone, and the Western coastal zone. The Meghna Estuary falls within the Central coastal zone (Khatun et al., 2024).

The Meghna estuary is known for its dynamic morphology, mainly because of the approximately trillion cubic meters of water and almost a billion tons of sediment annually discharged by the Ganges, Jamuna, and Meghna rivers from their upper basins in China, Nepal, Bhutan, and India. This massive flow is channeled into the Bay of Bengal through several distributaries according to the Meghna Estuary Study carried out by Bangladesh Water Development Board. This includes the Tetulia channel to the north and west of Bhola, carrying 15 % of the monsoon flow; the Hatiya channel is responsible for about 10 % of the flow; and the Shahbajpur channel to the east of Bhola directs the remainder. (Khatun et al., 2024).

The Meghna estuary displays different tidal characteristics across its different parts. The tidal ranges in the Lower Meghna River near Chandpur and the Tetulia channel are classified as micro-tidal. Again, the regions north of Hatiya Island and south of Bhola Island are characterized by meso-tidal conditions, while the areas to the south and west of Sandwip and the east of Hatiya channel experience macro-tidal ranges. 80 % of the sediment entering the Meghna Estuary comprises silt and clay, with the rest comprising fine sand. Massive river discharges, huge sediment loads, strong tidal energies, and estuarine circulation drive the active delta-building processes in the Meghna Estuary. These dynamics lead to islands' continuous formation, degradation, and reshaping through erosion and accretion (Khatun et al., 2024).

The estuary of the Lower Meghna is usually considered to stretch from the Rabnabad islands to the Kumira coast, a distance of 153 km. The water is, however, saline for half of the year as far north as a line could be drawn from the middle of Bhola to the north of Sandwip. The estuary of the Lower Meghna may be considered as extending between the Ilsha (Tentulia) and Shahbajpur rivers which together have a width of about 40 km at the sea-face. The volume of the estuarine discharge is not known, but at Chandpur the mean discharge from June to October is around 2.5 million cusecs. The mean maximum in this period of the year is about four million cusecs. The winter flow is about one-eighth of it although the river is even then several kilometres wide. The low flow is due to the stream's sluggishness.

In maximum flood, the Lower Meghna's flow is not less than five million cusecs. The Lower Meghna, as the major outlet of the combined Ganges, Brahmaputra and Meghna has therefore somewhat less outflow than the Congo, which is second only to the Amazon.

Annexure 07

Bathymetry of Lower Meghna

Bathymetry of Lower Meghna River

Secondary data includes analysis of bathymetry data across three cross-sections of 2006, 2012, and 2021, Collected from BIWTA (**Table 1.1**). BIWTA collected the bathymetry data in January, respectively. The hardcopy data was first converted to digital format using ArcMap 10.8 for further analysis. (Joly et al., 2024)

Table 1.1: Cross Section Location of Bathymetry Data

River	Profile	Cross-section Location	Year
Meghna	1	22°29'38.25"N to 22°29'50.25"N latitude and 90°47'40.26"E to 90°52'1.88"E longitude	2006, 2012, 2021
	2	22°27'49.94"N to 22°28'4.95"N latitude and 90°49'8.22"E to 90°53'18.57"E longitude	2006, 2012, 2021
	3	22°26'34.04"N to 22°26'53.83"N latitude and 90°50'8.22"E to 90°54'14.31"E longitude	2006, 2012, 2021

In addition to the bathymetry data, Landsat images from the United States Geological Survey (USGS) Earth Explorer for the three available years (2006, 2016, and 2023) have also been studied (**Table 1.2**).

Table 1.2: List of Landsat Images

Date	Type	Band Used	Resolution	Purposes	Path and Row
2006-12-21	LT_05	3,5	30m	NDWI	137044
2016-02-16	LT_08	3,5	30m	NDWI	137044
2023-04-16	LT_09	3,5	30m	NDWI	137044

The study area was analyzed to determine the changes in land cover and assess the changes in riverbeds. From the images of each year, the NDWI calculation was operated for the selected year images. Here, showing the river area of Meghna with path and row 137044 was sufficient as this tile covers the expected area perfectly. In this step, all the procedure was done in ArcMap 10.8.

Three bathymetry charts of three different years were collected from BIWTA to study the change in bottom topography of the Meghna River at three different sections.

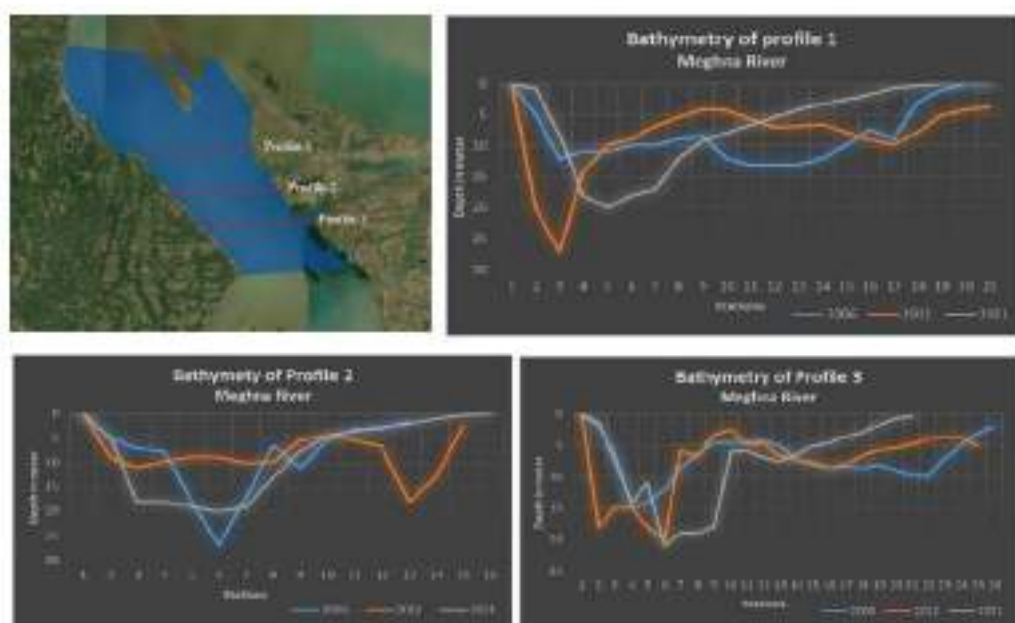


Figure 1.1: Cross Section at Three Different Locations

Profile 1 shows that the average depth across this section is 12 meters, with a trend of more water depth towards the right side of the river course. In 2006, the river bed was almost flat with little undulation topography and a moderate bankside slope. However, by 2012, there had been significant changes in the river bed topography and a sudden increase in water depth of up to 27 meters. Such an increase of water depth of about 14 meters only in 6 years adjacent to the right bank had accelerated the river bank erosion at the Hakimuddin area in Bhola district. This was also the period of massive sand mining in this section. By 2021, there had been natural sand filling at this section, and the depth also reduced.

Profile 2, about 3 km down from section-1, also shows significant changes in the bottom topography of the riverbed, mostly in the middle part of the course. The river depth was high in the middle of the course in 2006 and 2021, except lower river depth at this point in 2012. However, despite natural changes in bed configuration, sand mining activities continued at this site recklessly during the study period.

Profile 3, further 3 km down, shows a deep-water course closer to the right bank of the river. The maximum depth was 23 meters both in 2012 and 2021. The turbulent flow of river water along this deep course has always been the main cause of river bank erosion in and around this part of Tamizuddin upazila of Bhola district. The depth decreases in the eastern part of the river course, particularly in 2021, indicating rapid siltation and accretion of new landmass (chars) in the east. However, despite continuous changes in river bed configuration, extraction of sand from river bed remains during this process.

Based on Landsat Imageries of 2006, 2016, and 2023 and 3-bathymetry profiles, it has been attempted to reconstruct the shoreline shifting and bottom topography changes of the river course within the area. The NDWI calculation was operated for the selected years within the path and row of 137044 covering the study area. Using ArcMap 10.8, the river bed model was developed to project the morphological changes of the river course within the study period (**Figure 1.2**). It is found that there has been significant change in the river course, both horizontally and vertically, due to lateral erosion, scouring, and rapid siltation. In the upper part of the study area, while the deepest channel was less than 1 km wide in 2006, it was about 2.5 km in 2012. Such a change in bottom topography in only six years not only reflects the dynamic nature and instability of the river course but also how human interventions, such as unplanned river bed digging, have made the channel susceptible to scouring and lateral erosion.

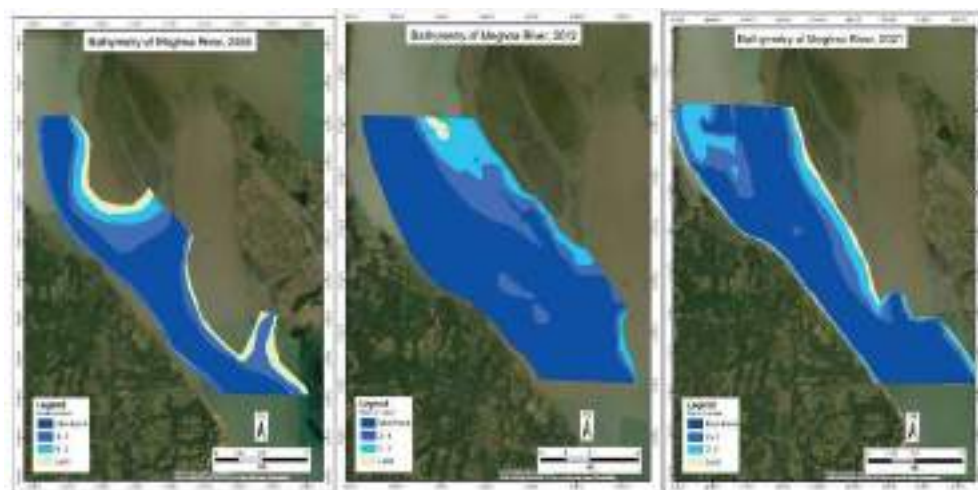


Figure 1.2: Map of Bathymetry of Lower Meghna River 2006-2021

The middle and lower parts of the course also show the shifting nature of the channel, both vertically and horizontally. However, the general observation is that the deepest channel within the study area always remains on the western side of the course, leading to massive riverbank erosion on the west bank. The Mirzakalu and Tojumuddin landing stations had to shift several times due to massive riverbank erosion in the past. Such bank erosion was accelerated due to unplanned sand mining from the river bed adjacent to the river banks. (Joly et al., 2024).

Annexure 08

Traffic Data

Road Traffic

Table 1: Traffic Data of Bhairab Bazar Landing Station

Hour	Direction	Vehicles									
		Bus	Truck	Tractor	Easy Bike	CNG	Auto Rickshaw	Van	Private Car	Cycle	Motor Cycle
Day											
07:00-09:00AM	Up	0	1	0	25	3	8	2	0	0	9
	Down	0	0	0	21	3	8	0	0	0	7
09:00-11:00AM	Up	0	2	3	117	14	2	6	0	0	6
	Down	0	0	1	89	11	2	3	0	0	7
11:00AM-01:00PM	Up	0	5	6	167	16	0	11	1	0	2
	Down	0	2	4	154	16	0	9	0	0	1
01:00-03:00PM	Up	0	2	3	115	9	0	7	0	0	4
	Down	0	3	5	137	10	0	6	0	0	4
03:00-05:00PM	Up	0	1	0	95	18	1	11	0	0	0
	Down	0	2	0	103	17	1	14	1	0	0
05:00-07:00PM	Up	0	4	2	134	13	4	4	0	0	0
	Down	0	0	0	119	15	4	6	0	0	1
Night											
07:00-09:00PM	Up	0	6	2	104	9	2	2	0	0	4
	Down	0	5	1	117	6	1	2	0	0	3
09:00-11:00PM	Up	0	5	0	62	6	0	3	0	0	8
	Down	0	5	0	58	8	0	2	0	0	10
11:00-01:00AM	Up	0	6	0	34	3	0	0	0	0	0
	Down	0	9	0	41	3	0	0	0	0	0
01:00-03:00AM	Up	0	2	0	9	0	0	0	0	0	0
	Down	0	0	0	7	0	0	0	0	0	0
03:00-05:00AM	Up	0	0	0	5	0	0	0	0	0	0
	Down	0	0	0	6	0	0	0	0	0	0
05:00-07:00AM	Up	0	2	0	16	0	2	0	0	0	0
	Down	0	4	1	11	1	3	0	0	0	0
Total		0	66	28	1746	181	38	88	2	0	66

Table 2: Traffic Data of Alubazar Landing Station

[illegible]

Hour	Direction	Vehicles									
		Bus	Truck	Tractor	Easy Bike	CNG	Auto Rickshaw	Van	Private Car	Cycle	Motor Cycle
05:00-07:00AM	Up	0	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0	0
Total		0	220	11	196	185	22	10	216	0	250

Table 3: Traffic Data of Hijla Landing Station

Hour	Direction	Vehicles									
		Bus	Truck	Tractor	Easy Bike	CNG	Auto Rickshaw	Van	Private Car	Cycle	Motor Cycle
Day											
07:00-09:00AM	Up	0	0	0	2	0	0	8	0	0	0
	Down	0	0	0	5	0	0	13	1	4	2
09:00-11:00AM	Up	0	0	0	3	1	0	10	0	2	0
	Down	0	0	0	4	1	0	9	0	6	4
11:00AM-01:00PM	Up	0	0	0	11	3	0	15	0	13	2
	Down	0	0	0	6	3	0	18	0	22	1
01:00-03:00PM	Up	0	0	0	3	0	2	4	0	19	5
	Down	0	0	0	7	0	2	1	0	16	1
03:00-05:00PM	Up	0	0	0	1	0	1	9	0	9	0
	Down	0	0	0	4	0	1	11	0	0	4
05:00-07:00PM	Up	0	0	0	10	2	0	12	0	3	6
	Down	0	0	0	7	2	0	16	0	19	2
Night											
07:00-09:00PM	Up	0	0	0	5	4	0	7	0	12	5
	Down	0	0	0	1	3	0	4	0	5	0
09:00-11:00PM	Up	0	0	0	0	0	0	2	0	7	2
	Down	0	0	0	0	0	0	0	0	2	1
11:00-01:00AM	Up	0	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0	0
01:00-03:00AM	Up	0	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0	0
03:00-05:00AM	Up	0	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0	0
05:00-07:00AM	Up	0	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0	0
Total		0	0	0	69	19	6	139	1	139	35

Table 4: Traffic Data of Ilisha Landing Station

Hour	Direction	Vehicles									
		Bus	Truck	Tractor	Easy Bike	CNG	Auto Rickshaw	Van	Private Car	Cycle	Motor Cycle
Day											
07:00-09:00AM	Up	0	0	0	17	12	5	4	4	11	8
	Down	0	0	0	23	22	9	2	1	13	11
09:00-11:00AM	Up	0	0	0	35	27	11	7	5	21	9
	Down	0	0	0	44	34	16	9	3	10	21
11:00AM-01:00PM	Up	0	0	0	59	43	13	4	0	1	26
	Down	0	0	0	54	24	19	8	2	9	22
01:00-03:00PM	Up	0	0	0	37	32	21	11	1	16	31
	Down	0	0	0	45	39	18	13	0	19	33
03:00-05:00PM	Up	0	0	0	31	17	32	6	0	12	19
	Down	0	0	0	34	32	36	14	6	11	21
05:00-07:00PM	Up	0	0	0	41	40	26	5	3	13	22
	Down	0	0	0	24	33	21	8	1	7	24
Night											
07:00-09:00PM	Up	0	0	0	19	14	16	2	1	4	13
	Down	0	0	0	24	25	13	1	2	3	16
09:00-11:00PM	Up	0	0	0	11	21	9	3	0	1	9
	Down	0	0	0	3	11	6	0	0	2	8
	Up	0	0	0	2	7	4	0	0	5	4

Hour	Direction	Vehicles									
		Bus	Truck	Tractor	Easy Bike	CNG	Auto Rickshaw	Van	Private Car	Cycle	Motor Cycle
11:00-01:00AM	Down	0	0	0	1	3	1	0	0	0	6
01:00-03:00AM	Up	0	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0	0
03:00-05:00AM	Up	0	0	0	0	1	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	2	0
05:00-07:00AM	Up	0	0	0	2	3	8	4	0	3	5
	Down	0	0	0	6	4	2	1	1	1	3
Total		0	0	0	512	444	286	102	30	164	311

Table 5: Traffic Data of Bankerhat Landing Station

Hour		Direction	Vehicles								
			Bus	Truck	Tractor	Easy Bike	CNG	Auto Rickshaw	Van	Private Car	Cycle
Day											
07:00-09:00AM	Up	0	0	0	6	0	4	0	0	0	6
	Down	0	0	0	9	0	3	0	0	0	3
09:00-11:00AM	Up	0	1	0	11	2	8	2	1	4	2
	Down	0	0	0	13	1	9	0	0	0	1
11:00AM-01:00PM	Up	0	0	0	15	0	7	0	0	0	4
	Down	0	0	0	9	0	12	0	0	6	1
01:00-03:00PM	Up	0	0	0	11	0	14	0	0	0	0
	Down	0	1	0	12	0	11	0	0	1	2
03:00-05:00PM	Up	0	0	0	8	0	8	0	1	0	4
	Down	0	0	0	14	0	9	3	0	2	6
05:00-07:00PM	Up	0	0	0	10	3	13	0	0	5	5
	Down	0	0	0	8	2	12	0	0	0	7
Night											
07:00-09:00PM	Up	0	0	0	6	0	6	0	1	0	3
	Down	0	0	0	4	1	8	0	0	3	2
09:00-11:00PM	Up	0	0	0	3	0	3	1	0	0	0
	Down	0	0	0	1	0	2	0	0	0	4
11:00-01:00AM	Up	0	0	0	1	0	0	0	0	1	0
	Down	0	0	0	2	0	2	0	0	0	0
01:00-03:00AM	Up	0	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0	0
03:00-05:00AM	Up	0	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	2	0
05:00-07:00AM	Up	0	0	0	3	0	2	0	0	0	0
	Down	0	0	0	1	0	0	0	0	0	0
Total		0	2	0	147	9	133	6	3	24	50

Table 5: Traffic Data of Laharhat Landing Station

Hour	Direction	Vehicles									
		Bus	Truck	Tractor	Easy Bike	CNG	Auto Rickshaw	Van	Private Car	Cycle	Motor Cycle
Day											
07:00-09:00AM	Up	0	4	0	24	16	6	0	0	0	15
	Down	0	3	0	15	11	10	0	0	0	21
09:00-11:00AM	Up	0	17	0	29	34	14	0	2	0	37
	Down	0	11	0	24	55	17	0	8	0	32
11:00AM-01:00PM	Up	0	19	0	33	41	11	0	26	0	56
	Down	0	24	0	27	38	9	0	31	0	63
01:00-03:00PM	Up	0	28	0	41	36	10	0	39	0	47
	Down	0	28	0	36	49	7	0	43	0	51
03:00-05:00PM	Up	0	24	0	13	24	21	0	30	0	33
	Down	0	19	0	22	29	15	0	33	0	42
05:00-07:00PM	Up	0	21	0	16	43	12	0	24	0	28
	Down	0	26	0	21	27	22	0	32	0	34

Hour	Direction	Vehicles									
		Bus	Truck	Tractor	Easy Bike	CNG	Auto Rickshaw	Van	Private Car	Cycle	Motor Cycle
Night											
07:00-09:00PM	Up	0	28	0	28	25	17	0	23	0	52
	Down	0	23	0	31	32	26	0	22	0	43
09:00-11:00PM	Up	0	14	0	17	18	6	0	10	0	38
	Down	0	20	0	9	37	11	0	13	0	26
11:00-01:00AM	Up	0	0	0	14	10	0	0	4	0	13
	Down	0	0	0	25	16	0	0	7	0	25
01:00-03:00AM	Up	0	0	0	0	0	0	0	0	0	7
	Down	0	0	0	0	0	0	0	0	0	0
03:00-05:00AM	Up	0	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0	0
05:00-07:00AM	Up	0	12	0	10	18	0	0	0	0	4
	Down	0	0	0	8	8	0	0	0	0	11
Total		0	321	0	443	567	214	0	347	0	678

Table 7: Traffic Data of Daulatkhan Landing Station

Hour	Direction	Vehicles									
		Bus	Truck	Tractor	Easy Bike	CNG	Auto Rickshaw	Van	Private Car	Cycle	Motor Cycle
Day											
07:00-09:00AM	Up	0	0	0	12	2	4	0	0	0	3
	Down	0	0	0	9	0	4	0	0	4	4
09:00-11:00AM	Up	0	0	0	10	1	6	1	0	3	6
	Down	0	0	0	13	1	4	0	0	5	3
11:00AM-01:00PM	Up	0	0	0	16	0	8	0	0	0	0
	Down	0	0	0	12	3	4	0	0	2	6
01:00-03:00PM	Up	0	0	0	8	1	2	0	0	0	7
	Down	0	0	0	21	0		0	0	1	0
03:00-05:00PM	Up	0	0	0	9	0	3	0	2	4	6
	Down	0	0	0	22	2	11	2	0	6	3
05:00-07:00PM	Up	0	0	0	15	3	7	0	0	7	11
	Down	0	0	0	19	2	13	0	1	8	8
Night											
07:00-09:00PM	Up	0	0	0	7	0	4	2	0	3	0
	Down	0	0	0	6	1	3	0	0	2	0
09:00-11:00PM	Up	0	0	0	11	2	1	0	0	0	0
	Down	0	0	0	13	0	2	0	0	1	0
11:00-01:00AM	Up	0	0	0	0	0	5	0	0	0	4
	Down	0	0	0	4	1	1	0	0	4	2
01:00-03:00AM	Up	0	0	0	0	0	6	4	2	0	6
	Down	0	0	0	0	0	13	6	3	0	9
03:00-05:00AM	Up	0	0	0	0	0	0	0	0	0	1
	Down	0	0	0	0	0	0	0	0	0	1
05:00-07:00AM	Up	0	0	0	6	0	0	0	0	2	0
	Down	0	0	0	0	1	0	0	0	0	0
Total		0	0	0	213	20	101	15	8	52	80

Table 8: Traffic Data of Tojumuddin Landing Station

Hour	Direction	Vehicles									
		Bus	Truck	Tractor	Easy Bike	CNG	Auto Rickshaw	Van	Private Car	Cycle	Motor Cycle
Day											
07:00-09:00AM	Up	0	0	0	0	0	0	0	0	3	1
	Down	0	0	0	0	0	2	0	0	2	0
	Up	0	0	0	5	0	4	0	1	0	4

Hour	Direction	Vehicles									
		Bus	Truck	Tractor	Easy Bike	CNG	Auto Rickshaw	Van	Private Car	Cycle	Motor Cycle
09:00-11:00AM	Down	0	0	0	6	0	6	0	0	0	3
11:00AM-01:00PM	Up	0	0	0	3	0	3	0	0	4	7
	Down	0	0	0	1	0	0	0	0	3	5
01:00-03:00PM	Up	0	0	0	3	2	0	0	0	0	2
	Down	0	0	0	0	1	4	0	0	0	1
03:00-05:00PM	Up	0	0	0	2	4	7	3	1	0	2
	Down	0	0	0	8	6	5	5	0	2	4
05:00-07:00PM	Up	0	0	0	2	0	6	0	0	5	6
	Down	0	0	0	3	0	9	1	0	0	7
Night											
07:00-09:00PM	Up	0	0	0	2	0	0	0	0	0	0
09:00-11:00PM	Down	0	0	0	0	1	4	0	0	6	0
	Up	0	0	0	0	0	1	1	0	1	2
11:00-01:00AM	Down	0	0	0	4	0	0	0	0	0	1
	Up	0	0	0	0	0	2	0	0	2	0
01:00-03:00AM	Down	0	0	0	0	0	0	0	0	1	0
	Up	0	0	0	2	0	0	0	0	0	0
03:00-05:00AM	Down	0	0	0	0	0	0	0	0	0	0
	Up	0	0	0	8	4	8	9	2	3	6
05:00-07:00AM	Down	0	0	0	11	5	13	7	4	6	7
	Up	0	0	0	2	1	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0	0
Total		0	0	0	62	24	74	26	8	38	58

Table 9: Traffic Data of Monpura Landing Station

[illegible]

Table 10: Traffic Data of Moju Chowdhury Landing Station

Hour	Direction	Vehicles									
		Bus	Truck	Tractor	Easy Bike	CNG	Auto Rickshaw	Van	Private Car	Cycle	Motor Cycle
Day											
07:00-09:00AM	Up	0	4	0	15	0	8	0	0	0	8
	Down	3	6	0	19	0	5	0	0	0	7
09:00-11:00AM	Up	2	4	0	21	0	11	4	2	3	11
	Down	4	9	0	23	0	12	3	0	0	13
11:00AM-01:00PM	Up	6	6	0	24	2	8	8	0	2	12
	Down	5	7	0	11	0	7	9	1	0	16
01:00-03:00PM	Up	3	3	0	22	0	4	0	0	1	12
	Down	2	2	0	16	0	6	3	0	0	8
03:00-05:00PM	Up	5	0	0	12	1	9	8	1	6	0
	Down	9	7	0	11	0	8	9	0	0	9
05:00-07:00PM	Up	5	8	0	21	0	12	6	4	2	18
	Down	0	9	0	19	1	16	8	6	3	21
Night											
07:00-09:00PM	Up	3	2	0	16	0	10	5	3	4	8
	Down	7	6	0	13	2	8	6	7	2	11
09:00-11:00PM	Up	1	5	0	14	1	2	0	1	0	6
	Down	2	4	0	16	0	5	4	2	2	4
11:00-01:00AM	Up	0	0	0	6	0	1	1	8	0	1
	Down	0	0	0	5	0	1	0	7	0	5
01:00-03:00AM	Up	0	0	0	0	0	0	0	0	0	0
	Down	0	0	0	3	0	0	0	0	0	0
03:00-05:00AM	Up	0	0	0	2	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0	0
05:00-07:00AM	Up	2	2	0	0	0	0	2	0	1	4
	Down	1	3	0	4	0	2	3	0	0	3
Total		60	87	0	293	7	135	79	42	26	177

Table 11: Traffic Data of Boddarhat Landing Station

[illegible]

Hour	Direction	Vehicles									
		Bus	Truck	Tractor	Easy Bike	CNG	Auto Rickshaw	Van	Private Car	Cycle	Motor Cycle
Total		0	0	2	28	18	27	5	0	22	24

Table 12: Traffic Data of Motirhat Landing Station

Hour	Direction	Vehicles									
		Bus	Truck	Tractor	Easy Bike	CNG	Auto Rickshaw	Van	Private Car	Cycle	Motor Cycle
Day											
07:00-09:00AM	Up	0	0	0	3	4	1	1	0	0	0
	Down	0	0	0	1	2	0	0	0	3	3
09:00-11:00AM	Up	0	1	0	4	3	2	0	0	0	0
	Down	0	0	0	2	6	3	0	0	0	2
11:00AM-01:00PM	Up	0	0	0	1	1	1	1	0	1	2
	Down	0	0	0	2	2	1	0	0	0	0
01:00-03:00PM	Up	0	0	0	0	1	0	0	0	0	0
	Down	0	0	0	1	1	2	0	0	0	0
03:00-05:00PM	Up	0	0	0	2	3	6	0	1	0	2
	Down	0	0	0	1	2	4	0	0	0	3
05:00-07:00PM	Up	0	0	0	4	4	3	2	0	2	4
	Down	0	1	0	6	5	8	0	1	4	1
Night											
07:00-09:00PM	Up	0	0	0	3	2	2	0	0	1	6
	Down	0	0	0	5	1	3	1	0	1	1
09:00-11:00PM	Up	0	0	0	0	0	4	0	0	3	2
	Down	0	0	0	1	1	2	0	0	0	0
11:00-01:00AM	Up	0	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0	0
01:00-03:00AM	Up	0	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0	0
03:00-05:00AM	Up	0	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0	0
05:00-07:00AM	Up	0	0	0	1	1	0	0	0	0	0
	Down	0	0	0	0	1	0	0	0	0	3
Total		0	2	0	37	40	42	5	2	15	29

Table 13: Traffic Data of Tomuruddin Landing Station

[illegible]

Hour	Direction	Vehicles								
		Fishing Trawler	Fishing Boat	Barges	Launch	Passenger Trawler	Cargo Trawler	Lighterage Ship	Ferry	Speed Boat
09:00-11:00PM	Up	0	0	0	0	0	0	0	2	0
	Down	0	0	0	0	0	0	0	1	1
11:00-01:00AM	Up	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0
01:00-03:00AM	Up	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0
03:00-05:00AM	Up	0	0	0	0	0	0	0	0	0
	Down	2	2	0	0	0	0	0	0	0
05:00-07:00AM	Up	4	1	0	0	0	0	0	2	2
	Down	4	4	0	0	0	2	0	1	2
Total		48	43	0	19	33	26	0	65	55

Table 3: Traffic Data of Hijla Landing Station

Hour	Direction	Vehicles								
		Fishing Trawler	Fishing Boat	Barges	Launch	Passenger Trawler	Cargo Trawler	Lighterage Ship	Ferry	Speed Boat
Day										
07:00-09:00AM	Up	4	4	0	0	0	2	0	0	0
	Down	6	2	0	0	0	4	0	0	0
09:00-11:00AM	Up	9	3	0	0	2	3	0	0	0
	Down	11	5	0	2	1	1	0	0	2
11:00AM-01:00PM	Up	14	8	0	2	4	2	0	0	0
	Down	7	4	0	1	2	5	0	0	0
01:00-03:00PM	Up	12	6	0	0	0	2	0	0	0
	Down	6	0	0	2	1	1	0	0	1
03:00-05:00PM	Up	9	10	0	2	3	5	0	0	2
	Down	5	4	0	3	3	3	0	0	0
05:00-07:00PM	Up	7	2	0	2	2	2	0	0	1
	Down	4	1	0	1	1	1	0	0	0
Night										
07:00-09:00PM	Up	10	0	0	0	0	3	0	0	0
	Down	2	0	0	0	0	2	0	0	0
09:00-11:00PM	Up	0	0	0	0	0	2	0	0	0
	Down	0	0	0	0	0	0	0	0	0
11:00-01:00AM	Up	0	0	0	0	0	2	0	0	0
	Down	0	0	0	0	0	1	0	0	0
01:00-03:00AM	Up	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0
03:00-05:00AM	Up	4	0	0	0	0	0	0	0	0
	Down	6	0	0	0	0	0	0	0	0
05:00-07:00AM	Up	8	3	0	0	0	0	0	0	0
	Down	10	1	0	1	0	0	0	0	2
Total		134	53	0	16	19	41	0	0	8

Table 4: Traffic Data of Ilisha Landing Station

Hour	Direction	Vehicles								
		Fishing Trawler	Fishing Boat	Barges	Launch	Passenger Trawler	Cargo Trawler	Lighterage Ship	Ferry	Speed Boat
Day										
07:00-09:00AM	Up	16	3	0	4	4	8	2	2	2
	Down	4	2	0	2	3	5	0	3	1
09:00-11:00AM	Up	6	3	0	4	4	7	4	4	3
	Down	4	4	0	3	6	4	2	3	2
11:00AM-01:00PM	Up	5	1	0	4	10	2	0	3	6
	Down	4	0	0	4	7	1	0	4	3
01:00-03:00PM	Up	10	4	0	2	3	5	0	3	4
	Down	8	2	0	4	1	2	0	3	2
03:00-05:00PM	Up	11	1	0	3	2	2	0	3	1
	Down	7	5	0	3	1	0	1	3	3
	Up	14	2	0	1	6	1	1	2	2

Hour	Direction	Vehicles								
		Fishing Trawler	Fishing Boat	Barges	Launch	Passenger Trawler	Cargo Trawler	Lighterage Ship	Ferry	Speed Boat
05:00-07:00PM	Down	8	3	0	5	3	3	0	1	2
Night										
07:00-09:00PM	Up	7	0	0	0	2	0	0	2	5
	Down	6	0	0	1	3	0	2	2	2
09:00-11:00PM	Up	0	0	0	2	0	0	0	1	1
	Down	0	0	0	1	0	0	0	1	0
11:00-01:00AM	Up	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0
01:00-03:00AM	Up	0	0	0	2	0	0	0	0	0
	Down	0	0	0	2	0	0	0	0	0
03:00-05:00AM	Up	13	0	0	0	0	0	0	0	0
	Down	18	0	0	0	0	0	0	0	0
05:00-07:00AM	Up	21	2	0	2	0	0	0	0	0
	Down	16	5	0	2	0	2	0	0	0
Total		178	37	0	51	55	42	12	40	39

Table 5: Traffic Data of Bankerhat Landing Station

Hour	Direction	Vehicles								
		Fishing Trawler	Fishing Boat	Barges	Launch	Passenger Trawler	Cargo Trawler	Lighterage Ship	Ferry	Speed Boat
Day										
07:00-09:00AM	Up	4	4	0	0	3	2	0	0	0
	Down	3	2	0	0	2	2	0	0	0
09:00-11:00AM	Up	6	1	0	0	3	4	0	0	0
	Down	2	0	0	0	3	3	0	0	0
11:00AM-01:00PM	Up	5	2	0	0	7	5	0	0	0
	Down	3	1	0	0	6	4	0	0	0
01:00-03:00PM	Up	7	1	0	0	5	2	0	0	2
	Down	2	3	0	0	6	3	0	0	2
03:00-05:00PM	Up	4	2	0	0	4	3	0	0	0
	Down	4	6	0	0	3	1	0	0	0
05:00-07:00PM	Up	3	2	0	0	5	1	0	0	1
	Down	6	2	0	0	6	3	0	0	1
Night										
07:00-09:00PM	Up	0	1	0	0	2	0	0	0	0
	Down	0	0	0	0	1	0	0	0	0
09:00-11:00PM	Up	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0
11:00-01:00AM	Up	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0
01:00-03:00AM	Up	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0
03:00-05:00AM	Up	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0
05:00-07:00AM	Up	0	4	0	0	2	0	0	0	0
	Down	0	5	0	0	1	2	0	0	0
Total		49	36	0	0	59	35	0	0	6

Table 5: Traffic Data of Laharhat Landing Station

Hour	Direction	Vehicles								
		Fishing Trawler	Fishing Boat	Barges	Launch	Passenger Trawler	Cargo Trawler	Lighterage Ship	Ferry	Speed Boat
Day										
07:00-09:00AM	Up	2	0	0	1	3	4	0	3	2
	Down	8	0	0	1	3	2	0	3	5
09:00-11:00AM	Up	4	2	0	2	2	3	0	4	4
	Down	4	2	0	2	4	2	1	3	5
11:00AM-01:00PM	Up	11	4	0	1	3	2	0	4	7
	Down	4	2	0	2	2	1	2	3	4

Hour	Direction	Vehicles								
		Fishing Trawler	Fishing Boat	Barges	Launch	Passenger Trawler	Cargo Trawler	Lighterage Ship	Ferry	Speed Boat
01:00-03:00PM	Up	6	3	0	0	3	2	1	4	4
	Down	4	1	0	1	2	0	1	4	5
03:00-05:00PM	Up	3	4	0	0	2	1	0	3	3
	Down	5	2	0	2	3	1	1	4	5
05:00-07:00PM	Up	2	0	0	1	1	0	0	3	2
	Down	4	1	0	1	1	1	0	3	4
Night										
07:00-09:00PM	Up	0	0	0	0	2	0	2	2	3
	Down	0	0	0	0	1	0	1	2	1
09:00-11:00PM	Up	0	0	0	1	0	0	0	3	0
	Down	0	0	0	1	0	0	0	2	0
11:00-01:00AM	Up	0	0	0	0	0	0	0	1	0
	Down	0	0	0	0	0	0	0	0	0
01:00-03:00AM	Up	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0
03:00-05:00AM	Up	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0
05:00-07:00AM	Up	0	0	0	1	0	1	0	0	0
	Down	0	0	0	1	0	0	2	0	0
Total		57	21	0	18	32	20	11	51	54

Table 7: Traffic Data of Daulatkhan Landing Station

Hour	Direction	Vehicles								
		Fishing Trawler	Fishing Boat	Barges	Launch	Passenger Trawler	Cargo Trawler	Lighterage Ship	Ferry	Speed Boat
Day										
07:00-09:00AM	Up	7	2	0	2	2	2	1	0	0
	Down	3	4	0	1	1	2	2	0	2
09:00-11:00AM	Up	5	2	0	3	2	4	0	0	0
	Down	3	0	0	2	2	3	2	0	1
11:00AM-01:00PM	Up	2	4	0	0	3	3	2	0	1
	Down	4	6	0	0	3	4	1	0	2
01:00-03:00PM	Up	4	3	0	1	2	2	0	0	2
	Down	5	1	0	0	1	1	0	0	3
03:00-05:00PM	Up	7	9	0	0	2	4	0	0	0
	Down	4	12	0	0	2	3	3	0	0
05:00-07:00PM	Up	15	4	0	0	3	2	2	0	0
	Down	7	3	0	0	2	3	1	0	0
Night										
07:00-09:00PM	Up	10	2	0	0	2	1	0	0	0
	Down	6	1	0	0	2	2	0	0	0
09:00-11:00PM	Up	4	3	0	0	0	1	0	0	0
	Down	0	2	0	2	0	1	0	0	0
11:00-01:00AM	Up	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0
01:00-03:00AM	Up	0	0	0	2	0	0	0	0	0
	Down	4	0	0	0	0	0	0	0	0
03:00-05:00AM	Up	3	0	0	0	0	0	0	0	0
	Down	8	0	0	0	0	0	0	0	0
05:00-07:00AM	Up	2	1	0	2	1	0	2	0	0
	Down	16	5	0	1	1	1	1	0	0
Total		119	64	0	16	31	39	17	0	11

Table 8: Traffic Data of Tojumuddin Landing Station

Hour	Direction	Vehicles								
		Fishing Trawler	Fishing Boat	Barges	Launch	Passenger Trawler	Cargo Trawler	Lighterage Ship	Ferry	Speed Boat
Day										
	Up	4	2	0	2	2	2	0	0	0

Hour	Direction	Vehicles								
		Fishing Trawler	Fishing Boat	Barges	Launch	Passenger Trawler	Cargo Trawler	Lighterage Ship	Ferry	Speed Boat
07:00-09:00AM	Down	2	1	0	1	1	1	0	0	0
09:00-11:00AM	Up	6	0	0	1	2	2	0	0	0
	Down	6	2	0	0	0	1	0	0	0
11:00AM-01:00PM	Up	1	1	0	0	2	1	0	0	0
	Down	0	2	0	1	1	2	0	0	0
01:00-03:00PM	Up	3	4	0	1	2	1	0	0	0
	Down	1	2	0	1	1	2	0	0	0
03:00-05:00PM	Up	1	1	0	0	1	1	0	0	0
	Down	4	5	0	1	2	0	0	0	0
05:00-07:00PM	Up	2	2	0	1	2	0	0	0	0
	Down	7	0	0	0	1	1	0	0	0
Night										
07:00-09:00PM	Up	3	2	0	1	2	1	0	0	0
	Down	5	1	0	0	2	1	0	0	0
09:00-11:00PM	Up	1	11	0	0	0	1	0	0	0
	Down	0	6	0	0	0	1	0	0	0
11:00-01:00AM	Up	0	3	0	0	0	0	0	0	0
	Down	0	4	0	0	0	0	0	0	0
01:00-03:00AM	Up	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0
03:00-05:00AM	Up	0	0	0	2	0	0	0	0	0
	Down	0	3	0	2	0	0	0	0	0
05:00-07:00AM	Up	4	0	0	0	0	0	0	0	0
	Down	1	2	0	0	0	0	0	0	0
Total		51	54	0	14	21	18	0	0	0

