Bangladesh – India Friendship Power Company (Pvt.) Limited
(A Joint Venture of NTPC Ltd. and BPDB)

Monitoring of Environment Parameter and Implementation of Environmental Management Plan during Construction Period along with Engineering Activities for 2X660 MW Maitree Super Thermal Power Project at Rampal in Bagerhat District

32nd Quarter Monitoring Report

Monitoring Period: February – April 2022

September 2022

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Last but not the least, the study team appreciates and acknowledges the concerns and perceptions of local people regarding the project and their active participations during field visits.

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Abbreviations and Acronyms

AAS	Atomic Absorption Spectrophotometer
AECL	Adroit Environment Consultants Ltd
As, Pb, Hg	Arsenic, Lead and Mercury
BCSIR	Bangldesh Council of Scientific and Industrial Research
BDS	Business Development Studies
BIFPCL	Bangladesh-India Friendship Power Company (Pvt.) Limited
BOD	Biochemical Oxygen Demand
BPDB	Bangladesh Power Development Board
BUET-BRTC	Bangladesh University of Engineering and Technology - Bureau of Research, Testing and Consultation
CDM	Clean Development Mechanism
CEGIS	Center for Environmental and Geographic Information Services
COD	Chemical Oxygen Demand
CPUE	Catch per Unit Effort
CSR	Corporate Social Responsibility
dBH	Diameter at Breast Height
DCR	Duplicate Carbon Receipt
DO	Dissolved Oxygen
DoE	Department of Environment
DPHE	Department of Public Health Engineering
EC	Electrical Conductivity
ECR	Environment Conservation Rules
EHS	Environmental Health Safety
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPC	Engineering Procurement Construction
ESP	Exchangeable sodium percentage
FGD	Focus Group Discussion
FGD	Flue Gas Desulfurization
FSR	Fisheries Species Richness
GIS	Geographic Information System
GoB	Government of Bangladesh
GPS	Global Positioning System

GW	Groundwater
HS	Household Survey
IFC	International Finance Corporation
IGA	Income Generation Activities
ISO	International Organization for Standardization
IUCN	International Union for Conservation of Nature
Kg	Kilogram
KII	Key Informants Interview
MoPEMR	Ministry of Power, Energy and Mineral Resources
MW	Mega Watt
MSDS	Materials Safety Data Sheet
NTPC	National Thermal Power Corporation
OHSAS	Occupational Health and Safety Management Systems
PCU	Passenger Car Unit
PGCB	Power Grid Company of Bangladesh Ltd
PMU	Project Management Unit
PRA	Participatory Rural Appraisal
PWD	Public Works Department
QMR	Quarterly Monitoring Report
RRA	Rapid Rural Appraisal
RS	Remote Sensing
SAR	Sodium absorption ratio
SRDI	Soil Resources Development Institute
SRF	Sundarbans Reserve Forest
TDS	Total Dissolved Solid
TH	Total Hardness
ToR	Terms of References
TSS	Total Suspended Solid
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds

Units

dB	Decibel
hr	Hour
Kg	Kilogram
Km	Kilometre
KV	Kilo Volt
KW	Killo Watt
m	Meter
mg	Milligram
MW	Mega Watt
Nm	Normal Meter
ppm	parts per million
ppt	parts per trillion
ton/year	Ton Per Year
s	Seconds

Units Conversion Table

General Units

1°C = 274.15 K=33.8° F

1 hectare = 10-2 km2 = 2.471 acres

1 kilogram = 2.20 pound

1 kilometre = 0.62137 mile

1 liter = 0.001 cubic meter

1 meter = 3.2808 feet

1 metric ton = 1000 kg

1 mg/L ≈1 g/m3≈1 ppm (w/w)

1 mg/m3 = 1 µg /L

1 pascal = 1 N/m2= 0.01 millibar

1 square mile = 640 acre = 2.590 km2

Energy Units

1 GWyr = 8.76 x 109 kW

1 horsepower = 746 W

1 KWh = 3412 Btu

1 kWh = 859.85 kcal

1 KWh = 3.6 x 106 J

1MW=1000KW=106W

Glossary

Aman:	Group of rice varieties grown in the monsoon season and harvested in the post-monsoon season. This is generally transplanted at the beginning of monsoon from July-August and harvested in November-Dec. Mostly rain-fed, supplemental irrigation needed in places during dry spell.
Aus:	Group of rice varieties sown in the pre-monsoon season and harvested in the monsoon season. These are broadcasted/transplanted during March-April and harvested during June-July. Generally, rain-fed, irrigation needed for HYVT. (High yield variety) Aus.
B Aus:	Broadcast Aus
Bazar:	Market
Beel:	A saucer-shaped natural depression, which generally retains water throughout the year and in some cases seasonally connected to the river system.
Boro:	A group of rice varieties sown and transplanted in winter and harvested at the end of the pre-monsoon season. These are mostly HYV and fully irrigated, planted in December-January and harvested before the onset of monsoon in April- May.
Haat:	Market place where market exchanges are carried out either once, twice or thrice a week, however not every day.
Gear/Jaal:	Different types of fishing net to catch fish from the water bodies.
Kutcha:	A house made of locally available materials with earthen floor, commonly used in the rural areas.
Khal:	A drainage channel usually small, sometimes man-made through which the water flows. These may or may not be perennial.
Kharif:	Pre-monsoon and monsoon growing season. Cropping season linked to monsoon between March-October, often divided into kharif-1 (March-June) and kharif-2 (July-October).
Perennial Khal:	Water available in the khal all the year round.
Pacca:	Well-constructed building using modern masonry materials.
Rabi:	Dry agricultural crop growing season; mainly used for the cool winter season between November and February.
Seasonal Khal:	Water not available in the khal all the year round.
T. *Aman*:	Transplanted Aman
Upazila:	Upazila is an administrative subdivision of a District.

Executive Summary

This 32nd quarterly monitoring report covers the status of EMP (Environmental Management Plan) implementation for the concurrent period (during construction stage) as recommended in the EIA (Environmental Impact Assessment) study of power plant vide Memo No: DoE/Clearance/5062/2011 dt. 05/08/2013 as well as EIA report of Coal Transportation vide Memo No: DoE/Clearance/5532/2016 dtd.31/01/2018. During the month of May, 2022 CEGIS team carried out the monitoring activities covering every monitoring aspects as assigned in the ToR (Terms of Reference) and approval conditions of DoE along with valuable suggestions and recommendations from different national and international organizations. In other words, the aspects can briefly be addressed as monitoring of the Environmental Compliances and monitoring of the selected environmental parameters such as ambient air quality, noise level, water quality, land resource, traffic management status, water resources management status, agricultural resources monitoring, fisheries resources, Socio-economic monitoring, aquatic & terrestrial ecosystem monitoring and the Sundarbans Reserve Forest (SRF) health monitoring.

However, the present environmental compliance monitoring includes the status of EMP implementation based on physical observation, investigation and interviews/discussion with the proponents and project officials, contractor or sub-contractors, or relevant authorities. A comprehensive due diligence checklist was prepared to monitor the environmental compliance of different components e.g., Environmental and Social Management System and Action Plan; Labour and Working Condition; Community Health, Safety and Security; Biodiversity and Sustainable Management of Living Natural Resources.

An E&S team from CEGIS recently visited to the plant on 25th May, 2022 to have a look and to acquire information intrinsically considering the bio-physical and other related parameters through a rigorous walk-in visit, meeting with plant officials, general labours and overall the close observation of the ongoing work at the plant.

Due to the consecutive lockdown for spreading Corona Virus across at India and in Bangladesh the construction progress was temporarily decelerated to meet the anticipated commencement date for commercial operation but the construction work has recently gained momentum and the associated plant authority and Bangladesh Government are very optimistic of launching the commercial operation on their expected date. It can be said that the progress of unit-1 of the “Maitree Super Thermal Power Project” is over 90% now that is expected to be operational in September, 2022 while overall progress stands at nearly 80%, according to the officials.

However, the present environmental compliance monitoring includes the status of EMP implementation based on physical observation, investigation and interviews/discussion to the proponents and project officials and the relevant authorities. Though a comprehensive due diligence checklist was prepared to monitor the environmental compliance of different components e.g. Environmental and Social Management System and Action Plan; Labor and Working Condition; Community Health, Safety and Security; Biodiversity and Sustainable Management of Living Natural Resources, this 32nd environmental compliance report has focused on waste generation and its management in and around of the main plant and labour shed. Along with other compliance element, the key issues of the visit can be summarized as follow:

- During the visit inside the labour shed plenty of household waste were found on the road in a messed-up condition.

- Lack of waste bin and lack of proper initiative of source segregation of the organic waste has made the labour shed unhygienic
- Unused bath-tub with dirty water has noticed where waste garbage and polybags were being floated.
- Lack of adequate drainage and sewerage facilities, lavatory/toilet waste is being accumulated inside the labour shed that has been causing malodorous stench and health deterioration.
- Stock-pile of construction and household waste were found by the side of the Maidara river bank that may washed away and deteriorate the adjacent river water during heavy rainfall.
- Heap of Sand and other loose material were found uncovered at the labour shed and inside the plant premises.
- Though there are 657 coloured waste bin there is no written labelling on the bin that is very important for source segregation and easily understandable for the general workers.
- Keeping record about the amount of waste generation per day or per week is very important that was absent.

In course of air quality monitoring it was observed that the concentration of major air pollutants was found comparatively lower in the Sundarbans area than that of the other monitoring locations. But due to the seasonal effect the concentration of the particulate matter was found to be slightly higher at Khan Jahan Ali Bridge area though is comparable to the standards set by DOE. However, major sources of criteria pollutants generation in and around the project site as observed were the piling activities, digging, tunnelling and burrowing works, jetty erection activities, major construction works, dust from unpaved roads and vehicle movement, construction materials and goods transportation activities through the roads and river Passur etc. Other sources of pollutants which may contribute to the existing pollution load are the small industries like cement works and refinery industries etc., diffuse sources like wood stoves, fires and wind generated dust etc.

Observed noise level at *Chalna*, a commercial area located at a distance of 4 km to the north-west direction of the proposed chimney location was recorded as 59.08 dB whereas it's standard level is 70 dB**.** Levels of noise at *Kaigar Daskati (*48.60 dB) situated at the Gucchha Gram, a residential area located at north-west corner of the project area; Chunkuri-2 (48.91 dB) located at 4km south-west direction from the chimney location; *Maidara Khal* (50.53 dB), south-west corner of the project area and a residential area and; *Shapmar*i (49.76 dB), proposed township area didn't cross their corresponding standard limits (55 dB) of noise level. The level of noise at *Barni (Gaurambha)* was found to be 47.23 dB which was 12.77 dB lower than that of standard limit (60 dB) of noise level for this location. *Harbaria (49.37 dB)* and *Akram Point* (43.08 dB), the two ecologically silent zones were also not found to exceed the Bangladesh standard limit (50 dB) of their corresponding standard values.

On the other hand, observed noise levels at Khan Jahan Ali Bridge (58.60 dB), a commercial zone, and Mongla Port (57.38 dB), an industrial zone, were also not found to exceed the Bangladesh standard limit of noise at their corresponding values. The standard noise limits for Khan Jahan Ali Bridge and Mongla Port during the day are 70 dB and 75 dB, respectively.

Passur River is highly influenced by tidal effects. Tidal penetration in the Passur River depends on seasonal change, upstream flow and catchment water discharge. However, the physico-chemical properties of Passur iver changes with the tidal intrusion in different seasons. During 32nd quarterly monitoring, pH was found slightly basic in nature. Salinity, Temperature and Dissolved oxygen level was found in fair and favourable for the aquatic life forms. During the 31st quarter (post-monsoon, 2021), TDS and TH has been relatively same with respect to the same seasons of last consecutive years. Nitrate (NO_3^-) level remained relatively lower. The phosphate (PO_4^{3-}) was found within the safe limit of aquatic organisms. In case of metal pollution, no variation was recorded for As, Pb and Hg concentration and even no issues as well. Oil & grease concentration was found less than 2.0 mg/L at all sites which is less than the recommended concentration (10 mg/L) for Inland Surface Water.

On the other hand, in course of groundwater quality monitoring, the physical characteristics of groundwater quality is still in good condition with slight variation in pH and salinity. The reason being saline water intrusion and infiltration due to excessive withdrawn of groundwater by the surrounding communities during the dry season. In addition, evaporation also responsible for this slight salinity in groundwater. Project activities are not related to this sort of changes in salinity. Chemical characteristics of the groundwater quality are also found relatively good.

In course of agricultural and land resources monitoring it was observed that, Soil samples were collected from monitoring plots and sent to SRDI, Dhaka laboratory for chemical analysis. The analysis report will be incorporated with next (33rd monitoring) report.

Maximum crop production is found in Chunkuri-2 whereas minimum in Bidyarban and Chakgona. No crop damage was found during this monitoring field visit. Boro cultivation is found for the first time in monitoring plot-1 (Baranpara) where the crop variety is BRRIdhan 67. For Aman rice cultivation, BRRIdhan 23 is cultivated in monitoring plot-1 (Baranpara), monitoring plot-2 (Chunkuri-2) and monitoring plot-6 (Bidyarbon). Local Aman rice (Chapshail) is cultivated in monitoring plot-4 (Chakgona) and monitoring plot-5 (Basherhula).

Livestock resource is found to be similar during this monitoring field visit. However, number of freely reared livestock continues to decrease due to lack of grazing land.

Sediment samples analysis report of 31st monitoring (January, 2022 or Dry season, 2022) is incorporated in this report. According to the analysis, Mercury (Hg) exceed average shale value and average upper crust value in all locations while Pb crossed the both values only in one location (Monlgla port). Compared to previous dry season monitoring report (January, 2021), As and Hg concentration is reduced in all sampling locations while Pb concentration is increased. The maximum concentration for As, Pb and Hg is found in Moidara River, Mongla port and project Jetty site respectively. In project site (jetty point), only the concentration of Pb remains below this monitoring season average while the other two crossed the average value.

Monitoring of 32-quarter for fisheries resources have been conducted at 13 sampling sites which were set at the inception stage. Out of these sites, effective samplings were done at 07 sites as fishing in other sites in the river were not observed. Amongst the effective sites, eight (04) were in the river and three (03) were in the country side (shrimp farms). The followings are the key findings of the 32nd quarter monitoring in the fiscal year of 2021-22. Changes in habitat uses were observed in every past fiscal year along with the current one (as compared to the fiscal year of 2014-2015, 2015-2016, 2017-2018, 2018-2019, 2019-20 and 2020-21), caused mainly due to biophysical changes like tidal effect, forest erosion and vegetation coverage, seasonal variability, food availability and also fisheries management practices.

Moreover, through analyzing the type of habitat uses by different age group of fish species (based on the length-based community structure model) two types of habitats were found i.e. i) spawning and nursery ground and ii) maturation ground. Shannon-Weiner diversity index has also been observed to vary between 32-quarter with that of all previous quarters. Highest Shannon-Weiner index was found at Chandpai (0.84 out of 19 species) indicating moderate evenly distributed fish species. On the contrary, lowest evenness was found at the Mongla Point (0.31 out of 13 species). However, maximum FSR was obtained in the Chandpai (n=19), while very low FSR was recorded at the Maidara (n=04). Fries of fin fish and shrimp were widely distributed from middle stretches to the down stretches (Chandpai and Mongla), juveniles age group at Chandpai and Chalna of the Passur River system. Adults of large-sized fishes were observed at Maidara point in this quarter monitoring. Fish species like Chapila, Chela and Amadi attain the maximum abundance among the migratory fish species observed in 32-quarter of monitoring. Moreover, among migratory species, Amadi was observed to migrate long distances. In this monitoring, the highest productivity was found at Maidara point followed by Chalna point. The present study revealed that the highest catch susceptibility was also found in case of Bhola Jal (0.58 kg/haul).

In course of ecological monitoring Vegetation composition, plant diversity, vegetation canopy status, plant health, bird habitat status, dolphin occurrence, benthos and plankton in aquatic ecosystems have been monitored for this monitoring season. A total of 38 tree species were recorded from all the monitoring sites with Shanon-Winner diversity index of 1.65 which denotes the diversity is improved than previous monitoring tier. Canopy status revealed insignificant improvement comparing the same seasonal monitoring in last year. There is slightly change of plant health all the sites. Two site recorded bird nests of resident avifauna.

Occurrences of dolphin in Passur-Maidara River revealed same and significantly higher at Bhadra and Dhangmari Khal than previous monitoring and this may be due to abundance of fishes and stringent of fishing activities within the restricted khals. A total of 47 phytoplankton and only two zooplankton species has been recorded from the Passur and inland ponds. No benthos was recorded any of the site.

The Sundarbans is the most significant natural mangrove forest in Bangladesh and has a diverse range of plants. This ecosystem of the forest is dynamic and intricate. The local population has depended on the resources and services provided by the forest for many years. Ecological Critical Areas (ECA) have been designated in a buffer zone 10 km wide from the Sundarbans' border (Hossain, M. 2015). In any case, Bangladesh needs more electricity to advance its economy. The rate of industrialization and population increase are both driving up energy demand. This is the rationale behind the establishment of the 2x660 MW Maitree Super Thermal Power Project at Rampal, Bagerhat, close to the Sundarbans' Ecologically Critical Area in Bangladesh. The Rampal plant, among all other coal-based power projects, sparked an extraordinary outrage among environmentalists both domestically and internationally since it is being built near to the Sundarbans, the largest mangrove forest in the world. The Rampal Thermal Coal Power Plant Project is currently being implemented, and the Center for Environmental and Geographic Information Services (CEGIS) team has been frequently monitoring (32nd) the health of the Sundarbans Reserve Forest to oversee any potential effects. Various bio-indicators such as tree diameter, height, species diversity, seedling regeneration capacity, pneumatophore occurrence, carbon stock, crab hole density, canopy cover changes, Leaf Area Index, leaf phenology, pest, and diseases, and soil physical and chemical properties were observed in the permanent sample plots (PSPs) along the Passur River over time. Hiron point plot was not observed this time due to unfavourable weather conditions. Monitoring result shows that Gewa (*Excoecaria agallocha*) and Sundari (*Heritiera fomes*) is the dominant species among all the PSPs followed by Passur (*Xylocarpus mekongensis*) and Kakra (*Bruguiera gymnorrhiza*). While the forest floor in Karamjol was nearly dry with a lush green canopy, the forest floor in the Sutarkhali plot was damp with numerous crab holes and flourishing vegetation. In Herbaria and Akram Point, several deer tracks were discovered, and the dry forest floor in Akram Point was heavily covered in crab molds. However, the number of top dying Sundari trees is higher, and the majority of the tree was encircled by parasites. Species diversity indices show that sample plots of Karamjol have more diversified compared to other PSPs. Among sites, the comparison shows that the average tree diameter is higher in Karamjol whereas lower at Sutarkhali Point. No severe pest and disease attacks were observed in the monitoring PSPs except the top dying symptom of Sundari (*Heritiera fomes*). Phenological changes were observed in four plots. Forest health along the Passur River can be considered to be stable, with the exception of the top dying Sundari (*Heritiera fomes*) tree species.

Moreover, the Socio-economic monitoring was conducted to explore project impacts on livelihoods, working environment, community health and safety, and activities under the Corporate Social Responsibility (CSR). For the study, physical observation, consultation and informal interviews collected information from the PMU and local communities. It is found that presently, about 10-15% of local labourers work at the project site Now a days, the engagement of local labors is decreasing because of conducting more technical activities in the project site and relevant technicians are unavailable or rarely found in the study area . However, the scope of employment is increased in the study area because of fully operating widen and well-designed access road, bazaar at the zero point and other newly development initiatives (i.e. LPG industries, cement factories, solar power plant etc.) near to the project area. In addition, local people are trying to make some scope of developing small business opportunities which become possible especially due to the project intervention

Most of the labor sheds were not found clean but found with adequate toilet facilities, drinking water facilities. Drainage system and waste management facilities were not found satisfactory. A number of mangroves, fruits, coconut, and herbal plants were planted in the project area and the program is still ongoing, though the survival rate of the plants (except mangrove trees) are not satisfactory. In this regard, a caretaker from the Forest Department is engaged for supervising the maintenance of the plants. At present mangrove plants are found in the project area which changes canopy coverage in the project area and creates living environments of life.

1. Introduction

1.1 Background

The scope of works as assigned has provisioned to monitor the environmental components, social indicators and the implementation status of EMP (Environmental Management Plan) during the construction phase of 2x660 MW Maitree Super Thermal Power Plant. As an independent environmental monitoring agency, CEGIS was engaged for conducting the said activities in accordance with the Power Plant EIA approval condition no. 32 and Coal Transportation EIA approval condition no.17.

The location of 2x660 MW MSTPP project encompasses Sapmari, Katakhali and Kaigar Daskati Mauza of Rajnagar Union under Rampal Upazila of Bagerhat District (Figure 1.1). The Power Plant lies in between latitude 22˚ 37' 0'' N and 22˚ 34' 30'' N and longitude 89˚ 32' 0'' E and 89˚ 34' 5'' E. The Plant site is located at about 23 km south from the Khulna City and near about 14 km from the north-west direction of nearest tip of the Sundarbans (considering the proposed chimney location). Location of the study area along with the distance from World heritage sites are presented in Figure 1.1.

The study area includes: i) Area covering 10 km radius from the Plant location, ii) Area within 5 km strip from both banks of the Passur river starting from the Plant site to Hiron point (Figure 1.2). As per the contract, the findings of the previously formulated quarterly monitoring reports have been submitted to BIFPCL.

Monitoring of Environmental parameters and associated data collection is being continued considering the spatial as well seasonal variations. However, in May, 2022 CEGIS team has carried out the 32nd quarterly monitoring activities covering all the preselected monitoring parameters.

1.2 Objectives

The prime objectives of the study are:

- To monitor the important environment and social parameters during construction phase of the Power Plant and
- To monitor, the environmental compliances regarding EMP implementation during Power Plant's construction works and associated activities.

1.3 Criteria for Selection of Monitoring Sites/Locations

The monitoring sites have been selected considering the sensitivity and the ambience of the surroundings likely to be impacted from the Project related activities which includes-

- Wind speed and direction, sensitive receptors in and around the vicinity of the project site were considered for monitoring the ambient air quality. Potential areas were also identified and selected for noise level monitoring likely to be impacted by the project activities. Similarly, sites for water quality monitoring were selected considering the water resources (Maidara and other nearer water bodies, Passur River from Chalna to Hiron Point) likely to be impacted by the project activities.
- Potential locations for fisheries resources monitoring were selected considering the fish habitats, biodiversity, migration and production zones likely to be impacted by the project activities.

- Monitoring locations for ecosystem and biodiversity, Soil and land resources were selected considering the induced impacts of the Project related activities on the project surrounding areas.
- Monitoring of socio-economic conditions of the PAPs (Project Affected Peoples) and project surrounding communities were being carried out on the basis of their circumstances likely to be transformed and /or altered by the project activities.
- Locations for Sundarbans Reserve Forest (SRF) Health Monitoring were selected considering the potential access routes of coal transportation through Sundarbans Forest area and associated activities for different phases of the power plant development and operation which might have significant effects on Sundarbans's flora and fauna.
- Monitoring aspects for Environmental compliances regarding EMP implementation status in and around the project area has been set as per suggestions made in the EIA reports and approval conditions from DoE of both the Power Plant and Coal transportation studies respectively for ensuring environmental sustainability and social acceptability.

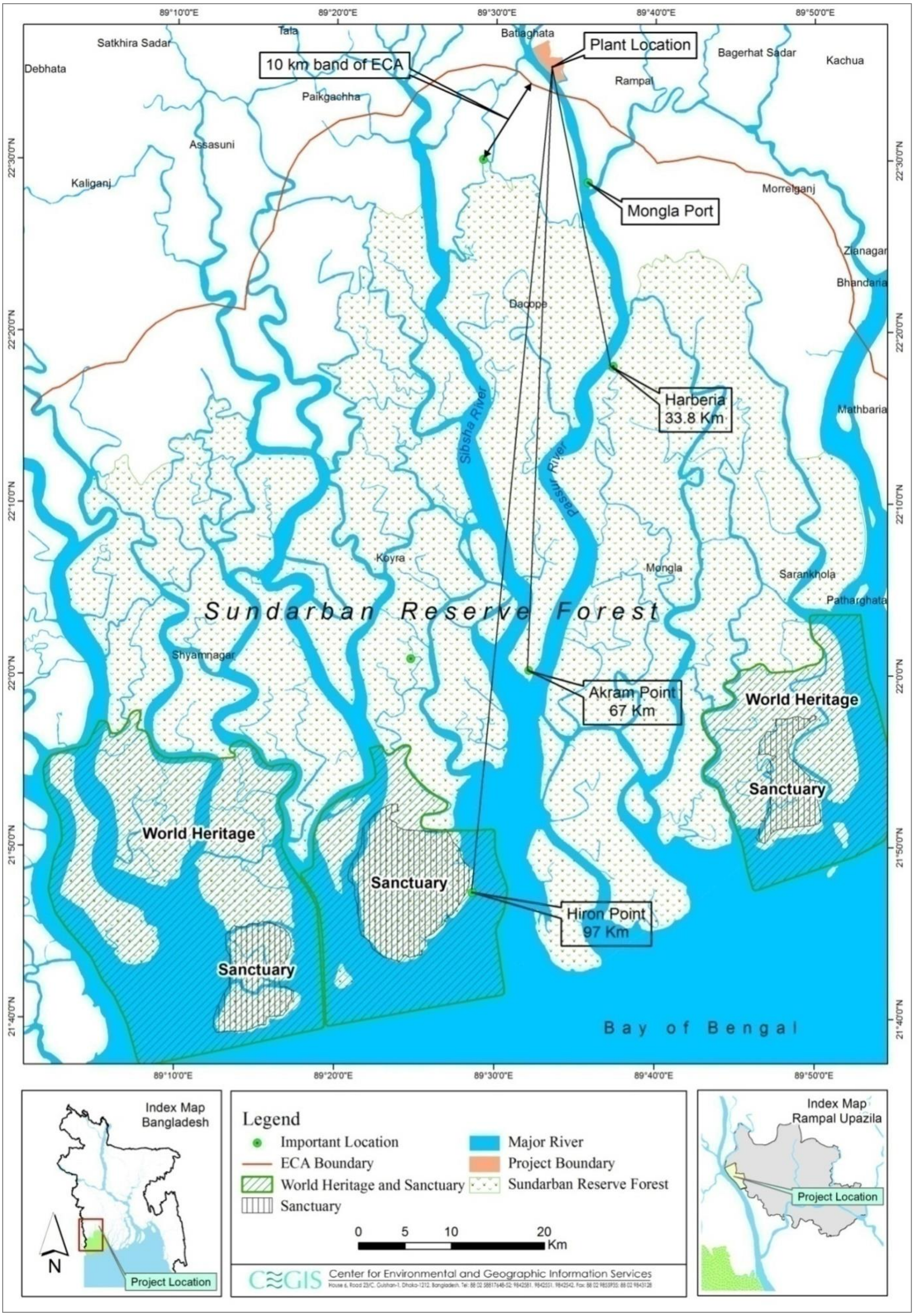


Figure 1.1: Location Map of the Study Area

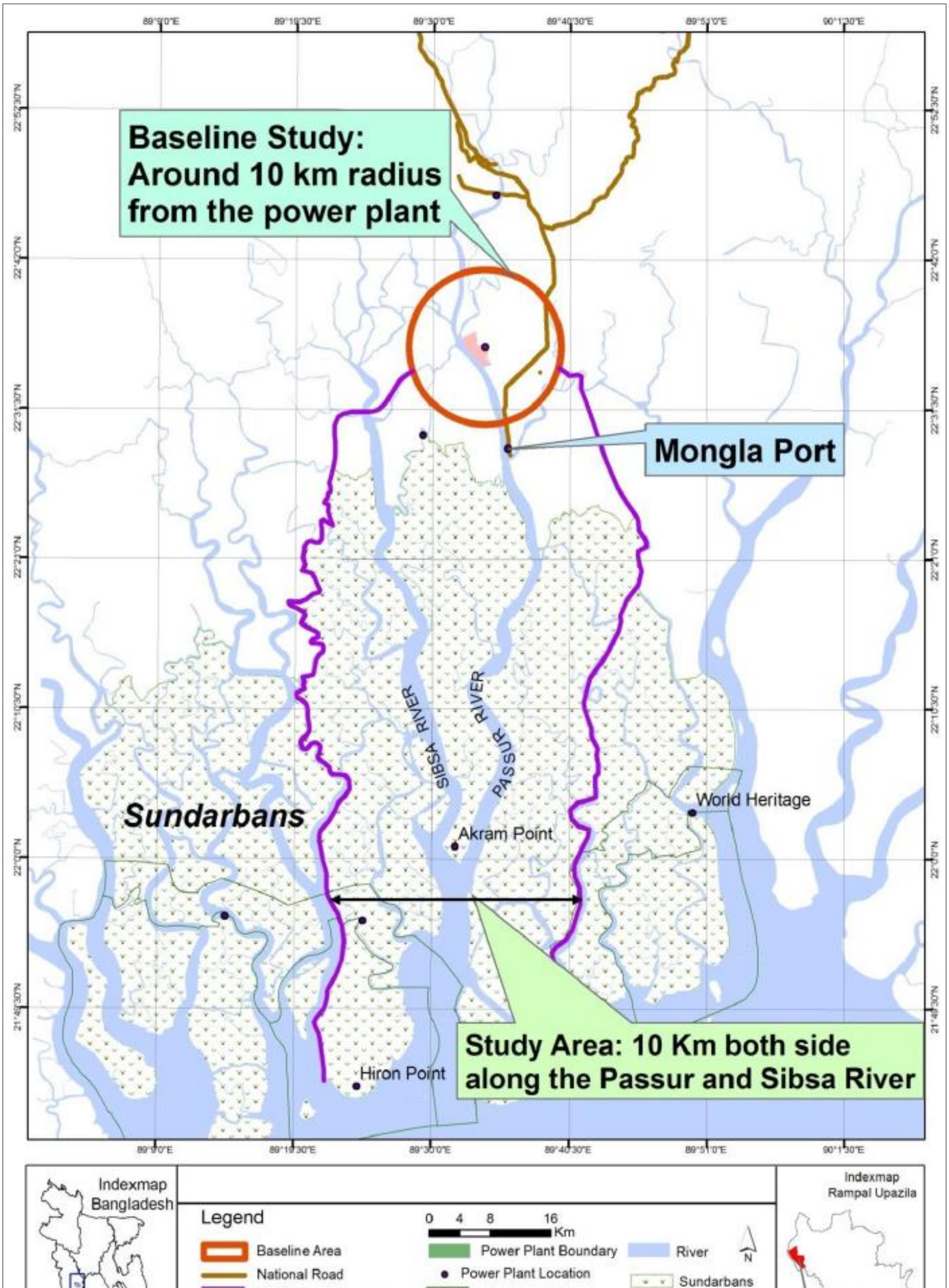


Figure 1.2: AOI of Environmental and Socio-economic Monitoring

1.4 Main Stakeholders

1.4.1 Forest Department

Monitoring of the Sundarbans Reserve Forest area need to be addressed as the conditions set out by the DoE. Hence, permission from the Forest Department is essential to carry out the said activities. The Forest Department has been providing the permission under certain conditions i.e. keeping close communication with the Forest Department, submission of the monitoring reports to the Forest Department along with the following activities:

- Inclusion of a Soil Scientist and a Botanist in the monitoring team,
- Monitoring of regeneration, in growths (seedlings), diseases and pests (if necessary, to carry out laboratory analysis),
- Monitoring of soil nutrients (macro, micro) and heavy metals,
- Monitoring of floral diversity, species richness and dominancy,
- Measurement of carbon content both above and below the ground level,
- Assessment of impact on canopy cover, leaves phenology, flowers behaviour, pneumatophore and crab hole conditions.

However, BIFPCL forwards each copy of the earlier quarterly monitoring reports to the Chief Conservator of Forest, Bangladesh Forest Department, Agargaon, Dhaka and Conservator of Forest, Khulna Circle, Boyra, Khulna. Similarly, the report of 32nd quarterly monitoring will also be forwarded to the same officials of the corresponding Departments.

1.4.2 Department of Environment (DoE)

The monitoring plans, indicators, parameters, location have been selected and arranged by incorporating the suggestion(s) and approval condition(s) from both the Power Plant EIA study and Coal Transportation EIA study. The BIFPCL forwards the monitoring reports and data to DoE on a regular basis (Monthly and Quarterly). The monitoring reports are also presented to the Environmental Clearance Committee of the DoE during renewal of the site clearance. In addition, one representative from the local DoE office is involved in each monitoring visit to accompany the monitoring team.

1.4.3 Bangladesh India Friendship Power Company (Pvt.) Limited (BIFPCL)

Bangladesh India Friendship Power Company (Pvt.) Limited (BIFPCL) is the Project Proponent of the proposed Power Project. The official(s) of BIFPCL has been assisting the study team from the beginning of the study. In addition, BIFPCL is thus far implementing the Environmental Management Plan (EMP) for ensuring environmental and social safeguarding of the Project surroundings including the Sundarbans Reserve Forest.

1.4.4 Local Community

The Project Affected Peoples (PAPs) has been included in each of the social environment-monitoring program. The changes in important socio-economic indicators were examined through Focus Group Discussions (FGDs), Key informant interview(s) and other informal discussions with the local people in different locations of the project influenced area.

1.4.5 Major Component of Monitoring Study

The Physical, Biological and Social aspects are monitored on regular basis and this quarterly monitoring report is furnished with the following subsequent chapters-

- Physical Environment covers monitoring of air quality, noise level, water quality, Soil and land resources, traffic management and the morphological study;
- Biological environment covers monitoring of fisheries resources, ecological resources and the Sundarbans Reserve Forest (SRF) health conditions;
- Socio-economic environment covers compensation, resettlement/rehabilitation, project related employment generation, labour and working condition, community health, security and safety, along with corporate social responsibilities.
- Environmental compliances monitoring includes Monitoring of Environmental and Social Management System Action Plan Implementation; Labour and working conditions; Community health, safety & security and Monitoring of biodiversity and sustainable management of living natural resources in and around the project area.

2. Physical Environment

2.1 Air Quality

Air is considered one of the major environmental components and in this connection, the parameters and monitoring locations of air quality were selected considering the major effects to be exerted by the power project activities during the pre-construction, construction, and operation stages. However, during the recent visit, all the preselected parameters and locations were monitored to observe major changes in air quality due to concurrent construction and supporting erection activities of the project.

2.1.1 Methodology

Particulate Matters (i.e., $PM_{2.5}$, PM_{10}, and SPM), SOx, NOx, CO and O_3 are expected to be generated from different phases i.e. pre-construction, construction, and operation activities of the Power Plant. However, the monitoring locations as well as the indicators for this study were selected during the EIA study based on a number of criteria e.g., the sensitivity of the receptors, project activities like movement of coal-carrying vessels, coal trans-shipment point; wind speed, wind direction, atmospheric deposition (Wet and Dry) and atmospheric stability classes etc.

2.1.2 Method of Sampling and Laboratory Testing

Respirable Dust Sampler (Model-Envirotech India APM-460 BL) and Fine Particulate Sampler (Model-Envirotech India APM-550) were used to collect air samples from the selected sites. The $PM_{2.5}$, PM_{10}, and SPM were tested by gravimetric method. The concentration was analyzed by West-Gaeke method. Likewise, the concentration of NO_2 was tested by Jacob and Hochheiser method and concentration of Carbon Monoxide (CO) and Ozone (O_3) were measured by Metravi CO-10 meter and Tongdy O_3 Monitor respectively.

2.1.3 Pollution Sources in the Sundarbans

The key sources of air pollution around Mongla Port area and project site can be considered as cement factories, non-regulated mechanized boats, cargo vessels and ships and other commercial activities. The non-regulated ships, mechanized boats, cargo vessels plying through the Sundarbans Reserve Forest (SRF) in connection with the Mongla Port operation; fishing activities; honey, Golpata and timber collection; tourism etc. could be big contributing sources of air pollutants i.e., Particulate matters ($PM_{2.5}$, PM_{10} and SPM), Oxides of Sulphur (SOx), Oxides of Nitrogen (NOx) and Green House Gases (GHGs) in the study area as well as across the Passur channel. However, an inventory of the existing emission types and sources for the study area has been provided in **Table A2** of **Appendix IV**.

2.1.4 Monitoring Locations

Air quality is assessed monitored at the fixed locations for each of the monitoring quarters. As per the recommendations of DoE and experts' panel, two additional locations were included along with the existing monitoring locations. The air quality monitoring activities are shown in **Figure 2.1** and monitoring locations are shown in **Figure 2.2**. Details of the monitoring plan are attributed in **Table 2.1**.

Figure 2.1: Acquisition of Air Quality Monitoring data

Table 2.1: Air Quality Monitoring Plan

Sl. No.	Monitoring Indicators	Locations	GPS Points	Frequency	Methods/ Tools/ Techniques
1	Particulate Matter ($PM_{2.5}$, PM_{10} and SPM) SO_X, NO_X, CO and O_3.	South West corner of the Project boundary	89°33'34.5"E; 22°34'33.8"N	Each Quarter of the year	Method of testing $PM_{2.5}$: Gravimetric
2		Proposed township area near Chimney location, Mauza: Sapmari Katakhali.	89°32'3.8"E; 22°36'32.5"N		Method of testing PM_{10}: USEPA (1997) Method 201 or 201A (as appropriate)
3		North West corner of the Project boundary (Kaigar Daskati)	89°33'51.8"E; 22°36'1.06"N		Method of testing SO_X: USEPA (2000) Method 6 or 6A or 6B or ISO (1998)
4		Barni, Gaurambha Union (4km North East from the chimney location)	89°34'37.7"E; 22°38'51.8"N		Method 11632 (as appropriate)
5		Chunkuri-2, Bajua Union (4km South West from the chimney location)	89°34'01.1"E; 22°32'3.3"N		Method of testing NOX: USEPA (2000) Method 7, 7A, 7B, 7C, 7D, or ISO (1993) Method 10396 (as appropriate).
6		Pankhali, Dacope, (4km North West from the Chimney location)	89°31'24.2"E; 22°36'6.7"N		
7		Mongla Port Area	89°35'50.4"E; 22°28'24.8"N		
8		Harbaria, Sundarbans	89°35'34.2"E 22°17'43.1"N		
9		Akram point, Sundarbans	89°30'54.1"E 22° '23.50"N		
10		Hiron Point, Sundarbans	89°27'53.2"E; 21°46'27.60"N		
11		Khulna city near Khan Jahan Ali Bridge	89°35'35.5"E; 22°46'36.8"N		
12		Project site-1 (Proposed Township area)	89º 33′ 13.7"E 22º35′43"N		
13		Access road bridge area	89°35'16.49" 22°34'37.11"N		

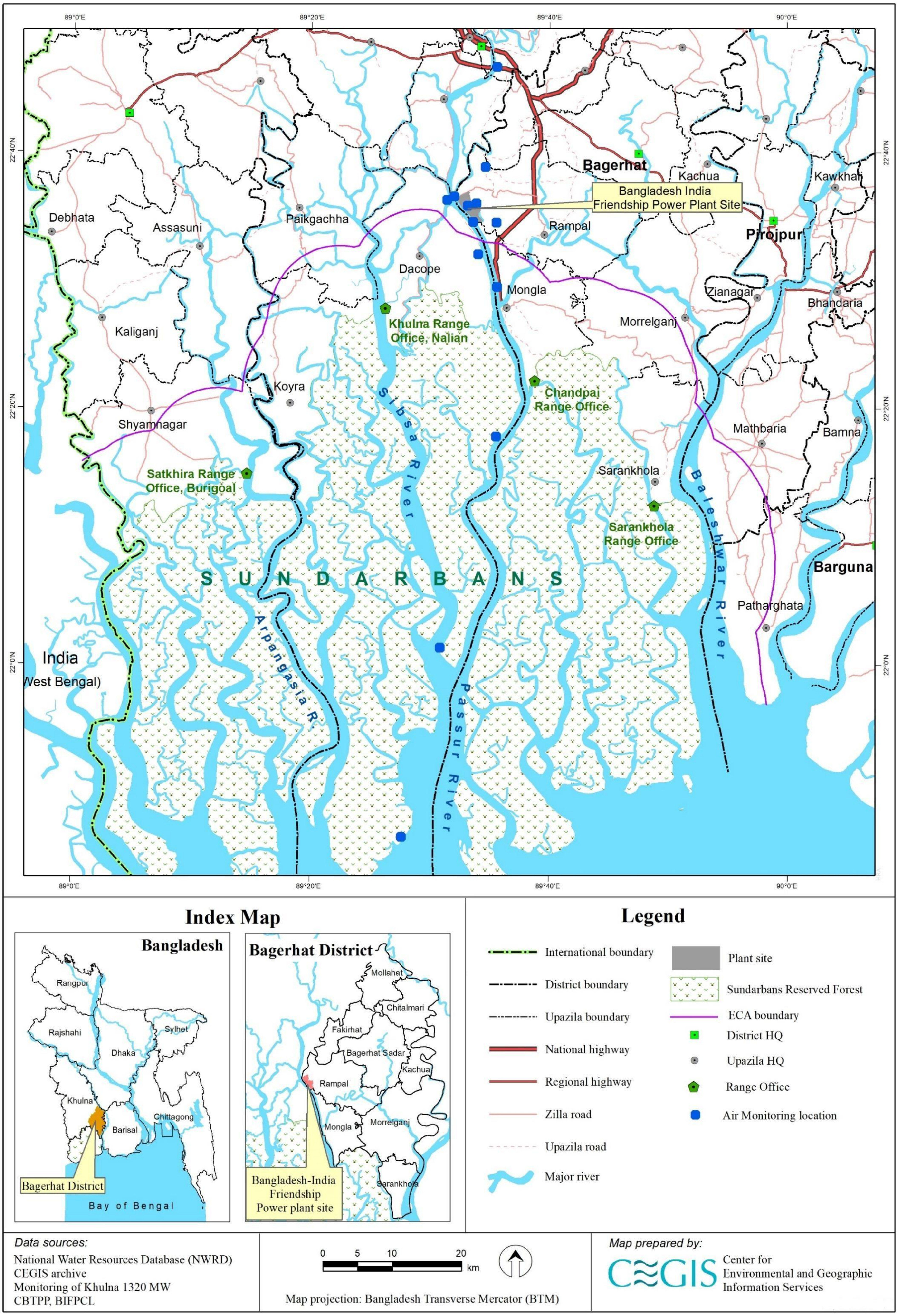


Figure 2.2: Air Quality Monitoring Locations

2.1.5 Status of Air Quality

During this monitoring tier, the maximum value (69.23µg/m^3) of $PM_{2.5}$ was found at the Padma Abashan area of the Power plant whereas the minimum value (28.19 µg/m^3) was recorded at Mongla Ghat area. On the other hand, PM_{10} concentration was found highest (94.28 µg/m^3) at Padma Abashan area the of Power plant and lowest (46.29 µg/m^3) at the Gaurambha area. Similarly, the concentration of SPM was also found highest (181.85 µg/m^3) at the Padma Abashan area of the Power plant and the minimum concentration (92 µg/m^3) was observed at the Mongla Ghat area.

On the contrary, the concentration of Sulphur dioxide (SO_2) in ambient air was found much lower than the Bangladesh standard limit of (365 µg/m^3) at all the sampling locations. However, among those, the maximum concentration (27.45 µg/m^3) was found at Township area while the minimum concentration (10.47 µg/m^3) was recorded at Koigardash kathir Char area. Similarly, the values of NOx were also observed well below than the Bangladesh standard value of 100 µg/m^3. During this monitoring period maximum concentration (40.28 µg/m^3) of NOx was found at Gaurambha area whereas the lowest concentration (20.47 µg/m^3) was recorded at Shapmari area. The contributor of such NOx emission may be from local human hauler, car, bus etc. Furthermore, during the monitoring period it was observed that the maximum values of CO (4 µg/m^3) and O_3 (59 µg/m^3) were measured at Padma abashan area though the results were found much lower than the standard value (10,000 µg/m^3 and 157 µg/m^3) set in ECR' 2005 respectively. From the measured values, it can be concluded that effect of seasonal variations on the surrounding environment may be the prominent reason for increasing or decreasing of the concentrations of the criteria pollutants for the corresponding air sheds.

Only $PM_{2.5}$ concentrations has been observed to be slightly exceeded at Padma Abashan area than the Standard as set in ECR'97 and subsequent amendment. Similarly, concentration of all other the criteria pollutants were also seen higher at Padma Abashan area than the other locations during the monitoring period. Though the concentration were found to be within the standard limit but specially to minimize the particulate matter as well as the other criteria pollutant's concentration inside the power plant, the authority may take the necessary initiatives as suggested in the EMP of the EIA study e.g. continuous or periodic water spraying on the connected road networks inside the power plant area, install water sprinkler system at the prominent infrastructures like office areas, township area etc. and the major construction area, strictly maintain the vehicular speed at the sensitive areas and properly maintain the EMPs as stated in the EIA study of the power plant. The monitoring results of 32nd monitoring program has been shown in **Table 2.2** and all the monitoring results across the monitoring periods are attached in **Table A1** of **Appendix IV.** The baseline emissions scenarios are appended in **Table A2** of **Appendix IV**.

Seasonal variations among the air quality parameters

The values of all the criteria pollutants as averaged for the corresponding locations for the corresponding seasons were found to be higher in Khan Jahan Ali Bridge area than the project influence area followed by the Sundarbans reserve Forest (SRF) area. On the other hand, the concentration of the measured parameters was found to be higher in winter seasons of the monitoring periods except for SOx, NOx which found to be higher in monsoon periods and CO concentration was found higher in post monsoon seasons. It can be mentioned here that the concentration was always observed to be much lower in SRF area than the other areas and never exceeded comparing to the standards set by DoE (ECR, 1997) (**Figure 2.3**).

Table 2.2: Air Quality Monitoring Results (32nd Quarterly Program)

Sl. No.	Location	Parameters (Concentration in µg/m³)						
		$PM_{2.5}$	PM_{10}	SPM	SO_2	NOx	CO	O_3
1	South-West corner of the project Boundary, Moidara	41.78	74.32	139.42	15.22	22.49	1	18
2	Propose Township area near Chimney location, Mouza-Sapmari Katakhali	36.71	68.79	158.14	13.96	20.47	1	8
3	North west corner of the project boundary (Koigardas Kathir Char)	54.16	63.26	132.77	10.47	23.96	0.6	8
4	Barni, Gaurambha Union 4 KM North-West from the Chimney location	31.43	46.29	98.15	18.42	40.28	1	10
5	Bauja Union 4km south west from the chimney location	48.94	86.48	165.58	14.82	26.42	1	13
6	Chalna Bazar Area, Dacope	42.57	71.22	128.98	19.71	29.44	2	39
7	Mongla Port area	28.19	51.66	92	20.33	31.63	0.2	13
8	Harbaria, Sundarban	43.27	51.04	110.28	13.76	39.23	1	24
9	Akram Point (Sibsa River)	58.43	77.69	141.37	21.81	38.3	0.3	41
10	Hiron Point, Sundarban	39.62	48.81	96.23	15.38	39.72	0.7	38
11	Khulna Khan Jahan Ali Bridge near toll plaza area	67.33	92.36	178.28	19.29	37.91	0.2	36
12	Township area	69.23	94.28	181.85	27.45	39.56	4	59
13	Taltola Bazar/BIFPCL (Project)	31.28	59.15	98.74	19.3	33.62	1	31
Standard (Air Pollution Control Rules, 2022)		**65**	**150**	**200 (ECR'97)**	**80**	**80**	**5000**	**100**

Source: CEGIS field survey, May, 2022; STD-Standard.*

Figure 2.3: Seasonal Variation of the Air Quality Parameters

Cluster analysis was performed to identify the grouping pattern of the criteria pollutants along with their corresponding locations. Euclidean distances were observed to measure the distances among the objects using as variables (annual average concentrations of the seven studied variables for every station). According to the dendogram (**Figure 2.4.**) Hiron point (L10), Akram Point (L9) and Harbaria (L8) represents the locations of minimum pollution level situated inside the Sundarbans Forest area and are away from the nuclei of Mongla industrial zone and the project site. On the other hand, Chalna (L6), Mongla Ghat (L7) and Khan Jahan Ali Bridge in Khulna (L11) are subjected to higher in population density and increased industrial activities among all sites whereas Maidara (L1), Shapmari (L2), Koigardashkatir char (3), Gaurambha (L4) and Bajua (L5) represent lower or moderate commercial activities **(Figure 2.4.**

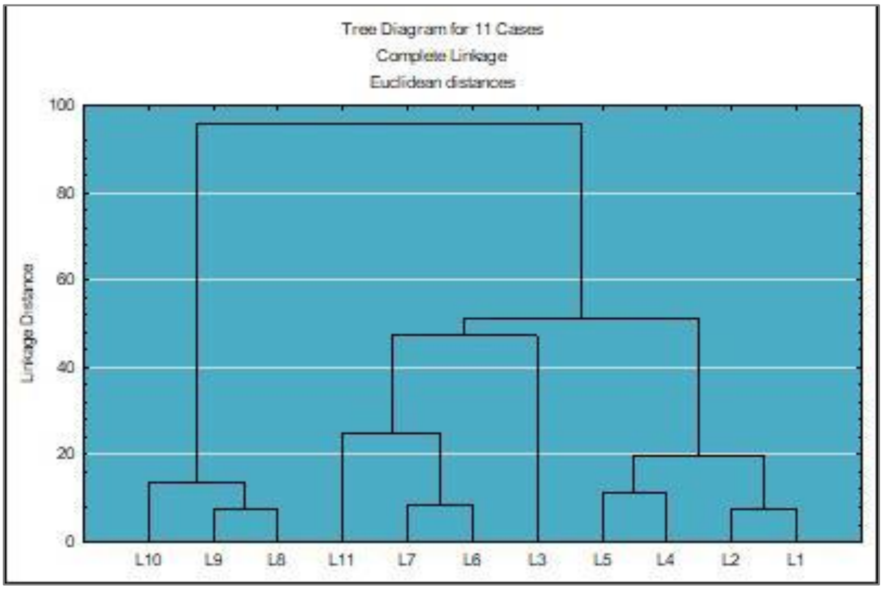


Figure 2.4: Dendogram of the Monitoring Stations using Euclidean Distance

2.1.6 Findings

According to the observed data it can be concluded that the concentration of major air pollutants was found comparatively lower in the Sundarbans area than that of the other monitoring locations. But due to the seasonal effect the concentration of the particulate matter was found to be slightly higher at Khan Jahan Ali Bridge area though is comparable to the standards set by DOE. However, major sources of criteria pollutants generation in and around the project site as observed were the piling activities, digging, tunnelling and burrowing works, jetty erection activities, major construction works, dust from unpaved roads and vehicle movement, construction materials and goods transportation activities through the roads and river Passur etc. Other sources of pollutants which may contribute to the existing pollution load are the small industries like cement works and refinery industries etc., diffuse sources like wood stoves, fires and wind generated dust etc.

2.2 Noise Quality

Noise is the sound that is not wanted by the perceiver, because it is unpleasant, loud, or interferes with hearing. By extension, in experimental sciences, "noise" refers to any random fluctuations of data that makes more difficult the perception of an expected signal. From a physics standpoint, noise is indistinguishable from sound as both are vibrations through a medium, like air or water. In general point of view, noise is the chaotic feeling of sound where many sound waves are mixed and difficult to distinguish a single signal. Noise is described by a weighted sound intensity (or level), which represents sound heard by the human ear and is measured in units called decibels (dBA). However, engine boats, trawlers, small barges, ships plying over the waterways, birds' chirping, stormy wind, falling of leaves from the trees and the wave breaking sound were the main source of noise generation in and around the Sundarbans. On the other hand, construction activities, the urban and rural vehicles i.e. buses, trucks, local human haulers, auto-rickshaws, motorized vans, motorbikes etc. were much noticeable in the outside of Sundarbans area.

2.2.1 Methodology

Noise levels were measured thrice in a day (morning, afternoon and evening) at seven locations and twice (morning & noon and noon & evening) at four locations around the project and study area. Each time, noise levels were recorded using sound level meter for five minutes of time span with an interval period of 30 second and the noise meter was properly set up and calibrated following the instruction manual. On the other hand, the monitoring locations were selected considering the sensitivity of the nearest receptors and accordingly, 6 (six) sites were selected in and around the Project area, 3 (three) sites were designated inside the Sundarbans Reserve Forest Area, 1 (one) at Mongla port area and the remaining one was selected at the Khan Jahan Ali Bridge toll plaza area near Khulna City (**Figure 2.5**).

Figure 2.5: Ambient Noise Acquisition

2.2.2 Sources of Noise in the study area

Among the sources of noise generation engine boats, trawlers, small barges, ships plying over the waterways, birds' chirping, stormy wind, falling of leaves from the trees and the wave breaking sound were the main source of noise generation in and around the Sundarbans. On the other hand, construction activities, the urban and rural vehicles i.e. buses, trucks, local human haulers, auto-rickshaws, motorized vans, motorbikes etc. were much noticeable around the project area.

2.2.3 Locations of Noise Level Monitoring

Out of (11) locations, three (03) locations were inside the Sundarbans, six (06) locations were in and around the Project site, one at Khan Jahan Ali Bridge and the remaining one was at Mongla Ghat area (**Figure 2.7** and **Table 2.3**).

Table 2.3: Noise Monitoring Plan

SL. No.	Monitoring locations	GPS points	Time of noise monitoring
1	South West corner of the Project boundary	89°33'34.5"E; 22°34'33.8"N	Morning, Noon and evening
2	Proposed township area near Chimney location, Mauza: Sapmari Katakhali	89°32'3.8"E; 22°36'32.5"N	Morning, Noon and evening
3	North West corner of the Project boundary (Kaigar Daskati)	89°33'51.8"E; 22°36'1.06"N	Morning, Noon and evening

SL. No.	Monitoring locations	GPS points	Time of noise monitoring
4	Barni, Gaurambha union (4km North East from the chimney location)	89°34'37.7"E; 22°38'51.8"N	Morning, Noon and evening
5	Chunkuri-2, Bajua Union (4km South West from the chimney location)	89°34'01.1"E; 22°32'3.3"N	Morning, Noon and evening
6	Pankhali, Dacope, (4km North West from the Chimney location)	89°31'24.2"E; 22°36'6.7"N	Morning, Noon and evening
7	Mongla Port Area	89°35'50.4"E; 22°28'24.8"N	Morning, Noon and evening
8	Harbaria, Sundarbans	89°35'34.2"E; 22°17'43.1"N	Morning and Noon
9	Akram point, Sundarbans	89°30'54.1"E; 22°'23.50"N	Morning and Noon
10	Hiron Point, Sundarbans	89°27'53.2"E21°46'27.60"N	Not monitored
11	Khulna city near Khan Jahan Ali Bridge	89°35'35.5"E; 22°46'36.8"N	Morning, Noon and evening

2.2.4 Status of Noise

In order to provide an overview of the observed noise data set, the average values for the respective locations have been appended in **Table 2.4** for ready reference; but the detailed noise level data have been attached in **TableC1, C2**, **C3, C4, C5, C6, C7, C8 and C9** respectively in the **Appendix IV**.

However, the Department of Environment of the People's Republic of Bangladesh, an agency under the Ministry of Environment and Forests has set up the standard of permissible limits of noise level at day time for different classified areas. According to Bangladesh Noise Pollution Control Rules (2006), the eleven monitored locations fall under different classified area like residential, commercial, mixed, silent and industrial class.

Observed noise level at *Chalna*, a commercial area located at a distance of 4 km to the north-west direction of the proposed chimney location was recorded as 59.08 dB whereas it's standard level is 70 dB **(Table: 2.4).** Levels of noise at *Kaigar Daskati (*48.60 dB) situated at the Gucchha Gram, a residential area located at north-west corner of the project area; Chunkuri-2 (48.91 dB) located at 4km south-west direction from the chimney location; *Maidara Khal* (50.53 dB), south-west corner of the project area and a residential area and; *Shapmar*i (49.76 dB), proposed township area didn't cross their corresponding standard limits (55 dB) of noise level **(Table: 2.4)**. The level of noise at *Barni (Gaurambha)* was found to be 47.23 dB which was 12.77 dB lower than that of standard limit (60 dB) of noise level for this location **(Table: 2.4)**. *Harbaria (49.37 dB)* and *Akram Point* (43.08 dB), the two ecologically silent zones were also not found to exceed the Bangladesh standard limit (50 dB) of their corresponding standard values (**Table: 2.4)**.

On the other hand, observed noise levels at Khan Jahan Ali Bridge (58.60 dB), a commercial zone, and Mongla Port (57.38 dB), an industrial zone, were also not found to exceed the Bangladesh standard limit of noise at their corresponding values (**Table: 2.4**). The standard noise limits for Khan Jahan Ali Bridge and Mongla Port during the day are 70 dB and 75 dB, respectively.

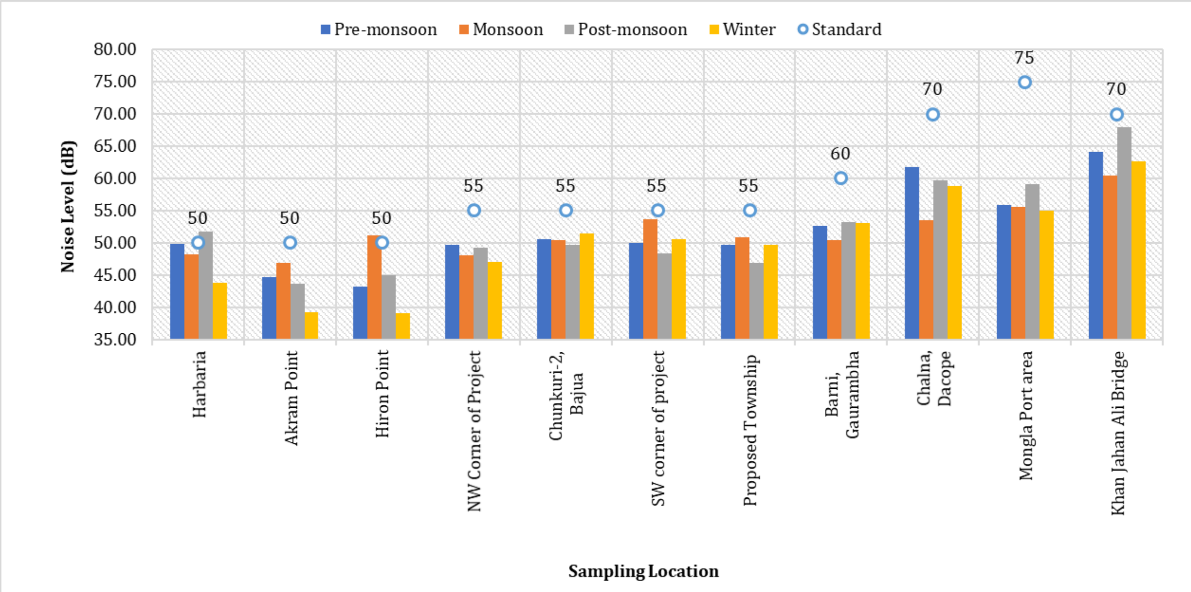


Figure 2.6: Status of seasonal variations of Noise level at different monitoring locations

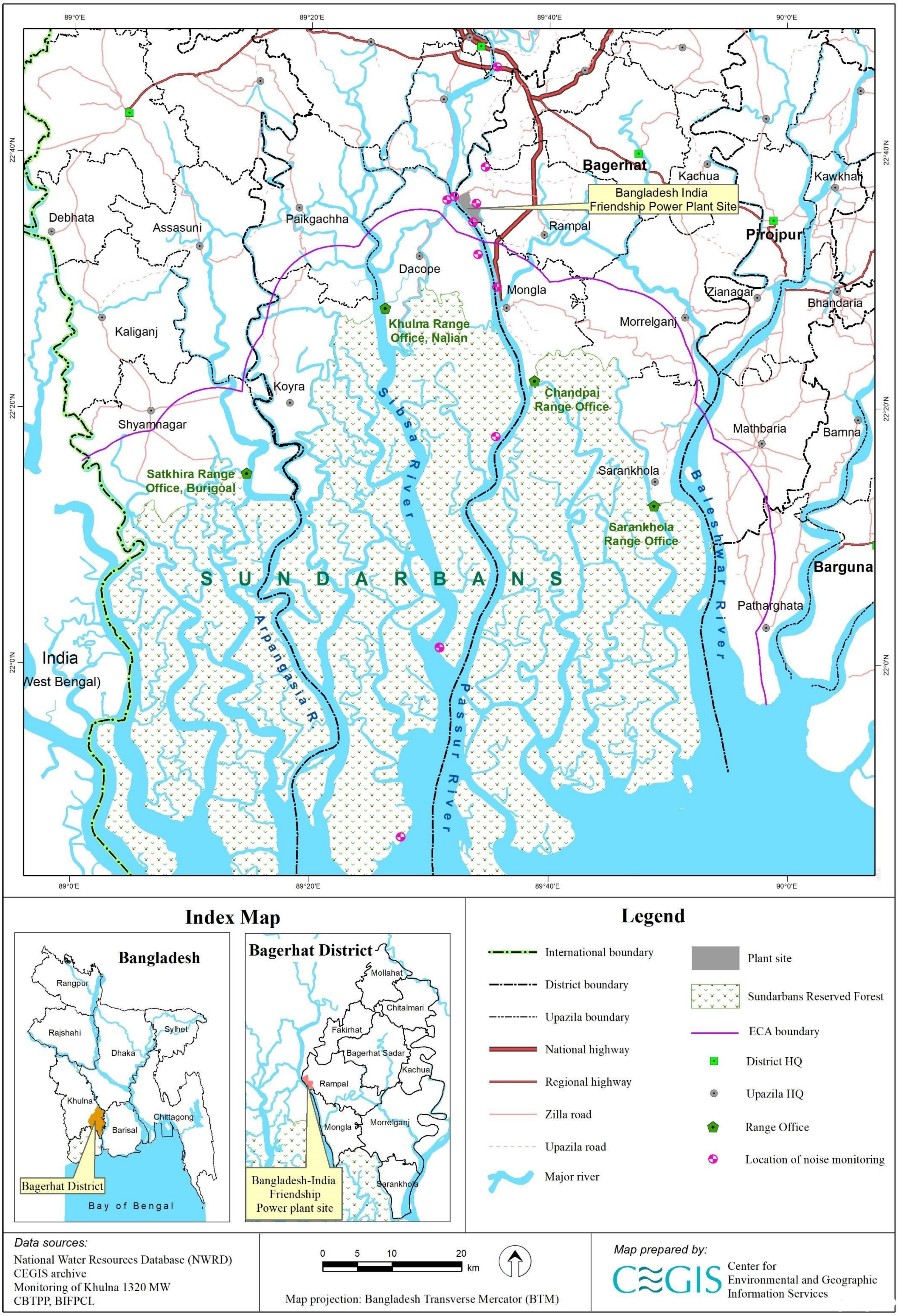


Figure 2.7: Noise Level Monitoring Locations

Table 2.4: Summary of the Ambient Noise Levels Recorded in Consecutive Monitoring Periods

Monitoring periods																				
Sl.	**Location**	**QM-32 (May-22)**	**QM-31 (jan-22)**	**QM-30 (Oct-21)**	**QM-29 (Aug-21)**	**QM-28 (Apr-21)**	**QM-27 (Jan-21)**	**QM-26 (Nov-20)**	**QM-25 (jul-20)**	**QM-23 (Feb-20)**	**QM-22 (Nov-19)**	**QM-21 (Jul-19)**	**QM-20 (Apr-19)**	**QM-19 (Feb-19)**	**QM-18 (Nov-18)**	**QM-17 (jul-18)**	**QM-16 (Apr-18)**	**QM-15 (Jan-18)**	**QM-14 (Oct-17)**	**Std* (dB)**
		Value (dB)																		
1	*Chalna, Dacope*	59.08	59.71	64.57	51.21	61.44	60.50	58.15	51.28	54.59	58.60	59.34	61.67	56.45	58.23	57.54	59.63	60.1	58.64	60
2	*NW Corner of the Project area (Kaigar daskati)*	48.60	48.82	49.59	50.11	49.50	51.42	48.48	43.37	45.42	51.11	55.18	56.85	50.75	58.82	45.63	47.90	49.3	46.95	60
3	*Chunkuri-2, Bajua*	48.91	49.02	46.87	50.36	51.31	47.05	45.91	48.75	55.44	55.27	59.36	51.68	50.18	48.69	47.54	52.93	51.4	50.44	60
4	*SW corner of the project area (Maidara)*	50.53	54.65	49.37	51.90	55.24	52.36	49.18	50.18	55.60	46.57	63.66	56.05	*55.79*	61.78	52.63	47.55	44.5	43.26	60
5	*Proposed Township area (Shapmari)*	49.76	50.03	47.17	53.84	52.05	49.09	44.45	53.72	48.95	54.88	54.53	58.83	*58.13*	50.68	44.25	50.81	53.3	43.93	60
6	*Barni, Gaurambha*	47.23	48.89	63.96	51.00	52.34	53.09	58.33	48.80	61.97	50.53	54.67	53.18	52.57	53.03	45.52	56.14	55.6	45.52	60
7	*Khan Jahan Ali Bridge, Khulna*	58.60	62.33	80.18	52.38	54.65	61.94	81.81	66.31	62.20	66.05	63.46	66.95	66.93	62.15	63.36	64.87	61.7	62.47	70
8	*Mongla Ghat area*	57.38	55.95	76.86	55.49	53.63	56.52	76.92	64.41	61.06	57.25	62.01	63.99	66.18	55.97	60.97	62.95	59.8	49.66	75
9	*Harbaria, Sundarbans*	49.37	47.31	57.02	NM	48.04	44.40	54.54	49.97	43.94	44.10	44.90	48.43	49.67	48.80	50.28	47.93	44.4	46.48	50
10	*Akram Point, Sundarbans*	43.08	37.41	43.29	44.62	43.42	37.85	42.23	51.04	36.59	44.86	44.84	42.33	46.45	41.00	45.20	45.39	40.1	42.38	50
11	*Hiron Point, Sundarbans*	NM	36.29	52.27	50.94	NM	38.85	50.70	NM	40.34	40.28	NM	NM	39.21	39.4	NM	NM	38.8	39.79	50

Sl.	Location	Monitoring periods													
		QM-13 (Apr-17)	QM-12 (Jan-17)	QM 11 (Oct-16)	QM 10 (Jul-16)	QM 9 (Apr-16)	QM 8 (Jan-16)	QM 7 (Oct-15)	QM 6 (Jul-15)	QM 5 (Apr-15)	QM 4 (Jan-15)	QM 3 (Oct-14)	QM 2 (Jul-14)	QM 1 (Apr-14)	Std* (dB)
		Value (dB)													
1	*Chalna, Dacope*	61.62	59.29	65.51	52.42	65.08	66.07	65.12	49.77	57.08	53.28	54.63	52.87	68.13	60
2	*NW Corner of the Project area (Kaigar Daskati)*	47.19	44.52	55.48	52.65	50.79	50.96	41.94	41.56	44.67	35.25	41.92	NM	51.89	60
3	*Chunkuri-2, Bajua*	50.44	55.31	51.55	53.4	44.49	53.62	47.43	40.66	47.05	49.29	51.39	52.55	57.76	60
4	*SW corner of the project area (Moidara)*	43.25	45.19	48.51	65.37	54.50	60.44	42.7	43.75	43.58	36.03	45.95	47.6	49.2	60
5	*Proposed Township area (Shapmari)*	42.65	42.62	43.69	55.79	53.37	53.77	50.52	46.75	41.47	41.47	41.92	46.68	48.75	60
6	*Barni, Gaurambha*	44.83	49.05	54.91	56.75	53.97	59.16	55.16	46.18	54.17	43.6	49.78	49.95	58.84	60
7	*Khan Jahan Ali Bridge, Khulna*	56.72	55.57	60.95	63.77	65.85	68.45	64.25	52.82	73.45	61.72	66.28	60.8	71.7	70
8	*Mongla Port area*	47.61	48.95	49.86	52.86	49.88	52.7	47.01	39.61	48.15	38.69	60.5	53.84	61.24	75
9	*Harbaria, Sundarbans*	54.10	41.18	55.33	52.9	44.55	45.2	50.75	35.03	65.37	34.38	55.3	56.13	40.88	50
10	*Akram Point, Sundarbans*	44.30	38.08	41.77	47.96	42.95	42.95	49.6	NM	54.86	34.32	43.98	47.9	40.94	50
11	*Hiron Point, Sundarbans*	NM	42.29	44.38	NM	43.11	NM	46.06	NM	47.84	37.37	47.98	51.29	38.63	50

*Note: All values are in decibels (dBA), QM- Quarter Monitoring, NM – Not Monitored, *Std- Standard as defined in National Noise Control Rules, 2006*

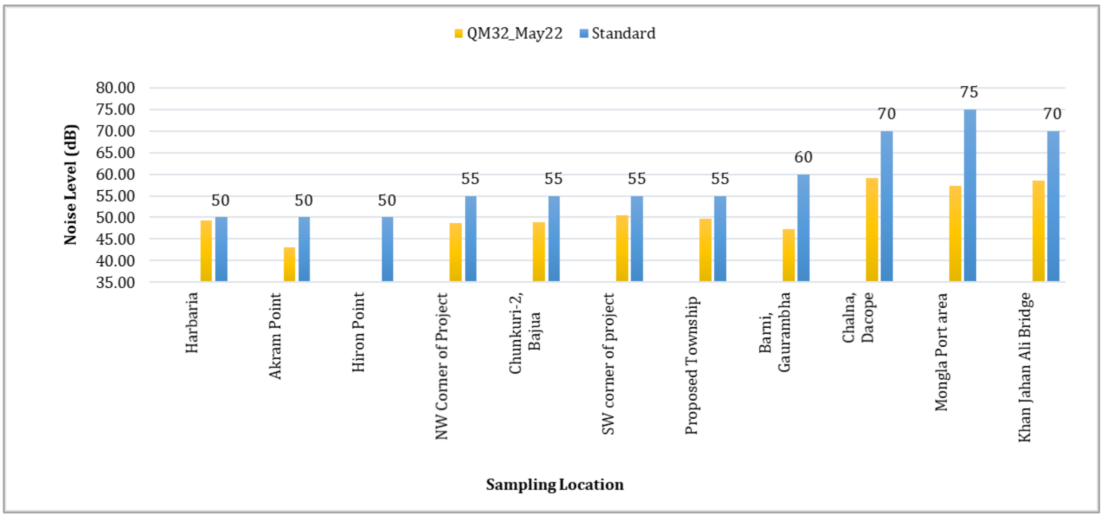


Figure 2.8: Status of average Noise Level at the Monitoring Locations (32nd quarter)

2.2.5 Findings

The noise generation sources in the study area can mainly be divided into two types; one is natural and the other one is anthropogenic. Natural sources of noise generation were birds' chirping, stormy wind, wave breaking on the shoreline, howling of leaves and so on. On the other hand, traffic mobilization, industrial activities, vessels movement within the rivers and local vehicles were the anthropogenic sources of noise. However, the observed noise level was not found to exceed the Bangladesh standard limit of noise level.

2.3 Water Quality

An updated water quality status of the Passur-Sibsa River system and adjacent water bodies have been depicted in this section. Both the national and international guidelines were followed and adopted for sample collection as well as analysis. This report includes physical water quality parameters collected during 32nd quarterly monitoring tier (May, 2022) and the tested results obtained from the laboratory up to January, 2022 (31st quarterly monitoring). A number of identical parameters as well for the selected locations to understand the effect of power plant activities on the surface and groundwater quality which may affect the aquatic life of the adjacent river, the Sundarbans Forest ecosystem and community health in and around the power plant area. Due to the rough weather condition the team could not reach to Hiron point of Sundarbans and hence the water quality of Hiron Point was not assessed for this monitoring tier.

2.3.1 Methodology

The procedure for water quality monitoring covers selection of water quality parameters, identification of sampling locations, determination of sampling frequency and evaluation criteria of the monitoring parameters etc. Standard approaches and methodologies were followed for the above-mentioned events. Both the surface and groundwater quality status of the water bodies in and around the Power Plant and the Sundarbans area were examined. The monitoring results are presented and compared with the national standards (ECR, 1997 and all available amendments). The samples were collected from eighteen (17) pre-selected locations (14 locations for surface water along the Passur River from Chalna to Sibsa River near Akram Point, Maidhara River near the project area and 3 locations for groundwater i.e. project area, Kapashdanga and Rajnagar). However, the standard sampling procedure was followed for both surface and groundwater sampling to reduce the possibility of any error. Each sample was labelled at the time of sampling. The selected monitoring locations for the monitoring program are shown in **Figure 2.9**. The details of the monitoring plan covering sampling locations, geographical locations, frequency and analysis techniques of sampling for surface and groundwater are given in **Table 2.5** and **Table 2.6** respectively.

Table 2.5: Groundwater Quality Monitoring Parameters, Locations and Plan

Sl. No.	Locations	GPS (Decimal Degree)		Frequency	Methods/Monitoring indicators/ Techniques
		Easting	Northing		
1	Near Proposed Township Area	89.566139°E	22.594167°N	Quarterly	In-situ testing of physical water quality parameters was done by Horiba U-50 multi-meter. Preservation of samples and Laboratory analysis were carried out at DPHE Central Laboratory and BCSIR
2	Rajnagar	89.576056°E	22.612528°N		
3	Kapasdanga	89.563000°E	22.622528°N		

2.3.2 Selection of Parameters

The selected parameters for Ground water quality monitoring include pH, Temperature, Dissolved Oxygen (DO), Total Dissolve Solids (TDS), Total Hardness (TH), Chemical Oxygen Demand (COD), Salinity, Nitrate (NO_3^-), Phosphate (PO_4^{3-}), Sulphate (SO_4^{2-}), and Heavy Metals (As, Pb, Hg) etc.

Surface Water Quality Parameters

The selected parameters for surface water and groundwater quality include Temperature, pH, Dissolved Oxygen (DO), Total Dissolve Solids (TDS), Total Suspended Solids (TSS), Total Hardness (TH), Turbidity, Chemical Oxygen Demand (COD), Salinity, Nitrate (NO_3^-), Phosphate (PO_4^{3-}), Sulphate (SO_4^{2-}), Heavy Metals (As, Pb, Hg), and Oil and Grease (for surface water). The parameters were categorized into 4 groups:

- Physical and aggregate properties i.e. pH, Temperature, Salinity, Hardness, TDS, TSS, Turbidity, Oil & Grease (for surface water);
- Inorganic non-metallic constituents i.e., DO, NO_3^-, PO_4^{3-} and SO_4^{2-};
- Aggregate organic constituents i.e. COD and
- Heavy metals i.e. As, Pb and Hg;

However, some additional parameters i.e., PAH (Polycyclic Aromatic Hydrocarbons), TOC (Total Organic Carbon) and TC (Total Carbon) were included in connection with the surface water quality monitoring study (3 locations as per recommendation of the DoE approved coal transportation study monitoring framework as well as approval condition no. 26 and accordingly the analysed data of the additional parameters are recorded and submitted to the DoE and other concerned authorities periodically.

Groundwater Quality Parameters

The selected parameters for Ground water quality monitoring include pH, Temperature, Dissolved Oxygen (DO), Total Dissolve Solids (TDS), Total Hardness (TH), Chemical Oxygen Demand (COD), Salinity, Nitrate (NO_3^-), Phosphate (PO_4^{3-}), Sulphate (SO_4^{2-}), and Heavy Metals (As, Pb, Hg) etc.

Table 2.6: Surface Water Quality Monitoring Parameters, Locations and Plan

Sl no	Monitoring Indicators	Locations	GPS (Decimal Degree)		Frequency	Methods/Tools/ Techniques
			Easting	Northing		
1	pH, Temperature, Salinity, DO, BOD_5, TDS, TH, TSS, COD, Nitrate, Sulphate, Phosphate, Arsenic, Lead, Mercury, Oil & Grease, PAH, TOC, TC	Left Bank of Passur River at 100m u/s of North West corner of the Project boundary	22.604167°N	89.527222°E	Quarterly	In-situ testing of physical water quality parameters was done by Horiba U-50 multi-meter. Preservation of samples and Laboratory analysis were carried out at DPHE Central Laboratory and BCSIR
2		Middle of Passur River at 100m u/s of North West corner of the Project boundary	22.607222°N	89.528889°E		
3		Right Bank of Passur River at 100m u/s of North West corner of the Project boundary	22.609361°N	89.531417°E		
4		Left Bank of Passur River at Project Site-Jetty	22.584833°N	89.543583°E		
5		Middle of Passur River at Project Site-Jetty	22.587667°N	89.546472°E		
6		Right Bank of Passur River at Project Site-Jetty	22.589333°N	89.548222°E		
7		Left Bank of Passur River at South West corner of the Project boundary	22.572889°N	89.552583°E		
8		Middle of Passur River at South West corner of the Project boundary	22.574611°N	89.557500°E		
9		Right Bank of Passur River at South West corner of the Project boundary	22.575667°N	89.559861°E		
10		Maidara river at the South East corner of the project boundary at Ichamoti-Maidara confluence	22.600639°N	89.565611°E		
11		Maidara river near proposed Township area	22.577472°N	89.569250°E		
12		Passur river at Passur – Ghasiakhali confluence	22.473861°N	89.602361°E		
13		Passur river at Harbaria of the Sundarbans Reserve Forest area	22.295250°N	89.593139°E		
14		Passur river at Akram Point of the Sundarbans Reserve Forest Area	22.024120° N	89.514220°E		
15		Passur river at Hiron point of the Sundarbans Reserve Forest Area	21.774183°N	89.464778°E		

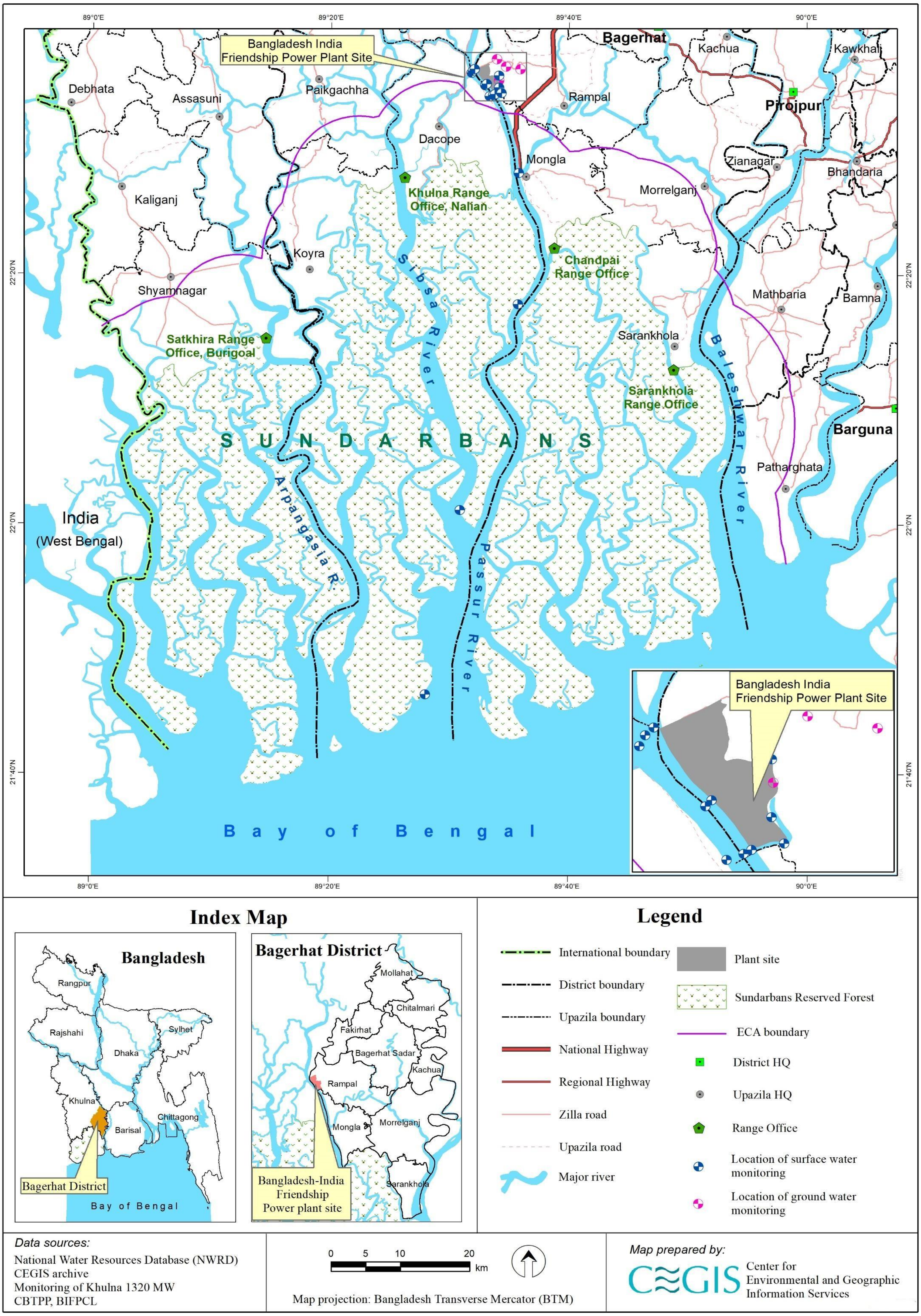


Figure 2.9: Surface Water and Groundwater Quality Monitoring Location

2.3.3 Surface Water Sampling Procedure

The study area is highly influenced by tidal variation. Hence, temporal and spatial variations of tides were considered in sampling procedure. Surface water samples were collected at a distance of 50-100m away from the riverbank and at a depth of 6cm below the water surface during low tides or relative slag period after the low tide for all parameters except oil and grease. The non-acidified sampling bottles were rinsed with respective water samples before sampling. Acidified sampling bottles were used for heavy metal (As, Pb, Hg) sample collection. On the contrary, Analysis of BOD_5 has been discarded because of constraints to maintain the proper procedure to collect, preserve and lab testing the water samples at ideal condition. All samples were preserved as per standard procedure. The in-situ testing of the selected water quality parameters is shown in **Figure 2.10**.

On the other hand, the groundwater samples were collected from hand operated tube wells after 5-7 minutes of water extraction. Each sampling bottle was rinsed with respective water samples before sample collection and storing. Acidified sampling bottles were used for heavy metals (As, Pb, Hg) sample collection and were preserved following standard procedure.

Figure 2.10: Water sample collection and Insitu Testing of Water Parameters

2.3.4 Water Quality Parameter Analysis Techniques/Methods

Water quality parameters were analysed as per the procedure of American Public Health Association (APHA) standard. The analysis procedures of different parameters along with the standards are given in **Table 2.7**.

Table 2.7: Testing Methodology of Water Quality Parameter

Parameters	Methods/Measuring Tools	Unit	BD Standard (ECR 1997)
Temperature	Horiba U-50 multimeter	^0C	20 - 30
pH	Horiba U-50 multimeter	-	6.5-8.5
TDS	Horiba U-50 multimeter	ppm or mg/L	2100 (SW), 1000 (GW)
TSS	Horiba U-50 multimeter	ppm or mg/L	150 (SW), 10 (GW)
Salinity	Horiba U-50 multimeter	ppt	-
DO	Horiba U-50 multimeter	ppm or mg/L	6
BOD_5	5-Day BOD Test at 20^0C	ppm or mg/L	50 (SW)
COD	Closed Reflux Method	ppm or mg/L	200 (SW), 4.0 (GW)
Total Hardness (as $CaCO_3$)	Titrimetric	ppm or mg/L	200-500
Ortho-Phosphate (PO_4^{3-})	UV-VIS Spectrophotometers	ppm or mg/L	6

Parameters	Methods/Measuring Tools	Unit	BD Standard (ECR 1997)
Nitrate (NO_3^-)	UV-VIS Spectrophotometers	ppm or mg/L	10
Sulphate (SO_4^{2-})	UV-VIS Spectrophotometers	ppm or mg/L	400
Oil and Grease	Liquid-liquid extraction with hexane, treatment with silica gel and gravimetric determination	ppm or mg/L	10 (SW)
Arsenic (As)	Atomic Absorption Spectrophotometers–Hydride Vapor Generating (AAS-HVG)	ppm or mg/L	0.05
Lead (Pb)	Atomic Absorption Spectrophotometers–Graphite Furnace (AAS-GF)	ppm or mg/L	0.05
Mercury (Hg)	Mercury Analyzer	ppm or mg/L	0.001
PAH	APHA 5310.B	mg/L	N/A
TOC and TC	APHA 5310.B	mg/L	N/A

2.3.5 Water Quality Reporting Arrangement

Water quality status of the adjacent water bodies of power plants and the Sundarbans Reserve Forest (SRF) are being observed since April, 2014. The 32nd quarterly report covers yearly variations of winter (January, 2022) for chemical water quality status and yearly variations for Pre-monsoon in physical water quality status (May, 2022) and are presented and compared with the ECR' 1997 Standards. To do so, all sampling points are clustered in five different sampling sites considering homogenous characteristics of the sampling points as well as the type of ecosystem touching the sample points. The clustered sample monitoring sites and the logical explanation of the clusters are presented in the following T**able 2.8.**

Table 2.8: Monitoring Sites and Characteristics

SL	Monitoring sites	Site Characteristics
(a)	**Power plant & adjacent areas**	Total 11 sampling points were selected and the values were averaged to represent the water quality status of power plant adjacent surface water bodies. These 11 sampling points are situated in the same river system or network and embedded within 1km radius of power plant area. Therefore, this study makes the clusters to represent the water quality status of the areas in a more explainable and understandable way.
(b)	**Mongla-Passur confluence**	This monitoring site is situated at least 13km downstream of the power plant. This point is a confluence area of Passur river and Mongla-Ghasiakhali channel. Around this point, the terrestrial ecosystem is mostly dominated by agricultural lands followed by rural settlements.
(c)	**Harbaria**	Harbaria site is situated around 15 km downstream of the Mongla/Ghasiakhali and Passur confluence. This site is dominated by Sundarbans Forest and heavily influenced by the activities of mother vessels unloading and small cargo movement for carrying of clinker, coal and LPG gas. It is to be noted here that the tidal effects of Bay of Bengal is very prominent here.
(d)	**Akram point**	Akram point is located around 35 km downstream of the Harbaria point. This site is situated at the confluence point of Passur and Sibsa river. This site is completely dominated by deep forests ecosystems. Influenced by tidal effects of Bay of Bengal.
(e)	**Hiron Point**	Hiron point is the furthest point of this surface water-monitoring scheme. This point is at 25 km downstream of the Akram point. Deep forests and marine habitats are the main characteristics of the site. This site is completely exposed to the Bay of Bengal.

Status of Surface Water Quality

In-situ tested parameters

The in-situ tested results obtained up to 32nd monitoring period (May, 2022: Pre monsoon season) are described below:

pH

During the visit, pH values in the monitoring sites were ranged between 7.81 and 7.5. The pH values of surface water monitoring data were found within the standard limit of ECR, 1997 Standard (6.5-8.5). The highest value (7.81) was found at Left Bank of Passur River at Project Site-Jetty and lowest (7.5) was observed at Passur River at Maidhara River area. However, the values indicated slightly basic in nature during this pre-monsoon.

However, the pH values of monsoon and post-monsoon seasons were found to be comparatively lower than those of the pre-monsoon and winter seasons (**Table B.1: Appendix-IV**) which might be due to the decreased river water level during pre-monsoon and winter season triggered by inadequate rainfall and insufficient inflow from U/S (upstream) of Passur-Sibsa RS (River System) which has also been reported by others (*Rahman et al., 2013*). Fluctuations in pH values during different season of the year can be attributed to factors like removal of CO_2 by photosynthesis through bicarbonate degradation, dilution of waste with freshwater, reduction in salinity and temperature, and decomposition of organic matter (*Rajasegar, 2003*).

Seasonal variations in pH concentrations among the selected monitoring sites during the quarterly monitoring programs of the previous years of Passur-Sibsa RS are presented in **Figure 2.11** and the observed dataset are attached in **Table B.1** of **Appendix- IV**.

Temperature

During the monitoring period the temperature varied from 31^0C -29^0C among the monitored sites. The maximum water temperature (31^0C) was recorded at Passur River at Harbaria of Sundarbans. According to the ECR' 1997, 30^0C water temperature is still be tolerable by the aquatic organisms in tropical environment. The surface water temperature largely depends on daily weather condition (*Bartram. J. et. al., 1996*). According to the seasonal weather pattern of Bangladesh the temperature drops to a minimum level during winter and reach to the maximum level which is also applicable for the water temperature. Recorded temperatures indicated that there was spatial variation among the monitoring sites even in the same seasons.

Seasonal variations in surface water temperature in the selected sites during the quarterly monitoring of previous years are presented in **Figure 2.12** and all the observed dataset are attached in **Table B.2 of Appendix- IV**.

Salinity

The observed salinity concentration ranged between 8.3 ppt. and 2.1 ppt. during the last monitoring season. The maximum salinity (8.3 ppt.) was observed at Akram point in the Sundarbans while minimum was at Maidara River near Power plant jetty area. Insufficient fresh water flow from upstream section of the river system increase the salinity concentrations during winter and pre-monsoon seasons.

In general, high salinity from sea water increased water salinity in the direction of downstream to upstream. In the monitored river systems, the highest salinity was observed in pre-monsoon season followed by winter season where monsoon reflects the lowest. Freshwater flow from upstream and the dominated towards the sea water are the main reason of low salinity concentration in monsoon.

However, the water salinity data in the selected sampling stations of Passur-Sibsa RS of the previously monitoring periods are presented in **Figure: 2.13** and all the observed dataset are attached in **Table B.3 of Appendix- IV**.

Dissolved Oxygen

The standard DO level for the fisheries in aquatic environment is more than 5.0 mg/L (ECR'1997). In the last pre-monsoon season, DO values ranged from 5.0 mg/L to 7.8 mg/L which was found within the permissible limit recommended by DoE. In general, higher DO level was observed in monsoon and post-monsoon season basically for heavy rainfall and freshwater availability. Seasonal variations of DO at the monitoring sites of Passur-Sibsa RS for the monitoring periods are shown in **Figure: 2.14** and all the observed dataset are attached in **Table B.4 of Appendix- IV.**

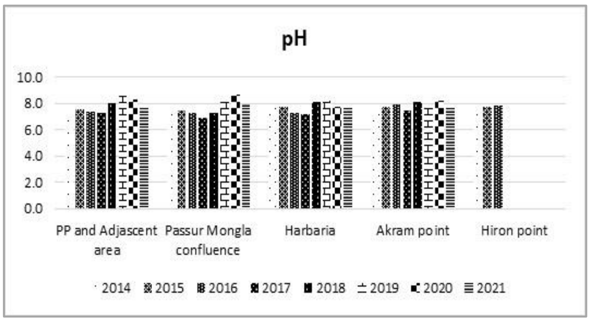


Figure 2.11: Variations in pH values in different monitoring sites

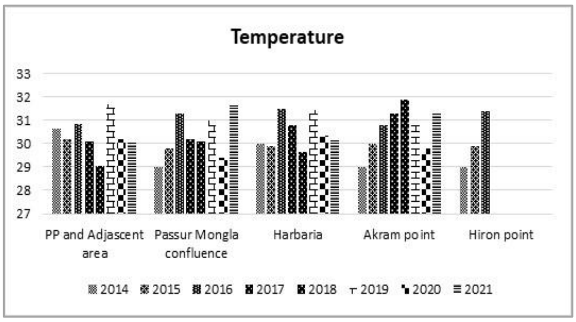


Figure 2.12: Variations in Temperature values in different monitoring sites

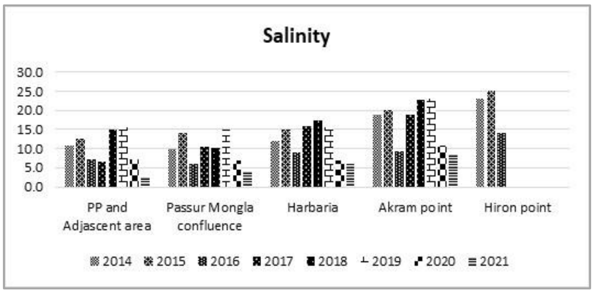


Figure 2.13: Variations in Salinity values in different monitoring sites

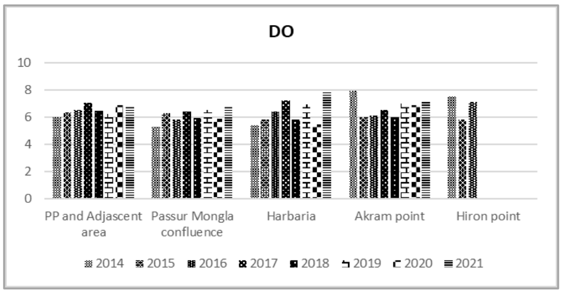


Figure 2.14: Variations in DO values in different monitoring sites

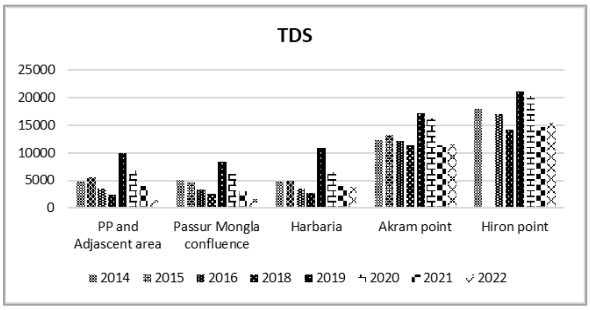


Figure 2.15: Variations in TDS values in different monitoring sites

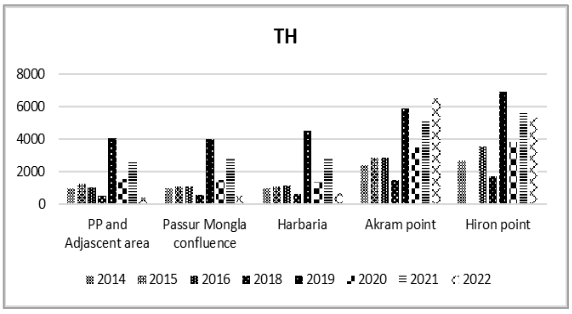


Figure 2.16: Variations in TH values in different monitoring sites

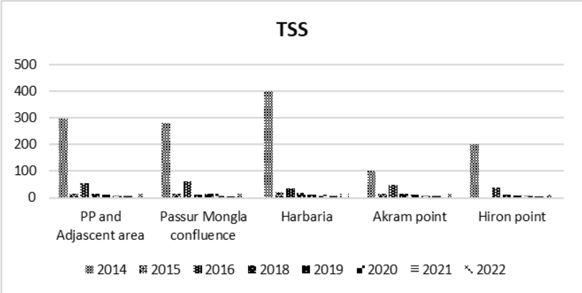


Figure 2.17: Variations in TSS values in different monitoring sites

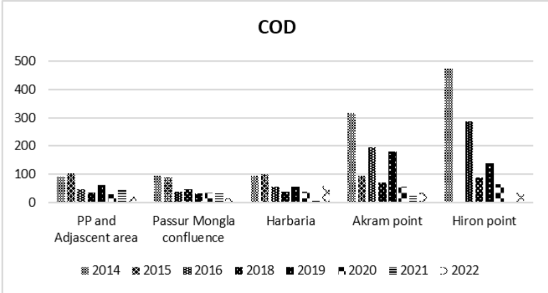


Figure 2.18: Variations in COD values in different monitoring sites

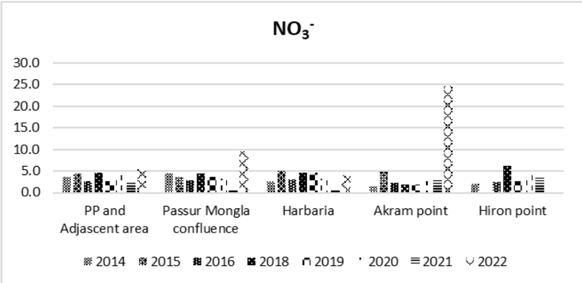


Figure 2.19: Variations in Nitrate values in different monitoring sites

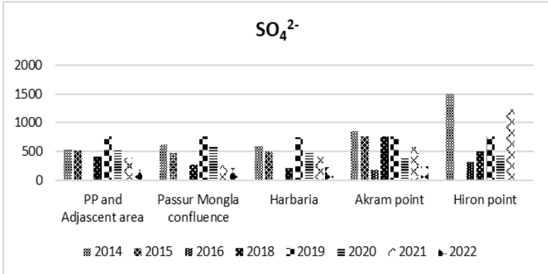


Figure 2.20: Variations in Sulphate values in different monitoring sites

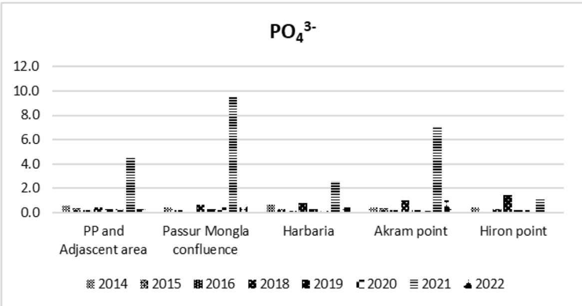


Figure 2.21: Variations in Phosphate values in different monitoring sites

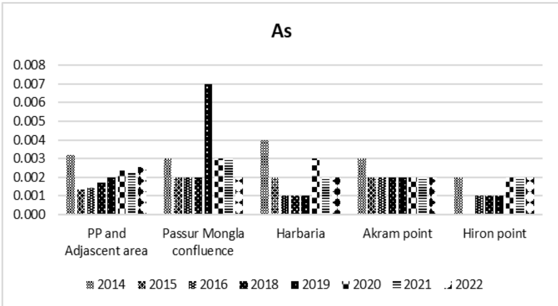


Figure 2.22: Variations in Arsenic values in different monitoring sites

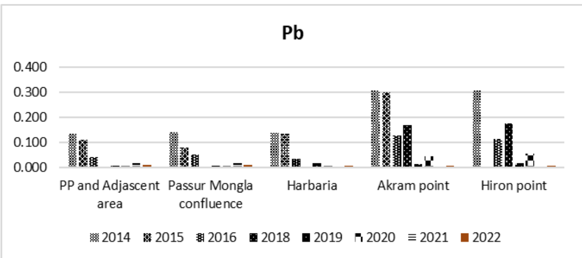


Figure 2.23: Variations in Lead values in different monitoring sites

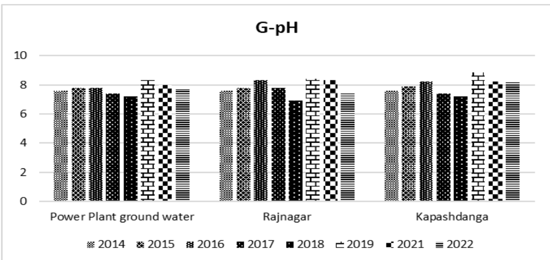


Figure 2.24: Variations in G-pH values in different monitoring sites

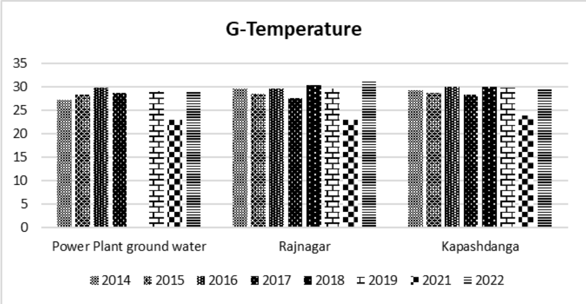


Figure 2.25: Variations in G-Temperature values in different monitoring sites

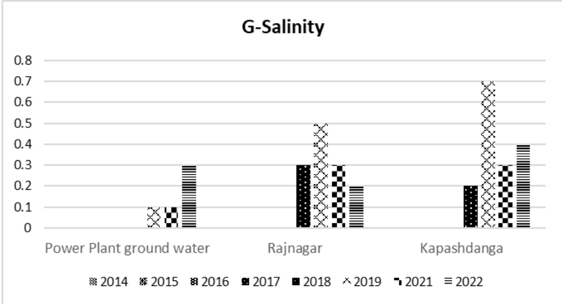


Figure 2.26: Variations in G-Salinity values in different monitoring sites

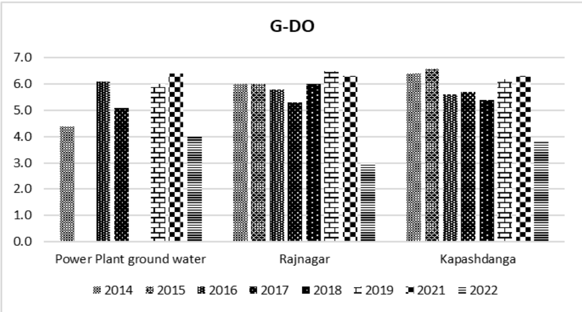


Figure 2.27: Variations in G-DO values in different monitoring sites

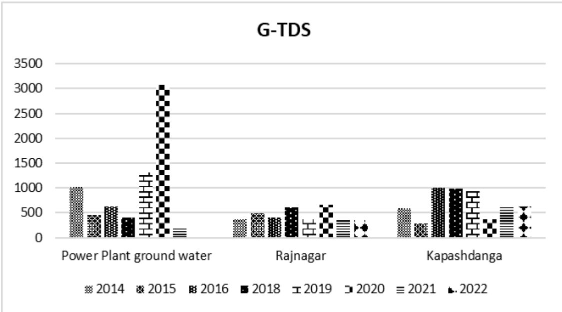


Figure 2.28: Variations in G-TDS values in different monitoring sites

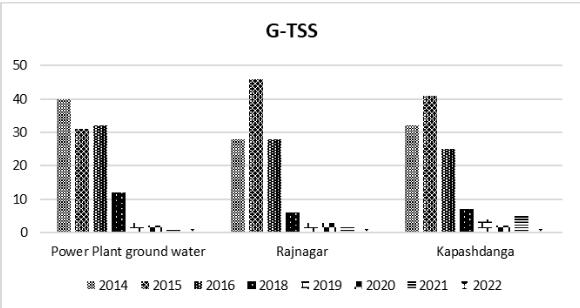


Figure 2.29: Variations in monsoon G-TSS values in different monitoring sites

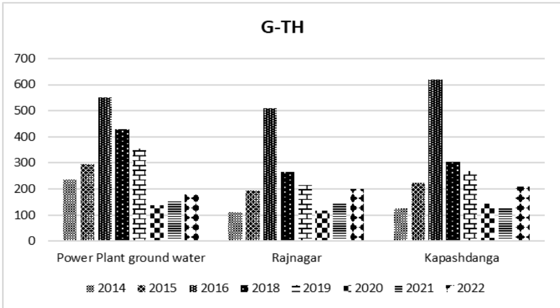


Figure 2.30: Variations in monsoon G-TH values in different monitoring sites

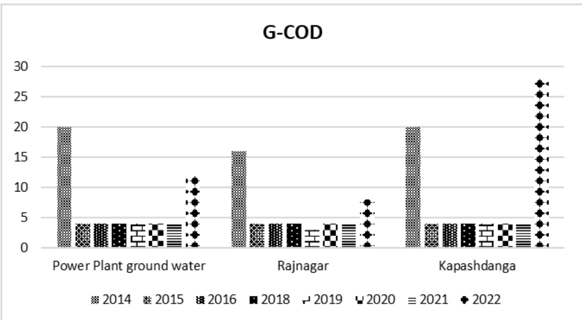


Figure 2.31: Variations in G-COD values in different monitoring sites

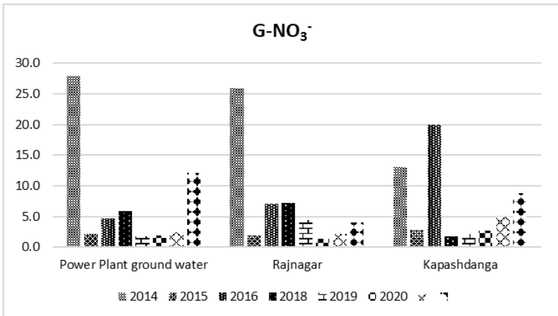


Figure 2.32: Variations in G-Nitrate values in different monitoring sites

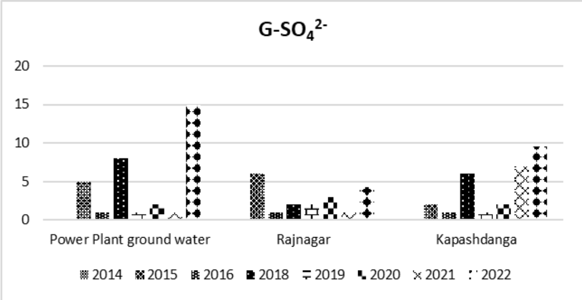


Figure 2.33: Variations in monsoon G-Sulphate values in different monitoring sites

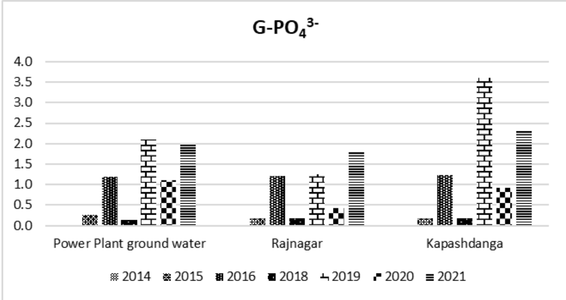


Figure 2.34: Variations in monsoon G-Phosphate values in different monitoring sites

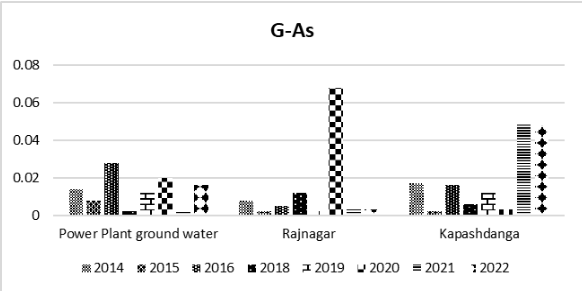


Figure 2.35: Variations in monsoon G-Arsenic values in different monitoring sites

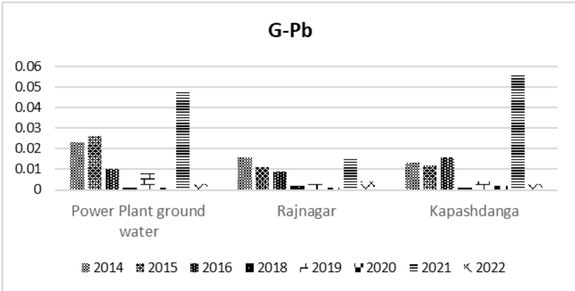


Figure 2.36: Variations in monsoon G-Lead values in different monitoring sites

Laboratory tested parameters

The laboratory tested results obtained up to 31st monitoring period (January, 20212: winter season) are described below:

Total Dissolved Solids (TDS), Total Hardness (TH) and Total Suspended Solids (TSS)

TDS mainly indicates the presence of various kinds of minerals like ammonia, nitrate, phosphate, alkalis, some acids, sulphates and metallic ions etc., in water which comprise both colloidal and dissolved solids in water (Tareq. M. S. *et al.,* 2013). During the last visit, the TDS values were found to be ranged between 1210-15500 mg/L (**Figure 2.15**). Among the monitoring sites highest TDS was observed at Hiron point (15500 mg/L) and lowest was found at Right Bank of Passur River at 100m u/s of North West corner from the Project boundary (1210 mg/L). In general, the TDS values increase in Pre-monsoon and winter seasons than in monsoon and post-monsoon periods which could be the contribution of less rainfall and decreased upstream flow to its dilution in the rainy season (Izonfuo and Bariweni, 2001)[1]. TDS values in Passur River increased as it progressed towards the Sea. Therefore, Hiron point showed the highest TDS with respect to remaining sampling point. **Table B.8**: **Appendix IV**). Regarding spatial variation, towards downstream of the River System, usually high TDS concentrations due to tidal influence of the Bay of Bengal that contains lots of salts and other nutrients.

Total Hardness (TH) follows similar pattern as that of TDS e.g., high TH during pre-monsoon and winter season as the higher the TDS, the higher the nutrients and therefore higher occurrence of TH.

[1] Izonfuo W. A and. L Bariweni 2001.The effect of urban runoff water and human activities on some physicochemical parameters of the Epie creek in the Niger Delta. J. Appl. Sci. & Enviro. Mgt, **5(1)**: 4755.

Insufficient freshwater supply due to low rainfall during winter and pre-monsoon period increase the TDS concentrations in the Passur-Sibsa RS. Seawater contains huge quantity of minerals including calcium and magnesium, which make the water hard. During the monitoring period the TH values were found to be ranged between 310 mg/L to 6500 mg/L. In the deep Sundarbans hardness always found to be comparatively higher than the standard value of surface water (**Figure 2.16**). Generally, water hardness is found to be higher in monsoon season but in Passur River, it is found to be higher in pre-monsoon and winter season due to the saline water intrusion toward upstream (Rahman et al., 2013).

Total Suspended Solids (TSS) include solid materials of organic and inorganic in origins, which are normally suspended in water. In the Passur-Sibsa RS, the suspended matters generally contain sand, clay, silt and loam. TSS concentrations among the monitoring sites varied from 11 mg/L to 17 mg/L as observed in the last monitoring results. TSS values recorded during the last winter period found to be within the permissible limit of 150 mg/L (ECR, 1997). In 2014, TSS reached more than 150 mg/L at Mongla-Passur Confluence due to the oil spillage incident occurred at 9th December, 2014 (**Figure 2.17**). After that, the issue was not found any more, and the water bodies reinstated its properties naturally. Above all, in the Passur-Sibsa RS, TSS showed consistency in the concentrations of suspended matters.

Generally, in the Passur-Sibsa RS, TSS was found to be higher in post-monsoon and winter seasons than those of pre-monsoon and monsoon which may be due to relatively low precipitation and less upstream freshwater flow, urban runoff, industrial wastes, bank erosion, bottom feeders (such as carp), algae growth or wastewater discharges.

The status of TDS, TH and TSS of Passur River in the observed winter seasons at different monitoring sites are presented in **Figure 2.15, 2.16** and **2.17** respectively and all the observed dataset are attached in **Table B.7**, **Table B.8** and **Table B.9** of **Appendix- IV.**

Chemical Oxygen Demand (COD)

COD is an indicator of organic pollution, which is caused by the inflow of natural organic loads, domestic, livestock and industrial wastes, which contain elevated levels of organic pollutants (Ayati, 2003). In fact, the higher the organic matter, the higher will be the decomposition and hence there will be a higher demand of O_2 in the water body.

COD concentrations varied from 8 mg/L to 60 mg/L during the last post-monsoon season (**Figure 2.18)**. The highest value was found at Harbaria while the lowest value was found in Right Bank of Passur River at 100m u/s of North West corner from the Project boundary. The higher values of COD indicate high level of organic matter in the river water (Sivasubramanium, 1999). **Figure 2.18** indicates that, organic loads are higher in the deep forests of Sundarbans than the upstream areas especially the power plant and its adjacent areas. Deep forests supply many organic loads in the river while upstream loads as well increase the organic materials concentrations in huge at the downstream of the RS. COD concentrations of all the monitoring sites found slightly higher than the Draft ECR’ 2017 (25 mg/L).

Over the year, COD concentration was found to be higher in pre-monsoon followed by winter as these seasons had insignificant rainfall comparing to those of other seasons and which actually increased the density of organic matter. In monsoon, higher discharge diluted the COD load of the river water, which in turn reduced COD concentration in post monsoon. All observed values of COD are shown in **Figure 2.18** and the completely monitored dataset are provided in **Table B.5** of **Appendix- IV.**

Nitrate, Sulphate and Phosphate

During monsoon the highest nitrate value was found to be 24.7 mg/L at Akram point and lowest value was found to be 1.1 mg/L at Left Bank of Passur River at South West corner from the Project boundary. Higher nitrate concentration has been found in monsoon period across the Passur-Sibsa RS, which would be the result of surface run-off, agricultural run-off, atmospheric deposition and domestic wastes dumping together with industrial pollution from upstream.

On the other hand, during the monitoring tier sulphate concentration was found to be higher in Harbaria (246 mg/L) and lowest (81 mg/L) at Right Bank of Passur River at Project Site-Jetty. In general, sulphate (SO_4^{2-}) concentration is higher in seawater as well as in coastal river due to tidal influence. The monitored dataset substantiates this fact i.e., SO_4^{2-} concentration of Passur-Sibsa RS increases in the direction of upstream to downstream. However, this variation is visible clearly in monsoon and pre-monsoon seasons only. Freshwater availability from upstream makes this variation.

On the other hand, PO_4^{3-} concentrations was found highest (1.03 mg/L) during the last monitoring period. However, the recorded low phosphates value during dry seasons might be attributed to the limited flow of upstream freshwater, high salinity and utilization of phosphate by phytoplankton, stated by Senthilkumar et al., 2002; Rajasegar, 2003 (**Table B.11**).

NO_3^-, SO_4^{2-} and PO_4^{3-} concentrations at different monitoring sites are shown in **Figure 2.19**, **Figure 2.20** and **Figure 2.21** and all the observed dataset are given in **Table B.10**, **Table B.11** and **Table B.12** of **Appendix- IV**.

Heavy Metals

Arsenic (As) concentrations varied between 0.002 to 0.003 mg/L. During the monitoring, the results again fitted with the said range. Seasonal variations in arsenic were due to seasonal differences in riverine input and the intrusion of water masses (Yuan, et al., 2021). Higher As concentration at Hiron point in 2020 might be due to the less rainfall and higher seawater intrusion. On the other hand, the concentration of Pb ranged from 0.005 to 0.014 mg/L (**Figure 2.23**). Dissolved Pb is very harmful to aquatic organisms due to bioaccumulation, it increases in body tissue of organisms (Rompas, 2010). On the contrary, the values of Mercury (Hg) revealed consistency among all the monitoring points in all the seasons in all monitoring quarters. The values never exceeded 0.001 mg/L. In the last winter period, the concentrations also remain same. All the observed data are found to be within the permissible limit (0.05 mg/L) as per ECR, 1997.

The average value of As and Pb concentrations at different monitoring sites of the consecutive monitoring quarters for winter season are presented in **Figure 2.22** and **2.23** and all the observed dataset are given in **Table B.13**, **Table B.14** and **Table B.15** of **Appendix- IV**.

Oil and Grease

In order to measure the concentration of oil and grease in Passur-Sibsa River, samples were collected at five locations during low tide from the surface layer and analysed following the standard testing method of APHA. The concentration of oil and grease are presented in **Table-B.6** of **Appendix-IV.** During monsoon and post monsoon periods, the concentration of Oil and Grease were found lower than that of winter and pre-monsoon season. It appears from the data that Passur and Sibsa river system recorded high concentration of oil and grease in winter period in 2014, which might be due to accidental oil spillage occurred on December 9, 2014. An amount of 350,000 litres (Philips, 2014) of furnace oil had spilled in the river and spread over an area of 350 km^2 (Welle, 2014). During the monitoring period in winter, Oil and grease was found <2.0- mg/L for all the monitoring sites. Plying of motorized boats, launches and other tourist boats, Navy boats and fishing boat at Dublar char could be the reasons of Oil and Grease in that areas. Moreover, for the seasonal fishing at sea, the engine boats and other fishing boats contributes huge amount of oil and grease in the river water.