Table 9: Traffic Data of Monpura Landing Station

Hour	Direction	Vehicles								
		Fishing Trawler	Fishing Boat	Barges	Launch	Passenger Trawler	Cargo Trawler	Lighterage Ship	Ferry	Speed Boat
Day										
07:00-09:00AM	Up	2	0	0	0	2	3	0	0	3
	Down	9	0	0	0	1	4	0	0	2
09:00-11:00AM	Up	2	0	0	0	2	2	0	0	4
	Down	4	0	0	0	2	3	0	0	3
11:00AM-01:00PM	Up	4	0	0	1	2	1	0	0	6
	Down	5	0	0	1	1	0	0	0	3
01:00-03:00PM	Up	3	0	0	0	2	3	0	0	4
	Down	8	0	0	1	1	1	0	0	3
03:00-05:00PM	Up	1	0	0	0	3	0	0	0	3
	Down	2	0	0	1	1	2	0	0	2
05:00-07:00PM	Up	5	0	0	0	2	0	0	0	1
	Down	1	0	0	0	1	1	0	0	1
Night										
07:00-09:00PM	Up	2	0	0	0	1	0	0	0	3
	Down	4	0	0	0	1	0	0	0	1
09:00-11:00PM	Up	2	0	0	0	0	0	0	0	3
	Down	4	0	0	0	0	0	0	0	2
11:00-01:00AM	Up	4	0	0	0	0	0	0	0	0
	Down	5	0	0	0	0	0	0	0	0
01:00-03:00AM	Up	4	0	0	0	0	0	0	0	0
	Down	10	0	0	0	0	0	0	0	0
03:00-05:00AM	Up	22	0	0	0	0	0	0	0	0
	Down	12	0	0	0	0	0	0	0	0
05:00-07:00AM	Up	18	0	0	2	1	2	0	0	0
	Down	14	0	0	0	1	1	0	0	0
Total		147	0	0	6	24	23	0	0	44

Table 10: Traffic Data of Moju Chowdhury Landing Station

Hour	Direction	Vehicles								
		Fishing Trawler	Fishing Boat	Barges	Launch	Passenger Trawler	Cargo Trawler	Lighterage Ship	Ferry	Speed Boat
Day										
07:00-09:00AM	Up	2	0	0	1	3	2	1	2	4
	Down	1	0	0	2	1	3	0	2	3
09:00-11:00AM	Up	1	0	0	3	4	5	1	2	5
	Down	0	0	0	2	2	3	1	1	8
11:00AM-01:00PM	Up	2	2	0	1	2	7	0	3	7
	Down	1	1	0	1	5	4	0	2	11
01:00-03:00PM	Up	3	4	0	1	4	2	0	1	9
	Down	1	1	0	1	1	5	0	1	6
03:00-05:00PM	Up	1	0	0	0	3	6	0	2	11
	Down	3	1	0	0	4	11	0	3	14
05:00-07:00PM	Up	2	1	0	1	2	2	2	2	3
	Down	0	2	0	0	1	4	1	2	5
Night										
07:00-09:00PM	Up	0	0	0	0	2	6	1	2	3
	Down	0	0	0	0	1	4	2	1	2
09:00-11:00PM	Up	0	0	0	0	2	3	1	0	4
	Down	0	0	0	0	2	2	0	0	1
11:00-01:00AM	Up	0	0	0	2	0	0	0	0	0
	Down	0	0	0	1	0	0	0	0	0
01:00-03:00AM	Up	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0
03:00-05:00AM	Up	0	0	0	0	0	0	0	0	0
	Down	2	0	0	0	0	0	0	0	0
05:00-07:00AM	Up	1	2	0	2	3	3	0	1	4
	Down	1	1	0	1	2	1	0	1	3
Total		21	15	0	19	44	73	10	28	103

Table 11: Traffic Data of Boddarhat Landing Station

Hour	Direction	Vehicles								
		Fishing Trawler	Fishing Boat	Barges	Launch	Passenger Trawler	Cargo Trawler	Lighterage Ship	Ferry	Speed Boat
Day										
07:00-09:00AM	Up	2	1	0	2	0	2	0	0	2
	Down	4	2	0	0	0	1	0	0	1
09:00-11:00AM	Up	13	1	2	1	0	0	1	0	3
	Down	9	2	0	1	0	1	1	0	2
11:00AM-01:00PM	Up	10	4	2	0	0	1	2	0	1
	Down	17	1	0	0	0	0	1	0	1
01:00-03:00PM	Up	14	1	2	0	2	2	0	0	4
	Down	9	2	2	0	1	1	0	0	2
03:00-05:00PM	Up	11	3	1	1	1	3	1	0	3
	Down	16	0	0	1	0	2	1	0	4
05:00-07:00PM	Up	16	0	0	0	0	1	2	0	2
	Down	9	0	0	0	0	0	1	0	1
Night										
07:00-09:00PM	Up	1	1	0	0	0	2	0	0	0
	Down	1	0	2	0	1	1	0	0	0
09:00-11:00PM	Up	0	1	4	0	1	0	0	0	0
	Down	0	0	4	0	0	0	0	0	0
11:00-01:00AM	Up	0	2	2	0	0	0	0	0	0
	Down	0	1	1	0	0	0	0	0	0
01:00-03:00AM	Up	0	0	0	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0
03:00-05:00AM	Up	0	0	1	0	0	0	0	0	0
	Down	0	0	0	0	0	0	0	0	0
05:00-07:00AM	Up	3	0	0	0	0	0	0	0	0
	Down	2	0	1	1	0	1	0	0	1

Hour	Direction	Vehicles								
		Fishing Trawler	Fishing Boat	Barges	Launch	Passenger Trawler	Cargo Trawler	Lighterage Ship	Ferry	Speed Boat
01:00-03:00AM	Down	0	0	0	0	0	0	0	0	0
03:00-05:00AM	Up	14	0	0	0	0	0	0	0	0
	Down	8	0	0	0	0	0	0	0	0
05:00-07:00AM	Up	16	1	0	0	0	0	0	0	4
	Down	4	1	0	1	4	0	1	0	2
Total		89	20	0	4	38	44	8	0	224

Annexure 09

Flood Frequency Analysis

Flood Frequency Analysis

The Upper Meghna River basin in Bangladesh is critical for flood risk management. The Upper Meghna Basin's low-lying topography makes it prone to seasonal flooding during the monsoon from June to October, with annual rainfall averaging 1700 mm. Bhairab Bazar station is crucial for monitoring water levels and flood forecasting, providing vital historical data for managing flood risks. The Upper Meghna River basin is essential for studying flood dynamics due to its geographical position, climatic conditions, and socio-economic significance. (Islam et al., 2024)

❖ Data Collection and Processing

This study analyzes flood frequency models for the Upper Meghna River in Bangladesh, focusing on annual peak flows recorded at the Bhairab Bazar station over a 32-year period (1990-2021). The study utilizes discharge data from the BWDB, including daily water level and river discharge records, crucial for understanding flood dynamics and trends. The data was meticulously verified completeness. Initial for accuracy processing and involved cleaning the data by correcting outliers and filling missing values using interpolation methods. (Islam et al., 2024)

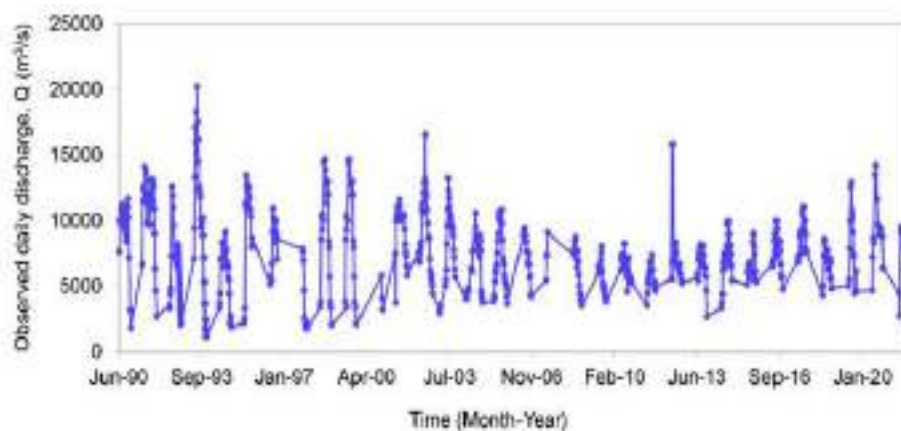


Figure 1.1 (a): Time series plots depicting discharges over 32 years (1990-2021)

Figure 1.1 (a) presents time series graphs of daily observed discharges, highlighting significant trends and patterns over the 32-year period. These trends reveal notable inter-annual variability in peak discharge values, with extreme weather events influencing certain high flood years. Continuous and accurate data collection is emphasized for improving flood prediction models. (Islam et al., 2024)

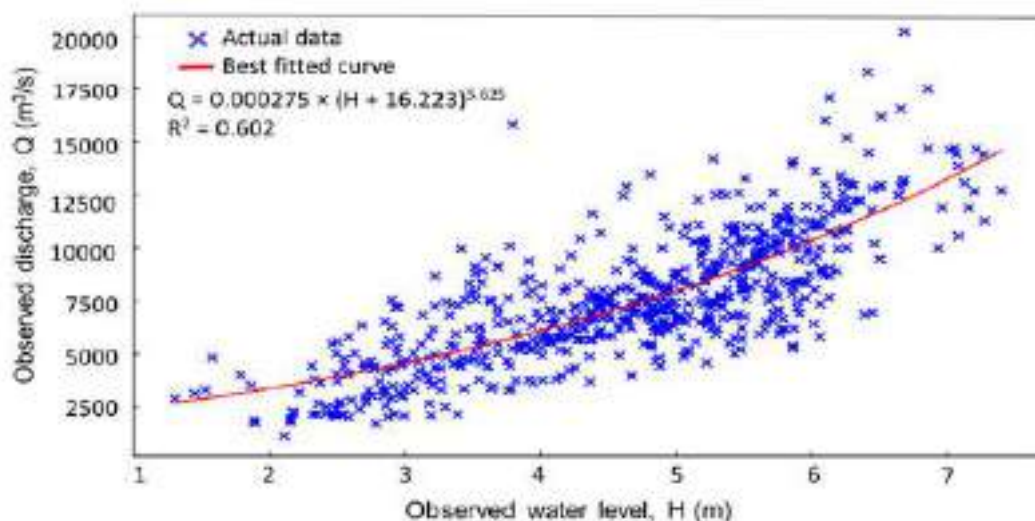


Figure 1.1 (b): Rating curve illustrating observed discharge versus river water level (or stage) at the Bhairab Bazar station along the upper Meghna River in Bangladesh

In addition, **Figure 1.1 (b)** illustrates the rating curve, which shows the relationship between discharge and river water level at the Bhairab Bazar station. This curve was developed using the generalized reduced gradient algorithm resulting in a stable and predictable relationship with a coefficient of determination (R^2) value of 0.602. This stability is crucial for accurate flood forecasting and management. The steepness of the curve indicates a high sensitivity of river stage to discharge changes, which is vital for flood risk planning. (Islam et al., 2024)

For the flood frequency analysis, the dataset was divided into the **Extreme Value Series (EVS)** and the **Peak Over Threshold (POT)** series. The EVS includes the maximum annual discharge values from 1990 to 2021, while the POT series includes discharge values exceeding a predefined threshold, representing moderate to severe flood events. By selecting 32 significant peaks for the POT series, the study captures a comprehensive range of over-threshold flood events. This dual approach enhances the robustness of the flood frequency analysis by capturing the full spectrum of flood events, from extreme annual floods to frequent moderate floods. The study provides insights crucial for designing effective flood management and mitigation strategies tailored to the specific flood dynamics of the Upper Meghna River. (Islam et al., 2024)

❖ Probability Distribution Models

To analyze the flood frequency of the Upper Meghna River, we utilized two commonly applied probability distribution models: **Gumbel model** and **Log-Pearson Type III (LP3)** model. These models are represented by equations (1) through (9).

➤ Gumbel Probability Distribution

The Gumbel distribution serves as a statistical model for extreme events, especially in regionalization procedures. It is considered a suitable method for predicting flood recurrence intervals. The reduced variate (Y_t) for a given return period (T) is determined using the following formula:

$$Y_t = - [\ln \{ \ln (T/(T-1)) \}] \dots\dots\dots (1)$$

The reduced mean (Y_n) and reduced standard deviation (S_n) are obtained from the Gumbel distribution table for the given sample size (number of recorded years) [28]. The frequency factor (K_t) is then estimated using:

$$K_t = \frac{(Y_t - Y_n)}{S_n} \dots\dots\dots (2)$$

where K_t is the frequency factor, Y_t is the reduced variate, Y_n is the reduced mean, and S_n is the reduced standard deviation. The predicted discharge is computed using the standard normal distribution formula for various return periods:

$$Q_p = \mu + K_t \sigma \dots\dots\dots (3)$$

where Q_p is the predicted discharge (m^3/s), μ is the mean, and σ is the standard deviation.

➤ Log-Pearson Type III (LP3)

The Log-Pearson Type III (LP3) distribution is a statistical approach employed to model frequency distribution values, particularly for predicting floods at specific locations. Also referred to as the three-parameter Gamma distribution; it has been extensively utilized in flood frequency analysis since its endorsement by the Water Resources Council of the United States. This distribution is especially effective for analyzing flood peak data. (Islam et al., 2024)

To implement the LP3 model, the logarithm of the actual discharges (Z) is first calculated, followed by determining the logarithmic mean (μ) and logarithmic standard deviation (σ):

$$Z = \log_{10} Q \dots\dots\dots (4)$$

Subsequently, the coefficient of skewness (C_s) is computed using the logarithmic discharges (Z). For a given return period (T), the probability (P) is then calculated as follows:

$$P = \frac{1}{T} (\%) \dots\dots\dots (5)$$

Using the standard normal distribution table, we interpolated to find the standard normal deviate (z). The frequency factor (K_t), which depends on the coefficient of skewness (C_s) and the return period (T), is adjusted using the formula proposed by Kite:

$$K_t = z + (z^2 - 1)k + \frac{1}{3}(z^3 - 6z)k^2 - (z^2 - 1)k^3 + zk^4 + \frac{1}{3}k^5 \dots\dots\dots (6)$$

$$\text{where, } k = \frac{C_s}{6} \dots\dots\dots (7)$$

The predicted logarithmic discharge is calculated as:

$$q_p = \mu + K_t \dots\dots\dots (8)$$

where q_p is the predicted logarithmic discharge. The predicted discharge (Q_p) in m^3/s is then obtained by taking the antilog of q_p :

$$Q_p = \text{antilog}(q_p) \dots\dots\dots (9)$$

Flood Frequency Estimates for Various Return Periods

Estimating flood frequency for various return periods is essential for effective flood risk management. A comparative analysis of flood frequency models for the Upper Meghna River at Bhairab Bazar station offers valuable insights.

Table 1.1: Flood frequency estimates for Bhairab Bazar station along the Upper Meghna River in Bangladesh using Gumbel distribution with Extreme Value Series (EVS) and Peak Over Threshold (POT) data series

Return period (T) in years	Reduced variate, Y_t	Frequency factor, K_t	Predicted discharge, Q_p in m^3/s	
			EVS	POT
2	0.37	-0.15	10709.71	14397.00
5	1.50	0.86	13885.11	16172.20
10	2.25	1.53	15987.51	17347.54
25	3.20	2.38	18643.89	18832.59
50	3.90	3.01	20614.55	19934.28
100	4.60	3.63	22570.65	21027.83
200	5.30	4.25	24519.62	22117.40

Table 1.1 shows predicted discharges for return periods from 2 to 200 years using the Gumbel distribution. For the EVS data series, discharges start at 10,709.71 m^3/s for a 2-year return period and rise to 24,519.62 m^3/s for a 200-year return period. The POT data series predicts higher discharges, starting at 14,397.00 m^3/s for a 2 year return period and reaching 22,117.40 m^3/s for a 200-year return period. These higher values from the POT series indicate its effectiveness in capturing more extreme flood events, which is crucial for estimating higher discharges for longer return periods.

Table 1.2: Flood frequency estimates of Bhairab Bazar station at Upper Meghna River of Bangladesh using Log-Pearson Type III distribution with Extreme Value Series (EVS) and Peak Over Threshold (POT) data series

Return period (T) in years	Frequency factor, K_t		Predicted logarithmic discharge, q_p in m^3/s		Predicted discharge, Q_p in m^3/s	
	EVS	POT	EVS	POT	EVS	POT
2	-0.03	-0.19	4.03	4.15	10701.51	14265.76

Return period (T) in years	Frequency factor, K_t		Predicted logarithmic discharge, q_p in m ³ /s		Predicted discharge, Q_p in m ³ /s	
	EVS	POT	EVS	POT	EVS	POT
5	0.84	0.74	4.13	4.20	13568.75	15833.15
10	1.3	1.34	4.19	4.23	15383.32	16934.61
25	1.82	2.09	4.25	2.27	17728.42	18419.81
50	2.16	2.63	4.29	4.29	19451.81	19569.17
100	2.47	3.15	4.33	4.32	21168.74	20743.69
200	2.76	3.66	4.36	4.34	22911.84	21964.07

Similarly, **Table 1.2** provides flood frequency estimates using the LP3 distribution. For the EVS series, the discharge for a 2-year return period is 10,701.51 m³/s, increasing to 22,911.84 m³/s for a 200-year return period. The POT series estimates start at 14,265.76 m³/s for a 2-year return period and rise to 21,964.07 m³/s for a 200-year return period. The LP3 distribution, known for better handling skewed data shows that the POT series yields higher discharge estimates for shorter return periods but slightly lower estimates for longer return periods compared to the Gumbel distribution. This variance highlights the importance of selecting the appropriate distribution model based on data characteristics and specific flood risk management needs.



Figure 1.2 (a): Comparative analysis of estimated flood discharges using gumbel and log-pearson type III (LP3) distributions with extreme value series (EVS)

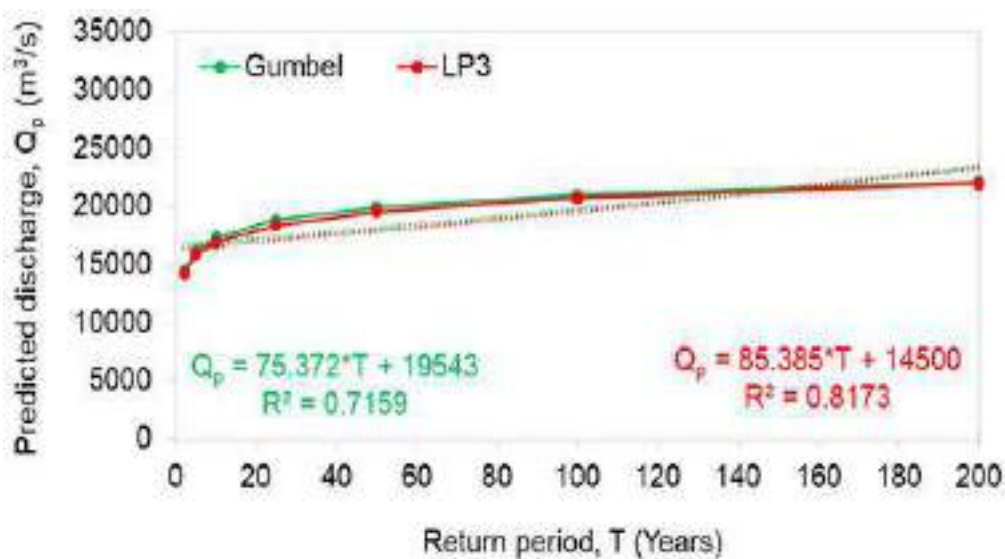


Figure 1.2 (b): Comparative analysis of estimated flood discharges using gumbel and log-pearson type III (LP3) distributions with peak over threshold (POT) data

Figure 1.1 (a) and **Figure 1.2 (b)** compares the estimated flood discharges using both the Gumbel and LP3 distributions for EVS and POT data. High coefficients of determination (R^2) for both distributions indicate a good fit to the observed data. However, discrepancies in predicted discharges, particularly for higher return periods, highlight the importance of model selection. The POT data series consistently predicts higher discharges compared to the EVS series across both distributions, indicating its sensitivity to recent extreme events. This is critical for near-term flood risk management, while the EVS method provides more conservative estimates over longer periods, offering stable long-term risk assessments.

Integrating both EVS and POT approaches could enhance flood risk management strategies. Short-term infrastructure planning could benefit from POT estimates, while long-term policies and land-use planning could rely on EVS estimates. The study underscores the POT method's capability to account for extreme flood events, making it a potentially more reliable tool for regions prone to high variability in flood magnitudes. For example, the 200-year return period discharge using the Gumbel distribution is 24,519.62 m³/s (EVS) versus 22,117.40 m³/s (POT), and for the LP3 distribution, it is 22,911.84 m³/s (EVS) versus 21,964.07 m³/s (POT). These findings align with previous studies emphasizing the variability in flood frequency estimates based on distribution models and data series. Ultimately, this study highlights the importance of using multiple flood frequency models and data series to capture a range of potential flood discharges. The choice of method should be tailored to the specific needs of flood risk management, balancing short-term responsiveness with long-term reliability.

❖ Comparison of Flood Frequency Estimates with Severe Flooding Threshold

The analysis compares flood frequency estimates with critical water levels as defined by local authorities, specifically the BWDB. The danger level is set at a 5.8-m water level, while the severe flooding threshold is marked at 6.8 m. **Figure 1.3** illustrates the predicted discharges for different return periods and their relation to these critical water levels. The discharge values corresponding to these water levels were obtained using the rating curve presented in **Figure 1.1 (b)**, which maps the relationship between observed discharge and river water level at the targeted hydrological monitoring station.

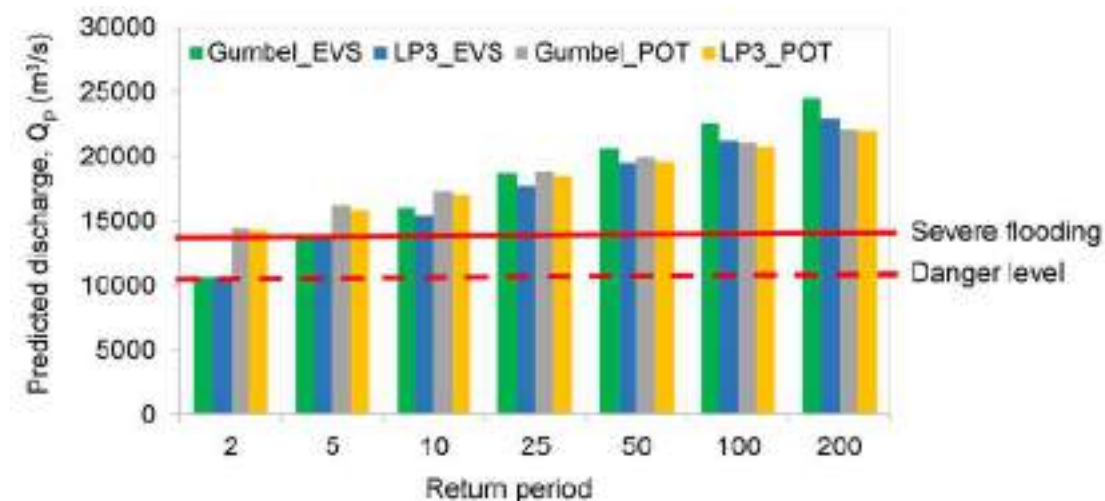


Figure 1.3: Comparison of flood frequency estimates with the danger level (5.8 m water level) and severe flooding threshold (6.8 m water level) set by local authorities. The discharge values for these thresholds were derived from the rating curve shown in Figure 1.1 (b)

For shorter return periods, such as 2 years, the predicted discharges indicate a relatively modest increase in water levels. These levels generally remain above the danger threshold (5.8 m or approximately 10,150 m³/s, as shown in **Figure 1.1 (b)**) but below or around the severe flooding threshold (6.8 m or approximately 13,036 m³/s, as shown in **Figure 1.1 (b)**). Specifically, this 2-year return period reflects a discharge just above normal river levels, indicating minimal risk to the surrounding areas.

As it progresses to the 5-year return period, the predicted discharge begins to approach the danger level, highlighting an increasing risk of severe flooding that necessitates vigilant monitoring and early warning systems. In contrast, longer return periods, such as 10, 25, 50, 100, and 200 years, predict significantly higher discharges that exceed the severe flooding threshold of 6.8 m. These longer return periods indicate a potential for catastrophic flooding events. For instance, the 100-year return period predicts a discharge well above 10 m of water level, signifying extreme flood events that could severely impact infrastructure and communities. These results underscore the necessity for robust flood management strategies to mitigate the impacts of such rare but devastating events. This aligns with previous studies that emphasize the importance of incorporating long-term flood frequency data into risk management frameworks. (Islam et al., 2024).

Annexure 10

Brief description of Floral and Faunal Species

Brief description of Floral and Faunal Species

1. Bhairab LS

This site represents a highly modified and built up area of influence comprise of business and industrial infrastructures. The construction site is almost devoid of any vegetation, while aquatic environment comprises the moderately polluted in Upper Meghna River.

In the Terminal Site, there are no crops; the use of the land is urban with dispersed vegetation, without continuous areas of trees, forests, or bushes. There is no natural vegetation, nor riverside. But some scattered wooden trees are visible around 2km from the proposed project area. The proposed construction site is barren and devoid of ground vegetation. However, some floating water hyacinth (*Eichhornia crassipes*), Kolmi shak (*Ipomoea aquatica*), Thankuni (*Centella asiatica*) and Khudipana (*Lemna perpusilla*) temporarily aggregate around the terminal pontoons.

3 species of amphibians are commonly found in project area i.e., Cricket Frog (*Fejervarya spp*), Common Asian Toad (*Duttaphyrnus melanostictus*) and Skipping Frog (*Euphlyctis cyanophlyctis*). 4 Reptiles species of the project site include -Common garden lizard (*Calotes versicolor*), Bengal monitor (*Varanus bengalensis*), Common house gecko (*Hemidactylus frenatus*) and Dhora sap (*Amphiesma stolatum*). Likewise, 7 common mammalian species of this site include- Ganges river dolphin (*Platanista gangetica*), Small Indian mongoose (*Herpestes auropunctatus*), Clawless otter (*Aonyx cinerea*), House mouse (*Mus musculus*). House rat (*Rattus rattus*), Common Indian Field Mouse (*Mus booduga*) and Greater bandicoot rat (*Bandicota indica*). 15 species of avian/birds project site include- House Sparrow (*Passer domesticus*), Jungle Myna (*Acridotheres fuscus*), House Crow (*Corvus splendens*), Cuckoos (*Cuculus micropterus*), Rose-ringed Parakeet (*Psittacula krameri*), Red-vented bulbul (*Pycnonotus cafer*), Spotted dove (*Spilopelia chinensis*), Mallard duck (*Anas platyrhynchos*), Black-headed oriole (*Oriolus larvatus*), Fulvous-breasted Woodpecker (*Dendrocopos macei*), Baya weaver (*Ploceus philippin*), Magpie robin (*Copsychus saularis*), Common kingfisher (*Alcedo atthis*), Indian Pond Heron (*Ardeola grayii*) and White-breasted Water hen (*Amaurornis phoenicurus*).

2. Ilisha LS

These areas have some commercial planted tree species with good canopy coverage that provides refuge to many bird species. Some floating water hyacinths aggregate the riverbank areas. Some sparsely distributed herbaceous species are found in some small localized areas. In the Terminal Site, there are no crops, the use of the land is urban with disperse vegetation. Natural vegetation like Dholkolmi densly found at riverside. The vegetation predominates in isolated arboreal form except in the surroundings where there are several spots with groups of vegetation, mainly trees. On the banks, there is huge presence of invasive plants Water hyacinth (*Eichhornia crassipes*)

In total, 50 flora species, including 16 types of trees, 7 species of herb, 24 species of shrub and 3 species of climber, were found within 2km radius of terminal area. The major common planted tree species of the site are Chapalish (*Artocarpus chama*), Eucaliptus (*Eucalyptus globules*), Akashmoni (*Acacia auriculiformis*), Sishu (*Dalbergia sissoo*), Gamari (*Gmelina arborea*), Raintree (*Samanea saman*), Narikel (*Cocos nucifera*), Supari (*Areca catechu*), Banyan tree (*Ficus benghalensis*), Mehghoni (*Swietenia mahagoni*), Krishnochura/Flame tree (*Delonix regia*), Jackfruit (*Artocarpus heterophyllus*) and Mango (*Magnifera indica*). The common and major herbaceous plants observed are Bermuda grass (*Cynodon dactylon*), Carpet grass (*Axonopus compressus*), Assamlata (*Eupatorium odoratum*), Akand (*Calotropis gigantean*), Dolkolmi (*Ipomoea fistulosa*) and Sensitive plant (*Mimosa pudica*).

3 species of amphibians are commonly found in project area i.e. Common Asian Toad (*Duttaphyrnus melanostictus*), Skipping Frog (*Euphlyctis cyanophlyctis*) and Cricket Frog (*Fejervarya spp*). Some 6 species of the common reptiles of the site include- Common garden lizard (*Calotes versicolor*), Bengal monitor (*Varanus bengalensis*), Spotted flapshell turtle (*Lissemys punctata*), Dhora sap (*Amphiesma stolatum*), Common house gecko (*Hemidactylus frenatus*) and spotted flapshell turtle (*Lissemys punctata*). Likewise, common 6 mammalian species of this site include- Small Indian mongoose (*Herpestes auropunctatus*), Clawless otter (*Aonyx cinerea*), House mouse (*Mus musculus*). House rat

(*Rattus rattus*), Common Indian Field Mouse (*Mus booduga*) and Greater bandicoot rat (*Bandicota indica*), 20 species of avian/birds project site include; Oriental magpie-robin (*Copsychus saularis*), Indian pied myna (*Gracupica contra*), Cuckoos (*Cuculus micropterus*), Black Drongo-(*Dicrurus macrocercus*), Red-vented bulbul (*Pycnonotus cafer*), Mallard duck (*Anas platyrhynchos*), Rock Pigeon (*Columba livia*), Spotted dove (*Spilopelia chinensis*), Black-headed oriole (*Oriolus xanthornus*), Great Egret (*Ardea alba*), Long-tailed Shrike (*Lanius schach*), Common kingfisher (*Alcedo atthis*), House Swift (*Apus nipalensis*), Cinnamon Bittern (*Botaurus cinnamomeus*), Fulvous-breasted Woodpecker (*Dendrocopos macei*), Baya weaver (*Ploceus philippin*), House Sparrow (*Passer domesticus*), Indian Pond Heron (*Ardeola grayii*), Thornback ray (*Raja clavata*) and House Crow (*Corvus splendens*).

Common migratory birds in Bangladesh include waders (like godwits and stints), ducks (like Mallards and Green-winged Tail), and gulls (like Brown-headed Gull). Other notable migratory birds include herons, egrets, birds of prey, storks, and spoonbills. These birds often arrive around project site during the winter season.

3. Bankerhat LS

The terminal is planned to be newly built in a green field location and situating at the left bank of Tentulia river. There is no any structure here for facilitating passengers. The project site and its adjoining areas have good ground vegetation cover of herbaceous plants. The riverbank, upon which the terminal facilities will be developed, is a gently sloping/flat area containing creeping vegetation, most of which becomes inundated during monsoon periods.

A ditch, part of which is located within the project boundary, contains some aquatic vegetation including, among others, Water hyacinth (*Eichhornia crassipes*), Keshordam/Creeping Water primrose (*Jussiaea repens*), Topapana/Water lettuce (*Pistia stratiotes*), Khudepana/Duckweed (*Lemna minor*) which are considered invasive species in Bangladesh, but not particularly established at the site. The upper part of the bank has some planted trees.

A total of 26 flora species, none of them endemic or red-listed comprising 17 tree species, 5 herb and 4 shrub species occur within and immediately around the site. Some noted herbaceous plants are Akand (*Calotropis gigantea*), Dolkolmi (*Ipomoea fistulosa*), Sensitive plant (*Mimosa pudica*), katanotey/spiny amaranth (*Amaranthus spinosus*), Bermuda grass (*Cynodon dactylon*), Swamp cabbage (*Ipomoea aquatica*), Prickly Chaff-flower (*Achyranthes aspera*), but found in negligible quantities. The major trees are Jackfruit (*Artocarpus heterophyllus*), Mango (*Magnifera indica*), Eucalyptus (*Eucalyptus globules*), Akashmoni (*Acacia auriculiformis*), Sishu (*Dalbergia sissoo*), Banyan (*Ficus benghalensis*), Mehgoni (*Swietenia mahagoni*), Chambol (*Artocarpus chaplasha*), Neem (*Azadirachta indica*), Beetle nut (*Areca catechu*), Coconut (*Cocos nucifera*), Raintree (*Samanea saman*), Yellow fig (*Ficus comosa*), Blackberry (*Syzygium cumini*), which all represent planted trees.

3 species of amphibians are commonly found in project area i.e. Skipping Frog (*Euphlyctis cyanophlyctis*), Common Asian Toad (*Duttaphrynus melanostictus*) and Cricket Frog (*Fejervarya spp.*). 6 species of common reptiles of the site: Bengal monitor (*Varanus bengalensis*), Binocellate cobra (*Naja naja*), Spotted flapshell turtle (*Lissemys punctata*), Dhora sap (*Amphiesma stolatum*), Common house gecko (*Hemidactylus frenatus*) and spotted flapshell turtle (*Lissemys punctata*). Likewise, 6 common mammalian species of this site include- Greater bandicoot rat (*Bandicota indica*), Fishing Cat (*Felis viverina*), Small Indian mongoose (*Herpestes auropunctatus*), House mouse (*Mus musculus*), House rat (*Rattus rattus*) and Common Indian Field Mouse (*Mus booduga*). 18 species of avian/birds project site include- Oriental magpie-robin (*Copsychus saularis*), Great Egret (*Ardea alba*), Indian pied myna (*Gracupica contra*), Cuckoos (*Cuculus micropterus*), House Crow (*Corvus splendens*), Black Drongo (*Dicrurus macrocercus*), Baya weaver (*Ploceus philippin*), Red-vented bulbul-(*Pycnonotus cafer*), Rock Pigeon (*Columba livia*), Spotted dove (*Spilopelia chinensis*), Long-tailed Shrike (*Lanius schach*), House Swift (*Apus nipalensis*), Fulvous-breasted Woodpecker (*Dendrocopos macei*), House Sparrow (*Passer domesticus*), Common kingfisher (*Alcedo atthis*), Mallard duck (*Anas platyrhynchos*), Thornback ray (*Raja clavata*) and Indian Pond Heron (*Ardeola grayii*).

Migratory birds such as godwits and stints, ducks (like Mallards and Green-winged Tail), Gulls (like Brown-headed Gull) and other migratory birds are easily noticeable in riverine and coastal areas.

4. Tojumuddin LS

The terminal is planned to be built inner side of Berry Baddth location. This terminal is situated on lower Meghna river. Proposed construction area covered by green field. In the Terminal Site, there are no crops. This area of influence is rich in floral diversity and abundance. Most recorded species are common and abundant throughout the country and considered weeds. The use of the land is rural with dominant vegetation, with continuous areas of trees and bushes.

In total, 50 flora species, including 21 types of trees, 9 species of herb, 17 species of shrub and 3 species of climber, were found within the terminal area. The major tree species of the study site are Eucalyptus (*Eucalyptus globules*), Akashmoni (*Acacia auriculiformis*), Sishu (*Dalbergia sissoo*), Krishnochura/Flame tree (*Delonix regia*), Jackfruit (*Artocarpus heterophyllus*), Mango (*Mangifera indica*), Banyan tree (*Ficus benghalensis*), Moringa (*Moringa oleifera*), Mehghoni (*Swietenia mahagoni*) and Arjun (*Terminalia arjuna*). The common and major herbaceous plants observed are Bermuda grass (*Cynodon dactylon*), Carpet grass (*Axonopus compressus*), Assamlata (*Eupatorium odoratum*). Some water hyacinth (*Eichhornia crassipes*) aggregated around the terminal jetty.

3 species of amphibians are commonly found in project area i.e. Common Asian Toad (*Duttaphyrnus melanostictus*), Skipping Frog (*Euphlyctis cyanophlyctis*) and Cricket Frog (*Fejervarya spp*). Besides, 5 common reptiles of the site Include-Bengal monitor (*Varanus bengalensis*), Spotted flapshell turtle (*Lissemys punctata*), Common house gecko (*Hemidactylus frenatus*), Dhora sap (*Amphiesma stolatum*) and spotted flapshell turtle (*Lissemys punctata*). 7 common mammalian species of this site includes- Greater bandicoot rat (*Bandicota indica*), Fishing Cat (*Felis viverina*), Small Indian mongoose (*Herpestes auropunctatus*), Clawless otter (*Aonyx cinerea*), House mouse (*Mus musculus*), House rat (*Rattus rattus*) and Common Indian Field Mouse (*Mus booduga*). 19 species of avian/birds project site include- Black-headed oriole (*Oriolus larvatus*), Black Drongo (*Dicrurus macrocercus*), Spotted dove (*Spilopelia chinensis*), Indian pied myna (*Gracupica contra*), Cuckoos (*Cuculus micropterus*), Baya weaver (*Ploceus philippin*), House Sparrow (*Passer domesticus*), Fulvous-breasted Woodpecker (*Dendrocopos macei*), House Crow (*Corvus splendens*), Oriental magpie robin (*Copsychus saularis*), Great Egret (*Ardea alba*), Red-vented bulbul (*Pycnonotus cafer*), Common kingfisher (*Alcedo atthis*), Little Cormorant (*Microcarbo niger*), Mallard duck (*Anas platyrhynchos*), Thornback ray (*Raja clavata*), Graylag goose (*Anser anser*), White-breasted Water hen (*Amaurornis phoenicurus*) and Indian Pond Heron (*Ardeola grayii*).

Migratory birds are those that regularly travel long distances between different locations, typically in response to seasonal changes like breeding or food availability. Many birds migrate from warmer regions during the breeding season to take advantage of food resources, such as insects, which are more abundant in summer in higher latitudes. Migratory birds include ducks (like Mallards and Green-winged Tail), gulls (like Brown-headed Gull) and other migratory birds are easily noticeable in riverine and coastal areas.

5. Monpura LS

The proposed terminal building is planned to be built inner side of newly constructing Berry Baddth location. Existing LG is about 1.5 km away from proposed LG. The construction area covered by homestead and pond areas. In the Terminal Site, there are no crops. This area of influence is plenty floral diversity and abundance. Most recorded species are common and abundant throughout the country and considered weeds. The use of the land is rural with dominant vegetation, with continuous areas of trees and bushes.

In total, 65 flora species, including 33 types of trees, 11 species of herb, 18 species of shrub and 3 species of climber, were found within the terminal area. The major tree species of the study site are Banyan tree (*Ficus benghalensis*), Akashmoni (*Acacia auriculiformis*), Sishu (*Dalbergia sissoo*), Mehghoni (*Swietenia mahagoni*), Arjun (*Terminalia arjuna*), Krishnochura/Flame tree (*Delonix regia*), Mango (*Mangifera indica*) and Jackfruit (*Artocarpus heterophyllus*). The common and major herbaceous plants observed are Carpet grass (*Axonopus compressus*), Bermuda grass (*Cynodon dactylon*), Assamlata (*Eupatorium odoratum*). Some water hyacinth (*Eichhornia crassipes*) aggregated around the terminal jetty. Also a rare plant, Cycas sp. has been recorded in the Terminal.