Total Organic Carbon and Total Carbon (TC)

Total Carbon (TC) represents all the carbon in the sample, including both inorganic and organic carbon. Total Organic Carbon (TOC) is the amount of carbon found in an organic compound and is often used as a non-specific indicator of water quality or cleanliness of pharmaceutical manufacturing equipment. Total Inorganic Carbon (TIC) often referred to as inorganic carbon (IC), carbonate, bicarbonate, and dissolved carbon dioxide (CO_2).

This study only considers TOC, which is very important in detecting contaminants in drinking water, cooling water, water used in semiconductor manufacturing, and water for pharmaceutical use. However, three sites of Project Jetty, Harbaria and Hiron Point were monitored for TOC concentrations. During the monitoring tier TOC concentration was found highest across the Project jetty area i.e. 21.2 mg/L. On the other hand, the highest TC was found to be 544 mg/L at HIron Point. Observed surface water is safe from TOC and TC contaminant so far (**Table B.28: Appendix IV**).

PAHs (Polycyclic aromatic hydrocarbons)

During the last monitoring (monsoon), the PAHs was undetectable near the Project jetty site, Harbaria and at the Hiron point. It indicates that there were no PAHs pollution until now in the Passur-Sibsa RS (**Table B.27: Appendix IV**)

Findings

Passur River is highly influenced by tidal effects. Tidal penetration in the Passur River depends on seasonal change, upstream flow and catchment water discharge. However, the physico-chemical properties of Passur iver changes with the tidal intrusion in different seasons. During 32nd quarterly monitoring, pH was found slightly basic in nature. Salinity, Temperature and Dissolved oxygen level was found in fair and favourable for the aquatic life forms. During the 31st quarter (post-monsoon, 2021), TDS and TH has been relatively same with respect to the same seasons of last consecutive years. Nitrate (NO_3^-) level remained relatively lower. The phosphate (PO_4^{3-}) was found within the safe limit of aquatic organisms. In case of metal pollution, no variation was recorded for As, Pb and Hg concentration and even no issues as well. Oil & grease concentration was found less than 2.0 mg/L at all sites which is less than the recommended concentration (10 mg/L) for Inland Surface Water.

2.3.6 Status of the Groundwater quality

In-situ tested parameters

The in-situ tested results obtained up to 32nd monitoring period (May, 2022: Winter season) are described below:

pH and Temperature

The values of pH and temperature of groundwater in the monitored sites complied with the drinking water quality standards as specified in ECR, 1997 (6.5-8.5 and 20-30^{0}C respectively). The pH values during 32nd monitoring scheme were found to vary from 7.7-8.2. When it comes to increasing drinking water alkalinity, various chemicals and pollutants are known to cause high pH levels. If the soil or bedrock around groundwater sources includes carbonate, bicarbonate, or hydroxide compounds, those materials get dissolved and travel with the water. These mineral deposits also increase the alkalinity of the water. On the other hand, the temperature was recorded between 29^{0}C -31^{0}C. No significant differences have been observed against the previously monitored periods of the same seasons results. Temperature were found more or less consistent with the previously respective season's data. However, the monitoring results of pH and temperatures (monsoon) of selected sites are presented in **Figure 2.24** and **2.25** the observed dataset of pH and Temperature are attached in **Table B.16** of **Appendix- IV**.

Salinity and Dissolved Oxygen (DO)

Groundwater salinity concentration in all the monitoring sites were found to be increasing trend with respect to previous years during post-monsoon period. High ground water extraction, ground water salinity intrusion or surface saline water percolation may be the key reason for increasing the level of salinity into ground water over the years for Rajnagar and Kapashdanga. (**Table B.18: Appendix- IV**). However, during the monitoring period, highest salinity was found at Kapashdanga (0.4 ppt.) and lowest at Power plant area (0.2 ppt.).

DO values ranged between 2.99-4.0 mg/L during this monitoring season. DO concentrations were found to be within the permissible limit of ECR, 1997 (6.0 mg/L) in power plant groundwater and other monitoring sites. A slight low DO concentration in drinking water might only reduce the taste of water. Higher DO level makes water tastier but causes corrosion to the supply pipe.

All monitoring results of salinity and DO of the selected monitoring sites are presented in **Figure 2.26** and **2.27** and all the observed dataset of DO and Salinity are attached in **Table B.17** of **Appendix- IV** respectively**.**

Laboratory tested parameters

The laboratory tested results obtained up to 31st monitoring period (Jan, 2022: post-monsoon season) are described as follows:

TDS, TSS and TH

The highest TDS value of 620 mg/L was recorded in Kapashdanga tube well, followed by Rajnagar (350 mg/L) and Project area (0.86 mg/L). Which complied completely with the ECR' 1997 (1,000 mg/L) (**Figure 2.28: TDS**). TSS also known as non-filterable residue, are the solids (minerals and organic material) which remain trapped on a 1.2μm filter (U.S.EPA, 1998). During the 31st monitoring period, the TSS concentrations was recorded 1.0 mg/L at all the monitoring sites, which complied within the Standard for Drinking Water, Bangladesh (TSS: 10mg/L, ECR, 1997) (**Figure 2.29: TSS**). TSS was found much higher than the drinking standard quality particularly at Rajnagar during the pre-monsoon in 2017 and 2018.

On the other hand, TH concentrations of the three monitored spots varied from 180mg/L to 210mg/L during the last winter period. The maximum value was found at Kapashdanga and and lowest at pwer plant area. The drinking water collected from the monitoring sites complied with standard limit (200-500 mg/L) of water hardness set by the ECR' 1997 during the monitoring tier.

Groundwater TDS, TSS and TH values of the consecutive winter periods are presented in **Figure: 2.28, 2.29** and **2.30** and all the observed dataset are attached in **Table B.18** and **B.19** of **Appendix- IV**.

Chemical Oxygen Demand

The Bangladesh standard for COD in drinking water is 4.0 mg/L. Monitoring results completely breached with the Bangladesh Standard for COD concentrations for every site in the last winter period as like the year 2014 and 2015. However, the highest value of COD was found at Kapashdanga drinking water (28.0 mg/L). Increasing of organic or inorganic compounds or ion in the ground water may be the major cause for increasing COD in the ground water during winter in the monitoring areas which may be triggered by the decreased groundwater recharge.

The COD concentrations of all the pre-monsoon period monitoring sites are given in **Figure 2.31** and all the observed dataset are attached in **Table B.20** of **Appendix- IV**.

Nitrate, Sulphate and Phosphate

Natural nitrate levels in groundwater are generally very low (typically less than 10 mg/l NO_3^-), but nitrate concentrations increase due to human activities, such as agriculture, industry, domestic effluents. The sources of nitrates pollution in groundwater are cultivation in areas where the soil layer is relatively thin, or has poor nutrient buffering capacity, or where there are changes in land use; over fertilization of crop for intensification of agricultural activity; spread cultivation of crops which require high fertilizes doses and which leave the soil bare over long periods (maize, tobacco and vegetables); drainage systems which lead to drainage of fertilizers; intensive agricultural rotation cycles involving frequent ploughing and extensive areas of bare soils during winters; organic fertilizers form animal husbandry and increased urbanization. Among the monitoring tiers, the NO_3^- values were found to be highest during the monsoon of 2018 though it was found to be within the standard limit set by ECR'97. However, during last winter period, the nitrate values were found to be highest (12.09 mg/L) at Power plant area and lowest in Rajnagar (4.02 mg/L).

On the other hand, Sulphate (SO_4^{2-}) results were found complying with the Bangladesh Standard for Drinking Water Quality (400 mg/L) from the beginning of the monitoring study. During the last winter period, highest (14.94 mg/L) values was found in power plant area and lowest (4.22 mg/L) in Rajnagar area.

In addition, the concentrations of PO_4^{3-} were ranged between 0.6mg/L and 1.4mg/L, which was within the standard limit of 6.0mg/L (ECR'1997). PO_4^{3-} concentrations actually have both spatial and temporal variations but which is minor in the interest of this monitoring objectives as well as drinking purpose by the community resides there. The observed winter seasons NO_3^-, SO_4^{2-} and PO_4^{3-} concentrations of groundwater are presented in **Figure 2.32, 2.33** and **2.34** and all the observed dataset are attached in **Table B.21, B.22,** and **B.23** of **Appendix- IV.**

Arsenic (As), Lead (Pb) and Mercury (Hg)

According to Bangladesh Standard (ECR, 1997), the maximum acceptable concentration of Arsenic (As) in groundwater is 0.05 mg/L. The As concentrations among all the monitoring locations ranged between 0.003 mg/L and 0.048 mg/L. During the last winter period Pb concentration was found to be exceeded the permissible limit as specified in the (0.001 mg/L for Pb). Highest Pb concentration was found at Rajnagar (0.004 mg/L). less than 0.001 mg/L for Hg). The concentration of Pb showed only spatial variation to some extent in some seasons (**Figure 2.36: Lead**). However, the water of the tube-wells was found suitable for drinking purpose in terms of metal pollution status. The observed values of As and Pb in all the winter seasons are presented in **Figure: 2.35** and **2.36** and all the observed dataset of As, Pb and Hg are presented in **Table B.24, B.25 and B.26** of **Appendix-IV**.

Remarks

This concluding remark represent that the physical characteristics of groundwater quality is still in good condition with slight variation in pH and salinity. The reason being saline water intrusion and infiltration due to excessive withdrawn of groundwater by the surrounding communities during the dry season. In addition, evaporation also responsible for this slight salinity in groundwater. Project activities are not related to this sort of changes in salinity. Chemical characteristics of the groundwater quality are also found relatively good.

2.4 Land and Agricultural Resources Monitoring

2.4.1 Methodology of land resources monitoring

Monitoring of selected indicators very crucial for better management of land resources in the study area. Plot/land use, soil fertility/nutrient status, soil contamination with heavy metals and soil salinity are considered as the major indicators for land resources monitoring. It is also assumed that during the operation phase of the power plant fly ash and other air borne pollutants may deposit on the surrounding agriculture land, which ultimately pollute the study area soil. Before that (during pre-construction and construction stage), only natural phenomenon's are responsible to alter soil parameters.

Sampling Frequency

The frequency of monitoring for land resources data collection has been considered twice in a year. So, plot wise agricultural and land resources monitoring is accomplished in April and October in each year. Accordingly, agriculture production related data was collected during this monitoring field visit.

Monitoring Indicators

The continuous monitoring had given an opportunity to observe seasonal change along with spatial change of selected indicators of sampling plots. The selected indicators are soil reaction (pH), soil salinity (EC), Organic matter (OM), base cations Ca, Mg, K and Na, status of macro nutrients (N, P and S), status of micro nutrients (B, Fe, Mn and Zn) and presence of heavy metals (Pb and Cd). Sodium absorption ratio (SAR), exchangeable sodium percentage (ESP) can be calculated from the analysed data. It can also be mentioned that the structural change of soils in the sampling plots may also be identified from these data. The formula to calculate SAR is given below, with concentration expressed in mill equivalents per liter (meq/L) analyzed from a saturated paste soil extract.

$$SAR = \frac{[Na^{+}]}{\sqrt{\frac{1}{2}([Ca^{+}] + [Mg^{+}])}}$$

ESP is the sodium adsorbed on soil particles as a percentage of the Cation Exchange Capacity (CEC). It is calculated as:

$$ESP = \frac{[Na]^{+}}{CEC} X100$$

CEC is often estimated as the major exchangeable cations, including hydrogen. Both cation and CEC are expressed as meq/100g. ESP can also be calculated as:

$$ESP = \frac{[Na]^{+}}{[Ca^{2+} + Mg^{2+} + Na^{+} + K^{+}]}$$

ESP is used to characterise the sodicity of soils only, whereas SAR is applicable to both soil and soil solution or irrigation water.

Location

The selected mauzas for monitoring are Baranpara (E-89°30′59.1″, N-22°37′57.0″) of Batiaghata Upazila, Chunkuri-2 (E-89°32′20.0″, N-22°34′51.0″) of Dacope Upazila, Kapalirmet (E-89°36′8.8″, N-22°32′18.9″) of Mongla Upazila, Chakgona (E-89°34′25.3″,N-22°34′18.3″) of Rampal Upazila and Basherhula (E-89°34′25.0″, N-22°36′14.0″) of Rampal Upazila under Khulna and Bagerhat Districts. However, a new sampling location (Bidyarbon- E-89°34′40.0″, N-22°33′42.0″) of Mongla Upazila was included with the previous ones for monitoring as per ToR. The sampling locations with their corresponding coordinates are stated in **Table 2.9**. Locations of collected soil samples are presented in **Figure 2.37**.

Table 2.9: Land Resources Monitoring Plan

Site No.	Monitoring indicators	Location	GPS(Decimal Degree)		Sampling Frequency	Methods/Tools/ Techniques
			Northing	Easting		
1	Plot use, Soil fertility and nutrient, Chemical properties of soil (pH, Pb, Cd), Crop production and damage	Mouza: Baranpara, Union: Gangarampur Upazila: Batiaghata, District: Khulna	N-22°37′57.0″	E-89°30′59.1″	Bi-yearly (April and October)	In situ field sampling and Laboratory Testing in SRDI
2		Mauza:Chunkuri-2,Union:Bajua Upazila: Dacope, District :Khulna	N-22°34′51.0″	E-89°32′20.0″		
3		Mouza: Kapalirmet/Buridmial Union: Burirdanga, Upazila: Mongla District: Bagerhat	N-22°32′18.9″	E-89°36′8.8″		
4		Mouza: Chakgona, Union: Rajnagar Upazila: Rampal, District: Bagerhat	N-22°34′18.3″	E-89°34′25.3″		
5		Mouza: Basherhula, Union: Rajnagar Upazila: Rampal, District: Bagerhat	N-22°36′14.0″	E-89°34′25.0″		
6		Mouza: Bidyarbon, Union: Burirdanaga Upazila: Mongla, District: Bagerhat	N-22° 33′ 42.0″	E-89° 34′ 40.0″		

2.4.2 Process of Soil Samples Collection

Plot Selection

Monitoring plots were selected at the very beginning of this study. Expert's judgement along with plot owner's opinion was taken into consideration for this selection. Upazila Agriculture Officers of Batiaghata and Dacope of Khulna, Rampal and Mongla of Bagerhat District and Senior Scientific Officer of Soil Resource Development Institute (SRDI) of Khulna were contacted for collecting expert's judgement. Wind speed and wind direction were considered as potential local factor for the monitoring purpose. All the selected plots were characterized as medium high land (F_1), which are normally flooded in the range of 30-90 cm and remain inundated for more than two weeks to few months during the flood period.

Soil sample collection

According to regular practice, soil samples are collected in October and April monitoring session. In accordance with it, soil samples were collected during this monitoring field visit **(Figure 2.38)**. Collected soil samples were immediately sent to SRDI, Dhaka laboratory for chemical analysis. Analysis report will be incorporated with next (33rd Monitoring) report.

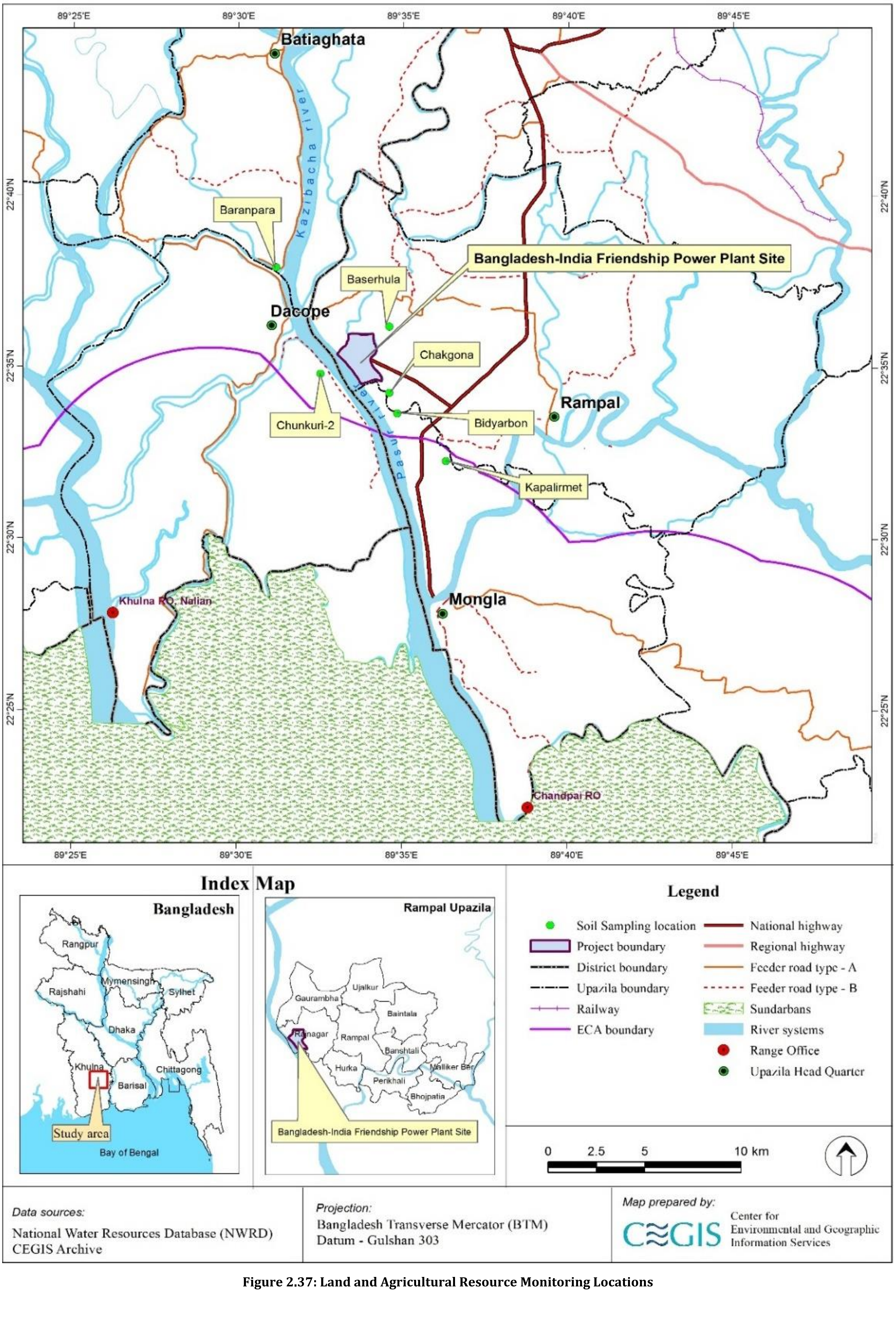


Figure 2.37: Land and Agricultural Resource Monitoring Locations

Figure 2.38: Soil sample collection from monitoring plots

Present condition of Baranpara sampling location, May, 2022.

Present condition of Chunkuri-2 sampling location, May, 2022.

Present condition of Kapalirmet sampling location, May, 2022.

Present condition of Bidyarbon sampling location, May, 2022.

Present condition of Chakgona sampling location, May, 2022.

Present condition of Basherhula sampling location, May, 2022.

Figure 2.39: Present condition of the sampling locations

2.4.3 Metyhodology of Agriculture Resources Monitoring

Monitoring of agriculture resources has been scheduled twice a year as per the monitoring plan of the ToR. The data on Local Aman (Production, damage, input use etc.) was collected through informal interview (KII, RRA and FGD) with the local farmers from the monitoring area. The agricultural monitoring locations remain same as the soil sampling locations.

Monitoring indicators

For data collection, six sampling plots have been selected on random basis within the project influence area during construction phase monitoring. The mauzas which were selected for land resources monitoring were considered as well as monitored for agricultural resources monitoring too.

2.4.4 Present Cropping Patterns of Monitoring Plots

Detailed data on cropping pattern for this year were obtained through discussions with the plot owners. Based on the discussions, the plot-based cropping patterns was identified and the associated data was collected in May.

Monitoring Plot-1 (Baranpara)

This plot is about 0.4 Hectare. Due to waterlogging and associated problems BRRI 23 is cultivated in this monitoring spot. This year no adverse impact was found in this monitoring plot. The cropping practice and management practice remain same as the previous monitoring. From this monitoring, field visit it has been found that the owner had cultivated BRRI 67 in Rabi season **Table E.4** of **Appendix IV**.

Monitoring Plot-2 (Chunkuri-2)

Organic matter, Nitrogen and Sulfur concentration decreased, but Phosphorus concentration has increased which might be due to the impact of erosion and increasing salinity. Although EC has decreased, but SAR and ESP value increased where base mono valent cations (K, Na) have increased but divalent cations show decreasing pattern. pH is almost similar to last year. All micro nutrients concentration has decreased except iron concentration. Pb and Cd concentration also increased but stay within the permissible limit **Table E.4** of **Appendix IV**.

Monitoring Plot-3 (Kapalirmet)

This monitoring plot size is about 0.14 hectare. This plot was only cultivated in 1st monitoring after that this was used for fish cultivation. So no crop production is found in this plot. Detailed for this plot is presented in **Table E.4 of Appendix IV**.

Monitoring Plot-4 (Chakgona)

This monitoring plot is located at Chakgona and the size of the plot is about 0.23 hectare. The previous monitoring plot is converted to school cum cyclone shelter instead of agricultural land. So that, monitoring plot is shifted to the opposite bank of the river where cropping practice, water logging condition and other local factors are similar to the previous one. Local Aman (Chapsail) is found in the field during field visit where no chemical fertilizer is used. **Table E.4** of **Appendix IV**.

Monitoring Plot-5 (Basherhula)

This monitoring plot is located in Basherhula and the size of the plot is about 0.47 hectare. Local Aman (Chapshail) was found to be cultivated in this plot. The cropping practice and management practice remain same as the previous monitoring. Detailed cropping pattern is shown in **Table E.4** of **Appendix IV**.

Monitoring Plot-6 (Bidyarbon)

This sampling plot is newly selected for monitoring as per the TOR during 18th monitoring in November 2018 and accordingly, the monitoring is continuing in this plot. The size of the plot is 0.1 hectare. Only BRRI 23 is cultivated in this area during Kharif-II season. Detailed cropping pattern is shown in **Table E.4** of **Appendix IV**.

2.4.5 Crop production in monitoring plots

The information on crop production were collected after harvesting in May, 2022. Crop production varies from plot to plot and variety to variety due to fertility status and management practices of the plot. For this reason, the production level of the plots is not same. The highest rice production (2.9 tons/plot) was observed in monitoring agriculture plot-2 (Chunkuri-2) and the lowest (0.4 tons/plot) rice production was observed in monitoring agricultural plot-4 (Chakgona) and plot-6 (Bidyarbon). Besides this, 2.1 tons Boro rice is produced in Baranpara plot for the first time. The monitoring plot (Kapalirmet) inundated by saline water in 2018-19. Farmers are practicing shrimp culture instead of traditional crops cultivation in this plot due to adverse impact of salinity (**Figure 2.40**).

Detailed information on crop production in monitoring plots is presented in the **Table E.5** of **Appendix IV and Figure E1**.

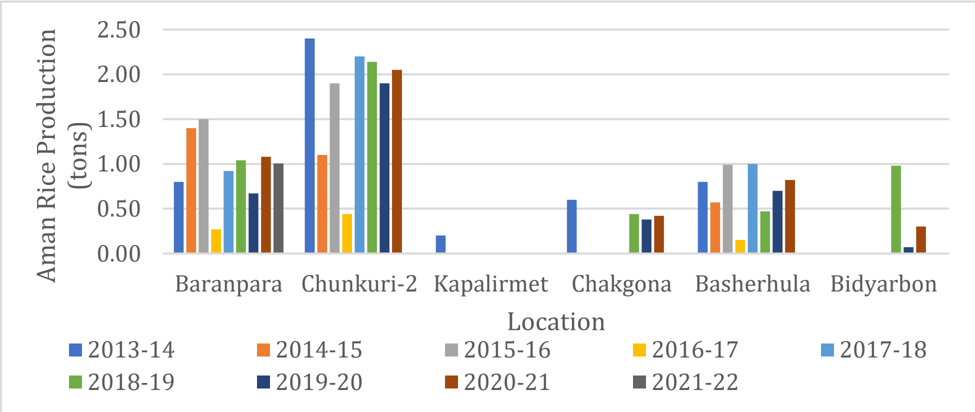


Figure 2.40: Trend of crop production in the monitoring year

2.4.6 Livestock resources monitoring

The frequency of monitoring for livestock resources data collection has been considered twice in a year (April and October). Next survey will be conducted in April, 2022 and report will be incorporated accordingly.

2.4.7 Crop Damage in Monitoring Plots

No crop damage was observed during this monitoring field visit. Detailed crop damage information is presented in **Table E.6** of **Appendix IV**

2.4.8 Methodology of Livestock Resources Monitoring

Monitoring Indicators

The frequency of monitoring for livestock resources data collection was considered twice in a year. During the monitoring period, some extensive consultations/group discussions were organized with local people to know the status of feed/fodder and diseases of livestock in the adjacent of the project area (Baranpara of Batiaghata, Chunkuri-2 of Dacope) and study area (Digraj bazar of Mongla, Bhaga bazar of Rampal). Livestock related data was collected in May, 2022 and described in the following sections and present livestock scenario is presented in **Figure 2.41**

Feed/Fodder condition of Livestock Resources

Overall feed and fodder situation remain unchanged. The farmers of the sampling points still claim for fodder shortage. Due to commercial use of land, grazing land become squeezed day by day. Under this situation livestock farming become difficult in the sampling areas.

Cattles rearing scenario in the study

Sheep rearing scenario in the study area

Duck rearing scenario in the study

Goat rearing scenario in the study area

Figure 2.41: Present livestock scenerios around the study area.

2.4.9 Monitoring of EMP during construction activities on land and agriculture resources

At present, the following activities on land and agriculture resources are in progress at project site and surrounding areas as follows:

i. Soil fertility

ii. Soil and ground water quality

iii. Damage to surrounding crops.

Table 2.10: Monitoring of EMSAP Implementation

Sl. No.	Impacts	Mitigation Measures	Remarks on Due Diligence
1	Soil fertility might be impacted due to disposal of waste and waste water.	• Construction materials must be collected, stored, and disposed in an appropriate manner. • Recycled waste should be disposed in a suitable landfill.	Complied
2	Soil and ground water quality might be deteriorated by leakage of oil, fuels and hazardous chemicals from tank or storage.	• Harmful effluents and waste leakage from oil and chemical tank or storage must be controlled strictly • Wastes or used oil must be stored in a designated area for disposal through authorized vendors. • Measures must be undertaken for fire suppression and the neutralization and collection of any spilled materials • Treatment plant must be installed. • Provide training and awareness building program to the labors and professionals.	Complied
3	Damage to surrounding crops due to project related activities.	• Fencing of project area by drum sheet or Tarija. • Limiting the construction activities and stocking within the project boundary.	Complied

Source: Field Survey, May, 202

2.4.10 Diseases of Livestock Resources

Diseases of livestock/poultry remain similar to the previous monitoring periods. According to Veterinary Surgeon (VS) of the Rampal upazila, the unhygienic condition of the courtyard is between July to November for spreading diseases to livestock and poultry populations. However, some diseases were also found in year round. The severity of the infestation was reported more or less alike in this concurrent circumstances as for the past situations. The mortality rate of the livestock/poultry becomes negligible, due to immunization and insemination program run by Department of Livestock.

2.5 Transportation Monitoring

2.5.1 Location of Traffic Survey

The traffic survey for this monitoring during the construction phase was conducted from January 29th to January 31st, 2022 on two weekdays and one weekend at three pre-selected locations around the project site. Weather was sunny on all the three days when the survey was conducted**.**

The selected sites were Khudir Bottola and Gonai Bridge at Khulna Mongla Road and Gonabelai Bridge at Power Plant access road presented in the **Figure 2.42.**

2.5.2 Methodology

Traffic surveys were carried out at three distinct periods (morning - 7:00 AM to 10:00AM; noon-12:00 PM to 2:00PM and evening- 17:00 PM to 19:00PM) to understand the nature of traffic flow and traffic load on the preselected locations during different phase of the day. Vehicles were categorized based on the available vehicle types around the project area.

2.5.3 Traffic Volume Calculation

The survey results were used in computing the traffic volume of these roads in Passenger Car Unit (PCU). PCU is a matrix used in Transportation Engineering, to assess traffic-flow rate on roadways. A PCU is essentially the impact that a mode of transport has on traffic variables (such as headway, speed, density) compared to a single car. While calculating the traffic volume in PCU, vehicle conversion factors suggested by the Roads and Highway department of Bangladesh were used as mentioned in **Table 2.11.**

Table 2.11: Vehicle Conversion Factors

Vehicle type	Factor
Bus	2.5
Minibus/Truck	2
Car/Microbus/Zeep	1
CNG	0.5
Rickshaw/Auto Rickshaw	0.8
Tempo/Human hauler	0.6
Motorcycle	0.3
Bicycle	0.2
Push Chart	4

2.5.4 Results of Monitoring

The summary results of vehicular movements at three different locations presented in **Table 2.12** shows that, according to the Passenger Car Unit (PCU) per hour, the Khulna-Mongla Highway receives the largest number of vehicles, compared to other surveyed roads.

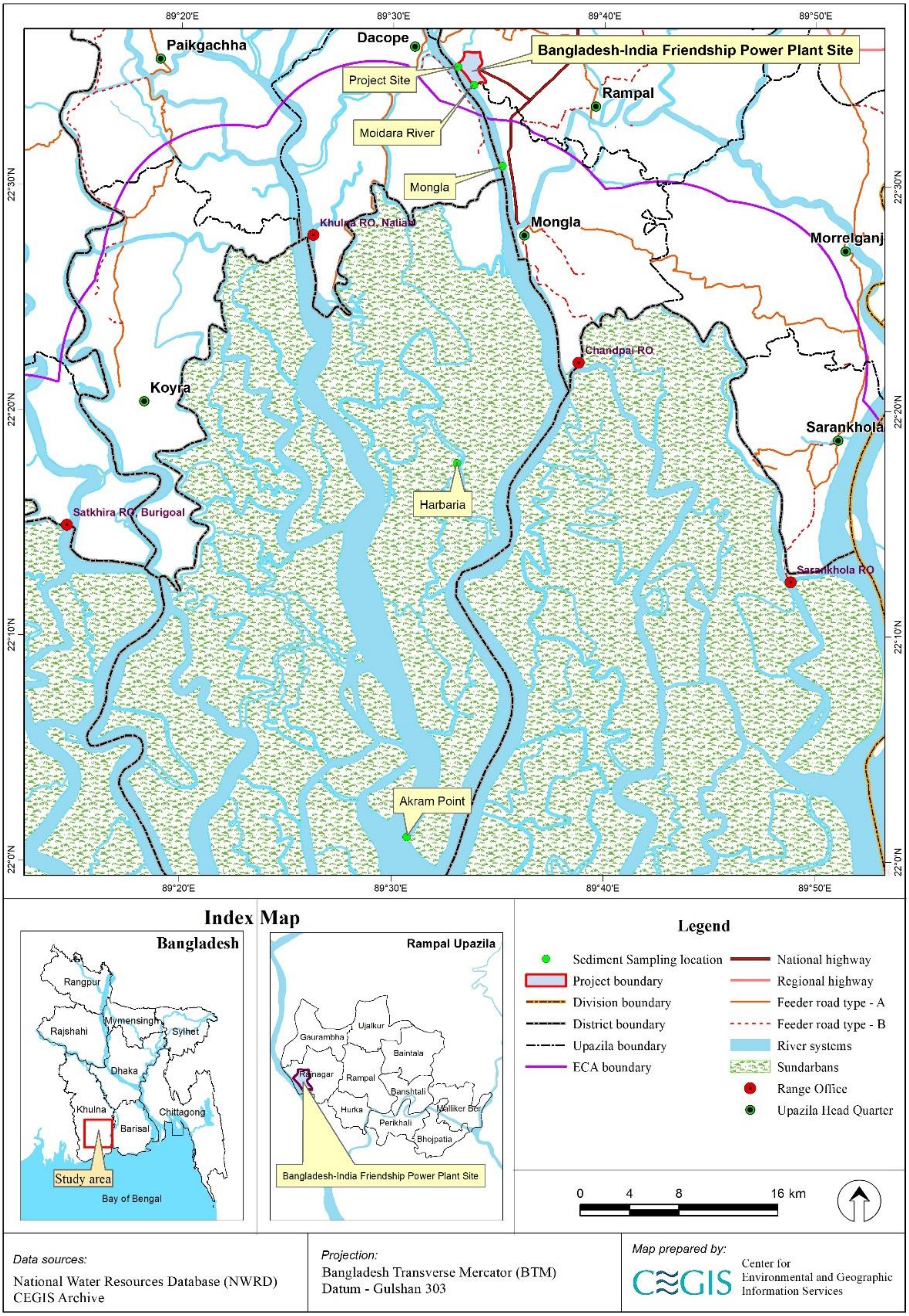


Figure 2.42: Locations of Traffic Survey

Table 2.12: Calculated PCU in Three Locations at Three Different Time Period

Location	7:00 AM to 10:00AM	12:00 PM to 2:00PM	17:00 PM to 19:00PM
Khulna Mongla Road at Khudir Bottola	880	1137	607
Khulna Mongla Road at Gonai Bridge	378	394	523
Power Plant access road at Gonabelai Bridge	141	95	166

Source: Field Survey, May, 2022.

Similar to the earlier months monitoring report, vehicular movements were observed during the surveys were mostly for the regular construction activities of the Power Plant as the construction activities of the Power Plant are progressing heavily. Khulna Mongla Road at Khudir Bottola received the highest traffic volume compared to the other two locations namely Khulna Mongla Road at Gonai Bridge and Power Plant access road at Gonabelai Bridge. It is to be mentioned here that, during the afternoon time traffic volume at Khulna Mongla Road at Gonai Bridge and during morning and afternoon time Power Plant access road at Gonabelai Bridge were found to be lower whereas, during the other monitoring time at all the three locations, traffic volume has been found to be higher compared to the previous monitoring period. The detail survey findings regarding the traffic volume surveys as well as the detail calculations are attached in **Table E1, E2 and E3 of Appendix-IV.**

2.6 Water resources monitoring

For monitoring the erosion and accretion at the project site, Mongla, Harbaria and Akram point areas, banklines of the Passur River were superimposed with each other.

2.6.1 Monitoring of Chemical properties of riverbed sediment

Sediment have been considered as an important environmental indicator for metal pollution in any natural ecosystem. The investigation of heavy metals in water and sediments could be used to assess the anthropogenic impacts and risks posed by waste discharges to the riverine ecosystems. Therefore, sediment quality assessment is done during environmental issues monitoring of this project.

2.6.2 Methodology

Sampling frequency

The frequency of monitoring for sediment quality is considered twice in a year (January and July). Accordingly, sediment sampling was done in 31st monitoring (January, 2022; considered as dry season). Data analysis of that sampling is incorporated in this report.

Monitoring indicators

The main objective of sediment quality monitoring is to find out the heavy metal accumulation in sediments due to anthropogenic activities (e.g. power plant activity and coal transportation). To find out the answers a biannual sediment monitoring is done in different sampling points. The major indicators for monitoring are heavy metals (As, Pb and Hg), pH and Sulfate. The selected heavy metals are mainly found in coal and assumed to pollute the sediment and water system during operation stage of power plant.

Location

The sampling locations are selected in both near places of project area and inside the Sundarbans. The sampling locations are stated in **Table 2.13**. Locations of collected samples are presented in **Figure 2.43**.

Table 2.13: Location of Sediment Monitoring Plan

Site No	Monitoring Indicators	Location	GPS (Decimal Degree)		Sampling Frequency	Methods/Tools /Techniques
			Northing	Easting		
1	Heavy metals (Arsenic-As, Mercury-Hg, Lead-Pb); pH and Sulfate (SO_4)	Project Site	N-22°35′21.2″	E-89°32′53.4″	Bi-yearly (January and July)	In situ field sampling and Laboratory Testing at BCSIR
2		Moidara River	N-22°34′33.4″	E-89°33′38.8″		
3		Mongla Port	N-22°30′57.1″	E-89°35′0.3″		
4		Harbaria	N-22°17′44.2″	E-89°32′53.4″		
5		Akram Point	N-22°01′07.6″	E-89°30′34.4″		

2.6.3 Process of Sediment Samples Collection:

The sampling locations are selected on the basis of potential route of coal transhipment and assumed major polluted area. Project site and Moidara River is beside the power plant, while Harbaria and Akram point is inside the Sundarbans area where the coal transportation will take place. The sampling points were selected on the basis of TOR. Expert's judgement was also taken to validate the sampling points.

2.6.4 Sediment Samples Collection

Standard procedure was maintained during the collection of sediment samples. At least three replications were taken to ensure composite samples. Sediment samples were preserved in air-tight plastic bag for laboratory analysis.

2.6.5 Laboratory Analysis

Sediment samples are taken twice a year. Dry season samples are taken in January and wet season samples are taken in July 2021. Accordingly, dry season, 2022 sample was taken in January, 2022 (31st monitoring field visit). Data analysis of dry season, 2022 is incorporated in this report.

2.6.6 Status of sediment quality of the Passur River:

The data presented in this report represents dry season, 2022 which was collected in January, 2022 (31st monitoring). According to the analyzed data, only Mercury (Hg) exceed average shale value (ASV) (Marowsky and Wedepohl, 1971) and average upper crust value (AUCV) (Rudnick and Gao, 2014) whereas, Lead (Pb) crossed AUCV and ASV only in one location (Mongla port) and Arsenic (As) remains within the stated limits. All As and Pb value found within the stated limits even in published reports (Ali et al., 2018), except as concentration in Mongla port. Compared to previous dry season monitoring report (January, 2021), As and Hg concentration is reduced in all sampling locations while Pb concentration is increased. The maximum concentration for As, Pb and Hg is found in Moidara River, Mongla port and project Jetty site respectively. The average concentration for As, Pb and Hg during this monitoring is 3.65 ppm, 12.79 ppm and 0.49 ppm respectively. In project site (jetty point), only the concentration of Pb remains below this monitoring season average while the other two crossed the average value (Figure 2.44 to Figure 2.48).

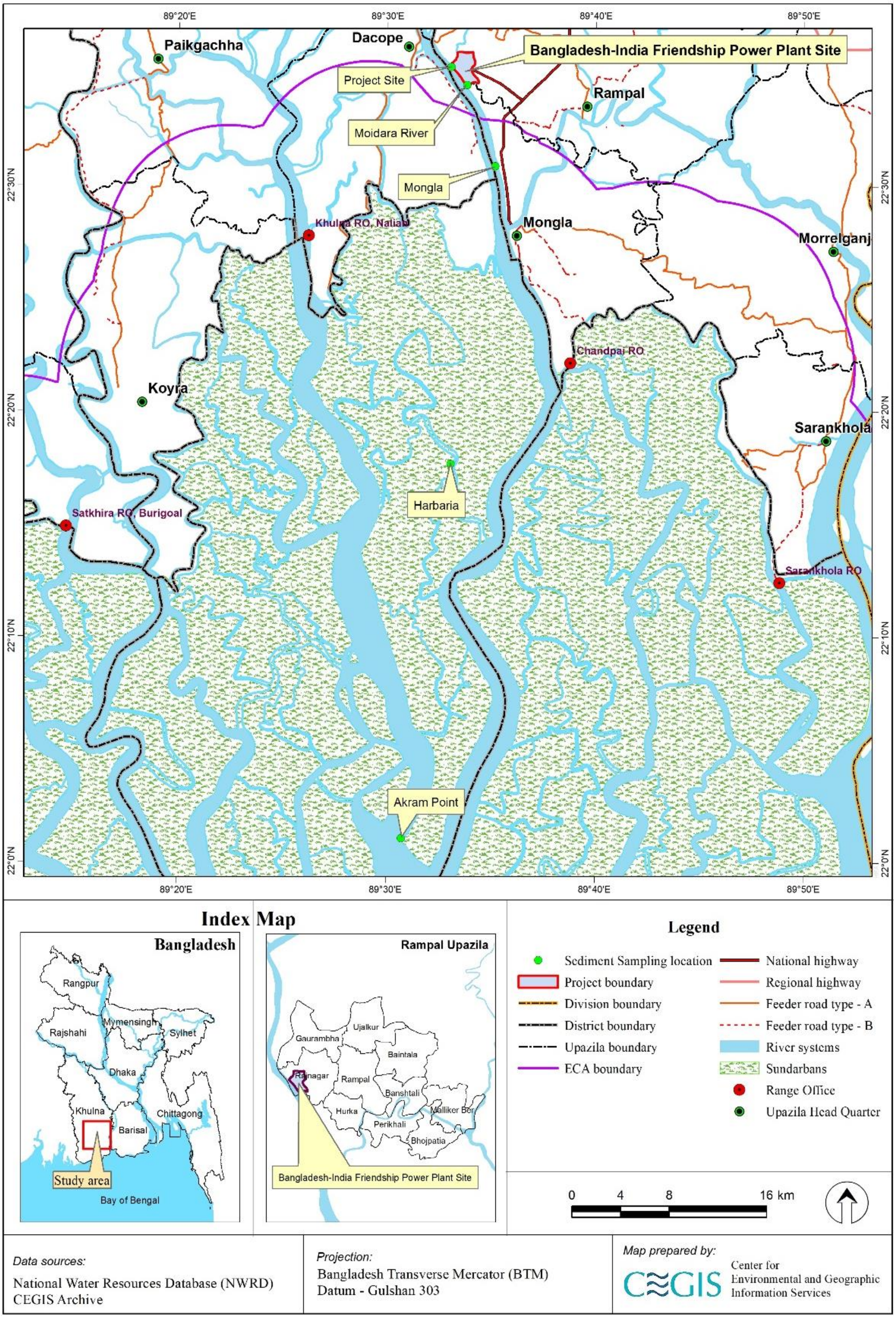


Figure 2.43: Locations of Sediment Sampling

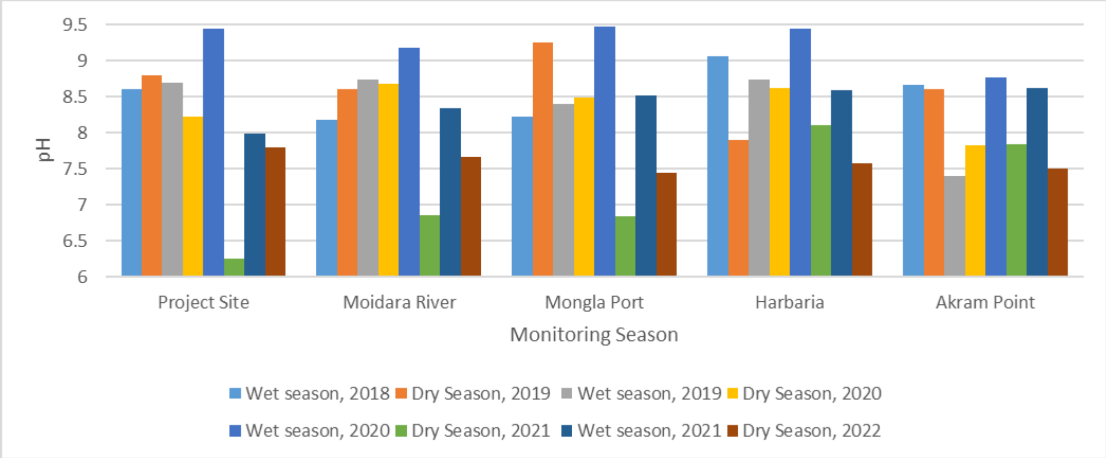


Figure 2.44: Seasonal variation of pH in different sediment samples

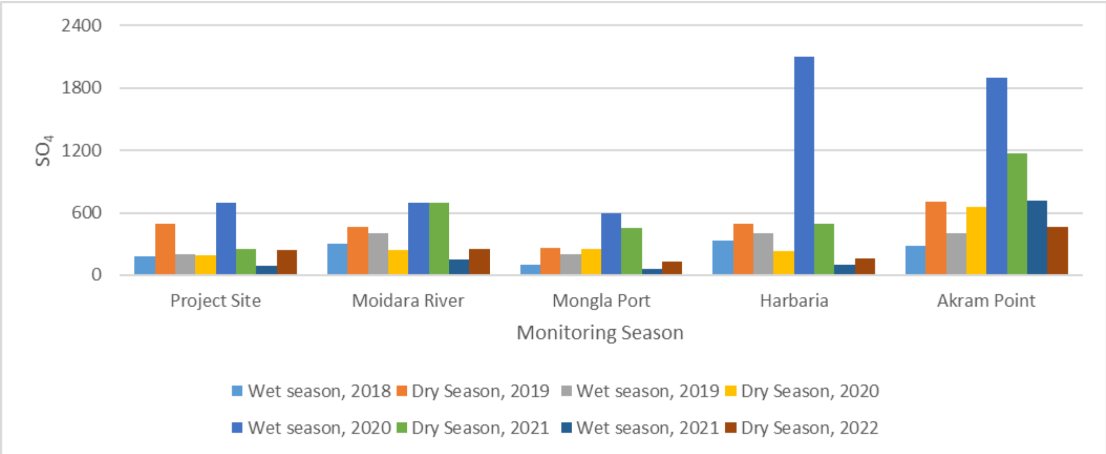


Figure 2.45: Seasonal variation of sulphate (SO_4^{2-}) in different sediment samples

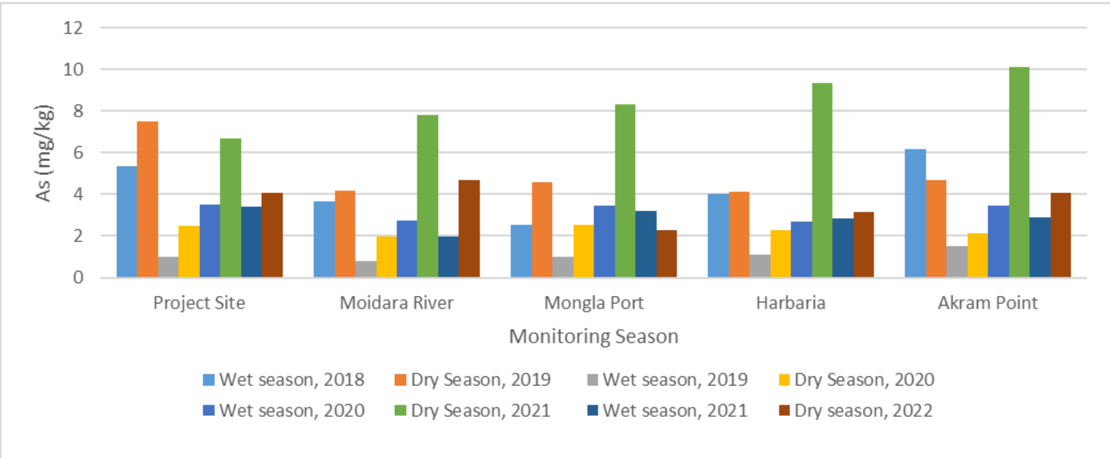


Figure 2.46: Seasonal variation of Arsenic in different sediment samples

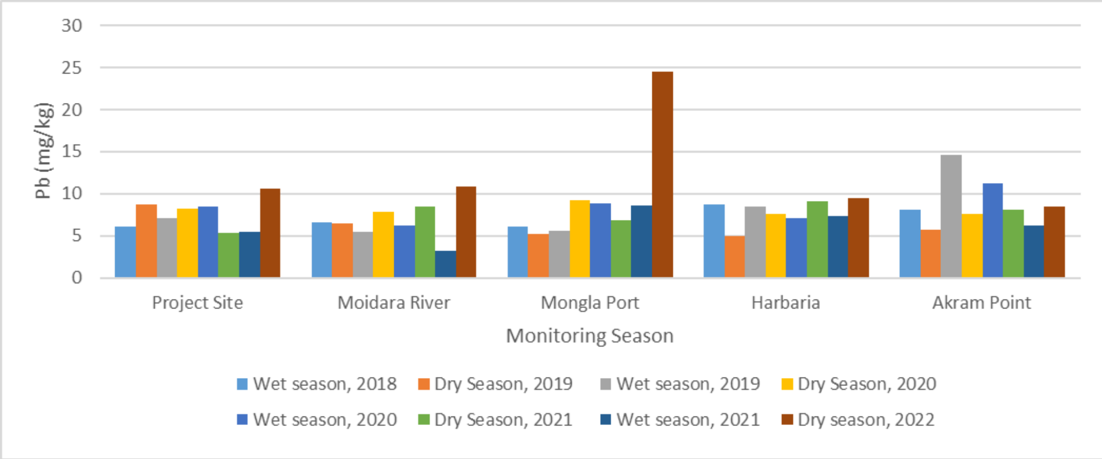


Figure 2.47: Seasonal variation of Lead in different sediment samples

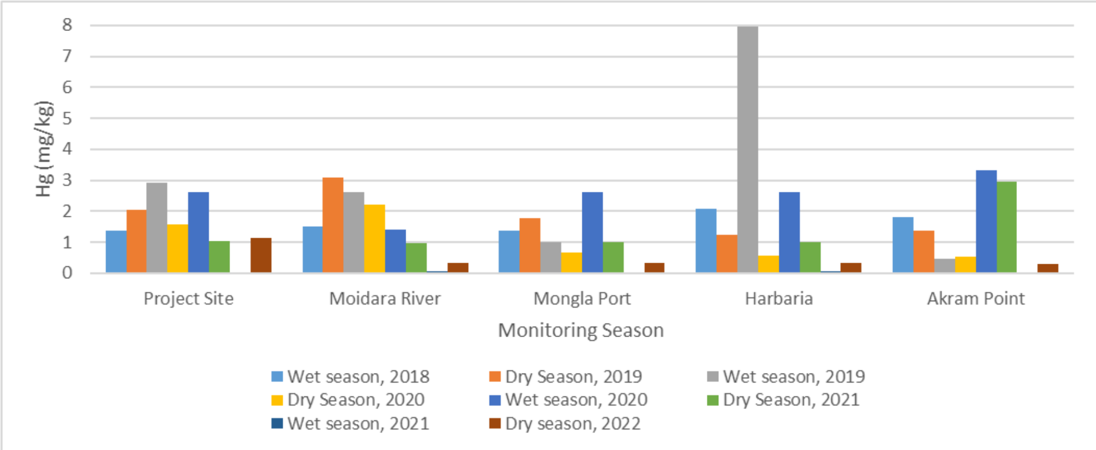


Figure 2.48: Seasonal variation of mercury in different sediment samples

Table 2.14: Reference level of different metals in sediment of the Passur River

Sl No.	Name of Heavy metal	Average upper crust concentration (ppm)	Average Shale Value (ppm)	Average heavy metal content in the Passur River in ppm (Ali *et al.*, 2018)	
				Summer	Winter
1	Arsenic (As)	4.8	14	8.87	12.4
2	Lead (Pb)	17	20	21.9	33.6
3	Mercury (Hg)	0.05	0.26	-	-

3. Biological Environment

Biological resources include all living organisms within an ecosystem which interact with one another as well as with the concerned physical environment. The biological resources around the project site were categorized into three major groups and monitored quarterly with the aim to establish baseline conditions to compare with the probable impact of proposed project in place. These groups include fisheries resources, ecological resources and Sundarbans Reserve Forest (SRF).

3.1 Fisheries Resources

The monitoring of Thirty-first quarters for the session of 2014-15, 2015-16, 2016-17, 2017-18, 2018-2019, 2019-20 as well as of 2020-21 was completed and reported earlier. This chapter contains the findings of 32nd quarter and comparison with the earlier 31 quarters.

3.1.1 Methodology

Location of Monitoring Sites

In this phase, the monitoring activities were carried out in 13 pre-selected locations of which 10 locations were for capture fish habitat and three (03) were for shrimp/fish farms (culture fish habitat). Sampling sites for capture fishery were selected based on the available fishing grounds at upstream, midstream and downstream of the Passur River system. Sampling sites for culture fishery (shrimp/fish farms) were selected considering the project influence area. The fisheries resources monitoring locations are provided in **Table 3.1** and also shown in **Figure 3.1**.

Table 3.1: The Sampling Locations for Monitoring of Fisheries Resources

Site	Capture Habitat Location	Site	Capture Habitat Location
A	Akram Point	F	Chandpai
B	Haldikhali	G	Jongra
C	Charaputia	H	Mongla Port
D	Bhodra	I	Maidara
E	Harbaria	J	Chalna Point, Batiaghata
Site	**Culture Habitat Location**	**Site**	**Culture Habitat Location**
1	Bhekatkhali Khal, Rajnagar	3	Chunkuri-2
2	Kapasdanga-Muralia		

Selection of Parameters

According to ToR, five major components were selected for fisheries monitoring, such as fish habitat status, fish migration, fish diversity, shrimp/fish farm practices and fish production. Fish habitat status was monitored through investigating habitat suitability index in view of habitat classification based on length frequencies of different fish species, sensitivity of fish diversity and survival success of different life stages of fish to abiotic factors (water quality, bed material, morphological aspects and biotic factors (food cover). Fish migration status was monitored through assessing migratory fish species diversity, migration pattern, migration purpose, period and extent of migration etc. Species evenness, species richness and community structure were investigated for monitoring fish diversity. Shrimp/fish farm practice was monitored by viewing stocking pattern, growth rate and mortality rate. Fish production monitoring was divided into capture and shrimp/fish farm production.

Fish Habitat Status

Fish habitat status was monitored through determination of Habitat Suitability Index (HSI) by applying numerical habitat model based on the habitat classification and sensitivity of fish diversity and survival success of different life stages of fish to abiotic and biotic factors. Fish habitat classification was analyzed by calculating Euclidean Distance among sampling sties. Moreover, the similarities in species composition among the sites were analyzed using the Jaccard Index (JI) for estimating the extent of similarity between pairs of data sets.

Fish Migration

Migratory species were identified from the sampling sites by analyzing the common species found in the catch assessment survey and based on IUCN list.

Fish Diversity

Fish diversity was surveyed by Catch per Unit Effort (CPUE) method. The fish individuals were counted according to the length of each species from the samples. Diversity was estimated by analyzing Shannon-Weiner Index ranges from 0 to 1. Fish species richness (FSR) was analyzed using the Simpson's Index that generates two types of values. The first one includes values from 0 to 1 expressing normalization scores for species richness status and the second one includes values from one (01) to values equal to the total number of species found in the sample which suggests that how many species are dominant in this fish community. Fish community structure has also been analyzed through counting the length-wise fish individuals.

Fish-Shrimp Culture Practice

For monitoring shrimp/fish farm, three farms within the direct impact zone of the proposed Power Plant were surveyed. Stocking pattern of the shrimp/fish farm is the major issue for successful production, because of having natural genetic resources from the wild source of the Passur River System. Moreover, mortality rate should be minimized for getting more economical output from the farms. So, stocking pattern and mortality rate and its causes were surveyed intensively.

Fish Production

Fish production for riverine fish was surveyed through CPUE. The information on the species-wise production of shrimp/fish farm was collected from the selected farms for the last catch.

3.1.2 Status of Monitoring

Followed by the quarter monitoring of the 2014-15, 2015-16, 2016-17, 2017-18, 2018-19, 2019-20 and 2020-21 (up to 31st quarter monitoring), 32nd quarter monitoring of session 2021-22 was conducted during the period from 24 may -01 June, 2022. No fishing activities were observed at Akram Point (A), Haldikhali (B), Charaputia (C), Bhodra Khal (D), Harbaria (E) and Jongra (G)) during the field visit in this quarter monitoring as this time was the government-imposed fishing ban period.

Fish Habitat Status

Fish habitat status has also varied in the view of habitat classification and habitat use pattern of different life stages of different fish species.

Habitat Classification

Habitat classification was analyzed by using the length-wise distribution of different fish species in the sampling sites. The length of different life stages of fish species was identified and evaluated from literature review. Linkage distance was calculated with the similarity in distribution. The entire stretch of the Passur River System consists of three major behavioral habitats. The sampling sites were classified on the basis of abundance of different life stages of fish species in those habitats. The following **Tables 3.2** show the classification of seven (07) sampling site for 1 to 15^{th} quarter monitoring and ten (10) sampling sites from 16^{th} to 31^{st} quarter monitoring according to the ToR in respect of habitat uses for previous quarters of fisheries monitoring.