4 species of amphibians are commonly found in project area i.e. Indian Bull Frog (*Hoplobatrachus tigerinus*), Common Asian Toad (*Duttaphrynus melanostictus*), Cricket Frog (*Fejervarya spp*) and Skipping Frog (*Euphlyctis cyanophlyctis*). 5 common reptile species of the site: Bengal monitor (*Varanus bengalensis*), spotted flapshell turtle (*Lissemys punctata*), Water snake (*Xenochrophis piscator*), Common house gecko (*Hemidactylus frenatus*) and spotted flapshell turtle (*Lissemys punctata*). Likewise, 7 common mammalian species of this site include- Fishing Cat (*Felis viverina*), Small Indian mongoose (*Herpestes auropunctatus*), Clawless otter (*Aonyx cinerea*), House mouse (*Mus musculus*), House rat (*Rattus rattus*), Common Indian Field Mouse (*Mus booduga*) and Greater bandicoot rat (*Bandicota indica*). 19 species of avian/birds project site include- Oriental magpie robin (*Copsychus saularis*), Baya weaver (*Ploceus philippin*), Indian pied myna (*Gracupica contra*), Spotted dove (*Spilopelia chinensis*), Black Drongo (*Dicrurus macrocercus*), Long-tailed Shrike (*Lanius schach*), Red-vented bulbul (*Pycnonotus cafer*), Rock Pigeon (*Columba livia*), Cuckoos (*Cuculus micropterus*), Common kingfisher (*Alcedo atthis*), Black-headed oriole (*Oriolus xanthornus*), Fulvous-breasted Woodpecker (*Dendrocopos macei*), House Sparrow (*Passer domesticus*), House Crow (*Corvus splendens*), Indian Pond Heron (*Ardeola grayii*), Mallard duck (*Anas platyrhynchos*), Thornback ray (*Raja clavata*), Slender-billed Gull (*Larus brunnicephalus*) and White-breasted Water hen (*Amaurornis phoenicurus*).

Migratory birds are those that regularly travel long distances between different locations, typically in response to seasonal changes like breeding or food availability. Many birds migrate from warmer regions during the breeding season to take advantage of food resources, such as insects, which are more abundant in summer in higher latitudes. Migratory birds follow established routes called flyways, which are like "avian motorways in the sky" Migratory birds visit at Monpura every winter and they are easily noticeable in riverine and coastal areas.

6. Daulatkhan LS

Proposed sites and adjacent areas are rich in floral diversity and abundance. The adjacent areas of the Daulatkhan LG include rural area, characterized by numerous tinshed houses, a mosque and some commercial shops. However, the Terminals existing road covered by wood bearing planted with a largenumber of timber species (about 27) and has a good coverage of understory vegetation.

In total, 60 flora species, including 21 types of trees, 11 species of herb, 25 species of shrub and 3 species of climber, were found within the terminal area. The major tree species of the study site are Sishu (*Dalbergia sissoo*), Akashmoni (*Acacia auriculiformis*), Arjun (*Terminalia arjuna*), Krishnochura/Flame tree (*Delonix regia*), Jackfruit (*Artocarpus heterophyllus*). The common and major herbaceous plants Akand (*Calotropis gigantean*) and Assamlata (*Eupatorium odoratum*). Some water hyacinth (*Eichhornia crassipes*) aggregate around the terminal jetty. A rare plant, Cycas sp. has been recorded in the Terminal area.

2 species of amphibians are commonly found in project area i.e., Common Asian Toad (*Duttaphrynus melanostictus*) and Skipping Frog (*Euphlyctis cyanophlyctis*). 5 species of the common reptiles of the site includes Bengal monitor (*Varanus bengalensis*), spotted flapshell turtle (*Lissemys punctata*), Dhora sap (*Amphiesma stolatum*), Common house gecko (*Hemidactylus frenatus*) and spotted flapshell turtle (*Lissemys punctata*). Likewise, common 6 mammalian species of this site include- Greater bandicoot rat (*Bandicota indica*), Fishing Cat (*Felis viverina*), Small Indian mongoose (*Herpestes auropunctatus*), Clawless otter (*Aonyx cinerea*), House mouse (*Mus musculus*) and House rat (*Rattus rattus*), 16 species of avian/birds project site include- House Sparrow (*Passer domesticus*), Black Drongo (*Dicrurus macrocercus*), Oriental magpie robin (*Copsychus saularis*), Spotted dove (*Spilopelia chinensis*), Common kingfisher (*Alcedo atthis*), Cuckoos (*Cuculus micropterus*), Black-headed oriole (*Oriolus larvatus*), Indian pied myna (*Gracupica contra*), Fulvous-breasted Woodpecker (*Dendrocopos macei*), Red-vented bulbul (*Pycnonotus cafer*), Baya weaver (*Ploceus philippin*), House Crow (*Corvus splendens*), Indian Pond Heron (*Ardeola grayii*), Mallard duck (*Anas platyrhynchos*), Thornback ray (*Raja clavata*) and Great Egret (*Ardea alba*).

Migratory Birds includes herons, egrets, birds of prey, storks, and spoonbills. These birds often arrive around project site during the winter season.

7. Hijla LS

The terminal is planned to be newly built in end of the existing access road and situating at the bank of lower Meghna river. There is no any structure here for facilitating passengers. The project site and its adjoining areas have good ground vegetation cover of herbaceous plants. The river bank, upon which the terminal facilities will be developed, is a gently sloping/flat area containing creeping vegetation, most of which becomes inundated during monsoon periods. This area of influence is rich in floral diversity and abundance. Most recorded species are common and abundant throughout the country and considered weeds. The use of the land is rural with dominant vegetation, with continuous areas of trees and bushes.

In total, 37 flora species, including 13 types of trees, 4 species of herb, 17 species of shrub and 3 species of climber, were found within 2km radius of terminal area. The major common planted tree species of the study site are Gamari (*Gmelina arborea*), Raintree (*Samanea saman*), Chapalish (*Artocarpus chama*), Eucaliptus (*Eucalyptus globules*), Akashmoni (*Acacia auriculiformis*), Sishu (*Dalbergia sissoo*), Narikel (*Cocos nucifera*), Supari (*Areca catechu*), Banyan tree (*Ficus benghalensis*), Mehghoni (*Swietenia mahagoni*), Krishnochura/Flame tree (*Delonix regia*), Jackfruit (*Artocarpus heterophyllus*) and Mango (*Magnifera indica*). The common and major herbaceous plants observed are Bermuda grass (*Cynodon dactylon*), Carpet grass (*Axonopus compressus*), Assamlata (*Eupatorium odoratum*), Akand (*Calotropis gigantean*), Dolkolmi (*Ipomoea fistulosa*) and Sensitive plant-Lojjaboti (*Mimosa pudica*).

2 species of amphibians are commonly found in project area i.e. Common Asian Toad (*Duttaphyrnus melanostictus*) and Skipping Frog (*Euphlyctis cyanophlyctis*). Some 5 species of the common reptiles of the site include- Common house gecko (*Hemidactylus frenatus*), Bengal monitor (*Varanus bengalensis*), Spotted flapshell turtle (*Lissemys punctata*), Dhora sap (*Amphiesma stolatum*) and spotted flapshell turtle (*Lissemys punctata*). Likewise, common 5 mammalian species of this site include- Greater bandicoot rat (*Bandicota indica*), Fishing Cat (*Felis viverina*), House mouse (*Mus musculus*), House rat (*Rattus rattus*) and Common Indian Field Mouse (*Mus booduga*), 18 species of avian/birds project site include- House Sparrow (*Passer domesticus*), Black-headed oriole- (*Oriolus xanthornus*), Long-tailed Shrike (*Lanius schach*), Oriental magpie-robin (*Copsychus saularis*), Great Egret (*Ardea alba*), Indian pied myna (*Gracupica contra*), Cinnamon Bittern (*Botaurus cinnamomeus*), Red-vented bulbul (*Pycnonotus cafer*), Rock Pigeon (*Columba livia*), Spotted dove (*Spilopelia chinensis*), Fulvous-breasted Woodpecker (*Dendrocopos macei*), Cuckoos (*Cuculus micropterus*), Baya weaver (*Ploceus philippin*), House Crow (*Corvus splendens*), Mallard duck (*Anas platyrhynchos*), Thornback ray (*Raja clavata*), Indian Pond Heron (*Ardeola grayii*) and Common kingfisher (*Alcedo atthis*).

Migratory Birds includes herons, egrets, birds of prey, storks, and spoonbills. These birds often arrive around project site during the winter season.

8. Laharhat LS

Laharhat Terminal already in existence, the use of the land is totally urban with dispersed vegetation focused on gardening use, without large trees or natural bushes. There is no natural riverside vegetation but a huge presence of invasive plants Kochuripana- *Eichhornia crassipes* (Water hyacinth). The adjacent areas of the Laharhat LG include business area, characterized by numerous commercial buildings, widely pucca roads and a bus station.

In total, 15 flora species, including 4 types of trees, 3 species of herb, 5 species of shrub and 3 species of climber, were found within 2km radius of terminal area. The major common planted tree species of the study site are Chapalish (*Artocarpus chama*), Eucaliptus (*Eucalyptus globules*), Raintree (*Samanea saman*), Narikel (*Cocos nucifera*), Supari (*Areca catechu*), Banyan tree (*Ficus benghalensis*) and Jackfruit (*Artocarpus heterophyllus*) The common and major herbaceous plants observed are Bermuda grass (*Cynodon dactylon*), Carpet grass (*Axonopus compressus*), Assamlata (*Eupatorium odoratum*), Akand (*Calotropis gigantean*), Dolkolmi (*Ipomoea fistulosa*) and Sensitive plant (*Mimosa pudica*).

3 species of amphibians are commonly found in project area i.e. Skipping Frog (*Euphlyctis cyanophlyctis*), Common Asian Toad (*Duttaphrynus melanostictus*), and Cricket Frog (*Fejervarya spp*). Some 5 species of the common reptiles of the site include- Common house gecko (*Hemidactylus frenatus*), Bengal monitor (*Varanus bengalensis*), Spotted flapshell turtle (*Lissemys punctata*), Dhora sap (*Amphiesma stolatum*) and spotted flapshell turtle (*Lissemys punctata*). Likewise, common 7 mammalian species of this site include- Greater bandicoot rat (*Bandicota indica*), Fishing Cat (*Felis viverina*), Small Indian mongoose (*Herpestes auropunctatus*), Clawless otter (*Aonyx cinerea*), House mouse (*Mus musculus*), House rat (*Rattus rattus*) and Common Indian Field Mouse (*Mus booduga*), 12 species of avian/birds project site include- Oriental magpie-robin (*Copsychus saularis*), Cuckoos (*Cuculus micropterus*), Indian pied myna (*Gracupica contra*), Spotted dove (*Spilopelia chinensis*), Black-headed oriole (*Oriolus xanthornus*), Long-tailed Shrike (*Lanius schach*), Fulvous-breasted Woodpecker (*Dendrocopos macei*), House Crow (*Corvus splendens*), Great Egret (*Ardea alba*), Indian Pond Heron (*Ardeola grayii*), House Sparrow (*Passer domesticus*) and Common kingfisher (*Alcedo atthis*).

Migratory birds such as Red-Crested Pochard (Rangamuri), African Pied Wagtail (Khonjon), Cotton Pygmy Goose (Balihansh/ Belehansh), Pintail Duck (Lenja Hansh/Kaldigheri), Ruddy Shelduck (Chokha- Chokhi) and other migratory birds are easily noticeable in riverine and coastal areas.

9. Alubazar LS

The terminal is planned to be newly built in an adjoining area of brick field location and situating at the left bank of Meghna river. There is no any structure here for facilitating passengers. The project site and its adjoining areas have poor ground vegetation cover of herbaceous plants. The riverbank, upon which the terminal facilities will be developed, is a gently sloping/flat area containing creeping vegetation, most of which becomes inundated during monsoon periods. The adjacent areas of the Alu bazar LG include rural business area, characterized by numerous buildings, narrow roads and a CNG station.

In total, 32 flora species, including 13 types of trees, 4 species of herb, 12 species of shrub and 3 species of climber, were found within 2km radius of terminal area. The major common planted tree species of the study site are Gamari (*Gmelina arborea*), Raintree (*Samanea saman*), Chapalish (*Artocarpus chama*), Eucaliptus (*Eucalyptus globules*), Akashmoni (*Acacia auriculiformis*), Sishu (*Dalbergia sissoo*), Narikel (*Cocos nucifera*), Supari (*Areca catechu*), Banyan tree (*Ficus benghalensis*), Mehghoni (*Swietenia mahagoni*), Krishnochura/Flame tree (*Delonix regia*), Jackfruit (*Artocarpus heterophyllus*) and Mango (*Magnifera indica*). The common and major herbaceous plants observed are Bermuda grass (*Cynodon dactylon*), Carpet grass (*Axonopus compressus*), Assamlata (*Eupatorium odoratum*), Akand (*Calotropis gigantean*), Dolkolmi (*Ipomoea fistulosa*) and Sensitive plant-Lojjaboti (*Mimosa pudica*). Aquatic flora species, includes 4 types of aquatic trees, Thankuni (*Centella asiatica*), Khudipana (*Lemna minor*), Kolmi shak (*Ipomoea aquatic*) and Kachuri pana (*Eichhornia crassipes*) etc.

2 species of amphibians are commonly found in project area i.e. Common Asian Toad (*Bufo melanostictus*) and Skipping Frog (*Euphlyctis cyanophlyctis*). Some 6 species of the common reptiles of the site include- Small Indian mongoose (*Herpestes auropunctatus*), Dhora sap (*Amphiesma stolatum*), Common house gecko (*Hemidactylus frenatus*), Bengal monitor (*Varanus bengalensis*), Spotted flapshell turtle (*Lissemys punctata*), and spotted flapshell turtle (*Lissemys punctata*). Likewise, common 5 mammalian species of this site include- Greater bandicoot rat (*Bandicota indica*), Fishing Cat (*Felis viverina*), House mouse (*Mus musculus*), House rat (*Rattus rattus*) and Common Indian Field Mouse (*Mus booduga*). 13 species of avian/birds project site include- Indian pied myna (*Gracupica contra*), House Sparrow (*Passer domesticus*), Black Drongo (*Dicrurus macrocercus*), Red-vented bulbul (*Pycnonotus cafer*), Baya weaver (*Ploceus philippin*), Spotted dove (*Spilopelia chinensis*), Oriental magpie robin (*Copsychus saularis*), Cuckoos (*Cuculus micropterus*), Fulvous-breasted Woodpecker (*Dendrocopos macei*), House Crow (*Corvus splendens*), Great Egret- (*Ardea alba*), Indian Pond Heron (*Ardeola grayii*) and Common kingfisher (*Alcedo atthis*).

Migratory Birds such as Pintail Duck (Lenja Hansh/ Kaldigheri), Red-Crested Pochard (Rangamuri), Gadwall (Piyang Hansh), Northern Shoveler (Pantamukhi/ Utture Khuntehansh), Ruddy Shelduck (Chokha-Chokhi), African Pied Wagtail (Khonjon), Cotton Pygmy Goose (Balihansh/ Belehansh) and other migratory birds.

10. Moju Chowdhury LS

Moju Chowdhury Terminal already in existence, the use of the land is totally commercial with dispersed vegetation focused on gardening use, without large trees or natural bushes. There is no natural riverside vegetation but a huge presence of invasive plants Kochuripana-Eichhornia crassipes (Water hyacinth). The adjacent areas of the Moju Chowdhury include business area, characterized by numerous ship buildings, highway roads, a Ferry ghat, large commercial area and a bus station. However, the terminal area hasn't good coverage of understory vegetation.

Fauna includes 2 species of amphibians are commonly found in project area i.e. Common Asian Toad (*Duttaphrynus melanostictus*) and Skipping Frog (*Euphlyctis cyanophlyctis*). Some 6 species of the common reptiles of the site include: Bengal monitor (*Varanus bengalensis*), Spotted flapshell turtle (*Lissemys punctata*), Water snake (*Xenochrophis piscator*), Common house gecko (*Hemidactylus frenatus*), Common Garden Lizard/Girgiti (*Calotes versicolor*) and spotted flapshell turtle (*Lissemys punctata*). Likewise, common 7 mammalian species of this site include: Small Indian mongoose (*Herpestes auropunctatus*), Greater bandicoot rat (*Bandicota indica*), Fishing Cat (*Felis viverina*), Clawless otter (*Aonyx cinerea*), House mouse (*Mus musculus*), House rat (*Rattus rattus*) and Common Indian Field Mouse (*Mus booduga*). 14 species of avian/birds project site include- Red-vented bulbul (*Pycnonotus cafer*), Spotted dove (*Spilopelia chinensis*), Baya weaver (*Ploceus philippin*), Cuckoos (*Cuculus micropterus*), Indian pied myna (*Gracupica contra*), Black Drongo (*Dicrurus macrocercus*), Fulvous-breasted Woodpecker (*Dendrocopos macei*), House Sparrow (*Passer domesticus*), Thornback ray (*Raja clavata*), Great Egret- (*Ardea alba*), House Crow (*Corvus splendens*), Oriental magpie-robin (*Copsychus saularis*), Indian Pond Heron (*Ardeola grayii*) and Common kingfisher (*Alcedo atthis*).

Migratory Birds such as various waterfowl like ducks, geese, birds of prey, such as eagles and harriers, along with storks and ibises, and other wetland birds visit in study area in every winter month.

11. Boddarhat LS

Proposed sites and adjacent areas are rich in floral diversity and abundance. The adjacent areas of the Boddarhat LG include rural area, characterized by numerous tin shed houses and some commercial shops. However, the Terminals existing road covered by wood bearing planted with a large number of timber species (about 27) and has a good coverage of understory vegetation.

In total, 42 flora species, including 12 types of trees, 7 species of herb, 20 species of shrub and 3 species of climber, were found within 2km radius of terminal area. The major common planted tree species of the study site are Chapalish (*Artocarpus chama*), Eucalyptus (*Eucalyptus globules*), Akashmoni (*Acacia auriculiformis*), Sishu (*Dalbergia sissoo*), Gamari (*Gmelina arborea*), Raintree (*Samanea saman*), Mehghoni (*Swietenia mahagoni*), Krishnochura/Flame tree (*Delonix regia*), Jackfruit (*Artocarpus heterophyllus*) and Mango (*Magnifera indica*), Narikel (*Cocos nucifera*), Supari (*Areca catechu*), Banyan tree (*Ficus benghalensis*), The common and major herbaceous plants observed are Bermuda grass (*Cynodon dactylon*).

3 species of amphibians are commonly found in project area i.e. Skipping Frog (*Euphlyctis cyanophlyctis*), Common Asian Toad (*Duttaphrynus melanostictus*) and Cricket Frog (*Fejervarya spp*). Some 5 species of the common reptiles of the site include- the Bengal monitor (*Varanus bengalensis*), Spotted flapshell turtle (*Lissemys punctata*), water snake *Xenochrophis piscator*, Common house gecko (*Hemidactylus frenatus*) and spotted flapshell turtle (*Lissemys punctata*). 7 species of this site include mammalian include: Greater bandicoot rat (*Bandicota indica*), Fishing Cat (*Felis viverina*), Small Indian mongoose (*Herpestes auropunctatus*), Clawless otter (*Aonyx cinerea*), House mouse (*Mus musculus*), House rat (*Rattus rattus*) and Common Indian Field Mouse (*Mus booduga*). 20 species of avian/birds project site include-Oriental magpie-robin (*Copsychus saularis*), Rock Pigeon (*Columba livia*), Spotted dove- (*Spilopelia chinensis*), Indian pied myna (*Gracupica contra*), Black Drongo (*Dicrurus macrocercus*), Black-headed oriole (*Oriolus xanthornus*), Long-tailed Shrike (*Lanius schach*), House Swift (*Apus nipalensis*), Cinnamon Bittern (*Botaurus cinnamomeus*), Baya weaver (*Ploceus philippin*), Cuckoos (*Cuculus micropterus*), House Sparrow (*Passer domesticus*), House Crow (*Corvus splendens*), Great Egret (*Ardea alba*), Common kingfisher (*Alcedo atthis*), Red-

vented bulbul (*Pycnonotus cafer*), Thornback ray (*Raja clavata*), Slender-billed Gull (*Larus brunnicephalus*), Fulvous-breasted Woodpecker (*Dendrocopos macei*) and Indian Pond Heron (*Ardeola grayii*).

Migratory birds are those that regularly travel long distances between different locations, typically in response to seasonal changes like breeding or food availability. Many birds migrate from warmer regions during the breeding season to take advantage of food resources, such as insects, which are more abundant in summer in higher latitudes. Migratory birds follow established routes called flyways, which are like "avian motorways in the sky". Migratory Birds such as various waterfowl like ducks, geese, birds of prey, such as eagles and harriers, along with storks and ibises, and other wetland birds visit in study area in every winter month.

12. Motirhat LS

The terminal is planned to be newly built in a sandy field location and situating at the bank of Meghna estuary. There is no any structure here for facilitating passengers. The project site and its adjoining areas have good ground vegetation cover of herbaceous plants. Traditional Fishing Boat crowded here for Hilsa and other marine fish species landed. The river bank, upon which the terminal facilities will be developed, is a gently sloping/flat area containing creeping vegetation, most of which becomes inundated during monsoon periods.

In total, 38 flora species, including 14 types of trees, 5 species of herb, 16 species of shrub and 3 species of climber, were found within 2km radius of terminal area. The upper part of the bank has some planted trees like Mehghoni (*Swietenia mahagoni*), Arjun (*Terminalia arjuna*), Eucalyptus (*Eucalyptus globules*), Akashmoni (*Acacia auriculiformis*), Gamari (*Gmelina arborea*), Chapalish (*Artocarpus chama*), Sishu (*Dalbergia sissoo*), Raintree (*Samanea saman*), Krishnochura/Flame tree (*Delonix regia*), Jackfruit (*Artocarpus heterophyllus*), Mango (*Manigera indica*), Coconut (*Cocos nucifera*) and Betel nut (*Areca cathchu*).

The project boundary, contains some aquatic vegetation including, among others, Water hyacinth (*Eichhornia crassipes*), Keshordam/Creeping Water primrose (*Jussiae arepens*), Topapana/ Water lettuce (*Pistia stratiotes*), Khudepana/Duckweed (*Lemna minor*) which are considered invasive species in Bangladesh, but not particularly established at the site.

2 species of amphibians are commonly found in project area i.e. Common Asian Toad (*Duttaphrynus melanostictus*) and Skipping Frog (*Euphlyctis cyanophlyctis*). Some 5 species of the common reptiles of the site include- the Bengal monitor (*Varanus bengalensis*), spotted flapshell turtle (*Lissemys punctata*), Dhora sap (*Amphiesma stolatum*), Common house gecko (*Hemidactylus frenatus*) and spotted flapshell turtle (*Lissemys punctata*). Likewise, common 6 mammalian species of this site include- Greater bandicoot rat (*Bandicota indica*), Small Indian mongoose (*Herpestes auropunctatus*), Clawless otter (*Aonyx cinerea*), House mouse (*Mus musculus*), House rat (*Rattus rattus*) and Common Indian Field Mouse (*Mus booduga*), 18 species of avian/birds project site include- Black Drongo (*Dicrurus macrocercus*), Black-headed oriole (*Oriolus xanthornus*), Rock Pigeon (*Columba livia*), Oriental magpie-robin (*Copsychus saularis*), Indian pied myna (*Gracupica contra*), Cuckoos (*Cuculus micropterus*), Red-vented bulbul (*Pycnonotus cafer*), Spotted dove (*Spilopelia chinensis*), House Swift (*Apus nipalensis*), Fulvous-breasted Woodpecker (*Dendrocopos macei*), Baya weaver (*Ploceus philippin*), House Sparrow (*Passer domesticus*), House Crow (*Corvus splendens*), Great Egret (*Ardea alba*), Common kingfisher (*Alcedo atthis*), Thornback ray (*Raja clavata*), Indian Pond Heron (*Ardeola grayii*) and Long-tailed Shrike (*Lanius schach*).

Migratory birds include various species of sandpipers, plovers and curlews.

13. Tomuruddin LS

The terminal is planned to be built in fallow land and situating at the bank of Meghna estuary. There is no any structure here for facilitating passengers. The project site and its adjoining areas haven't any significant herbaceous vegetation coverage. The river bank, upon which the terminal facilities will be developed, is a gently sloping/flat area containing creeping vegetation, most of which becomes inundated during monsoon periods.

The project boundary, contains some aquatic vegetation including, among others, Water hyacinth (*Eichhornia crassipes*), Keshordam/Creeping Water primrose (*Jussiaea earepens*), Topapana/Waterlettuce (*Pistia stratiotes*), Khudepana/Duckweed (*Lemna minor*) which are considered invasive species in Bangladesh.

In total, 39 flora species, including 13 types of trees, 6 species of herb, 17 species of shrub and 3 species of climber, were found within 2km radius of terminal area. The major common planted tree species of the study site are Chapalish (*Artocarpus chama*), Eucalyptus (*Eucalyptus globules*), Akashmoni (*Acacia auriculiformis*), Sishu (*Dalbergia sissoo*), Gamari (*Gmelina arborea*), Raintree (*Samanea saman*), Mehghoni (*Swietenia mahagoni*), Krishnochura/Flame tree (*Delonix regia*), Jackfruit (*Artocarpus heterophyllus*), Mango (*Mangifera indica*), Narikel (*Cocos nucifera*), Supari (*Areca catechu*) and Banyan tree (*Ficus benghalensis*). The common and major herbaceous plants observed are Bermuda grass (*Cynodon dactylon*), Carpet grass (*Axonopus compressus*), Assamlata (*Eupatorium odoratum*), Akand (*Calotropis gigantea*), Dolkolmi (*Ipomoea fistulosa*) and Sensitive plant (*Mimosa pudica*).

3 species of amphibians are commonly found in project area i.e. Common Asian Toad (*Duttaphrynus melanostictus*), Skipping Frog (*Euphlyctis cyanophlyctis*) and Cricket Frog (*Fejervarya spp*). Some 5 species of the common reptiles of the site include: Bengal monitor (*Varanus bengalensis*), Spotted flapshell turtle (*Lissemys punctata*), Dhora sap (*Amphiesma stolatum*), Common house gecko (*Hemidactylus frenatus*) and spotted flapshell turtle (*Lissemys punctata*). Likewise, common 6 mammalian species of this site include: Greater bandicoot rat (*Bandicota indica*), Small Indian mongoose (*Herpestes auropunctatus*), Clawless otter (*Aonyx cinerea*), House mouse (*Mus musculus*), House rat (*Rattus rattus*) and Common Indian Field Mouse (*Mus booduga*). 19 species of avian/birds project site include- Oriental magpie-robin (*Copsychus saularis*), Baya weaver (*Ploceus philippin*), Black Drongo (*Dicrurus macrocercus*), Red-vented bulbul (*Pycnonotus cafer*), Long-tailed Shrike (*Lanius schach*), Rock Pigeon (*Columba livia*), Indian pied myna (*Gracupica contra*), Cuckoos (*Cuculus micropterus*), House Swift (*Apus nipalensis*), Cinnamon Bittern (*Botaurus cinnamomeus*) Fulvous-breasted Woodpecker (*Dendrocopos macei*), Spotted dove (*Spilopelia chinensis*), House Sparrow (*Passer domesticus*), House Crow (*Corvus splendens*), Great Egret (*Ardea alba*), Indian Pond Heron (*Ardeola grayii*), Common kingfisher (*Alcedo atthis*), Slender-billed Gull (*Larus brunnicephalus*) and Thornback ray (*Raja clavata*).

Migratory birds are those that regularly travel long distances between different locations, typically in response to seasonal changes like breeding or food availability. Many birds migrate from warmer regions during the breeding season to take advantage of food resources, such as insects, which are more abundant in summer in higher latitudes. Migratory birds follow established routes called flyways, which are like "avian motorways in the sky." Migratory birds include various species of sandpipers, plovers and curlews.

Annexure 11

Socio-Economic Data

Socio-Economic Data

1. Kishoreganj District

1.1 Demographic profile

Kishoreganj district is surrounded on the north by Netrokona district, on the east by Habiganj and Brahmanbaria districts, on the south by Narsingdi and Brahmanbaria districts and on the west by Mymensingh, Gazipur and Narsingdi districts. The district lies between 24°02' and 24°39' north latitudes and between 90°15' and 91°15' east longitudes. The total area of the district is 2688.6 sq. km (1038.00 sq. miles). Demographic Characteristics of Kishoreganj District is shown in **Table 1.1**

Table 1.1: Demographic Characteristics of Kishoreganj District

Kishoreganj District	Total number
Upazila/Thana	13
Municipality	8
Union	108
Village	1725
Total Area (Sq. km)	2688.6
Total Household	627322
Total Population	3267277
Sex ratio	96.8

(Statistical Year Book, 2022)

1.2 Household by Type of Dwelling

In rural and urban area 19.69% & 80.31% are floating household, 26.77% & 73.23% are slum household, 72.61% & 27.39% are household including slum and floating, 72.58% & 27.42% are all household respectively.

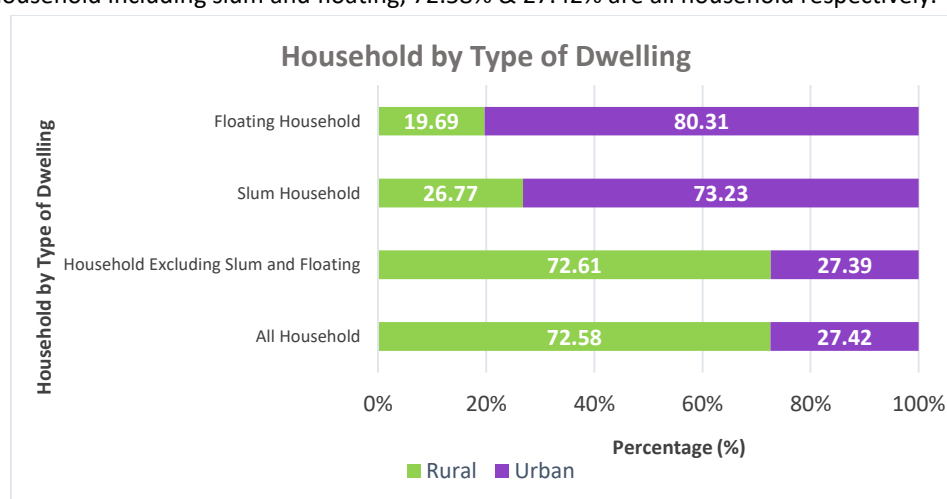


Figure 1.1: Household by Type of Dwelling

1.3 Religion

From the Figure below it could be understood that Kishoreganj District is predominantly a Muslim populated area with 95.12 percent of Muslim population, while Hindus are the second most populated religion, with a presence of 4.9 percent. Buddhists and Christians are the two other religions having a slight presence of 0.004 and 0.005 percent while others are 92 in number representing a trivial population of 0.002 percent.

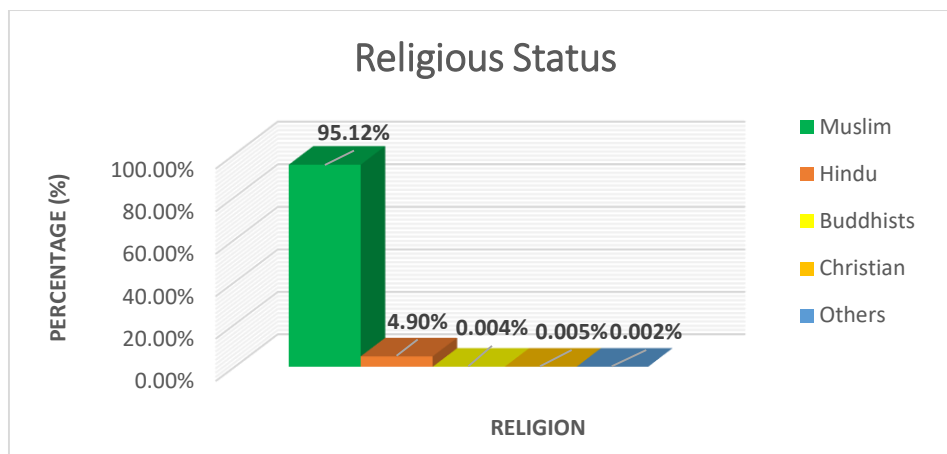


Figure 1.2: Religious Status of Kishoreganj District

1.4 Marital Status

In Kishoreganj District, 62.10% is currently married, 31.1% never married, 6.03% Widow/widower, 0.4% Separated, 0.3% are divorced. (Population and Housing Census 2022)

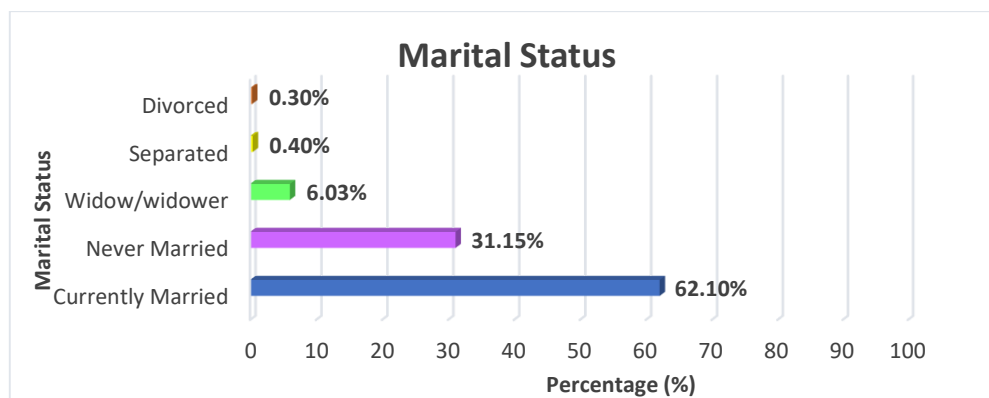


Figure 1.3: Marital Status of Kishoreganj District

1.5 Source of Drinking Water

In Kishoreganj District, 97.57% general household get the facility of drinking water from tube-well, 2.3% from tap/pipe, 0.05% from bottled/jar water, 0.01% from well, 0.02% from pond/river/lake and the remaining 0.05% household get water from other sources. (Population and Housing Census 2022)

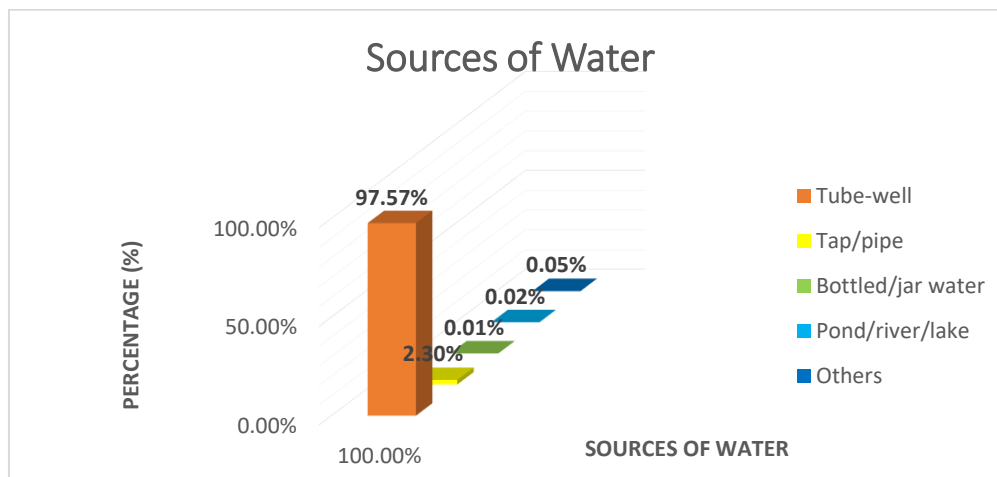


Figure 1.4: Source of Drinking Water in Kishoreganj District

1.6 Sanitation

In the District, 43.66% household use sanitary latrine having safe disposal with flushing, 21.80% latrine having unsafe disposal with flushing, 17.88% composting latrine, 8.86% open pit latrine, 6.50% permanent/ temporary latrine and 1.31% have no latrine facility. (Population and Housing Census 2022).



Figure 1.5: Sanitation facility in Kishoreganj District

1.7 Literacy

In the district, it is found that 67.60% population aged 7 years and over are literate. (Population and Housing Census 2022).

1.8 Access to Electricity

A total of 98.85% general household reported to have electricity connection from the national grid, 0.30% from solar power, 0.18% from others and 0.67% have no electricity connection. (Population and Housing Census 2022).

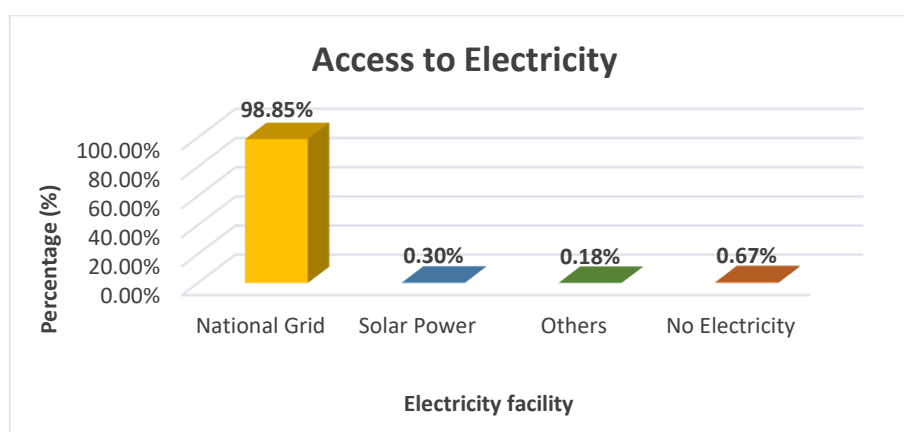


Figure 1.6: Electricity Facility in Kishoreganj District

1.9 Archaeological Heritage and Relics

Among the archaeological heritage and relics, Jangalbari Fort (fifteenth century), Egarasindhur Fort (fifteenth century), Sadi Mosque (1652), Salanka Jame Mosque at Pakundia, Gurai Mosque at Bajitpur (1680), Kutub Shah Mosque at Austagram (1538), Jawar Saheb Bari Mosque at Tarail (1534), Badshahi Mosque at Itna (seventeenth century), Bhagalpur Dewan Bari Mosque at Bajitpur (eighteenth century), Sekandarnagar Mosque at Tarail (eighteenth century), Hazrat Samsuddin Bokhari Mosque Kurikhai at Katiadi (1005), Chandrabati Shiva Mondir (sixteenth century) and Delhi Akhra at Mithamain is notable.

2. Shariatpur District

2.1 Demographic profile

Shariatpur district is bounded on the north by Munshiganj district, on the east by Chandpur district, on the south by Barisal district and on the west by Madaripur district. It lies between 23°01' and 23°27' north latitudes and between 90°13' and 90°36' east longitudes. The total area of the district is 1174.1 sq. km (453.00 sq. miles). Demographic Characteristics of Shariatpur District is shown in **Table 2.1**.

Table 2.1: Demographic Characteristics of Shariatpur District

Shariatpur District	Total number
Upazila/Thana	6
Municipality	5
Union	65
Village	1254
Total Area (Sq. km)	1174.1
Total Household	247880
Total Population	1294451
Sex ratio	93.7

(Statistical Year Book, 2022)

2.2 Household by Type of Dwelling

In rural and urban area 35.71% & 64.29% are floating household, 66.84% & 33.16% are slum household, 75.88% & 24.12% are household including slum and floating, 75.86% & 24.14% are all household respectively.

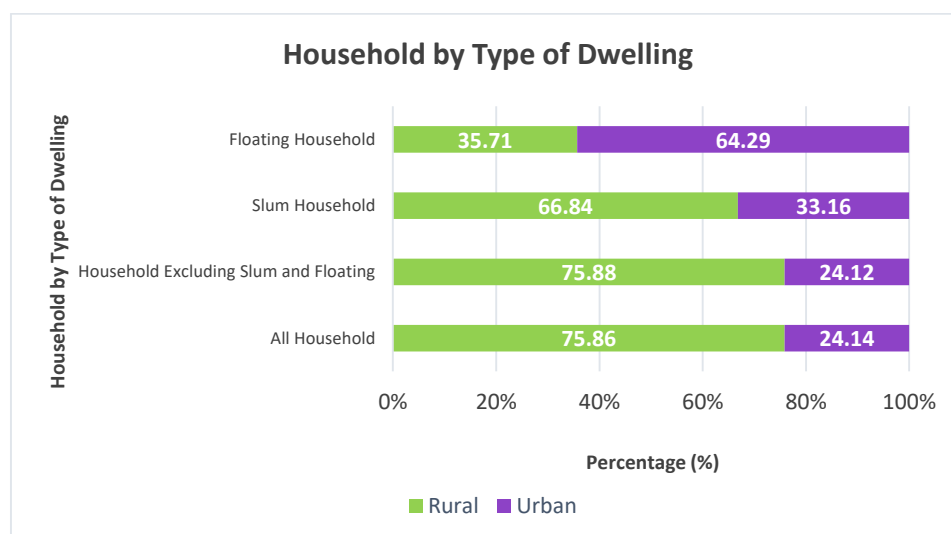


Figure 2.1: Household by Type of Dwelling

2.3 Religion

Shariatpur District is predominantly a Muslim populated area with 96.7 percent of Muslim population, while Hindus are the second most populated religion, with a presence of 3.28 percent. Buddhists and Christians are the two other religions having a slight presence of 0.02 and 0.007 percent while others are 22 in number representing a trivial population of 0.002 percent.

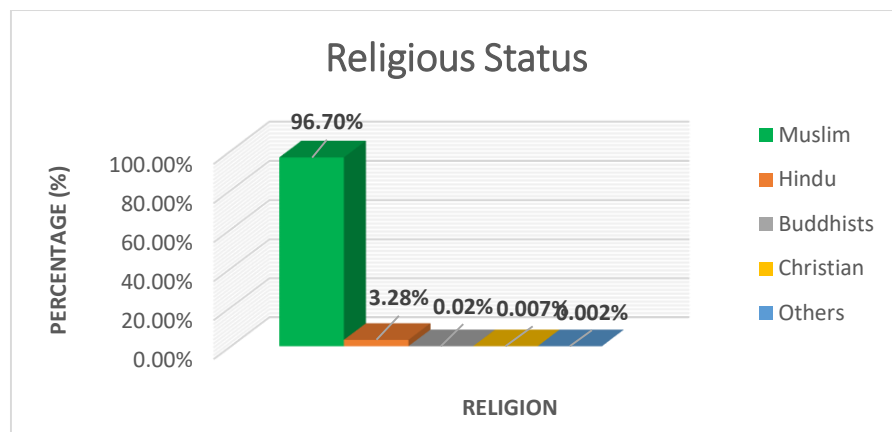


Figure 2.2: Religious Status of Shariatpur District

2.4 Marital Status

In Shariatpur District, 65% is currently married, 30% never married, 5.3% Widow/widower, 0.2% Separated, 0.3% are divorced. (Population and Housing Census 2022)

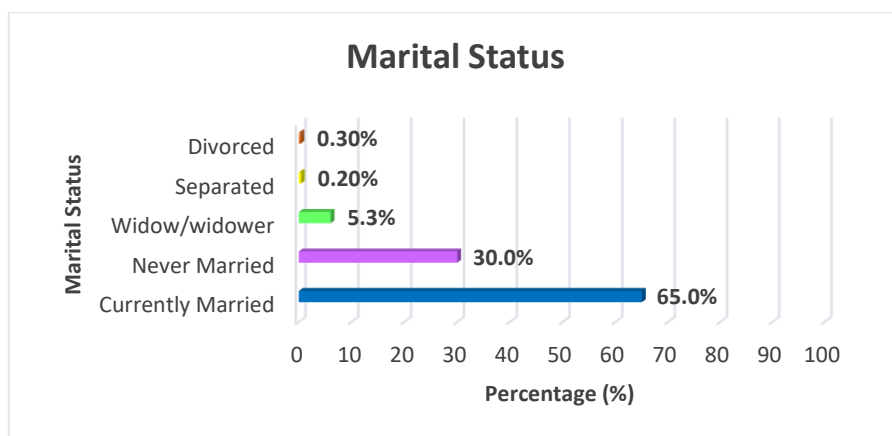


Figure 2.3: Marital Status of Shariatpur District

2.5 Source of Drinking Water

In Shariatpur District, 99.18% general household get the facility of drinking water from tube-well, 0.72% from tap/pipe, 0.05% from bottled/jar water, 0.04% from pond/river/lake and the remaining 0.01% household get water from other sources. (Population and Housing Census 2022)

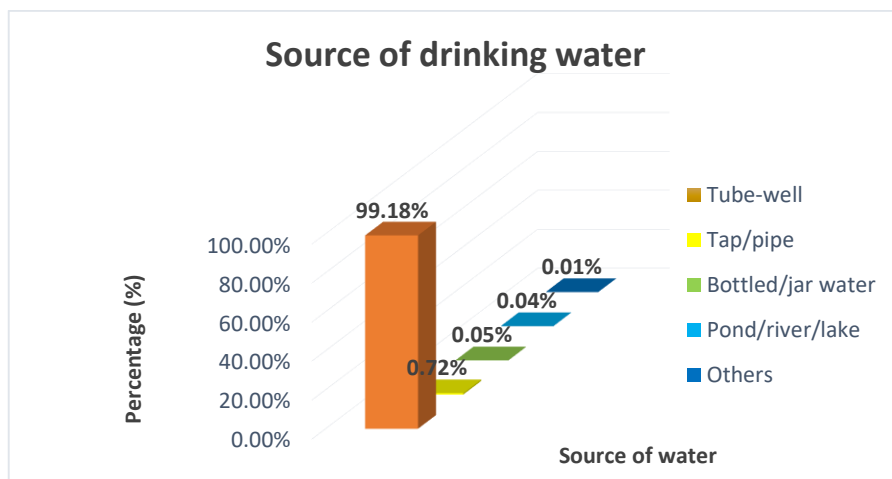


Figure 2.4: Source of Drinking Water in Shariatpur District

2.6 Sanitation

In the District, 50.6% household use sanitary latrine having safe disposal with flushing, 13.45% latrine having unsafe disposal with flushing, 31.16% composting latrine, 3.71% open pit latrine, 0.88% permanent/ temporary latrine and 0.21% have no latrine facility. (Population and Housing Census 2022)

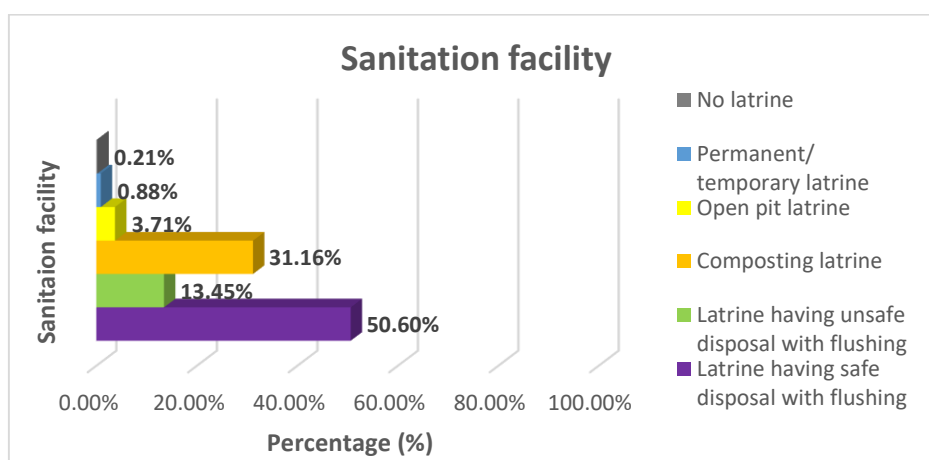


Figure 2.5: Sanitation facility in Shariatpur District

2.7 Literacy

In the district, it is found that 72.90% population aged 7 years and over are literate. (Population and Housing Census 2022).

2.8 Access to Electricity

A total of 98.46% general household reported to have electricity connection from the national grid, 1.09% from solar power, 0.07% from others and 0.38% have no electricity connection. (Population and Housing Census 2022)

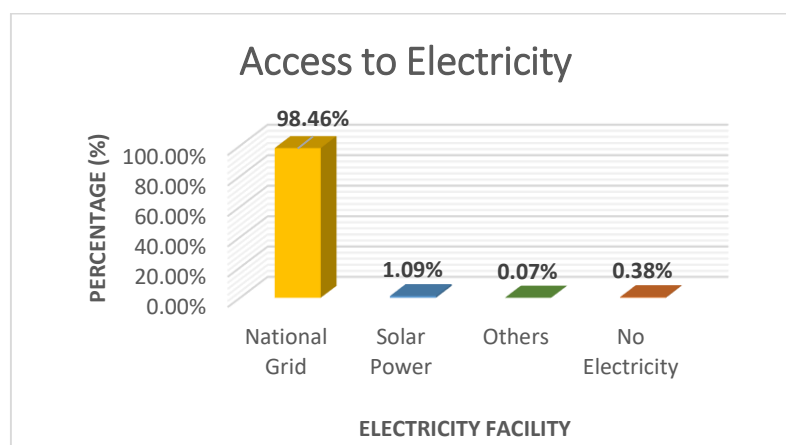


Figure 2.6: Electricity Facility in Shariatpur District

2.9 Archaeological Heritage and Relics

South Baluchara Mosque, Bilaskhan Mosque (Mughal period), Fatehjungpur Fort, Kedarbari at Kedarpur, Haturia and Kartikpur Zamindarbaris, Mohishar Dighee, Burirhat Mosque etc. are notable archaeological heritage and relics of this district.

3. Barishal District

3.1 Demographic profile

The total area of the district is 2784.5 sq. km. of which 160.37 sq. km. is riverine. Barisal district is bounded by Madaripur, Shariatpur, Chandpur and Lakshmipur districts on the north, Patuakhali, Barguna and Jhalakathi districts on the south, Bhola and Lakshmipur districts on the east, Jhalakathi, Pirojpur and Gopalganj districts on the west. It lies between 22°27' and 22°52' north latitudes and between 90°01' and 90°43' east longitudes. Demographic Characteristics of Barishal District is shown in **Table 3.1**

Table 3.1: Demographic Characteristics of Barishal District

Barishal District	Total number
Upazila/Thana	10
Municipality	6
Union	85
Village	1116
Total Area (Sq. km)	2784.5
Total Household	513673
Total Population	2568630
Sex ratio	95.8

(Statistical Year Book, 2022)

3.2 Household by Type of Dwelling

In rural and urban area 41.31% & 58.69% are floating household, 3.53% & 91.47% are slum household, 70.55% & 29.45% are household including slum and floating, 69.71% & 30.29% are all household respectively.

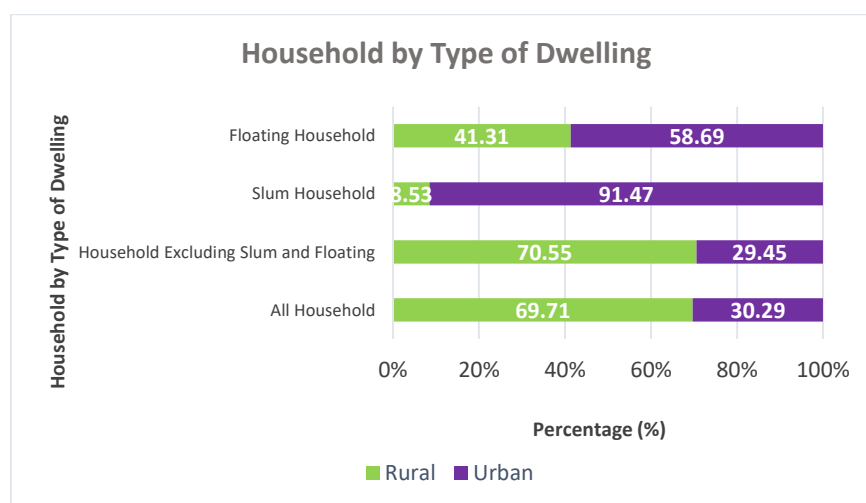


Figure 3.1: Household by Type of Dwelling

3.3 Religion

Barishal District is predominantly a Muslim populated area with 88.9 percent of Muslim population, while Hindus are the second most populated religion, with a presence of 10.7 percent. Buddhists and Christians are the two other religions having a slight presence of 0.01 and 0.45 percent while others are 64 in number representing a trivial population of 0.002 percent.

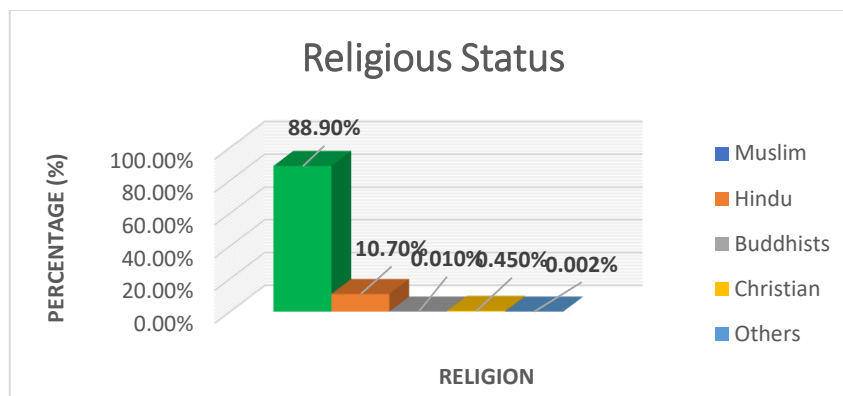


Figure 3.2: Religious Status of Barishal District

3.4 Marital Status

In Barishal District, 64.5% is currently married, 29.4% never married, 5.6% Widow/widower, 0.3% Separated, 0.28% are divorced. (Population and Housing Census 2022)

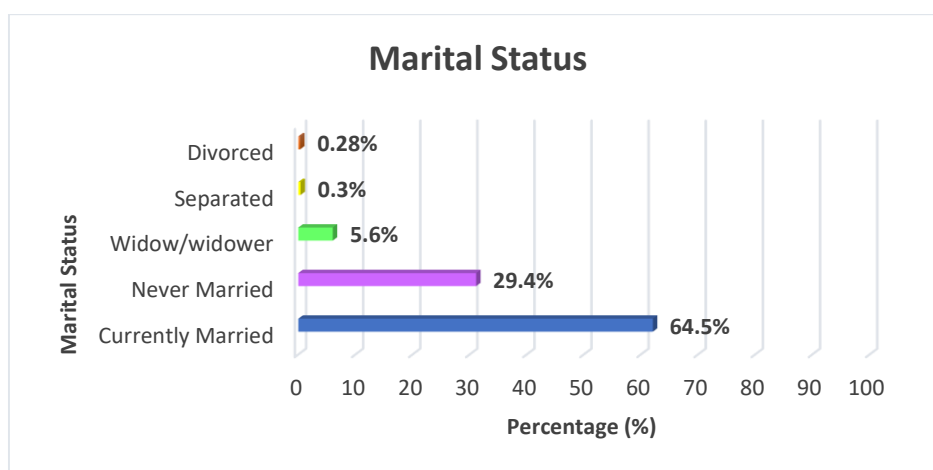


Figure 3.3: Marital Status of Barishal District

3.5 Source of Drinking Water

In Barishal District, 93.72% general household get the facility of drinking water from tube-well, 5.41% from tap/pipe, 0.12% from bottled/jar water, 0.03% from well, 0.71% from pond/river/lake and the remaining 0.01% household get water from other sources. (Population and Housing Census 2022)

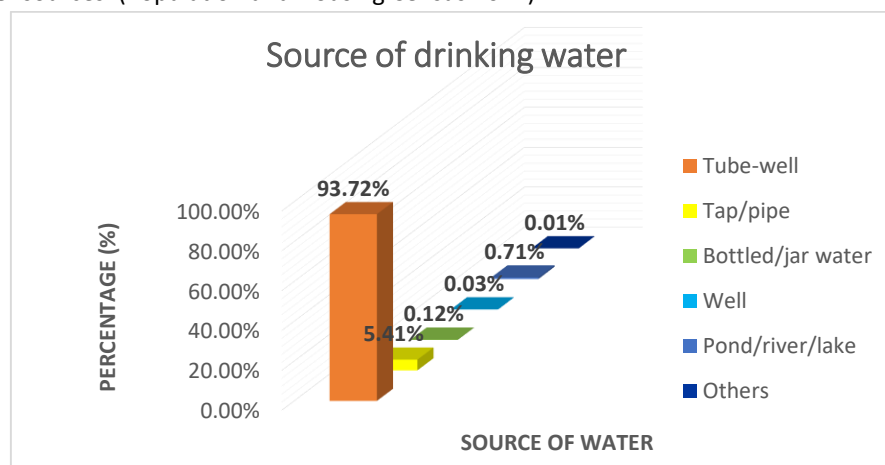


Figure 3.4: Source of Drinking Water in Barishal District

3.6 Sanitation

In the District, 45.80% household use sanitary latrine having safe disposal with flushing, 11.72% latrine having unsafe disposal with flushing, 35.50% composting latrine, 4.98% open pit latrine, 1.73% permanent/ temporary latrine and 0.27% have no latrine facility. (Population and Housing Census 2022).

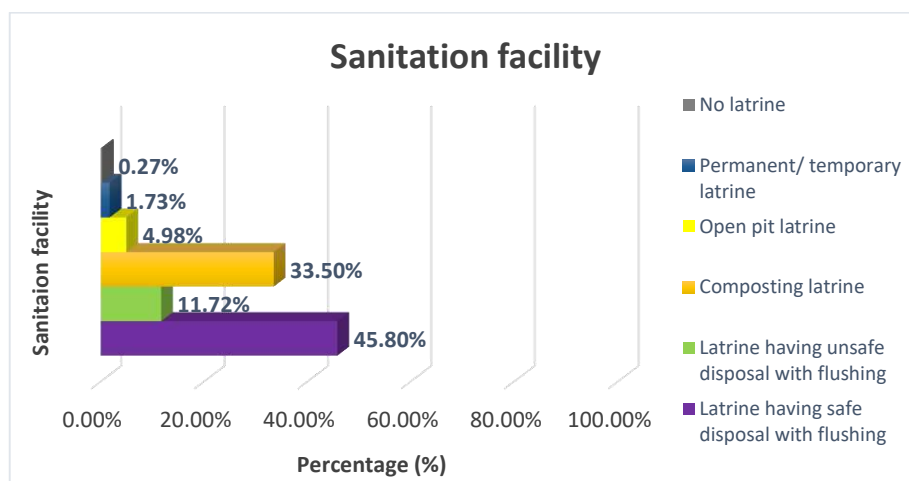


Figure 3.5: Sanitation facility in Barishal District

3.7 Literacy

In the district, it is found that 79.85% population aged 7 years and over are literate. (Population and Housing Census 2022).

3.8 Access to Electricity

A total of 98.42% general household reported to have electricity connection from the national grid, 0.96% from solar power, 0.12% from others and 0.5% have no electricity connection. (Population and Housing Census 2022).

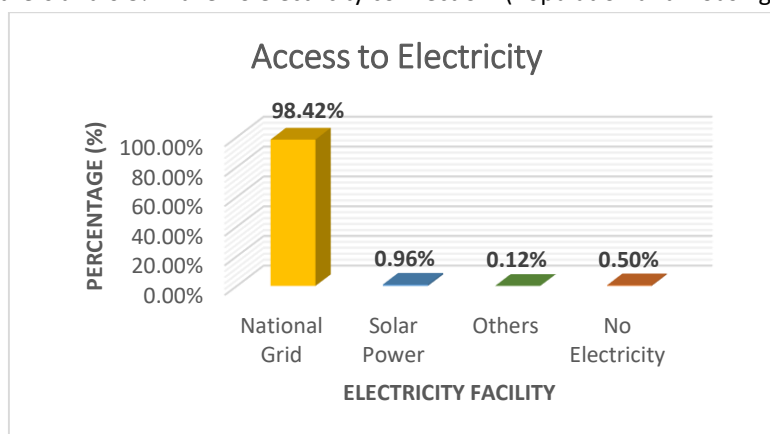


Figure 3.6: Electricity Facility in Barishal District

3.9 Archaeological Heritage and Relics

Rammohan Samadhi Mandir, Sujabad Kella, Sangram Kella, Sharkal Fort, Girja Mahalla, Bangabandhu Uddan, Muktijoddha Park, Ebadullah Mosque, Kasai Mosque, Oxford Mission Church, Shankar Math, Kali Bari of Mukunda Das, Joint Mosque at Bhatikhana, Aswini Kumar Townhall, Charkella, Durgasagar Dighee, One domed Mosque (Kasba), Brass image of Manasa weighing three maunds (Char Bania Bari), Padda Pukur, Bibir Pukur, Ulania Jamidar

Bari (Mehendiganj), Bara Auliar Majar (Bakerganj), Bephist Church, Cathalik Church, Saint Alfreed Church etc. are notable in this district.

4. Bhola District

4.1 Demographic profile

Bhola is an offshore island, bounded on the north by Barisal zila, on the east by Lakshmipur and Noakhali zilas, on the south by the Bay of Bengal and on the west by Barisal and Patuakhali zilas. It lies between 21°54 and 22°52 north latitudes and between 90°34 and 91°01 east longitudes. The total area of the zila is 3403.5 sq.km (1314.08 sq. miles) of which 1456.87 sq.km. is under forest. Demographic Characteristics of Bhola District is shown in **Table 4.1**.

Table 4.1: Demographic Characteristics of Bhola District

Bhola District	Total number
Upazila/Thana	7
Municipality	5
Union	68
Village	438
Total Area (Sq. km)	3403.5
Total Household	372723
Total Population	1932477
Sex ratio	99.0

(Statistical Year Book, 2022)

4.2 Household by Type of Dwelling

In rural and urban area 30.77% & 69.23% are floating household, 59.46% & 40.54% are slum household, 72.83% & 27.17% are household including slum and floating, 72.82% & 27.18% are all household respectively.

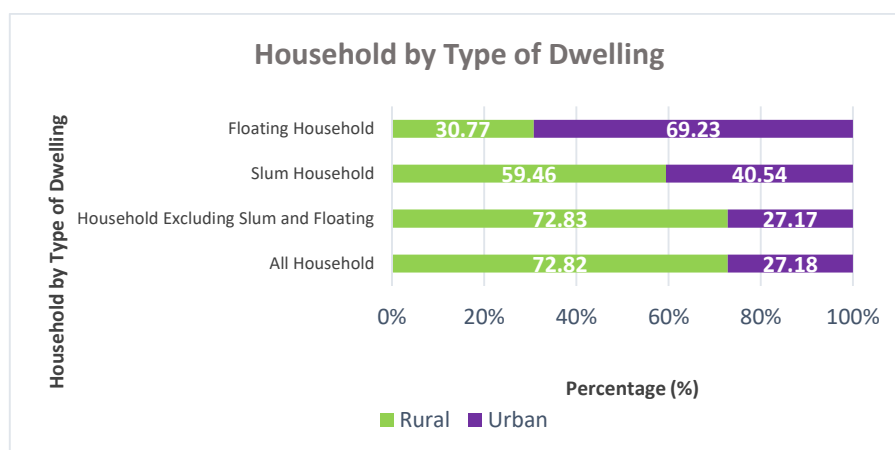


Figure 4.1: Household by Type of Dwelling

4.3 Religion

Bhola District is predominantly a Muslim populated area with 97.2 percent of Muslim population, while Hindus are the second most populated religion, with a presence of 2.8 percent. Buddhists and Christians are the two other religions having a slight presence of 0.004 and 0.005 percent while others are 26 in number representing a trivial population of 0.001 percent.

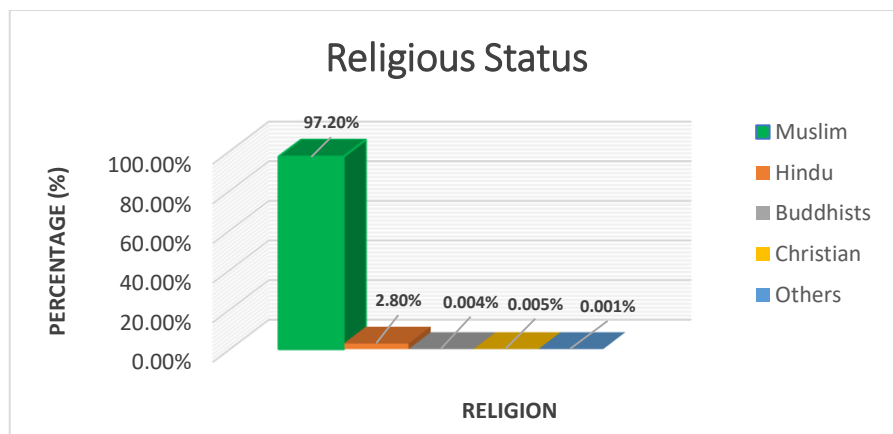


Figure 4.2: Religious Status of Bhola District

4.4 Marital Status

In Bhola District, 67.6% is currently married, 28% never married, 4.08% Widow/widower, 0.18% Separated, 0.18% are divorced. (Population and Housing Census 2022)

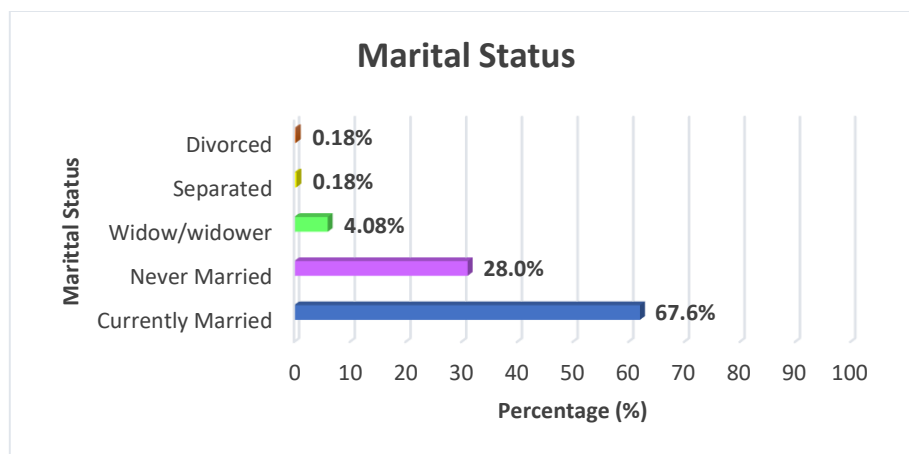


Figure 4.3: Marital Status of Bhola District

4.5 Source of Drinking Water

In Bhola District, 98.21% general household get the facility of drinking water from tube-well, 0.70% from tap/pipe, 0.11% from bottled/jar water, 0.1% from well, 0.85% from pond/river/lake and the remaining 0.03% household get water from other sources. (Population and Housing Census 2022)

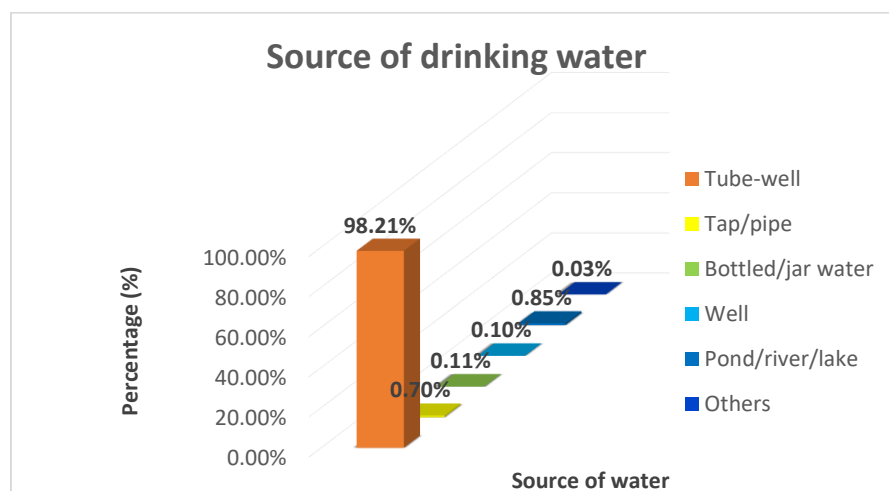


Figure 4.4: Source of Drinking Water in Bhola District

4.6 Sanitation

In the District, 30.13% household use sanitary latrine having safe disposal with flushing, 15.19% latrine having unsafe disposal with flushing, 44.04% composting latrine, 6.62% open pit latrine, 2.71% permanent/ temporary latrine and 0.60% have no latrine facility. (Population and Housing Census 2022).

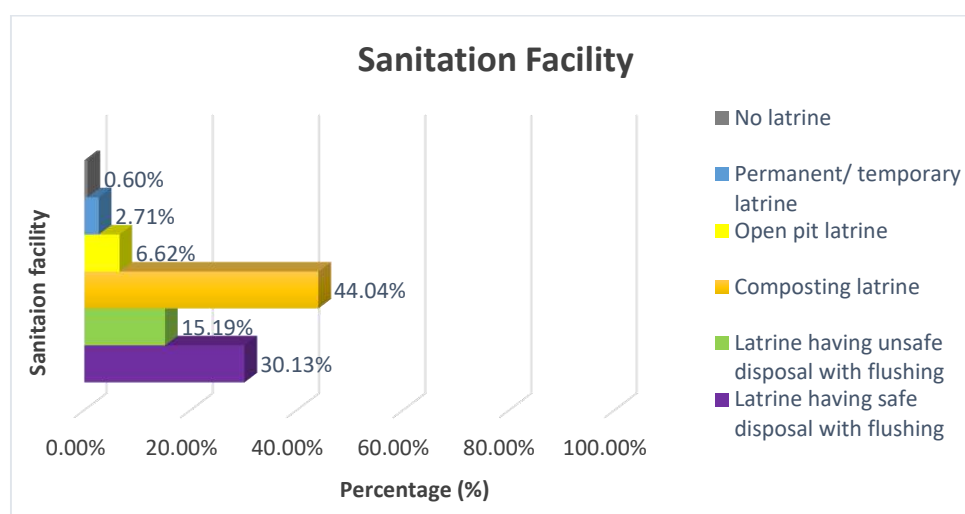


Figure 4.5: Sanitation facility in Bhola District

4.7 Literacy

In the district, it is found that 67.30% population aged 7 years and over are literate. (Population and Housing Census 2022).

4.8 Access to Electricity

A total of 91.16% general household reported to have electricity connection from the national grid, 6.97% from solar power, 0.57% from others and 1.30% have no electricity connection. (Population and Housing Census 2022).

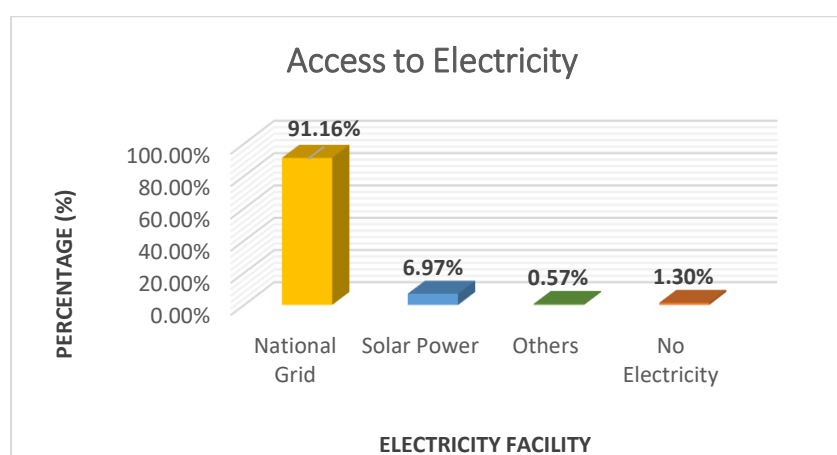


Figure 4.6: Electricity Facility in Bhola District

4.9 Archaeological Heritage and Relics

There is no notable archaeological heritage and relics found in this district.

5. Lakshmipur District

5.1 Demographic profile

Lakshmipur is surrounded on the north by Chandpur district, on the east by Noakhali district, on the south by Bhola district and on the west by Barisal and Bhola districts with Meghna River. It lies between 22°30' and 23°10' north latitude and between 90°38' and 90°01' east longitudes. Demographic Characteristics of Lakshmipur District is shown in **Table 5.1**

Table 5.1: Demographic Characteristics of Lakshmipur District

Lakshmipur District	Total number
Upazila/Thana	5
Municipality	4
Union	58
Village	547
Total Area (Sq. km)	1440.4
Total Household	365339
Total Population	1937589
Sex ratio	91.8

(Statistical Year Book, 2022)

5.2 Household by Type of Dwelling

In rural and urban area 90.74% & 9.26% are floating household, 0% slum household, 75.36% & 24.64% are household including slum and floating, 75.36% & 24.64% are all household respectively.

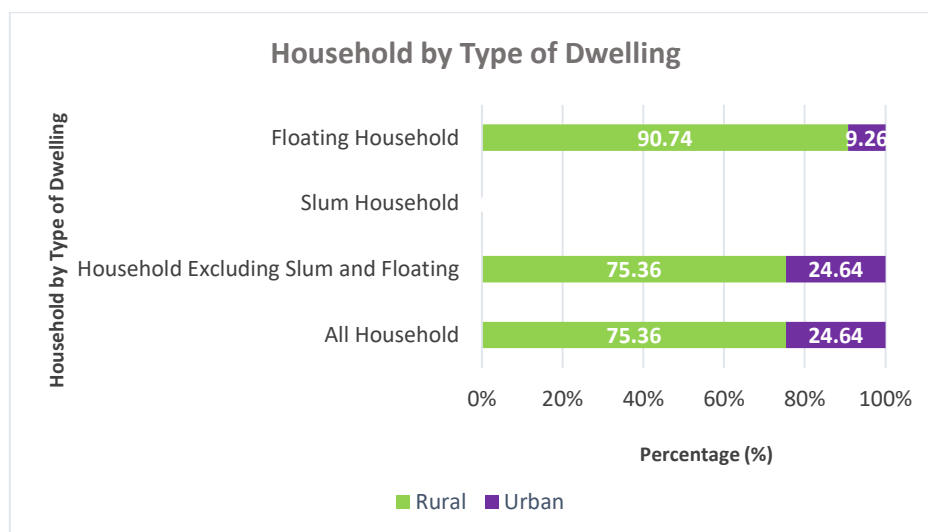


Figure 5.1: Household by Type of Dwelling

5.3 Religion

Lakshmipur District is predominantly a Muslim populated area with 96.8 percent of Muslim population, while Hindus are the second most populated religion, with a presence of 3.2 percent. Buddhists and Christians are the two other religions having a slight presence of 0.007 and 0.007 percent while others are 26 in number representing a trivial population of 0.001 percent.

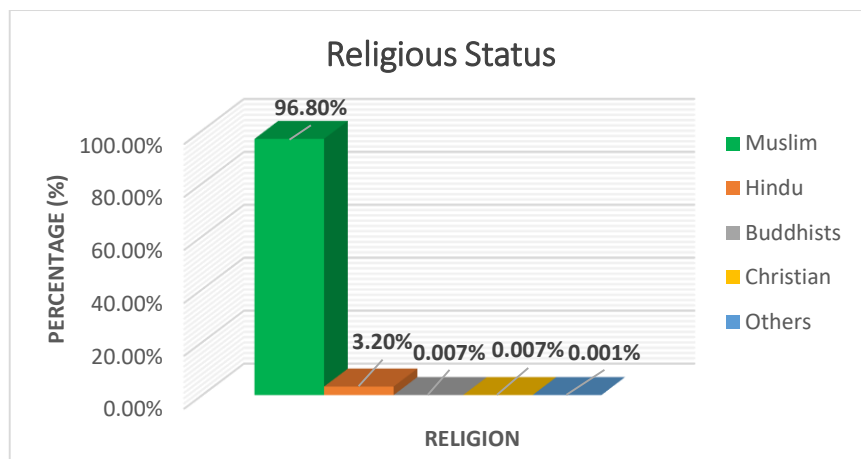


Figure 5.2: Religious Status of Lakshmipur District

5.4 Marital Status

In Lakshmipur District, 64% is currently married, 30% never married, 5.4% Widow/widower, 0.28% Separated, 0.32% are divorced. (Population and Housing Census 2022)

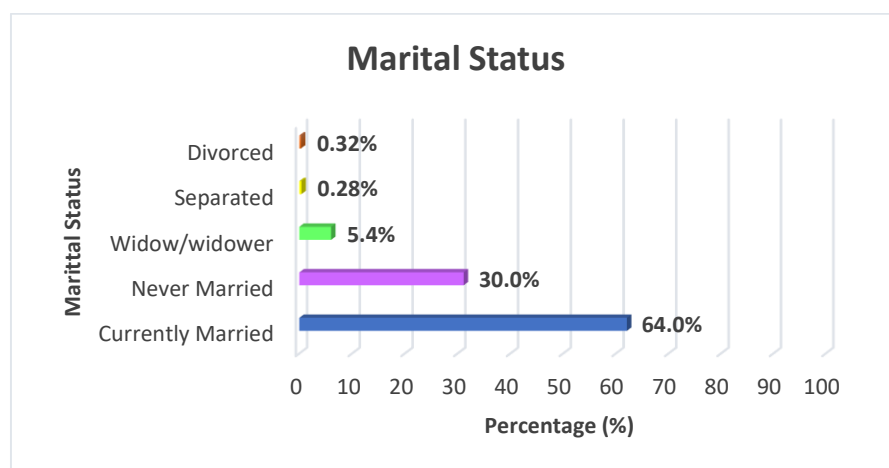


Figure 5.3: Marital Status of Lakshmipur District

5.5 Source of Drinking Water

In Lakshmipur District, 94.66% general household get the facility of drinking water from tube-well, 4.93% from tap/pipe, 0.07% from bottled/jar water, 0.02% from well, 0.28% from pond/river/lake and the remaining 0.04% household get water from other sources. (Population and Housing Census 2022)

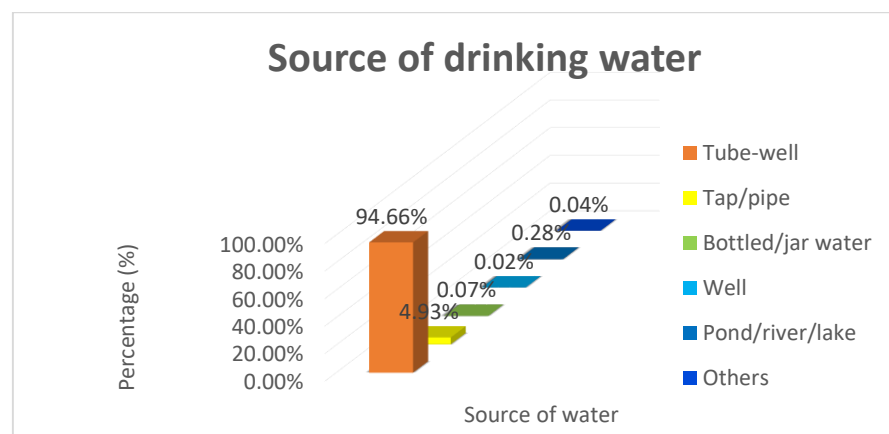


Figure 5.4: Source of Drinking Water in Lakshmipur District

5.6 Sanitation

In the District, 57.15% household use sanitary latrine having safe disposal with flushing, 10.87% latrine having unsafe disposal with flushing, 28.48% composting latrine, 2.43% open pit latrine, 0.84% permanent/ temporary latrine and 0.23% have no latrine facility. (Population and Housing Census 2022).