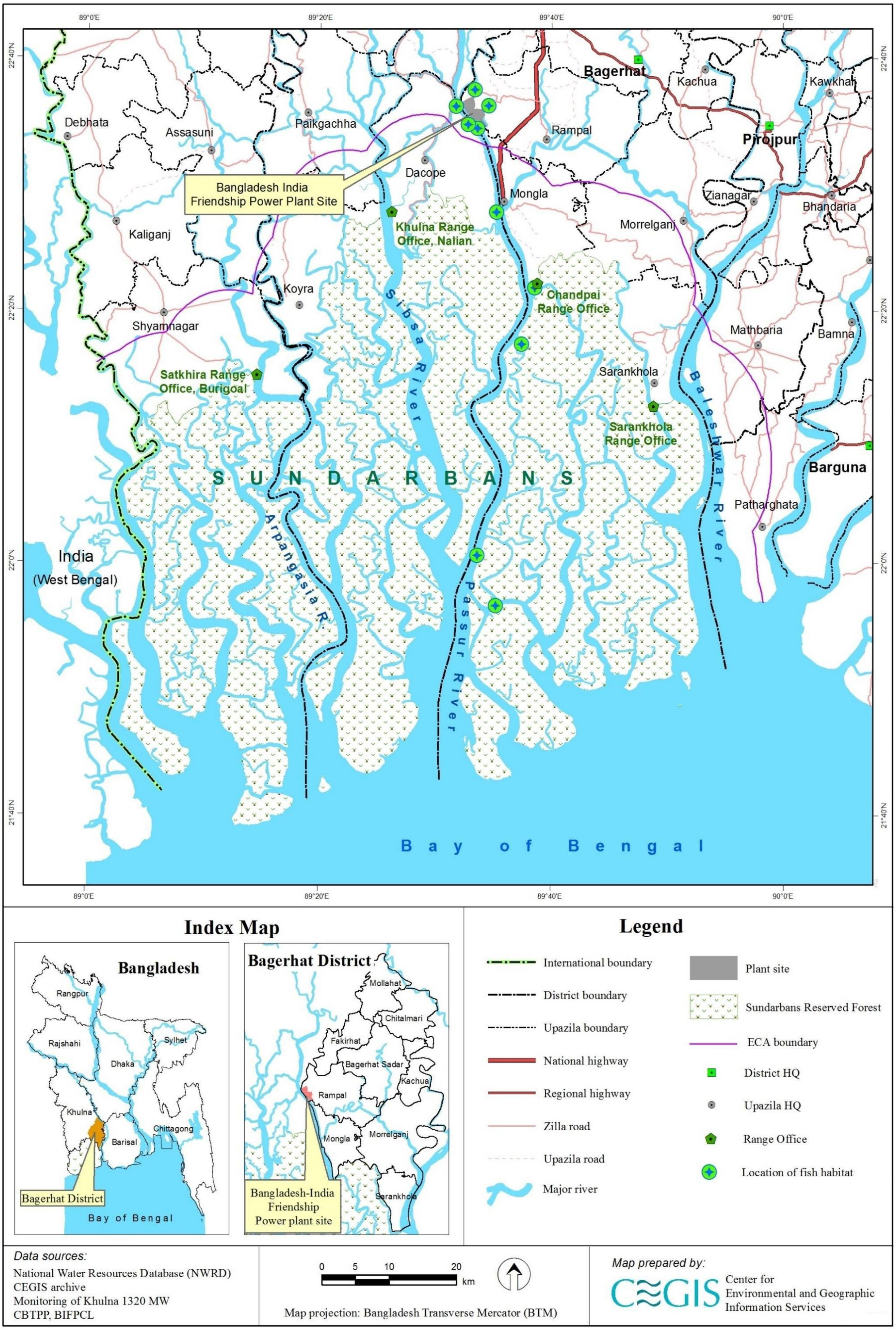


Figure 3.1: Fisheries Resources Monitoring Locations

Table 3.2: Classification of habitat use of 10 sampling sites

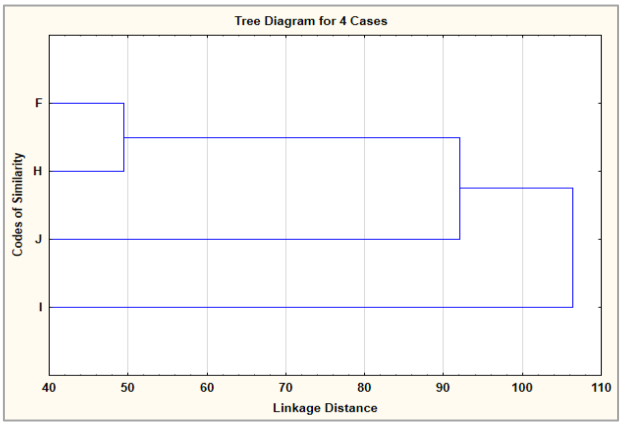
Monitoring Quarter	Type of Habitat Use
1st (April, 2014)	• Grazing Ground • Grazing and Breeding Ground
2nd (July, 2014)	• Grazing Ground • Spawning and Nursery Ground
3rd (October, 2014)	• Grazing Ground • Grazing and Breeding Ground • Spawning, Nursery and Grazing Ground
4th (January, 2015)	• Grazing Ground • Grazing and Breeding Ground • Spawning, Nursery and Grazing Ground
5th (April, 2015)	• Grazing Ground • Nursery Ground • Spawning and Nursery
6th (August, 2015)	• Grazing, Breeding Ground • Spawning, and Nursery Ground
7th (October, 2015)	• Grazing Ground, • Nursery Ground and • Growing and Feeding
8th (January, 2016)	• Nursery and Feeding Ground • Growing and Feeding
9th (April, 2016)	• Spawning and Nursery Ground • Feeding and Growing Ground
10th (July, 2016)	• Nursery Ground • Feeding and Breeding Ground
11th (October, 2016)	• Breeding and Spawning Ground • Feeding and Grazing Ground
12th (January, 2017)	• Grazing and Spawning Ground • Nursing Ground
13th (April, 2017)	• Grazing and Feeding Ground • Nursing Ground
14th (October, 2017)	• Grazing and Feeding Ground • Nursing Ground
15th (January, 2018)	• Grazing and Feeding Ground • Nursing Ground
16th (April, 2018)	• Feeding ground • Growing ground • Nursing ground
17th (July, 2018)	• Spawning and Nursery Ground • Nursery Ground with Feeding and Growing Capacity

Monitoring Quarter	Type of Habitat Use
	• Growing and Feeding Ground • Omni-ground
18th (November, 2018)	• Ground for Maturation • Omni-Ground: Nursery and Feeding Ground/Migratory Route; Ground for Maturation; Growing and Maturation Ground; Maturation Ground for Juveniles
19th (February, 2019)	• Ground for Feeding • Omni-Ground including Nursery Ground and Ground for Maturation
20th (April, 2019)	• Ground for Feeding and Maturation • Omni-Ground including Nursery Ground and Ground for Maturation
21st (July, 2019)	• Ground for Feeding and Maturation • Omni-Ground including Nursery Ground and Ground for Maturation
22nd (November, 2019)	• Spawning and Nursery Ground • Omni-Ground including Feeding and Maturation Ground
23rd (February, 2020)	• Nursery Ground • Spawning ground • Ground for maturation and feeding
25th (July, 2020)	• Nursery Ground • Ground for maturation and feeding
26th (November, 2020)	• Nursery Ground • Omni-Ground including Spawning and Nursery Ground, and Maturation Ground
27th (January, 2021)	• Nursery Ground • Omni-Ground including Spawning and Nursery Ground, and Maturation Ground
28th (April, 2021)	• Spawning and Nursery Ground • Ground for Maturation and Feeding
29th (September, 2021)	• Nursery Ground • Ground for Maturation and feeding
30th (November, 2021)	• Feeding Ground • Omni Ground including Nursery ground, and Maturation and Feeding Ground
31st (February, 2022)	• Nursery Ground • Maturation and Feeding Ground

During the 32nd quarterly monitoring conducted in May of 2021-22 Session, the sampling sites were divided into two major classes and shown in the **Figure-3.2 (Figure D.1 of Appendix IV**).

1. Spawning and Nursery Ground: The sampling sites, Mongla (H) and Chandpai Point (F) were found to support mostly length groups of <2cn, 2-3cm of available fish species. Field findings revealed that the mentioned sampling sites were found to be used as nursery ground of observed fish species.

2. Maturation Ground: The sampling site, Maidara (I) and Chalna Point (J) observed of dominant length group of 5-10cm, 10-20cm and >25cm indicates that the sites function as the maturation of different fish species (following the considerations of Rahman, 1989 and 2005; Huda et al., 2003).

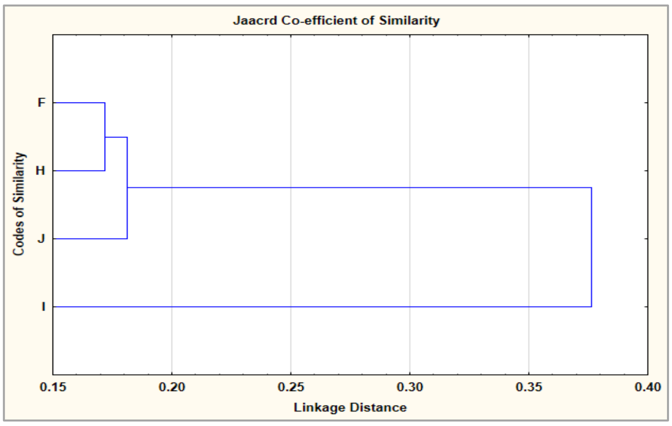


32nd Monitoring (May, 2022)

(Note: Life stages are identified through length measurement of the fish individuals)

Figure 3.2: Habitat classification on the basis of different life stages of fish species

The dendogram indicated the distances among the JI (Jaccard Coefficient Index) indices which are opposite to the JI values. It was found that the length-wise distribution relationship varied not only with the seasons but also with the year to year. In this quarterly monitoring in 2021-22, the JI value between the Maidara (I) and Chalna (J) sampling sites were the highest (**Figure 3.3**) which indicates the maximum similarity in species occurrence between the two sites out of 04 sampling sites of available fishing.



32nd Monitoring (May, 2022)

Figure 3.3: Dendogram showing similarity in binary species composition in three sampling sites

Fish Diversity

Shannon-Weiner Index

In this monitoring year of 2021-22, species evenness also varies among the sampling sites. Highest Shannon-Weiner index was found at Chandpai (0.84) indicating most evenly distributed fish species. On the contrary, lowest evenness was found at Mongla Point (0.31) (shown in **Table 3.1.4**). It has also been found that both the number of fish species found in in-situ catch and the evenness of their distribution within the sampling sites show high variation with the changing seasonal and yearly bio-physical conditions.

Fish Species Richness (FSR)

Fish species richness was identified through Simpson's Index[2]. Considerable difference is noticed in the fish species richness (FSR) in different habitat classes (**Table 3.3** and **-3.4** and **Figure-3.6**).

In this monitoring phase, species richness varies with the sampling sites. Maximum FSR was obtained at Chandpai (n=19), while very low FSR was recorded at Maidara Point (n=04). Different scenarios of richness were found in this quarter in comparison to the previous monitoring years. Among habitats in the up-stream of the Passur River system, Chandpai was home to rich assemblage of Chaka Chingri, Tiger Chingri, Datina, Paissa and Poa, Haldakhali was of Chemua, Motka Chingri, Mutkura Bele, Potka, Bagda, Golda and Bele. Mongla was rich of Vadi Chingri, Chela, Amadi, Chewa and Tiger Chingri, Chalna was rich of Chapila, Chali Chingri and Tiger Cgingri

In this monitoring year of 2021-22, species evenness also varies among the sampling sites. Highest Shannon-Weiner index was found at Harbaria Point (0.71) indicating most evenly distributed fish species. On the contrary, lowest evenness was found at Mongla Point (0.06) (shown in **Table 3.5**). It has also been found that both the number of fish species found in in-situ catch and the evenness of their distribution within the sampling sites show high variation with the changing seasonal and yearly bio-physical conditions.

Table 3.3: Site wise Rich Species Number (1st to 12th QM)

Site	Location	No. of Rich Species											
		2014-2015				2015-2016				2016-2017			
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th
A	Akram Point	4	0	4	3	3	-	3	2	0	0	1	2
B	Haldikhali	7	0	4	2	0	-	3	2	0	0	1	0
C	Harbaria	1	5	2	0	4	4	3	6	4	0	4	2
D	Chandpai	2	2	5	4	5	8	3	7	4	6	3	7
E	Mongla Point	1	10	4	5	3	6	4	2	4	7	3	2
F	Maidara	3	6	2	2	4	2	4	2	3	2	3	3
G	Chalna Point	3	3	2	3	1	3	3	4	2	4	1	2

[2] Simpson's index is a method to calculate the community characteristics of fish in a particular habitat. It is mainly used to know about the species richness of a particular habitat to tell how many species are rich in their abundance. The value of this index ranges from 0 to 1. There is other kind of value which is described in the methodology section. The second value is mainly used to measure the species richness in the sampling sites.

Table 3.4: Site wise Rich Species Number (13th to 32nd QM)

Site	Location	No. of Rich Species																		
		2017-18			2018-19				2019-20				2020-21				2021-22			
		13th	14th	15th	16th	17th	18th	19th	20th	21th	22th	23th	25th	26th	27th	28th	29th	30th	31th	32nd
A	Akram Point	2	0	0	4	0	1	0	2	0	0	0	0	2	4	0	1	3	5	0
B	Haldikhali	1	0	0	0	0	3	0	-	0	0	0	0	0	0	0	0	4	4	0
C	Charaputia	0	0	0	4	0	0	4	7	0	0	5	0	3	3	2	2	6	4	0
D	Bhodra	0	0	0	0	0	0	0	-	0	0	1	0	0	0	0	0	-	-	0
E	Harbaria	7	6	6	0	2	4	0	2	0	0	2	0	1	0	2	4	4	4	0
F	Chandpai	6	5	7	11	9	2	3	7	4	6	2	0	4	1	2	0	3	5	19
G	Jongra	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	-	-	0
H	MonglaPoint	2	2	1	2	3	0	3	-	1	5	2	3	0	1	0	3	-	3	13
I	Maidara	1	3	2	1	3	9	3	1	1	6	3	2	3	0	3	1	1	4	4
J	ChalnaPoint	4	2	1	2	3	2	2	2	3	2	3	2	3	1	2	0	2	-	10

Source: CEGIS Field Survey, April 2014 - May 2022

Table 3.5: Available species No. of the instanteneous catch Site Wise Species Diversity using Shannon–Weiner Index (1st to 13th QM)

Site	Species No																													
	1st QM	2nd QM	3rd QM	4th QM	5th QM	6th QM	7th QM	8th QM	9th QM	10th QM	11th QM	12th QM	13th QM	14th QM	15th QM	16th QM	17th QM	18th QM	19th QM	20th QM	21st QM	22nd QM	23rd QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31st QM	32nd QM
A	33	0	13	7	3	0	10	15	0	0	1	2	2	0	0	3	0	8	0	2	0	0	0	0	7	18	0	6	20	25	0
B	12	0	24	14	0	0	11	3	0	0	1	0	5	0	0	0	0	2	0	-	0	0	0	0	0	0	0	0	7	25	0
C	2	12	9	0	11	26	18	24	17	0	23	10	18	0	0	12	0	0	24	11	0	0	10	0	4	28	4	10	34	33	0
D	12	22	15	26	27	24	20	25	8	19	32	27	15	0	0	0	0	0	0	-	0	0	1	0	0	0	0	0	0	0	0
E	7	13	10	11	6	16	9	9	15	12	5	4	4	0	0	0	17	12	0	2	0	0	2	0	9	0	3	13	25	12	0
F	3	13	6	4	10	8	14	6	7	5	7	12	9	6	17	0	0	0	13	22	19	11	11	0	12	7	20	0	10	13	19
G	6	3	5	7	18	3	8	6	6	4	12	3	15	81	29	21	16	19	0	26	0	0	0	0	0	0	0	0	0	0	0
H	0	0	0	0	0	0	0	0	0	0	0	0	0	112	13	3	18	2	13	-	5	11	10	11	0	3	0	9	1	11	13
I	0	0	0	0	0	0	0	0	0	0	0	0	0	3	13	12	10	17	11	8	9	11	12	6	16	0	18	1	1	12	4
J	0	0	0	0	0	0	0	0	0	0	0	0	0	4	5	10	14	11	21	12	14	9	8	15	11	12	4	0	8	0	10

Site Wise Species Diversity using Shannon–Weiner Index (14th to 32nd QM)

Sl. No.	Shannon-Weiner Index																														
	1st QM	2nd QM	3rd QM	4th QM	5th QM	6th QM	7th QM	8th QM	9th QM	10th QM	11th QM	12th QM	13th QM	14th QM	15th QM	16th QM	17th QM	18th QM	19th QM	20th QM	21st QM	22nd QM	23rd QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31st QM	32nd QM
A	0.5	0	0.7	0.6	1	-	0.6	0.4	0	0	0	0.9	0.74	0	0	0.92	0	0.16	0	0.65	0	0	0	0	0.64	0.59	0	0.49	0.61	0.5	0
B	0.9	0	0.6	0.4	0	-	0.6	0.6	0	0	0	0	0.37	0	0	0	0	0.92	0	-	0	0	0	0	0	0	0	0	0.73	0.52	0
C	0.3	0.77	0.4	0	0.8	0.6	0.5	0.7	0.6	0	0.6	0.6	0.79	0	0	0.69	0	0	1.69	0.86	0	0	0.78	0	0.82	0.53	0.88	0.82	0.83	0.54	0
D	0.3	0.78	0.7	0.5	0.7	0.7	0.5	0.7	0.6	0.6	0.6	0.8	0.76	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0
E	0.4	0.6	0.8	0.8	0.2	0.7	0.9	0.4	0.7	0.5	0.7	0.7	0.51	0	0	0	0.31	0.73	0	0.99	0	0	0.72	0	0.29	0	0.74	0.79	0.73	0.71	0
F	0.8	0.77	0.5	0.6	0.7	0.4	0.8	0.7	0.8	0.7	0.9	0.9	0.53	0.85	0.81	0	0	0	1.44	0.74	0.5	0.81	0.56	0	0.7	0.18	0.37	0	0.68	0.59	0.84
G	0.7	0.82	0.7	0.7	0.2	1	0.7	0.8	0.6	0.9	0.2	0.7	0.67	0.62	0.74	0.78	0.85	0.34	0	0.58	0	0	0	0	0	0	0	0	0	0	0
H	0	0	0	0	0	0	0	0	0	0	0	0	0	0.54	0.21	0.55	0.49	0	1.44	-	0.14	0.76	0.4	0.55	0	0.12	0	0.85	0	0.06	0.31
I	0	0	0	0	0	0	0	0	0	0	0	0	0	0.88	0.33	0.21	0.65	0.85	1.46	0.14	0.52	0.8	0.54	0.45	0.41	0	0.52	0	0	0.67	0.69
J	0	0	0	0	0	0	0	0	0	0	0	0	0	0.78	0.32	0.54	0.52	0.52	0.98	0.5	0.71	0.5	0.64	0.46	0.53	0.19	0.96	0	0.58	0	0.37

**According to Shannon-Weiner Index, 0-0.30: Low diversity/equally distribution (VH); 0.31-0.50: Moderate Diversity (M); 0.51-0.80: High Diversity (HD) and 0.80-1.0: Very High Diversity (VHD)*

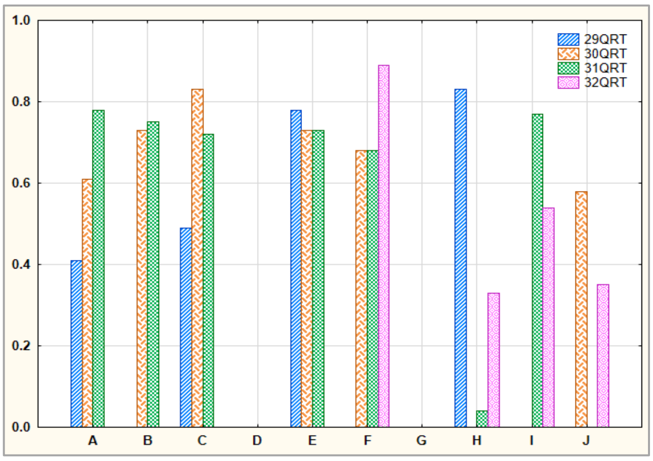
Ilish (*Tenualosa ilisa*)

Poa (*Johnius coitor*)

Paissa (*Setipinna phesa*)

Tular Dandi (*Sillaginopsis panijus*)

Figure 3.4: Different available observed fish species in 31st quarterly monitoring tier

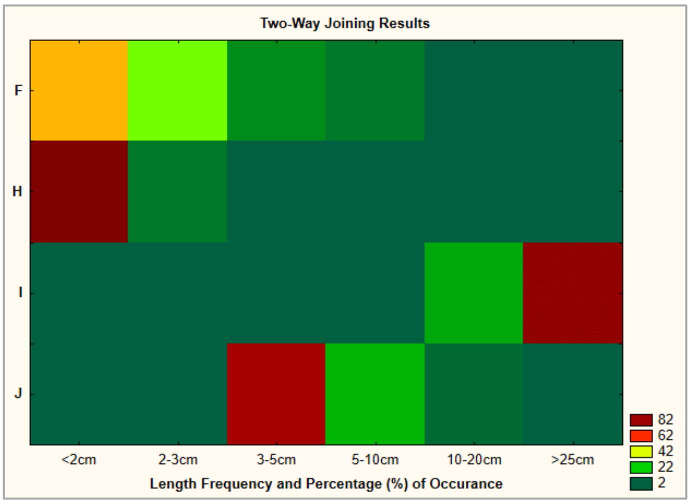


(FSR is identified though Simpson's Index)

Figure 3.5: Site-wise fish species richness (FSR) in the Passur River System

Fish Community Structure

Fish community structure was analyzed through counting the length-wise fish individuals (**Figure 3.7**). The following Table **D.3** of **Appendix IV** and **Figure 3.6** for 32nd quarter of monitoring shows that fry were dominant at Chandpai and Mongla Point, Juvenile were at Chandpai and Chalna but adult age group were dominant at Maidara Point.



30th Monitoring, November, 2021

Figure 3.6: Habitat Distribution of Different Life Stages of Fish Species

Note: N.B.: Colour ranges from deepest green to deepest red. 0-4.99% Occurrence signifies Deepest Green; 5-9.99%-Shaded Green; 11-14.99%-Normal Green; 15-19.99%-Light Green; 20-24.99%; 25-29.99%-Lightest Green; 30-34.99%; 35-39.99%; 40-44.99; 45-49.99; 50-54.99-Light Magenta; 55-59.99-Deep Magenta; 60-64.99%; 65-69.99%; 70-74.99%; 75-79.99%-Light Red; 80-84.99%-Deep Red; 85-89.99%; 90-94.99%; 95-100%-Deepest Red

Fish Migration

Migratory Species Diversity

Migratory species were identified by analyzing the common species available in the regular catch from the sampling sites. Fish species like Chapila, Chela and Amadi attain the maximum abundance among the migratory fish species observed in the 32nd quarter of monitoring. The relative abundance of the migratory species is given below in the **Figure 3.8**.

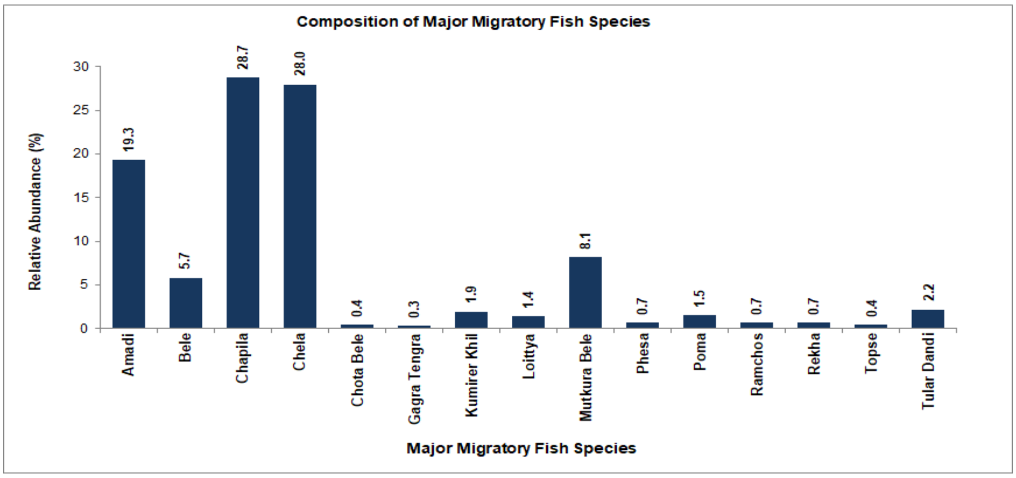


Figure 3.7: Relative abundance of major migratory fish species in sampling sites

Migration Extent, Time and Purpose

Major fish species showed interesting pattern in distribution for exploiting different purposes mentioned in the following table all along the sampling sites. Among migratory species, Amadi was observed to migrate long distance (**Figure 3.9 and Table D.4 of Appendix-IV**).

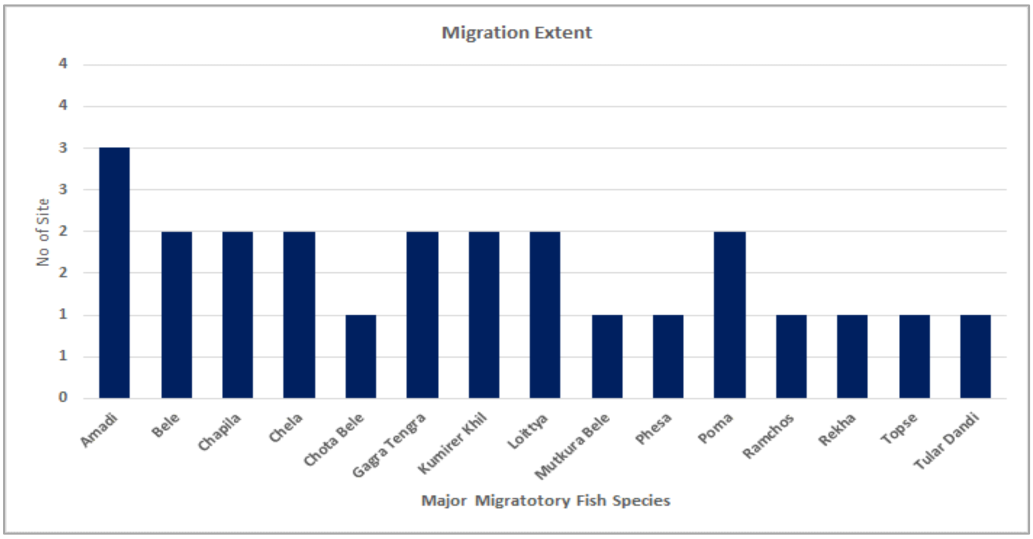


Figure 3.8: Migration extent of major migratory fish species in sampling sites

Shrimp/Fish Farm

Three farms situated in the direct impact zone of Power Plant were surveyed for monitoring shrimp/fish. Stocking pattern of the shrimp/fish farm is one of the major issues for successful production because of having natural genetic resources from the wild source of the Passur River System. Moreover, maximization of growth rate and minimization of mortality rate should be ensured for getting more economical output from the farms. So, stocking pattern, growth rate and mortality rate and its causes were surveyed intensively.

Stocking Pattern

It is reported by the farmers of the shrimp farms that maximum stocking in case of Bagda Chingri was found at Rajnagar Gher followed by Chunkuri-2 and Kapashdanga Gher. On the other hand, stocking density in respect of Paissa was highest at Chunkuri-2 followed by Rajnagar (**Table 3.5**).

Table 3.6: Stocking Pattern of Fish/Shrimp Farm

Name of shrimp farm	Name of species	Stocking Density (No/ha)	Stocking date
Rajnagar *(42.09 ha)*	Bagda	14255	March, 2022
Kapashdanga-Muralia *(115.7ha)*	Bagda	4322	March. 2022
	Paissa	1729	March, 2022
Chunkuri-2 *(6.07ha)*	Kharolla	1647	April, 2022
	Paissa	3295	April, 2022
	Bagda	6590	March, 2022
	Patari	329	April, 2022

Shrimp/Fish Growth Rate and Mortality

During the 32nd quarter of monitoring, the highest growth rate was observed in Kapashdanga Gher (**Table 3.6** and **Table 3.7)**.

Table 3.7: Growth Rate and Mortality of Fish/Shrimp (1st to 13th QM)

Gher No.	1st QM		2nd QM		3rd QM		4th QM		5th QM		6th QM		7th QM		8th QM		9th QM		10th QM		11th QM		12th QM		13th QM		14th QM		15th QM		16th QM	
	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)
1	0.3	15-20	0.2	40	0.25	50	-	-	-	30	0.18	25	0.20	60	-	-	-	-	0.2	20	0.20	60	-	-	-	30	0.03	50	-	-	0.28	0.28
2	0.3	30-35	0.3	94	0.25	10	-	-	-	-	0.14	20	0.15	100	-	-	0.21	15	0.3	40	0.25	50	-	-	-	10	0.38	35	-	-	0.42	0.42
3	0.2	25-30	0.2	25	0.20	65	-	-	-	10	0.15	50	0.25	20	-	-	0.17	30	0.15	30	0.20	30	-	-	-	25	0.02	25	-	-	0.4	0.4

Table 3.8: Growth Rate and Mortality of Fish/Shrimp (15th to 32nd QM)

Gher No.	17th QM		18th QM		19th QM		20th QM		21th QM		22st QM		23nd QM		25rd QM		26th QM		27th QM		28th QM		29th QM		30th QM		31st QM		32st QM	
	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)
1	0.38	80	-	-	-	-	0.35	50	0.38	-	0.35		-	-	0.38	-	0.42	35	-	-	0.41	20	0.38		0.36	-	-	-	0.36	-
2	0.30	70	0.30	80	-	-	0.45	80	0.44	-	0.45		-	-	0.48	-	0.45	30	-	-	0.35	90	0.42		0.44	-	-	-	0.43	-
3	0.20	50	-	-	-	-	0.34	40	0.36	-	0.37		-	-	0.32	-	0.38	90	-	-	0.39	30	0.4		0.37	-	-	-	0.33	-

Source: CEGIS Field Survey, 2014-2021

Fish Production

Capture Fish Production

The present study revealed that the highest catch susceptibility was also found in case of Bhola Jal (1.2 kg/haul) shown in **Table 3.8** In 32nd quarter monitoring, the highest productivity was found at Maidara Point followed by Chalna (**Table 3.9**). It is to be noted that fries found in catch were not considered in the productivity assessment.

Table 3.9: Total Catch in Different Gears in the Sampling Sites

Site	Habitat	Gear Name/Type	Haul Duration (hr)	No of Haul	kg/haul
F	Passur River	Net Jal	0.5	1	-
H	Passur River	Net Jal	0.5	1	-
I	Passur River	Bhola Jal	0.75	2	0.58
J	Passur River	Ber Jal	0.75	2	0.4
		Phesa Jal	0.5	1	0.5

Source: Catch assessment survey, CEGIS, May 2022

*** Weight of Fry is not considered for catch assessment*

Table 3.10: Total Catch in the Sampling Sites

Sampling Site	Total Catch (kg)												
	1st QM	2nd QM	3rd QM	4th QM	5th QM	6th QM	7th QM	8th QM	9th QM	10th QM	11th QM	12th QM	13th QM
A	28	0	3	28.7	6	0	20	276.2	0	0	10	2	2
B	65	0	1	3.3	0	0	10	12.8	0	0	4	0	0.25
C	1,559	0.5	8	8.7	1.05	0.33	19.5	173.6	2.8	0	2.6	10	8.13
D	0	12	3	30	10.5	5.08	10.75	189	0	12	18	56	77.5
E	0	0.6	5	0	0.5	0.4	0.6	7.8	5	7.5	2.6	0	0
F	0	1.2	13	3.7	1.5	0.7	0.8	0	1.5	0.8	0.5	0	0.3
G	0	1.6	4	0.7	2.9	0.83	0.825	70	1	0.8	0.1	0	0.12

Sampling Site	Total Catch (kg)																	
	14 QM	15 QM	16 QM	17 QM	18 QM	19 QM	20 QM	21 QM	22 QM	23 QM	25 QM	26 QM	27 QM	28 QM	29 QM	30 QM	31 QM	32 QM
A	0	0	17	0	16	0	0.40	0	0	0	0	30.5	3.5	-	1.1	27	30	-
B	0	0	0	0	1	0	0.00	0	0	0	0	-	-	-	0	13	14.5	-
C	0	0	1.50	0	0	93	17.50	0	0	4.6	0	18.9	33	12.7	5.85	23	20	-
D	0	0	0	0	0	0	0.00	0	0	1.35	0	-	-	-	0	-	-	-
E	1.5	2.56	0	0.1	2	0	0.50	0	0	1.17	0	2.07	-	47.5	11.34	52	4	-
F	0	0	0	0	0	0	0.00	0	0	0	0	0.6	-	2.3	0	-	-	
G	10.5	37.67	3	4	27	0	0.00	0	0	0	0	-	-	-	0	-	-	-
H	0	0	0.33	22	0	5	0.00	11.5	0.2	20	10.5	-	4	-	6.1	0.25	1	-
I	0.4	0.67	0.13	3	5	1.2	0.00	0.5	1.7	0.4	3.0	5	-	3.5	7.75	2.5	0.1	1.2
J	0.3	0	1	0.25	1.2	0.6	0.17	1.6	0.8	0	6.3	7.5	-	0.3	0	3.25	-	1.3

**Average Weight 0.15kg/mud crab and average weight 0.6 kg/mud eel*

*** Weight of Fry is not considered for catch assessment*

Figure 3.9: Fishing gears and crafts observed during 32nd quarter monitoring

Culture Fish Production

The present study on shrimp/fish farm in the 32nd quarter monitoring phase showed that the highest production was observed in the Gher of Kapashdanga (**Table D-5, Appendix-1**).

3.2 Monitoring of Ecosystem and Bio-diversity

3.2.1 Indicators Selection

Indicators for terrestrial and aquatic ecosystems have been selected by prior anticipation of probable impacts on ecological resources in different phases of the proposed project. Composition and diversity of flora is important for vegetation study which indicates vegetation structure of an area. Plant health is directly related with biomass productivity. Plant health of an area may change for changing of different environmental parameters like temperature, composition of gaseous components, soil salinity, humidity and nutrients, air particulate dust etc. Plant diseases and proportion of healthy/ unhealthy plant is needed to observe for ensuring plant health condition.

Canopy status of terrestrial vegetation indicates plant health and biomass properties of an area. Vegetation canopy structure may be change for change of plant growth rate due to soil properties change, plant physiological disorders due to change of climatic parameters or even for different human interventions. To monitor vegetation canopy status of the study area, canopy cover has been followed in different time intervals. Among the terrestrial faunal community, Bird is an important class that is sensitive to their habitat condition. Changes of environmental parameters, landuse and vegetation composition directly impact on bird's habitat of a locality. Broadly, two types of bird are found in an area; local and migratory. To observe local bird habitat suitability, number of bird nest and nesting bird species can be a good indicator. Numbers of wetlands where migratory birds come in each migration season have also been considered to observing migratory bird habitat suitability of the area.

In the respects of aquatic ecosystems, dolphin is an ecological indicator which indicates water quality as well as aquatic habitat suitability. This aquatic mammal is still present all the river systems of the study area. Any changes of water quality and river bed siltation may change dolphin occurrence in a river system. So, dolphin occurrence is needed to monitor for this study.

3.2.2 Rationales for Selection of Locations

4 homesteads have been selected for monitoring terrestrial ecosystem's indicators of the study area. Locations of the homesteads have been selected considering wind direction and spatial distribution from the project boundary. All the selected locations for terrestrial ecosystem monitoring is at northern sites as maximum time of the wind rose south to north direction and anticipated impacts will be take part according to this area. Beside this, Sundarban Reserve Forest is located sum of 14 km south from the project and various indicators of different locations of this forest is also observing for forest health monitoring. So, no site has been selected at south site of the proposed project.

3.2.3 Terrestrial Ecosystem

Terrestrial ecosystem supports most of the floral and faunal communities which are directly related to the environmental parameters like temperatures, air quality, sunlight, soil nutrients etc. In the study area, homesteads occupy maximum portions of terrestrial ecosystems. As such, observation on different indicators of selected homestead vegetation and dweller wildlife will be helpful to know the ecological impacts for the proposed project.

Description of the selected homestead

The homestead in Rajnagar is located at 2.5 km. east from upper North-east boundary of the project site. This is situated inside the damp area as numerous small swamps exist inside and surround the homesteads. Water retention capacity of surface soil of this homestead is very low and for this reason very little number of grasses and other herbs are present. Land elevation of selected homestead at Kalekarber village is comparatively flood free. This is located at about 1.8 km. east from Middle-east boundary of the project. Chalkghona village is located about 0.5 km south from south-east boundary of the project. The selected homestead of this village is close to Maidara River to it's north side and saline water shrimp farms to its south periphery. Presence of shallow ditches and peripheral waterbodies support to grow staple coverage of saline tolerant plant species. Borni village is located at about 3.0 km north from north-east boundary. Sampled homestead at Borni is situated at the middle part of the village. This homestead is also dominated by planted tree species and soil condition is similar to Rajnagar site. Vegetation of this homestead have been severely been damaged by past Cyclone Aila.

Species Composition of selected homestead vegetation

Homestead at Rajnagar

Once, this homestead was dominated with Gewa *(Excoecaria agallocha)* among all the trees due to its height population which get favor from soil's salinity for luxurious succession. But at ending of the year 2020, the homestead owner re-developed the homestead platform by filling sand extracted from nearer canal beds. Due to this activities, a staple portion of the *Gewa* coverage has been damaged along with other tree species. As a result, it is difficult to indicate the dominated tree species of this site. However, monocots fruits including Narikel *(Cocos nucifera)* and Khejur *(Phoenix sylvestris)* occupied the top canopy of the vegetation. Beside this, Safeda *(Manilkara zapota)* and Boroi *(Zizyphus sp)* are the two species of fruit yielding trees. In addition, a number of Bola *(Hibiscus tiliaceus),* Kewra *(Sonneratia apetala)* and one Sundari (*Heritiera fomes)* also found to exist. The homestead was cover very few grasses or undergrowth vegetation which also have been scarce after the land re-development.

Homestead at Kalekarber dighi

Two species like Narikel *(Cocos nucifera)* and Khejur *(Phoenix sylvestris)* occupies the top canopy. The homestead has many Mahagoni *(Swietenia mahagoni*) saplings which population is also high. Aam *(Mangifera indica)*, Safeda *(Manilkara zapota)*, Peyara *(Psidium guajava)* and Boroi (Zizyphus sp) are common trees height not more than 7 m. Mahagoni *(Swietenia mahagoni),* Rendi Koroi *(Albizia saman)* and Raj Koroi *(A. richardiana)* are timber trees those are occupied top canopy height more than 10m. Beside this, Neem *(Azadirachta indica),* Bakul (*Mimusops elengii)* and few numbers of Kola (Musa sp) are found on these homestead platforms.

Homestead at Chalkghona

Vegetation of this homestead has rich population of mangrove plant species like Gewa *(Excoecaria agallocha)*, Gol *(Nipa fruticans),* Kewra *(Sonneratia apetala), and* Ora *(Sonneratia caseolaris).* Narikel is the dominating tree species as well as occupying the top canopy. As the homestead is near the peripheries of river and shrimp gher, soil salinity supports luxurious growth of mangrove plant. This homestead has two shallow ditches which contain brackish water throughout the year. A number of ornamental plants also observed on this homestead platform.

Homestead at Barni

A total of 38 tree species have been recorded through quadrate sample survey of this homestead. Of which, Rendi Koroi *(Albizia saman)*, Mahagoni *(Swietenia mahagoni*), Taal *(Borassus flabellifer)*, Narikel *(Cocos nucifera),* Khejur *(Phoenix sylvestris)* are referable. The home owner has planted many fruit yielding trees which is now in growing form. Among this, Kotbel *(Limonia acidissima)*, Aam *(Mangifera indica)* and Safeda *(Manilkara zapota)* are common. Gewa *(Excoecaria agallocha)* was dominated at western part of this homestead now being less populated due to fell by the house owner. Tiger Fern *(Acrostichum aureum)* is a mangrove herb which presence at here also referable. Random quadrate vegetation survey has been conducted at selected homesteads during recent monitoring tier. A total of 38 plant species (excluding undergrowths) has been recorded from 16 number of surveyed sample quadrates which Shanon-Winner Diversity Index were 1.65.

Table 3.11: Plant species composition of the sampled homesteads

Species Name	Local Name	Family	Rajnagar				Borni				Kalekarber				Chalkghona				Total No. of individuals	Biodiversity Index
			Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16		
Accia arabica	Babla	Fabaceae														1			1	**1.65**
Acrostichum aureum	Tiger Fern	*Pteridaceae*						2	3	5								2	12	
Adhatoda vasica	Bashok	Acanthaceae							1										1	
Albizia richardiana	Chambol	*Fabaceae*									1		4	4					9	
Albizia saman	Rain Tree	Fabaceae	1				2	5	2						1	2			13	
Aphanamixis polystachya	Rhyna	Meliaceae										1							1	
Areca catechu	Supari	Arecaceae						1	7			2							10	
Azadirachta indica	Neem	Meliaceae					3	2	1				3	5		1			15	
Borassus flabeliffer	Taal	Arecaceae						1	2		3		1	1			1		9	
Cocos nucifera	Narikel	Arecaceae	4	2	3	2	2	2	2	2	2	4	5	2	2	2	2		38	
Diospyrus pregrina	Gab	Ebenaceae													1	1			2	
Excoecaria agallocha	Gewa	Euphorbiaceae	7	8	5	8												15	43	
Ficus benjamina	Lokkho Pakur	Moraceae					1		1										2	
Ficus hispida	Dumur	Moraceae											1				3		4	
Heritiera fomes	Sundari	Sterculiaceae	1						1										2	
Ipomoea fistulosa	Dhol Kolmi	Convolvulaceae								10									10	
Limonia acidissima	Kotbel	Lamiaceae				1									1				2	
Mangifera indica	Aam	Sapindaceae						4		2					1				7	
Manilkara zapota	Safeda	Sapotaceae							1		1								2	
Mimusops elengi	Bokul	Sapotaceae										1							1	
Moringa oleifera	Sazna	Moringaceae					1							1			1		3	
Musa sp	Kola	Musaceae		5	1		2				6				3	1			18	
Phoenix sylvestris	Khejur	Arecaceae		2	3	4							2			2	3	1	17	
Psidium guajava	Peyara	Myrtaceae															1		1	
Punica granatum	Bedana	Punicaceae													2				2	
Sonneratia apetalla	Kewra	Sonneratiaceae				1													1	
Swietenia mahagoni	Mahagoni	Meliaceae					4		2	2	10	13	8			8	2		49	
Syzygium cumini	Jaam	Myrtaceae						1							4				5	
Tamarindus indica	Tentul	Fabaceae													1	1			2	

Species Name	Local Name	Family	Rajnagar				Borni				Kalekarber				Chalkghona				Total No. of individuals	Biodiversity Index
			Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16		
Terminalia arjuna	Arjun	Combretaceae													1				1	
Terminalia catapa	Kathbadam	Combretaceae														1			1	
Zizyphus sp	Kul boroi	Rhamnaceae							1						1				2	
Lannea coromandelica	Jigar	Anacardiaceae	7	4						2				2	8				23	
Acacia auriculiformis	Akashmoni	Fabaceae						1								1			2	
Citrus grandis	Jambura	Rutaceae														1			1	
Eucalyptus globulus	Eucalyptus	Myrtaceae					1												1	
Nypa fruticans	Golpata	Arecaceae											3						3	
Phyllanthus acidus	Orboroi	Phyllanthaceae									1								1	

Plant Health

Structure of vegetation community of this area is tree dominant. Random saline water shrimp farming is a big threat to plant health of this area. Hence, Plant health of this area is not satisfactory. Expansion of shrimp farming in this area triggered incretion of salinity of soils. For this reason, overall plant succession, growth and productivity have changed day by day.

Plant Diseases and symptoms in homestead vegetation

Plant diseases observation of an area is needed to evaluate plant health and productivity. During initial field survey, some tree species were selected for regular observation of plant disease. In this regards, a number of common tree species have been observed in each homestead.

Leaf blast, Leaf spot, lethal yellowing, nut fall, Mite damage on nut fruit are common diseases of the plants in the study area. A brief discussion was held with home owners about diseases of selected economic plants which exist in their homesteads. Most symptoms for plant diseases are descriptive. Although, all plant diseases symptoms are not visible in a same time of the year, but it was tried to observe the existing disease symptoms. Leaf spot and mite damage on fruits is the common symptoms of *Cocos nucifera.* In addition, bud/trunk rot (Heart Rot), lethal yellowing and diameter loss at top portion of this monocot is also common symptom of this plant in all location. Infection of fungal/bacterial is not remarkable all the homesteads. But Leaf Anthracnose on *Mangifera indica* and Bacteriosis on *Psidium guajava* is commonly found most of the trees. *Phoenix sylvestris* also found unhealthy due to leaf yellowing from manganese deficiency.

Number of diseases affected trees

Plant health has been insignificantly improved at all the sites... This improvement may be due to reduction of soil salinity for improving drainage condition. Comparing to same season monitoring in previous tier (Apr, 2021), the present year shows remarkable improving trend.

Vegetation canopy status

Species representation in different canopy layers of homestead vegetation

Coconut (*Cocos nucifera)* occupied top canopy of all the studied homestead vegetation. Date Palm (*Phoenix sylvestris)* is prevalent as second top layer followed by Gewa (*Excoecharia agallocha)*. Most of the fruit yielding trees like Sofeda (*Manilkara zapota),* Mango (*Mangifera indica)* possess upper bole of canopy layer. Lower bole are occupied by small fruit yielding trees like Guava (*Psidium guajava)*, Musa sp. Very few grass species and undergrowth vegetation were followed at studied homesteads.

Estimated Canopy cover in homestead vegetation of sampling sites

Canopy cover has been slightly improved at two sites like Chalkghona and Rajnagar. Overall canopy coverage in all the sites are revealed improvement comparing the same seasonal monitoring in Apr 2021 (**Table 3.11**). Canopy coverage of the studied homesteads has been represented in following table.

Table 3.12: Vegetation Canopy Cover in different studied homesteads

Location	% of canopy Coverage																										
	Apr 2014	Jun 2014	Oct 2014	Jan 2015	Apr 2015	Aug 2015	Oct 2015	Jan 2016	Jul 2016	Oct 2016	Jan 2017	Jan 2018	Apr 2018	Jul 2018	Nov, 2018	Feb, 2019	Apr, 2019	Jul, 2019	Nov, 2019	Feb, 2020	Jul, 2020	Nov, 2020	Jan, 2021	Apr, 2021	Jul, 2021	Nov, 2021	Feb, 2022	May, 2022
Rajnagar	NS	19	19	17	20	20	20	20	21	23	19	15	18	14	11	22	19	18	16	14	11	8	8	8	10	14	11	15
Borni	NS	26	18	18	12	14	20	20	25	25	23	21	21	23	20	21	21	20	18	20	17	22	19	23	24	22	20	20
Kalekarber	NS	20	24	25	23	24	24	22	24	26	25	23	24	24	25	24	25	25	24	24	22	22	24	19	21	24	24	24
Chalkghona	NS	13	24	22	17	21	21	20	21	27	26	25	16	18	21	22	22	22	20	23	17	21	18	21	24	23	20	23

Note: NS = Not Surveyed

Table 3.13: Proportion of healthy and unhealthy plants in studied homesteads

Location	Plant Name	Total No. of Plant	No. of Unhealthy Plant																										
			Apr, 2014	Jun, 2014	Oct 2014	Jan 2015	Apr 2015	Aug, 2015	Oct, 2015	Jan, 2015	Oct, 2016	Jan, 2017	Jan, 2018	Apr, 2018	Jul, 2018	Nov, 2018	Feb-19	Apr, 2019	Jul, 2019	Nov, 2019	Feb, 2020	Jul, 2020	Nov, 2020	Jan, 2021	Apr, 2021	July, 2021	Nov, 2021	Feb, 2022	May, 2022
Rajnagar	*Cocos nucifera*	17*	NS	10	5	5	15	4	5	NS	3	4	6	6	9	4	4	3	2	3	10	3	7	11	10	10	10	3	1
	Phoenix sylvestris	25	NS	15	4	4	22	9	13	NS	10	2	5	4	7	6	8	9	5	3	4	4	5	2	12	2	3	2	2
	Manilkara zapota	1	NS	-	-	-	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
	Albizia saman	2	NS	-	-	-	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	2	2	-	2
	Excoecaria agallocha	55*	NS	-	1	1	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	10	-	-	-
	Mangifera indica	3	NS	1	-	-	2	-	-	NS	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	2	2	-	-
	Psidium guajava	2	NS	2	-	-	2	-	-	NS	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-
Borni	*Cocos nucifera*	10	7	3	-	-	3	1	2	NS	1	2	3	1	2		1	1	1	2	1	-	-	-	-	-	-	1	-
	Phoenix sylvestris	12	-	5	4	4	3	1	4	NS	4	3	4	2	1		-	1	1	-	-	-	-	-	-	-	-	-	-
	Borassus flabellifer	6	3	1	-	-	-	-	-	NS	-	-	-	-	-	1	1	-	-	-	-	1	-	-	-	-	-	-	-
	Mangifera indica	6	3	3	1	1	4	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-
	Excoecaria agallocha	18	-	-	-	-	-	-	-	NS	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	3	-		3
	Swietenia mehogani	11	-	-	-	-	1	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Areca catechu	10	-	6	2	2	8	2	2	NS	-	1	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Manilkara zapota	1	-	-	-	-	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Psidium guajava	2	2	1	-	-	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Location	Plant Name	Total No. of Plant	No. of Unhealthy Plant																										
			Apr, 2014	Jun, 2014	Oct 2014	Jan 2015	Apr 2015	Aug, 2015	Oct, 2015	Jan, 2015	Oct, 2016	Jan, 2017	Jan, 2018	Apr, 2018	Jul, 2018	Nov, 2018	Feb-19	Apr, 2019	Jul, 2019	Nov, 2019	Feb, 2020	Jul, 2020	Nov, 2020	Jan, 2021	Apr, 2021	July, 2021	Nov, 2021	Feb, 2022	May, 2022
Kalekarber Dighi	*Cocos nucifera*	56	35	5	1	1	2	2	3	NS	1	1	-	6	3	-	1	3	1	7	4	2	-	-	-	2	-	-	-
	Phoenix sylvestris	10	-	3	-	-	1	-	1	NS	3	-	3	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-
	Mangifera indica	5	1	1	-	-	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
	Manilkara zapota	2	-	-	-	-	1	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Borassus flabellifer	8	-	-	-	-	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Zizyphus sp	1	-	-	-	-	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
	Psidium guajava	8	-	-	-	-	-	-	-	NS	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Tamarindus indica	2	-	-	-	-	1	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chalkghona	*Cocos nucifera*	39	25	19	5	5	34	20	-	NS	2	2	4	5	3	-	3	4	2	4	3	5	-	-	-	-	-	-	-
	Phoenix sylvestris	24	-	10	1	1	6	5	1	NS	1	-	5	2	3	-	-	1	2	2	1	3	-	1	3	2	1	1	-
	Albizia saman	3	-	-	-	-	1	-	-	NS	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
	Excoecaria agallocha	36	-	-	1	1	-	-	-	NS	-	-	-	-	2	-	-	-	-	-	-	-	-	-	2	-	-	-	1
	Manilkara zapota	1	-	-	-	-	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Psidium guajava	17	1	7	-	-	-	-	-	NS	-	-	-	-	-	1	3	-	-	1	-	-	-	-	-	-	-	-	-
	Mangifera indica	7	2	1	-	-	-	-	-	NS	-	1	-	1	-		-	-	-	-	-	-	-	-	-	-	-	-	-
	Borassus flabellifer	2	-	-	-	-	-	-	-	NS	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-

*Note: NS = Not Surveyed *=1 Cocos and 45 Excoecaria have been cut*

Bird Habitat

Local birds and their nesting behavior

Numerous local bird species are occurred in the study area. Homestead vegetation are the prime habitat for local birds. Existence of vast shrimp farms as well as canals and rivers also favor good number of water dependent bird species in this area. Most of the birds are nesting on tall trees of homesteads. Small bird like Tailor bird, prefer small bushy shrubs. Although, birds do not follow any local boundaries, a clear conception on available bird species have been gathered through discussions with studied homestead owners as well as physical observation.

Bird species and number of Bird nests in sampling sites

Two Black Rumped Flameback nests have been recorded from Rajnagar and Kalekarber sites. Both of the nest were on Coconut tree. However, **Table 3.13** represent the bird nest monitoring datasheet over the monitoring periods.

Table 3.14: Bird Nest Monitoring Datasheet

Monitoring Tier	Location	Name of nesting Bird						
		Little Cormorant	Little Egret	Asian Pied Starling	Tailor Bird	Great Egret	Spotted Dove	Black R. Flameback
Apr 2014	R	NS	NS	NS	NS	NS	-	-
	B	-	-	1	-		-	-
	K	NS	NS	NS	NS	NS	-	-
	C	-	1	-	1	-	-	-
Jun 2014	R	12	4	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C			11		-	-	-
Sep 2014	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Dec 2014	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Apr 2014	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Aug 2015	R	1	5	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Jan 2016	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Jun 2016	R	10	5	-	-	3	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-

Monitoring Tier	Location	Name of nesting Bird						
		Little Cormorant	Little Egret	Asian Pied Starling	Tailor Bird	Great Egret	Spotted Dove	Black R. Flameback
	C	1	1	-	-	-	-	-
Oct 2016	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Jan 2017	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Jan 2018	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	1	-	-	-	-	-
Nov 2018	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Feb 2019	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	1	-	-	-
Apr 2019	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Jul 2019	R	-	-	-	1	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Nov 2019	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Feb 2020	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Jul 2020	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Nov 2020	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Jan 2021	R	-	-	1	1	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-

Monitoring Tier	Location	Name of nesting Bird						
		Little Cormorant	Little Egret	Asian Pied Starling	Tailor Bird	Great Egret	Spotted Dove	Black R. Flameback
Apr 2021	R	-	-	1	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	1	-
Jul 2021	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Nov 2021	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Feb 2022	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
May, 2022	R	-	-	-	-	-	-	1
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	1
	C	-	-	-	-	-	-	-
Note: Location R=Rajnagar, B=Borni, K=Kalekarber, C=Chalkghona								

3.2.4 Aquatic Ecosystem Monitoring

Rivers, canals, ponds and saline water shrimp farms are main wetland forms in the study area. Of which, river bear the flowing/ lotic and ponds bear the stagnant/lentic water systems. Canals of this area have merged with shrimp farms. Shrimp farms extend a large proportion of total watershed of the study area those are intervene by human. Therefore, canals are not an actual flowing or stagnant water system.

Monitoring Locations

Passur is the only external river beside the project area which maintains connectivity with all flowing water systems of the study area. On the other hand, Maidara River including two branches (Sailtakhali and Ichamoti) exists as an internal river system. Both of the river systems are support River Dolphin whole of the year. Hence, status of aquatic mammals (Dolphin) in these river systems has been monitored.

Dolphin Occurrence

Dolphin migration route in study area

Two dolphin species (Ganges River Dolphin and Irrawaddi Dolphin) travel throughout the Passur River for whole of the year. The Ganges River dolphin migrates from estuary regions to upstream connected rivers like Rupsha and Madhumoti. Though Irrawardi Dolphin is mostly habituated in estuary regions of Bangladesh, but this aquatic mammal is also occasionally sighted in Passur River. Ganges Dolphins also roam through Maidara River mainly during high tide. Siltation and narrowing of upstream branches are limiting the length of migration area of this river day by day.

Dolphin occurrence in Passur and Maidara River

Presence of Dolphin have been surveyed within 15 km length of Passur and Maidara river surround the project area (From Digraz Kheyaghat to Chalna including Maidara River) through boat transact during full tide and mid tide. A total of 6 dolphins have been recorded in this survey. Of which 3 individuals have sighted in Maidara River and lest one recorded within Passur River. The encounter rate is 0.16 individual/km/hr which is lower than previous monitoring tier. **Figure 3.12** represents the survey transact and location of dolphin occurrence within these river channels.

Dolphin occurrence in Shella Gang and Bhadra Khal

Dolphin occurrence has monitored within 7.5 km length of Dhangmari Khal and recorded 22 dolphins. The transect length was 13.5 km which duration was 79 mins. The encounter rate was 1.24 individual/km/hour which is significantly higher than previous monitoring. The distribution of dolphin occurrence at Dhangmari Khal is presented in **Figure 3.11**.

Six Dolphins were also sighted in Shella Gang while 7.66 km transact survey conducted from Chandpai to Joymonirgol Thota to Food Silo to Jongra Patrol Post to Joymonirgol Thota (**Figure 3.13**). The occurrence rate was 0.50 individual/km/hour.

A total of 30 dolphins have been recorded at Bhadra Khal during 38 min survey time and the 3.55 km inner reach from Bhadra Patrol Post. The encounter rate was 10.23 individuals/km/hr. The encounter rate was significantly higher than the previous monitoring and this may be due to increase fish abundance within this khal for ongoing restriction of fishing activity by BFD within this tributary of Passur River. The distribution of dolphin occurrence at Bhadra Khal is presented in **Figure 3.14**.

Another short survey was conducted Karomjal, Harbaria and Akram Point while passing the river. Dolphin has been notified at Karamjal and Harbaria while travelling on boat. However, the survey result is included in **Table 3.14**.