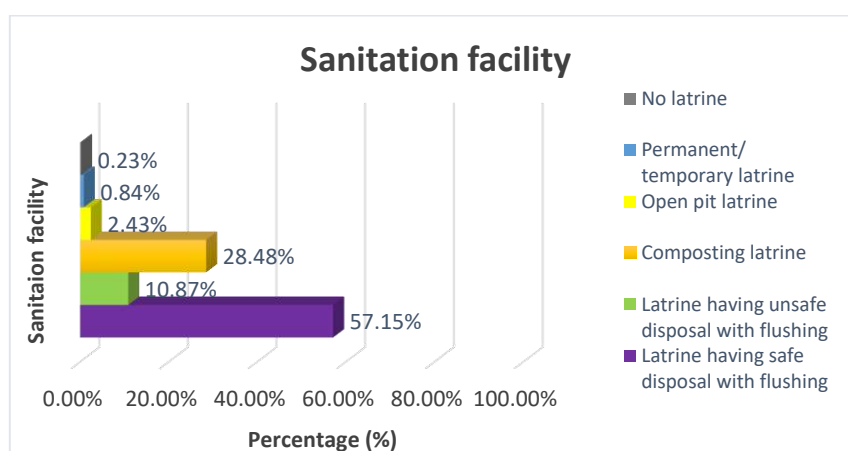


Figure 5.5: Sanitation facility in Lakshmipur District

5.7 Literacy

In the district, it is found that 73.98% population aged 7 years and over are literate. (Population and Housing Census 2022).

5.8 Access to Electricity

A total of 97.86% general household reported to have electricity connection from the national grid, 1.24% from solar power, 0.12% from others and 0.79% have no electricity connection. (Population and Housing Census 2022).

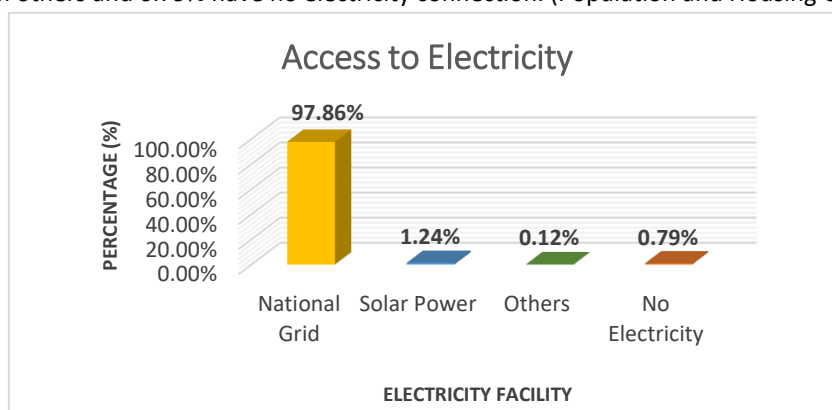


Figure 5.6: Electricity Facility in Lakshmipur District

5.9 Archaeological Heritage and Relics

Archaeological heritage and relics are Tita Khan Jami Mosque, Mita Khan Mosque, Majupur Matka Mosque, Madhu Banu Mosque, Dayem Shah Mosque, Abdullahpur Jami Mosque, Sahapur Neel-kuthi, Sahapur Saheb-bari, Zamindar house at Dalal Bazar, Srigovinda Mahaprabhu Jau Akhra, Dalal Bazar Math, Khoa-sagor dighi, Oidara Dighi, Kamala Sundari Dighi, Jinn's Mosque at village Kerea in Raipur, Bara Mosque, Rani Bhabani Kamada Math of Ramgati, Sreerampur Rajbari in Ramganj, Shyampur Dayra Sharif, Kachua Dargah, Harishchar Dargah, Kanchanpur Dargah.

6. Noakhali District

6.1 Demographic profile

Noakhali is bounded on the north by Comilla district, on the east by Feni and Chittagong districts, on the south by the Bay of Bengal and on the west by Bhola and Lakshimpur districts. The district lies between 22°07' and 23°08' north latitudes and between 90°53' and 91°27' east longitudes. Total area of the district is 3,685.9 sq. km. (1423.12 sq. miles) of which 337.13 sq. km. is under reserve forest. Demographic Characteristics of Noakhali District is shown in **Table 6.1**.

Table 6.1: Demographic Characteristics of Noakhali District

Noakhali District	Total number
Upazila/Thana	9
Municipality	8
Union	91
Village	967
Total Area (Sq. km)	3685.9
Total Household	593918
Total Population	3624916
Sex ratio	91.5

(Statistical Year Book, 2022)

6.2 Household by Type of Dwelling

In rural and urban area 28.42% & 71.58% are floating household, 66.99% & 33.01% are slum household, 82.629% & 17.71% are household including slum and floating, 82.18% & 17.82% are all household respectively.

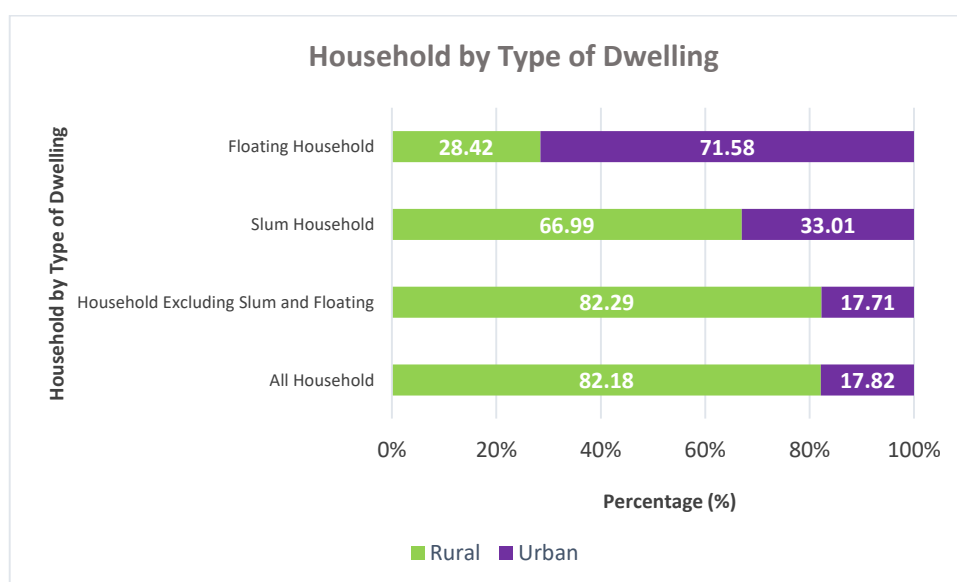


Figure 6.1: Household by Type of Dwelling

6.3 Religion

Noakhali District is predominantly a Muslim populated area with 95.8 percent of Muslim population, while Hindus are the second most populated religion, with a presence of 4.0 percent. Buddhists and Christians are the two other religions having a slight presence of 0.22 and 0.02 percent while others are 74 in number representing a trivial population of 0.002 percent.

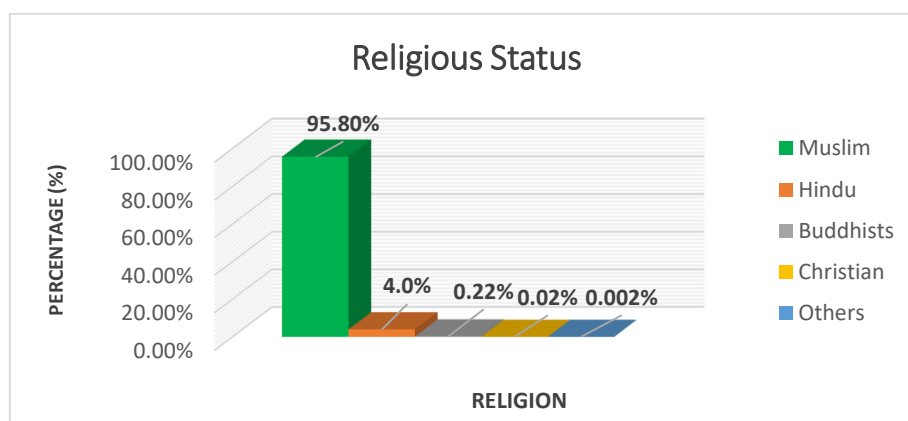


Figure 6.2: Religious Status of Noakhali District

6.4 Marital Status

In Noakhali District, 62% is currently married, 32.3% never married, 5.2% Widow/widower, 0.3% Separated, 0.2% are divorced. (Population and Housing Census 2022)

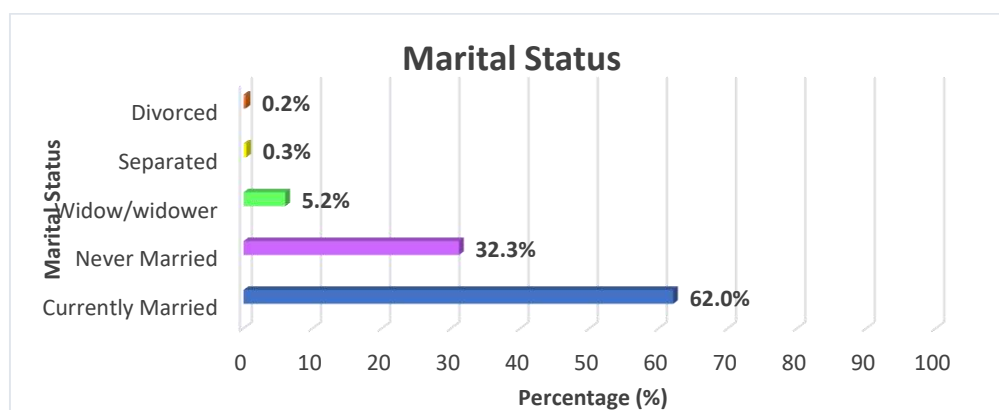


Figure 6.3: Marital Status of Noakhali District

6.5 Source of Drinking Water

In Noakhali District, 93.58% general household get the facility of drinking water from tube-well, 4.56% from tap/pipe, 0.32% from bottled/jar water, 0.21% from well, 1.16% from pond/river/lake and the remaining 0.17% household get water from other sources. (Population and Housing Census 2022)

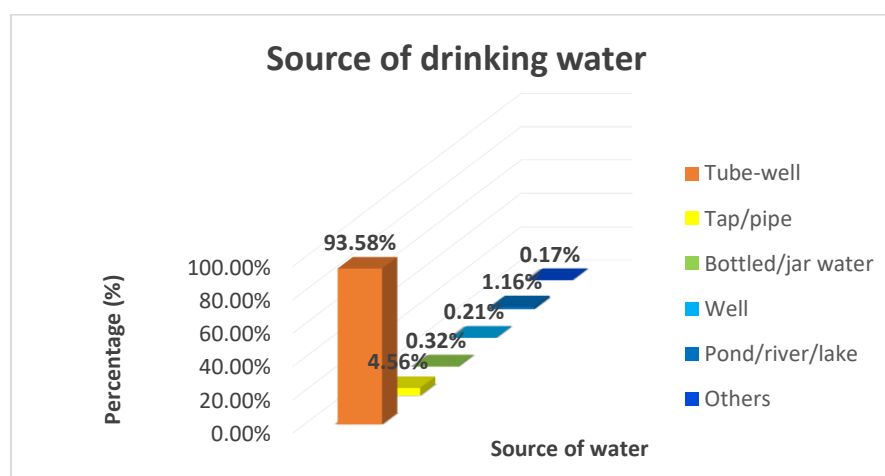


Figure 6.4: Source of Drinking Water in Noakhali District

6.6 Sanitation

In the District, 54.70% household use sanitary latrine having safe disposal with flushing, 11.84% latrine having unsafe disposal with flushing, 27.35% composting latrine, 3.43% open pit latrine, 1.91% permanent/ temporary latrine and 0.77% have no latrine facility. (Population and Housing Census 2022).

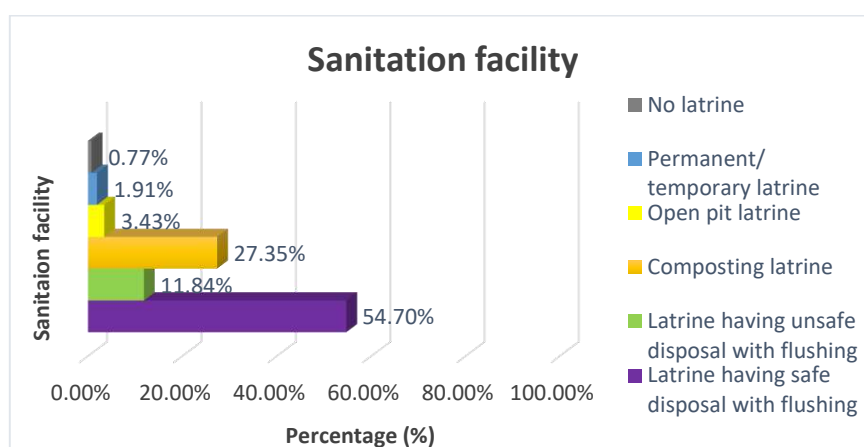


Figure 6.5: Sanitation facility in Noakhali District

6.7 Literacy

In the district, it is found that 75.52% population aged 7 years and over are literate. (Population and Housing Census 2022).

6.8 Access to Electricity

A total of 86.26% general household reported to have electricity connection from the national grid, 11.78% from solar power, 0.48% from others and 1.48% have no electricity connection. (Population and Housing Census 2022).

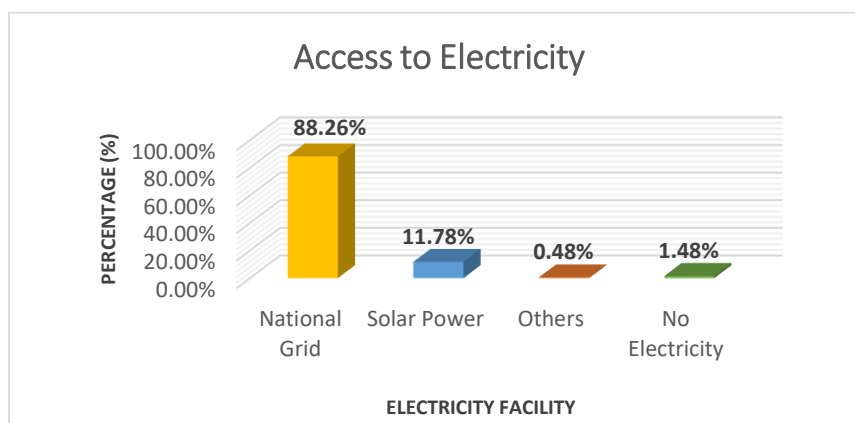


Figure 6.6: Electricity Facility in Noakhali District

6.9 Archaeological Heritage and Relics

The famous archaeological heritage and relics in this district are- Noakhali Public Library (1895), Bajra Shahi Mosque (1153 AH, Chatkhil), Kali Statue (18th century, at Sirajpur union of Companiganj upazila).

During our survey no cultural, historical or archaeological heritage site was found within 5 km area of the project site. No traditional group was seen in and around the project site.

Annexure 12

Environmental and Social Screening Checklist

Table 1: Environmental and Social Screening Checklist

SL. No.	Description	Yes/ No	Remarks
OP 4.01 Environmental Assessment			
1.	Will the effect of the component's scale in the impact area be unusual or particularly complex?		
2.	Will the project be implemented on green-field?		
3.	Will the project cause significant impact on air?		
4.	Does the site affect surface water quality, quantity, or drainage systems?		
5.	Are there any risks of groundwater contamination?		
6.	Is there any dredging activity?		
7.	Are the species or habitats that could be impacted by dredging?		
8.	Is the site near communities or areas that could be affected by noise and dust impacts from dredging activity?		
9.	Are there any sensitive receptors (schools, Mosque, hospitals) within 1 km of the site?		
10.	Are there any significant environmental risks identified at the site?		
11.	Is the project erosion-prone area?		
12.	Is the project flood-prone area?		
13.	Are there risks to the health, safety, or well-being of surrounding communities?		
OP 4.04 – Natural Habitats			
14.	Is there any significant wetland providing important habitat/ Old-growth Forest/ Mangrove Forest or plantation/ Special area for protecting biodiversity?		
15.	Are there any ecological sensitive or protected areas within or near the project area?		
16.	Are there any potential impacts on local flora and fauna?		
17.	Is the site a fish sanctuary or part of it?		
18.	Is the site a fish breeding ground, fish nursery ground/ migratory route of fish, etc.?		
19.	Are there any protected area/ fish sanctuary/ fish breeding/ nursery grounds within 1 km of the site?		
20.	Is there any loss of fish/pond due to project implementation?		
OP 4.10 - Indigenous People			
21.	Are there Indigenous Peoples residing in or near the project area?		
22.	Is there a risk of Indigenous Peoples being displaced or resettled due to the project?		
23.	Are there any positive or negative impacts of the project on Indigenous Peoples?		
OP 4.11 - Physical Cultural Resources			

SL. No.	Description	Yes/ No	Remarks
24.	Are there any physical cultural resources (e.g., monuments, archaeological sites) in or near the project area?		
25.	Is the project area considered archaeologically or culturally sensitive?		
26.	Could the project directly or indirectly impact known cultural resources?		
OP 4.12 - Involuntary Resettlement			
27.	Will the project involve land acquisition?		
28.	Will the project result in loss of property?		
29.	Will the project result in loss of structures?		
30.	Will the project result in loss of tenant?		
31.	Will the project result in loss of trees?		
32.	Will the project result in loss of crops?		
33.	Will the project affect the business enterprises?		
34.	Will the project affect Community Property Resources (CPRs)?		
35.	Will the project affect the livelihoods of people living in the project area?		
36.	Will the project affect any vendor?		
OP 4.36 - Forest			
37.	Is there any forest near the project area or any impact on Forest?		
38.	Is there any impact on Forest?		
OP 4.09 - Pest Management			
39.	Does the project involve agricultural production, forestry, aquaculture, or other operations that might require pest management?		
40.	Does the project require the use of pesticides, and if so, which ones?		
41.	Any measures are in place for pesticide handling, application, and disposal?		
OP 4.37 – Safety of Dams			
42.	Does the project involve the construction of a new dam, or rely on an existing dam for its operation?		
OP 7.50 - Projects on International Waterways			
43.	Will there be any potential for trans-boundary (frontier) impact?		
OP 7.60 – Projects in Disputed Areas			
44.	Is the project site located in disputed territory?		

Annexure 13

Labor Management Procedure (LMP)

LABOR MANAGEMENT PROCEDURE (LMP)

1.1 INTRODUCTION

Labor Management Procedure (LMP) is a strategic approach that an organization employs to effectively manage its workforce. This procedure outlines the strategies, policies, and practices that ensure the organization has the right number of employees with the right skills in the right place and at the right time to meet its operational needs and goals. The procedure aims to optimize labor resources while ensuring employee satisfaction and compliance with labor laws and regulations.

This Labor Management Procedure has been developed according to Bangladesh Labor Act, 2006 (Amended in 2013 and 2018), as well as the World Bank's Environmental and Social Framework, Environmental and Social Standard 2: Labor and Working Conditions (ESS2) for all workers and laborers involved in the proposed project.

1.2 SPECIFIC OBJECTIVE OF LMP

This Labor Management Procedures (LMP) has been developed to achieve the following specific objectives:

- ✓ To highlight and promote workplace safety and health;
- ✓ To promote the fair treatment, nondiscrimination and equal opportunity for project workers irrespective of sex, race or ethnic identity;
- ✓ To protect project workers, including vulnerable workers such as women, persons with disabilities and children (of working age, in accordance with the ESS2 of the World Bank ESF) and, contracted workers, community workers and primary supply workers, as applicable;
- ✓ To prevent the use of all forms of forced labor and child labor;
- ✓ To provide project workers with accessible means to raise workplace grievances.

1.3 OVERVIEW OF LABOR USE IN THE PROJECT

The LMP applies to all Project workers whether full-time, part-time, temporary, seasonal or migrant workers. The LMP is applicable to the Project in the following manner:

- **Direct Workers:** People employed or engaged directly by the Project Implementation Unit (PIU) on its behalf to work specifically in relation to the Project;
- **Contracted Workers:** People employed or engaged by contractors to perform work related to core function i.e., construction of terminals, dredging, etc. for the project, regardless of location.
- **Community Workers:** People employed or engaged by the Project Implementation Unit (PIU) to perform duties specifically related to the Project on its behalf.

The project will engage skilled and unskilled labor and workers. However, in case of workers are engaged, it has to be ensured that no child and/or force labor are engaged and OHS requirement for the labors are followed.

❖ **Project Implementation Unit (PIU)**

PIU of BRWTP-1 will comprise a full-time project director, a deputy project director, and personnel with specialization in financial management, procurement, monitoring and evaluation, environment and social and others, posted from within the BIWTA.

❖ **Timing of Labor Requirement**

The Direct workers will be recruited as soon as the project is approved, especially those forming part of PIU. The employment of Contractors' workers will be done after award of contract and before the civil works begin.

Information on Contracted Workers

The format for submittal of worker's information will be finalized at the mobilization of the contractors. The information database on contracted works to be maintained by the contractors will include but not limited to the following:

- o Name and age (supported by NID);
- o Father's name and permanent address;
- o Marital status and name of the spouse (if married);
- o Number of dependents with relations and gender (as applicable);
- o Place of stay of spouse and children during work engagement under the Project;
- o Address and contact number (in case of an emergency);
- o Key skills and years of experience;
- o Work activities, schedule and duration of engagement as per contract with the contractors/PIUs;
- o Duration of contract;
- o Facilities arranged by contractor including health check-ups prior to engagement, accommodation (to be specified by contractor);
- o Pre-employment check-ups, fitness tests and health awareness campaign for workers.

1.4 ASSESSMENT OF KEY POTENTIAL LABOR RISKS

There will be multiple working sites for the project interventions. Following are the key labor risks that have been identified by the environmental and social assessment:

Labor influx: All the civil construction and repair work of the project will be done by local workers. Thus, there will be very low level of labor influx throughout the project cycle. Generally, specific requirements to manage risks associated with labor influx, related to interaction between project workers and local communities, such as communicable diseases and GBV/SEA/SH, are expected to be low and managed through contractual requirements, code of conduct and training set out in this document. Both male, female, persons with disabilities, and other workers from vulnerable groups will be given equal opportunity for employment, equal wages for equal work or standard under the project.

Child Labor: As per the Labor Act 2006 and WB ESS2 no one below the age of 14 (minimum age) will be employed as a labor. A child over the minimum age (14) and under the age of 18 may be employed or engaged in connection with the project only if the work is not likely to be hazardous or interfere with the child's education or be harmful to the child's health or physical, mental, spiritual, moral or social development; an appropriate risk assessment is conducted prior to the work commencing; including regular monitoring of health, working conditions, hours of work and the other requirement of ESS2. During construction period, there is a risk of engaging child labor in different tasks. Contractor will be prohibited to employ anyone under the age of 18 in this project and digitally issued birth certificates from the respective Union Parishad (U/P) will be the basis to verify minimum age of workers eligible to employ for the project.

Forced Labor: Bangladesh passed "The Prevention and Suppression of Human Trafficking Act, 2012" which specifically indicates in Chapter One, Article (2) debt-bondage and Article (3) forced labor or service are strictly prohibited and the Article (9) of Chapter Two also indicates "If any person unlawfully forces any other person to work against his/ her will or compels to provide labor or services or holds in debt-bondage to exact from the person any work by using force or other means of pressure or by threat to do such, she/he will be deemed to have committed a punishable offense". Forced employment of laborers especially of local laborers is a serious offence and must be prohibited. Surprise and random inspection will be carried out on a regular basis to ensure ESS compliance.

Gender-Based Violence (GBV including SEA and SH): Due to the nature and scope of the project, where workers are mostly local, the GBV including sexual exploitation and abuse (SEA) and sexual harassment (SH) risk is expected to

be low and manageable. Contractors will make sure that workers are provided with the necessary GBV/SEA/SH training and Code of Conduct (CoC) are signed prior to commencement of works. And adequate measures will be put in place to mitigate GBV/SEA/SH risks in and around works sites.

Occupational Health and Safety (OHS): The project workers are likely to be exposed to hazards that put them at risk of infection with an outbreak pathogen (in this case COVID-19). Hazards include face-to-face interaction with the general public that increase pathogen exposure, long working hours, psychological distress, fatigue, occupational burnout, and physical and psychological stress.

The occupational health and safety of those involved in the project is a significant issue as COVID-19 is a highly contagious virus that spreads easily from person to person when in close proximity. In addition, some infected people may not know that they have become infected and may contribute to the spread unknowingly. Risk factors for worker exposure to COVID-19 include job duties that involve close (within 6 feet) contact with other workers, the community, construction workers, patients and healthcare workers etc. Exposure risks can increase for civil workers interacting with individuals with higher risks of contracting COVID-19 and for workers who have exposure to other sources of the virus in the course of their job duties.

World Bank Group Environmental Health and Safety Guidelines, World Health Organization's COVID-19 Occupational Health and Safety Guidelines, World Bank's COVID-19 Considerations in Construction/Civil Works Projects and Public Consultations and Stakeholder Engagement in WB-supported operations when there are constraints on conducting public meetings will be referred to minimize the OHS hazards and risks.

1.5 OVERVIEW OF LABOR LEGISLATIONS, POLICIES AND GUIDELINES

The Bangladesh Labor Act, 2006 along with its amendments in 2013 and 2018 (BLA 2006) illustrates the basic conditions of employment. The Act makes it mandatory for employers to furnish employees with written particulars of employment stating, hours of work, wages, leave entitlements, job description, grievance procedure, benefits if any etc. This Act also contains:

- Contracts of employment
 - Leave entitlements, i.e. annual leave, sick leave, maternity leave and compassionate leave
 - The protection of wages (prohibition against unlawful deductions)
 - Retrenchment procedures
 - Fair and unfair reasons for termination of employment
 - Grievance mechanism
- Chapter III of the BLA 2006 in Articles 34 (1) and 34 (2) prohibits employment of children and adolescents. Articles 39, 40, 41-44 of the BLA 2006 provides requirements in relation to employment of project workers particularly children and adolescents.
 - Chapter IV of the BLA 2006 in Articles 45 (1), 45(2) and 45 (3) specifically emphasizes restriction on engagement of women worker in work under certain situation. The employer must ensure protection of women workers in certain condition.
 - Chapter VI in Articles 61 to 78A specifically mentions details of the safety and working condition of the assigned workers. The salient aspects that this chapter covers are the following:
 - ✓ **Safety of building and machinery:** It details with the inspection requirement of these installations and actions to be taken if these are found unsafe for workers.
 - ✓ **Fencing of machinery, machinery in motion, automatic machines:** Details the fencing and safety requirement to be set around dangerous machinery.
 - ✓ **Floors, Stairs and Passages:** Sets out the construction and setup requirement for safe access and ease of use.

- ✓ **Excessive weights:** Illustrates that no excessive weights to be lifted by any worker.
 - ✓ **Dangerous fumes and explosive and flammable gas:** Details courses of action in case dangerous and explosive gases and fumes are in work area.
 - ✓ **Personal protective equipment (PPE):** (i) Makes it mandatory to supply workers with quality PPE including helmet, gloves, boot, etc. (ii) Every worker shall be made aware of the hazards of work through training in order to ensure the protection and safety of his professional health in the place of work.
- Chapter VII of the BLA 2006 provides special provision relating to health, hygiene and safety including the following:
 - ✓ **Dangerous operations:** All potential dangerous operations to be declared and women and children to be barred from such operations.
 - ✓ **Notice on accident:** Makes it mandatory to report any accident in workplace.
 - ✓ **Notice on diseases:** If any worker is infected with any disease listed in the Second Schedule of the Act, it is mandatory to notify and the employer is obligated to treat the worker.
 - ✓ **Restriction to Employ Women Worker:** Lists specific assignments where women may not be employed.
 - Chapter X of the BLA 2006 provides guidance on wages and payment as follows:
 - ✓ **Responsibility for payment of wages:** Every employer shall be liable to pay to workers employed by him/her all wages required to be paid under this Act:
 - ✓ Provided that in the case of all other workers, except any worker employed by a contractor, the Chief Executive Officer, the manager or any other person responsible to the employer for the supervision and control of an establishment shall also be liable for such payment:
 - ✓ Provided further that if the wages of a worker employed by the contractor is not paid by the contractor, the wages of such worker shall be paid by the employer of the establishment, and the same shall be adjusted from the contractor.
 - Chapter XII of the BLA 2006 provides requirements on compensation for injury caused by accidents. It is the liability of the employer to pay compensation in accordance with the provisions of this Chapter, if a worker is bodily injured by an accident arising out of the course of his/her employment.
 - Chapter XXI of the BLA 2006 provides miscellaneous issues and requirements importantly obligations of workers and conduct towards women. Article 331 provides that no worker in an establishment shall:
 - ✓ willfully misuse or interfere in the use of any system or appliance provided in the establishment for the purpose of securing the health, safety or welfare of the workers therein.
 - ✓ willfully or without reasonable cause do anything which is likely to endanger himself or any other person.
 - ✓ willfully neglect to make use of any appliance or system provided in the establishment for the purposes of securing the health or safety of the workers therein.
 - Article 332 provides conduct towards women. Where any woman is employed in any work of any establishment, whatever her rank or status may be, no person of that establishment shall behave with her which may seem to be indecent or unmannerly or which is repugnant to the modesty or honor of that woman.

1.6 RESPONSIBLE STAFF AND PROCEDURES

The summary of responsibility with respect to labor issues is appended below:

Overall Management: The PIU have the overall responsibility to oversee all aspects of the implementation of the LMP, in particular to ensure contractor compliance. PIU will address all LMP aspects as part of procurement for works as well as during contractor induction. The contractor is subsequently responsible for management of labor issues in

the field. The Contractor will be required to adopt and implement good labor management practices acceptable to the PIU.

Occupational Health and Safety (OHS): Contractors must ensure day-to-day compliance with acceptable safety measures and will record safety incidents. Minor incidents are reported to PIU on a monthly basis, serious incidents are reported immediately. Minor incidents are reflected in the quarterly reports to the WB, major issues are flagged to the WB immediately.

Labor and Working Conditions; Contractors will comply with the provision of labor conditions including non-discrimination, wages, safer working conditions etc. PIU will carry out periodic monitoring to ensure that labor working conditions are met as per national legislation. PIU may at any time require records to ensure that labor conditions are met. PIU will review records against actuals at a minimum monthly basis and can require immediate remedial actions if warranted.

Waste management, communicable diseases. Contractor will be fully responsible to ensure that their workers know and are trained on their obligations with respect to avoidance of any form of GBV/SEA, safe disposal of waste and reporting of communicable diseases if they contract any. Continuous motivation, monitoring and reporting on the same is the responsibility of the Contractor. The PIU will have a monitoring team to ensure the same.

Additional Training: Contractors are required to ensure that the assigned workers are adequately trained and briefed with overall safety arrangement, use of equipment (especially PPE), GRM procedure, working conditions of the project. Training on use of PPE, hygiene facilities and behaviour, GBV/SEA and preparation and obtaining signed code of conduct are also Contractor's responsibility.

Verification, Monitoring and Evaluation (M&E): M&E will be an integral part of the project under the responsibility of the PIU. BIWTA will be responsible for managing a common web-based platform, which will be developed to track the project's progress based on the results framework. The platform will support a participatory M&E, which will allow project stakeholders—such as the local BIWTA officials, and consultants—to collect data on project progress.

1.7 POLICIES AND PROCEDURES

This section outlines main policies and procedures to be followed during the implementation of the project and will be updated and amended as needed, after contracts have been awarded. Bangladesh has in place the Bangladesh Labor Act 2006 and Amendment 2013 and 2018, National Occupational Health and Safety Policy 2013 and Communicable Diseases (Prevention, Control and Eradication) Act 2018 that illustrate rights and responsibilities of employers and workers, conditions of employment, child and force labor issues, OHS requirements, requirement related to communicable disease such as COVID-19 etc. The principles and procedures presented below represent minimum requirements but are not an exhaustive list of requirements.

As specified in the Labor Act, the employment of project workers will be based on the principles of non-discrimination and equal opportunity. There will be no discrimination with respect to any aspects of the employment relationship, such as recruitment, compensation, working conditions and terms of employment, access to training, promotion or termination of employment.

The following measures will be developed by the contractors and monitored by PIU to ensure fair treatment of all employees:

- ✓ As per Labor Code requirements, recruitment procedures will be transparent, public and non-discriminatory with respect to ethnicity, religion, disability, gender, and other grounds included in the Labor Code;
- ✓ Applications for employment will be considered in accordance with the application procedures established by the Contractor;

- ✓ Labor will be preferentially recruited from the local areas;
- ✓ The contracted workers will not pay any hiring fees. If any hiring fees are to be incurred, these will be paid by the Contractor;
- ✓ The labor contracts will be developed in Bangla so as to be understandable by all workers;
- ✓ In addition to written documentation, an oral explanation of conditions and terms of employment will be provided to workers who may have difficulties with understanding the documentation;
- ✓ While communicating with women workers, it is to be ensured that they understand their rights and process of raising issues and grievances related to their employment;
- ✓ PIU will include in contracts that no forced or child labor would be allowed.

The health and safety procedure illustrated in the Labor Acts, WB Environmental and Health Safety Guidelines (EHSG), (General including Construction and Decommissioning), Communicable Diseases (Prevention, Control and Eradication) Act 2018 as well as guidelines to address COVID-19 issues will be referenced all activities under the Project. PIU is expected to carry out field visits and inspections of the construction from time to time. However, the WBG's EHSG (General Guidelines and for Construction and Decommissioning) may not have sufficient details and specific requirements to deal with various occupational health and safety issues posed by the project, thus the PIU should put in place specific standards meeting Good International and Industry Practices (GIIP) in the bidding documents and contracts reflecting appropriate level of risk.

The following OHS standard requirements should be borne in mind:

- ✓ Risk Assessment Procedure;
- ✓ Work permitting for hazardous work (working at heights, hot work, work on energized lines, work within confined spaces);
- ✓ Rules for life threatening works;
- ✓ Emergency response procedure;
- ✓ Fall prevention and working at heights;
- ✓ Excavations safety, Ladders and scaffolding safety; welding and cutting safety; Cranes, Derricks, and forklifts safety; power and hand tools safety;
- ✓ Respiratory prevention to chemical and airborne hazards (including dust, silica and asbestos); Electrical safety (hazardous energies control, safe distance work, wiring and design protection, grounding, circuit protection, arc fault protection, PPE etc); hazards communication; Noise and vibration safety; Steel erection safety; fire safety; material handling safety; concrete and masonry safety;
- ✓ PPE and other protective gear including training on usage.

Contractors will provide a safe workplace, therefore a risk assessment will be completed before the commencement of any construction activities, and safety measures will be implemented in accordance with applicable safety standards. PPEs and other preventive measures will be provided at no cost to employees. Periodic OHS meetings will be conducted to discuss preventive measures, deviations and non-compliances, accidents and corrective actions. Contractors will conduct internal OHS surveys and audits to verify compliance of OHS practices. Non-compliances will be documented and reported internally. A time frame for a corrective action will be set and followed up. Daily OHS briefings will be conducted before the commencement of the works highlighting the hazards and preventive measures from each job. Contractors will document and report to PIU all accidents and illness, fatalities or serious injuries that may happen at work site. There must be on site resources for first aid and for more serious injuries there must be a pre-approved health facility for medical treatment, as well as appropriate transportation of injured/sick/symptomatic workers. Contractors will control the access to the construction site only to authorized people and verify if workers are meeting training and capacity requirements to carry out their jobs. All workers must complete at minimum an OHS induction to have access to the construction site.

PIU will arrange periodic supervision of Contractor's OHS performance, including site visits, at least monthly. These supervisions will cover compliance with above mentioned standards, accidents, violations of rules, recommendations, and progress of ongoing corrective actions.

PIU will inform WB promptly about any incident or accident related to the project which has, or is likely to have a significant adverse effect on the environment, the affected communities, the public or workers (labor, health and safety, or security incident, accident or circumstance) as soon as reasonably practicable. Such events can include COVID-19 cases and symptoms, labor protests, serious worker injuries or fatalities, project-caused injuries to community members or property damage.

The Contractor will develop and implement Code of Conduct (CoC). The CoC will reflect the Contractors' core values and overall working culture, provisions relating to GBV/SEA/SH, waste management and disease prevention and work ethics. The CoC should be written in plain local language and signed by each worker to indicate that they have:

- ✓ Received a copy of the CoC as part of their contract;
- ✓ Had the CoC explained to them as part of the induction process;
- ✓ Acknowledged that adherence to this CoC is a mandatory condition of employment;
- ✓ Understood that violations of the CoC can result in serious consequences, up to and including dismissal, or referral to legal authorities.

A copy of the CoC shall be displayed in a location easily accessible to the community and project-affected people. It shall be provided in Bangla. Contractors must address the risk of GBV/SEA/SH, through:

- ✓ Mandatory training and awareness-raising for the workforce about refraining from unacceptable conduct toward local community members, specifically women. Training may be repeated;
- ✓ Informing workers about national laws that make sexual harassment and gender-based violence a punishable offence which is prosecuted;
- ✓ Adopting a policy to cooperate with law enforcement agencies in investigating complaints about GBV/SEA/SH;
- ✓ Developing a system to capture gender-based violence, sexual exploitation and workplace sexual harassment-related complaints/issues.

The Contractor will be required to provide the periodic information on the performance in terms of labor, OHS issues. The information will be included in the Contractor's monthly report and will be reviewed by PIU.

1.8 AGE OF EMPLOYMENT

In the Bangladesh Labor Act, 2006, Section 34, it is mentioned that no child shall be employed to work in any occupation. Section 44 mentions that anyone under age 14 is considered as child and under 18 but over 14 is considered as adolescent. World Bank ESS strictly prohibits child labor and clearly mentioned that the minimum age of 18 years is required for anyone to get employment in such works. Section 37 of the act suggests a fitness certificate required for adolescents to get employed and they can be appointed to do the light works and less work hours.

According to the World Bank standards and guidelines, the minimum age of employment for this project shall be 18 years (given the potential hazardous situation posed by COVID-19) and to ensure ESS compliance, all employees will be required to produce National Identification Cards as proof of their identity and age which is required for employment. If any contractor employs a person under the age of 18 years, measures to address the same will be taken by PIU.

1.9 TERMS AND CONDITIONS

The terms and conditions of employment for the Project workers are governed by the provisions of Bangladesh Labor Act 2006, Labor Law (Amendment) 2013, Bangladesh Child Labor Elimination Policy 2010.

- **Conditions of employment and service:** It mandatory for the employers to provide workers with Appointment Letter, Identity Card and a Service Book (**Articles 5 and 6**). A register of workers including details of all workers engaged is also mandatory to be maintained by the employer (**Article 9**). Leave Procedures are illustrated in **Article 10**. Termination of employment is described in **Article 26** for both permanent and temporary workers.
- **Working hours:** Working hours (maximum 8 hours a day ordinarily, except exceptional cases and 48 hours a week), rest hour (1 hour for more than 6 hours of work), overtime work (more than 8 hours a day with twice the rate of normal working hour), working hour for women (no work between 10 PM to 6 AM without her consent) and leave entitlement [Chapter IX].
- **Wages and calculation of wages:** **Article 123** describes the time for wage payment (the wages of a worker shall be paid before the expiry of the seventh working day following the last day of the wage period in respect of which the wages are payable). **Article 125** defines the cases where deductions may be made from wages.
- **Condition of minimum wage rate:** **Article 148** makes it binding on the contractors (employers) to abide by the minimum wages rate. Contractors will also be required to comply with the most current decision of Wages Board assigned by the government. The Wage Board Order and the Labor Act specify the minimum wages, hours of work, overtime pay, leave entitlements, travelling and subsistence allowances and the issue of protective clothing.