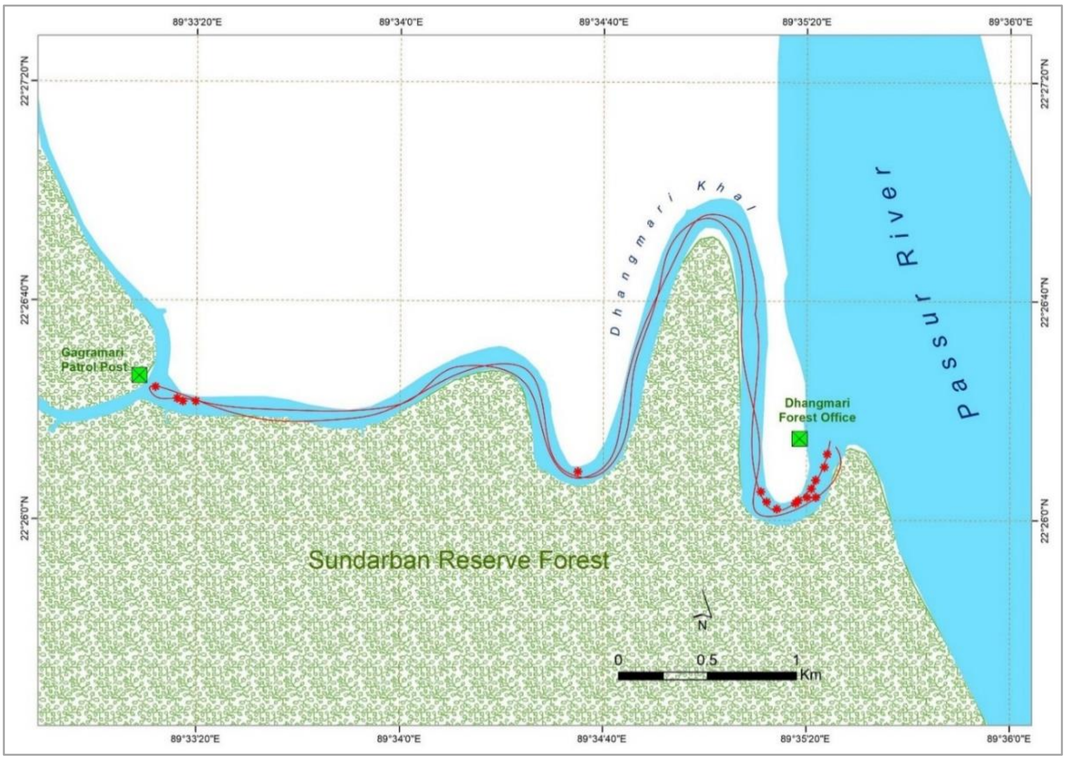


Figure 3.10: Location of dolphin Dhangmari Khal

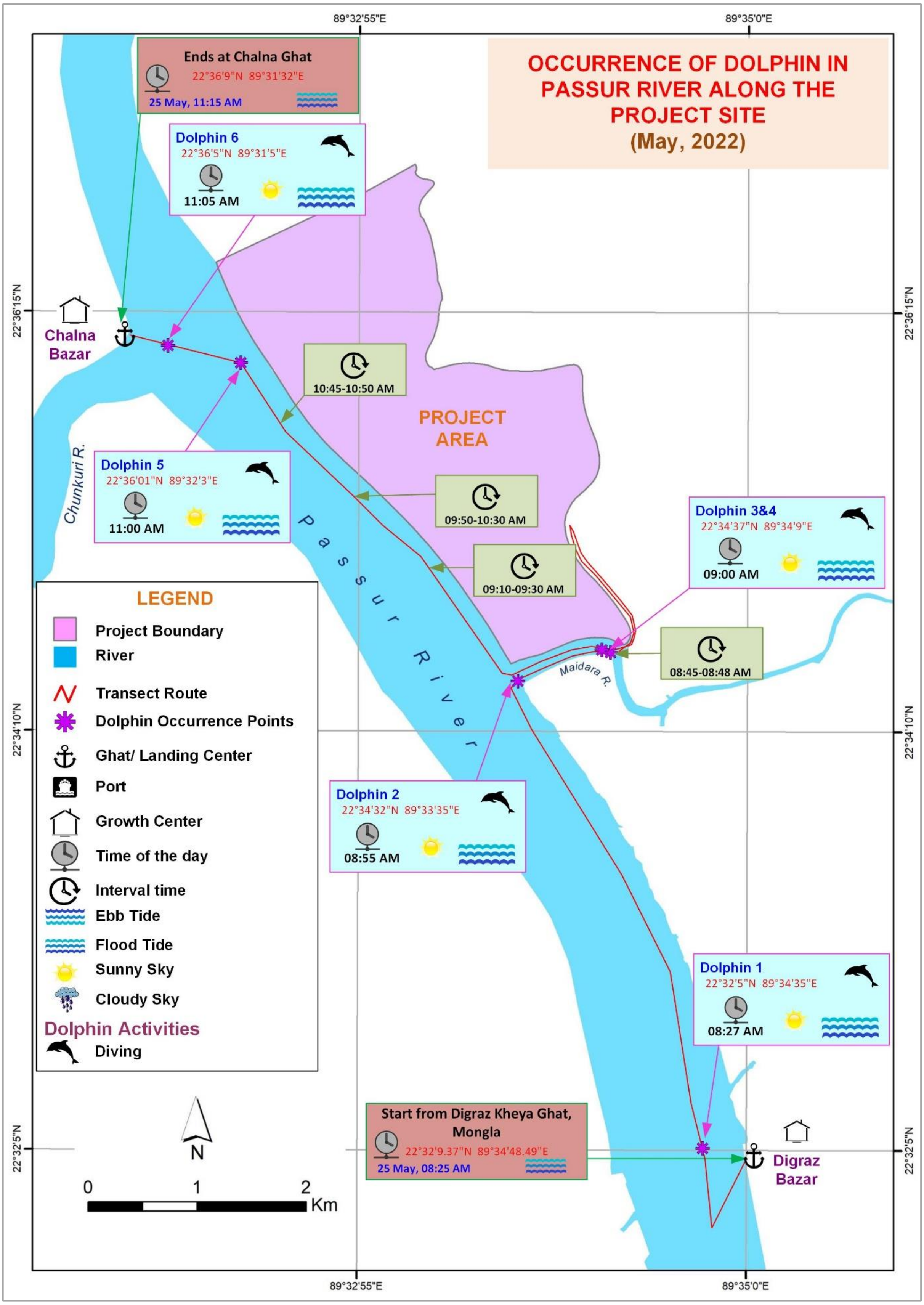


Figure 3.11: Occurrence of dolphins at Passur and Maidara River along the project site

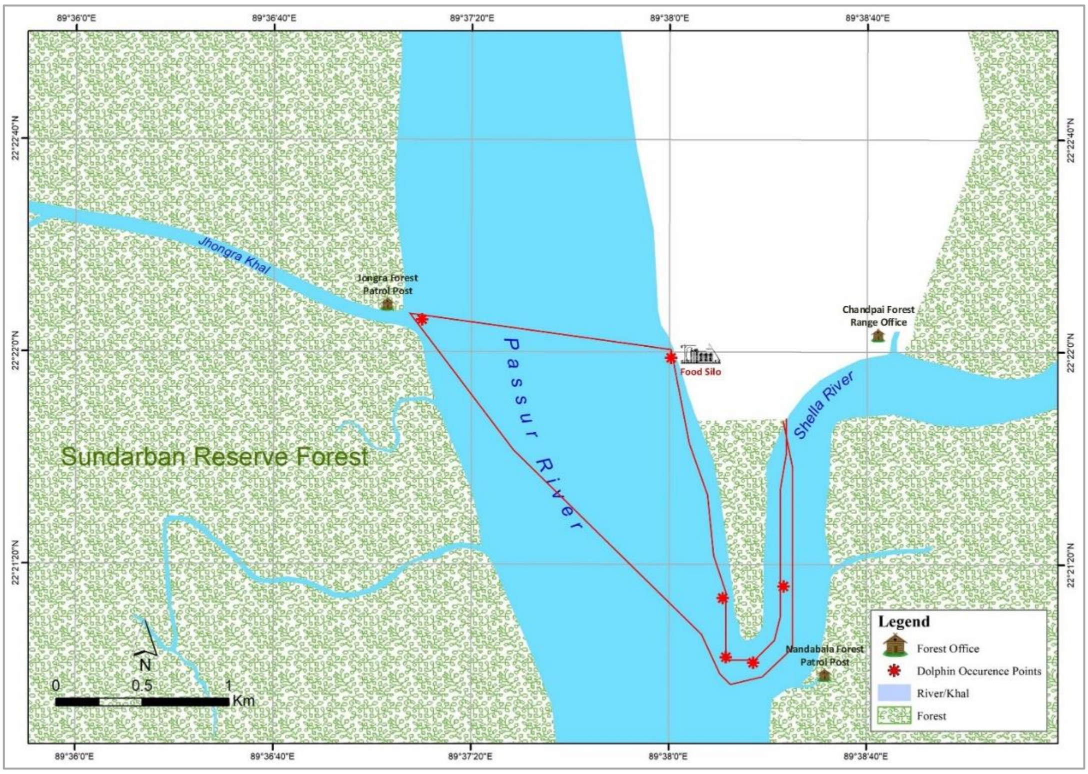


Figure 3.12: Location of dolphin Occurrences at Chandpai

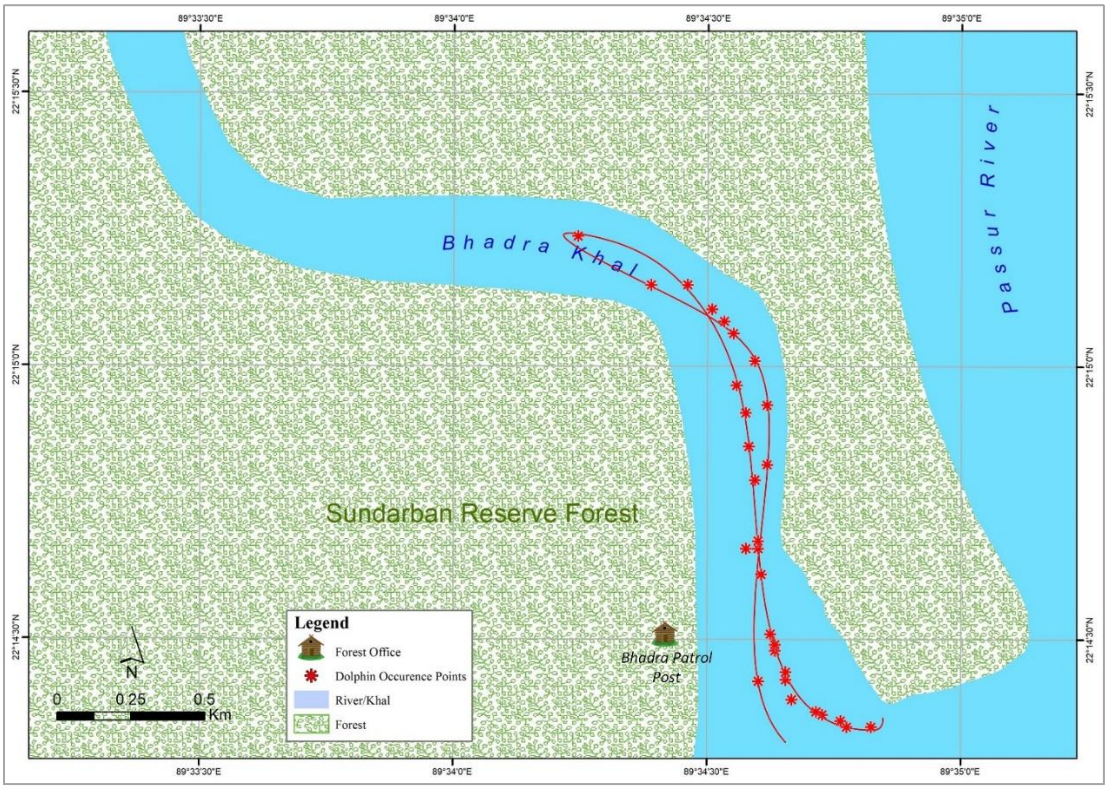


Figure 3.13: Location of Dolphin Occurrence at Bhadra Khal

Table 3.15: Dolphin observation Datasheet

Monitoring Tier	Tidal Condition	Passur River at Project Site	Karamjal	Harbaria	Akram Point	Moidara River	Shella River at Chandpai
Apr-2014	FT	Y	NS	NS	NS	Y	NS
	NT	Y	NS	NS	NS	N	NS
Jun-2014	FT	Y	NS	NS	NS	N	NS
	NT	Y	N	N	N	N	NS
Oct-2014	FT	Y	NS	NS	NS	Y	NS
	NT	Y	Y	Y	N	Y	NS
Jan-2015	FT	Y	Y	Y	NS	Y	NS
	NT	Y	Y	N	Y	N	NS
Apr-2015	FT	Y	N	N	Y	Y	NS
	NT	Y	N	N	Y	N	NS
Aug-2015	FT	Y	NS	N	NS	Y	NS
	NT	Y	Y	N	NS	N	NS
Oct-2015	FT	NS	NS	Y	N	NS	NS
	NT	Y	Y	NS	Y	Y	NS
Oct-2015	FT	Y	Y	Y	Y	N	NS
	NT	Y	N	N	NS	Y	NS
Jul-2016	FT	Y	Y	Y	NS	Y	NS
	NT	Y	NS	Y	NS	NS	NS
Oct-2016	FT	N	Y	Y	N	NS	NS
	NT	Y	Y	NS	N	Y	NS
Jan-2017	FT	Y	Y	N	NS	N	NS
	NT	Y	Y	N	NS	Y	NS
Jan-2018	FT	Y	NS	Y	N	NS	NS
	NT	Y	Y	N	N	Y	N
Jun-2018	FT	Y	N	N	N	Y	Y
	NT	Y	NS	N	Y	Y	NS
Nov-2018	FT	NS	N	N	N	NS	NS
	NT	Y	N	N	N	Y	Y
Feb-2019	FT	NS	Y	Y	N	NS	Y
	NT	Y	N	N	Y	N	NS
Apr-2019	FT	NS	Y	N	N	NS	NS
	NT	N	N	Y	N	N	Y
Jul-2019	FT	Y	Y	N	N	Y	Y
	NT	Y	NS	N	N	N	NS
Nov-2019	FT	NS	Y	Y	N	NS	Y
	NT	Y	Y	N	Y	Y	Y
Feb-2020	FT	Y	Y	Y	Y	Y	Y
	NT	Y	N	NS	NS	Y	Y
Jul-2020	FT	Y	N	N	N	Y	Y
	NT	Ns	Y	N	N	NS	Y
Nov-2020	FT	NS	NS	NS	NS	NS	Y
	NT	Y	NS	NS	NS	Y	NS

Monitoring Tier	Tidal Condition	Passur River at Project Site	Karamjal	Harbaria	Akram Point	Moidara River	Shella River at Chandpai
Jan-2021	FT	NS	NS	NS	NS	NS	Y
	NT	Y	NS	NS	NS	Y	NS
Apr-2021	FT	NS	NS	NS	NS	NS	Y
	NT	Y	NS	NS	NS	Y	NS
Jul-2021	FT	y	NS	Y	Y	Y	Y
	NT	NS	Y	N	N	NS	NS
Nov-2021	FT	Y	NS	N	N	Y	NS
	NT	N	N	Y	N	NS	NS
Feb-22	FT	y	Y	Y	N	Y	Y
	NT	N	NS	Y	N	NS	NS
May-22	FT	y	Y	N	N	Y	NS
	NT	NS	Y	Y	N	NS	Y
Note: FT=Flood Tide, NT=Neap Tide, NS=Not Surveyed; Occurrence Status: Y = Occurred, N = Not occurred							

Status of benthos and planktons in river systems

Benthos and plankton sample have been collected from 7 different locations of Passur and Maidara rivers during different tidal conditions in February 2022. Detail status of benthos and planktons from recent survey is presented in following sections.

Species Composition of Benthos

No benthos species has detected from any of the four sampled sites.

Species Composition of Planktons

Phytoplankton: A total of 47 phytoplankton species were recorded from the 5 locations of river water and one locations of inland freshwater pond. 17 phytoplankton has been recorded from Passur and Maidara River. Out of which, Closteriopsis longissimi, Coscinodiscus granii Gough and Raphidiopsis mediterranea skuja are abundant both of the river water.

The lentic aquatic ecosystem supports highest population and highest species diversity. Gardaskathi pond support 16 phytoplankton species. Closteriopsis longissimi, Coscinodiscus granii Gough and Coscinodiscus oculus etc are the dominant species. Species composition and abundance of Phytoplankton in different monitoring locations have been listed in following Table (**Table 3.15**).

Table 3.16: Species composition and abundance of Phytoplankton in different monitoring locations

Sl. No.	Species Name	Abundance (Individual/liter)					
		Passur at Project Jetty Site	Moidara River	Akram Point	Harbaria	Hiron Point	Gardaskhathi
1	*Coscinodiscus excentricus*			29	364		
2	*Oscillatoria princeps*					385	
3	*Actinocyclus octonarius*				1,163		
4	*Alexandrium catenella*			20			
5	*Alexandriumcyst*	90				727	
6	*Anabaena flos-aquae*						

Sl. No.	Species Name	Abundance (Individual/liter)					
		Passur at Project Jetty Site	Moidara River	Akram Point	Harbaria	Hiron Point	Gardaskhathi
7	*Aphanizomenon flos-aquae*			80			84
8	*Asterolampra marylandica*				436		
9	*B. pisiforme*			20			
10	*Boreadinium*	163					
11	*Ceratium sp.*						29
12	*Chroomonas coerulea*	60					
13	*Closteriopsis longissimi*	300	669				415
14	*Coscinodiscus*						145
15	*Coscinodiscus excentricus*	160	287	340		203	36
16	*Coscinodiscus granii Gough*	220	63		290		290
17	*Coscinodiscus oculus*				146		289
18	*Coscinodiscus wailesii*				291		
19	*Cyclotella comta Kützing*			50			
20	*Entomoneis*	75					
21	*Eucampia*	73		20	47		
22	*Euglena acus*						63
23	*Gloeotrichia pisum*		174				42
24	*Gonatozygon aculeatum*	110	73				35
25	*Hemidiscus cuneiformis*				145		25
26	*L. danicus*			19			
27	*Licmophora*			20			
28	*Lyngbya confervoides*				80		
29	*Nitzschia longissimi*						
30	*Nitzschia lorenziana*		974				
31	*Nitzschia sigma*			200		21	
32	*Odontella alchetron*			15			
33	*Oscillatoria limosa*				72		
34	*Oscillatoria princeps*		240	30			42
35	*P. micans*						21
36	*Phacus longicauda*					44	
37	*Pinnularia*						28
38	*Pinnularia brevicostata*		38				
39	*Planktoniella sol*			40			
40	*Pleurosigma angulatum*			240			25
41	*Pleurosigma diverse-striatum*	147					
42	*Pseudonitzschia pungens*			300			
43	*Pyrocystis fusiformis*	120					
44	*Raphidiopsis mediterranea skuja*	155	110				56
45	*Staurastrum*	45					

Sl. No.	Species Name	Abundance (Individual/liter)					
		Passur at Project Jetty Site	Moidara River	Akram Point	Harbaria	Hiron Point	Gardaskhathi
46	*Thalassionema sp.*			420			
47	*Thalassiosira lacustris*					43	
Source: CEGIS Field Sampling, Feb 2022; Laboratory Test at Environmental Science Discipline, Khulna University							

Zooplankton: Only two Zooplankton has been identified from the Passur river systems at Akram Point, Harbaria and Hiron Point. Of which Calanus sp. was presented at all the sites and Brachionus rubens was detected at Harbaria only. Species compositions of zooplankton in different monitoring locations have been presented in following Table (**Table 3.16**).

Table 3.17: Species composition and abundance of zooplanktons

Sl. No.	Species Name	Passur at Project Jetty Site	Moidara River	Mongla-Passur Confluence	Akram Point	Harbaria	Hiron Point	Kalekarber Dighi	Gardaskhathi
1	Calanus sp.	-	-	-	10	73	36	-	-
2	Brachionus rubens	-	-	-	-	58	-	-	19
Source: CEGIS Field Sampling, Feb 2022; Laboratory Test at Environmental Science Discipline, Khulna University									

3.3 Sundarbans Forest Health monitoring

3.3.1 Background

The goal of the Forest Health Monitoring program is to track indicators of forest condition over a predetermined time period and identify status, changes, and trends. In order to address forest health issues that jeopardize the sustainability of forest ecosystems, the Forest Health Monitoring program analyzes data from a range of sources, including ground plots (i.e., long-term monitoring plots), aerial surveys, and other biotic and abiotic data sources. Under similar conditions, stands with a high leaf area index will produce more biomass and total volume per ha than will stands with a low leaf area index (Beets et al. 2008). Another reliable sign of the health of a forest is the presence of lichen. Growing on trees and shrubs, lichens frequently take up nutrients from the air. Lichens' existence or absence is a sign of the health of the forest since they are extremely sensitive to air pollution, especially sulfur dioxide, fluoride, and ammonia. By expanding the number of their pneumatophores, mangrove trees may adapt to anaerobic and waterlogged environments, hence increasing the surface area available for gas exchange.

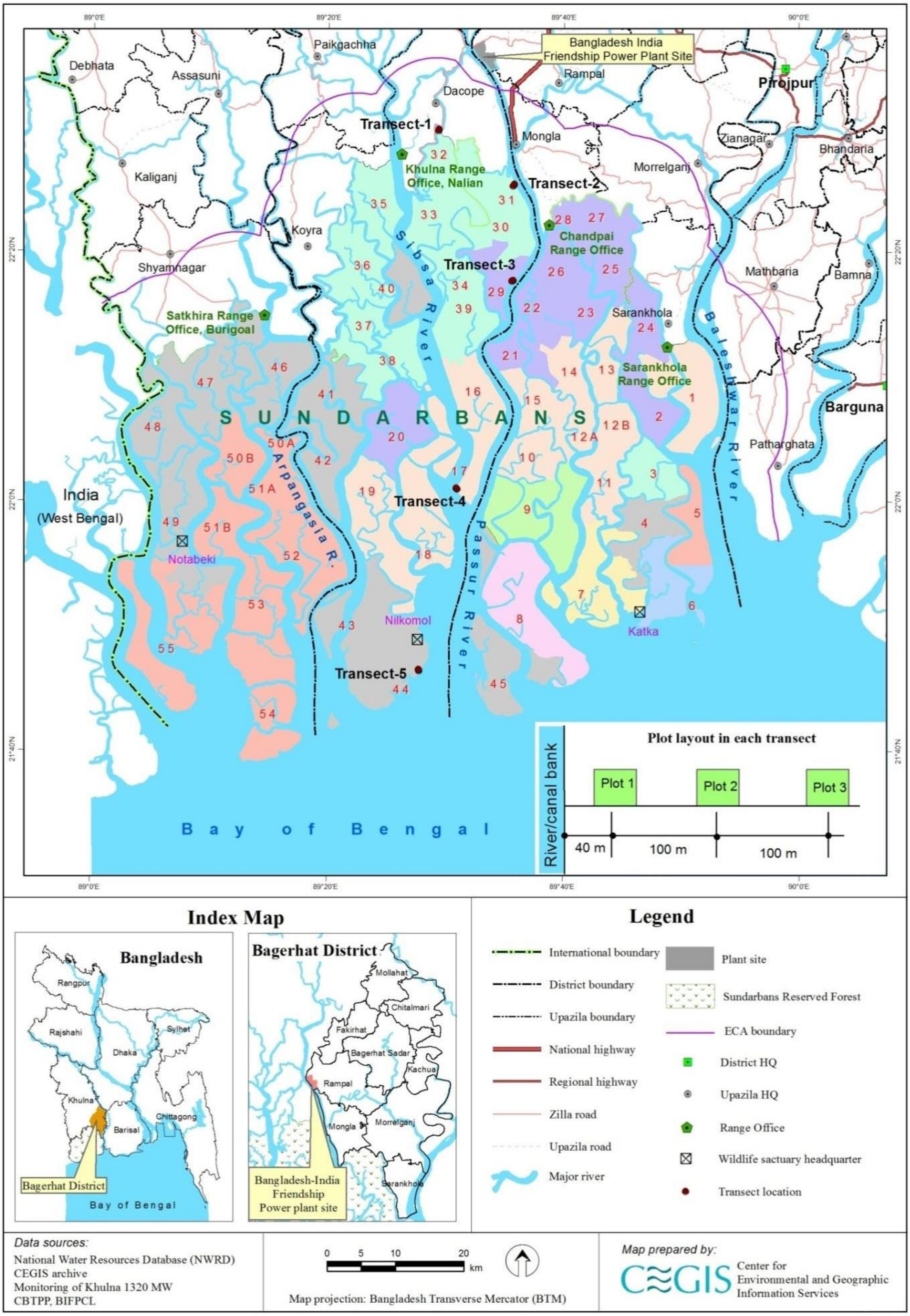


Figure 3.14: Location Map of Sundarbans Forest Health Monitoring Plots (PSP)

The mangrove forest ecosystem's ecological stability is significantly shaped by crab. According to Lee (1989), crab burrows can efficiently remove nitrogen from the aquatic ecosystem in the form of gaseous nitrogen (N_2) and nitrous oxide (N_2O), as well as increase the amount of oxygen in the soil layer (Amarasinghe, 2009). Another crucial sign of the health of a forest is the quality of the soil there (USDA Forest Service. 2007). Measuring the physical, chemical, and biological characteristics of the soil at various depths are typically required for an evaluation of its quality. The diversity of plant species is another bio-indicator of a healthy forest. If there is a mixture of plant species of various sizes and ages, forming forest "layers" that serve as habitats for numerous species, that is one approach to measure this variety (Greenleaf Forestry and Wood Products Inc. 2010). These bio-indicators will be investigated in Sundarbans Reserve Forest (SRF) in light of the Rampal Power Plant Installation.

The state of the forest to monitor the potential impacts of the Rampal Thermal Coal Power Plant Project, bio-indicators will be used in the Sundarbans Reserve Forest (SRF). It is necessary to establish a baseline state in order to determine the genuine scenario of power plant impact on forest health. In light of this, CEGIS is implementing a forest health monitoring study at five Sundarbans Reserve Forest (SRF) locations along the Passur River: Sutarkhali, Karamjal, Herbaria, Akram Point, and Hiron Point. Tree height and diameter, regeneration capacity, crab activity, plant diversity, biomass, and carbon stock were among the indicators monitored in this program.

3.3.2 Methodology

Permanent Sample Plot (PSP) Establishment and Layout

To set up permanent sample plots, five plots were established (**Figure 3.15**). Among those, five sites are along the Passur River at Karamjal, Herbaria, Akram point, and in Hiron point respectively and the fifth plot is near Sutarkhali forest office. The sites were selected considering the distance from the proposed project site, wind directions, coal transportation route, river systems, and vegetation types.

Bio-Indicators for Forest Health Monitoring

There are many Bio-indicators for forest health monitoring. As the study forest is a mangrove forest, some of the mangrove traits were also selected as Bio-indicator. The Bio-indicators observed in this forest health monitoring program were seedling regeneration, pneumatophores, species diversity, crab hole density, canopy cover, leaf phenology, Leaf Area Index, Tree growth, phonological behavior, pest, and disease.

Sampling Design of Permanent Sample Plots (PSPs)

At each site, a transect line was laid out perpendicular to the river or canal bank. Along the transect line, three circular nested subplots of a 12.62m radius have been laid out at 100m intervals to capture the maximum tree species (**Figure 3.16**). Because of the variation in species composition in SRF, observation plots were laid out from the coast, river, or canal-side to the upper slope zone where the forest area is denser. The location of the first subplot was 40m away from the ecotone zone to save the subplot from riverbank erosion. Each subplot was again subdivided into four quadrates (**Figure 3.17**.

Table 3.18: General Description of Permanent Sampling Plots (PSPs)

Transect	Plot	Range	Compartment No.	GPS ± (m)		Soil Description	Plot Location Notes
				Latitude (N)	Longitude (E)		
Sutar khali	1	Khulna	32	22.4981	89.4875	Hard Clay	Just opposite from Sutar Khali Forest Station and 40m SW from Sutar Khali Canal
	2	Khulna	32	22.4973	89.4871	Hard Clay	Just opposite from Sutar Khali Forest Station and 140m SW from Sutar Khali Canal
	3	Khulna	32	22.4965	89.4866	Hard Clay	Just opposite from Sutar Khali Forest Station and 240m SW from Sutar Khali Canal
Karamjal	1	Chandpai	31	22.4253	89.5943	Hard Clay	Plot center 40m west from Passur River
	2	Chandpai	31	22.4252	89.5934	Hard Clay	Plot center 140m west from Passur River
	3	Chandpai	31	22.4226	89.5925	Hard Clay	Plot center 240m west from Passur River
Harbaria	1	Chandpai	29	22.2061	89.5924	Hard Clay	40m west from Passur River
	2	Chandpai	29	22.2962	89.5917	Hard Clay	140m west from Passur River
	3	Chandpai	29	22.2962	89.5908	Muddy	240m west from Passur River
Akram Point	1	Khulna	17	22.0195	89.5129	Hard Clay	40m east from Shibsha River
	2	Khulna	17	22.0187	89.5134	Clay	140m east from Shibsha River
	3	Khulna	17	22.0180	89.5140	Hard Clay	240m east from Shibsha River
Hiron Point	1	Khulna	44	22.7753	89.4610	Sandy	350m east from Gogari Canal
	2	Khulna	44	21.9166	89.2333	Sandy	40m north from Bay of Bengal
	3	Khulna	44	22.1833	89.5000	Hard Clay	648m south east from Shibsha River

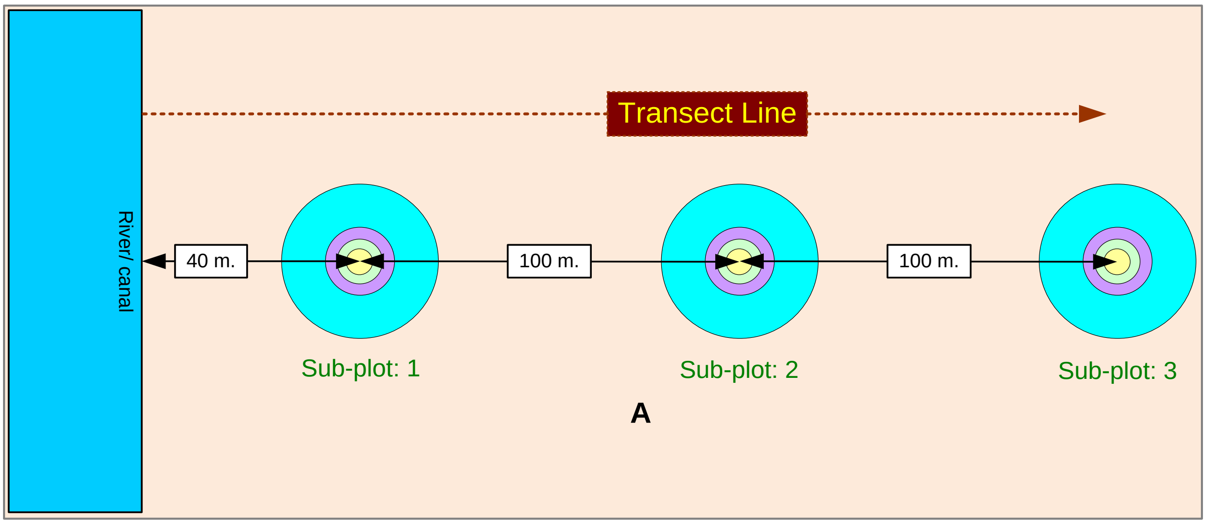


Figure 3.15: Layout of the Subplots and Transect Line Perpendicular from Ecotone (river or canal bank)

Tree growth

Tree species growth data were obtained from measured tree DBH. Individual tree DBH ≥5cm was considered for growth trend observation.

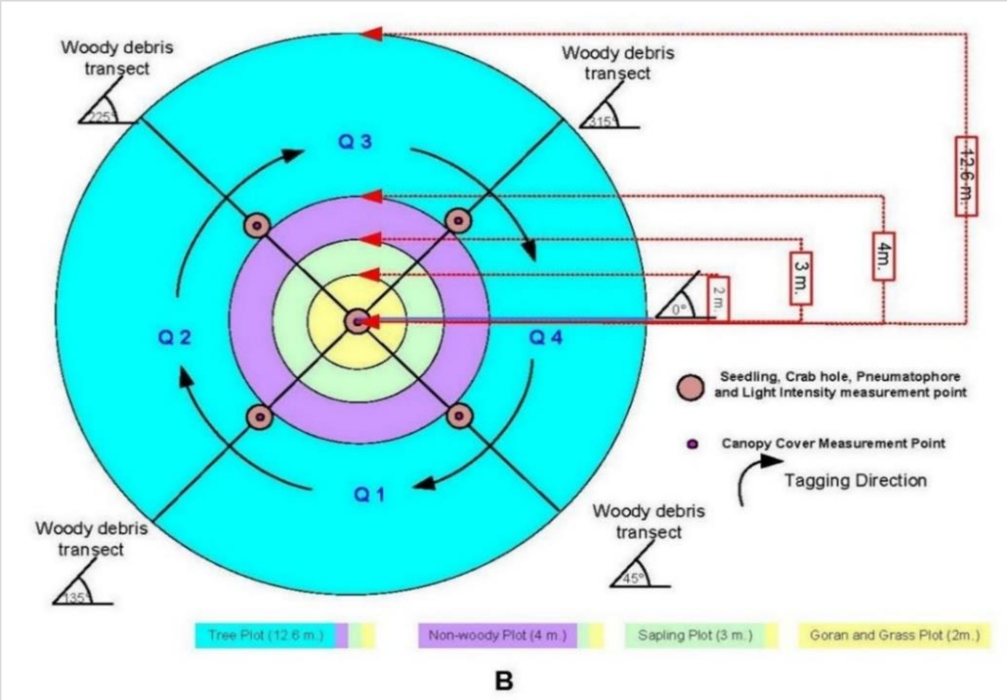


Figure 3.16: Layout of the Survey Activities in each Subplot

Vegetation Diversity

Tree species data were collected from the PSPs. Individual tree DBH ≥5cm was considered. Saplings (DBH<5cm and height 1.37m) and seedlings (height<1.37m) were assessed within a 3m and 2m radius circle respectively in each PSP. Seedlings were counted as species wise and their status of living was also recorded. For saplings, species name and DBH were recorded along with the living status.

Biomass and carbon stock estimation in tree

From each plot, tree species were identified and each individual was recorded. Diameter at breast height (1.37m) and height was measured in the field. The total biomass of trees was estimated after adding above and below-ground biomass. As the study was conducted in a reserved forest area, it was not possible to cut all the trees and bring them to the laboratory for estimating biomass. After reviewing models developed by several authors from across the world (e.g., FAO 1997, Brown et al. 1989), the generic allometric model developed by Chave et al. (2014) was used for measuring biomass as this is widely used for tropical region tree standing biomass. Below ground biomass was calculated considering 15% of above-ground biomass (Mac-Dicken 1997). After calculating biomass, carbon content was calculated based on the assumption that carbon content is 50 percent of the dry woody biomass (Brown 1997). Aboveground biomass and carbon were calculated on a per-hectare (ha) basis. The model for above ground biomass estimation is as follows:

$AGB(Y)=0.0673 \times (\rho D^2H)^{0.976}$

Where, Y = above-ground biomass in Kg; H = Height of the trees in meters; D = Diameter at breast height (1.3m) in cm; ρ = Wood density in units of g/cm^3.

Pneumatophores

The total numbers of living pneumatophores were recorded within a circular area of a 1m radius centering each of the four points of all the subplots.

Crab hole

Crab plays an important role in mangrove ecosystems such as decomposing litter falls which play an important role in increasing soil fertility. To record the crab density, crab hole abundance was monitored. For this purpose, the crab holes were counted within an area of a 1m radius circle in each subplot's center and the midpoint of four transects.

Canopy Cover

Canopy cover percentage was estimated by a spherical densitometer (i.e. densitometer a gridded convex mirror that provides a simple and inexpensive approach to measuring canopy cover). The densitometer was held at a distance of 30–40 cm from the body and at an elbow height so that head has not become visible in the mirror. After leveling the instrument using the level bubble, the dots which had not been occupied by the canopy were systematically counted. In each subplot, the meter readings have been taken at four points facing north, south, east, and west direction including the center point of the subplot. The canopy cover was calculated by taking the average of these readings.

Leaf Area Index

Leaf Area Index (LAI) is a key structural characteristic of forest ecosystems because of the role of green leaves in controlling many biological and physical processes in plant canopies. LAI influences net canopy photosynthesis. Light absorption by the forest canopy can be used to estimate Leaf Area Index (LAI). In this monitoring report, LAI was calculated as follows:

Leaf Area Index (LAI) = $\log_e (I/I_o)/-K$ leaf area/area of ground (Where, I = Under Canopy Light Intensity, I_o = Open Canopy Light Intensity, and K is Canopy light extension coefficient i.e., 0.5).

3.3.3 Results and Discussion

Vegetation Diversity, Richness and Compositional Variation

In comparison to Bangladesh's other forest types, the Sundarban mangrove forest is a unique plant ecosystem and diversified place. The distribution of plant species in the Sundarban is influenced by saline water. Halophytic tree species dominate the Sundarbans' natural vegetation. The patterns of plant dispersal in various locations are depicted in **Figure 3.18.** Healthy *Heritiera fomes* trees dominate the Sutarkhali area, with *Excoecaria agallocha* and *Xylocarpus* species following closely after. The Karamjol area, which is less populated than other areas, is dominated by *Heritiera fomes, Excoecaria agallocha*, and *Bruguiera* spp. The species composition is higher in Karamjal, however. The Herbaria zone is dominated and disseminated by *Excoecaria agallocha* and *Heritiera formes*, which, despite growing well in this zone, show top dying symptoms. In the Akram point area, *Excoecaria agallocha*, *Heritiera fomes*, and *Ceriops decandra* cohabit.

According to Shannon's diversity index, species diversity is comparatively higher in Karamjol and diversity gradually decreases towards the plot near the sea (**Figure 3.19**). While Simpson's dominance index of trees increased from Karomjol to Hiron point. Thus, an inverse relationship between tree dominance and diversity was observed with the distribution. Species diversity order in four locations are: Karamjol (1.531)>Herbaria (0.947)>Akram point (0.749)>Sutarkhali (0.542. These indicate that the Sundarbans biodiversity is much richer in the oligohaline or low saline zones in comparison to that of the polyhaline or mesohaline zones i.e. biodiversity varies salinity gradient-wise.

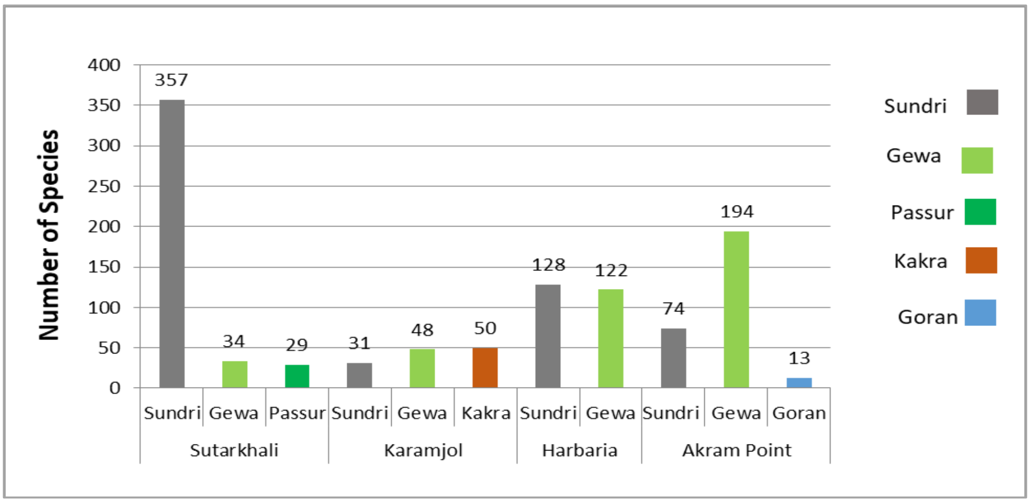


Figure 3.17: Dominated tree species status in 5 plots

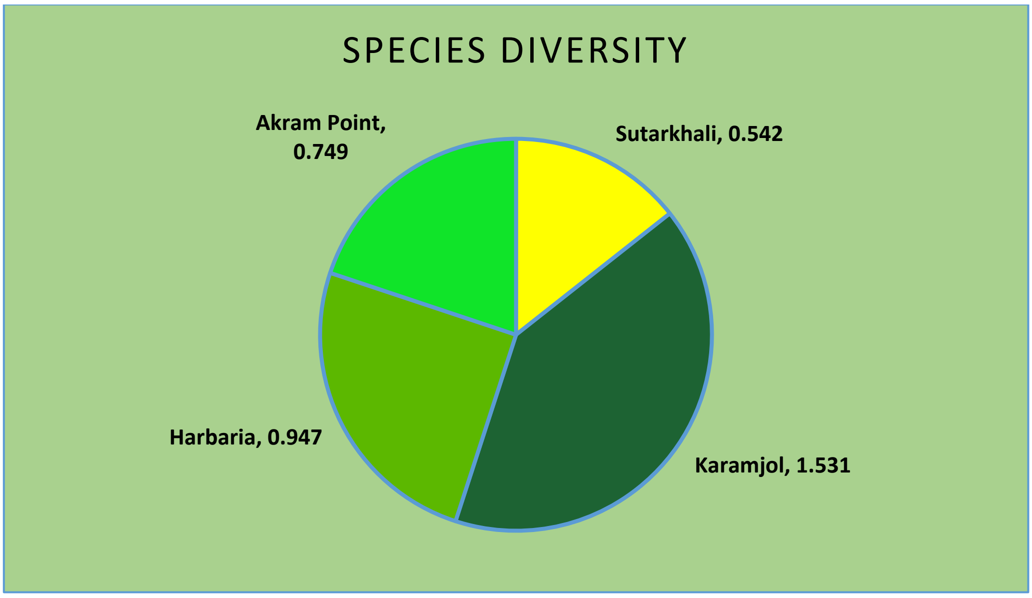


Figure 3.18: Species diversity in the monitoring plots

Carbon stock in trees

Comparing the carbon stock (mt/ha) within all plots, the Sutarkhali range was found to have the maximum carbon stock with 4244 mt/ha with a recruit density of 105 trees/ha. The lowest carbon stock was observed in Karamjol (1129 mt/ha) with a recruit density of 39 trees/ha. Carbon stock in Herbaria and Akram Point was found at 2478 mt/ha and 1920 mt/ha respectively with a density of 68 and 70 trees/ha. However, no significant variation (P>0.05) was found within the plots for carbon stock. The total carbon stock in four locations of the Sundarbans is in the order of Sutar Khali> Harbaria> Akram Point> Karamjol (**Figure 3.20**). Due to unfavorable weather conditions, the hiron point plot was not observed. The difference in the carbon stocks in the vegetation biomass of mangrove systems in different zones may be attributed to the structural peculiarities of the stands in each region (Kasawani et al. 2007).

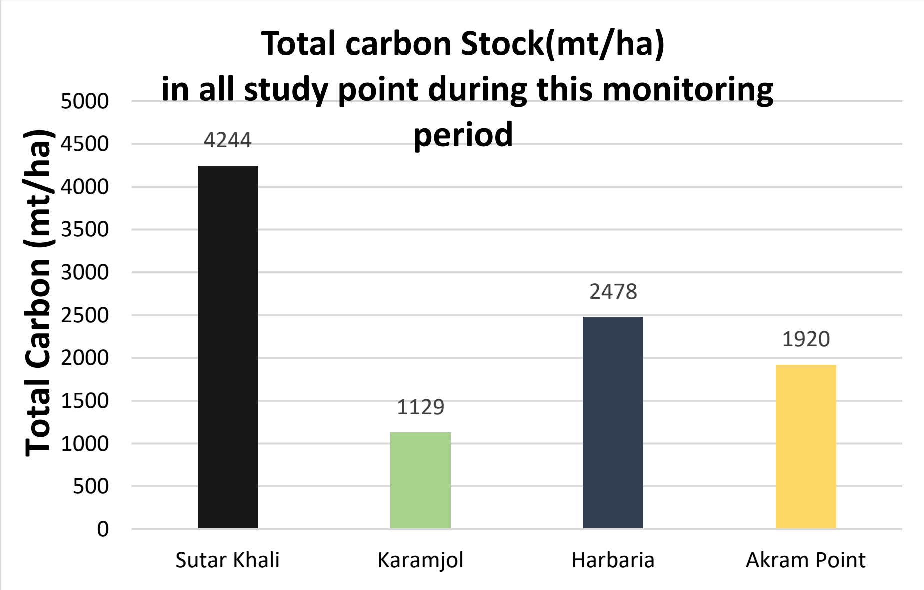


Figure 3.19: Carbon stock variation in the monitoring plots

Status of Forest Health Indicator

The average number of pneumatophores density per hectare was found highest in Sutarkhali and lowest in Akram point. This may be due to the high density of trees in Sutarkhali plot but the Akram point plot is mostly carpeted with sand so the pneumatophore density was found low there. Herbaria plot has the 2nd highest pneumatophore density and then Karamjol. Though tree density is very low in karomjol but it is a diversified plot with heterogeneous species (**Figure 3.20**)

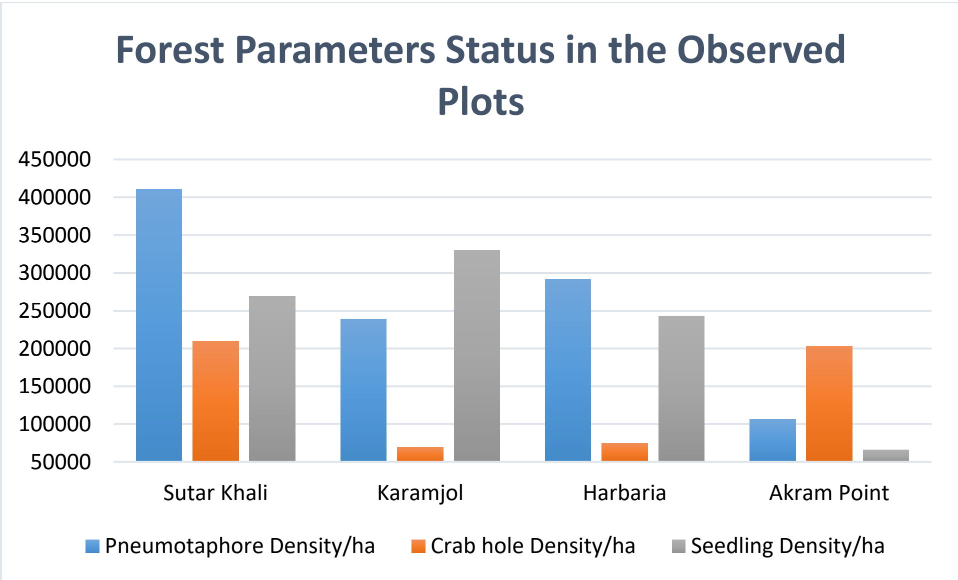


Figure 3.20: Seasonal variation in Pneumetaphore density

Crab mound is found to be higher at Akram point during this survey time where crab hole density is higher. Crab hole density has increased in `all plots from the previous year but did not vary significantly (P>0.05) across the monitoring period. This indicates that crab activity rises at the forest floor, causing the soil to become more aerobic, allowing for faster decomposition of organic matter which is a good indication for forest health.

DBH measuring at Sutarkhali

Light intensity measure at Harbaria

Crab hole counting at Karamjal

Field Data recording at Akrampoint

Figure 3.21: Forest health monitoring activities

Crab hole density per hectare was found higher in Sutarkhali and Akram point but lower in Harberia and Karamjol respectively. It was found that differences in vegetation types and density had a large impact on crab density and that the density of crab burrows was lower on low density plots than under high density tree communities. In general, the amount of leaf litter and debris on Sutarkhali and Akram point was greater than the others two plots for crabs **(Figure 3.23**). Crab activity causes the soil to become more aerobic, allowing for faster decomposition of organic matter and enriching nutrients in the soil

Seedling density was found dominant in Karamjol, Sutarkhali, and Herbaria respectively but Akram point plots have low seedling density as the maximum portion of the plot was sand carpeted which limits the seedling survival. Nutrients limitation and salinity conditions may affect the survival of seedling growth

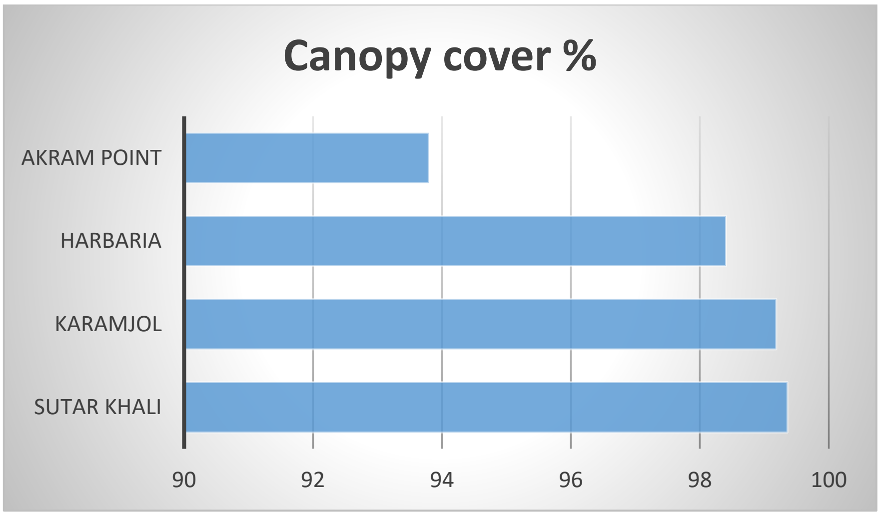


Figure 3.22: Canopy coverage variation in the observed plots

As shown in **Figure 3.24**, the estimated LAI (Leaf Area Index) at the 4 plots varies between 2 sqm^2 sqm^{-2} (Akram points) and 9 sqm^2 sqm^{-2} (Sutarkhali). Similarly, with canopy coverage, the variation coefficient confirms a low variability of LAI in the forest. The daily rate of net canopy photosynthesis is influenced by the LAI (Light Area Index), which results in an exchange of atmospheric CO2. The minimum ratio of under canopy to open canopy light intensity value indicates the maximum LAI. However, no variation ($P>0.05$) was observed in light intensity within the four plots.

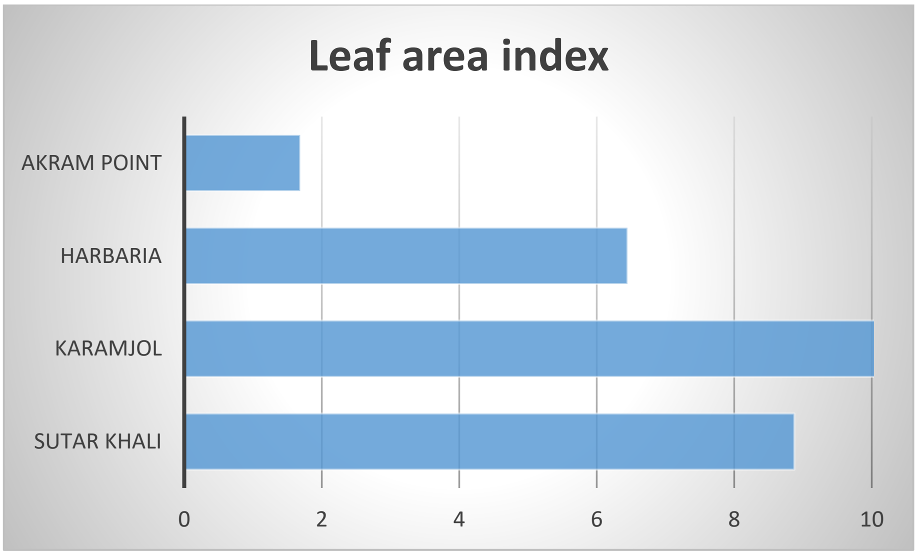


Figure 3.23: LAI variation in the observed plots

During this monitoring period there were phonological behavior observed in different species **Table 3.18** However, the 'top dying' of Sundari was observed in all the PSPs. In addition, parasite was observed mostly in all of the Sundari trees.

Table 3.19: Phonological Behavior of Major Mangrove Species in the PSPs

Species	Months	
	May	June
Sundari		
Baen		
Keora		
Gewa		
Goran		
Kakra		
Passur		
Amoor		
Jhana Garjan		
Kilalata		
Kholsi		
Hental		
Singra		
Bhaila		
Dhundal		
Hargoja		
Keyakata		
Dineria		
Bonlebu		
Ora		
Nipabulas		
Leaf Shedding		
Sundari		
Baen		
Keora		
Gewa		
Goran		
Kakra		
Passur		
Amoor		
Jhana Garjan		
Kilalata		
Kholsi		
Hental		
Singra		
Bhaila		
Dhundal		
Hargoja		
Keyakata		
Dineria		
Bonlebu		
Ora		
Nipabulas		
Flowering		
Sundari		
Baen		
Gewa		
Goran		
Kakra		
Passur		
Amoor		
Jhana Garjan		
Kilalata		

Species	Months	
	May	June
Kholsi		
Hental		
Singra		
Bhaila		
Dhundal		
Hargoja		
Keyakata		
Dineria		
Bonlebu		
Ora		
Nipabulas		
Fruiting		
Sundari		
Baen		
Gewa		
Goran		
Kakra		
Passur		
Ammor		
Jhana Garjan		
Kilalata		
Kholsi		
Hental		
Singra		
Bhaila		
Dhundal		
Hargoja		
Keyakata		
Dineria		
Bonlebu		
Ora		
Nindebulebu		
Seed/popagule dropping time		
Sundari		
Gewa		
Goran		
Kakra		
Passur		
Amoor		
Jhana Garjan		
Kilalata		
Kholsi		
Hental		
Singra		
Bhaila		
Dhundal		
Hargoja		
Keyakata		
Dineria		
Bonlebu		
Ora		
Nipabulas		

Source: CEGIS 32nd Monitoring visit, May 2022

4. Social Environment

4.1 Introduction

Social safeguards refer to the policies, procedures, and measures intended to mitigate unintended negative impacts of the projects implemented or under implementation stage. Social safeguard monitoring helps to mitigate negative impacts and suggest measures and pathway for successful implementation following national and international standard. This safeguard monitoring is a follow-up study that occurred following the guidelines of DoE and Environmental Management Plan (EMP), suggested in the Environmental Impact Assessment (EIA) Report and conditions set by the DoE during the phase of implementation. This monitoring has examined the compliance status of the working environment, project implementations impact on local livelihoods, community health and safety and activities of Corporate Social Responsibility (CSR) done by the Project Management Unit (PMU). Additionally, the Corrective Action Plan (CAP) suggested addressing the non-compliance issues based on the findings of the safeguard monitoring.

4.1.1 Methodology

This monitoring was conducted based on the physical observation, consultation, interpersonal interview at the project site and community level adjacent to the MSTTP. The consultations were held at the MSTPP office whereas health safety officer, project manager, safeguard specialist and focal person from MSTTP attended and provided feedback according to the asked questions in order to understand compliance status and CSR related activities. In addition, physical observation and informal interviews were held with the workers and local people. The informal interview was carried out at Zero Point, Kapasdanga, Rajnagar, Gaurambha, Foylarhat, Borodurgapur, Rajnagar and labor sheds located within the project site.

4.1.2 Results of Social Safeguard Status

Impact on Employment and Livelihood

It was estimated that the construction of MSTPP provided both technical and non-technical job as temporary aspect. However, local people are not technically sound in getting these kinds of jobs. Because of that local people could manage non-technical works from the MSTPP. During this phase of monitoring it was observed that activities related to the non-technical aspects were reducing. Apart from that about 20% local people from different unions of Rampal Upazila working as labor force with the different companies under the BHEL.

According to the local people of Gaurambha union, about 150 to 200 laborers were working at the project site. Besides, there were scopes of employment due newly developed access and paved road, bazaar at the zero point and other newly development initiatives (i.e. LPG industries, cement factories, solar power plant etc.) near to the project area. It was found that an easy bike-stand developed close to Gurudaskathi school (Gaurambha union) due to newly paved way. In this way, people tried to choose new livelihood options. Additionally, about 280 people were registered (under the motor vehicle federation) to run motor vehicles (i.e. easy bike, auto rickshaw and Van) at the approach road to carry both goods and passengers. As a result, it helps people to involve more earning opportunities than the previous time. Furthermore, local people started thinking to be skilled and also started learning wielding, machinery works, electrical works to catch the future jobs related to the project as well as other scopes that will be developed in the future in this area.

Already some local people of near villages are engaged in food, beverages, vegetable, mobile banking services and other service providing business/employment at the project adjacent area i.e. at the approach road side and within the labor sheds area which is found as the main earning sources of those households. The project authority organized training programs related to the ICT and sewing to learn people to be engaged new area of livelihoods options.

Local people stated that some of those trainees utilized the trainings by involving in sewing related income generating activities. During critical period of Covid pandemic, the MSTPP authority sewed 50,000 masks by these female trainees which also influenced them to professionally engage in this occupation. The MSTPP authority stated that they also some plans to engage females to join people some of the future initiatives.

Working Environment

A work environment refers to the condition of the workplace whereas professionals and workers spend time to conduct different works. A healthy working is very important to add value and benefits for the work place. However, the MSTTP is in construction phase, the workplace that requires to ensure safety and friendly environment for the construction of the project activities. In this phase, there is a lot of chances to expose different risks elements and health hazard, obviously, required to protect safe environment considering all aspects of Occupational Health and Safety (OHS). The OHS risks include exposures to physical hazards due to the use of heavy equipment, dust, noise, vibrations, falling objects and the use of electrical and machinery equipment. The best planning to implement a safe working environment, procedures and culture during the construction phase provide better occupational health and safety issues. The Department of Environment (DoE) and EIA report on MSTTP provided guideline in which the BIFPCL authority took initiative keeping a good and friendly working environment. In this regard, laborers got training about safety, working at heights and use of PPE. The tri-party coordination meeting was held with all safety officers from BIFPCL, BHEL, and other construction companies to ensure compliance with the working environment. Regular toolbox training is held every day before starting the construction activities. The PMU was monitoring the all safety related issue if found during the ongoing activities.

Most of the labor sheds were found clean with adequate toilet facilities, drinking water, proper drain out and waste management facilities. At the same time, it was also observed that waste management wasn't satisfactory, and the laborers were dumping waste here and there. The dustbin provided by the third party was not adequate and clean to manage the kitchen and solid waste.

Community Health

Many community health and safety impacted during the construction of thermal power plant projects. There is a General guideline of IFC (section 1.1) which was considering during the construction of the MSTTP. In this consideration, the PMU used to check the community health and safety issues (i.e. dust and noise pollution, road safety, green belt preparation other community safeguards). In this regard, the EA maintaining the protocol to avoid noise and dust pollution. Considering the road safety, speed limit sign provided at the project site and it was monitored by the PMU. In addition, the EA have the additional risks management plan to overcome the situation occurred due to any accidental cases.

According to the field findings, the local communities at Gaurambha and Rajnagar unions are not encountered noise problems due to the construction activities of MSTPP. According to the PMU, noise generating construction activities are almost ending up and they try to maintain DoE standard for conducting noise generating construction activities. A green belt developed in the peripheral area of the power plant area following the conditions of DoE.

Besides, a number of mangrove, fruits, coconut, and herbal plants were planted in the project area and the program is still ongoing, though the survival rate of the plants (except mangrove trees) are not satisfactory. In this regard, a caretaker from the Forest Department is engaged for supervising the maintenance of the plants. Formalized process by which grievances couldn't raise by the local community and staff during construction phase of the project.

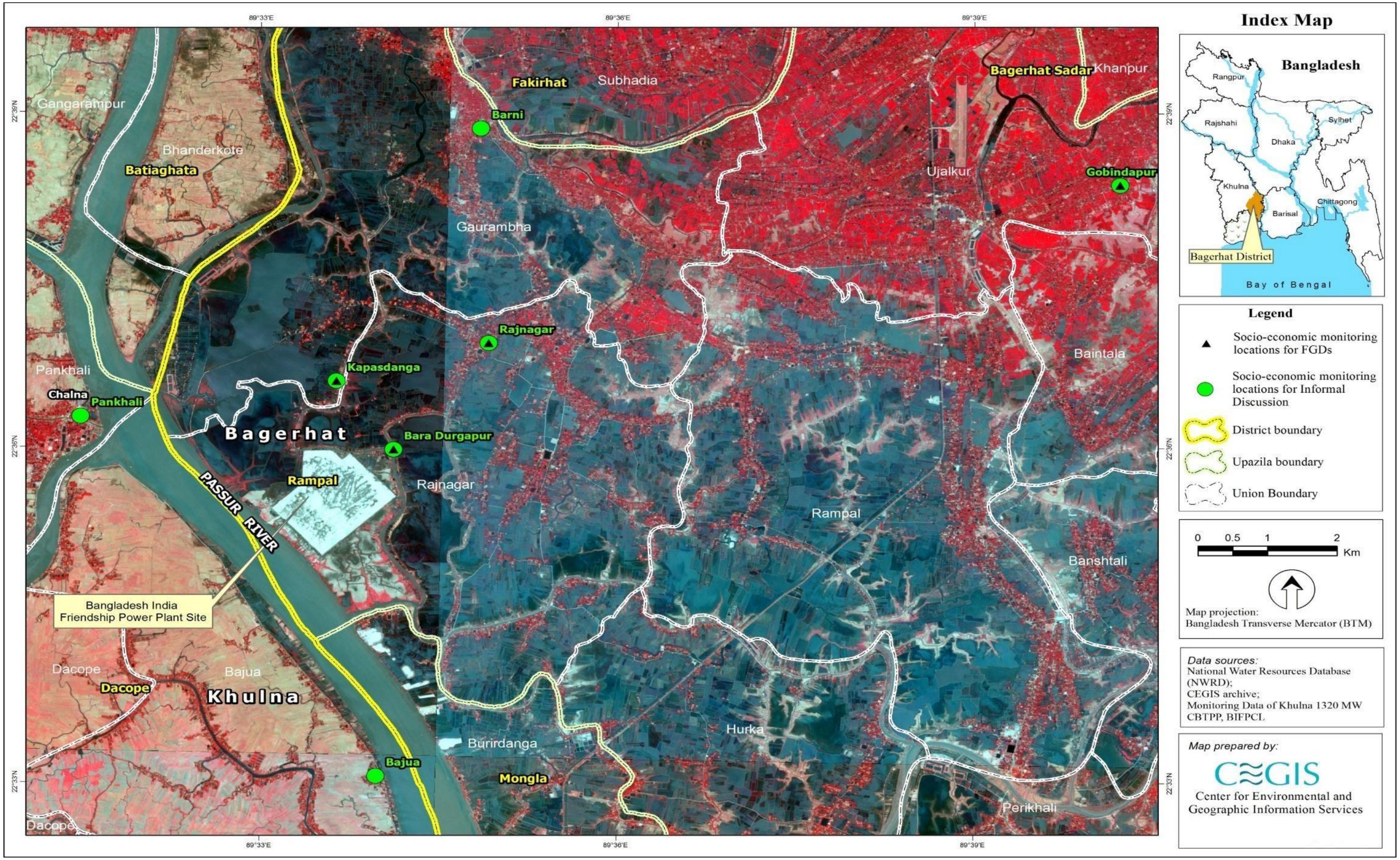


Figure 4.1: Socio-Economic Environment Monitoring Location

Figure 4.2: Water Sprayed (left) and Green Belt (right) at the Project site

4.1.3 Corporate Social Responsibility (CSR)

The BIFPCL is committed to continue supporting/development activities under the CSR. It made a significant impact to the community in which community people get better interaction with the project. However, the CSR was the part of operation phase but it was observed that the BIFPCL committed to organize different programs, logistic and infrastructural support during the phase of construction.

The BIFPCL have conducting medical campaigns along with different socially demand-based programs. In consequence, they allocated vaccination program under the CSR in which officials and labor force got vaccinated. Also, constructed water treatment and filtering RO systems at 4 locations in Rajnagar and Gaurambha Unions for ensuring safe water for the community under the CSR activity. Previously, sewing and ICT training were introduced for the livelihood development of the local community in the study area.

RO System Installation

Four (4) RO system has been installed in the Rajnagar and Gaurambha Unions as 2 in each union where one in each union is operated successfully while remaining 2 are under process for operation. Each of these ROs are operated by a local committee formed by the guidance of respective union chairman.

Figure 4.3: RO treatment and filtering system installation in the study area

Participation in Development Fair

A dedicated team from MSTTP joined in the development fair organized at the Rampal Upazila. During this fair, the team showed various activities and initiatives of CSR program and Power Plant related activities. However, different organizations participated in the fair and displayed activities. Based on the presentation and activity display, the MSTTP team got the second position and received the award during the award giving ceremony.

Figure 4.4: Award Receiving Moment during the Award giving ceremony

Medical Campaign

Medical campaign is one of the major program under the CSR of MSTPP. According to BIFPCL, it was found that following services provided under the medical facilities provided by the CSR program till June 2022. On march 19 and 27, 2022, two (2) mobile medical campaigns organized at Hurka and Buridanga union. In this medical campaign a total of 434 patients received free treatment that became very beneficial for them. Local people appreciated this initiative very much and stated that the coverage of this free medical is required to be extended as more people can be benefitted accordingly.

Health Care Services- 61,925
Medical Support at Project Site -54,605
Office Medical Center- 8,247
Weekly Camp (Saturday & Tuesday)- 42,565
Labor colony camps- 3,187
Pathology test -298
Physiotherapy -308
Specialty Monthly Mobile Medical Camp at Different Union Parishad's Premises -5949
Boat Medical camp -1371

Figure 4.5: Medical Facilities provided by the MSTTP till June 2022

Figure 4.6: A glimpse of medical facility provided by BIFPCL

Recommendations

a. Waste Management at the Labor Shed should organized properly; If required, awareness raising workshop can be organized to convince people for maintaining waste management protocol;

b. Local people are becoming aware about the new entrepreneurship development in this area; in this regard, training on entrepreneurship development should be arranged under the CSR activities;

c. Rehabilitees should be given preference in implementing CSR program as they are under serious threat of another shifting;

d. Dust suppression by spraying water should be continued on construction sites, and other places where necessary to suppress dust and minimize air pollution; Special monitoring team required to monitor the dust pollution;

e. River water should be used for dust suppression activities and ground water use should be avoided completely;

f. Local work forces should be trained on masonry, carpentering, electrician & electronics, welding, driving, safety worker, rod binding and machineries operation to prepare them as the semi-skilled working force for this project;

g. It is required to establish a grievance redress team to monitor and solve the problem (especially during selecting beneficiaries for providing any services from the MSTTP) of localities regarding the aspect of construction activities of MSTTP;

h. A gender action plan regarding the women employment is required for the local communities;

i. Previously sewing and computer training were introduced for the skill development of local people. Outcomes of those trainings should be monitored as a lesson learnt, before initiating further such types of training;

j. Some ROs are installed in different location of the study area to ensure safe drinking water for the local people. Few of those are not properly operated due to malfunctioning of the Operational Local Committee. It is essential, to solve the issues immediately through discussion with those committees and related officials including LGIs representative;

k. Regular plantation is to be continued for making the desired and committed greenery effectively as per conditions of DoE;

l. Continuing regular health checkup and disease monitoring for the daily laborer at work place as well as for the laborer staying at labor colony;

m. Close monitoring should be continued for maintaining Covid-19 protocol and for handling any syndrome related to the COVID 19;

n. Ensure masks and other PPEs for everyone who are working at the Project site;

o. All officials and workers should be included under the Covid-19 vaccination program and project authority should maintain record and close monitor the issue;

p. CSR activities should be performed primarily among the PAPs on equitable manner. This should be audited by a third party monitoring team;

q. Special attention should be taken care for assessing the needs to local schools and colleges for implementing different programs under the CSR;

r. The PMU should be active and efficient in maintaining vehicle speed limits in the Project site;

s. Mindset of local people have been changed and people are more positive about the project. To increase more awareness, it is required to arrange some consciousness program in which they can be more aware how this power plant will be operated and how this project will be beneficial for the local people;

t. Digital Billboard about the MSTPP work progress status, and operation system would be placed on the approach road at main road connecting side to create more awareness about the construction and operation of the MSTPP;

u. It is required to arrange program at local schools, colleges and UP offices about the operation and impact of the power plant to disseminate the progress of the project and create more awareness about the MSTPP;

5. Environmental Compliance

5.1 Introduction

This environmental compliance report aims to highlight any actual or potential breach of compliance with the measures and requirements set forth in the EMP measures in EIA report at Bangladesh-India Friendship Power Company Ltd (BIFPC). Providing an operational translation of local laws, international standards and company codes, the report will demonstrate the actions required to ensure that all operations along the supply chain, from the production of the raw material to the production of the electricity that are consistent and comply with DoE conditions and also Environmental Management Plan (EMP) requirements stated in the EIA report.

An E&S team from CEGIS recently visited to the plant on 25th May, 2022 to have a look and to acquire information intrinsically considering the bio-physical and other related parameters through a rigorous walk-in visit, meeting with plant officials, general labours and overall the close observation of the ongoing work at the plant.

It can be said that the progress of unit-1 of the "Maitree Super Thermal Power Project" is over 90% now that is expected to be operational in September, 2022 while overall progress stands at nearly 80%, according to the officials.

However, the present environmental compliance monitoring includes the status of EMP implementation based on physical observation, investigation and interviews/discussion to the proponents and project officials and the relevant authorities. Though a comprehensive due diligence checklist was prepared to monitor the environmental compliance of different components e.g. Environmental and Social Management System and Action Plan; Labor and Working Condition; Community Health, Safety and Security; Biodiversity and Sustainable Management of Living Natural Resources, this 32nd environmental compliance report has focused on waste generation and its management in and around of the main plant and labour shed. Along with other compliance element, the key issues of the visit can be summarized as follow:

1. During the visit inside the labour shed plenty of household waste were found on the road in a messed-up condition.
2. Lack of waste bin and lack of proper initiative of source segregation of the organic waste has made the labour shed unhygienic
3. Unused bath-tub with dirty water has noticed where waste garbage and polybags were being floated.
4. Lack of adequate drainage and sewerage facilities, lavatory/toilet waste is being accumulated inside the labour shed that has been causing malodorous stench and health deterioration.
5. Stock-pile of construction and household waste were found by the side of the Maidara river bank that may washed away and deteriorate the adjacent river water during heavy rainfall.
6. Heap of Sand and other loose material were found uncovered at the labour shed and inside the plant premises.
7. Though there are 657 coloured waste bin there is no written labelling on the bin that is very important for source segregation and easily understandable for the general workers.

8. Keeping record about the amount of waste generation per day or per week is very important that was absent.

The aim of this compliance checklists is to check the implementation and effectiveness of mitigation measures as stated in EIA. The checklists are produced as Compliance Data Sheet that contains both quantitative and qualitative data. The summary of findings of the environmental compliance monitoring are presented in the following **Table no. 5.1, 5.2, 5.3** and **5.4** respectively.

Table 5.1: Monitoring of Environmental and Social Management System Action Plan Implementation

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/ Measures already Implemented	Compliance Status	Recommended Action
1	Generation of Noise within the BIFPCL's Plant construction premises.	• Switch off / throttle down all site machinery, vehicles, water vessels, and generator when not in use • No construction activities at night Use noise damper within the project boundary, Limit vehicle speed and monitor it at every suitable point.	• Noise data are being monitored monthly and quarterly basis both night and day time at different potentially sensitive areas (Labor colony, township) and compared with the ECR-1997 Standard which are being documented.by EPC contractor. • No noticeable noise detected except some gentle sound during the walk-in visit inside the project boundaries. • Signboards regarding noise permits were not observed at site. • No harsh Vehicular horn except some emergency gentle horn noticed as it is maintained in the project site strictly • No construction or equipment installation activities operate at night Idle machines / equipment / generators are switched off/throttled down.	Complied	• Schedule the Heavy noise related work if required and that should be disseminated to the workers and nearby communities before • CEGIS team has suggested to attach precautionary signboard regarding noise management. • Noise silencer should be imposed if any plan to run the work at night
2	Dust generation from construction works	• Limiting activities for producing fugitive dust particle within project area • Vegetation clearance and base stripping should be minimized. • Vehicle speed restriction must be enforced to control dust generation. • Earthen roads and undeveloped roads should be avoided to minimize dust generation • Construction materials must be covered to protect from wind action	• Monthly and quarterly air quality monitoring in and around the project sites is being conducted and checked with ECR, 2005 standard. • Mixing of cement and concrete may generate some unavoidable dust but the crushed material was well covered and also noticed the water spraying at those areas. • Though maintaining the vehicle speed limit but dust was observed during the field visit.	Mostly Complied	• It is strongly recommended to cover all the Stockpiles of sand or any type of loose materials inside the plant premises and at the labour shed/camp. • Dust suppression activities should be monitored on a regular basis for maintaining the

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/ Measures already Implemented	Compliance Status	Recommended Action
		• Spray water regularly for suppressing fugitive dust • Dust particle generated from access road must be controlled by spraying water during dry season. • Stock piles of construction materials must be covered in order to protect from wind action. An appropriate freeboard must be maintained in trucks hauling construction materials.	• Continuous water spraying on the dusty road was noticed. BHEL has contracted a company for 3 years for this job. • Like the 31st monitoring visit still some stockpiles of sand and other loose material were noticed uncovered. • Substantial warning sign, speed limit and convex mirror have been displayed at the strategic locations. • Monitoring of pollution control systems are done on a regular basis. • No black smoke observed because of plant and equipment are well maintained. • Visual monitoring of dust is also being conducted.		air quality within standard limit. • Face musk should be use wear throughout the workplace. • Cleaning the Mud on the Inside roads has recommended.
3	Water Quality	• Surface water must be saved from any harmful effluent emission and waste dumping from project site • Provide closed system facilities and wastewater treatment plant to minimize discharge of effluents from worker's colony. • Good housekeeping at workshop and construction site • Appropriate equipment with safety measures should be used for storage and handling of lubricant • Provide training and awareness building program to the workers during construction. The training and awareness programs are:	• Surface water is regularly monitored. The discharge water quality has been recorded within the standard limit (ECR, 1997) • Ground water is not used for construction purpose. • Construction waste water discharge is minimum and need based only. They are also meeting effluent norms. • Rainfall, runoff and other construction water are being drained out though permanent drainage system. And also two no rain off settling ponds are being made to settle the silt before discharge in to river • Permanent drainage for waste water discharge under BHEL is still under construction.	Mostly Complied at present	• Good housekeeping at workshop and construction site is strongly recommended

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/ Measures already Implemented	Compliance Status	Recommended Action
		a) Arrange weekly consultation session among the workers through plant site managers. The duration of consultation is one hour according to ISO-14001 standard, Arrange monthly environmental meeting among the mid-level officers through top management when those issues will be discussed under guidance of ECR 1997.	• Closed system wastewater treatment facility on site is near to finish. Mechanical and equipment installation work is underway. • Temporary chemical lab has established where turbidity, PH, alkalinity, conductivity, chlorine, iron (Fe) parameter are being tested and monitored (Picture attached) • RO1 and RO2 tank establishment has completed to remove the dissolved solids (less than 400 TDS at RO1 and less than 10 TDS at RO2) • ETP plant is still under construction where the effluent will be further treated before final discharge. • BIFPCL authority has established a silt trap at the North-East corner of the project site to control sediment running out from the projects with rainfall runoff. Training and awareness program staged regularly through PEP talks, lectures, one to one talk etc.		
4	Waste Generation	• Limiting site clearance and base stripping activities within the project boundary. • Gathering and stocking of construction materials and machinery must be within a limited area in the project boundary. • The project area has to be fenced prior to initiation of construction activities. • Stock piles of construction materials requiring cover up in order to protect them from wind and weathering action.	• During the visit CEGIS team found most of the construction waste are compiled at the demarcated place but more attention need to manage this properly as some waste were scattered here and there. • Most of the Labour shed/camp area were found very dirty. Organic and inorganic waste were found on the roads/lanes inside the camp which are spreading the stench around the community.	Partially Complied with many lacking	• Strongly advised to keep the footpath of the labour shed clean and waste free. • Riverbank must be waste free and keep clean to save the river water deterioration. • Proper and immediate step need to be taken for the lavatory sewerage waste management.

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/ Measures already Implemented	Compliance Status	Recommended Action
		• The existing right of way have to be used for material transportation without creating any block • Location of spoil stock pile ought to be located in safe area and protected from wind and rain action. • No spoil store on River bank/slope • Construction wastes must be reused or recycled as and where possible • Burning of waste material should be restricted • Quality housekeeping practice must be maintained by regular inspection and checking. • Keep onsite waste collection and disposal facilities • Keep provision of different colored waste bin for dumping biodegradable, reusable and recyclable wastes. Keep provision of awareness building meeting and training for employees	• Stockpile of construction and household waste were noticed along with the bank of the nearby river which may pollute the river water during rainy season. (Pic attached) • Lack of proper drainage facilities of the lavatory waste has worsened the ambient environment. • Though requested waste quantity is not being yet to be measured. • No chemical or gaseous waste noticed during the visit as Chemical wastes are properly stored and labelled • Limited but Onsite waste collection and disposal facility has been observed. • Source segregation method were absent and not kept in separate labelled container. • Though there are 657 different colored waste container (EMP report) but not labeled by Bengali or English written sticker that is very important for source segregation of the waste. • Burning of waste materials is strictly banned inside the plant premises. • BHEL has engaged a company name Rahman Brothers in collaboration with the KCC for collection of waste from the disposal. • Waste management training has been included in induction training of the labor. There is a provision of development of solid waste management system which is given at		• Special care and training need to be conducted regarding source segregation of the waste • Awareness raising programs regarding waste recycle and reuse should be introduced. • Team advised again to label the waste container in written by both Bengali and English so that one can easily understand which container is for which type of waste.

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/ Measures already Implemented	Compliance Status	Recommended Action
			clause no B12, Part no 9 of book no -2, page no 147-161 but that is still under construction.		
5	Compensation and Resettlement	• Proper resettlement action plan and compensation plan if the Project needs any land acquisition addressing compensation, restoration, livelihood, living standards etc. based on proper socio-economic studies. • Resettlement of the PAPs • Cash for compensation of land (CCL) before resettlement formal agreement with the affected people prior to migration/resettlement • Sufficient standing crop compensation • Compensation for movable structures • Retention of salvageable materials • Compensation for loss of trading income one-time moving assistance grant to cover loss of regular wage income • Has a resettlement plan been developed which includes compensation, restoration, livelihood, living standards etc. based on proper socio-economic studies? • Human provide/ take extra care/caution for the disadvantaged/ vulnerable group/s (i.e. women, children, ethnic minorities, indigenous people etc.) Provision of monitoring the compensation and resettlement process	• Compensation has been given to the rightful owners of the land as per the laws of Bangladesh e.g., 'Acquisition and Requisition of Immovable Property Ordinance, 1982 started in 2011 • Compensation was paid by the local DC office as per law of the land. • Local DC office facilitates to obtain house of the PAPs (settlers of the project area) in cluster villages provided by the GoB. • Almost 32 affected families are now having their houses at Foyla cluster villages. • BIFPCL is giving priority to affected people in project employment or trained them as much possible. • A significant number of affected people (especially who deserve) are working at the construction site. • 136 indirectly affected people were given compensation by the DC Office, Bagerhat. • About one third of the labor has been recorded from the locals. • The project authority has given training on computer and swing to the nearby villagers including PAPs which is stopped at present due to COVID-19.	In the process of Compliance	• The CSR activities should be oriented towards the affected people or household; CEGIS team advised to collect the original copy of compensation disbursement to the affected peoples from local DC office.

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/ Measures already Implemented	Compliance Status	Recommended Action
			• 17 families got their residence who have shifted their houses from project area to Kapashdanga. The project authority has developed plans to monitor the resettled PAPs		
6	Livelihood and living condition	• The labor recruitment policy must be formulated in such a way that the local laborers can easily get the chance of employment in the project work force. • Govt./NGOs need to provide support the skill development program and income generation activities to local people; • For the increased movement of people and heavy vehicles, the road networks must be developed. • Keep provision of sanitary toilet, one toilet for 10 persons.	• BIFPCL are recruiting the local people especially PAPs with the help of local government (UP Chairman and members). • An NGO "SAMAHAR" was engaged by BPDB to give livelihood training for the affected people. • Accidental log sheet or injury log book are being maintained. • Provisions has been kept for health facilities to the labors as well as for the communities. • Proponent has taken numbers of potential measures for COVID protection which is continued • The wage of the labor was found compatible with the national standard. • Labour accommodation seems clean but plenty of waste were found on the camp road that is polluting the camp environment. • Some water reservoirs inside the labour camp were found very dirty where plenty of polybags and other garbage waste were floating. • Inadequate drainage facility of lavatory waste made the whole workers camp very unhygienic.	Being Complied with some lacking	• Drainage and sewerage facility must be improved for proper lavatory waste management. • Dirty water reservoirs must be cleaned immediately. • 1 toilet for 10 people should be ensured Health and financial support should be available for the labour in case of COVID and other health effects.

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/ Measures already Implemented	Compliance Status	Recommended Action
			• Available drinking water, sanitation facilities, prayer room are provided at site.		
7	Green House Gas Controlling Measures	• Restriction of any kind of solid waste disposal • Approved pollution control devices to be fitted in equipment and machinery. • Transport vehicles must not be overloaded. • Avoid queuing of vehicles in areas adjacent to site, particularly near sensitive receptors including housing. • Switch off / throttle down all site vehicles, water vessels, generator and machinery when not in use. Regular maintenance of water vessels, vehicles, generator and machinery in accordance with manufacturer's	• Fitness certification of vehicles and equipment are lacking for the construction works • The EPC Contractor is using relatively new equipment and vehicles to reduce the GHGs emission. • Energy efficient goods like light, AC and other equipment are used. • Equipment, generators and vehicles were observed switched off during non-operation period. • Green waste is not being segregated from others that can be a major concern for GHG emission. • No GHG inventories were prepared yet.	Partially Complied	• GHGs inventory checklist should be prepared • Team advised to label the waste container in written by both Bengali and English so that one can easily understand which container is for which type of waste.

Table 5.2: Monitoring of Labor and Working Condition

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual measures already Implemented	Compliance Status	Recommended Action
1	Working Conditions and Management of Worker Relationship	• Preparation of Human Resources Policies and Procedures for Direct workers; • Defined Working condition and Terms of Employment for direct worker; • Sustainably equivalent terms and condition for migrant workers; • Compliance to national law of forming workers' organization; • No discrimination and equal opportunity for all; Grievance Redress Mechanism.	• BIFPCL is running through the HR polices and switching their professionals as per demand of the project. • Based on the conversation with HR manager we came to know all the agreement for the direct workers are well maintained. • 33 no of Foam type, DCP type-261 no of DCP type and 218 no of CO2 type Fire extinguishers have been kept at different places of sites. • In addition to this, two no fire fighting vehicle, two no ambulance with doctors are also available at sites. • Accidents, incidents, near miss, corrective actions, preventive measures, are reviewed and recorded. • O2 level measurement and other precautionary measures followed properly if there is any work need to be done in a confined space or any other closed premises. • The EHS department is also monitoring the occupational health safety issues carefully under this COVID situation. • No discrimination was recorded among at labor level between local or migrating labor in Bangladesh • BIFPCL has ensured minimum wage and working hours for the labor as per GoB rules and regulation. • Routine medical checkup and emergency medical care has been ensured Continued in association with COVID management guideline. GRM procedure is available for the project workers and officials but Community GRM is absent.	Mostly Complied	• OHAS must be monitored for construction workers • Requested to develop labour association protecting labour interest but still not done. • Create fund to support the labour and his families in case of any fatalities CEGIS team strongly and repeatedly recommended to the authority for Community GRM but still not done. The grievance box may be fixed just at the outside of the main entrance.
2	Protecting Work Force	• The client will not employ children in any manner that is	• CEGIS tem visited all part of the construction area and pleased to see there is no child	Complied	• Complied but this should be continued

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual measures already Implemented	Compliance Status	Recommended Action
		economically exploitative, or is likely to be hazardous or to interfere with the child's education, or to be harmful to the child health or physical, mental, spiritual, moral, or social development. No Forced Labor	involved in the construction and any other works. • No forced labor has been recorded in the project. • Proper documentation of contract with the worker is being maintained which includes working hour, wage and benefit. • Work in hot condition and height need another permission • Awareness about Covid-19 is being monitored. Team observed the workers are maintaining a physical distancing as well as using the proper precaution against COVID-19. • Workers must get the safety clearance before initiating any work like – routine checkup of the work places and administrative clearance is being Implemented • Sanitization is being done at regular intervals at Offices and labor sheds First Aid support is readily available for the labors as required.		strictly till the end of the pandemic. Awareness work should be continued regarding the local cultural values, STD, redressing of workers grievances, insurance policy related facilities and also contract clauses of the job to get maximum benefit.
3	Safety at site	• Installation/Construction of Safety Fence around the Project area • Use of Personnel Protective Equipment's (i.e. safety vest, safety goggles, ear plug, safety shoes, gloves, dust mask, etc.); • Safety trainings for workers (i.e. fire control, working at height, working in heat, first aid etc.); • Practice of Tool box meeting, safety talks • Safe Storage of Hazardous Chemicals (e.g. fuel, flammable	• BIFPCL has demarcated the specific construction site with appropriate warning sign. • It was impressive to see that all Labors and Project personnel are using appropriate PPEs like reflecting vest, helmet, and safety shoes and face masks. • Fire extinguishers were found sufficient and well-functioning at required places. Workers get training from the fire service station and also achieve the certificate for the emergency firefighting. • BIFPCL has employed one Manager & Assistant Manager in Fire & Safety department. Approximately 93 safety officers/supervisor have been employed by the EPC contractor and Sub-contractors under the supervision of	Complied	Satisfied but this process must be continued through the entire construction and operational phage.

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual measures already Implemented	Compliance Status	Recommended Action
		chemical, toxic chemicals, etc.); • Maintaining Material Safety Data Sheet (MSDS); • Provision of Health care facilities such as doctor, hospital etc. available at/nearby the Plant construction site; • Availability of First Aid at work place; • Preparation and Follow of Emergency Response Plan (ERP); • Adequate fire precautions in place (e. g., fire extinguishers, escape routes etc.); • Documentation and reporting of occupational accidents, diseases, and incidents; Policies and procedures for managing and monitoring the performance of third-party employers in relation to OHS	BIFPCL Fire & Safety department. During duty time, • Through safety park (Pic attached) continuous training are being given. Induction trainings and awareness program were given to 860 participants during month of April,2022 • The OHAS Company named Cholamandalam has been looking into the occupational safety system of this project. • Safety walk-down at a regular interval by the OHS officer has been strengthening the HIRA process. • Emergency contact address was found on the board at the site for any kind of sudden incident. Different type of awareness posters was also observed at the site premises (Pic attached) • The existing temporary hospital are fully running with doctors and 24hr availability of ICU supporting ambulance at the Project site; • EPC has made a contract with the Gazi Medical of Khulna city for emergency medical support. During COVID situation all the necessary precautionary measures including physical distancing is maintained properly. Vaccination program was arranged and basic health checkup including body temperature is monitored at regular basis while enter into the working site.		
4	Occupational Health and Safety procedure	• Provision of complete EHS division in the Human Resources Planning/ Organogram Preparation of Safety Policy to be adopted during Plant operation	• Adequate number of safety officers have been employed by the EPC contractor and Sub-contractors. • The OHAS Company named Cholamandalam has been looking into the occupational safety system of this project. • One safety park has been established for continual training as well as training during induction level.	Being Complied	• OHS should be a Continuous process regarding awareness build-up and strict to the safety issues, • Continued the safety training, buildup the awareness and make the labour habituated

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual measures already Implemented	Compliance Status	Recommended Action
			• Zero major accident/ incident happened from 21st April 2021 till now except some minor injuries. • Total Recordable Injury Frequency Rate (TRIFR) and Lost Time Injury Frequency Rate (LTIFR) are being followed. • Medical aid, fire extinguishers, PPEs are being provided adequately. • Regular Safety talk, safety meetings are being organized at site and also in class rooms. Photo are being attached. Adequate safety bill-boards etc. have been displaced all over the construction area.		with the safety procedure
5	Workers Well Being	• Provision of Welfare facilities for Worker/Labor such as, timely bonuses, wage, overtime, sick leaves, vacations etc.; • Routine medical check-up and emergency medical care for the sick and injured; Appointment of a leader amongst the labor group, who will look into workers' well- being.	• Workers are satisfied with the residence facilities provided by BIFPCL. No dissatisfaction among the workers observed. • BIFPCL has developed apps https://bifpcl.com/safety.aspx for stepping up the safety issues well. • BIFPCL has ensured the benevolent grant developed by the contractor for the victim's family as per Government' rule. • Basic amenities like food, medicines, hygiene etc. are being ensured in labor colony • Workers get lemon or water during work period • Basic Medical care with free medicine and counseling is being provided to workers on regular basis. • Vitamin-C rich fruits, ORS distribution being done to contract workers occasionally. • Grievance mechanism available for the workers that usually address the safety issues. • No labour association identified yet to look after workers 'well-being issues	Mostly Complied	• Establish and Freedom of Association, Rights & scope of bargaining should be open for the workers. Take care about the ultimate payment of the labors from the sub-contractor or local contractor. It should not be lower than the national standard fixed by the PWD for the labors.

Table 5.3: Monitoring of Community Health, Safety and Security

Sl. No	Potential Impacts	Proposed EMP	Actual measures already Implemented	Compliance Status	Recommended Action
1	Disturbance to nearby community due to dust from developed land and Noise from construction activities	• Construction of boundary wall around the Project area; • Installed water spraying system to control dusts; • Conducting dust monitoring and visual inspection around the site boundary; Adopted noise management plan.	• Boundary wall construction is almost completed except some part in the North-eastern part around the project area. • Some sand pile and other loose material were found uncovered that could be a concern for the local communities. • Water is also being sprayed regularly on the stockpiles and registered. • Environmental Monitoring tem from CEGIS is routinely communicating with the nearby communities for assessing impacts and related complaints on dust generation issue. • Regular communication and consultation are taken places with the local government and local administration officials except this COVID situation • CEGIS team regularly monitors the noise level in the ambient area of the project site like Bajua, Mongla, koigordashkathi and it meets the standard nose level. Community GRM system was absent that is considered as an important tool to identify communities' complain	Mostly complied	• Uncovered sand and other flyable material should be covered and watered regularly. • Any complaint regarding noise and dust from local people must be addressed immediately and recorded accordingly in the register. The grievance register should be placed at the gate of MSTPP so that the communities could easily raise their issues on this ground.
2	Grievance of local people	• Availability and operation of Grievance Redress Mechanism; Maintaining open communication channel with the local community.	• Social liaison officer is working for maintaining relation with local communities especially the CSR activities. • Office medical centers of BIFPCL Total 196 patients have taken treatment in April,	Mostly complied	Recommended again to Put the grievance receiving box at outside the project boundary or at the project entrance gate

Sl. No	Potential Impacts	Proposed EMP	Actual measures already Implemented	Compliance Status	Recommended Action
			2022. Pathology test has done on 26 and Physiotherapy has given to 45 patients • BIFPCL regularly display the progress of the development through their website (https://www.bifpcl.com/) and disclosure meeting at the local government Though BIFPCL is receiving grievance from local community through local government like Union Chairman or Local Administration, Community Grievance Redress Mechanism (CGRM) has yet to be in action. It should be started as soon as possible.		so that the local community could easily state any grievance properly.
3	Risk of breaching Community Safety	• Construction of boundary wall/safety fence around the Project area; • Practicing Risk Assessment and Evaluation Process; • Practicing safe management for hazardous materials which may pose threat to the community; • Availability and operation of Emergency Response Plan; • Maintaining open communication channel with the local community; • Training and instruction to the security personnel about their behavior and communication with the local people;	• Implement numbers of pollution mitigating system for protecting the dust and other pollution outside to the project area. • Strictly prohibited to enter outsider to the project site or labor camp and if required entry pass is required to enter the project site area. • Health check-up is mandatory to every labor during the induction training on which they get pass for work. • No conflict has been noticed between local communities and project authorities or workers. • Project Security personnel is well trained and instructed by the authority to demonstrate a decent behavior and attitude to the local communities.	Complied	• Maintain social distancing with the communities during this COVID situation Keep on tack about the communicable diseases transmission between the labors and nearby communities

Sl. No	Potential Impacts	Proposed EMP	Actual measures already Implemented	Compliance Status	Recommended Action
		Aware the security personnel about the right of the community people.	• Maintaining communication with local community regarding their grievance about the worker and work facilities. • Routine medical camp has been conducted each month. Distribution of essential food items, soaps to nearby villages and contract workers was done.		
4	Community Health and Risk	• Provision of providing health service facilities to community if the Project poses any health risk like sexually transmitted disease, contract disease, vector-borne diseases; Implement all pollution mitigation measures to ensure safeguarding to community.	• Continued the medical facilities (consisting medical officer, medical assistant, office assistant) at Plant site for checkup the communicable diseases of the workers and staffs; • Total 190 patients have taken treatment in May, 2022. Pathology and Physiotherapy has given 27 and 35 no of patients respectively. • Total 226 patients have been taken eye treatment on Monthly Mobile Medical Camp at Hurka on 19.05.2022. • Distribution of essential food items, soaps to nearby villages and contract workers during this COVID situation • BIFPCL arrange regular weekly health service program (medical consultation and free medicine) for the local community considering the COVID situation. • Medical facilities for the local people has been running amid the COVID situation • Local people are coming to the office medical center for health issues where they	Complied	BIFPCL may introduce awareness program for STD and other transmitted diseases from workers to the community.

Sl. No	Potential Impacts	Proposed EMP	Actual measures already Implemented	Compliance Status	Recommended Action
			are supported with health check-up and common medicine. EPC contractor is educating to the labors about protective action taken to avoid vector borne diseases and HIV positives and COVID pandemic		
5	Youth Employment (Local)	Providing training/awareness program for the local youth to let them aware about the required qualification to get involved in the Project related activities Emphasis to recruit local labors according to their skills and capacities.	• Regular communication is being maintained with the local government and community representatives for labor recruitment • An NGO "SAMAHAR" was engaged by BPDB to give livelihood training for the affected people • The proponent took a number of initiatives to encourage local students through awarding them scholarships before the COVID situation. They will work again on this field after reducing the COVID cases significantly. BIFPCL took initiatives and started to give computer training for generating ICT skill among local people. Besides, BIFPCL have also plan to initiate skill development trainings on electronics, driving, health and hazard safety, fittings, welding etc.	Being Complied	Training related to skilled construction work i.e. masonry, rod binding, plumbing, carpenter, electrician, lineman, elevator mechanic, glazier, iron worker, driving, heavy equipment operator or laborer etc. should be introduced immediately.
6	Public Communication, Consultation and Awareness	• Arranging public communication/consultation meeting; • Sharing of Project information with local people;	• One social liaison officer is working continuously for developing relation with local communities. • Regular consultation meetings are carried out with the local government and administration.	Mostly Complied	• BIFPCL may use print media, social media, digital media might be used for spreading the project right information

Sl. No	Potential Impacts	Proposed EMP	Actual measures already Implemented	Compliance Status	Recommended Action
		Organizing environmental and social awareness programs/meetings.	• Environmental and social awareness programs are organized and conducted by proponent on a regular basis except during the COVID situation. • BIFPCL regularly display the progress (thru Video) of the development through their website (https://www.bifpcl.com/) and also disclosure meeting at the local government. • The local people are aware regarding the project activities from multiple sources like consultation, display board, website etc.		The proponent should aware and clarify about the project the local people to stopover any rumor.

Table 5.4: Monitoring of Biodiversity and Sustainable Management of Living Natural Resources

Sl No	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/ Measures already Implemented	Compliance Status	Recommended Action
1	Rainfall runoff from the construction site would cause deterioration of aquatic ecosystem.	• Installation of proper runoff drains; Use of sediment fences, traps and basins for trapping the sediment, if required.	• Permanent drainage system (Under BHEL) to discharge waste water from the project area is still under construction. • The connectivity of Maidara River is being maintained. • EPC Contractor is monitoring the water quality on monthly basis at every outlet of the project site and comply with the ECR 1997 standard • Construction waste water quantity is minimum but this water is being discharged to the adjacent Maidara River without proper treatment.	Being complied	• Take immediate measures to maintain the roads and basin for trapping the sediment as monsoon season has started. • BHEL need to complete their drainage facilities for the better waste water management.

Sl No	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/ Measures already Implemented	Compliance Status	Recommended Action
			• Rainfall, runoff and other construction water are being drained out though permanent drainage system. And also two no rain off settling ponds are being made to settle the silt before discharge in to river Runoff/ wash away of the sediment is comparatively low to zero during this dry season.		
2	Disturbance to nearby ecosystem due to different construction activities	• No cutting/ felling of trees along the river bank; • Implementation of onsite waste and air quality management plan; • Limiting soil extraction activities within the defined area; • Limiting the vegetation clearance and base stripping process within the Project boundary; • Safety fence around the construction site; • Limiting the use of night light; • Using shade (directed downwards) around the outdoor lights; • Provision of cut-off time to switch off unnecessary lights at night; • Initiate Green plantation; • No plantation of non-native species; • Retaining top soil for future habitat restoration; No degradation of sensitive habitat.	• Most of the civil works has already completed. Now only the mechanical (instrumental and machine fitting) and electrical works are under-way. Thus the risk of deforestation and disturbance to the nearby ecosystem are minimal in this quarter. • Limiting the vegetation clearance within the Project boundary especially around the ash impoundment. • An MoU signed with Forest Dept., Bangladesh on 24.02.2015 for implementation of Afforestation Program. Initial target was to plant 2 lac saplings in 3 years. During the visit we came to know that about 80,000 plantations have already done. Another 30000 to 50000 trees were supposed to be planted by April to May 2022. This task is behind but land development works for this plantation in underway. • They are maintaining the EMP measures in a desired way for protecting the adjacent ecosystem. • No alien species has been recorded	Being Complied	• Advised to finish the unfinished plantation ASAP. • Regular monitoring of the planted trees. • Reduce the rate of mortality at the sapling stages.

Sl No	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/ Measures already Implemented	Compliance Status	Recommended Action
			• Wild species like avifauna and mammals are now recorded in the greenery areas of the project site • Employees are aware about the rescues of species and no harm to wild species		
3	Disturbance to river, inter-tidal areas and wet lands	• No encroachment of inter-tidal flood plain area; • No disturbance to Dolphin community; • Monitoring of Ecosystem Health and Monitoring of Sundarbans Forest Health; • If required, embankment should be constructed considering a setback distance from river/canal bank; • Slope protection work along the Maidara River should be completed on an urgent basis before rainy season come, and; • BIFPCL may take initiatives of excavating of silted reach of Maidara river near proposed township area to facilitate proper functioning of River for maintaining tidal flow dynamics	• Monitoring of ecosystem health of Sundarbans, and around the Project site is being continued. • The project is not obstructing the surface water flow. • BIFPCL has started maintenance of the slope protection works • Bank protection works of western bank of Maidhara river has finished • EPC Contractor is monitoring the discharged water quality at each of the outlet from this project on a monthly basis. • The project authority has constructed the permanent jetty as per approved layout. • The Maidara River is showing its natural phenomena without any negative impact due to the construction interventions. • Selected coal suppliers ensured the appropriate vessels with minimum sound for the coal transportation to avoid the disturbance to Dolphin community.	Complied	• Initiatives should be taken for excavation of silted reach of Maidara River to protect the rainfall runoff washout.

Table 5.5: Status of Compliance to the Conditions of DoE

Sl. No	Condition of DoE	Compliance Status	Remarks
1	This EIA Report is approved only for 1320 MW Khulna Coal Based Power Plant. Any expansion or extension of this Power Plant will require obtaining further Environmental Clearance with additional EIA Study.	BIFPCL has not yet initiated any plan for expansion or extension of the 2x660 MW Maitree Super Thermal Power Plant.	BIFPCL will comply with the condition prior to initiation of any expansion or extension of the Power Plant.
2	The Coal Specification and Power Plant technology should be maintained as per EIA report. In case any change in design the proponent must obtain consent from DoE.	The Coal Specification and Power Plant technology are being maintained as per EIA report so far. In case of any change in Plant design and coal specification, the proponent shall have to obtain early consent from DoE.	Suggested to comply as and when required.
3	Project Proponent may undertake activities for land development and infrastructural development of the Project.	BIFPCL has already completed land development and Infrastructure development activities mostly for the Block–A area. Now the mechanical and electrical works are in progress.	Being Complied.
4	Project Proponent may open L/C (Letter of Credit) for importing machineries for the Project, which shall also include machineries relating to waste treatment plant and other pollution control devices.	The appointed EPC contractor has already imported maximum Equipment & machineries relating to waste treatment plant and other pollution control devices through opening the L/C.	Being Complied.
5	The activity under Proposed Khulna 1320 MW Coal based Thermal Power Plant Construction and operation shall not release any pollutant that affect human health or will have damaging impact on the environment or natural resources.	BIFPCL engaged CEGIS as an independent entity for monitoring the construction activities for examining environmental impacts on quarterly basis before the construction works started and accordingly the environmental and social impacts are being monitored as per EMP since 2014. No significant impact of Power Plant activities on the surrounding environment or on the natural resources has been recorded and reported (by the community) yet. Moreover, to control the emission and pollution an Effluent Treatment Plant, ESP, and FGD etc. have already been incorporated in the technical specification of main Plant as per DoE stipulations. During the visit to prepare 32nd quarterly monitoring report we found the construction and structural work of FGD and ESP has almost finished. Civil works of ETP is running in a full swing and expected to finish by next quarter. Moreover, environmental compliance monitoring is also being continued in the project site in order to assess the	Being Complied.

Sl. No	Condition of DoE	Compliance Status	Remarks
		impact on project ambient air quality, discharge water quality and noise level around the project site, working and labor conditions, occupational safety procedures community grievances etc. as per the monitoring plan stated in the EIA.	
6	Proper and adequate mitigation measures shall be ensured throughout preparation, construction and operation period of the proposed Khulna 1320 MW Coal based Thermal Power Plant Project activities.	• BIFPCL has taken appropriate mitigation measures conforming EMP and technical specification of main Plant at each of the stages of Project Development. Proper safeguard measures for the safety of the workers was very satisfactory. Proper PPE and scaffolding structures was observed during the site visit.	Being Complied.
7	Any heritage sight, ecologically critical area, and other environmentally, religious and archaeologically sensitive places shall be kept protected during Project construction phase.	There is no Religious and Archaeological place in and around the Project site. As a third party, CEGIS is continuously monitoring the potential locations and indicators which are sensitive to coal transportation in the Sundarbans ECA, Sundarbans Reserve Forest and Sundarbans World Heritage Site as per the guidance of DOE and Bangladesh Forest Department (BFD).	Being Complied and suggested to continue this compliance till and during the operation stage.
8	Environment friendly construction and development practices shall be followed that minimize loss of habitats and fish breeding, feeding & nursery sites.	All the construction activities along with the coal transportation system will be followed through best practices and according to the EMPs of EIA Report. Since, the environmental monitoring survey are not observed any anomalies, it can be concluded that the construction work is progressing in environment friendly procedure yet now.	Being Complied.
9	Construction works shall be restricted to daytime hours so as to avoid/mitigate the disturbance of local lives as well as implementation schedules of the works shall be notified in advance to nearby residents.	Construction related activities are restricted to daytime and sometimes extends to the late evening. The community responses towards construction works of Power Plant are being monitored and recorded regularly. Moreover, BIFPCL has appointed one social liaison officer who is working (24x7) for developing relation with local communities. Regular consultation meetings are carried out with the local government and administration in order to receive and realize the grievances and accordingly to redress those. There are no grievances related to the noise effects registered yet from the nearby communities.	Being Complied.
10	Proper and adequate sanitation facilities shall be ensured in labor camps throughout the proposed Project period.	EPC contractor and sub-contractor are providing adequate sanitation facilities for the workers. Sanitation facilities for health safety from COVID are supplied by the Contractor at the labor camps as well as in the work areas.	Being Complied

Sl. No	Condition of DoE	Compliance Status	Remarks
11	In order to control noise pollution, vehicles & equipment shall undergo regular maintenance; working during sensitive hours and locating machinery close to sensitive receptor shall be avoided.	All vehicle & equipment used at site are under regular maintenance and registration process. Working during sensitive hours like night time and locating machinery close to sensitive receptor like near the labor camps are being avoided or managed through appropriate measures as observed during the monitoring span.	Being Complied
12	No solid waste can be burnt in the Project area. An environment friendly solid waste management should be in place during the whole period of the Project in the field.	• Burning of waste materials is strictly prohibited inside the project boundary. • BHEL has engaged a solid waste management company who is now collecting the solid waste from the project area and dump it to the Khulna City Corporation (KCC) designated places. • Development of environment friendly waste collection and disposal system like Solid Waste Management, STP etc. are being developed at the demarcated place in plant premises. In addition, waste management training has been conducted in a regular basis among the labor.	Being complied
13	Proper and adequate on-site precautionary measures and safety measures shall be ensured so that no habitat of any flora and fauna would be endangered or destructed.	Quarterly monitoring activities are being carried out to examine the potential impacts on habitat of flora and fauna. No significant changes are yet recorded. Moreover, monthly environmental monitoring has been performed for noticing any harmful air pollutant emission or waste discharge form the project area.	Being Complied
14	All the required mitigation measures suggested in the EIA report along with the emergency response plan are to be strictly implemented and kept operative / functioning on a continuous basis.	The proponent is giving top priorities to occupational health and safety issues. To keep the workers and the plant safe, plenty of precautionary measures has identified during the physical visit of the plant. • An ICU rich hospital with an experienced medical team and ambulance has kept ready to provide the instant services • In case of emergency situation for both BIFPCL and EPC contractor, a contract has been signed with a private hospital (GAZI medical, Khulna) for medical services. • Emergency fire exit, the fire extinguisher, fire alarm has observed available and well-functioning. • As a part of emergency response plan emergency contact numbers contained laminated poster has noticed beside the construction site.	Being Complied

Sl. No	Condition of DoE	Compliance Status	Remarks
		• Proper PPE and scaffolding has observed during the field visit. BIFPCL working hard to build awareness about Covid-19 among workers and office support staff. Thermal scanning of workers is being done at regular frequency for checking COVID symptom.	
15	To control dust, spraying of water over the earthen materials should be carried out from time to time.	Periodic air quality monitoring in and around the project sites is being conducted and checked it with ECR, 2005 standard. Monthly air quality monitoring at three locations inside the project boundary are being carried out. Based on the air quality monitoring findings and seasonal aspects, site specific water spraying is scheduled. BHEL has contracted with an external company for three years (renewable) who are spraying water as per schedule by three (03) water tankers to suppress fugitive dust.	Being Complied
16	Storage area for soils and other construction materials shall be carefully selected to avoid disturbance of the natural drainage.	• BIFPCL authority has selected designated areas for safe storage of construction materials. In addition, the maximum stock piles are sprinkling. They have established a silt trap at the North-east corner of the project site to control sediment running out from the projects with rainfall runoff. • During 32nd field visit piles of sand and other construction material were noticed uncovered. Plenty of construction residuals has been kept by the side of the Maidara river bank.	Being Complied but it was strongly advised to cover up the sand pile and other loose material and the wastage should be placed at the demarcated place.
17	Adequate considerations should be given to facilitate drainage system for runoff water from rain/tidal surge.	Adequate attempt has been adopted to facilitate drainage system for runoff water from rain/tidal surge as BIFPCL has already constructed the permanent drainage system for discharging water from the project area. Construction of permanent drainage system under BHEL scope of work is still behind	Being Complied.
18	Adequate facilities should be ensured for silt trap to avoid clogging of drain/canal/water bodies	Silt trap has been developed at the north-east corner of the project site. It is used to depositing the sediments coming with the storm water and finally discharge relatively sediment free storm water through the drainage line.	Being Complied.
19	The entire coal handling system should be designed as an enclosed (and not only covered) conveyor system. There should be integrated dust control system with dust	Entire coal handling system is designed and constructed as an enclosed conveyor system as per DoE requirement. Integrated dust control system with dust extraction system/bag filter and dust suppression system at crusher house, unloading points, transfer points has been specified in the technical specification	Compliance action initiated.

Sl. No	Condition of DoE	Compliance Status	Remarks
	extraction and bag filters at unloading areas and at each transfer points on the conveyor system.	of Main Plant EPC contract package. Refer Section (V), B4 of Technical Specification. During the field visit by CEGIS team it is observed that about 70% installation of the closed system coal conveyor belt from jetty to the coal shed has completed.	
20	Coal Plant should have high-efficiency bag filter for arresting dust emissions.	Integrated dust control system with dust extraction system/bag filter and dust suppression system at crusher house, unloading points, transfer points has been specified in the technical specification of EPC contract. Refer Section (V), B4 of Technical Specification (Clause no B4.3.1.4). High-efficient ESP is now at construction stage.	Compliance action initiated.
21	Coal should be stored in a covered storage yard.	All these stipulations have been included in the technical specification of Main Plant EPC contract package, Section (V), B4 of Technical Specification (Clause No B4.3.1.6). The coal shed construction has already finished and the sheeting work is at finishing stage.	Being complied
22	The entire coal stockyard should be covered with water sprinkler provided with automated moisture sensor to control self-combustion.	All these stipulations have been included in the technical specification of Main Plant EPC contract package, Section V, B4 of Technical Specification. The covered Coal stockyard is now at the final stages.	Being complied
23	100% utilization of fly ash and bottom ash should be planned and implemented throughout the operation of the Plant. There should only be a provision of small ash dyke that will not exceed 25 (twenty-five) acres of land to store residual ash.	100% utilization of fly ash has been planned and shall be implemented throughout the operation of this Plant. EOI has been received in this regard from nearby Cement Industries. 25 acres' area has been allocated to store residual ash in case of emergencies. The ash dyke is now under construction stage.	Compliance action initiated.
24	Integrated dry ash handling, loading, unloading and transportation system should be established.	Integrated dry ash handling, loading, unloading and transportation system will be established during the operation stage of the power plant. Provisions in line with this has been included in Technical Specification of main Plant EPC contract package (Section V, Chapter B4). Erection of Ash silo structures has done beside the jetties in order to transport the dry ash with ships/cargo.	Compliance action initiated.

Sl. No	Condition of DoE	Compliance Status	Remarks
25	There should be adequate and properly sized and designed dry ash silo with appropriate conveyor system.	Adequate and properly sized dry ash silo with appropriate conveying system have been specified in Technical Specification of main Plant EPC contract package (Section V, Chapter B4). The construction work of dry ash silo is at final stage.	Compliance action continued
26	Bottom ash should be extracted, crashed and stored in silos for utilization with proper collection and conveyor system.	Bottom ash shall be extracted, crushed and stored in silos for utilization with proper collection and conveying system during the operation stage of the power plant. The procedures have been included in the technical Specification of EPC contract package. (Section V, Chapter B4). The construction of silo is almost finished.	Compliance action initiated
27	Resettlement and rehabilitation of the displaced population (including those who do not own land) should be done properly.	Land has been acquired as per the legal procedure of GoB. However, BPDB wrote to Ministry for suitable resettlement and rehabilitation as per DoE requirement. BPDB prepared an assessment (Livelihood Restoration Plan) regarding the rehabilitees (including those who do not own land) for this Power Plant. As per the recommendation of the LRP, a NGO “SAMAHAR” completed Their tasks. This monitoring has recorded that DC office has rehabilitated around 32 families at Foyla and 17 families at Koigardaskati.	Compliance action continued
28	Resettlement plan should be properly implemented and people should be adequately compensated.	Resettlement and rehabilitation action had been taken as per the law of the land, Bangladesh. However, BPDB conducted an assessment (Livelihood Restoration Plan) regarding the rehabilitees (including those who do not own land) for this Power Plant. Based on the recommendation of the LRP, local NGO conducted the training and other tasks to the PAPs. DC office is trying to resettle the PAPs at their selected sites according to the LRP.	Compliance action continued
29	Construction material should be properly disposed-off after construction work is over.	Most of the civil works has already finished and now the mechanical and electrical works are going at full phase. During the field visit we found all the mechanical and construction residual are being kept at demarcated places. For the solid waste management, BHEL has engaged a company named Rahman & brothers in association with Khulna City Corporation (KCC) for collecting and safe disposal of waste materials form site. Further development of environment friendly waste collection and disposal system like Solid Waste Management, STP etc. are being developed at the demarcated place in plant premises.	Compliance action initiated

Sl. No	Condition of DoE	Compliance Status	Remarks
		There is a provision of development of solid waste management system which is given at clause no B12 ,Part no 9 of book no -2 ,page no 147-161.In which there is development of WMC which has waste collection ,waste segregation at source, recycling ,treatment and disposal of waste will be done	
30	As described in the report environmental monitoring should be strictly followed and monitoring report should be shared with DoE to ensure the environmental management properly.	BIFPCL has engaged CEGIS as a third party independent entity for conducting environmental monitoring on a quarterly basis in February 2014. Accordingly, each quarterly monitoring report has been prepared, submitted and shared with DoE, which are also available at BIFPCL web site.	Being Complied.
31	All activities (pre-construction, construction and post-construction stage) should be implemented according to EMP clearly listed in the EIA report.	BIFPCL has adopted the EMP suggestions applicable at construction stages. BIFPCL is taking appropriate actions based on EMP monitoring report. BIFPCL regularly updates the EMP and OHAS which assist to reduce the risk of accidental events further. From the preconstruction stage till now BIFPCL has been following the guideline of EMP listed in the EIA report and we have suggested to follow the EMP strictly for the rest of the work.	Being Complied
32	A third party/independent monitoring bodies excluding JVC/BPDB should be engaged immediately for monitoring of all activities during pre-construction, construction and operation phases as per monitoring plan of EIA report and monitoring report must be submitted to Bagerhat District Office, Khulna Divisional Office and Headquarters of the Department of Environment simultaneously.	CEGIS has been engaged by BIFPCL as an independent monitoring entity for conducting environmental monitoring on a quarterly basis since February 2014. Since the contract, CEGIS has been conducting the monitoring programs quarterly and producing monitoring reports on quarterly basis which are submitted by CEGIS to BIFPCL for onward submission to the Bagerhat District Office, Khulna Divisional Office and Headquarters of the Department of Environment as directed by DoE.	Being Complied
33	Regular monitoring of the susceptible places of Sundarbans for protecting ecosystem, biodiversity and forest coverage should be made using latest high-resolution image for keeping ambient environment.	The Monitoring activities of CEGIS includes monitoring of the susceptible places of Sundarbans. The monitoring report contains analysis of biodiversity and forest coverage. However, in addition to this, Forest Department has also suggested some survey & analysis which have also been monitored and reported by CEGIS through the quarterly monitoring report.	Being Complied.