Upon receiving the Project contract, the Contractor shall certify in writing that the wages, hour and conditions of work or persons to be employed by him on the contract are not less favorable than those contained in the most current wages regulation issued by the government recommended by the Wages Board Chairman. The Contractor shall maintain worker's register which will be available for inspection during working hours.

In ensuring full compliance with the law in this regard, the Contractor will be required to furnish PIU with copies of the Service Book or copies of contract of all its workforce. Contractors will not be allowed to deploy any employee to work in the project if such copy of employment of that employee has not been handed to PIU. The Contractor also is obliged by the law to allow workers to form trade unions subject to the provision of Labor Act 2006.

As a monitoring mechanism, a contractor shall not be entitled to any payment unless he has filed, together with his claim for payment, a certificate: - a) stating whether any wages due to employees are in arrears; b) stating that all employment conditions of the contract are being complied with. It will be a material term of the contract to allow PIU to withhold payment from contractor should the contractor not fulfill their payment obligation to their workers.

1.9.1 Workers' Organization

The Bangladesh Labor Act, 2006 (Section 176) and the WB ESS2 ratifies the Rights of Workers, guarantees all workers of their rights to freely form, join or not join a trade union for the promotion and protection of the economic interest of that worker; and collective bargaining and representation and in the Bangladesh Labor Act, 2006, a worker's welfare society holds the right to negotiate the terms and conditions of employment and other related matters and any worker has the right to join the welfare society. Section-119 of this Act suggest collective bargaining agent to negotiate representing the welfare society of workers.

1.10 GRIEVANCE REDRESS MECHANISM

Experience from the phase one of GRM implemented to support social and environment safeguards will be used to extend the protocol and inform the design of project wide GRM. The project PIU will need to identify groups of users that are likely to use the GRM and assess the resources—human, financial, and technological—that are available (and required) for the GRM to function effectively while establishing the protocol to support all project components and implementation. PIU will need to develop standard operating procedures and flow charts to detail how the grievance redress process will unfold within the project's operating structures and how it will be monitored and reported on. More specifically:

- ✓ Assign a dedicated GRM officer at the PIU (e.g., drafting operating procedures, guidelines and manual, and stand-alone information for GRM staff and users); and assign grievance redress responsibilities and train staff at the local level to handle grievances;
- ✓ Raise awareness of the availability of the GRM through project-related events and by posting information about the GRM in public locations / project sites (e.g., via project boards);
- ✓ The communications strategy should aim to reach out to poor and marginalized groups and communication materials should be translated into local language;
- ✓ Accept grievances through a variety of locally-appropriate channels (e.g., in-person, phone – set up toll free number, email);
- ✓ Register all grievances (e.g., ensure that all complaints lodged through local authorities are logged and tracked, and that data on resolutions is made public);
- ✓ Follow a clear and transparent procedure of complaint investigation (e.g., field visits, inspection of contractors and/or local project implementation teams, discussion with relevant service providers, etc.);
- ✓ Take a remedial action within a specified amount of days;
- ✓ Monitor and evaluate grievance-related data.

❖ **GRM to deal with labourers**

This GRM will deal with wage rates and unpaid overtime works; irregular and partial payments; lack/ inadequacy of living accommodations; lack of clean drinking water and sanitation facilities; lack of medical care in emergencies; lack of protection against Gender-Based Violence (GBV)/ Sexual Exploitation and Abuse (SEA).

The Labor Act 2006 Section 33 provides for the Formal Grievance Procedure in case a worker who has been laid-off, retrenched, discharged, dismissed, removed, or otherwise terminated from employment. Section 202 (Subsection 24) describes the responsibilities of a Collective Bargaining Agent (CBA) especially bargain with the employer in matters of the conditions of work or environment of work of the workers and conduct cases on behalf of any individual worker or a group of workers under this Act.

However, the PIU will require the Contractor to develop and implement a Grievance Redress Mechanism (GRM) for their own workforce prior to the start of design stage. The Contractor will prepare their own workers GRM. The GRM must be well circulated and written in a language understood by all. The workers GRM will include:

- ✓ A channel to receive grievances such as comment/ complaint form, suggestion boxes, email, a telephone hotline that might also be anonymous;
- ✓ Stipulated timeframes to respond to grievances;
- ✓ A register to record and track the timely resolution of grievances;
- ✓ A responsible section/wing/committee to receive, record and track resolution of grievances.

The GRM will be described in workers' induction trainings, which will be provided to all project workers. The mechanism will be based on the following principles:

- ✓ The process will be transparent and allow workers to express their concerns and file grievances;
- ✓ There will be no discrimination against those who express grievances and any grievances will be treated confidentially;
- ✓ Anonymous grievances will be treated equally as other grievances, whose origin is known;
- ✓ Management will treat grievances seriously and take timely and appropriate action in response. Information about the existence of the grievance mechanism will be readily available to all project workers (direct and contracted) through notice boards, the presence of "suggestion/complaint boxes", and other means as needed;
- ✓ The Project workers' grievance mechanism will not prevent workers to use conciliation procedure provided in the Labor Act 2006.

A PIU representative will monitor the Contractors' recording and resolution of grievances, and report these to PIU in their monthly progress reports. The process will be monitored by the GRM Focal Point of PIU (preferably the Social Consultant).

1.11 CONTRACTOR MANAGEMENT

As part of the process to select Contractors who will employ contracted workers, the PIU will review the following information:

- ✓ Information in public records, for example, corporate registers and public documents relating to violations of applicable labor law, including reports from labor inspectorates and other enforcement bodies;
- ✓ Business licenses, registrations, permits, and approvals;
- ✓ Documents relating to a labor management system, including OHS issues, for example, labor management procedures;
- ✓ Workers' certifications/permits/training to perform required work;
- ✓ Records of safety and health violations, and responses; recordable incidents;
- ✓ Accident and fatality records and notifications to authorities;
- ✓ Records of legally required worker benefits and proof of workers' enrolment in the related programs;
- ✓ Worker payroll records, including hours worked and pay received;
- ✓ Copies of previous contracts with contractors and suppliers, showing inclusion of provisions and terms reflecting/ materially consistent with WB EHS guideline.

The PIU will manage and monitor the performance of the Contractor in relation to contracted workers, focusing on compliance by contractors with their contractual agreements (obligations, representations, and warranties). This may include periodic audits, inspections, and/or spot checks of project locations or work sites and/or of labor management records and reports compiled by contractors. Contractors' labor management records and reports may include:

- ✓ A representative sample of employment contracts or arrangements between third parties and contracted workers;
- ✓ Records relating to grievances received and their resolution;
- ✓ Reports relating to safety inspections, including fatalities and incidents and implementation of corrective actions;
- ✓ Records relating to incidents of non-compliance with national law; and
- ✓ Records of training provided for contracted workers to explain labor and working conditions and OHS for the project.

1.12 COMMUNITY HEALTH AND SAFETY

The Contractors shall follow the standards set by World Bank EHS guideline and Bangladesh Labor Act 2006 (including amendment 2013 & 2018) in order to ensure the health and safety of the community. During implementation of the project interventions by the contractor, they shall be inspected by PIU as well as Construction Supervision Consultants (CSCs) to assess any risks or hazards associated. After inspection, the competent professionals from PIU and CSCs shall certify which shall reflect on the risk of adverse consequences posed by the nature and use of the structural elements and the natural conditions of the area. Since the locations of the project are in different zones of the country, community people are to be consulted for broader support to minimize adverse impacts on them.

PIU shall appoint quality management systems to anticipate and minimize any risks and impacts that may have on community health and safety. Traffic and road safety should be ensured, as some of the materials will be carried to the project sites by truck and local transport, therefore, reckless driving of the heavy vehicles are to be controlled to avoid accidents.

Annexure 14

Stakeholder Engagement Plan (SEP)

STAKEHOLDER ENGAGEMENT PLAN (SEP)

1.1 GENERAL CONSIDERATION

Stakeholder engagement and communication is an important tool for ensuring transparency, accountability and effectiveness of development projects. It's a means of involving all primary and secondary stakeholders in the project's decision-making process in order to address their concerns, improve project design and give the project legitimacy.

Community input (both of knowledge and values) on socio-economic and environmental issues can greatly enhance the quality of decision-making. Stakeholder consultation was therefore conducted in the project area not only to satisfy the legal requirements in Bangladesh but also to improve and enhance the social and environmental design of the project.

1.2 OBJECTIVE OF STAKEHOLDER ENGAGEMENT

The overall objective of this Stakeholder Engagement Plan (SEP) is to define a program for stakeholder engagement, including public information disclosure and consultation, throughout the implementation of the project, starting from the early stage of the project preparation. The SEP outlines the ways in which the project will engage the relevant stakeholders including the marginalized and disadvantaged groups, and provide them with a mechanism through which people can raise concerns and provide feedback.

The involvement of the local population is essential to the success of the project(s) in order to ensure smooth collaboration between project staff and local communities and to minimize and mitigate environmental and social risks related to the proposed project activities.

1.3 STAKEHOLDER IDENTIFICATION AND ANALYSIS

People who live near and around the project and who will be directly and indirectly affected by the project are considered as the stakeholders. For this particular project- Project proponent, Local communities, Local Farmer, Local Fishermen, squatters, businessman, tenants, vendors, wage labors, women and old persons and government officials are the stakeholders to whom have been consulted and the people who live near the project. For the sake of their interest, it is an absolute necessity to consult all primary and secondary stakeholders.

1.3.1 Primary Stakeholders

Primary stakeholders are people who would be directly affected by the proposed project. In this context, people who have/ had land within/ around the project boundary, who were dependent on that land economically were considered as the primary stakeholders.

1.3.2 Secondary Stakeholders

This category of stakeholders pertains to those who may not be directly affected but have interests and could contribute to the study, play role in implementation at some stage, or affect decision making on project aspects. In this project, local elite persons, people who are living at the close vicinity, occupational groups and government departments fall under this category.

Apart from categorization, the stakeholders can also be classified in accordance with the level of influence they have over the project as well as their priority to the project proponent in terms of importance.

The influence and priority have both been primarily rates as:

High Influence/Priority (Manage Closely): People who have high power and interest are grouped in this category. They always must be managed closely. This implies a high degree of influence of the stakeholder on the project in terms of participation and decision making or high priority for project proponent to engage that stakeholder.

Medium Influence/Priority (Keep Satisfied/ keep informed): People who have high power but low interest as well as who have high interest but low power should be kept satisfied or informed. This implies a moderate level of influence and participation of the stakeholder in the project as well as a priority level for project proponent to engage the stakeholder who are neither highly critical nor are insignificant in terms of influence.

Low Influence/Priority (Monitor with minimum effort): This implies a low degree of influence or interest of the stakeholder on the project in terms of participation and decision making or low priority for project proponent to engage that stakeholder.

A general list of stakeholder groups identified is presented in **Table 1.1** below.

Table 1.1: Potential Stakeholders Group and Interested Parties

Stakeholder Group	Interest/Cause In Engagement
International level	
World Bank Group	Is financing the project.
National level (Interested Parties)	
Bangladesh Inland Water Transport Authority (BIWTA)	Executing Agency
Different government Agencies like District Administration, DoE, etc.	Would be responsible to support BIWTA by acquiring land, making the site incumbrance-free, find alternative land for relocation of the displaced shops/houses for the successful implementation of the Project. Support/consent from all these agencies is required during the project implementation at different stages. As project has construction activities and require local government services, these groups are highly interested with this project.
Mass media (Print and Electronic)	They are intermediaries for informing the general public about the planned activities of the project developer and for information disclosure in connection with the proposed project.
Civic and Women's organizations in the area	Different women's organizations will be highly interested with the project as during the implementation and operational stages, there would be specific programs to redress GBV/SEA/SH issues and scope of employment of local women/vulnerable groups in project activities.
Human Rights, Gender and Labor Organizations	To monitor compliance of HR, Gender Issues and labor rights during implementation stage
RAP implementing NGO	They are involved in assessing losses of the people and assist BIWTA in delivering compensation, relocation and livelihood restoration of the vulnerable groups.
Local Level	
Project Affected People including vulnerable people	Affected people are important part of the project since there will be significant impact on them due to land acquisition and displacement of shops and houses.
Affected Community Properties	Management Committee/Authority of the CPRs/Offices and Institutions affected by the project are interested party. Relocation of these properties will be managed by the concerned authority /management committee for successful implementation of the project
Launch Ghat (LG) users /local people /beneficiaries	Local people including LG users (other than the affected people) will be major beneficiaries of the project.

Stakeholder Group	Interest/Cause In Engagement
Project employees and consultants, vendors, contractors and labors	Project's suppliers, Different consultants, labors, contractors, sub-contractors, suppliers and vendors will be engaged with this project.

Key Stakeholders identified for this project are shown in **Table 1.2** below.

Table 1.2: Identified Key Stakeholders

List of Stakeholder Consultation	
Key Informants Interview (KII)	
Governments Officials	Department of Environment (DoE)
	Bangladesh Water Development Board (BWDB)
	Local Government Engineering Department (LGED)
	Palli Bidyut
	Land Office
	UNO Office
Focus Group Discussions (FGD)	
Local Community	Local Community
	Local Fisherman
	Local Farmers
	Squatter
	Businessman
	Tenant
	Vendor
	Local Women and Elderly Group
	Wage laborers

1.4 STAKEHOLDER ENGAGEMENT PROCESS

Stakeholder engagement process for this project would start from identification, mapping and analysis. It is anticipated that this Stakeholder Engagement process will help to clarify the stakeholder identification procedure at project level. **Table 1.3** show the plan and techniques suggested to be used during the engagement process:

Table 1.3: Stakeholder Engagement Plan (SEP) and Techniques

Engagement Technique	Appropriate Application of the Technique
Correspondences (Phone, e-mails)	- Distribute information to officials of different government agencies and organizations; - Invite stakeholders to meetings and follow-up.
Focus Group Discussion (FGD)	- Present Project information to a group of stakeholders; - Allow stakeholders to provide their views on targeted baseline information; - Build relationships with communities; - Allow small groups of people (women, youth, vulnerable people, disabled people, local community etc.) to provide their views and opinions; - Record responses.
Key Informant Interview (KII)	- Seeking views and opinions of individuals; - Enable stakeholder to speak freely about sensitive issues; - Build trust and relationships; - Record meetings.
Formal meetings/ Public Consultation	- Present project information to a large group of stakeholders, especially communities; - Discuss about the all-project components; - Allow the group to provide their views and opinions; - Build relationship with the communities, especially those impacted; - Distribute non-technical information;

Engagement Technique	Appropriate Application of the Technique
	- Facilitate meetings with presentations, PowerPoint, posters etc.; - Record discussions, comments and questions.
Radio or television entries	- Short radio programs, - Video materials - Documentary broadcast on TV.
Information Centre/ Information Boards/ GRM	- Establish Information Board in each project area; - Present project information and progress updates; - Disclose E&S documents; - Disclose component wise project activities.
Project information on website	Share information on project activities.
Direct communication with affected people	- Share information on timing of project activities; - Collect the opinion about the project.
Project leaflet	- Brief project information to provide regular update; - Site specific project information in local language.
Surveys	- Gather opinions and views from individual stakeholders; - Gather baseline data and develop database for monitoring impacts; - Record data and analysis.

1.5 STAKEHOLDER MAPPING

“Stakeholder mapping” is a process of examining the relative influence that different individuals and groups have over a project as well as the influence of the project over them. The purpose of a stakeholder mapping is to-

- Study the profile of the stakeholders identified and the nature of the stakes;
- Understand each group’s specific issues, concerns as well as expectations from the project that each group retains;
- Gauge their influence on the project.

On the basis of such an understanding, the stakeholders are categorized into High Influence/ Priority, Medium Influence/ Priority and Low Influence/ Priority.

1.5.1 Approach and Methodology for Stakeholder Mapping and Analysis

The significance of a stakeholder group is categorized considering the magnitude of impact (type, extent, duration, scale, frequency) or degree of influence (power, proximity) of a stakeholder group and urgency/ likelihood of the impact/ influence associated with the particular stakeholder group in the project context. The magnitude of stakeholder impact/ influence is assessed taking the power/ responsibility and proximity of the stakeholder group and is categorized as negligible, small, medium and large. Influence on/by Stakeholder on project is assessed in a scale of low, medium and high. The overall significance of the stakeholder group is assessed as per the matrix provided in **Table 1.4** below:

Table 1.4: Stakeholder Significance and Engagement Requirement

Magnitude of Influence/ Impact	Influence on/by Stakeholder on project		
	Low	Medium	High
Negligible	Negligible	Negligible	Negligible
Small	Negligible	Minor	Moderate
Medium	Minor	Moderate	High
Large	Moderate	High	High

The following **Table 1.5** provides brief profiles of the various stakeholders in the project along with their key concerns about the project and their degree of influence.

Table 1.5: Stakeholder Profiles and Influence Mapping

Stakeholders	Category of Stakeholder	Profile/ Status	Magnitude of Influence/Impact (Negligible, Small, Medium, Large)	Influence on/by Stakeholder on project (Low, Medium, High)	Rating of Stakeholder Influence	
Project Management						
BIWTA	Primary	BIWTA is the authority which controls the inland water transport in Bangladesh. It's also responsible for managing development and maintenance of inland water transport system.	BIWTA is the primary project proponent owns a controlling stake of 100% in the project	Large - Responsible for all the project related risks and impact liabilities; - Are the primary project proponents; - Responsible for establishment and operation of this project; - Primary financial beneficiaries.	High	High
Community people						
Local Community	Primary	This stakeholder group comprises of the community residing in the study area	The local population has high expectation on getting employment opportunity from the project	Medium - Support to land losers in terms of temporary sustenance and employment opportunities; - Increase in employment opportunities and preference in job; - Generation of business opportunities for the local community.	Medium	Moderate
Local Fisherman	Primary	Local fisherman around the project site	Provide alternative employment who lost their current means of livelihood.	Medium Dumping any waste in surrounding water bodies may create some negative impact.	Medium	Moderate
Local Farmer	Primary	Local farmers around the project site	Has high expectation on getting employment opportunity for the younger generation as they are mostly not interested in pursuing agricultural activities.	Small - Employment opportunity through the entire project phase; - Better establishment of the community area.	Medium	Minor
Squatter	Primary	Squatters around the project site	- Adequate compensation for the lost assets; - Provide financial help from the project to run our family.	Medium - Employment opportunity of the affected people in the project construction and operation phase; - Environmental issues are to be carefully taken care of.	Medium	Moderate
Businessmen	Primary	Businessman around the project site	- Pay compensation and resettlement benefits for business restoration; - They expect Government to help in shifting their business structures.	Medium - Financial support/ alternative business scope to run the business; - Employment opportunity through the entire project phase who lost their jobs due to project.	Medium	Moderate
Tenants	Primary	Tenants around the project site	Provide alternative employment opportunity;	Small - Adequate compensation for the affected people is to be paid; - Fair compensation must be ensured;	Medium	Minor

Stakeholders	Category of Stakeholder	Profile/ Status	Magnitude of Influence/Impact (Negligible, Small, Medium, Large)		Influence on/by Stakeholder on project (Low, Medium, High)		Rating of Stakeholder Influence
			Authorities should take action on things which is harmful to environment.		Resettlement assistance for relocation of household.		
Vendor	Primary	Vendors around the project site	- Provide financial support to run family who lost job due to project; - Provide adequate compensation for all types losses.	Medium	Resettlement assistance and alternative location of business to smoothly continue their livelihood.	Medium	Moderate
Women and Elderly Group	Primary	The marginal groups around the project area primarily comprises of landless households, households below poverty threshold, men headed households, old aged & destitute	- The employment opportunities available to them will be for short term only - Environmental pollution may impact negatively on their health	Small	- Employment opportunity during pre-construction and construction phase; - Job prospect for their children; - Secondary business opportunities; - Mitigation measures should be strictly followed to avoid any health impact	Low	Negligible
Wage laborers	Primary	Laborers and workers recruited from the area of influence mostly during the pre-construction and construction phase of the project	Local workers expect to have high employment opportunity from the project	Medium	- Responsible for undertaking mostly un-skill and semiskilled based work during pre-construction and construction phase of the project; - Engagement level primary in civil construction part of the work.	Medium	Moderate
Government Officials							
Department of Environment (DoE), Bangladesh	Primary	The Department of Environment is the primary government regulatory authority for this project in Bangladesh	BIWTA has already obtained ECC from DoE for the Project “Proposed Dredging Activity in Chattogram-Dhaka-Ashuganj IWT Corridor along with associated linked routes and construction of terminal with allied infrastructure under the Bangladesh Regional Waterway Transport Project-1.	Medium	- Government Regulatory agency to provide Environmental Clearance Certificate (ECC) to the project based on evaluation and approval of Environmental Impact Assessment (EIA) study; - Environmental compliance throughout the project lifecycle.	Medium	Moderate
Bangladesh Water Development Board (BWDB)	Primary	BWDB is responsible for surface water and groundwater management in Bangladesh.	The authority has to take permission for any kind of surface and ground water management	Medium	- Responsible for surface water and groundwater management; - Development and control of rivers, river basins	Medium	Moderate

Stakeholders	Category of Stakeholder	Profile/ Status	Magnitude of Influence/Impact (Negligible, Small, Medium, Large)		Influence on/by Stakeholder on project (Low, Medium, High)		Rating of Stakeholder Influence
Local Government Engineering Department (LGED)	Primary	LGED is one of the largest public sector organizations in Bangladesh entrusted with planning and implementation of local level infrastructure development programs.	Is responsible for maintenance of the approach road to the project site over the lifecycle of the project	Medium	- All kinds of support should be provided for the better establishment of this project; - Communication and transportation systems will be significantly improved, enhancing connectivity within the region.	Medium	Moderate
Palli Biddiyut	Primary	It is responsible for rural electrification	The authority is responsible for managing rural electricity distribution in different parts of the country	Small	Building, maintaining, and upgrading power distribution networks in villages	Medium	Minor
Land Office	Primary	Land office is the primary agency responsible for land issues	Responsible for managing, recording, and regulating land ownership, use and rights.	Medium	- Government authority will help the project authority for resettlement of land; - Assist for proper compensation and resettlement.	Medium	Moderate
Community representatives							
Upazila Nirbahi Officer (UNO)	Secondary	UNO works as chief executive officer of an upazila parishad for executing all decisions taken by the upazila parishad and ensuring financial disciplines of the funds of upazila parishad	- Mostly concerned about land acquisition and compensation; - Concerned about the Pollution due to project activity - High expectation on getting employment opportunity for the local people and development activity in the area	Medium	- Local Administration need to work out a mechanism for cooperation to avoid loss to the property of villagers; - They need to play an effective role in grievance redress mechanism established by BIWTA.	Medium	Moderate

1.6 DESCRIPTION OF INFORMATION DISCLOSURE METHOD

As a standard practice, the Project materials (ESMP, SEP etc.) released for disclosure are accompanied by making available the registers of comments and suggestions from the public that are subsequently documented by the PIU in a formal manner. PIU will continue applying the similar approach to disclosure for any additional E&S appraisal materials that will be prepared as part of the project development.

The ESMP and SEP in Bangla and English languages will be made available for public in accordance with the World Bank and standard international requirements. The SEP will be released in the public domain simultaneously with the ESMP reports and will be available for stakeholder review.

Distribution of the disclosure materials will also be done by making them available online, with hardcopies at PIU and field offices. This will allow stakeholders to obtain information about the planned development and to initiate their involvement in the public consultation process. The website will be equipped with an on-line feedback feature that will enable readers to leave their comments in relation to the disclosed materials.

The SEP will remain in the public domain for the entire project life cycle. It is a live document and will be updated on a regular basis as the project progresses through its various phases, in order to ensure timely identification of any new stakeholders and interested parties and their involvement in the process of collaboration with the project. The methods of engagement will also be revised periodically to maintain their effectiveness and relevance to the project’s evolving environment.

The outline presented in the table below summarizes the main stakeholders of the project, types of information to be shared with stakeholder groups, as well as specific means of communication and methods of notification. **Table 1.6** below provides a description of recommended stakeholder engagement and disclosure methods to be implemented during stakeholder engagement process.

Table 1.6: Stakeholder Engagement and Disclosure Methods

Stakeholder Group	Project Information Shared	Means of communication/ disclosure
Communities directly affected and benefited by project interventions	– ESIA, ESMP, SEP, LMP, RAP; – Public Grievance Procedure; – Regular updates on Project development; – And any other documents prepared during construction stage	– Online notices. – Electronic publications (in Bangla and English languages) and press releases on the Project website. – Dissemination of hard copies (in Bangla and English languages) at designated public locations. – Press releases in the local media. – Consultation meetings. – Information leaflets and brochures (in Bangla and English languages). – Separate focus group meetings with vulnerable groups, as appropriate.
Non-governmental and community-based organizations	– ESMP, RAP, SEP; – Public Grievance Procedure; – Regular updates on Project development.	– Public notices (in Bangla and English languages). – Electronic publications and press releases on the project website. – Dissemination of hard copies at designated public locations. – Press releases in the local media (in Bangla and English languages). – Consultation meetings. – Information leaflets and brochures (in Bangla and English languages)
Government Ministries/ authorities and agencies	– ESMP, RAP, SEP; – Regular updates on Project development; – Additional types of Project’s information if required for the purposes of regulation and permitting.	– Dissemination of hard copies of the ESMP, RAP and SEP at PIU offices – Project status reports. – Meetings and round tables.
Related businesses and enterprises	– SEP; LMP, Public Grievance Procedure; – Updates on Project development and tender/ procurement announcements.	– Electronic publications and press releases on the Project website. – Information leaflets and brochures. – Procurement notifications.
Project Employees including Labor Force	– SEP, LMP;	– Staff handbook.

Stakeholder Group	Project Information Shared	Means of communication/ disclosure
	- Employee Grievance Procedure including GRM for the Labor Force; - Updates on Project development.	- Email updates covering the Project staff and personnel. - Regular meetings with the staff. - Posts on information boards in the offices and on site. - Reports, leaflets.

1.7 PLANNED STAKEHOLDER ENGAGEMENT STRATEGY

The primary objective of these engagement activities is to allow for the stakeholders to interact with the project and contribute towards the project planning in an effective and culturally appropriate manner. While the **Table 1.7** below identifies the key proposed engagement activities, in keeping with the present understanding, it is acknowledged that the engagement plan is a live document. These engagement activities proposed with their method of engagement and their frequency and location will be updated as required, based on the monitoring process and feedback of the stakeholders; through the life of the project. Furthermore, the following table and engagement plan will not limit the project from interacting with the stakeholders when required.

Table 1.7: Stakeholder Engagement Strategy

Target stakeholders	Topic(s) of engagement	Method(s) used	Location/frequency	Responsibilities
Stage 1: Project preparation (Project design, Scoping, ESMP/RAP/SEP Disclosure)				
Project Affected People - People residing in the project area - Vulnerable households	- ESMP, ESIA, RAP, SEP - Project scope, rationale and Project E&S principles - Grievance mechanism process	- Public meetings, separate meetings for women and the vulnerable group - Face-to-face meetings - Mass/social media communication (if needed) - Disclosure of written information: brochures, posters, flyers, website Information boards or desks - Grievance mechanism - Local newspaper	- Quarterly meetings at project sites and as various components are executed and put to operation - Continuous communication through mass/social media and routine interactions	- BRWTP (PIU) - RAP Implementin g NGO - Construction Supervision Consultants (CSC)
Other Interested Parties (External) NGOS working in the affected community in micro finance and GBV sectors	- ESMP, ESIA, RAP, LMP, SEP disclosures - Project scope, rationale and E&S principles - Grievance mechanism process	- Face-to-face meetings - Joint public/community meetings with PAPs	- Quarterly meetings with affected communities - Disclosure meetings in local and national levels	- BRWTP (PIU) - RAP Implementin g NGO
Other Interested Parties (Internal) - Press and media, - Local NGOs, - Different Government Departments having link with project implementatio n namely District Administratio n District Police, Municipal, DoE etc.	- ESMP, ESIA, RAP, LMP, SEP disclosures - Project scope, rationale and E&S principles - Grievance mechanism process	- Public meetings, trainings/ workshops (separate meetings specifically for women and vulnerable people if needed) - Mass/social media communication - Disclosure of written information: Brochures, posters, flyers, website - Information boards - Grievance mechanism	- Project launch meetings with relevant stakeholders - Meetings in affected locations/ communities if needed; - Communication through mass/social media (if needed); - Information desks with brochures/poste rs in affected	- BRWTP (PIU) - RAP Implementin g NGO, - Administratio n District Police, DoE etc.

Target stakeholders	Topic(s) of engagement	Method(s) used	Location/frequency	Responsibilities
General public, jobseekers etc.		Notice board for employment recruitment	villages (continuous)	
Other Interested Parties (External) - Other Government Departments from which permissions/clearances are required; - Businessmen, Contractors and suppliers	- Legal compliance issues - Project information scope and rationale and E&S principles - Coordination activities - Grievance mechanism process - ESMP/ESIA/RAP/S EP disclosures	- Face-to-face meetings - Invitations to public/community meetings - Submission of required reports	- Disclosure meetings - Reports as required	- BRWTP (PIU) - RAP Implementing NGO - Administration District Police, DoE etc.
Other Interested Parties (Internal) - Supervision Consultants; - contractors, sub-contractors, - Service providers, suppliers, and their workers/labor force	- Project information: scope and rationale and E&S principles - Training on ESMP, LMP, SEP, OHS requirements and other management plans - Grievance mechanism process - E&S requirements - Feedback on consultant/contractor reports	- Face-to-face meetings - Trainings/workshops - Invitations to public/community meetings	If needed	- BRWTP (PIU) - RAP Implementing NGO
STAGE 2: Construction Phase				
Project Affected People including Vulnerable group	- ESMP, RAP, SEP, LMP - Grievance mechanism, Health and safety impacts (EMF, community H&S, community concerns) - Employment opportunities - Project status	- Public meetings, open houses, trainings/workshops - Separate meetings if needed for women and vulnerable group - Individual outreach to PAPs if needed - Disclosure of written information: brochures, posters, flyers, website Information boards; - Notice board(s) at construction sites - Grievance mechanism - Local monthly newsletter	- Quarterly meetings during construction phase - Communication through mass/social media if needed - Notice boards updated weekly - Routine interactions - Brochures in local offices	- BRWTP (PIU) - RAP Implementing NGO
Other Interested Parties (External)	- Project scope, rationale and E&S principles - Grievance mechanism - Project status	- Face-to-face meetings - Joint public/community meetings with PAPs	If needed (quarterly during construction phase)	- BRWTP (PIU) - RAP Implementing NGO
Other Interested Parties (External) - Press and media - Various Government Departments	Project information - scope and rationale and E&S principles, SEP, LMP, Project status	- Public meetings, open houses, trainings/workshops - Disclosure of written information:	Same as for PAPs/ at regular intervals throughout the project period to educate and raise awareness	- BRWTP (PIU) - RAP Implementing NGO

Target stakeholders	Topic(s) of engagement	Method(s) used	Location/frequency	Responsibilities
General public, jobseekers	- Health and safety impacts - Employment opportunities - Environmental concerns - GBV related consultation, Grievance mechanism process	brochures, posters, flyers, website, Information boards Notice board(s) at construction sites - Grievance mechanism - GBV related issues would be handled and awareness on the issue including change of mind on the matter by the society at large would be addressed by implementing agencies including, NGOs specifically working on GBV matter, local leadership, Religious leaders, and village elders including women representatives, Headmasters of the local schools and Madrassas.	amongst the population about the pitfalls of GBV and making them capable of arresting GBV in respective community.	
Other Interested Parties (Internal) - Supervision Consultants; - Local NGOs, - Contractor, sub-contractors, service providers, suppliers and their workers/labor force	- Project information: scope and rationale and E&S principles - Training on ESMP, LMP, SEP requirements and other sub-management plans - Worker grievance mechanism	- Face-to-face meetings - Trainings/workshops - Invitations to public/community meetings	Monthly, if needed	- BRWTP (PIU) - RAP Implementing NGO
STAGE 3: Operation and maintenance				
Project Affected People including vulnerable group	- Satisfaction with engagement activities and GRM - Grievance mechanism process	- Outreach to individual PAPs - BIWTA website - Grievance mechanism	- Outreach if needed - Meetings with affected people and villages (if needed/requested)	- BRWTP (PIU) - RAP Implementing NGO
Other Interested Parties (External) - Press and media, NGOs linked with on GBV issue, - Various Government Departments, - General public, etc.	- Grievance mechanism process - Issues of concern - Status and compliance reports	- Grievance mechanism - BIWTA websites - Face-to-face meetings - Submission of reports as required	If needed	- BRWTP (PIU) - RAP Implementing NGO

1.8 GRIEVANCE REDRESS MECHANISM (GRM)

The purpose of the GRM is to record and address any complaint that may arise during the life cycle of the project period effectively and efficiently. Two-phased approach GRM has been proposed in this project; The Phase-1 GRM will be established to mitigate resettlement compensation related impacts of the project, a grievance redress mechanism will be established to address social and environmental issues throughout the project period. The Phase -2 GRM is for the remaining issues may encounter during project implementation including procurement, social conflict, gender-based violence, sexual exploitation and abuse, etc. Three-tier Grievance Redress Committees (GRCs) will be established in the project through gazette notifications from the Ministry of Shipping. Grievance Redress Mechanism (GRM) is a valuable tool which will allow affected people to voice concerns regarding environmental and social impacts for the project activities. Committees (site level, port level and PIU level) for phase -1 GRM will be assigned to handle the GRM to be produced under Phase-2. Apart from these two phases GRM, another GRM has been proposed for the laborers to be deployed by the contractor/sub-contractor for the project.

The fundamental objective of GRM will be to resolve any project-related grievances locally, in consultation with the aggrieved party to facilitate smooth implementation of the social and environmental action plans. Another important objective is to democratize the development process at the local level and to establish accountability to the affected people.

The procedures will however not a person's right to go to the courts of law pre-empt. BIWTA would ensure that grievance redress procedures are in place and would monitor those procedures to ensure that grievances are handled properly. The BIWTA office will establish a procedure to answer project related queries and address complaints, disputes, and grievances about any aspect of the components, including disagreements regarding the assessment and mitigation of environmental and social impacts.

Generally, the grievance redress committees (GRC) are of two types (i) formal courts of appeal and (ii) a locally constitutes GRC for dispute resolution. The second may not totally avoid but may reduce the problem significantly. The Laborer GRM will hear and resolve complaints of the workers regarding employment, supply of personal protective equipment, payment of salary, gender-based violence risks, etc.

1.8.1 Grievance Redress Committee (GRC)

The proposed GRM will be supported by establishment of Grievance Redress Committees which are expected to be effective in resolving grievances related to compensation and relocation aspects. If aggrieved, it is expected that affected people will first approach the local grievance mechanism before taking the issue to another forum. All affected persons will have full and free access to GRCs.

The Grievance Redress Committee will be established at: site level, port level and project level to give room for grievances to be fairly reviewed and resolved. Site level and project level GRCs will be established through office order of BIWTA and port level GRC will be established through gazette notification from the ministry of shipping (MOS).

The PAPs can also call upon the support of the implementing NGO (INGO) engaged to implement the RAP to assist them in presenting their grievances or queries to the GRC. Other than disputes relating to ownership right under the court of law, the GRC will review grievances involving all resettlement assistance, relocation and other support.

1.8.2 Structure of the GRM

A three-tier bottom-up Grievance Redress Committee (GRC) system will be established in this project. First, there will be GRC at the site level; second, GRC at the port level; and third, GRC at the project level to give room for grievances to be

received and fairly reviewed. The GRCs at all three tiers will be responsible to deal with Phase-1 and Phase-2 GRMs. At each level, the GRC will be composed of 3-5 members, consisting of the followings.

A. Structure of the Site Level GRC

A five-member port level GRC has been proposed to review grievances consisting of the followings:

Table 1.8: Structure of the Site Level GRC

Sl. No.	Designation	Representative	Number (in person)	Remarks
1.	Convener	BIWTA representative (not below the rank of Assistant Director/Assistant Engineer or equivalent)	1	Total number of members=5
2.	Member	Representative, Local Govt. (Union Council/Paurashava/City Corporation)	1	
3.	Member	2 Representatives of PAPs (at least 1 being a woman)	2	
4.	Member-Secretary	Representative, Safeguards Implementation NGO	1	

B. Structure of the Port Level GRC

A five-member port level GRC has been proposed to review grievances to be referred by site level GRC. This GRC will be formed by BIWTA through Office Order. The members of port level GRC are as under-

Table 1.9: Structure of the Port Level GRC

Sl. No.	Designation	Representative	Number (in person)	Remarks
1.	Convener	BIWTA representative (not below the rank of Executive Engineer or equivalent)	1	Total number of members=5
2.	Member	Representative from Local Govt. (Union Council/Paurashava/City Corporation)	1	
3.	Member	BIWTA representative (not below the rank of Assistant Director/ Assistant Engineer or equivalent)	1	
4.	Member	Representative, from Civil society	1	
5.	Member-Secretary	Representative, Safeguards Implementation NGO	1	

C. Structure of the Project (PIU) Level GRC

A three-member GRC has been proposed in the Project level for review and finalization of decision of the grievances to be referred from port level GRC. This committee will be formed by office Order of the BIWTA.

Table 1.10: Structure of the Project (PIU) Level GRC

Sl. No.	Designation	Representative	Number (in person)	Remarks
1.	Convener	Deputy Project Director, BRWTP-1	1	Total number of members=3
2.	Member	Head of BIWTA E&S Cell, BRWTP-1, PIU	1	

Sl. No.	Designation	Representative	Number (in person)	Remarks
3.	Member-Secretary	Communications/GRM Expert, BRWTP-1 Project, PIU	1	

1.8.3 Phase Two of GRM

The second phase GRM will be functional during construction phase of the project and operationalized simultaneously with the First phase GRM. The Second phase GRM will deal with the social and environmental issues, procurement, quality of work, gender-based violence, etc. Such grievances can be produced before the GRC by individual or group of people anonymous or un-anonymous. Affected people, local community, beneficiary groups, etc. can submit their complaints/grievance/observation/ recommendation to the grievance redress committee of the second phase GRM. Grievance Redress Committees (GRCs) of the first phase GRM will act as the GRC of the second phase GRM. Only Gender based violence (GBV) issues will be monitored by the Project level GRC. The GBV related grievances will be dealt with by the Contractor's GRM and directly report to PIU and therefore, site level and Port level GRM will not deal with it.

Social NGO and BRWTP-1 field level officials will explain the project interventions including timeline, quality assurance mechanism, etc. to the aggrieved people. If, he/she is not satisfied, he/she can submit their complaints through letter, email and web-application to the site level GRC. The contractor will display detailed Project information in the open place at the site. The second phase GRM will be functional as under-

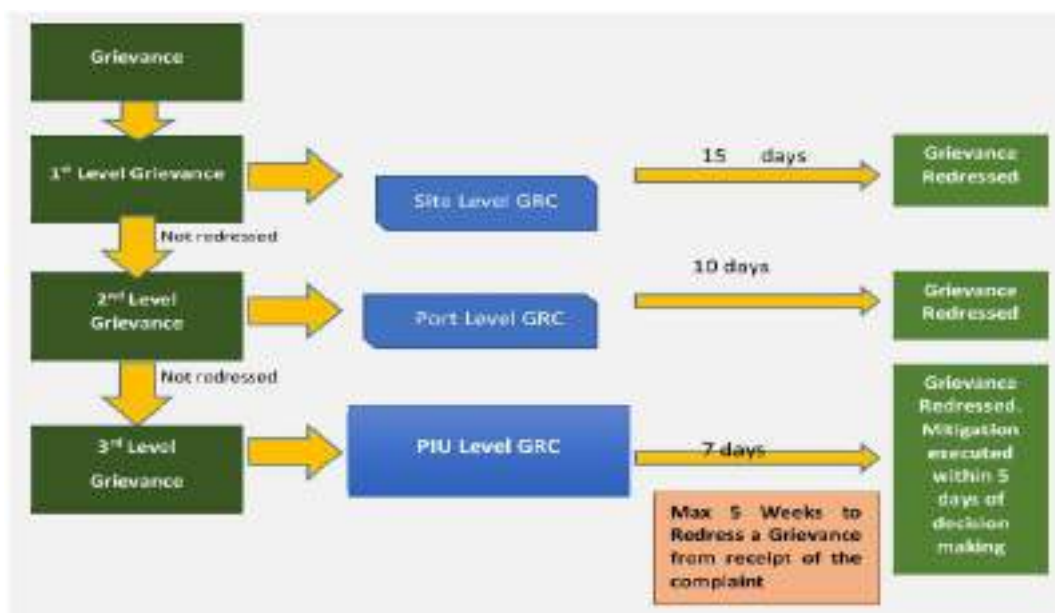


Figure 1.1: GRM for Phase 2

1.8.3.1 Grievance Mechanism for the Gender-based Violence

In case of minor GBV (eve teasing, bad touching, etc.) the complaints can be resolved under the Contractor's GRM but in case of major GBV (Rape, Acid throw, etc.) the issue will be brought to OCC/Police Station. A Service Provider (Community Based Organization) will be recruited by the PIU under a particular TOR to facilitate the GBV victim. In case of both minor and major GBV, the Service Provider will provide support to Victim to get justice (compensation, treatment, legal support, etc.) as per laws. The PIU will assign a grievance focal person (Female) at PIU level with whom the victim can communicate for further advices.