Sl. No	Condition of DoE	Compliance Status	Remarks
34	Air, water, soil, biological and social data should be monitored regularly with a network monitoring system with a view to assess the natural quality of the Sundarbans and other fragile ecosystem and report of monitoring results should be submitted to Bagerhat District Office, Khulna Divisional Office and Headquarters of the Department of Environment simultaneously.	The network monitoring system will be installed as a part of the project construction and it will be run as online monitoring system during the operation of the Power Plant. All these stipulations have been included in the technical specification of Main Plant EPC contract package. (Section-V, Clause No B0 6.19.13.2 and Clause No. B0 6.19.13.5). However, air, water, soil and biological components are regularly monitored as per recommendation of EMP. Each of the monitored environmental data has been incorporated in the Monitoring report and displayed on the BIFPCL website at present.	Compliance action initiated.
35	There should be regularly disclosure of the report through workshops and websites and responses should be taken care accordingly.	CEGIS has been regularly carrying out public consultation at different levels. All the monitoring reports are being kept available on website of BIFPCL (www.bifpcl.com)	Being Complied.
36	Online air and water quality monitoring system should be made functional throughout the life of the Plant.	The online monitoring system will be installed when the Plant will be in operation phase. This will be continued throughout the life time of the Power Plant. All these stipulations have been included in the technical specification of Main Plant EPC contract package. (Section-V, Clause No B0 6.19.13.2 and Clause No. B0 6.19.13.5).	Compliance action initiated
37	Management Information System (MIS) is to be developed for this coal-based Power Plant. The scope of MIS services will obviously include representing the real time monitored data especially environmental parameters displaying at Bagerhat District Office, Khulna Divisional Office and Headquarters of the Department of Environment, BPDB and other concerned agencies/Ministries. The MIS should be web based for accessing every individual to show the real time monitored records.	The MIS will be prepared before commissioning of the Power Plant. For developing MIS, consultant will be engaged earlier. Specifications of MIS system is already included in EPC contract document. Technical Specification like DDCMIS, DDCS, PADO System, HART system, Plant MMS, Information management security system etc. have been included. Moreover, the EPC contractor is going to initiate this activity.	Compliance action initiated

Sl. No	Condition of DoE	Compliance Status	Remarks
38	JVC should provide all sort of logistics support to DoE and other relevant agencies for monitoring environment related items/events.	BIFPCL is ready and being provided all sort of logistic support as and when required by DoE and other relevant agencies for monitoring of Plant construction activities and environmental items/events maintain the health and safety protocol of the construction site.	Being complied
39	No ground water should be allowed to use for plant purposes.	The Power Plant has been designed considering use of surface water only during all stages of project development and operation. The authority has already installed Reverse Osmosis (RO) Water Treatment Plant (ABM Water) for use ground water for potable and domestic purposes. A second unit of RO plant is now in operation fulfilling fresh water from both domestic and construction requirements. However, a 1200ft deep tube well has been recorded near the ABM water plant for backup during emergencies. Proponent informed that some time it is used to supply the drinking water.	Ground water is being withdrawn only for supplying the drinking water.
40	Conduct stakeholder meetings on regular basis for better performance of the Project as a whole.	BIFPCL has appointed a social liaison officers who regularly visits nearby community to consult with the local people. Besides CEGIS, appointed by the Project authority, is also carrying out consultation with the local people with interviews on regular basis for better performance of the Project as a whole.	Being Complied
41	Additional Environmental baseline data to be collected as suggested in the EIA report and conveyed to DoE and other concern authorities.	All quarterly monitoring reports containing latest baseline data are being collected as suggested in the EIA study and are disseminating to DoE and other concerned authorities as instructed.	Being Complied
42	The Environmental Management Plan under the EIA study shall strictly be implemented and kept functioning on a continuous basis.	BIFPCL has been implementing all the EMP measures realistically phase by phase as suggested in EIA report and approval condition of DoE. The status of EMP implementation are also regularly monitored. Based on the monitoring, BIFPCL continuously updated the site specific EMP for better management of the potential impacts.	Being Complied
43	The Project authority shall submit a detail work plan with time schedule of development activities at least 7 (seven) days ahead of the work commences in the field to the Bagerhat District Office, Khulna Divisional Office and	The construction works is now about to finish. BIFPCL practiced the submission the detailed work plan seven (7) days before start of any construction activities to the suggested offices of DOE. This practice will be continued till the end of the project.	Being complied

Sl. No	Condition of DoE	Compliance Status	Remarks
	Headquarters of the Department of Environment simultaneously.		
44	Environmental Monitoring Reports according to specific format specified in the EIA Report shall be made available simultaneously to DoE Bagerhat District Office, Khulna Divisional Office and Headquarters on a monthly basis during the construction period of the Project.	Environmental Monitoring Reports as per specific format provided in the EIA Report made available by BIFPCL and submitted to DoE Bagerhat District Office, Khulna Divisional Office and Headquarters accordingly.	Being Complied
45	The following records must be kept in respect if any samples required to be collected for the purpose of environmental monitoring activities: • The date(s) on which the sample was taken; • The time(s) at which the sample was collected; • The point at which the sample was taken; and The name of the person who collected the sample.	The Monitoring report keeps all the records as suggested.	Being Complied
46	The results of any monitoring, required to be conducted under this EIA report must be recorded.	BIFPCL has been collecting all the monitoring data and submitting with proper documentation and accordingly sharing with DoE on regular basis.	Being Complied
47	In case of any emergency, the following information shall be immediately be reported to Bagerhat District Office, Khulna Divisional Office and Headquarters of the Department of Environment (DoE) simultaneously. Nature of incident (oil spill, fire, accident. Collision, land slide, etc.). Personnel affected (injured, missing, fatalities, etc.). Emergency support	No single emergency incident has occurred since April, 2021. The COVID restriction has been withdrawal by Gov. with the decreasing infection which also implemented for the MSTPP construction site. At present, the labors are working fully to this project with proper COVID safety measures. BIFPCL has given top priority on safety issues as like environment for this project after the bitter experience of two incidents. They have instructed the EPC contractor to establish best practices on OHAS and keep all records for avoiding any incident as like earlier. However, taking numbers of initiatives by	Complied at present

Sl. No	Condition of DoE	Compliance Status	Remarks
	available and its location (standby transport, medical facilities, etc.). Weather conditions Current operations (abandoning the site, firefighting, etc.)	the EPC and proponent significantly improve the safety system of the project. No environmental, accidental, anthropogenic incident has been not recorded since April 2021.	
48	The Project authority or its employees must notify the department of Environment of incidents causing or threatening material harm to the environment as soon as practicable after the person becomes aware of the incident.	BIFPCL has established a proper mechanism for recording such incident as suggested and notify the department of Environment regarding incidents causing or threatening material harm to the environment as soon as practicable after the person becomes aware of the incident. EPC have already revised the health and safety management manual to continue the work amid the COVID pandemic. Moreover, CEGIS is monitoring the EMP implementation as a whole.	Complied at present.
49	All pollution incidents shall be reported immediately and simultaneously to the Bagerhat District Office, Khulna Divisional Office and Headquarters of the Department of Environment (DoE) in Dhaka.	BIFPCL has established a proper mechanism for recording such incident as suggested in the ERP	Being complied
50	Appropriate permission would require to be obtained from the Forest Department in favor of cutting/felling on any plant/tree/sapling forested by any individual or government before doing such type of activity.	There is no need of cutting/felling down of any trees outside the project boundary. However, in future, if any such case arises, BIFPCL is committed to obtain appropriate permission from the Bangladesh Forest Department (BFD).	Being complied
51	Re-vegetation and re-plantation under green belt activities shall be undertaken in consultation with the Forest Department according to those mentioned in the EIA report.	• Limiting the vegetation clearance within the Project boundary especially around the ash impoundment. • An MoU signed with Forest Dept., Bangladesh on 24.02.2015 for implementation of Afforestation Program. Initial target was to plant 2 lac saplings in 3 years. 80000 plantations have already done. • Under these plantation program initiated by Bangladesh Forest De4partment (BFD) about 80,000 trees of fruits and medicinal species has already planted. • Another 30000 to 50000 trees were supposed to be planted by April to May 2022. This task is behind but land development works for this plantation in underway.	Being Complied

Sl. No	Condition of DoE	Compliance Status	Remarks
		However, BFD and BIFPC is optimistic to fulfill the target before commissioning of the power plant.	
52	Climate Change impacts and maximum storm surge height shall have to consider at the design and construction phase.	The design level (elevation) of the land and earthen embankment has designed and constructed considering the climate change impact and maximum storm surge height.	Being Complied
53	A separate EIA/morphological study shall have to be conducted for coal transportation and river dredging to develop sound environmental management plan towards conservation of ecosystem and biodiversity.	Coal transportation will be done through the existing maritime route, which is Mongla Port Authority (MPA) controlled waterways. M/s. Institute of Water Modelling (IWM) has already completed the EIA study for the dredging activity and submitted the report to MPA. A separate EIA study for Coal Transportation was conducted by M/s. Center for Environment and Geographic Information Services (CEGIS) which has been approved by DoE.	Being Complied.
54	A full-fledged institutional setup for EHS and CSR must be put in place before operation of the Power Plant.	A full-fledged institutional setup for EHS activities have been operated. After the consecutive accidents, the EHS process has been drastically re-arranged and reshaped. As a result, no major incident has been occurred since April, 2021. Safety walk-down by the EHS team inside the plant premises help to identify and register all kind of accident and incidental hazards if occurred and take immediate remedy measures. Meanwhile, a number of CSR activities like free medical camp, Boat Medical camp and medicines, free potable water supply to the local people, medical campaign, blanket distribution to the local people, EHS training, infrastructure development etc. are being conducted by the BIFPCL authority as a continuous process at the plant site. As a part of CSR about 226 patients have been taken eye treatment on Monthly Mobile Medical Camp at Hurka on 19.05.2022	In the process of compliance
55	The Project authority shall extend active cooperation to DoE officials to facilitate their visit to the site as and when necessary.	BIFPCL is extending its all-out cooperation to DoE.	Being Complied
56	Violation of any of the above conditions shall render this approval void.	Noted by BIFPCL	

Sl. No	Condition of DoE	Compliance Status	Remarks
57	Any injunction on this Project from the Honorable Supreme Court/High Court Division shall render this approval void.	Noted by BIFPCL	
58	Without installation of 275 Meter Height Chimney, Effluent Treatment Plant (ETP), Waste Water Treatment Plant (WWTP), Settling Pond, Desalinization Plant, API Oil Water Separator, High Efficiency Electro Static Precipitator (ESP), 'closed-loop' Flue Gas Desulfurization (FGD), Low NOx Burner, online air and water quality monitoring system and other pollution control equipment and obtaining Environmental Clearance Certificate, the proponent shall not start operation of the Project.	At present, the Plant is in construction phase. Some of the required parameter from DoE are ready, some are under ready and some will be ready before operation phage. **<u>Current status:</u>** • **Chimney:** Shell construction completed in Apr'21 (270 Meter). Flue liner erection completed and ready for Boiler light up (pic attached). • **DM water plant:** Plant commissioned and DM water production commenced. • **Effluent Treatment Plant (ETP):** Civil works of the ETP in under-way. Will be finished soon • **Electro Static Precipitator (ESP):** Structural erection has completed. Air Tightness test completed for all 04 pass completed. • **Flue Gas Desulfurization (FGD):** Equipment erection and commissioning activities in progress. Absorber Rubber lining work completed • **Desalinization plant:** One Stream is running while rest are under construction • **Low NOx Burner:** Ready for operation except some instrumental adjustment • **Settling pond:** 02 no rain off settling ponds are being constructed to settle the silt before discharge in to river. • **Online air and water quality monitoring system:** It will be in operation before the commissioning of the plant Moreover, BIFPCL has got the Environmental Renewal Certificate each of the year through maintaining the conditions of DOE.	Compliance action initiated
59	This EIA Approval has been issued with the approval of the appropriate authority.	BPDB and BIFPCL are thankful to DoE.	

5.2 Compliance to the Conditions of DoE (EIA study of Coal Transportation)

However, with reference to the approval of EIA study of coal transportation for 2x660 MWMSTPP having (Memo no: DoE/ clearance/ 5532 / 2016/50, dated 31/01/2018), Department of Environment has set some specific conditions to be followed as a fulfillment of the condition no.53 of the EIA approval letter of 2x660 MWMSTPP. The conditions and compliance status have been listed as follows-

Table 5.6: Compliance conditions of DoE (EIA study of Coal transportation)

Sl. No.	Conditions	Compliance status	Remarks
1	This EIA Report is approved only for Coal Transportation for the Proposed 2x660 MW Maitree Super Thermal Power Plant Project. Any modification of this project as well as Coal Transportation will require further EIA approval with additional EIA Study.	The power plant is now in construction stage. BIFPCL will notify to DOE prior to initiation of any modification, expansion or extension of the Power Plant.	Suggested to comply as and when required.
2	The route of coal Transportation should be maintained as per EIA Report. In case of any changes the proponent must obtain consent from DoE.	The route of coal Transportation will be maintained as stated in the EIA report. In case of any changes in the transportation route, the proponent shall obtain consent from DoE.	Suggested to comply as and when required.
3	Project Proponent may open L/C (Letter of Credit) for importing machineries for the project which shall also include machineries relating to waste treatment plant and plant and other pollution control devices.	EPC contractor has been appointed for this Project. They are importing all the Power Plant machineries complying with the national laws and regulations.	Being Complied.
4	The activity under Coal Transportation for the Proposed 2x660 MW Maitree Super Thermal Power Plant Project shall not release any pollutant that affect human health or will have damaging impact on the environment or natural resources.	So far, no activity under Coal Transportation for the Proposed 2x660 MW Maitree Super Thermal Power Plant Project has been commenced. So, there is no issue for impact on the surrounding environment or natural resources from the coal transportation activities. BIFPCL engaged CEGIS for monitoring and examining status of the environment or natural resources. A strong baseline has been prepared throughout the coal transportation route for assessing the impact in future.	Suggested to comply as and when required.
5	Proper and adequate mitigation measures shall be ensured throughout the operation period of the Project	The project proponent has included all the mitigation measures in their BID document of Coal Transportation. However, BIFPCL is monitoring the implementation of mitigation measures	Suggested to comply at operation stage.

Sl. No.	Conditions	Compliance status	Remarks
		for the entire jetty construction period. They have developed a skilled manpower and system for ensuring the EMP during operation stage as well.	
6	Any heritage site, ecologically critical areas, and other environmentally, religious and archeologically sensitive places shall be kept protected during project operation.	There is no Religious and Archaeological place in and around the Project site. As a third party, CEGIS is now monitoring the potentially vulnerable locations and indicators which are sensitive to coal transportation in the Sundarbans ECA, Sundarbans Reserve Forest and Sundarbans World Heritage Site. Those information and data assist to protect the ecological critical areas in future during the operation of coal transportation.	Suggested to comply at operation phase.
7	Environment friendly construction and development practices shall be followed that minimize loss of habitats and fish breeding, feeding and nursery sites.	Development of coal transportation system will be followed through best practices, EMPs of EIA of Coal Transportation Report, national and international rules and guideline. Since, the environmental monitoring indicators are not observed any anomalies, it can be concluded that the construction work is progressing in environment friendly procedure till now.	Being Complied
8	Proper and adequate sanitation facilities shall be ensured in labor camps throughout the proposed project period.	BIFPCL, EPC contractor and sub-contractors should ensure the sanitation facilities for the labour camps. But during the field visit the following anomalies has identified: • During the visit inside the labour shed plenty of household waste were found on the road in an unmanaged situation. • Lack of waste bin and lack of proper initiative of source segregation of the organic waste has made the labour shed unhygienic • Unused bath-tub with dirty water has noticed where waste garbage and polybags were floating. • Lack of lavatory/toilet waste drainage and sewerage facilities that has been causing waste accumulation and malodorous stench. But Authority has been providing sufficient training, instruction and facilities for managing COVID-19 to improve hygienic condition at labor	Partially Complied

Sl. No.	Conditions	Compliance status	Remarks
		camps and workplaces. Adequate no. of toilets has been made at every location at sites & labour colony	
9	Proper and adequate on-site precautionary Measures and safety measures shall be ensured so that no habitat of any flora and fauna would be endangered or destructed.	All the finished construction works so far including the Jetty has been followed in accordance with the EMP guidelines sated in the EIA report. Moreover, regular monitoring activities will be carried out to assess the significant changes (if any) for the rest of the unfinished works. The quarterly monitoring reports do not reflect any significant changes of the habitat of flora and fauna of the project influenced Passur river and Sundarbans ecosystem.	Being Complied
10	All the required mitigation measures Suggested in the EIA report along with the emergency response plan are to be Strictly implemented and kept operative/functioning on a continuous basis.	The proponent is giving top priorities to occupational health and safety issues. To keep the workers and the plant safe, plenty of precautionary measures has identified during the physical visit of the plant. • An ICU rich hospital with an experienced medical team and ambulance has kept ready to provide the instant services • In case of emergency situation for both BIFPCL and EPC contractor, a contract has been signed with a private hospital (GAZI medical, Khulna) for medical services. • Emergency fire exit, the fire extinguisher, fire alarm has observed available and well-functioning. • As a part of emergency response plan emergency contact numbers contained laminated poster has noticed beside the construction site. EHS team of BIFPCL, BHEL and Cholamandalam are compelling to ensure the safety mitigation measures as per EIA and EHS guideline. Moreover, Periodic training has been made as mandatory for the workers. BIFPCL working hard to build awareness about Covid-19 among workers and office support staff. Thermal scanning of workers is being done at regular frequency for checking COVID symptom.	Being complied
11	To control dust, spraying of water over the earthen	Periodic air quality monitoring in and around the project sites is being	Being Complied

Sl. No.	Conditions	Compliance status	Remarks
	materials should be carried out from time to time	conducted and checked it with ECR, 2005 standard. BHEL has contracted with an external company for three years (renewable) who are continuously spraying water as per schedule by three (03) water tankers to suppress fugitive dust.	
12	The entire coal handling system should be designed as an enclosed (and not only covered) conveyor system. There should be integrated dust control system with dust extraction and bag filters at unloading areas and at each transfer points on the conveyor system.	In the BID document, the coal handling system has been mentioned as closed system with the integration of dust control measures. Moreover, continuous monitoring system has been instructed in the EIA monitoring section.	Compliance action initiated
13	Coal should be stored in a covered storage yard.	All these stipulations have been included in the technical specification of Main Plant EPC contract package, Section V, B4 of Technical Specification (Clause No B4.3.1.6). The coal stockyard construction has already finished. Now the sheeting work is underway.	Compliance Action initiated.
14	The entire coal stockyard should be Covered with water sprinkler provided with automated moisture sensor to control self-combustion.	EIA study of the Power Plant suggested to install water sprinkler in coal stockyard which has been repeated in EIA study of Coal transportation. However, all these stipulations have been included in the technical specification of Main Plant EPC contract package.	Compliance Action initiated.
15	Construction material should be properly disposed of after the construction work is over.	For the solid waste management, BHEL has engaged a company named Rahman & brothers in association with Khulna City Corporation (KCC) for collecting and safe disposal of waste materials form site. During the field visit it was observed plenty of household and construction waste were scattered on the pathway of the labour camp and by the bank side of the Maudara river. Source segregation was absent. Quantify the waste generation from construction plant and other household waste were also absent. Sand pile and other loose materials were found uncovered.	Partially complied Though there are 657 colored waste collection bin available without any labelling, field team has suggested to put the written label on the box to classify the waste easily Intensive care should be taken in waste management issue.

Sl. No.	Conditions	Compliance status	Remarks
		There is a provision of development of solid waste management system which is given at clause no B12, Part no 9 of book no -2, page no 147-161.**In which development of WMC will** ensure waste collection, waste segregation at source, recycling, treatment and disposal of waste. The progress of this facility is about very minimal.	
16	As described in the report environmental monitoring should be strictly followed and monitoring report should be shared with DOE to ensure the environmental management properly.	BIFPCL has engaged CEGIS for environmental monitoring the environmental management plan in February 2014. Accordingly, each quarterly monitoring report has been submitted and shared with DoE, which are also available at BIFPCL web site.	Being Complied.
17	A third party/independent monitoring bodies excluding BIFPCL should be engaged immediately for monitoring of all the activities during pre-construction, construction and operation phases as per monitoring plan of EIA report and monitoring report must be submitted to Bagerhat District Office, Khulna Divisional Office and Headquarters of the Department of Environment simultaneously.	CEGIS, as an independent monitoring body has been engaged by BIFPCL since February 2014 and still continued. From then on, CEGIS has been conducting the monitoring programs quarterly and producing monitoring reports on regular basis which are submitted by CEGIS to BIFPCL for onward submission to the Bagerhat District Office, Khulna Divisional Office and Headquarters of the Department of Environment as directed by DoE.	Being Complied
18	Regular monitoring of the susceptible places of the Sundarbans for protecting ecosystem, biodiversity and forest coverage should be made using latest high-resolution image for keeping ambient environment.	The Monitoring activities have been carried out by CEGIS as third-party independent entity. The study includes all of recommended issues vastly. The monitoring report contains analysis of ecosystem, habitat, and biodiversity and forest coverage at susceptible sites of Sundarbans. In addition to this, Forest Department has also suggested some survey & analysis of Sundarbans ecosystem along with the quarterly compliance monitoring report.	Being Complied.
19	Air, water, soil, biological and social data should be monitored regularly with a network monitoring system with a view to assess the natural quality of the Sundarbans and other fragile ecosystem and report of monitoring results should be submitted to Bagerhat District	The network monitoring system will be installed as a part of the project construction for online monitoring and it will run at the time in operation phase. All these stipulations have been included in the technical specification of Main Plant EPC contract package. (Section-V, Clause No B0 6.19.13.2 and Clause No. B0 6.19.13.5).	Being Complied.

Sl. No.	Conditions	Compliance status	Remarks
	Office, Khulna Divisional Office and Headquarters of the Department of Environment simultaneously.	All the environmental monitoring reports are available on the BIFPCL website at present.	
20	There should be regular disclosure of the report through workshops and websites and responses should be taken care accordingly.	All of the environmental monitoring reports and other relevant reports are available on website of BIFPCL (www.bifpcl.com). BIFPCL as well as CEGIS is regularly carrying out public consultation at local level to get the responses from the community.	Being Complied.
21	BIFPCL should provide all sort of logistics support to DOE and other relevant agencies for monitoring environment related items/events.	BIFPCL is ready to provide all sort of logistic support as and when required by DoE and other relevant agencies for monitoring of Plant construction activities and environmental items/events.	Suggested to Comply as and when required.
22	In order to control noise pollution, vessels and equipment shall undergo regular maintenance; working during sensitive hours and locating machinery close to sensitive receptor shall be avoided.	Not applicable in this stage	Suggested to Comply as and when required.
23	Vessels of this project should follow the MPA guidelines and protocol to ensure no hindrance to other vessels.	Not applicable in this stage	Suggested to Comply as and when required.
24	The vessels used for this project should maintain IMO criteria to enable identification of substances harmful to the marine environment.	Not applicable in this stage	Suggested to Comply as and when required.
25	All the vessels should follow applicable MARPOL Convention, Appendix V on the prevention of pollution by garbage from ships.	Not applicable in this stage	Suggested to Comply as and when required.
26	Additional Environmental baseline data to be collected as suggested in the EIA report and conveyed to DOE and other concern authorities.	Environmental baseline data has been collected by third party *i.e.* CEGIS. CEGIS has submitted reports of quarterly monitoring containing latest baseline data to BIFPCL for further dissemination to DoE and other concerned authorities.	Being Complied
27	The Environmental Management Plan under the EIA study shall· strictly be implemented and kept functioning on a continuous basis.	BIFPCL has so far been implementing the EMP measures phase by phase as suggested in EIA report and approval condition of DoE. The status of EMP implementation are also regularly monitored by CEGIS.	Being Complied

Sl. No.	Conditions	Compliance status	Remarks
28	The project authority shall submit a detail work plan with time schedule of development activities at least 7 (seven) days ahead of the work commences in the field to the Bagerhat District Office, Khulna Divisional Office and Headquarters of the Department of Environment simultaneously.	The jetty construction works is now completed. Beforehand, BIFPCL submitted the detailed work plan seven (7) days prior starting of the construction activities to the Bagerhat District Office, Khulna Divisional Office and Headquarters of the Department of Environment simultaneously. It must be maintained in future.	Being complied
29	Environmental Monitoring Reports According to specific format specified in the EIA Report shall be made available simultaneously to DOE Bagerhat District Office, Khulna Divisional Office and Headquarters on a quarterly basis during the project period.	Environmental Monitoring Reports are being produced as per specific format provided in the EIA from the beginning till now. Report's content are disclosed by BIFPCL and submitted to DoE Bagerhat District Office, Khulna Divisional Office and Headquarters on monthly basis since April, 2018.	Being Complied
30	The following records must be kept in respect of any samples required to be collected for the purposes of environmental monitoring activities: a) the date(s) on which the sample was taken; b) the time(s) at which the sample was collected; c) the point at which the sample was taken; and The name of the person who collected the sample.	The Monitoring report of CEGIS keeps all the records as suggested.	Being Complied
31	The results of any monitoring required to be conducted under this EIA report must be recorded.	CEGIS is maintaining database fort all monitoring data analysis result and submitting to BIFPCL through proper documentation. The report is being shared with DoE on regular basis through monitoring reports.	Being Complied
32	In case of any emergency, the following information shall immediately be reported to Bagerhat District Office, Khulna Divisional office and Headquarters of the Department of Environment (DOE) simultaneously: a. Nature of incident (oil spill, fire, accident, collision, land slide etc.)	Emergency Reporting/ Emergency response Plan has been prepared and maintained for the Jetty construction (already finished) and will be followed for the coal transportation issues in future. As Coal transportation and its management is very sensitized to Environment and human body, Health and safety management manual have been revised for better and precautious implementation of OHAS.	Compliance Action initiated.

Sl. No.	Conditions	Compliance status	Remarks
	b. Personnel affected (injured, missing, fatalities, etc.) c. Emergency support available and its location (standby transport, medical facilities, etc.) d. Weather conditions Current operations (abandoning the site, firefighting, etc.)	Though BIFPCL has already put a top priority on OHAS issue, extra care will be ensured for this coal related issues. BIFPCL will adopt the ERP suggested on the EIA study of coal transportation in association with the NOSCOP and NPDM for any future incidents as suggested.	
33	National Oil Spill Contingency Plan (NOSCOP) should be followed to establish an organizational structure to combat marine pollution	Not applicable in this stage	Suggested to comply as and when required.
34	The project authority or its employees must notify the Department of Environment of incidents causing or threatening material harm to the environment as soon as practicable after the person becomes aware of the incident.	BIFPCL has strengthened the mechanism for the incident as suggested that is notify to DoE regarding incidents causing or threatening material harm to the environment as soon as practicable after the person becomes aware of the incident. The institutional arrangement for managing the incident during coal transportation will be set up before operation stage based on the EIA and DoE recommendations. Moreover, monitoring activities is continued for checking any significant changes in natural ecosystem.	Complied at Present.
35	All pollution incidents shall be reported immediately and simultaneously to the Bagerhat District Office, Khulna Divisional Office and Headquarters of the Department of Environment (DOE) in Dhaka.	BIFPCL has established a proper mechanism for recording such incidents as suggested in the ERP. CEGIS has been engaged to monitor the social and environmental compliance monitoring on a regular interval.	Complied at Present.
36	Climate Change impacts and maximum storm surge height shall have to consider at the design and construction phase of the jetty.	The design level (elevation) of the land and earthen embankment has been fixed considering the climate change impact and maximum storm surge height.	Being Complied
37	The transshipment point Faraway Buoy at the Bay should be used from November to March, and Mazhar point should be used from April to October every year for transporting coal	Not applicable in this stage	Suggested to comply as and when required.

Sl. No.	Conditions	Compliance status	Remarks
	which has been mentioned in the EIA Report.		
38	Violation of any of the above conditions shall render this approval void.	Noted by BIFPCL	-
39	Any injunction on this project from the Honorable Supreme Court/High Court Division shall render this approval void.	Noted by BIFPCL	-
40	This EIA approval is valid for one year from the date of issuance and the project authority shall apply for renewal to the Bagerhat District Office of DoE at Bagerhat with a copy to Head Office of DOE in Dhaka.	The authority is maintaining the renewal process as suggested. As like previous years, BIFPCL has got the renewal for this year.	Being complied

Status of project activities

Construction garbage

Household waste on the road at labor shed

Toilet waste with some other wood board inside the labor shed

Household and construction waste at the bank of Maidara river

Unused bath-tub with floated waste

Construction waste inside the plant

Uncovered sand heap

Uncovered Loose material including sand

Poster of Emergency Contact number

Awareness placard

Awareness poster

Emergency Contact number

Waste water discharge into the Maidara river

Settling pond

Safety park & Training center

Awareness poster

Water sprinkler

Closed system coal conveyor

Near finished Coal stockyard

Civil works of ETP construction

Meeting with BFPCL

Discussion with the manager of Labour shed

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Appendices

Appendix I: Checklist of Monitoring Environmental Compliances

Table A: Checklist of Monitoring for ESMP Implementation (During Construction Phase)

Sl No	Potential Impacts	Proposed EMP	Actual Implementation	Recommended Action	Compliance Status
1	Generation of Noise within the BIFPCL's Plant premises	• Conduct noise survey around and inside the site boundary • Reducing Noise and Vibrations to country's ambient standards, and occupational health and safety standards • Introducing vehicle speed limit and speed limit monitoring system • Green Plantation around the Project boundary • Switching off/ throttling down of machines/equipment's/generators which are not in use			
2	Dust Generation from Land development activities and other construction works	• Conducting dust monitoring and visual inspection around the site boundary • No use of earthen and undeveloped roads by vehicles related to the Project use • Installation of water spraying system to control fugitive dusts • Introducing vehicle speed limit and speed limit monitoring system • If yes, do they monitor vehicle speed regularly?			
3	Water Quality	• Fencing the construction site by drum sheet or Tarjja of any other fencing • Arrangement of runoff drainage for reducing any water logging • Location of backfilling stockpile in safe area and protected from wind and rain action • No storing of backfilling materials/spoil stored on river bank/slope • No disposal of waste and wastewater to river or canal.			
4	Waste Management System	• Provision of onsite waste management system			
5	Compensation and Resettlement	• Prepare Proper resettlement action plant and compensation plan if the Project needs any land acquisition addressing compensation, restoration, livelihood, living standards etc. based on proper socio-economic studies • Resettlement of the PAPs • cash for compensation of land (CCL) before resettlement			

Sl No	Potential Impacts	Proposed EMP	Actual Implementation	Recommended Action	Compliance Status
		• formal agreement with the affected people prior to migration/resettlement • Sufficient standing crop compensation • Compensation for shift able structures? • Retention of salvageable materials? • Compensation for loss of trading income? • one-time moving assistance • grant to cover loss of regular wage income • Has a resettlement plan been developed which includes compensation, restoration, livelihood, living standards etc. based on proper socio-economic studies? • Provide/take extra care/caution for the disadvantaged/vulnerable group(s) (i.e., women, children, ethnic minorities, indigenous people etc.) • Provision of monitoring the compensation and resettlement process			
6	Livelihood and living	• Does the Project pose any threat to the livelihood/living standards of the local people? • If yes, are adequate steps taken to reduce the impacts? • Has the company developed any policy which prioritizes the local laborers in employment opportunities? • Is there any possibility that large vehicle related to the Project will cause traffic induced disturbance/s to the local dwellers? • If yes, are there any mitigative steps taken to decrease the disturbance/s? • Has the road network been developed after the Project being proposed and during the construction phase? • Are there separate water and sanitation facilities for the construction workers in the Project area?			
7	Green House Gas Controlling Measures	• Use of efficient generator in the construction activities • Regular maintenance of vehicles, generator and machinery in accordance with manufacturer's specifications • Use of approved pollution control devices fitted in the equipment's and machineries • Switching off and throttling down the machines/equipment's/generators which are not in use			

Table B: Checklist of Monitoring ESMP Implementation (During Construction phase)

(Labor and Working Condition)

Basic Data

Sl No	Description	Values
1	Direct Workers	
2	Contracted Workers	
3	Supply Chain Workers	
4	Child labor	
5	0 - 12	
6	13 - 14	
7	14 - 18	

Checklist for Labor and Working Condition

Sl No	Potential Impacts	Proposed EMP	Actual Implementation	Recommended Action	Compliance Status
1	Working Conditions and Management of Worker Relationship	• Preparation of Human Resources Policies and Procedures for Direct workers • Defined Working condition and Terms of Employment for direct worker • Sustainably equivalent terms and condition for migrant workers • Compliance to national law of forming workers' organization • No discrimination and equal opportunity for all • Measures for diminishing past discrimination • Grievance Mechanism			
	Protecting Workforce	• The client will not employ children in any manner that is economically exploitative, or is likely to be hazardous or to interfere with the child education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development. • No Force Labor			
2	Safety at site	• Installation/Construction of Safety Fence around the Project area			

Sl No	Potential Impacts	Proposed EMP	Actual Implementation	Recommended Action	Compliance Status
		• Use of Personnel Protective Equipment (i.e. safety suit, safety goggles, ear plug, safety shoes, gloves, dust mask, etc.) • Safety trainings for workers (i.e. fire control, working at height, working in heat, first aid etc.) • Practice of Tool box meeting, safety talks, • Safe Storage of Hazardous Chemicals (e.g. fuel, flammable chemical, toxic chemicals, etc.) • Maintaining Material Safety Data Sheet (MSDS) • Provision of Health care facilities such as doctor, hospital etc. available at/nearby the plant construction site • Availability of First Aid at work place • Preparation and Follow of Emergency Response Plan • Adequate fire precautions in place (for example, fire extinguishers, escape routes etc.) • Documentation and reporting of occupational accidents, diseases, and incidents • Policies and procedures for managing and monitoring the performance of third-party employers in relation to OHS			
3	Occupational Health and Safety Procedure	• Provision of complete EHS division in the Human Resources Planning/Organogram • Preparation of Safety Policy to be adopted during plant operation			
4	Worker's Well Being	• Establishment Grievance Mechanisms • Ensuring fair treatment, non-discrimination and equal opportunity • Compliance of Project's labor policy with the national labor law • No Child Labor • No incident of forced labor • Provision of Welfare facilities for Worker/Labor			

Table C: Checklist of Monitoring ESMP Implementation (During Construction phase)

(Community Health, Safety and Security)

Sl No	Potential Impacts	Proposed EMP	Actual Implementation	Recommended Action	Compliance Status
1	Disturbance to nearby community due to dust from newly developed land and Noise from construction activities	• Construction of boundary wall around the Project are • Installation of water spraying system to control dusts • Conducting dust monitoring and visual inspection around the site boundary • Adoption of Noise management plan			
2	Grievance of local people	• Availability and operation of Grievance Redress Mechanism • Maintaining open communication channel with the local community			
3	Risk of breaching Community Safety	• Construction of boundary wall/safety fence around the Project area • Practicing Risk Assessment and Evaluation Process • Practicing safe management for hazardous materials which may pose threat to the community • Availability and operation of Emergency Response Plan • Maintaining open communication channel with the local community • Training and instruction to the security personnel about their behaviour and communication with the local people • Aware the security personnel about the right of the community people			
4	Community Health Risk	• Provision of providing health service facilities to community if the Project possess any health risk like sexually transmitted disease, communicable disease, vector-borne diseases • Implement all pollution mitigation measures to ensure safeguarding to community			***(Continued)***
5	Youth Employment	• Providing training/awareness program for the local youth to let them aware about the required qualification to get involved in the Project related activities			
6	Public Communication, Consultation and Awareness	• Arranging public communication/consultation meeting • Sharing of Project information with local people • Organizing environmental and social awareness programs/meetings			

Table D: Checklist of Monitoring ESMP Implementation (During Construction phase)

(Biodiversity and Sustainable Management of Living Natural Resources)

Sl No	Potential Impacts	Proposed EMP	Actual Implementation	Recommended Action	Compliance Status
1	Runoff (contain mostly sediment load) from newly developed land falls into nearby river and channel.	• Installation of proper run on/runoff drains • Use of sediment fences, traps and basins for trapping the sediment, if required			
2	Disturbance to nearby ecosystem due to different construction activities	• No cutting/ felling of trees along the river bank • Implementation of on-site waste and air quality management plan • Limiting soil extraction activities limited within the defined area • Limiting the vegetation clearance and base stripping process within the Project boundary • Safety fence around the construction site • Limiting the use of night light • Using shade (directed downwards) around the outdoor lights • Provision of cut-off time to switch off unnecessary lights at night • Initiate Green plantation • No plantation of non-native species • Retaining top soil for future habitat restoration • No degradation of critical habitat?			
3	Occupation of river, inter-tidal areas and wetlands	• No encroachment of inter-tidal flood plain area • No disturbance to Dolphin community • Monitoring of Ecosystem Health and Monitoring of Sundarbans Forest Health • If required, embankment should be constructed considering a setback distance from river/canal bank • Slope protection work along the Maidara River should be completed on an urgent basis before rainy season come and • BIFPCL may take initiatives of excavating of silted reach of Maidara river near proposed township area to facilitate proper functioning of River for maintaining tidal dynamics			

Appendix II: Photo Album

Environmental and Socio-economic Monitoring of Khulna 2×660 MW Power Plant for 32nd monitoring program (May, 2022)

Monitoring team

Canopy cover measurement

Forest health data collection

Mesuring tree DBH

insitu water quality testing

Insitu water Sampling & data collection

Appendix III: Terms of References (ToR)

Background

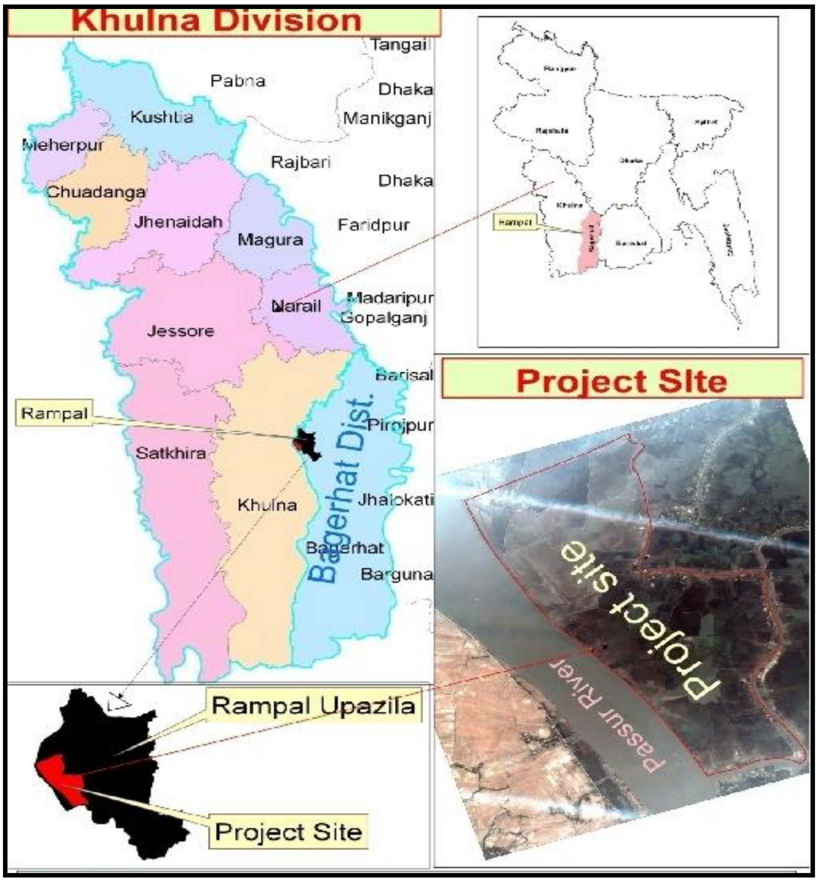
Bangladesh-India friendship Power Company (Pvt.) Ltd. (BIFPCL), a 50:50 Joint Venture Company of Bangladesh Power Development Board (BPDB) of Bangladesh & NTPC Limited of India is implementing a coal based thermal power plant named 2X660 MW Maitree Super Thermal Power Project at Rampal in Bagerghat District of Khulna Division of Bangladesh. The plant is envisaged to be based on super critical technology and is to be operated as Base Load Plant. The fuel envisaged is imported coal.

General Description of 2X660 MW Maitree Super Thermal Power Plant Project

Project Location: Upazila: Rampal, District: Bagerhat

Site is located at 23 kms Southward of Khulna City and 14 kms.

North-Eastward from Mongla Port.



Project Capacity: 1320 MW (2x660 MW), based on Ultra Super-critical Technology

Mode of Operation: Base Load

Fuel: Imported Coal

Fuel Transportation:	It is envisaged that imported coal from countries like Indonesia, Australia shall be transported through bigger ships, up to trans-shipment point, from where the coal shall be transported through barges to the coal unloading jetty at the plant end. From jetty to the power plant coal shall be transported through coal conveyor system.
Land& Land Development:	Based on the layout in the FR, it is estimated that approx. 575 acres of land will be required for the project. (375 Acres for Main Plant, 50 Acres for Township, 50 Acres for Jetty).
Evacuation of power:	Provision of line bays in generation switchyard for one no. 400 kV Double Circuit line and one no. 230 kV Double Circuit line have been kept. The Power evacuation (transmission line) system from the Project shall be at 400 kV level and will be outside the scope of the Project. 400 kV is being introduced for the first time in Bangladesh.
Expected Timeline for project implementation	The first unit of capacity 660 MW is scheduled to be synchronised in 41 months from the date of NTP to the EPC contractor for the Power project. Commissioning of the first unit of capacity 660 MW is envisaged at an interval of 5 months thereafter.

Broad Scope of Works

The study covers quarterly monitoring of different environmental and social parameters, and implementation of EMP (Environment Management Plan) during implementation phases as per DoE approval/requirement. The monitoring locations were selected based on physical activities, wind direction, sensitive receptors, etc. and were finalized through the consultation with DoE, Department of Fisheries (DoF), MPA and Forest Department (FD).

The Broad objectives of independent monitoring covers the following activities

- Monitoring implementation of EMP and environmental compliance;
- Monitoring of ambient air quality, noise level and water quality;
- Monitoring of cropping pattern and soil quality;
- Monitoring of fisheries resources covering fish habitats, biodiversity, migration and production;
- Monitoring of ecosystem and biodiversity;
- Monitoring of the Sundarbans Forest Health; and
- Monitoring of socio-economic condition and livelihoods.
- To evaluate the project environmental performance as due to construction activities.

The main objectives of this works are

- Monitoring of Social and Environmental parameters to update the baseline.
- Monitoring of Social and Environmental parameters during Implementation of the Project.
- Assistance to BIFPCL for implementation of Environmental Management Plan (EMP) during construction period.
- The scope of work of the Independent Monitoring will include the following specific tasks
- Develop specific monitoring indicators, checklists, and questionnaires to undertake independent monitoring (a preliminary list of monitoring indicators has been given in the EMP) in consultation with BIFPCL, DoE, Forest Department and the Financer;
- Review and verify the implementation progress of various EMP elements, particularly, mitigation plan, compliance monitoring, environmental trainings, documentation, and grievance redress mechanism;
- Physical aspects would cover air quality, noise level, water quality and land resources;
- Biological environment includes fisheries resources, ecological resources, Sundarbans Reserve Forest (SRF) health conditions including WHS;
- Environmental compliance monitoring includes Monitoring of Environmental and Social Management System Action Plan Implementation, monitoring of labour and working conditions, monitoring of community health, safety and security and monitoring of biodiversity and sustainable management of living natural resources.
- To establish baseline environmental conditions;
- Provide and monitor the environmental parameter during construction activities.
- To detect adverse environmental impacts for river dredging and other activities of site development;
- Provide technical assistance to the client for implementation of the EMP during the power plant construction at different sector of construction activities.
- To demonstrate whether the environmental control measures are operating as per designed;
- To provide data for emission inventories;
- To provide data at regular intervals for dissemination to the stakeholders
- To provide data for improvement and updating of the monitoring program;
- To assist in investigating the event of a trigger level or emission limit value being crossed.
- Update baseline data as per monitoring schedule and location.
- Provide technical assistance to the client for implementation of the EMP during power plant construction.
- Review the EIA document to evaluate the EMP measures incorporated in the contract to mitigate different social and environmental hazards and risks during construction of the Project
- Submit progress reports to the client.

- Physical observation to assess that all mitigation measures mentioned in EMP are carried out in all place.
- Sampling and carrying out necessary analysis of Environmental parameter such as surface & ground water quality, air quality, noise, Biological Environment, Socio-economic environment, Sundarbans Forest health etc. according to the monitoring framework in construction phase.
- Morphological changes of the adjacent river of the project will be influenced by the constructional activities. River bank erosion-accretion, drainage system, tidal inundation etc. will be investigate after regular intervals in the study area as per monitoring location of the EIA. The procedure of investigation and methodologies of analysis will be the same as pre-construction phases. River bed pollution will be identified though this study during construction of the power plant.
- Monitoring of floral resources will be performed quarterly. The indicators and procedures of flora monitoring will be relatively same as earlier studies of this projects. Plant composition, canopy coverage, indigenous and exotic species, plant intensities will be the main monitoring indicators during construction phases.
- Monitoring of faunal resources will be performed quarterly at the construction period. Faunal resources survey will coincide with floral resources survey as it will provide more insight about the inter-dependency between flora and fauna in an ecosystem.
- Render any other related services as and when requested.
- Conduct community level consultation in a regular interval and disclose project level information.
- Keep liaison with different organization like Govt department, NGOs, and relevant stakeholders.

The Monitoring parameter & associated indicator are given below

Monitoring Parameter	Indicators
Socio-economy	Livelihood and Occupation
	Income and expenditure
	Displacement and Migration
	Cultural and heritage
	Health and sanitation
	Risks and accidental assessment
	Transportation and communication
	Public and private Infrastructure development
Ecology and Biodiversity	Bio-indicator Assessment
	Movement of indigenous/ native species
	Envision of exotic species and regime dominance
	Species composition (Flora and Fauna)
	Assessment the services of dependent ecosystem
Agriculture	Land use and canopy coverage

Monitoring Parameter	Indicators
	Soil quality (Salinity, pH, OM,)
	Cropping pattern and crop intensities
	Irrigation and crop production
	Farmers survey result
Fisheries	Fish diversity and specification
	Fish production and availability
	Fisher survey result
Noise level	Sound level at the sensitive zone
Water resources	DO, BOD, COD, Salinity, TDS, TS, pH, Hg, Pb
	Total Hardness, Hg, NO_3 and PO_4
	River Morphology,
	Tidal inundation
	Drainage Network
	Erosion and Accretion
	Ground water quality
Air quality	SOx
	NOx
	SPM (PM_{10} and $PM_{2.5}$)
	CO

Air quality monitoring progress

The most commonly used method for automatically monitoring air pollutant such as those above are:

- SOx: measured by Fluorescent signal generated by exiting SO_2 with UV light
- NOx: measured by Chemilumiscent reaction between NOx & O_3
- O_3: measured by ultra violet absorption analyzer, this determines the Ozone concentration by the attenuation of 254 nm UV light along this signal fixed path cell
- Particulate matter (SPM, PM_{10}, $PM_{2.5}$): measured by gravimetric methods including true micro weighing technology for automatic monitoring & instrument named 'Tapered element oscillating micro balance (TOEM)' has been most frequently used. Measurement on filter tape using the principles of beta attenuation for estimating 30 mnt or 1 hr average concentrations of PM_{10} or $PM_{2.5}$ has also been used.
- CO: In urban air pollution studies, a non-disruptive infrared photo meter utilizing a gas filter co relation technology & state of the art optical & electronic technology is used to measure low concentration of CO accurately & reliably.

Expected Output

A breach of a trigger level or emission limit values may indicate a significant increase of a contaminate concentration in an environmental medium.

Baseline Monitoring is monitoring in and around the location of a proposed site so as to establish background environmental conditions prior to any development of the proposed site. In case of existing facilities, baseline-monitoring serves as a reference point to which later monitoring results are compared. The information will be used to evaluate in future compliance monitoring.

Compliance monitoring is periodic monitoring and is to determine whether there is any release of contaminants to the environment and to demonstrate compliance within the project area. It includes measurements of process conditions, process emissions and levels in receiving environments and the reporting of the results of such measurements to demonstrate compliance with limits specified in the legislation.

The information provided by compliance monitoring is also valuable for other environmental and management activities (e.g. for optimizing process, protecting sensitive ecosystems and informing the public of the effectiveness of environmental protection measures).

Assessment monitoring is investigative monitoring which is initiated after detection of the impacts to the environment or on attaining a trigger level. The assessment monitoring will:

- Identify the source of release materials;
- Characterize the nature, extent and rate of releases;
- Evaluate the risk to the environment and to human health;
- Evaluate measures to prevent or minimize future releases;
- Provide information for the design and implementation of corrective measures and
- Express the residual environmental impacts for proper compensation.

Reporting Requirements

As it is proposed to carry out the monitoring program for two quarters and the proposed deliverables are scheduled below:

SL	Name	No. of copies
1	Monitoring Report after each monitoring mission (each in one quarter) with complete data, analysis, lab. Results, discussion etc. as intended in the scope of work.	12
2	CD-ROM in respect of documents/datasheets	2

Appendix IV: Monitoring Data

(A) Air Quality Data

Table A1: Ambient Air Quality Monitoring Results

Locations of Monitoring	Pollutants	1st QM, Apr 2014	2nd QM, Jul 2014	3rd QM, Oct 2014	4th QM, Jan 2015	5th QM, Apr 2015	6th QM, Jul2015	7th QM, Oct 2015	8th QM, Jan 2016	9th QM, Apr 2016	10th QM, Jul 2016	11th QM, Oct 2016	12th QM, Jan 2017	13th QM, April, 2017	14th QM, Oct, 2017	15th QM Jan, 2018	16th QM April, 2018	17th QM, Jul 2018	18th QM, Nov, 2018	19th QM, Feb, 2019	20th QM, Apr, 2019	21st QM, Jul, 2019	22nd QM, Jul, 2019	23rd QM, Feb, 2020	25th QM, July, 2020	26th QM, Oct, 2020	27th QM, Jan, 2021	28th QM, April, 2021	29th QM, Aug, 2021	30th QM, Nov, 2021	31st QM, Jan, 2022	32nd QM, May, 2022	Bangladesh (DoE) Standard (Air Pollution Controlrules, 2022; ECR, 1997 and subsequent amendments)
Weather		Sunny	Rainy/Cloudy	Sunny	Sunny	Sunny	Rainy/Cloudy	Sunny/Rainy	Sunny	Sunny	Rainy/Cloudy	Rainy/Cloudy	Sunny	Sunny/Cloudy	Sunny	Sunny	Sunny/Cloudy	Rainy/Cloudy	Sunny/Cloudy	Sunny	Sunny	Sunny/Cloudy	Sunny/Cloudy	Sunny	Rainy/Cloudy	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny	Rainy/Cloudy	
	Concentrations are in µg/m³																																
SW Corner of the PP area	$PM_{2.5}$	33	37	25	33	47	25	22	34	19	5	9	24.8	8.12	28.2	32.9	28.4	15.2	31.1	27.3	21.7	37.76	51.32	27.12	18.71	44.18	55.35	49.13	38.25	56.83	46.83	41.78	65^{24hr}
	PM_{10}	78	77	53	79	83	35	52	135	117	32	22	79	43.8	73.6	133	70	15.8	106	105.4	98.2	67.15	127.6	68.1	80.28	107.16	106.13	103.88	59.17	83.46	91.25	74.32	150^{24hr}
	SPM	207	239	190	200	177	42	91	175	332	51	53	115.7	122.4	169.4	145.6	121.5	12.9	137.4	151.6	128.6	109.25	183.56	108.4	98.26	149.73	163.48	155.14	99.44	144.48	159.45	139.42	200^{8hr} (ECR, 1997)
	SO_2	21	24	19	23	15	52	35	14	18	9	8	9.5	9.0	7.2	14.3	11.4	11.9	12.7	11.6	13.9	56.5	31.53	18.35	19.91	26.63	14.74	16.26	14.49	16.28	21.54	15.22	80^{24hr}
	NOx	26	29	27	31	29	35	29	18	18	12	10	11.3	10.7	7.5	17.7	12.8	10.2	14.8	12.4	16	55.08	24.97	12.12	8.82	16.62	37.16	22.31	19.87	21.64	39.5	22.49	80^{24hr}
	CO	120	188	140	190	144	146	88	74	57	35	119	59	91	73	61	32	11.1	28	15	18	4	16	28	0	2	0	0	1	0	1	1	$(5000)^{8hr}$
	O_3	27	26	19	22	26	12	5	4	1	1	1	5	03	10	03	9	13.2	7	9	6	25	10	8	8	8	9	16	42	11	12	18	100^{8hr}
Shapmari area	$PM_{2.5}$	39	48	48	39	34	18	17	35	25	3	8	25	14.6	8.5	31.5	26.7	15.8	35.7	30.6	18.9	50.24	19.34	19.14	20.35	29.17	52.74	48.64	41.2	44.65	39.86	36.71	65^{24hr}
	PM_{10}	814.6	90	74	102	97	31	48	116	44	11	11	99.5	56.9	40.4	147.8	52	64.4	109.9	126.3	106.1	63.94	82.27	83.22	71.06	84.3	112.04	83.1	64.28	71.35	58.29	68.79	150^{24hr}
	SPM	2156.3	263	217	274	266	47	79	192	187	27	23	154.2	136.7	45.3	181.4	138.7	113.4	143.9	168	150.8	123.56	120.45	106.3	95.24	119.22	170.33	139.26	116.48	118.49	128.34	158.14	200^{8hr} (ECR, 1997)
	SO_2	19	28	22	21	22	58	27	13	11	4	6	12.9	10	4.3	15	9.6	10.8	12.2	12.3	12.1	31.53	60.26	27.41	17.44	14.15	18.32	14.06	11.77	14.55	14.48	13.96	80^{24hr}
	NOx	29	39	27	26	24	46	25	16	22	6	8	15.7	11.8	6	18.6	10.2	13.1	13.6	13.8	13.9	24.97	58.39	18.77	10.17	14.18	29.9	21.65	21.394	20.85	20.44	20.47	80^{24hr}
	CO	165	210	230	164	136	127	102	77	22	31	108	66	78	79	69	27	25	30	21	20	4	11	44	4	0.013	0	0	1	1.1	1	1	$(5000)^{8hr}$
	O_3	33	26	26	23	21	16	1	1	1	0	0	1	08	25	04	4	8	6	4	1	34	22	9	6	2	6	9	28	41	49	8	100^{8hr}
NW Corner of the PP area	$PM_{2.5}$	37	44	19	42	59	28	19	24	11	3	10	29	10.3	15.2	40.7	27.7	12.9	32.3	20.3	14.2	37.27	33.2	21.61	21.93	46.73	68.26	58.81	22.66	41.98	42.81	54.16	65^{24hr}
	PM_{10}	67	78	56	98	91	96	29	125	29	24	14	108.7	31.3	49.9	136.3	100.1	44.3	117.4	93.6	58.7	42.99	1119.34	77.69	76.76	110.43	131.84	97.61	48.19	61.48	73.42	63.26	150^{24hr}
	SPM	234	217	157	310	244	321	66	187	115	31	35	168	91.7	63.9	161.7	116.2	76.3	156.2	125.5	119.2	60.45	175.13	100.04	101.33	160.3	180.43	161.8	77.149	104.73	123.76	132.77	200^{8hr} (ECR, 1997)
	SO_2	19	22	18	27	21	56	32	13	17	4	8	12.2	5.8	7.5	9.6	13.2	5.8	13.4	10.7	11.6	60.26	54.02	19.68	16.21	25.82	16.19	16.58	13.58	12.19	11.79	10.47	80^{24hr}
	NOx	23	28	22	32	39	43	21	18	16	5	11	14.7	7.1	9.2	11.7	14.3	5.9	15	11.3	13.5	58.39	43.45	17.53	10.55	18.91	34.1	27.42	20.49	18.39	20.25	23.96	80^{24hr}
	CO	110	178	110	210	140	133	87	77	38	47	127	31	74	80	45	43	21	32	20	16	7	0	30	2	0.012	0	0.2	1	1.4	1	0.6	$(5000)^{8hr}$
	O_3	25	19	17	36	44	11	8	2	0	1	1	3	05	10	05	7	6	8	1	5	18	2	9	8	8	12	14	17	34	12	8	100^{8hr}
Barni, Gaurambha	$PM_{2.5}$	39	47	57	39	41	34	11	29	23	9	10	21.7	7.9	13.8	52.3	18	11.9	15.4	19.3	19.7	57.51	31.28	26.66	18.04	38.69	61.29	62.29	21.8	58.34	29.22	31.43	65^{24hr}
	PM_{10}	103	122	67	97	82	65	26	97	82	45	13	105.4	30.5	30.2	140	30.5	20.5	50.1	102	69.9	33.25	69.32	61.11	59.02	91.79	93.36	103.42	50.26	73.17	43.88	46.29	150^{24hr}
	SPM	233	244	183	277	236	79	112	176	268	69	30	167.8	95.6	57.2	171.9	90.6	5.2	113.5	127.5	92.2	75.13	102.17	98.74	82.02	128.48	159.8	154.35	83.2	134.6	92.38	98.15	200^{8hr} (ECR, 1997)
	SO_2	21	23	17	22	25	41	31	16	20	10	7	12.2	5.5	4.1	13.8	6.1	6.1	9.5	11.5	12.6	54.02	59.33	18.88	24.29	20.17	16.47	13.52	14.44	21.39	14.36	18.42	80^{24hr}
	NOx	25	28	22	26	27	44	32	21	16	12	9	19.3	9.8	5.0	16.7	7.3	7.4	10.7	13.8	13.8	43.45	57.02	11.58	10.62	14.47	21.18	19.371	19.48	38.46	21.92	40.28	80^{24hr}
	CO	175	210	190	150	196	96	96	81	73	41	98	63	85	77	59	24	20	20	17	18	6	0	32	0	0	0	0	0	0	0.1	1	$(5000)^{8hr}$
	O_3	26	29	22	19	15	9	6	4	0	0	3	5	08	6	04	6	6	2	3	4	7	52	12	8	0	6	2	19	28	6	10	100^{8hr}
Chunkuri-2,	$PM_{2.5}$	35	39	46	37	33	35	28	31	25	7	5	25.2	8.7	17.3	33.4	11.4	10.2	26.8	22.8	15	19.46	33.74	39.44	18.22	43.91	59.18	53.36	33.27	29.61	45.3	48.94	65^{24hr}