Experience from the phase one of GRM implemented to support social and environment safeguards will be used to extend the protocol and inform the design of project wide GRM. The project PIU will need to identify groups of users that are likely to use the GRM and assess the resources—human, financial, and technological—that are available (and required) for the GRM to function effectively while establishing the protocol to support all project components and implementation. PIU will need to develop standard operating procedures and flow charts to detail how the grievance redress process will unfold within the project’s operating structures and how it will be monitored and reported on. More specifically:

- Form a site-specific Contractor's GRM to deal with Workers' Complaints/grievance;
- A grievance committee with specific mechanism will be developed by the Contractor and get approval from the PIU;
- Assign a dedicated GRM officer at the PIU (e.g., drafting operating procedures, guidelines and manual, and stand-alone information for GRM staff and users); and assign grievance redress responsibilities and train staff at the local level to handle grievances;
- Raise awareness of the availability of the GRM through project-related events and by posting information about the GRM in public locations/ project sites (e.g., via project boards);
- The communications strategy should aim to reach out to poor and marginalized groups and communication materials should be translated into local language;
- Accept grievances through a variety of locally-appropriate channels (e.g., in-person, phone – set up toll free number, email);
- Register all grievances (e.g., ensure that all complaints lodged through local authorities are logged and tracked, and that data on resolutions is made public);
- Follow a clear and transparent procedure of complaint investigation (e.g., field visits, inspection of contractors and/or local project implementation teams, discussion with relevant service providers, etc.);
- Take a remedial action within a specified amount of days;
- Monitor and evaluate grievance-related data.

1.9 IMPLEMENTATION OF SEP AND BUDGET

1.9.1 SEP Implementation Arrangement

The management, coordination and implementation of the SEP and its integral tasks will be the responsibility of dedicated team members within PIU, its Port and Terminal offices, Contractors and local sub-contractors. The Project will ensure necessary logistics and budget to implement the SEP. The contact information of BIWTA is given below:

Table 1.11: Contact Information

Description	Contact Details
Company:	BIWTA
To:	Project Director, BRWTP-1, BSC Bhaban, Dhaka
Address:	
E-mail:	
Website:	
Telephone:	

Table 1.12: Role and Responsibilities for SEP Implementation

Actor/Stakeholder/ Responsible Person	Responsibilities
RAP Implementing NGO (Social NGO)	- Overall planning and implementation of the SEP; - Lead activities on stakeholders' engagement; - Management and resolution of grievances; - Guide/coordinate/supervise the contractors for activities related to the SEP; - Monitoring and reporting on SEP to BRWTP-1 (PIU); - Take lead in carrying out the beneficiary satisfaction survey.
BRWTP-1 Officials	- Visit project area for M&E (at least quarterly); - Report to World Bank on Quarterly Basis;
Construction Supervision Consultants (CSC)	- Supervision/monitoring of Contractors on SEP and GRM
External Monitoring Agency for RAP Implementation	- Monitoring and Evaluation of INGO's performance on RAP, SEP and GRM implementation;
Contractor(s)/ sub- contractors	- Report/inform BRWTP-1 on issues related to the implementation of the SEP / engagement with the stakeholders; - Resolve and convey management/resolution of grievance cases to the labor related grievance cases; - Prepare, disclose and implement the contractor's code of conduct, Labor Management Plan, etc. and report to BRWTP-1; - Collaborate/inform the local communities and other local level stakeholders on E&S monitoring.
Other interested stakeholders (external/ regulatory agencies)	- Participate in the implementation of SEP activities; - Monitor/ensure project's compliance with the laws of Bangladesh; - Engage with the project's stakeholders on E&S issues.

1.9.2 Budget for SEP Implementation

A tentative budget for implementing this SEP for the entire duration of the project is included below. The budget includes all the activities pertaining the project's stakeholder engagement plan and comprises of a range of activities of the project. This budget will be annually reviewed by BWITA PIU and if necessary, will be revised and adjusted. The budget is provided in **Table 1.13** below (all figures are in BDT).

Table 1.13: SEP Implementation Budget

Sl. No.	Stakeholder Engagement Activities	Quantity	Unit Cost (BDT)	Times/ Month	Total Cost (BDT)
1.	Staff/ Consultant Salaries	-	-	-	Paid from Project Consulting Service Budget
2.	Training on Stakeholder Engagement and GRC issues	2 times	1,00,000	-	2,00,000
3.	Information Desk Officer	1	40,000	12	4,80,000
4.	Stakeholder/Community/ Sensitization meeting in Project areas	Lump Sum	-	-	1,00,000
5.	Meeting with Municipalities/ Upazila Administration and Union Parishad	3 meetings per Landing Station (LS)/ year for 1 years, 13 LS = 39 meeting	10,000	-	3,90,000
6.	Meeting with District Administration	2 meetings/year for 1 years for 13 Districts = 26 meeting	10,000	-	2,60,000
7.	Travel Expenses for BRWTP-1 Officials	Lump sum	1,00,000/ yr	1 years	1,00,000
8.	Communication Materials (Poster, Brochure, flier, billboards, website)	Lump Sum	-	-	2,00,000
9.	GRM Guidebook/ Manual	Lump Sum	-	-	2,00,000
10.	Complaints/Suggestions Box (each LS -2 and PIU-1)	27	10,000	-	2,70,000
11.	GRM MIS Database	Lump sum	-	-	2,00,000
12.	Honorarium for committees	Lump sum	-	-	5,00,000
Sub-Total					29,00,000
Contingency (10%)					2,90,000
Grand Total					31,90,000

1.10 MONITORING AND REPORTING

Regular monitoring of project progress will be built into the design, in the form of appropriate indicators, targets, information systems, and review mechanisms. Project progress will be assessed using monitoring data, and course corrections will be made as necessary. BRWTP-1 officials will undertake regular supervision visits to project sites for supervision and monitoring, at least quarterly. Innovative actions under the project would include their own impact evaluation.

The officer designated for will be responsible for the monitoring and reporting of this SEP. He/she will prepare periodic monitoring report as required (monthly, quarterly, six-monthly, annual, etc.) by the PIU. In case consolidated report on E&S management is prepared, he/she will ensure that specific sections/chapters on the SEP implementation are entered in such reports.

Monitoring and reporting will include involving Project Affected Parties, internal and external stakeholders, interested group and the vulnerable in monitoring mitigation measures that will be agreed on the Contract Clauses to satisfy stakeholder concerns; thus, promoting transparency. The Project will establish a monitoring system that is participatory,

which will utilize indicators that are sensible to concerned stakeholders. Furthermore, the project will involve affected parties by gathering their observations to triangulate scientific findings and involve them in participatory discussions of external and monitoring & evaluation missions.

The monitoring report will include clear and specific indicators both as regard the engagement with stakeholders and also the project's grievance redress management. The communication officer will work on a reporting matrix in this regard.

Table 1.14: Monitoring Requirements

Key Elements	Timeframe	Methods	Responsibilities
Stakeholders' access to project information and consultations	Periodic (during project preparation and maintained throughout project implementation)	Interviews, observations, survey	BRWTP-1 PIU together with external monitor
Project affected people (residence and shops) to be displaced due to project activities, their entitlements, relocation & livelihood restoration	Periodic (during project implementation)	Interviews, observations, survey	BRWTP-1 PIU together with external monitor
Acceptability and appropriateness of consultation and engagement approaches	Periodic (during project implementation)	Interviews, observations, survey, score-card as relevant	BRWTP-1 PIU together with external monitor
Community Properties/ Offices/Institutions to be displaced by the project	Periodic (during project implementation)	Interviews, observations, survey, score-card as relevant	BRWTP-1 PIU together with external monitor
Public awareness of GRM channels and their reliability	Periodic (during project implementation)	Spot checks, interviews, observations	BRWTP-1 PIU together with external monitor
Accessibility and readability of public information dissemination materials	Periodic (during project implementation)	Spot checks, interviews, desk-review	BRWTP-1 PIU together with external monitor
Tones in social media and broader public perceptions (including NGOs)	Periodic (during project implementation)	Social media monitoring, interviews, observations	BRWTP-1 PIU together with external monitor
Rate of grievances and complaints (reported and unreported)	Periodic (during project implementation)	Desk review, interviews, survey	BRWTP-1 PIU together with external monitor

1.10.1 Reporting Back to Stakeholders

The PIU will ensure regular/periodic reporting back and information sharing with the PAPs and as well as the stakeholders' groups. This 'reporting back' measures vis-a-vis the PAPs should be always carried through face-to-face meeting or direct interactions, for the other stakeholders' group. Other pertinent media, such as website, social media, press briefing, may also be used.

Monthly summaries and internal reports on public grievances, enquiries and related incidents, together with the status of implementation of associated corrective/preventative actions will be collated by responsible staff and referred to the senior management of the project. The monthly summaries will provide a mechanism for assessing both the number and the nature of complaints and requests for information, along with the Project's ability to address those in a timely and effective manner.

The Project will arrange necessary training associated with the implementation of this SEP that will be provided to the members of staff who, due to their professional duties, may be involved in interactions with the external public, as well as to the senior management. Specialized training will also be provided to the staff appointed to deal with community stakeholder grievances as per the Public Grievance Procedure. Project contractors will also receive necessary instructions for the Grievance Procedure and in relation to the main principles of community relations GRM in relation to the labor force working under them.

Information on public engagement activities undertaken by the Project during the year may be conveyed to the stakeholders in two possible ways:

- Publication of a standalone annual report on project's interaction with the stakeholders.
- A number of Key Performance Indicators (KPIs) will also be monitored by the project on a regular basis, including the following parameters:
 - Number of public hearings, consultation meetings and other public discussions/forums conducted within a reporting period (e.g. monthly, quarterly, or annually);
 - Frequency of public engagement activities;
 - Geographical coverage of public engagement activities – number of locations and settlements covered by the consultation process, including the settlements in remote areas within the Project Area of Influence (PAI);
 - Number of public grievances received within a reporting period (e.g. monthly, quarterly, or annually) and number of those resolved within the prescribed timeline;
 - Type of public grievances received;
 - Number of press materials published/broadcasted in the local, regional, and national media;
 - Amount of Project's charitable investments in the local communities in the Project Area of Influence.

The outcomes/feedback from these 'reporting back' measures will be compiled and shared/disclosed with the stakeholders' and general public through the use of proper media, such as BIWTA website, social media accounts, communication materials, etc.

1.10.2 Reporting to the World Bank

The project director with the support of social and environment specialist will share the progress and results of the stakeholder engagement activities to the World Bank quarterly and annually where Stakeholder related activities will be described broadly. These reports will also include detailed reports on the GRM effectiveness, including a list of grievances received, addressed and the pending ones.

Annexure 15

Participants List of Stakeholder Consultation



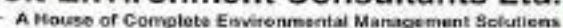
Name: Hanyu Pu

Index: 23-11-24

Parliament List of Formal Public Consultation

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Project Name: Consultancy Services for preparation of Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) of Landing Stations/Launch Chain (IRWTP-S&A) package of IRWTP-I.

Veronica Marmoreza

Date: 28-11-24

Participants List of Exempt Public Cancellations

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Project Name: Consultancy Services for preparation of Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) of Landing Suffers/Launch Glass (BRWTP-SGA) package of BRWTP-1.

Vincent Masip vincent.masip@univie.ac.at

Page 23 of 31

Participants: List of Formal Public Consultation

[illegible]

Project Name: Consultancy Services for preparation of Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) of Landing Stations/Launch Ghats (BRWTP-66A) package of BRWTP-I.

Vladimir Tchernomirski de la...

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Date: February 14, 1977

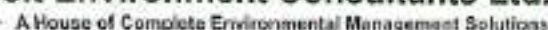
Participants List of Formal Public Consultation

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Abstract

www.aeccl-bd.org



Discussion

www.acl-hd.org



Adroit Environment Consultants Ltd.

A House of Complete Environmental Management Solutions

Project Name: Consultancy Services for preparation of Environmental and Social Impact Assessment (ESIA) and Remedial Action Plan (RAP) of Landing Station/Launch Jetty (BRWTP/SIA) (package of BRWTP).

Version: Detailed ERM.

Date: 11-10-2024

Participants List of Focused Public Consultation

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Project Name: Consultancy Services for preparation of Environmental and Social Impact Assessment (ESIA) and Remediation Action Plan (RAP) of Lunkar Wetland, Ghats (BRWTP-06A) under of BRWTP-1

Three

Date: 10-10-2024

Participants: List of Formal Public Consultation

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Project Name: Consultancy Services for preparation of Environmental and Social Impact Assessment (ESIA) and Remediation Action Plan (RAP) of Landing Stations/Launch Obols (BRWTP/56A) (package of BRWTP-1).

Young, Eliska

Nov 19 - 16 2019

Participants: List of Formal Public Consultation

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Adroit Environment Consultants Ltd.

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Project Name: Consultancy Services for preparation of Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) of Landing Stations/Launch Ghats (BRWTF-S6A) located at BRWTF-1

Viewing

Answer:

Participants List of Formal Public Consultation

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www.aacsb.edu



Project Name: Consultancy Services for preparation of Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) of Landing Stations/Launch Chais (BRWTP-S6A) (under of BRWTP-I)

Values:

Cluster:

Participants List of Formal Public Consultation

[illegible]

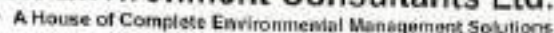
Project Name: Consultancy Services for preparation of Environmental and Social Impact Assessment (ESIA) and Remediation Action Plan (RAP) of Landing Stations/Launch Gluts (HRWTF-SSA) (package of HRWTF-1).

Vineyard: B. o. r. k. o. n. i. a. t.

Date: 17-10-2021

Participants List of Events Public Consultation

[illegible]



View page

Date: 17-10-2024

Participant List of Formal Public Consultation

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**Vermeulen**

Date: 12-10-2024

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Name	Occupation	Village	Contact No.	Signature
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Mr. Arvind Singh	Farmer	02 (02/01/20)	0292151010	Arvind Singh
Mr. Arvind Singh	Farmer	03 (02/01/20)	0292151010	Arvind Singh
Mr. Arvind Singh	Farmer	04 (02/01/20)	0292151010	Arvind Singh
Mr. Arvind Singh	Farmer	05 (02/01/20)	0292151010	Arvind Singh
Mr. Arvind Singh	Farmer	06 (02/01/20)	0292151010	Arvind Singh
Mr. Arvind Singh	Farmer	07 (02/01/20)	0292151010	Arvind Singh
Mr. Arvind Singh	Farmer	08 (02/01/20)	0292151010	Arvind Singh
Mr. Arvind Singh	Farmer	09 (02/01/20)	0292151010	Arvind Singh
Mr. Arvind Singh	Farmer	10 (02/01/20)	0292151010	Arvind Singh
Mr. Arvind Singh	Farmer	11 (02/01/20)	0292151010	Arvind Singh
Mr. Arvind Singh	Farmer	12 (02/01/20)	0292151010	Arvind Singh
Mr. Arvind Singh	Farmer	13 (02/01/20)	0292151010	Arvind Singh
Mr. Arvind Singh	Farmer	14 (02/01/20)	0292151010	Arvind Singh
Mr. Arvind Singh	Farmer	15 (02/01/20)	0292151010	Arvind Singh
Mr. Arvind Singh	Farmer	16 (02/01/20)	0292151010	Arvind Singh
Mr. Arvind Singh	Farmer	17 (02/01/20)	0292151010	Arvind Singh
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Project Name: Consultancy Services for preparation of Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) of Landing Station/Launch Quay (LRWTP-S&A) package of BRWTP-1.

Version: 1.0.0 - 2024-01-01

Date: 14-12-2024

Participants List of Formal Public Consultation

Name	Occupation	Village	Contact No.	Signature
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श्री. श्यामल (श्यामल)	श्यामल	श्यामल	017252584	(Signature)
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श्री. श्यामल (श्यामल)	श्यामल	श्यामल	01811254169	(Signature)
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श्री. श्यामल (श्यामल)	श्यामल	श्यामल	0130135340	(Signature)
श्री. श्यामल (श्यामल)	श्यामल	श्यामल	01544447219	(Signature)

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Project Name: Consultancy Services for preparation of Environmental and Social Impact Assessment (ESIA) and Remedial Action Plan (RAP) of Lindsay Solon/Lanark Ghats (UKWIP-593) package of SUT/13.1

Univariate

Date: 14.12.2024

Participants List of Formal Public Consultation

Name	Occupation	Village	Contact No.	Signature
(M) 21 42	233316	233316	01744522183	21 42
21 42	233316	233316	01314321103	21 42
21 42	233316	233316	01731268809	21 42
21 42	233316	233316	01821763427	21 42
21 42	233316	233316	01711986930	21 42
21 42	233316	233316	01679421835	21 42
21 42	233316	233316	01721067630	21 42
21 42	233316	233316	0179012652	21 42
21 42	233316	233316	0176075413	21 42
21 42	233316	233316	01309162785	21 42
21 42	233316	233316	01824470610	21 42
21 42	233316	233316	01822378301	21 42
21 42	233316	233316	0174438587	21 42
21 42	233316	233316	01743245553	21 42
21 42	233316	233316	0176217610	21 42
21 42	233316	233316	017227068	21 42
21 42	233316	233316	01702034648	21 42
21 42	233316	233316	01710509820	21 42
21 42	233316	233316	01718214769	21 42

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Project Name: Consultancy Services for preparation of Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) of Landing Stations/Launch Sites (BRWTP-56A) package of BRWTP-1.

Version:

Date:

Participants List of Formal Public Consultation

Name	Occupation	Village	Contact No.	Signature
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শ্রী: মোহাম্মদ	কৃষক	শ্রী: কিশোর	০১৮৩০৩৩৭১০১০৫৬৮৯০	
শ্রী: মোহাম্মদ	কৃষক	শ্রী: কিশোর	০১৮১৫০২৪০১০৫৬৮৯০	
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শ্রী: মোহাম্মদ	কৃষক	শ্রী: কিশোর	০১৭২৫৬৮৯০১০৫৬৮৯০	

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Adroit Environment Consultants Ltd.

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Project Name: Consultancy Services for preparation of Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) of Landing Stations/Launch Sites (BRWTP-56A) package of BRWTP-1.

Version:

Date:

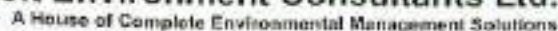
Participants List of Formal Public Consultation

Name	Occupation	Village	Contact No.	Signature
শ্রী: মোহাম্মদ	কৃষক	শ্রী: কিশোর	০১৬২৪৫২০০৭৬৮৯০	
শ্রী: মোহাম্মদ	কৃষক	শ্রী: কিশোর	০১৮৩৪১৪৬৭৫৬৮৯০১০৫৬৮৯০	
শ্রী: মোহাম্মদ	কৃষক	শ্রী: কিশোর	০১৭১৪৫৫২৪৬৮৯০১০৫৬৮৯০	
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শ্রী: মোহাম্মদ	কৃষক	শ্রী: কিশোর	০১৭৯০০৬৮৯০১০৫৬৮৯০	
শ্রী: মোহাম্মদ	কৃষক	শ্রী: কিশোর	০১৭২৪৫০২০৯০১০৫৬৮৯০	
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শ্রী: মোহাম্মদ	কৃষক	শ্রী: কিশোর	০১৬০৪৫৫৬৮৯০১০৫৬৮৯০	
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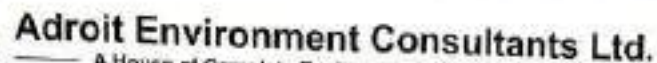
Visiting Medical Staff

Abstract

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Vignettes

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Significance

Discussion

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Environmental Management Consultants Ltd.
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Project Name: Consultancy Services for preparation of Environmental and Social Impact Assessment (ESIA) and Rehabilitation Action Plan (RAP) of Landing Station/Launch Canal (ILWLP-SAC) package of BEWTP-1.

Yamamoto

Results

Participants List of Formal Public Consultation

Participants List of Formal Public Consultation				
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श्री. अशोक	कृषि	नरसीपुर	01720504020	श्री. अशोक
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Project Name: Consultancy Services for preparation of Environmental and Social Impact Assessment (ESIA) and Remediated Action Plan (RAP) of Landing Stations/Launch Gloats (LHWP-SSA) package of LHWP-I.

$$v_{\text{max}} = \Delta \lambda_{\text{D}}/B_0 \approx 2.5 \text{ m/s}.$$

Keywords: *work, stress, coping, organizational commitment, organizational citizenship behavior*

Participants List of Survey Public Consultation

[illegible]

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Keywords: *Self-esteem, self-esteem threat, self-esteem threat sensitivity, self-esteem threat sensitivity scale, self-esteem threat sensitivity scale-2*

11476

Participants List of Former Public Canonization

[illegible]

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Verenigd Koninkrijk

Date: 6.11.2014

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(Name) [illegible]	[illegible]	"	01711147011	[Signature]
(Name) [illegible]	[illegible]	[illegible]	0292007860	[Signature]
(Name) [illegible]	[illegible]	[illegible]	0173916425	[Signature]

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Annexure 16

**Meeting minutes, participant list
and photographs of workshop**



Bangladesh Inland Water Transport Authority (BIWTA)
BIWTA Conference Room
Bangladesh Regional Waterway Transport Project 1 (BRWTP-1)
Level: 6, BIWTA Bhaban, 141-143 Motijheel C/A, Dhaka-1000, Bangladesh

Minutes of Meeting (MoM)

Date and Time: 03 August, 2025 (12.00 Hrs/GMT+6)
Venue: BIWTA Conference Room, Level:6, BIWTA Bhaban, 141-143 Motijheel C/A, Dhaka-1000, Bangladesh.
Name of the Assignment: **Preparation of Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) of Landing Stations/Launch Ghats (BRWTP-S6A) package of BRWTP-1, BIWTA**
Agenda: Workshop on Draft Final Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Report of Landing Stations/Launch Ghats (BRWTP-S6A) package of BRWTP-1, BIWTA

Synopsis

A workshop was arranged by Adroit Environment Consultants Ltd. (AECL) at the Conference Room of BIWTA office for sharing the Draft Final Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Report of Landing Stations/Launch Ghats (BRWTP-S6A) package of BRWTP-1, BIWTA.

- Welcome speech was given by **Md. Ayub Ali, Additional Chief Engineer and Project Director, BRWTP-1 Project, BIWTA.**
- **Commodore Arif Ahmed Mustafa, (G), NUP, ndc, afwc, psc, Chairman, BIWTA** was attended the workshop as the Chief Guest.
- **Capt. Md. Moazzem Hossain (S), Member (Finance)** presided over the workshop.
- Other **BIWTA Officials** and **AECL Consultants** were also present at the workshop.

Summary of Conversations

Opening discussion: Project Director of BRWTP-1, welcomed the participants. He informed the house that this workshop is arranged to discuss about the draft final report of ESIA and

RAP of Landing Stations/Launch Ghats (BRWTP-S6A) package of BRWTP-1. He also informed that a presentation on draft final report will be given by AECL on today's workshop as they have submitted the draft final report and after the discussion, they will submit the final ESIA and RAP report and we will send it to World Bank. Then he requested the Chairman of BIWTA to say his perspective about this BRWTP-S6A package.

Commodore Arif Ahmed Mustafa, (G), NUP, ndc, afwc, psc, Chairman of BIWTA thanked the BIWTA Officials and AECL Consultants for their cordial presence. He also mentioned that if the participants have any suggestions and comments regarding to this project, the consultant team can implement them in this study. Then, he requested the consultant team to start the program.

Presentation: Shanjana Haider, consultant of BRWTP- S6A start the presentation (project background, scope of the work, project location) and later assign it to Suchita Kha and Sabrina Islam Labonno, Assistant Consultant of AECL, to shared the detail findings from ESIA and RAP study.

Tea break: After finishing the presentation on draft final ESIA and RAP report, a tea break was arranged for the participants and the Chairman of BIWTA requested the participants to share their suggestions or comments regarding to this project.

Question & Answer session:

1. Md. Sajedur Rahman, Additional Chief Engineer of BIWTA, stated that the consultant team should include a recommendation in the ESIA report to upgrade the left-side road of the Alubazar Landing Station by LGED.

Answer: Shanjana Haider, Environmental Engineer of BRWTP-S6A package thanked Md. Shajadur Rahman for his important suggestions and ensured that they have noted it down and will include this information in the final reports.

2. Commodore Arif Ahmed Mustafa, Chairman of BIWTA, emphasized that dredging should be carried out and that the connecting road at the Alubazar Landing Station should be elevated sufficiently to prevent submergence during flooding.

Answer: The Project Director of the BRWTP-S6A package informed the Chairman of BIWTA that dredging work has been included in the contractor's scope of work. Subsequently, the Deputy Project Director (DPD) of BRWTP-1 informed the Chairman that the connecting road will be constructed above the highest flood level.

3. Commodore Arif Ahmed Mustafa, Chairman of BIWTA, inquired with the Project Director (PD) and Deputy Project Director (DPD) of BRWTP-S6A regarding the issues faced by the businessmen at the Bhairab Landing Station, as well as the current status of land acquisition and relocation at the site

Answer: The Project Director informed that an application regarding land acquisition and relocation has been submitted to the Deputy Commissioner's (DC) office, and Section 4 has already been implemented on the private land. He further stated that, if the acquisition process is carried out through the DC office, then the DC will be responsible for relocating the structures of the affected business owners. Additionally, the Deputy Project Director (DPD) noted that, if DC office provides the public land (Khas land) first, then the affected businesses in the private land can be relocated to structures built on the public land and contractors can quickly initiate the construction work.

4. Md. Sajedur Rahman, Additional Chief Engineer of BIWTA, recommended that the consultant team should include a literature review on the selection of the final location of the Moju Chowdhury Landing Station in the ESIA report. He also mentioned that near the Moju Chowdhury Landing Station there is a sluice gate, upstream of which aquaculture activities are carried out, leading to significant siltation at downstream. Accordingly, he advised the consultant team to analyze the siltation deposition pattern and conduct Focus Group Discussions (FGDs) with the aquaculture committee, and to incorporate the findings into the ESIA report.

Commodore Arif Ahmed Mustafa, Chairman of BIWTA asked, does there will be any bank protection in the Moju Chowdhury landing station. And which type of pilling will be implemented.

Answer: Shanjana Haider replied that, the design of the launch ghats has already been finalized. So, in our study we will keep the launch ghats design and location same and The Project Director and Deputy Project Director also added that, further noted that dredging at Moju Chowdhury Ghat is included in the project scope specifically to prevent siltation and ensure navigability.

The Project Director and Deputy Project Director responded that slope protection works will be carried out through the installation of concrete blocks. They further mentioned that, initially, the Moju Chowdhury site was assumed to be BIWTA-owned land; however, during the site visit, it was discovered to be privately owned. The land has been assessed as suitable for the project. Article 4 procedures have already been implemented, and data collection has been completed. Land acquisition will commence upon finalization of the budget.

5. Commodore Arif Ahmed Mustafa, Chairman of BIWTA asked about the width of the Ilisha LG connecting road from the Project Director of BRWTP-1, and advised the consultant team to collect and incorporate data from both sides of the road into the final report. He also suggested that appropriate compensation should be provided to the affected roadside shops and businessmen at Ilisha landing station, and the land should be cleared accordingly. Otherwise, the shops are likely to remain in place during the construction period, which may affect the project activities.

He further suggested to mention which locations currently have existing pontoons.

Answer: The Project Director of BRWTP-1 stated that the connecting road will have a width of 8 meters. In response, Shanjana Haider confirmed that in Ilisha Landing station data from both sides of the road have already been incorporated in the RAP report.

replied that in accordance with the Resettlement Action Plan (RAP) study, compensation will be provided to the affected persons, and the existing structures will be removed from the land like other BIWTA project.

Project director also replied that only the Bhairab Landing Station currently has an existing pontoon, which will be removed prior to the construction of the new pontoon.

6. Commodore Arif Ahmed Mustafa, Chairman of BIWTA suggested the project director to revise the work order (WO) for the contractors of the Landing Stations as the WO was prepared based on the previous location and the previous Tojumuddin location have existing pontoon.

Answer: The Project Director confirmed that the work orders have been revised in accordance with the newly proposed location and has already been provided to the contractors.

7. Commodore Arif Ahmed Mustafa, Chairman of BIWTA, inquired about current land acquisition status of the Daulatkhan Landing station. He also asked about the river embankment protection measures at the Daulatkhan Landing Station, including the specific location of the proposed river protection works and does this include under the contractor's scope of work.

Additionally, Md. Shajedur Rahman asked, whether the proposed design includes provisions for a cyclone shelter.

Answer: Project director stated that Article 4 has already been implemented and the land acquisition budget has been estimated. A joint signatory agreement has been made with the Deputy Commissioner's (DC) office. Once the final estimate is received from the DC office, the Project Director will proceed to deposit the required amount accordingly.

Engr. M M Islam, Project coordinator of BRWTP-1 mentioned that extensive double layer block slope protection has been planned near the Daulatkhan Landing Station and it is included in the contractors scope of work. DPD also added that, The protection works will be located along the river shore, outside the LAP area. The Project Director further stated that the infrastructure has been designed in such a way that the second floor of the terminal building can be utilized as a cyclone shelter during emergencies.

8. Commodore Arif Ahmed Mustafa, Chairman of BIWTA, suggested the Consultant team to revise the Tomuruddin and Laharhat Landing stations boundary in the final report.

He also suggested the PD of BRWTP-S6A after compensating the affected shop and business owner, the shops should be evicted in Laharhat Landing stations.

Answer: Shanjana Haider noted the point down and replied that it will be revised in the final report.

The Project Director informed that most of the shops in Laharhat are temporary structures. Following consultations with the Port Officer, he stated that the affected structures can be evicted upon providing appropriate compensation to the occupants.

9. Commodore Arif Ahmed Mustafa, Chairman of BIWTA recommended the Project director and Deputy Project director to show the final layout and connecting road design of Motirhat LG as it is not clear on the google earth.

Answer: The Project director and Deputy Project Director of BRWTP-S6A informed that the final layout and connecting road design of Motirhat LG has been provided by Ramboll, Denmark and DDC, Bangladesh JV. They also mentioned that they will present it to the Chairman next week.

10. Commodore Arif Ahmed Mustafa, Chairman of BIWTA, suggested that a detailed management plan for erosion-prone areas should be included, particularly for Monpura, Ilisha, Tojumuddin, and Daulatkhan, as these locations have shown signs of erosion according to the erosion–accretion map.

Engr. M. M. Islam, Project Coordinator of BRWTP-1, recommended that the consultant team should mention the basis of their study during the presentation. The Chairman of BIWTA agreed with this suggestion and asked how the erosion–accretion study was conducted does any secondary data used.

Answer: Shanjana Haider replied that a management plan for erosion-prone areas is suggested in ESMP section and the basis for the erosion–accretion study is 1 km and she also mentioned that satellite image in Arch GIS is used for erosion–accretion study.

11. Engr. M M Islam, Project coordinator of BRWTP-1 mentioned that according to the contract agreement, the BRWTP-S6A consultant team is obligated to conduct the ESIA and RAP at 15 locations. However, the final report has been prepared based on only 13 locations. Therefore, he recommended including a detailed explanation in the ESIA report clarifying the reasons for the exclusion of the remaining two locations from the final documentation.

Answer: Shanjana Haider thanked him for his valuable suggestion and informed that the explanation regarding the exclusion of the two locations has already been incorporated in the project background section of the ESIA and RAP reports.

12. Commodore Arif Ahmed Mustafa, Chairman of BIWTA, recommended that the Project Director of BRWTP-1 can incorporate solar panels as a backup support into the final design of the landing stations, as this is a WB funded project.

He also inquired whether the consultant team had detected salinity in the groundwater at any of the locations and whether any recommendations regarding the installation of drinking water filters had been included in the water management plan.

Answer: The Project Director of BRWTP-1 thanked him for his suggestion and Engr. M M Islam, Project coordinator of BRWTP-1 responded that solar panels will be incorporated into the project design.

Shanjana Haider added that no salinity was detected at any of the 13 locations assessed, and as part of the water management plan, the installation of drinking water filters has been recommended.

The Project Director further confirmed that the provision for filter installation has already been included within the project scope.

13. Md. Sajedur Rahman, Additional Chief Engineer of BIWTA, asked the consultant team does the suggested ESMP implementation cost is added in the BOQ.

Answer: The project director ensured that ESMP implementation cost has already included in the BOQ.

14. Commodore Arif Ahmed Mustafa, Chairman of BIWTA asked the PD of BRWTP-S6A, does this project have any tree plantation plan as part of biodiversity management plan.

Answer: Project Director replied that the 13 LGs package includes a tree plantation plan.

15. Commodore Arif Ahmed Mustafa, Chairman of BIWTA asked about the who will conducted this GRM

Answer: Project director replied that the GRM is proposed under the BRWTP-1 and the recruited contractors also have a post in the GRC.

16. Commodore Arif Ahmed Mustafa, Chairman of BIWTA suggested the Consultant team to add a budget to relocate the existing pontoon in the final budget, so that the problem they faced in the previous project do not continue is the present project.

Answer: Shanjana Haider informed that a budget for the relocation of the existing pontoon will be included in consultation with the PIU.

17. Commodore Arif Ahmed Mustafa, Chairman of BIWTA asked the consultant team how employment opportunities could be created for the local population.

He also asked the PD, does the project have any scope of local employment.

Answer: Shanjana Haider replied that during the construction phase, local residents will be engaged in various construction-related activities. In addition, one member from each affected household will receive skill development training from the social NGO.

Project Director confirmed that, local employment is included under the BRWTP-S6A project scope.

18. Commodore Arif Ahmed Mustafa, Chairman of BIWTA recommended the Project Director to review and finalize the project budget as the Budget for pontoon relocation should added, the Motirhat land has reduced to 30 decimal and Monpura pond is not affected anymore.

Answer: The Project Director responded that the budget will be finalized by the PIU in consultation with the BRWTP-S6A consultant team.

19. A.K.M. Arif Uddin, Director of port, BIWTA thanked for the brief presentation and suggested the consultant team to add SWOT analysis to easily relate the problem and the solution for the problem or a risk analysis including identified risk and mitigation measure in the ESIA report.

Answer: Shanjana Haider thanked him for his valuable suggestion and clarified that the SWOT analysis is a component of the feasibility study, which is not within the scope of work. She further explained that a detailed risk analysis has been conducted and included in the ESIA report. As the risk assessment for the 13 locations is extensive, it could not be presented in detail during the session due to time constraints. However, the ESIA report contains comprehensive risk analysis along with corresponding mitigation measures.

20. Md Mohiuddin Chowdhury, Director Planning of BIWTA suggested the Consultant team to suggest a time schedule in the RAP report.

Kazi Wakil Newaz, Director (Admin) of BIWTA, also suggested that the consultant team should recommend the construction of a cyclone shelter at the project site.

Answer: Shanjana Haider replied that a RAP implementation timeline will be proposed in the RAP report.

The Project Coordinator and Project Director acknowledged that it was a very important suggestion and informed that a feasibility study has already been conducted. Based on the study, both a cyclone shelter and an idle berthing shelter have been designed and will be implemented under the proposed BRWTP-2 project. Additionally, cyclone shelters are planned to be included in the landing stations of the Lower Meghna region.

21. Md. Saiful Islam, Director (Marine Safety), BIWTA, inquired about the dredging plan at Moju Chowdhury Ghat and whether the current location of Moju Chowdhury Ghat is feasible.

Answer: The Project Director responded that dredging activities are planned at Tomuruddin, Moju Chowdhury, Alubazar, and Boddarhat. The dredging works will be carried out by designated contractors.

22. A.K.M. Arif Uddin, Director of port, BIWTA, proposed designing the landing station as a Model (Standard) Landing Station.

Answer: Commodore Arif Ahmed Mustafa, Chairman of BIWTA, acknowledged the proposal as a very good idea. However, he noted that the design for the BRWTP-S6A has already been finalized. Therefore, he suggested considering the implementation of the Model (Standard) Landing Station design in future BIWTA projects.

23. Md. Mizanur Rahman, Environmental Consultant of BRWTP-1, suggested to add a ESMP implementation guideline for the responsible party during the operation phase of BRWTP-S6A. He also recommended that the ESMP be properly implemented during the operation phase to ensure effective environmental and social safeguards.

Commodore Arif Ahmed Mustafa, Chairman of BIWTA asked the Project director about the committee report and the progress about it and asked for the inception report.

Answer: Naeem Muhammed, Joint Director & Head of Safeguard cell of BRWTP-1 replied that the committee will be submitted the inception report within next week.

The Project Director requested the Chairman to consider forwarding the remaining components of the project under BRWTP-1 to the upcoming proposed BRWTP-2 initiative. In response, Commodore Arif Ahmed Mustafa, Chairman of BIWTA, stated that discussions on this matter are already underway, and if necessary, a consultant team will be engaged to carry out a detailed cost analysis.

Concluding Remarks: As there was no other issue, Commodore Arif Ahmed Mustafa, Chairman of BIWTA concluded the meeting thanking everybody for attending the workshop.

Attachment: Attendance Sheet – 4 pages

Morgan, M.E.T.A. Conference Board, Lowell, E. FENT & Hudson

0000-0001-9386-3528

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Project Name: Consultancy Services for preparation of Environmental and Social Impact Assessment (ESIA) and Remediation Action Plan (RAP) of Landing Station/Launch Quay (RRTWP-SSA) package of RRTWP-1

Values: BEWT-A, Cost Savings Index, Labeled: 6, BEWT-A, Rho=0.99

DOI: 10.1002/for

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Project Name: Consultancy Services for preparation of Environmental and Social Impact Assessment (ESIA) and Remediation Action Plan (RAP) of Landing Station/Launch Ghats (BRWTP-S&A) package of BRWTP-1.

Venue: BNTA Conference Room, Level: 6, BNTA Dhaka

Date: 03-08-2023

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Adroit Environment Consultants Ltd.

A House of Complete Environmental Management Solutions

Project Name: Consultancy Services for preparation of Environmental and Social Impact Assessment (ESIA) and Remediation Action Plan (RAP) of Landing Station/Launch Ghats (BRWTP-S&A) package of BRWTP-1.

Venue: BNTA Conference Room, Level: 6, BNTA Dhaka

Date: 03-08-2023

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Photographs of Workshop on Draft Final ESIA and RAP report



Annexure 17

Terminology

Terminology

- **Adverse impact:** An impact that is considered undesirable.
- **Affected Person (AP)-** includes any person, affected households (AHs), firms or private institutions who, on account of changes that result from the project will have their (i) standard of living adversely affected;(ii)right, title, or interest in any house, land (including residential, commercial, agricultural, forest, and/or grazing land), water resources, or any other moveable or fixed assets acquired, possessed, restricted, or otherwise adversely affected, in full or in part, permanently or temporarily; and/or (iii) business, occupation, place of work or residence, or habitat adversely affected, with physical or economic displacement.
- **Ambient air:** Surrounding air.
- **Assistance-** means support, rehabilitation and restoration measures extended in cash and/or kind over and above the compensation for lost assets.
- **Aquatic:** Growing or living in or near water.
- **Bangla:** Bengali language.
- **Baseline (or existing) conditions:** The 'baseline' essentially comprises the factual understanding and interpretation of existing environmental, social and health conditions of where the business activity is proposed. Understanding the baseline shall also include those trends present within it, and especially how changes could occur regardless of the presence of the project, i.e. the 'No-development Option'.
- **Beneficial impacts:** Impacts, which are considered to be desirable and useful.
- **Biological diversity:** The variety of life forms, the different plants, animals and microorganisms, genes they contain and the ecosystems they form. It is usually considered at three levels: genetic diversity, species diversity and ecological diversity.
- **Compensation-** means payment in cash or kind for an asset to be acquired or affected by a project at replacement cost at current market value.
- **Contractor:** The legal entity that is party to and performs a works contract, the other party to the contract being the "Procuring Entity."
- **Ecosystem:** A dynamic complex of plant, animal, fungal and microorganism communities and associated non-living environment interacting as an ecological unit.
- **Emission:** The total amount of solid, liquid or gaseous pollutant emitted into the atmosphere from a given source within a given time, as indicated, for e.g., in grams per cubic meter of gas or by a relative measure, upon discharge from the source.
- **Endangered species:** Species in danger of extinction and whose survival is unlikely if the existing conditions continue to operate. Included among those are species whose numbers have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to suffer from immediate danger of extinction.
- **Environmental effects:** The measurable changes, in the natural system of productivity and environmental quality, resulting from a development activity.
- **Environmental Impact:** An estimate or judgment of the significance and value of environmental effects for natural, socio-economic and human receptors.
- **Environment Management Plan (EMP):** A Plan to undertake an array of follow-up activities which provide for the sound environmental management of a project/ intervention so that adverse environmental impacts are minimized and mitigated; beneficial environmental effects are maximized; and sustainable development is ensured.
- **Environmental Management:** Managing the productive use of natural resources without reducing their productivity and quality.

- **Erosion:** Process in which wind and water removes materials from their original place; for instance, soil washed away from an agricultural field.
- **Evaluation:** The process of looking back at what has been really done or accomplished.
- **Fauna:** A collective term denoting the animals occurring in a particular region or period.
- **Flora:** All of the plants found in a given area.
- **Habitat:** The natural home or environment for a plant or animal.
- **Household:** A household is identified as a dwelling unit where one or more persons live and eat together with common cooking arrangement. Persons living in the same dwelling unit having separate cooking arrangements constitute separate household.
- **Important Environmental Component (IEC):** These are environmental components of biophysical or socio-economic importance to one or more interested parties. The use of important environmental components helps to focus the environmental assessment.
- **Land use:** Types include agriculture, horticulture, settlement, pisciculture and industries.
- **Literacy:** It denotes ability to write a letter in any language. Literacy status assessment is made for population 7 years and over.
- **Mitigation:** An action, which may prevent or minimize adverse impacts and enhance beneficial impacts.
- **Mouza:** Mouza is composed of several villages. It is officially called as Revenue Village with specific boundary at ground and Maps with plots and benchmarks.
- **Primary Structure:** These are the main buildings or constructions used for essential residential, commercial, or institutional purposes. Examples: Houses or apartments (used for living); Shops, offices, or warehouses (used for business)
- **Project Affected Person (PAP)-**all people enumerated during the census conducted in the project's impact corridor and identified as negatively affected by the project.
- **Public involvement/ Public consultation:** A range of techniques that can be used to inform, consult or interact with stakeholders affected / to be affected by a proposal.
- **Pucca-** Structure build with bricks concrete and solid tile roof
- **Relocation-** means displacement or physical moving of the DPs from the affected area to a new area/site and rebuilding homes, infrastructure, provision of assets, including productive land/employment and re- establishing income, livelihoods, living and social systems
- **Replacement cost-** refers to the value of assets to replace the loss at current market price, or its nearest equivalent, and is the amount of cash or kind needed to replace an asset in existing condition, without deduction of transaction costs or for any material salvaged.
- **Resettlement-** means mitigation of all the impacts associated with land acquisition including relocation and reconstruction of physical assets such as housing and restoration of income and livelihoods in post- relocation period.
- **Semi Pucca-** structure build with a combination of durable walls of brick or concrete and roof of thatch and leaves
- **Secondary Structure:** These are supporting constructions associated with the primary structure but not used as the main living or working space. (kitchen, latrine, boundary wall, hens house, cow shed, etc)
- **Significant impact-** refers to severity of impact (HHs losing more than 10% of productive assets, income below poverty line) with regard to loss of housing and productive assets of affected persons/families.
- **Stakeholders:** Those who may be potentially affected by a proposal, e.g. Local people, the proponent, government agencies, NGOs, donors and others, all parties who may be affected by the project or to take an interest in it.

- **Squatters-** refers to non-titled and includes households, business and common establishments on public land (including those acquired earlier). Under the project this includes land on part of the crest and slopes of flood control embankments, and similar areas of the drainage channels.
- **Structures-** refers to all buildings including primary and secondary structures including houses and ancillary buildings, commercial enterprises, living quarters, community facilities and infrastructures, shops, businesses, fences, and walls, tube wells latrines etc.
- **Taka:** Unit of Bangladeshi currency.
- **Terrestrial:** Living on land like forests, grasslands, deserts, shorelines, and wetlands.
- **Union:** Smallest unit of local self-government comprising several villages.
- **Tin-made-**structure made of corrugated iron sheets, considered flimsy and unstable.
- **Titled:** A titled owner, is the person or entity named as the legal owner of a property. This means they have the right to use, possess, and dispose of the property as they see fit, according to law
- **Thatched:** Structure built of mud, straw, bamboo and leaves and other non-durable materials.
- **Upazila:** Sub-district name. Upazila introduced in 1982.
- **Vendor:** Petty businessmen dealing in without structure fixed on ground. They deal in on the wheels or on the ground without any shed but do not move here and there. Vendor includes shoemaker, vegetable seller, fruit seller, etc. Mobile vendors are not included in this category.
- **Village:** Lowest rural geographic unit either equivalent to a mauza or part of a mauza.
- **Ward:** Smallest administrative urban geographic unit comprising of mahallas and having ward council institution.
- **Zila:** Bengali word of district.

Annexure 18

Comments Matrix on ESIA Report for 13 LSs

Comments Matrix on ESIA Report for 13 LSs (Volume I and II)

WB's Comments on Volume I- Executive Summary and ESIA Report (10/11/2025)

Sl. No.	WB's Comment	Reply from AECL
1.	The Labor Camp Management Plan must be followed by contractors across all project phases, including both pre-construction and construction, rather than being limited to the construction phase. Please mention this explicitly in the report.	Provided in Section 7.1.1 The Labor Camp Management Plan must be followed by contractors across all project phases. This plan is not limited only to the construction phase. Contractors are required to follow and implement the plan from the pre-construction phase, continuing through the construction period. It's a mandatory requirement for contractors across both pre-construction and construction stages of the project to ensure a safe, humane and compliant living environment for all labor camp workers. Contractor should include this issue in the Contractor's Environmental and Social Management Plan (C-ESMP)/CEAP. The plan must be approved prior to the commencement of construction activities. No construction work shall begin until formal approval of the Management Plan has been obtained.
2.	Mitigation measures for indicator species such as Hilsa and Dolphins should be treated separately in the management and monitoring plan from general aquatic species due to their ecological importance.	Mitigation Measures have been provided separately in the management and monitoring plan in Table 7.1 to Table 7.13. <u>Management Plan for Hilsa (During Construction Phase):</u> • Avoid construction activities during peak breeding and migration seasons of Hilsa to reduce disturbance on the species; • Implement sediment control measures (e.g., silt curtains, sediment traps) during in-water construction to prevent turbidity and siltation that can disrupt spawning habitats; • Limit piling, dredging and underwater noise generating activities by using noise reduction devices to minimize acoustic impacts on Hilsa movement; • Avoid use of harmful chemical substances, oils or discharge from construction equipment into water bodies to protect water quality and aquatic ecosystem integrity; • Avoid blocking fish migratory routes during construction; • Conduct awareness and training for contractors and workers on Hilsa protection importance and enforce zero tolerance for illegal fishing practices at project site; • As per our survey there was no breeding ground around the project area. If ever identified anywhere, artificial reefs or breeding grounds should be constructed to compensate for habitat loss.

Sl. No.	WB's Comment	Reply from AECL
		<u>Management Plan for Hilsha (During Operation Phase):</u> • Avoid strict control and monitoring of discharge, oil spill and waste disposal; • Maintain designated navigation routes in less sensitive habitat zones; • Limit vessel speed and restrict movement during Hilsha migration season; • Provide awareness training on sensitive fish habitats; • Prohibit illegal fishing and ensure enforcement of seasonal fishing ban periods. <u>Management Plan for Dolphin (During Construction Phase):</u> • Restrict noisy or high-impact construction and dredging activities during periods if dolphins are observed in that area; • Avoid construction activities during peak migration and breeding seasons for dolphins; • Use low-noise machinery and adopt noise-reducing technologies during underwater construction; • Prevent oil spills, chemical leaks, and waste discharge into the river by maintaining equipment properly; • Ensure strict prohibition of disposal of any kind of waste into water bodies; • Orient the vessel operators on how to make careful sightings and avoid the foraging areas of dolphins. <u>Management Plan for Dolphin (During Operation Phase):</u> • Maintain slow operational speed limits of vessels in dolphin-sensitive zones; • Install noise reduction measures for vessels; • Strict prohibition of waste disposal into the river; • Continuous visual monitoring during peak dolphin presence.

Comments (by RSA) on ESIA Report for 13 LSs (Volume I and II) (07/10/2025)

Section	Page No.	Comments by RSA	Reply from AECL
Executive Summary	-	Please ensure that the executive summary provides a clear, concise, and stand-alone summary of the full ESIA report, enabling decision-makers, stakeholders, and the public to quickly grasp the project's objectives, potential impacts, and proposed management measures. It is suggested that the executive summary follows the outline provided below: • Project Overview • Legal and Institutional Framework • Alternatives Analysis	Executive Summary has been updated following the provided outline.

Section	Page No.	Comments by RSA	Reply from AECL
		- Baseline Environmental and Social Conditions - Summary of key Environmental and Social risk and Impacts - Mitigation and Management Measures - Environmental and Social Management Plan (ESMP) - Stakeholder Engagement and Consultation - Conclusion and Recommendations	
	Page 17	An alternatives analysis was conducted, considering the 'No Project Scenario' and various site location options. The evaluation of alternative sites, summarized in Table 3, indicates that these new sites are feasible and sensible. Executive Summary should also include a concise overview of the impact identification and evaluation matrix presented in Table 6.5.	A concise overview of the impact identification and evaluation matrix has been included in executive summary.
Table 3.2	Page 54	Details of existing and proposed facilities at the landing stations and passenger river terminal. Please clarify if toilets are planned for the proposed facilities.	Yes, separate toilet for male and female are planned for proposed facilities.
Figure 3.12	Page 70	Boddarhat Landing Station. Legend indicates dredging area (61465m ²) but this is not pictured in the figure. Please revise.	Updated map has been provided.
Table 5.34	Page 147	Surface Water Quality. After this table, suggest a paragraph summarizing relevant findings is included.	Added
Section 5.4.6	Page 223	Dolphin. States that <i>Ganges river dolphins are occasionally seen at the Upper & amp; Lower Meghna River and its confluences 0.5-1.0 downstream of Bhairabbazar and to 2-3 km upstream of Hija, Laharhat, Bankerhat, Ilisha, Daulatkhan, Tozumuddin, Monpura, Alubazar, Moju Chowdhury, Motirhat, Boddarhat and Tomruddin landing stations. There will no any significant negative impact on Dolphin due to pre and post intervention of proposed project.</i> Two observations on this statement: The Atlas on Ganges River Dolphin and Irrawaddy Dolphin of Bangladesh (2022, Bangladesh Forest Dept./UNDP), page 41, indicate that <u>the immediate upstream from the Bhairab bridge on the Meghna River is an important dolphin habitat on the northeast region of Bangladesh.</u> During our visit in February 2019, we have spotted a good number of dolphins, within approximately 400 m on the north of Bhairab bridge. Please	- During our site visit from 1st– 27th March, 2025 we did not see any dolphins in Bhairab. If dolphins are sighted by the contractor during work activities, the below mentioned mitigation measures shall be followed. - Restrict noisy or high-impact construction and dredging activities during periods if dolphins are observed in that area; - Use low-noise machinery and adopt noise-reducing technologies during underwater construction; - Prevent oil spills, chemical leaks, and waste discharge into the river by maintaining equipment properly;

Section	Page No.	Comments by RSA	Reply from AECL
		clarify the occurrence of Ganges River dolphins in this area of the project. 2. Regarding the “no significant impact on Dolphin”, Table 6.5: Impact Identification and Evaluation Matrix, the Impact on Aquatic habitat (page 246) <i>Loss of fish biodiversity/ degradation to fish ecology and disturbances to foraging dolphin may occur to constructional waste</i>, under the impact scale, it is indicated as “high”. Please revise. Impacts on river dolphins arise from dredging and construction activities in the water, river traffic, not only waste. Also, this statement contradicts what is said in paragraph 5.4.6 that no significant impact on dolphins will be generated.	· Orient the vessel operators on how to make careful sightings and avoid the foraging areas of dolphins. 2. Revised.
Table 6.5	Page 246	Impact Identification and Evaluation Matrix. River traffic- Increased River traffic may create disturbance to fish habitats and also disruption of migratory routes for aquatic species, is under social impact, should be under environmental impact.	Revised
Section 6.6.2.9, 6.6.2.10 and 6.6.2.11	Page 265, 266	Impact due to Solid Waste, Impact due to Liquid waste, and Impact due to Hazardous waste. Please include mitigation measures, record keeping of all waste streams by type, amount, transportation and final certified disposal site, to avoid dumping waste in the open.	Included in the mitigation measures
Section 6.6.2.12	Page 267	Terrestrial Habitat. Include in mitigation measures restricted working schedule to avoid disturbance of terrestrial species.	Included in the mitigation measures
Section 6.6.2.13	Page 268	Aquatic habitat. Where stated Loss of fish biodiversity/ degradation to fish ecology, recommend including benthic communities.	Included
Section 6.6.2.18	Page 273	Impact due to River Traffic. Under mitigation measures, recommend including communication strategies to inform of planned construction activities.	Included in the mitigation measures
Section 6.6.2.19	Page 274	Occupational Health and Safety. Under mitigation measures: – recommend including that only workers who know how to swim carry out work near the river and wear life vests/ PEP. – provide a shaded area for breaks – include life and fire safety training	Included in the mitigation measures

Section	Page No.	Comments by RSA	Reply from AECL
Chapter 7	-	Environmental and Social Management Plan The recommendations provided above for Chapter 6, should also be reflected in Chapter 7 ESMP for each of the landing stations. Pre-construction phase. Recommend that for all activities in this phase indicate at least Frequency and Supervision of monitoring indicators. Construction phase: – Under <i>Impact due to construction of Jetty, gangway and placement of pontoon</i>, there are no monitoring indicators for any of the 13 landing stations. Please revise. – Under <i>Aquatic habitat</i>, include: i) visual monitoring of aquatic fauna prior to commencing works near/on water; ii) restricted working schedule to avoid disturbance (7am-7pm). – Impact on Noise & Vibration. Should include avoidance/mitigation measures for underwater noise and vibration. – Dredging activities are not included in the construction phase ESMP for each of the landing stations. Suggest specific measures for this activity are included. Guidance can be found in the WBG EHS Guidelines on Ports, Harbors and Terminals.	Included the recommended mitigation measures in Environmental and Social Management Plan (Table 7.1-Table 7.13) Pre-construction phase. Frequency and Supervision of monitoring indicators has been added. Construction phase: – Added – Added – Added – Dredging activities are not included in the construction phase ESMP for each of the landing stations because we have prepared location specific management plans. As dredging activities are not planned for all locations, the corresponding mitigation measures have been incorporated only for the specific locations where dredging will take place.
Section 7.2.2	Page 825	Please confirm if a Dredging Management Plan is considered among the management plans required within the Contractor's Environmental and Social Management Plan.	Dredging Management Plan is considered among the management plans required within the Contractor's Environmental and Social Management Plan.
Section 9.12	Page 870	Please ensure the GRM section describes uptake channels, including dedicated phone number, email, social media platforms, physical complaint boxes, and in-person submission points at GRCs. Additionally, include provisions for staff training and capacity building to manage grievances effectively, and implement public awareness programs (e.g., community meetings, posters, and leaflets) to ensure all PAPs and stakeholders are informed about how to access and use the GRM mechanism. This should be reflected in the RAP as well.	Added
Editorial	Page 262, Page 875	Mitigation measures for Dredging activities. States Dredging area should be checked every day prior to commencement of dredging work for the presence of aquatic habitat. All dredging activities should	Revised

Section	Page No.	Comments by RSA	Reply from AECL
		be stopped at sight of aquatic habitats. Should read aquatic fauna (or dolphins?) instead of aquatic habitat. Please revise. Same comment for page 875.	

Comments on ESIA Report of Volume – I in Workshop (03/08/2025)

Sl. No.	Comments from Workshop	Reply from AECL
1.	Md. Sajedur Rahman, Additional Chief Engineer of BIWTA, stated that the consultant team should include a recommendation in the ESIA report to upgrade the left-side road of the Alubazar Landing Station by LGED.	Addressed in Section 10.2
2.	Md. Sajedur Rahman, Additional Chief Engineer of BIWTA, recommended that the consultant team should include a literature review on the selection of the final location of the Moju Chowdhury Landing Station in the ESIA report. He also mentioned that near the Moju Chowdhury Landing Station there is a sluice gate, upstream of which aquaculture activities are carried out, leading to significant siltation at downstream. Accordingly, he advised the consultant team to analyze the siltation deposition pattern and conduct Focus Group Discussions (FGDs) with the aquaculture committee, and to incorporate the findings into the ESIA report.	Addressed in Section 6.6.2.7 and 6.6.2.13
3.	Commodore Arif Ahmed Mustafa, Chairman of BIWTA, suggested the Consultant team to revise the Tomuruddin and Laharhat Landing stations boundary in the final report.	Revised. Provided in Figure 4.5 and Figure 4.12
4.	Engr. M M Islam, Project coordinator of BRWTP-1 mentioned that according to the contract agreement, the BRWTP-S6A consultant team is obligated to conduct the ESIA and RAP at 15 locations. However, the final report has been prepared based on only 13 locations. Therefore, he recommended including a detailed explanation in the ESIA report clarifying the reasons for the exclusion of the remaining two locations from the final documentation.	Addressed in Executive summary, Section 1.1 and Section 3.1

PIU's Comments on ESIA Report of Volume – I (21/07/2025)

Sl. No.	Page No.	Chapter	Para	PIU's Comments	Reply from AECL
1	12	1.2		Name of the Bhairab Bazar Launch Ghat is not correct. Correct one is Bhairab Launch Ghat. Please make correction.	Revised
2	14	2.1	2 nd para, last line	Environment Clearance Certificate (ECC) has renewed up to June 2025, but here is mentioned up to June 2024. Please correct it.	Revised Section 2.1
3	24	-	-	WB safeguard Policy: Please write the project may require land acquisition and restriction of Govt. land use for construction of Landing stations/ launch ghats.	Revised in Table 2.2

Sl. No.	Page No.	Chapter	Para	PIU's Comments	Reply from AECL
4	29 and 30	3.2		Hizla launch ghat: No new access road to be constructed. Please correct it.	Revised in Table 3.2
				Ilisha: No parking yard and no new access road to be constructed. Please correct it.	Revised in Table 3.2
				Moju Choudhury: No new access road to be constructed. Please correct it.	Revised in Table 3.2
				Laharhat: No parking yard to be constructed. Please correct it.	Revised in Table 3.2
				Bankerhat: No new access road to be constructed. Please correct it.	Revised in Table 3.2
				Tojumuddin: No new access road to be constructed. Please correct it.	Revised in Table 3.2
				Monpura: No new access road to be constructed. Please correct it.	Revised in Table 3.2
				Boddarhat: No new access road to be constructed. Please correct it.	Revised in Table 3.2
5	34	3.3		Required Land acquisition area for landing stations acquired is 9.8182 acres and khas is 0.6526. It is not correct. Please put correct one.	It was confirmed by PIU that the total required land acquisition area for landing stations acquired is 4.2121 acres and khas is 0.3936.
6	35-60	3.3		LG lay-out Plan: Lay-Out plans for the landing stations are not updated one. Please put updated lay-out plans.	Recent layout plan has not been provided yet.

WB's Comments on Volume I- Executive Summary and ESIA Report (18/06/2025)

Section	Page No	Topic	WB's Comments	Reply from AECL
			Please add a response matrix separately showing how comments from the interim report have been addressed in the main report.	Added
Executive Summary			The Executive Summary reads more like a description of the report's chapter organization rather than a summary of key findings and issues. Revise the executive summary to reflect key points and feedback addressed across the entire document	Revised
	16	Policy	Please avoid specifying chapter. Similar to operational policies, please include a list of applicable national laws	Noted and revised. A list of applicable national laws has been Provided in Table 1.
	18	Project description	Please add a sentence on the current use of these 13 lands, such as residential, agricultural, commercial, or public/informal purposes	Added (Page 15)
	18	Project description	Please include a section here highlighting the salient features of the Landing Stations (LSs).	Recent layout of the locations has not been provided yet.

Section	Page No	Topic	WB's Comments	Reply from AECL
	23	Identification of Potential Impact	Please indicate whether the project gave specific consideration to potential impacts on cultural heritage, protected areas, or habitats and species classified as critically endangered.	Yes, the project gave specific consideration to potential impacts on cultural heritage, protected areas, or habitats and species. No cultural heritage, protected areas, threatened, endangered and vulnerable species was found within 5 km project area. (Page 24)
	23		Add labor influx	Added (Page 25)
	23		Have vulnerable groups been identified during this study? If so, what percentage of these groups are expected to be affected by the project activities?	Added (Page 25)
	30	ESMP	It Is better to include in the text that a separate Resettlement Action Plan will be prepared along with the ESIA to address any land acquisition and physical and economic displacement. Please add a para on the following questions: • What are the contractor's obligations regarding ESMP before starting construction? • Which specific management plans are required within the Contractor's Environmental and Social Management Plan (C-ESMP)/CEAP? • Who is responsible for reviewing and approving the ESMP and related management plans? • How often will the approved Contractor's CEAP be reviewed and updated during the project lifecycle? • What is the role of the PIUs in managing the ESMP? • How will environmental and social compliance be monitored during the construction phase?	Included (Page 26). The followings are provided in Section 7.2.2. • Contractor will prepare location specific ESMP based on the ESIA. • Management plans that required within the Contractor's Environmental and Social Management Plan (C-ESMP)/CEAP are- Air Quality and Dust Suppression Plan; Surface Water Management Plan; Waste and Materials Management Plan; Earthen Material/ Spoil Management Plan; Hazardous Materials Management Plan; Noise Management Plan; Health, Safety and Security Plan (including occupational health and safety (OHS); Construction Emergency Preparedness and Response Plan; Construction Traffic Management Plan; Construction Worker's Accommodation Management Plan; Recruitment, Labour Management and Monitoring Plan; Training Plan; Supply Chain Management Plan; Design Change and Management Procedure • The World Bank and PIU is responsible for reviewing and approving the ESMP and related management plans in order to review and will be finalized by incorporating the findings and observations of WB and PIU. • CEAP is a live document and it can be updated due to physical point of view of specific construction site. It

Section	Page No	Topic	WB's Comments	Reply from AECL
				can be updated as per demand of climatic condition of the country. Otherwise, it can be updated at least quarterly based on the prevailing seasons i.e. pre-monsoon, monsoon, winter and dry season. CEAP will be reviewed during the project lifecycle. • The role of PIU including- Review and approve ESMP; Regular monitor by visiting the construction sites and Check and cross check the monitoring report with ESMP. • During the construction phase, environmental and social compliance will be monitored through a structured hierarchy—beginning with the contractor, followed by the supervision consultant, then Project Implementation Unit (PIU), then an independent third-party monitor and ultimately, oversight by the World Bank.
	30	ESMP	Is the allocated budget available to the three contractors currently engaged? If not, their contracts will need to be revised accordingly to reflect the updated financial scope.	The allocated budget in contract agreement for the three contractors is not sufficient.
	30	Stakeholder consultation	Could you please specify the timing and project phase during which these stakeholder consultations were carried out?	Added (Page 27)
	30	Stakeholder consultation	Please prepare a table summarizing the identified concerns and corresponding stakeholder recommendations for each site, to support clearer presentation and analysis.	Provided in Table 6
1.4	36		The content provided under Tasks 1 to 10 appears to be reproduced from the Terms of Reference (ToR), as indicated by the continued use of future-tense language. Kindly revise this section by presenting a concise summary of the proposed approach and methodology in your own words, limited to 1–1.5 pages. If needed, detailed descriptions of data collection methodologies may be included in an annex.	Revised. Concise summary of the proposed approach and methodology is provided in Section 1.4. Detail methodology has been attached in Annexure 2.
1.6	45	The ESIA team	Please provide the name, position, qualification and required qualifications. Remove unnecessary information.	Revised Table 1.2.
			May add a section on 'Structure of the Report'	Included in Section 1.9

Section	Page No	Topic	WB's Comments	Reply from AECL
2	49		The report states that the ECC was valid until June 11, 2024. Is this information correct? What is the current status of the ECC, and what actions have been taken regarding its renewal or extension?	The ECC has renewed up to June, 2025
			Under which category does the proposed 13 LSs fall according to the ECR? Same question goes for WB. What specific assessments and plans are required for activities considered "XXX Risk" under World Bank OP guidelines? What is the main finding from IEE/screening analysis?	The proposed 13 LSs fall under Red Category according to the ECR 2023. The proposed project is classified as Category A, according to WB because of the scope of the expected impacts from dredging operation, river training, different construction and operation, the impacts of land acquisition, and the expected impacts on the natural environment. During the construction period surface water may be affected and can occur temporary obstruction of natural drainage. Dredging & construction activity may have negative impact on local aquatic & terrestrial flora & fauna. But the impact will be short term and manageable.
2	51-56	Table 2.1	Key features may not be necessary to include in the table.	Revised Table 2.1.
3	68	3.3	Provide a summary of the information regarding the number of settlers, including private settlers and other relevant categories. Additionally, indicate whether any of the land is under agricultural use or located near critical or protected areas. Avoid for repetition.	Provided in Table 3.4. Neither any of the land is under agricultural use nor located near critical or protected area.
3	68	3.3	Have these layouts been updated to reflect the recent changes in location?	Recent layout of the locations has not been provided yet.
	95-98	Work schedule	Remove work schedule.	Removed and Revised.
4	114		Climate data should be presented in tabular form, highlighting only the key information required for ESMP for each Landing Station (LS). For instance, the maximum monthly total rainfall of 785 mm was recorded in July 2015 for arisal. Prior to the table, please include a brief description of the data characteristics, including the data source, collection period, and any relevant context. A detailed analysis of the data should be provided separately in the Annex.	In the Interim Report, we included tabular data with data presentation, which was recommended to be moved to the Annex. Accordingly, in the Draft ESIA Report, we had kept only the graphical representations of the data. However, as per the feedback from the PIU, it is now advised to place all meteorological data in the Annex and include only a summarized version in the main report.

Section	Page No	Topic	WB's Comments	Reply from AECL
				So, detail Meteorological data have been attached in Annexure 3. The data has been collected from secondary source (Bangladesh Meteorological Department (BMD)).
	150	4.3.3	Provide a summary table of the locations of the 13 LSs showing the land use pattern within the project area only.	A summary table of the locations of the 13 LSs has been provided in Table 5.7.
	154	Table 4.19	Summarize in 1-3 sentences the factors considered and limitations encountered during sample collection and analysis.	Provided in Section 5.3.4.
	155	Table 4.19	Please calculated AQI and compare.	Provided in Table 5.23.
	182	Table 4.35	Highly contaminated with Arsenic. The water should not be prescribed for drinking. Same goes for Boddarhat, Motirhat, Tomuruddin	It is suggested to ensure that workers do not consume arsenic-contaminated water during the construction phase
	207	Traffic study	When does the peak condition occur? Please provide road widths and pavement details around the project location.	Provided in Section 5.3.9.
	259	Hisha Sanctuary	Provide distance of projects location form Hilsha Sanctuary.	Distance of projects location form Hilsha Sanctuary has been provided in Table 5.97
	313	4.5.8.9	Are any of the heritage sites located near the project area? Any traditional group of people around?	No cultural or archaeological heritage site was located within 5 km area of the project site. No traditional group was found.
			The baseline section is 199 pages, accounting for nearly ½ of the report. Please streamline the content by reporting only the key baseline information that is directly relevant. Supporting data and extended analysis should be moved to the Annex. Wherever possible, organize the information in clear, concise tables to enhance readability and facilitate comparison across sites.	Revised
5	319	Table 5.5	Based on the baseline information, it is evident that all sites may not respond uniformly to the identified impacts.	Due to the similarity of nature and type of the project and almost same land area in all the locations; more or less the impacts will be same.
5	319	Table 5.5	Please include the pre-construction phase (e.g., site preparation, vegetation clearance, tree cutting, landfill or cut, temporary land use, mobilization of labor and machinery, traffic, utility etc.) and associated impacts and mitigation measures or mention there will be no impacts from pre-construction activities.	Pre-construction phase has been included (Table 6.5 and Section 6.6.1)
	320		Add Impact due to liquid waste.	Added in Table 6.5 and Section 6.6.2.10.

Section	Page No	Topic	WB's Comments	Reply from AECL
	321	CHS	How the comment is related to community health and safety? Under the community health and safety, impacts may include exposure to pollution (air, water, soil), increased risk of accidents from infrastructure and traffic, spread of communicable and vector-borne diseases due to labor influx and poor sanitation, as well as social risks such as gender-based violence and disruption of local basic services	Revised in Table 6.5 (CHS)
	321	Sanitation diseases hazard	This may be discussed with labor and working condition.	Noted and Revised Table 6.5
	323		Add restricted public access to the site as an impact.	Added in table 6.5 and Section 6.6.2.23.
	323		Please clarify the comments section by specifying to whom the comment is addressed and who the referenced workers are during the operation phase.	The operation phase depends on the willingness of the Client and the staffing policy is not finalized yet for the BRWTP-1 project.
6		Alternative analysis	Alternative analysis chapter should come before the baseline.	Revised. Now Chapter 4 is Alternative analysis.
7.3	373	Consultation process	Provide Tables on when the consultation meetings were conducted at each site, how many consultations took place, who the stakeholders were, how they were identified, and the key discussion points. Make a mapping. Also see comments in the executive summary.	Provided in Table 9.2. A Mapping has been done and already provided in Stakeholder Engagement Plan (SEP).
	375	Tale 7.1	It is reported that an access road will be constructed. Is this provision included in the contract?	Revised in Table 9.3.

WB's Commnets on Volume II- Environmental & Social Management Plan (ESMP), Labor Management Procedure (LMP), Stakeholder Engagement Plan (SEP) and Emergency Response Plan (ERP) (18/06/2025)

Section	Page No	Topic	WB's Comments	Reply from AECL
Table 2.1			Update the ESMP in accordance with the comments provided on impact identification.	Updated
	14	Impact on groundwater	In some areas, groundwater is not potable due to elevated arsenic contamination (as indicated by the baseline assessment). Therefore, drinking water for laborers should be sourced from alternative safe water supplies.	It is suggested to ensure that workers do not consume arsenic-contaminated water during the construction phase.

Section	Page No	Topic	WB's Comments	Reply from AECL
	16	Dredging activity	Ensure bund height and slope are designed to safely retain the volume of dredged material plus freeboard for rainfall or wave action.	Added in Dredging activity
	24	Aquatic habitat	Is this measure readily available in the market?	As pollution free dredgers are not readily available in Bangladesh so we removed that mitigation measures.
	27	River Traffic	Install reflective signage along the river to enhance visibility and ensure safe navigation for river traffic, particularly during low-light conditions or adverse weather.	Added in River Traffic
	28	OHS	Availability of emergency equipment at site.	Added in OHS
	28	OHS	Mention about tool-box training daily.	Added in OHS
	31	OHS	A functional and accessible Workers' GRM shall be established at all project sites to allow workers to raise concerns related to their working conditions, wages, safety, discrimination, harassment, or any other employment-related issue.	Added in OHS
	31	CHS	labor influx should be avoided by prioritizing the engagement of local labor wherever possible.	Added in CHS
	32	CHS	Training on CoC should be added.	Added in CHS
	32	CHS	A signboard must be installed at the project site to display key project information, including contact details for the Grievance Redress Mechanism (GRM).	Added in CHS
	34	Labor and Working Condition	Please provide detailed mitigation measures to ensure adequate living conditions in workers' labor camps. This should address aspects such as shelter quality, sanitation, access to clean water, lighting facility, ventilation, bed, kitchen, dining, health and safety protocols, waste (solid and liquid) management, security, and measures to promote positive relations with the local community	Details have been already provided in Labor Camp Management Plan.
	37		Develop mitigation measures to handle wastewater	Added
	37	Impact due to solid waste	Propose mitigation measures for handling construction debris	Added
	39	Impact due to Hazardous Waste	Frequent training on hazardous waste management should be added.	Added

Section	Page No	Topic	WB's Comments	Reply from AECL
	47	Labor camp plan (health and hygiene)	Provide awareness programming on COVID protocols.	Added
2.2.2	52	Contractors EHS cell	Do the three contractors have such provisions included in their contract documents?	The contractors for the package W5A, W5B and W5C have such provisions in their contract Agreement. The document includes the position of Environmental, Social and OHS expert. But there was no ecologist.
	52-53	Table 2.3, 2.4, and 2.5	Add qualification of the personnel.	Added in Table 7.17, Table 7.18 and Table 7.19
3.2	57	Table 3.3	Is the budget for this provision allocated to the contracted contractors?	The allocated budget in contract agreement for the three contractors is not sufficient.
			Under Safeguards, LMP and SEP are not formally required documents.	Revised Table 7.22
4.3	58		The project may engage community workers. Add them in section 4.3.	Added in Annexure 13; Section 1.3
		Information on Contracted Workers	Specify the frequency at which this database should be updated.	This database should be updated. Quarterly
4.4	59		Potential risks could be generated from Labor influx.	Added in Annexure 13; Section 1.4
			Please use the publicly available SEP template (latest) to ensure the content is clear and concise.	Publicly available SEP template has been used
5.2	71		Key objectives are not necessary	Revised
5.3			This section 5.3 is not necessary.	Revised
5.4	74-75		The terminologies may be kept in the footnote or Annex.	Provided in Annex 16.

Overall,

Comments	Reply
It is evident the report updated the baseline information with latest data. However, a response matrix detailing the changes made since the interim report should be included for clarity and traceability.	Response matrix has been provided.
The EIA (Volume I and II) document should be revised to eliminate duplication and theoretical content. Information in the ESMP, LMP, and SEP should be concise and focused; supporting details should be relocated to annexes.	ESIA (Volume I and II) document has been revised as per given feedback.

Comments	Reply
Comments have been provided across both documents. The ESMP and executive summary should be updated to incorporate all relevant feedback to maintain consistency and completeness.	The ESMP has been incorporated in Main ESIA Report (Chapter 7) and executive summary has been updated incorporating all relevant feedback.

WB's Comments Matrix on Interim Report ESIA BRWTP-1 (11/03/2025)

Sl. No.	WB's Comments	Reply from AECL
1.	It is alarming that that the PIU assigned three contractors for three packages to implement the project without obtaining prior approval of the ESIA and RAP (ref Section 3.4). Clarify how this issue is being managed.	This issue is solely managed by PIU.
2.	Project Description & Land Requirements	
	Page 27 Remove the names of landing stations (LSs) that have been canceled from the list.	Removed.
2.	Page 35 & 62 (Table 3.3) - Confirm whether the required land area and acquisition details in the table are finalized. - Ensure consistency with Section 3.4 (New Locations under Planning); update and logically sequence the data accordingly.	Table 3.3 has been revised as per the updated data given by PIU. Till now this the finalized data provided by PIU. - Updated.
3.	Environmental Baseline & Monitoring Requirements	
	Page 81 (Table 4.1) Ambient Air Quality Monitoring: - The Department of Environment (DoE) recommends sampling at multiple locations depending on project size and impact. - The selection of monitoring stations should consider wind direction, human settlements, sensitive areas, and industrial sites. Noise Monitoring: - Ensure that noise monitoring stations are placed strategically near sensitive receptors such as residential areas and workplaces.	- The project area is very small. Only infrastructure and construction work will be carried out here. Considering this, we will monitor air quality at one location at or around each site near the settlement. This monitoring plan was also proposed in the Inception Report which was approved by the Bank. - Noted. - Noted.
	Page 82 Surface Water Quality Parameters: - Include temperature, chlorides, sulfates, and phosphates. Groundwater Quality Parameters: - Add Temperature and Dissolved Oxygen (DO). Sampling Locations:	- Suggested Surface Water Quality Parameters will be included. - Suggested Ground Water Quality Parameters will be added. - Noted.

Sl. No.	WB's Comments	Reply from AECL
	Determine the number of sampling stations based on the presence of water bodies, proximity to settlements, and drainage patterns.	
	Page 85 Specify the time period for the mean annual rainfall presented in Section 4.3.1.1.	We have provided the data based on the findings from the map.
	Pages 86-90 & 90-111 Rainfall, Humidity & Temperature Data: - Instead of detailed monthly tables, provide only total figures in the main report. - Move detailed tables to the Appendices.	- Revised. Only figures are provided. - Detailed tables have been provided in Appendix 1.
	Pages 111-115 Groundwater Hydrographs: - The data is from 2020, which may be outdated given the project timeline. Use the latest available data. Baseline Data Utilization: - Clearly outline how the baseline data will be applied during project implementation.	- This is the last updated BWDB report on Groundwater Hydrographs. After this BWDB has not published any updated report yet. - Groundwater extraction will be regulated according to this GWT hydrograph. Water should be utilized when groundwater levels are high, and minimal extraction should be undertaken as levels decline. During the operation phase, excessive groundwater use will be avoided. If groundwater is needed during the construction phase, a monitoring well can be installed to ensure extraction does not cause a significant drop in water levels.
4.	Ecological & Socio-Economic Considerations	
	Pages 126-152 Terrestrial Flora: - Compare findings with the Plant Red List of Bangladesh 2024 (IUCN Bangladesh Status).	Compared with Plant Red List of Bangladesh 2024 (IUCN Bangladesh Status).
	Pages 158-179 Socio-Economic Data: - Use the latest available socio-economic data. - For religious and marital conditions, display only summary figures in the main report, moving detailed tables to the Appendices. - Include additional socio-economic insights for each district: Livelihood patterns and income levels Displacement and livelihood loss due to the project (if applicable)	- The last census in Bangladesh was held in 2021. The last updated report of Population and Housing Census 2022 was published in November 2023. No further census data has been uploaded since then. - Detailed tables have been provided in Appendix 2. - No related secondary information was found in Population and Housing Census 2022. Primary data collection process is ongoing. After collecting, all data will be incorporated in the Draft ESIA report.