Locations of Monitoring	Pollutants	1st QM, Apr 2014	2nd QM, Jul 2014	3rd QM, Oct 2014	4th QM, Jan 2015	5th QM, Apr 2015	6th QM, Jul2015	7th QM, Oct 2015	8th QM, Jan 2016	9th QM, Apr 2016	10th QM, Jul 2016	11th QM, Oct 2016	12th QM, Jan 2017	13th QM, April, 2017	14th QM, Oct, 2017	15th QM Jan, 2018	16th QM April, 2018	17th QM, Jul 2018	18th QM, Nov, 2018	19th QM, Feb, 2019	20th QM, Apr, 2019	21st QM, Jul, 2019	22nd QM, Jul, 2019	23rd QM, Feb, 2020	25th QM, July, 2020	26th QM, Oct, 2020	27th QM, Jan, 2021	28th QM, April, 2021	29th QM, Aug, 2021	30th QM, Nov, 2021	31st QM, Jan, 2022	32nd QM, May, 2022	Bangladesh (DoE) Standard (Air Pollution Controlrules, 2022; ECR, 1997 and subsequent amendments)
Weather		Sunny	Rainy/Cloudy	Sunny	Sunny	Sunny	Rainy/Cloudy	Sunny/Rainy	Sunny	Sunny	Rainy/Cloudy	Rainy/Cloudy	Sunny	Sunny/Cloudy	Sunny	Sunny	Sunny/Cloudy	Rainy/Cloudy	Sunny/Cloudy	Sunny	Sunny	Sunny/Cloudy	Sunny/Cloudy	Sunny	Rainy/Cloudy	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny	Rainy/Cloudy	
	Concentrations are in µg/m³																																
Bajua Dacope	PM_{10}	77	86	69	68	61	109	49	98	60	23	20	74.4	44.4	100.2	157.1	40.6	30.6	105.9	126.7	72.7	46.37	78.27	100.08	59.91	88.93	117.42	86.44	61.9	44.28	66.54	86.48	150^{24hr}
	SPM	117	113	162	183	188	175	94	167	167	31	48	162	110.6	127.8	200	108	78.6	128.5	146.6	117.6	80.31	100.95	146.72	146.72	139.04	188.27	128.36	104.29	77.88	134.71	165.58	200^{8hr} (ECR, 1997)
	SO_2	19	24	21	18	11	55	33	21	13	7	9	18.9	8.2	7.9	19	10.4	7.5	12.1	12.4	11.2	45.81	35.42	36.14	18.74	29.94	16.45	19.66	15.98	10.59	12.84	14.82	80^{24hr}
	NOx	23	26	27	24	18	49	23	16	25	10	8	18	11.2	8.4	20.7	11.6	8.4	14	13.8	13.7	44.92	40.09	20.04	10.19	18.32	26.14	24.21	18.66	17.21	16.73	26.42	80^{24hr}
	CO	190	205	170	170	33	133	75	70	33	38	79	36	94	69	58	42	23	27	25	20	10	0	18	10	0	0.1	0.1	0.8	1	1	1	$(5000)^{8hr}$
	O_3	27	24	18	22	41	21	2	1	1	0	2	2	03	5	05	2	4	5	9	8	2	38	22	8	0	23	28	11	9	8	13	100^{8hr}
Pankhali, Dacope	$PM_{2.5}$	47	49	57	41	39	34	25	47	15	8	10	38.7	15.8	17	72.3	15.9	11.1	24.8	28.6	15.8	24.03	24.03	33.26	16.63	33.32	66.31	42.62	32.45	42.59	47.51	42.57	65^{24hr}
	PM_{10}	119	127	139	101	105	144	62	128	46	42	18	141.6	105	63.4	208.9	74.3	58.4	92	125.8	92.7	56.56	119.28	127.52	55.78	74.83	102.73	73.29	74.89	64.71	81.84	71.22	150^{24hr}
	SPM	297	266	254	208	299	339	183	198	114	78	34	194.6	179	87.5	223.9	154.1	98.4	139	178.2	141.1	93.5	100.95	160.02	70.23	111.95	156.56	116.73	118.4	107.31	148.93	128.98	200^{8hr} (ECR, 1997)
	SO_2	28	31	31	24	30	58	36	18	9	8	8	16.1	12.9	8	16.3	12.2	9.4	10.4	13.3	10.4	59.41	44.29	30.89	16.73	21.39	16.16	13.1	14.61	12.8	21.4	19.71	80^{24hr}
	NOx	41	39	36	26	27	47	23	15	19	9	9	19	18.7	10.2	17.7	13.7	12.1	13.4	14.9	11.7	51.09	17.72	19.02	10.52	12.12	28.54	17.18	20.27	19.33	38.27	29.44	80^{24hr}
	CO	230	217	250	188	177	125	105	101	55	29	112	48	83	87	49	34	29	30	14	14	9	0	11	0	0	1	0	1	1.1	2.8	2	$(5000)^{8hr}$
	O_3	49	38	36	27	11	13	5	2	2	0	0	3	06	0	06	6	8	8	8	3	22	26	2	2	4	20	2	10	19	48	39	100^{8hr}
Mongla Port area	$PM_{2.5}$	47	55	39	41	26	33	19	34	21	9	11	25.7	22.6	33.2	70.1	23.2	13.2	30.3	26.6	35	56.67	39.69	38.92	41.33	40.75	74.19	65.37	22.54	51.83	26.39	28.19	65^{24hr}
	PM_{10}	139	174	77	82	35	52	33	132	45	29	15	119.3	93.6	97	209.1	89.9	47.5	103.7	109.3	131	119	64.12	119.61	126.13	114.61	118.67	129.71	64.44	72.4	61.63	51.66	150^{24hr}
	SPM	288	303	197	217	214	118	65	189	144	50	6	172.3	196	187.2	242	144.7	73.7	161.9	157.1	183.1	192.17	83.9	173.36	166.16	152.76	201.16	180.22	85.2	128.3	100.53	92	200^{8hr} (ECR, 1997)
	SO_2	27	28	26	24	14	45	36	16	10	8	7	16.8	10.5	8.2	15.5	11.8	6.5	12	10.8	16.8	59.33	57.24	31.33	22.04	20.06	12.26	18.91	10.28	17.44	12.54	20.33	80^{24hr}
	NOx	44	39	33	27	17	40	20	13	14	10	8	15.3	15.1	10.7	18.4	13.2	7.2	16.8	12.6	17.8	57.02	46.58	13.34	11.29	9.69	19.25	30.2	19.73	29.16	18.43	31.63	80^{24hr}
	CO	230	320	220	211	24	110	84	71	29	31	97	44	72	79	52	29	20	33	28	17	15	48	29	24	0	2	0.9	2	2.4	2	0.2	$(5000)^{8hr}$
	O_3	57	52	37	26	09	15	8	3	1	2	1	4	04	9	02	3	1	9	7	3	5	40	4	2	1	66	91	23	43	20	13	100^{8hr}
Harbaria, Sundarbans	$PM_{2.5}$	19	22	33	27	24	27	24	26	13	6	10	19.2	10.5	28.3	43.5	11.6	11.4	20.6	15.4	14.2	28.03	39.69	17.81	20.11	34.42	53.28	46.13	34.94	31.2	41.58	43.27	65^{24hr}
	PM_{10}	41	39	59	56	49	42	50	82	42	20	14	85.2	36.7	89.9	152.4	29.1	24.3	80.5	92.6	63.9	21.85	64.12	63.27	62.24	79.38	100.11	82.83	61.53	49.07	58.92	51.04	150^{24hr}
	SPM	111	117	129	139	109	70	73	159	91	43	44	93.5	103.7	107	189.9	72.4	47.6	90.3	118.3	90.9	48.09	83.9	87.51	87.71	122.94	146.2	133.1	108.74	83.16	118.83	110.28	200^{8hr} (ECR, 1997)
	SO_2	9	10	14	12	16	51	34	15	11	6	7	11.9	5.7	7.6	13.2	7.9	4.9	11.6	9.5	11.6	49.72	57.24	16.47	13.31	19.74	14.66	16.58	14.75	12.68	22	13.76	80^{24hr}
	NOx	19	22	27	18	22	34	22	14	16	8	10	13	7.7	9.3	15.2	8.3	5.4	13	10.1	13	41.91	46.58	9.9	8.13	10.16	21.44	0	23.28	22.27	27.2	39.23	80^{24hr}
	CO	65	58	70	64	56	112	81	62	47	32	110	67	73	84	57	31	20	20	25	16	16	48	30	8	0	0	3	1	1	1	1	$(5000)^{8hr}$
	O_3	13	12	13	11	14	12	4	2	2	0	1	4	08	0	02	2	6	4	3	5	8	40	12	22	3	6	46.13	9	11	41	24	100^{8hr}
Akram Point, Sundarbans	$PM_{2.5}$	17	19	23	18	49	NO	25	18	9	4	4	14.3	13.2	7.5	35.4	13.7	14	29.1	16.2	13	19.68	36.67	23.04	13.16	22.74	48.2	41.33	39.16	23.6	29.65	58.43	65^{24hr}
	PM_{10}	39	44	32	39	77	NO	32	77	31	15	14	85.5	96.0	37.8	150.6	36.4	41.6	100.2	93.2	51.9	43	87.15	82.91	58.82	56.74	90.12	84.16	76.18	51.88	53.69	77.69	150^{24hr}
	SPM	114	133	97	88	102	NO	51	128	46	23	27	90.9	137.0	41.8	175.1	90.3	58	121.4	117.8	71.1	83.9	122.62	121.68	78.8	80.31	144.95	131.46	123.59	79.47	98.47	141.37	200^{8hr} (ECR, 1997)
	SO_2	7	9	12	13	21	NO	27	14	9	4	6	8.4	6	5.8	14	8.3	6.3	10.8	10.1	8.9	57.24	35.23	24.21	15.06	12.74	15.05	17.44	16.55	15.89	15.53	21.81	80^{24hr}
	NOx	17	19	22	17	27	NO	19	15	10	5	6	12.7	10.1	5.9	15.1	9.9	9.3	11.7	11.3	9.4	46.58	31.26	16.74	10.47	6.64	20.6	23.5	21.28	21.39	19.38	38.3	80^{24hr}
	CO	49	60	50	46	163	NO	92	64	21	37	101	58	79	69	52	21	25	28	17	14	38	24	20	14	0	0.2	0	2	1	1.4	0.3	$(5000)^{8hr}$
	O_3	11	14	9	10	27	NO	8	1	0	0	2	3	0	0	03	3	4	5	3	1	9	90	2	4	6	8	8	11	8	16	41	100^{8hr}
Hiron Point,	$PM_{2.5}$	15	23	19	17	28	NO	27	NO	17	NO	9	21.7	No	17.0	40.5	NO	NO	23.4	18.2	NO	NO	27.76	17.39	NO	28.15	55.71	NO	25.3	38.51	36.88	39.62	65^{24hr}

Locations of Monitoring	**Pollutants**	**1st QM, Apr 2014**	**2nd QM, Jul 2014**	**3rd QM, Oct 2014**	**4th QM, Jan 2015**	**5th QM, Apr 2015**	**6th QM, Jul2015**	**7th QM, Oct 2015**	**8th QM, Jan 2016**	**9th QM, Apr 2016**	**10th QM, Jul 2016**	**11th QM, Oct 2016**	**12th QM, Jan 2017**	**13th QM, April, 2017**	**14th QM, Oct, 2017**	**15th QM Jan, 2018**	**16th QM April, 2018**	**17th QM, Jul 2018**	**18th QM, Nov, 2018**	**19th QM, Feb, 2019**	**20th QM, Apr, 2019**	**21st QM, Jul, 2019**	**22nd QM, Jul, 2019**	**23rd QM, Feb, 2020**	**25th QM, July, 2020**	**26th QM, Oct, 2020**	**27th QM, Jan, 2021**	**28th QM, April, 2021**	**29th QM, Aug, 2021**	**30th QM, Nov, 2021**	**31st QM, Jan, 2022**	**32nd QM, May, 2022**	**Bangladesh (DoE) Standard (Air Pollution Controlrules, 2022; ECR, 1997 and subsequent amendments)**
Weather		**Sunny**	**Rainy/Cloudy**	**Sunny**	**Sunny**	**Sunny**	**Rainy/Cloudy**	**Sunny/Rainy**	**Sunny**	**Sunny**	**Rainy/Cloudy**	**Rainy/Cloudy**	**Sunny**	**Sunny/Cloudy**	**Sunny**	**Sunny**	**Sunny/Cloudy**	**Rainy/Cloudy**	**Sunny/Cloudy**	**Sunny**	**Sunny**	**Sunny/Cloudy**	**Sunny/Cloudy**	**Sunny**	**Rainy/Cloudy**	**Sunny**	**Sunny**	**Sunny**	**Sunny**	**Sunny**	**Sunny**	**Rainy/Cloudy**	
	Concentrations are in µg/m³																																
Sundarbans	**PM_{10}**	44	38	34	41	60	NO	45	NO	40	NO	14	104.5	NO	92.1	149.8	NO	NO	86.7	96.1	NO	NO	67.89	72.45	NO	59.31	99.64	NO	59.7	49.27	58.45	48.81	150^{24hr}
	SPM	101	119	107	97	110	NO	88	NO	132	NO	26	111.4	NO	102	173.7	NO	NO	107.9	127.8	NO	NO	90.31	94.28	NO	91.06	155.39	NO	94.7	89.36	106.93	96.23	200^{8hr} (ECR, 1997)
	SO_2	8	7	13	14	15	NO	28	NO	15	NO	9	13.5	NO	6	15.8	NO	NO	10.6	10.7	NO	NO	45.81	13.33	NO	11.36	16.2	NO	13.92	14.33	12.76	15.38	80^{24hr}
	NOx	18	18	19	22	20	NO	23	NO	19	NO	9	15.9	NO	7.8	18.1	NO	NO	12.5	10.9	NO	NO	44.92	8.65	NO	9.74	23.53	NO	20.06	16.27	19.66	39.72	80^{24hr}
	CO	52	62	65	60	60	NO	93	NO	40	NO	121	43	NO	72	71	NO	NO	22	21	NO	NO	2	36	NO	0	0	NO	0	0	0.3	0.7	(5000) ^{8hr}
	O_3	14	13	11	9	23	NO	2	NO	0	NO	0	4	NO	0	04	NO	NO	6	6	NO	NO	16	7	NO	1	11	NO	14	22	22	38	100^{8hr}
Khulna City, near Khan Jahan Ali Bridge	**$PM_{2.5}$**	54	39	52	42	55	46	19	35	11	16	9	34.6	23.1	19.5	78.7	12.4	12.5	21.3	20.8	33	38.59	18.65	40.22	46.73	48.32	88.71	71.2	29.47	65.66	61.57	67.33	65^{24hr}
	PM_{10}	139	117	91	84	75	89	49	112	69	68	24	145.9	99.5	39.6	213.9	38.8	45.4	57.9	91.3	125.9	47.05	59.19	116.16	119.11	109.63	159.22	120.38	64.44	124.55	100.3	92.36	150^{24hr}
	SPM	301	287	239	219	222	181	101	181	112	107	64	189.7	187.2	127.9	243.4	78.9	69.9	102.9	158	173.4	100.95	78.09	157.28	167.18	157.35	240.18	193.61	101.85	195.17	198.24	178.26	200^{8hr} (ECR, 1997)
	SO_2	33	29	33	28	31	59	28	16	11	10	10	17.1	7.2	7.1	21	7.5	7.5	8.7	10.4	15.3	35.42	49.72	28.31	30.73	29.58	18.8	20.64	12.73	26.18	28.52	19.29	80^{24hr}
	NOx	49	41	39	36	33	38	26	16	15	15	14	18.6	11.7	8.8	25	8.4	11.1	9.7	11.1	17.1	40.09	41.91	24.14	24.24	20.44	34.2	28.35	20.45	38.58	41.59	37.91	80^{24hr}
	CO	330	370	330	296	101	89	94	98	68	36	104	66	79	81	69	36	28	121	19	23	11	24	32	18	0.7	2	3	4	4.9	1.4	0.2	(5000) ^{8hr}
	O_3	59	67	57	39	21	7	4	2	1	0	2	3	07	07	09	9	7	4	5	6	6	18	10	4	0	80	63	21	59	53	36	100^{8hr}
Township area	**$PM_{2.5}$**	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	29.1	13.7	28.6	21.2	17.2	21.24	29.64	44.26	22.08	41.29	166.72	67.82	59.2	79.64	56.26	69.23	65^{24hr}
	PM_{10}	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	70.3	60.8	111.7	88.7	61.6	96.71	98.15	122.73	86.26	97.16	234.41	108.16	94.6	102.33	104.73	94.28	150^{24hr}
	SPM	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	120.6	98.1	144.6	129.4	102.5	127.79	127.79	171.29	111.73	142.36	347.39	170.37	158	193.43	178.63	181.85	200^{8hr} (ECR, 1997)
	SO_2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	13.1	8.4	10.2	11.3	7.9	9.32	19.32	34.12	20.61	21.73	18.61	23.72	19.7	16.92	38.36	27.45	80^{24hr}
	NOx	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	14	9	11.6	12.1	11.9	15.63	15.63	21.72	11.17	13.36	33.48	34.49	27.3	48.41	44.77	39.56	80^{24hr}
	CO	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	46	32	30	18	21	9	0	18	2	0	3	1	1	1	3.3	4	(5000) ^{8hr}
	O_3	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	9	4	9	1	5	19	11	4	2	0	212	108	92	68	93	59	100^{8hr}
Access road bridge	**$PM_{2.5}$**	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	33.1	20.9	40.9	26.9	36.1	39.65	14.65	26.26	20.16	38.72	94.23	64.73	52.2	55.31	57.29	31.28	65^{24hr}
	PM_{10}	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	118.1	83.7	128.3	112.9	137	142.84	79.92	91.39	78.69	93.48	188.64	119.73	96.1	69.4	69.89	59.15	150^{24hr}
	SPM	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	142.5	106.2	177.8	168.2	163.2	171.2	109.25	126.13	102.03	136.66	269.3	173.92	151	129.45	137.46	98.74	200^{8hr} (ECR, 1997)
	SO_2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	12.2	10.9	13.4	12.5	15.7	17.37	56.5	16.16	18.82	18.11	20.23	19.16	13.3	20.76	16.93	19.3	80^{24hr}
	NOx	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	14.8	13.4	15	13	17.6	21.32	55.08	9.04	9.22	9.92	26.3	23.74	20.1	31.69	21.62	33.62	80^{24hr}
	CO	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	38	34	32	23	21	8	0	22	0	0	0.8	0.2	2	1	1	1	(5000) ^{8hr}
	O_3	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	5	7	9	6	7	6	6	6	8	2	68	46	16	29	72	31	100^{8hr}

Note(s): Concentrations are in µg/m³

- DoE- Department of Environment, NF- Not found; NO-Not observed; x-not measured at pre-construction stage.
- Fine Particulate Matter ($PM_{2.5}$), Respirable Dust Content (PM_{10}), Suspended Particulate Matter (SPM), Oxides of Nitrogen (NO_X). Sulfur dioxide (SO_2), Carbone Monoxide (CO) & Ozone (O_3);
- Standards for 1hr, 24hr or Annual are indicated using superscript;

  This monitoring was carried out by - Respirable Dust Sampler (Model-Envirotech India APM-460BL) and Fine Particulate Sampler (Model-Envirotech India APM-550).; All data presented here are 8 hrs. Monitoring data.

Table A.2: Baseline conditions of emission of different infrastructures and sources

Sampling Locations	Criteria Pollutant	Cement Industry	Condensate Fractionating Plant	LPG Bottling Plant	Brick Field	Road Traffic	Small vessels, engine boat	Inland Water Cargo vessel	Sea going Mother Vessel (MV)	Fly ash Carrier	Clinkers Carrier	Clinker, Fly Ash Handling	Coal Carrier (MV)	Coal Ash Carrier (MV)	Coal Carrier (Lighter Vessel)	Coal Ash Carrier (Lighter Vessel)	Coal Loading and Unloading	Coal Handling (Stock Yard, Conveyor belt, etc)	BIF Power Plant (PP)	Other Coal Based PP	Other Fuel Based PP	Dredging and Land Filling	Earth excavation	Other Construction Activities	Residential sources
SW Corner of the PP area	PM	√	X	X	X	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	√	X	√	√
	SOx	X	X	X	X	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√
	NOx	X	X	X	X	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√
	GHGs	X	X	X	X	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√
Proposed Township area of the PP	PM	√	X	X	X	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	√	X	X	√
	SOx	X	X	X	X	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√
	NOx	X	X	X	X	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√
	GHGs	X	X	X	X	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√
NW Corner of the PP area	PM	X	X	X	X	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	√	X	X	√
	SOx	X	X	X	X	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√
	NOx	X	X	X	X	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√
	GHGs	X	X	X	X	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√
Barni, Gaurambha	PM	X	X	X	X	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√	√
	SOx	X	X	X	X	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√
	NOx	X	X	X	X	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√
	GHGs	X	X	X	X	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√
Chunkuri-2, Dacope	PM	√	X	X	X	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√
	SOx	X	X	X	X	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√
	NOx	X	X	X	X	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√
	GHGs	X	X	X	X	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√
Pankhali, Dacope	PM	√	X	X	X	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√	√
	SOx	X	X	X	X	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√
	NOx	X	X	X	X	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√
	GHGs	X	X	X	X	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√
Mongla Port area	PM	√	√	√	X	√	√	√	√	√	√	√	X	X	X	X	X	X	X	X	√	X	X	X	√
	SOx	X	√	X	X	√	√	√	√	√	√	X	X	X	X	X	X	X	X	X	√	X	X	√	√
	NOx	X	√	X	X	√	√	√	√	√	√	X	X	X	X	X	X	X	X	X	√	X	X	X	√
	GHGs	X	√	X	X	√	√	√	√	√	√	X	X	X	X	X	X	X	X	X	√	X	X	X	√
Harbaria, Sundarbans	PM	X	X	X	X	X	√	√	√	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X
	SOx	X	X	X	X	X	√	√	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	NOx	X	X	X	X	X	√	√	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	GHGs	X	X	X	X	X	√	√	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Akram Point Sundarbans	PM	X	X	X	X	X	√	√	X	X	X	√	X	X	X	X	X	X	X	X	X	X	X	X	X

Sampling Locations	Criteria Pollutant	Cement Industry	Condensate Fractionating Plant	LPG Bottling Plant	Brick Field	Road Traffic	Small vessels, engine boat	Inland Water Cargo vessel	Sea going Mother Vessel (MV)	Fly ash Carrier	Clinkers Carrier	Clinker, Fly Ash Handling	Coal Carrier (MV)	Coal Ash Carrier (MV)	Coal Carrier (Lighter Vessel)	Coal Ash Carrier (Lighter Vessel)	Coal Loading and Unloading	Coal Handling (Stock Yard, Conveyor belt, etc)	BIF Power Plant (PP)	Other Coal Based PP	Other Fuel Based PP	Dredging and Land Filling	Earth excavation	Other Construction Activities	Residential sources
	SOx	X	X	X	X	X	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	NOx	X	X	X	X	X	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	GHGs	X	X	X	X	X	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Hiron Point Sundarbans	PM	X	X	X	X	X	√	√	X	X	X	√	X	X	X	X	X	X	X	X	X	X	X	X	X
	SOx	X	X	X	X	X	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	NOx	X	X	X	X	X	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	GHGs	X	X	X	X	X	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Khulna City, near Khan Jahan Ali Bridge	PM	√	X	X	√	√	√	√	X	√	√	√	X	X	X	X	X	X	X	X	X	X	X	√	√
	SOx	X	X	X	√	√	√	√	X	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	√
	NOx	X	X	X	√	√	√	√	X	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	√
	GHGs	X	X	X	√	√	√	√	X	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	√
Township area	PM	X	X	X	X	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√	√	√	√
	SOx	X	X	X	X	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	NOx	X	X	X	X	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	GHGs	X	X	X	X	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√	√	√	√
Access road bridge area	PM	X	X	X	X	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√	√	√	√
	SOx	X	X	X	X	√	X	X	X	X	X	X	X	X	X	X	X	X	√	X	X	X	X	X	X
	NOx	X	X	X	X	√	X	X	X	X	X	X	X	X	X	X	X	X	√	X	X	X	X	X	X
	GHGs	√	√	X	√	√	X	X	X	X	X	√	X	X	X	X	X	X	√	X	X	√	√	√	√

Legend X-Absence of source or no emission

√-Presence of source, emission of pollutant

(B) Water Quality Data

Surface Water Quality Monitoring Data

Table B.1: pH Values of Passur River Water

Sl	Sampling Locations	Monitoring periods																															Std*
		Apr	July	Oct	Jan	Apr	July	Oct	Jan	Apr	July	Oct	Jan	Apr	Oct	Jan	Apr	July	Nov	Feb	Apr	July	Nov	Feb	July	Oct	Jan	Apr	Aug	Oct	Jan	May	
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM	32QM	
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	7.2	7.0	8.1	7.9	7.6	7.8	7.6	7.1	7.5	7.27	6.9	7.6	7.2	7.1	8.28	8.1	8.4	7.9	8.18	9.0	6.8	7.9	8.4	6.9	6.9	8.5	8.3	5.5	7.8	8.0	7.77	
2	Middle Passur River at 100m u/s of North West corner from the Project boundary	7.2	7.0	8.2	8.0	7.7	7.9	7.58	7.3	7.8	7.3	7	7.5	7.3	6.9	8.25	8.1	8.4	6.04	8.03	9.9	6.8	7.8	8.3	7.0	6.66	7.8	8.1	6.5	7.5	7.6	7.8	
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	7.2	6.9	8.0	8.1	7.8	7.8	7.64	7.3	7.2	7.93	7.2	7.8	7.3	6.9	8.17	8.1	8.4	8.09	8.06	8.7	7.1	7.8	8.8	7.1	6.59	8.0	8.0	8.5	6.5	7.7	7.7	
4	Left Bank of Passur River at Project Site-Jetty	7.9	7.1	8.1	7.9	7.5	7.9	7.6	7.1	7.4	7.56	7.3	8.2	7.2	6.9	8.2	8.1	8.3	7.65	7.78	8.9	7.5	7.5	8.3	7.0	6.6	7.7	8.6	7.4	6.8	8.1	7.63	
5	Middle Passur River at Project Site-Jetty	7.1	6.9	8.1	7.9	7.6	8	7.58	7.5	7.8	7.6	7	8.5	7.8	7.2	8.21	8.1	8.3	8.20	7.97	8.4	7.2	7.4	8.3	7.2	6.77	7.7	8.0	8.4	7.6	7.7	7.72	
6	Right Bank of Passur River at Project Site-Jetty	7.1	6.9	8.2	7.9	7.7	8	7.62	7.6	7.4	7.9	6.9	8.7	7.4	7.2	8.2	8.1	8.2	7.87	8.04	8.5	6.7	7.4	8.0	7.2	6.88	7.8	8.9	5.8	7.6	7.8	7.81	
7	Left Bank of Passur River at South West corner from the Project boundary	7.4	7.0	8.1	7.6	7.5	8.1	7.78	8.1	7.6	7.94	7.2	8.1	6.9	7.2	8.39	8.0	8.4	8.11	7.89	9.3	7.4	7.3	8.6	7.4	7.13	7.8	8.2	6.7	8.2	7.9	7.63	
8	Middle of Passur River at South West corner from the Project boundary	7.4	6.9	8.0	7.5	7.2	8	7.6	8	7.1	8.04	7.5	8.6	6.8	7.1	8.15	8.1	8.5	7.44	7.85	8.7	6.5	7.2	8.2	7.6	6.82	8.0	8.4	8.6	8.2	7.8	7.64	6.5–8.5
9	Right Bank of Passur River at South West corner from the Project boundary	7.3	6.8	8.0	7.8	7.3	8.1	7.64	7.9	7.2	8.2	7.3	8.9	7.1	7	8.16	8.1	8.5	7.07	8.06	8.4	7.3	7.2	8.3	7.8	6.8	7.8	8.3	8.5	7.9	7.7	7.8	
10	Maidara river of the South East corner of the Project at Ichamoti-Maidara confluence	7.4	6.9	8.1	7.7	7.5	8.1	7.3	7.3	7.1	8.1	6.8	8.1	7.2	7.1	8.4	8.1	8.6	7.94	8.05	9.3	7.2	7.4	8.0	7.1	6.85	7.4	8.0	5.9	7.8	8.0	7.61	
11	Maidara river near proposed township area	7.4	6.8	8.1	7.3	7.6	6.9	7.56	7.1	7.4	7.8	7.1	7.6	7.4	7	7.92	7.6	7.3	7.631	7.8	8.2	7.0	7.3	7.9	6.9	6.83	7.5	8.3	6.9	8.5	7.7	7.5	
12	Passur river at Passur-Ghasiakhali confluence	7.3	6.8	7.4	8.2	7.5	7.9	7.1	7.4	7.3	7.3	6.9	7.2	6.9	6.8	7.48	7.3	8.3	7.02	8.65	8.1	7.0	8.0	8.3	7.1	7.06	7.8	8.6	7.3	8.1	7.9	7.9	
13	Passur river at Harbaria of Sundarbans	7.9	6.9	8.0	8.1	7.7	7.9	7.8	8.2	7.3	7.63	7.4	7.8	6.9	7.1	8.19	8.1	8.4	7.19	7.71	8.2	7.2	8.0	8.4	7.4	6.1	8.2	7.8	6.6	7.3	7.7	7.7	
14	Passur river at Akram point of Sundarbans	7.2	6.9	7.9	8.1	7.7	NS	7.63	8	7.9	7.67	7.1	8.2	7.2	7.1	8.22	8.2	8```.2	8	7.77	7.9	7.1	7.8	8.2	7.7	6.6	7.7	8.2	6.0	6.9	7.6	7.69	
15	Passur river at Hiron po.000int of Sundarbans	7.2	7.0	7.0	8.1	7.7	NS	7.39	NS	7.8	NS	7.6	8.5	NS	6.8	8.2	NS	NS	7.18	7.79	NS	NS	7.8	8.2	NS	6.7	7.6	NS	8.0	6.7	7.5	NS	

Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring, NS – Not Surveyed

Table B.2: Surface Water Temperature (^0C) in Passur River

Sl. No.	Sampling Locations	Monitoring periods																															
		Apr	Jul	Oct	Apr	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	July	Oct	Jan	Apr	Aug	Oct	Jan	May	
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM	32QM	
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	31	33	31	19	30	31.8	31.2	22.0	31.2	29.6	30.1	22.8	30	29.8	19.7	30	30	28	22.02	31	30	27	25	30	27.67	20	31	30.26	26	22	29.99	
2	Middle Passur River at 100m u/s of North West corner from the Project boundary	31	33	31	20	30	30.5	31.8	21.0	31.1	29.1	30.8	22.5	30	30.1	19.8	30	30	26.85	21.96	31	30	27	25	30	27.68	20	30	30.46	26	22	30.18	
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	31	33	30	20	30	30.5	30.9	21.0	30.8	29.4	30.4	22.1	29.8	30.2	20.2	31	30	27.49	21.82	31	30	27	24	31	27.7	20	30	30.46	26	22	30.15	
4	Left Bank of Passur River at Project Site-Jetty	31	33	31	19	31	30.8	31.3	22.0	31.4	30.1	30.1	22.8	31.3	30.1	20.3	28	30	28.38	22.62	31	30	28	24	30	27.82	20	30	30.55	28	21	30.14	
5	Middle Passur River at Project Site-Jetty	30	32	31	19	30	30.6	31.6	22.0	30.9	30.5	31.0	21.8	30.0	29.8	20.3	29	30	27.97	22.55	31	31	28	24	30	27.76	20	30	30.44	27	22	30.28	
6	Right Left Bank of Passur River at Project Site-Jetty	30	32	31	19	30	30.4	31.1	21.0	31.0	30.5	31.1	21.9	30.0	29.9	20.3	28	31	28.05	22.35	31	30	28	24	30	27.67	20	30	30.54	30	22	30.24	
7	Left Bank of Passur River at South West corner from the Project boundary	31	32	30	20	31	30.5	30.3	23.0	30.7	30.7	30.4	22.1	29.9	30.0	20.6	28	31	27.85	22.17	33	30	27	25	30	28.42	21	30	30.44	27	23	30.14	
8	Middle of Passur River at South West corner from the Project boundary	31	31	29	19	30	30.8	30.5	22.0	30.4	29.8	30.2	22.0	29.8	30.1	20.2	28	31	28	22.27	31	30	27	25	30	27.9	20	30	30.5	27	22	30.24	20°C – 30°C
9	Right Bank of Passur River at South West corner from the Project boundary	31	31	29	19	31	30.6	30.8	21.0	30.1	29.8	31.1	22.1	30.1	30.1	20.3	28	31	28	22.54	32	30	27	25	30	27.83	21	30	30.46	27	22	30.21	
10	Maidara river of the South East corner of the Project at Ichamoti-Maidara confluence	30	31	28	19	30	30.8	31.8	22.0	31.2	30.4	31.1	21.9	30.3	29.9	19.1	28	31	27.62	22.06	33	30	27	25	30	28.67	22	31	30.39	27	23	30.45	
11	Maidara river near proposed township area	30	32	27	20	30	31.6	31.2	23.0	30.6	30.7	31.2	21.8	30.1	30.0	21.1	31	31	30.2	21	32	30	27	23	30	28	21	31	30.54	29	22	29.21	
12	Passur river at Passur-Ghasiakhali confluence	29	30	32	19	30	29.8	30.7	21	31.3	30.7	30.38	22.1	30.2	30	20.8	30	29	26.82	21.89	31	30	28	22	30	28.07	21	29	30.15	27	22	31.63	
13	Passur river at Harbaria of Sundarbans	30	30	27	22	30	29.0	30.8	22.0	31.5	30.9	29.9	23.1	30.2	29.8	21	30	29	27.62	21.81	31	31	30	24	31	28.35	21	30	29.6	27	24	30.13	
14	Passur river at Akram point of Sundarbans	29	29	30	21	30	NS	30.2	21.0	30.8	30.4	30.4	22.5	30.8	29.9	21.2	32	30	27.21	22.42	31	31	29	24	31	29.48	22	30	29.75	28	21	31.36	
15	Passur river at Hiron point of Sundarbans	29	30	29	21	30	NS	30.4	NS	31.4	NS	31.3	21.4	NS	29.4	21.2	NS	NS	28.66	23.78	NS	NS	31	23	NS	29.02	22	NS	30.66	28	22	NS	

Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring, NS – Not Surveyed

Table B.3: Salinity (ppt) in Passur River

Sl. No	Sampling Locations	Monitoring periods																														
		Apr	Jul	Oct	jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	July	Oct	Jan	Apr	Aug	Oct	Jan	May	
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30th	31QM	32QM	
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	11.5	2.5	0.0	4.5	13	0	0	4.1	8	0	0	3.7	6.3	0	2	11.5	0.2	0.9	11.1	16.6	0.5	0.4	3.8	0.2	0.1	2.4	7.1	0.1	0.1	0.8	2.6	No Specific standard for salinity has Been mention-ed in the ECR'1997
2	Middle Passur River at 100m u/s of North West corner from the Project boundary	11.5	0.3	0.0	4.1	15	0	0	4.3	7.4	0	0	3.8	5.9	0	2	11.5	0.2	0.1	11.1	16.2	0.2	0.3	3.9	0.3	0.1	2.7	7.5	0.1	0.1	0.7	2.5	
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	11.5	0.2	0.0	4.5	16	0	0	4.3	7	0	0	3.6	6.2	0	2	11.5	0.4	0.8	10.6	16.5	0.3	0.3	4.0	0.2	0.1	2.7	7.2	0.1	0.1	0.7	2.3	
4	Left Bank of Passur River at Project Site-Jetty	12.0	2.2	0.0	4.7	9	0	0	4.4	6	0	0	4	6.8	0	2.6	12.0	0.3	0.9	10.8	16.6	0.2	0.5	3.8	0.1	0.1	2.5	7.2	0.1	0.1	0.7	2.6	
5	Middle Passur River at Project Site-Jetty	12.0	0.3	0.0	5.1	13	0	0	5.1	6.2	0	0	3.9	6.9	0	2.6	12.0	0.2	0.8	10.8	16.9	0.2	0.3	3.9	0.2	0.1	2.7	7.3	0.1	0.1	0.8	2.3	
6	Right Left Bank of Passur River at Project Site-Jetty	12.0	0.5	0.0	5.0	14	0	0	5	9	0	0	4.2	6.1	0	2.7	12.0	0.2	0.8	11	16.9	1.2	0.3	3.9	0.1	0.1	2.4	7.3	0.1	0.1	0.8	2.1	
7	Left Bank of Passur River at South West corner from the Project boundary	9.5	4.0	0.0	5.2	14	0	0	5.2	8	0	0	4.2	6.5	0	2.8	9.5	0.2	1	9.9	12.0	0.3	2.1	3.7	0.2	0.2	2.6	7.0	0.1	0.1	1.0	2.6	
8	Middle of Passur River at South West corner from the Project boundary	9.0	0.0	0.0	5.2	13	0	0	4.9	7	0	0	4.1	7.1	0	2.8	9.0	0.3	0.2	11.5	16.7	0.2	0.1	0.1	0.2	0.1	2.5	7.3	0.1	0.1	0.9	2.7	
9	Right Bank of Passur River at South West corner from the Project boundary	10.0	2.5	0.0	5.1	12	0	0	5.5	6.8	0	0	4.1	7	0	2.8	10.0	0.3	0.3	11.1	16.9	0.3	0.4	3.5	0.3	0.1	2.7	7.4	0.1	0.1	0.9	2.4	
10	Maidara river of the South East corner of the Project at Ichamoti-Maidara confluence	10.0	0.5	0.0	5.2	10	0	0	3.8	7.1	0	0	3.9	7	0	2.6	10.0	0.3	0.9	11.3	16.5	0.3	0.3	4.0	0.3	0.2	2.5	7.0	0.1	0.1	0.9	2.7	
11	Maidara river near proposed township area	9.0	4.5	0.0	4.5	9	0	0	2.5	6.3	0	0	3.8	6.9	0	2.52	9.0	0.2	0.02	9.9	8.0	1.0	0.3	4.0	0.5	2.	2.5	6.5	0.8	0.5	0.2	2.5	
12	Passur river at Passur-Ghasiakhali confluence	10.0	9.5	0.0	5.0	14	0	0	4.8	6	0	0	6.7	10.4	1.2	10.8	10.0	0.6	1	7.9	14.9	0.4	0.5	3.6	0.4	0.2	1.8	6.9	0.1	0.1	0.9	4.0	
13	Passur river at Harbaria of Sundarbans	12.0	10.0	0.0	6.0	15	0	0	5.3	8.9	0	0	8.9	10.4	2.3	2.8	12.0	2.2	1.8	11.9	15.6	0.3	0.7	3.7	1.5	0.2	2.6	7.0	0.1	0.2	2.1	6.3	
14	Passur river at Akram point of Sundarbans	19.0	15.0	1.0	16.0	20	NS	5	11.3	9.4	4	3	16.3	16	3.6	13.1	19.0	2.8	9.1	16.7	22.9	0.9	6.6	8.9	4.0	1.6	7.1	10.9	1.0	2.2	6.4	8.3	
15	Passur river at Hiron point of Sundarbans	23.0	19.5	2.0	23.0	25	NS	6.2	NS	14	NS	5.8	21.4	NS	5.1	16.45	23.0	NS	13.9	22.7	NS	NS	9.2	11.0	NS	2.6	8.2	NS	0.9	2.6	8.0	NS	

Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring, NS – Not Surveyed

Table B.4: Dissolve Oxygen (DO) in Passur River

SL	Sampling Locations	Monitoring periods																														
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	July	Oct	Jan	Apr	Aug	Oct	Jan	May	
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM	32QM	
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	5.9	6.1	5.6	5.5	6.2	5.3	6.8	5.1	7.1	6.2	6	6.1	7.1	6.3	5.19	6.575	6.0	6.4	8.7	5.9	6.0	7.7	8.4	6.1	6.4	9.2	6.5	**5.8**	7.8	6.5	7.3	5 or more (standard for sustaining fisheries)
2	Middle of Passur River at 100m u/s of North West corner from the Project boundary	4.9	6.8	7.7	6.6	6.4	5	6.4	5.1	6.4	5.7	6.1	5.9	7.2	6.4	5.03	6.225	6.2	6.2	7.9	6.5	6.0	7.8	8.6	6.1	7.64	9.6	6.0	**6.0**	7.5	6.7	7.8	
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	5.2	6.7	7.7	6.7	6.2	5	7.1	6.2	6.9	5.6	6	6.1	6.8	6.5	5.06	6.275	6.1	6.3	7.3	6.3	6.1	7.8	7.6	6.0	6.3	7.8	6.8	**6.3**	6.5	6.5	7.5	
4	Left Bank of Passur River at Project Site-Jetty	5.7	6.8	7.6	5.8	6.2	6.7	6.8	5.9	5.8	6.1	6.3	6.2	6.9	6.3	5.1	6.15	5.5	6	8.7	6.1	6.5	8.6	8.1	6.0	8.2	9.0	8.4	**6.6**	6.7	7.1	7.5	
5	Middle of Passur River at Project Site-Jetty	5.9	6.9	7.2	5.9	6.6	6.6	7.2	5.3	6.1	6.3	5.9	5.9	7.4	6.3	5.03	6.5	6.0	6.2	7.3	6.5	6.3	8.0	8.2	6.4	8.89	8.9	8.0	**6.2**	5.6	5.5	6.0	
6	Right Bank of Passur River at Project Site-Jetty	5.8	6.6	8.0	6.8	6.4	6	7.6	5.4	6.6	5.8	6.1	5.9	7.5	6.5	4.9	6.575	6.5	6	7.4	6.0	6.4	8.2	7.0	6.2	7.8	9.3	8.5	**6.8**	6.5	6.7	5.0	
7	Left Bank of Passur River at South West corner from the Project boundary	6.6	7.3	5.6	6.1	6.3	7.5	6.4	6	6.9	6.3	5.9	6.3	6.4	6.5	5	6.55	6.8	6.1	7.8	6.1	6.2	9.9	6.9	6.6	9.7	9.6	5.4	**7.2**	6.7	6.4	6.2	
8	Middle of Passur River at South West corner from the Project boundary	6.5	7.1	5.6	6.9	6.5	7.4	6.1	6.1	7.1	6.4	6	6.4	7.2	7.1	4.98	6.825	6.2	6.3	7.1	6.5	6.2	10.0	7.2	6.5	9.76	7.0	6.3	**6.2**	6.5	6.6	7.2	
9	Right Bank of Passur River at South West corner from the Project boundary	6.5	7.2	5.8	6.6	6.4	7.3	6.3	5.8	6.8	5.6	6	6.4	6.8	6.5	5.11	6.625	6.0	6.2	6.9	6.1	6.3	10.5	7.8	6.3	9.76	6.4	5.9	**6.7**	6.1	6.5	6.7	
10	Maidara river of the South East corner of the Project at Ichamoti-Maidara confluence	6.0	6.5	8.0	6.0	6.2	6	7.1	4.1	6.4	5.2	6.1	6.7	6.8	6.3	5.17	6.35	6.7	5.8	7.5	6.3	6.4	7.1	9.7	6.4	9.7	8.1	7.5	**6.8**	6.7	6.5	6.1	
11	Maidara river near proposed township area	6.7	6.8	8.0	6.2	6.5	6.4	7.1	5.2	5.9	5.4	6.4	6.7	7.1	6.2	5.11	6.7	6.3	6	6.0	6.2	6.0	7.7	7.5	6.1		8.0	7.0	**5.5**	6.2	6.5	7	
12	Passur river at Passur-Ghasiakhali confluence	5.3	6.2	7.0	6.5	6.3	7	6.6	5.4	5.8	5.4	5.6	5.9	6.4	6.4	5.23	5.95	5.8	6	6.9	6.5	6.2	7.9	8.6	6.0	8.14	9.2	5.9	**6.2**	5.8	6.9	6.8	
13	Passur river at Harbaria of Sundarbans	5.4	5.9	7.0	6.6	5.8	7.5	7.1	5.2	6.4	5.4	5.8	6.1	6.4	6.2	5.03	5.8	6.9	8.21	7.5	6.9	6.0	8.4	6.9	6.1	7.65	7.6	5.5	**6.6**	6.8	5.9	7.8	
14	Passur river at Akram point of Sundarbans	7.9	6.4	7.7	6.7	6	NS	7.3	6.2	6.1	6.2	6.7	6.5	7.2	6.8	5.4	6	6.8	6.9	7.7	7.0	6.6	7.7	9.7	6.5	6.61	7.2	6.8	**6.1**	6.5	6.2	7.1	
15	Passur river at Hiron point of Sundarbans	7.5	6.5	7.8	6.5	5.8	NS	7	NS	7.1	6.8	6.9	6.8	NS	7.3	5.4	NS	NS	7.2	8.0	NS	NS	8.6	6.7	NS	8.2	9.0	NS	**6.2**	6.9	6.2	NS	

Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring (April, 2014), 2QM = Second Quarterly Monitoring (July, 2014), 3QM = Third Quarterly Monitoring (October, 2014), 4QM = Fourth Quarterly Monitoring (January 2015)

Table B.5: COD (mg/L) of Passur River System

Sl	Sampling Locations	Monitoring periods																													
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	July	Oct	Jan	April	Aug	Oct	Jan
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	288	24	6	128	87	42	32	124	220	8	12	56	52	24	48	276	20	56	72	188	36	56	24	32	16	56	508	4	44	24
2	Middle Passur River at 100m u/s of North West corner from the Project boundary	284	20	30	68	58	43	36	100	240	8	8	40	48	8	28	240	24	44	60	180	24	40	28	36	12	32	404	4	52	12
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	328	56	14	92	132	18	28	96	280	8	8	44	56	40	40	230	12	48	48	176	32	26	32	28	8	20	400	4	40	8
4	Left Bank of Passur River at Project Site-Jetty	376	28	18	84	102	26	36	100	280	8	12	48	40	32	36	232	30	60	44	192	20	40	24	24	28	48	304	4	20	40
5	Middle Passur River at Project Site-Jetty	400	60	14	116	110	21	36	108	240	12	16	52	36	40	32	254	16	36	56	180	28	28	40	36	16	20	412	4	40	32
6	Right Bank of Passur River at Project Site-Jetty	364	496	18	108	88	24	40	80	260	8	12	42	48	16	28	252	12	42	64	172	24	24	24	40	20	56	390	12	4	12
7	Left Bank of Passur River at South West corner from the Project boundary	364	108	10	104	96	32	42	100	240	12	8	56	42	48	40	212	10	48	88	200	28	20	26	48	8	48	408	8	4	16

Sl	Sampling Locations	Monitoring periods																													
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	July	Oct	Jan	April	Aug	Oct	Jan
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM
8	Middle of Passur River at South West corner from the Project boundary	400	40	22	16	18	25	28	100	180	8	8	52	36	8	44	218	24	32	36	160	20	32	20	36	12	56	424	8	24	36
9	Right Bank of Passur River at South West corner from the Project boundary	408	120	10	100	106	25	48	124	200	12	12	44	52	4	36	230	16	28	68	180	32	20	28	42	20	8	448	12	4	12
10	Maidara river of the South East corner of the project at Ichamoti-Maidara confluence	276	32	10	116	88	51	40	100	160	8	8	36	44	16	40	180	40	36	72	160	24	24	44	32	12	12	400	16	48	12
11	Maidara river near proposed township area	284	96	26	84	94	36	42	108	210	30	8	48	40	32	32	252	20	42	68	172	20	36	36	48	28	24	380	48	4	32
12	Passur river at Passur - Ghasiakhali confluence	408	172	14	96	92	30	46	88	220	12	16	40	64	**40**	48	260	10	20	32	178	24	40	36	72	56	32	472	32	12	16
13	Passur river at Harbaria of Sundarbans	372	216	14	96	102	26	36	100	140	16	12	**40**	216	32	40	280	16	58	56	184	32	32	40	80	76	12	424	16	4	60
14	Passur river at Akram point of Sundarbans	536	520	54	316	302	NS	84	96	156	4	68	56	240	**16**	72	296	110	44	**180**	160	220	92	56	108	60	28	392	80	192	36
15	Passur river at Hiron point of Sundarbans	540	416	122	472	470	NS	96	NS	160	NS	56	196	NS	4	88	NS	NS	76	140	NS	NS	72	64	NS	40	NS	NS	32	180	40

Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring: NS – Not Surveyed.

Table B.6: Oil and grease (mg/L) concentration of Passur River System

Sl	Sampling Locations	Monitoring periods																														
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	April	Aug	Oct	Jan	
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22 QM	23QM	25QM	26QM	27QM	28QM	29 QM	30QM	31QM	
1	Left Bank of Passur River at South West corner from the Project boundary	<5	<5	<5	>15	16.9	9	<5	39	61	5	<5	9.2	*5.73*	<5	16.6	<5	<1	<2.0	<2.0	<2.0	<2.0	<2.0	2.3	<2.0	**<2.0**	2.93	**<2.0**	<2.0	<2.0	**<2.0**	
2	Passur-Ghasiakhali Confluence	<5	<5	<5	>15	13	7.63	9.87	21	30.3	13.5	<5	15.6	<5	<5	<5	<5	<5	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	**<2.0**	<2.0	**<2.0**	<2.0	<2.0	**<2.0**	
3	Passur river at Harbaria of Sundarbans	<5	6.3	<5	>20	39.1	10.1	<5	14	26	5.73	<5	<5	<5	<5	<5	<5	<1	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	**<2.0**	<2.0	**<2.0**	<2.0	<2.0	**<2.0**	10
4	Akram Point of Sundarbans	<5	<5	<5	>20	<5	NS	10.8	ND	31	NS	10.1	13.8	7.71	<5	<5	<5	NS	<2.0	<2.0	<2.0	<2.0	<2.0	4.4	<2.0	**<2.0**	<2.0	**<2.0**	<2.0	<2.0	**<2.0**	
5	Passur river at Hiron point of Sundarbans	<5	<5	<5	>20	<5	NS	9.73	36	82	5.87	<5	14.2	ND	<5	<5	<5	<1	<2.0	<2.0	<2.0	<2.0	<2.0	2.3	<2.0	**<2.0**	NS	**3.2**	<2.0	<2.0	**<2.0**	

Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring: NS – Not Surveyed.

Table B.7: TDS (mg/L) of Passur River System

SL	Sampling Locations	Monitoring periods																													
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	13060	251	176	4360	14400	937	158	5570	13400	179	138	3100	13400	496	1913	14500	315	855	9940	15800	290	480	6800	134	122	3770	12500	58	160	1380
2	Middle of Passur River at 100m u/s of North West corner from the Project boundary	12630	246	162	3950	14700	941	169	5910	13280	112	106	3140	13480	122	1919	14420	224	733	9950	15600	150	175	6950	114	96	4410	12700	105	150	1300
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	12900	383	153	4330	14900	127	152	5490	13560	125	108	3330	13400	123	1915	14650	232	722	9730	15500	152	170	7300	116	94	4390	12300	106	147	1210
4	Left Bank of Passur River at Project Site-Jetty	13190	445	169	4750	14600	175	172	5720	12830	162	147	3630	13560	172	2500	14300	328	824	9860	15700	205	190	6760	221	102	4150	12800	74	158	1230
5	Middle Passur River at Project Site-Jetty	13330	353	156	4920	14500	132	162	5850	13100	185	110	3600	13490	125	2520	14450	235	716	9980	16000	142	175	6760	125	179	4170	13100	97	150	1510
6	Right Bank of Passur River at Project Site-Jetty	13380	402	152	4870	14200	156	160	5480	13460	143	112	3520	13330	125	2500	14540	208	732	9800	16100	150	174	6900	132	105	4060	13200	110	153	1380
7	Left Bank of Passur River at South West corner from the Project boundary	13180	655	162	5040	14500	336	192	5650	12820	205	113	3470	13640	160	2840	14400	205	945	10190	15640	208	325	6740	195	181	4100	13100	158	155	1850
8	Middle of Passur River at South West corner from the Project boundary	13390	587	153	5050	14600	158	164	5740	12960	195	108	3790	13680	126	2710	14500	286	784	10280	16000	145	180	6450	128	98	4210	13300	110	153	1680
9	Right Bank of Passur River at South West corner from the Project boundary	13240	916	154	5130	14250	160	164	5650	13590	140	146	3770	13360	127	2720	14610	296	786	10080	15800	154	172	6700	114	92	4450	13200	100	156	1650
10	Maidara river of the South East corner of the project at Ichamoti-Maidara confluence	12400	455	214	5050	14000	2320	183	5450	13340	165	196	2920	13490	1616	2500	14160	265	992	10040	15700	940	1405	7250	229	206	4170	12500	216	160	1540
11	Maidara river near proposed Township area	10970	2510	257	4390	13900	355	176	4420	11700	5170	238	3960	13110	1200	2970	14450	340	827	8860	15100	365	875	5800	2893	164	2320	11800	1270	780	1350
12	Passur river at Passur - Mongla confluence	12800	6410	209	5130	14050	298	227	4540	11330	893	162	3370	12340	204	2570	14500	580	940	8350	15722	172	350	6240	740	148	3010	12100	180	203	1580
13	Passur river at Harbaria of Sundarbans	12280	9360	285	4780	13900	683	205	4940	13580	1321	301	3370	13600	245	2690	15350	2190	1715	10950	15400	560	474	6430	489	2260	4060	12400	240	275	3850
14	Passur river at Akram point of Sundarbans	21500	15960	3400	12350	13600	NS	4220	13330	20720	7330	2550	3580	19370	3270	11390	20600	7680	8100	17200	14800	12500	3950	16300	4188	1472	11400	18500	1700	3850	11600
15	Passur river at Hiron point of Sundarbans	21500	14050	5720	17900	25300	NS	5830	NS	25500	NS	4120	12210	NS	4450	14190	NS	NS	12500	21110	NS	NS	5750	20400	NS	490	14600	NS	1610	6300	15500

Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring: NS – Not Surveyed.

Table B.8: TH (mg/L) Passur River System

SL	Sampling Locations	Monitoring periods																													
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	2900	250	216	930	3000	245	250	1270	3130	240	255	1090	3640	200	430	3100	210	335	2050	3000	2100	215	1540	205	272	2800	4500	140	145	370
2	Middle of Passur River at 100m u/s of North West corner from the Project boundary	2500	180	218	870	3050	110	330	1380	3090	205	250	980	3420	150	510	1040	205	310	3900	5000	1950	125	1485	200	195	2700	4200	200	125	385
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	2650	170	335	870	3250	105	360	1240	3140	205	190	1030	3300	155	498	1030	185	313	4100	5000	1900	190	1530	187	225	2750	4300	180	130	310
4	Left Bank of Passur River at Project site-Jetty	2550	175	390	940	3450	118	365	1220	3010	220	265	1020	3400	160	570	1060	200	285	4600	5200	1850	175	1580	217	210	3000	4100	200	175	375
5	Middle Passur River at Project Site-Jetty	2600	275	340	990	3250	103	355	1300	3070	232	237	915	3440	145	590	1040	210	255	4200	5000	2500	178	1560	215	235	3100	4500	175	140	325
6	Right Bank of Passur River at Project site-Jetty	2625	350	355	970	3200	105	350	1260	3100	218	242	1070	3380	140	480	1085	215	275	4400	4800	2550	155	1490	202	200	2500	4000	175	145	340
7	Left Bank of Passur River at South West corner from the Project boundary	2550	325	330	1045	3600	153	345	1370	3060	235	205	935	3540	150	505	1080	205	295	4400	4400	1700	175	1530	195	240	2550	4400	140	160	375
8	Middle of Passur River at South West corner from the Project boundary	2800	350	345	1125	3670	105	390	1340	3130	242	217	1100	3480	155	530	1110	212	265	4300	5100	1850	150	1560	210	235	3200	4100	130	170	420

SL	Sampling Locations	Monitoring periods																													
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM
9	Right Bank of Passur River at South West corner from the Project boundary	2500	475	325	975	3540	165	445	1270	3110	224	238	1110	3600	175	512	1100	205	325	4600	4900	2000	115	1485	207	243	2800	4400	100	155	430
10	Maidara river of the South East corner of the project at Ichamoti-Maidara confluence	2500	450	350	980	3260	470	183	950	3180	220	250	1040	1960	165	505	1300	210	295	4000	5200	2000	350	1460	310	198	1400	4200	145	165	380
11	Maidara river near proposed township area	2400	725	330	970	3190	130	340	1075	3080	875	240	1170	2300	320	478	1120	220	315	4100	5000	2200	285	1440	742	217	1200	4100	400	265	435
12	Passur river at Passur - Mongla confluence	3150	1400	377	1000	3210	135	410	1090	3060	405	245	1070	2450	220	1070	1410	245	325	4000	4782	1800	200	1510	250	265	2850	4200	150	190	500
13	Passur river at Harbaria of Sundarbans	2625	2150	345	970	3080	200	430	1100	3050	415	282	1070	3560	200	610	1330	530	2550	4500	4500	1400	185	1390	280	225	2870	4400	160	170	680
14	Passur river at Akram point of Sundarbans	4500	3625	980	2380	3420	NS	1090	2850	4520	1750	670	1130	4300	640	1475	1440	2030	2750	5900	4500	4300	830	3470	1000	210	5050	4300	480	1000	6500
15	Passur river at Hiron point of Sundarbans	4850	3050	1440	2690	3640	NS	1460	NS	5050	NS	810	2870	NS	905	1740	NS	NS	4200	6900	NS	NS	1225	3850	NS	230	5600	NS	470	1450	5300

Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring: NS – Not Surveyed.

Table B.9: TSS (mg/L) Passur River System

SL	Sampling Locations	Monitoring periods																													
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	598	126	234	180	160	26	76	14	8	61	20	46	51	18	14	18	17	14	15	12	14	8	11	14	7	11	15	12	13	15
2	Middle of Passur River at 100m u/s of North West corner from the Project boundary	45	92	193	210	167	25	80	12	7	48	18	52	42	15	15	17	16	11	12	14	11	7	8	6	11	6	23	14	12	14
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	53	112	174	230	170	127	65	14	10	56	16	48	48	22	14	22	15	15	14	13	13	6	7	11	8	7	20	9	10	17
4	Left Bank of Passur River at Project Site-Jetty	54	99	227	450	160	30	92	17	10	62	20	42	52	16	13	20	18	11	12	11	12	8	8	12	7	7	13	12	14	12
5	Middle Passur River at Project Site-Jetty	60	100	232	250	165	27	85	18	8	45	24	54	43	20	13	19	16	13	13	12	13	7	9	9	6	6	12	11	9	13
6	Right Bank of Passur River at Project Site-Jetty	55	105	186	200	155	40	97	22	7	49	19	46	38	17	14	21	15	12	15	15	14	6	6	12	9	8	16	8	13	11
7	Left Bank of Passur River at South West corner from the Project boundary	24	116	185	300	150	32	104	20	12	51	20	61	32	15	15	17	16	14	16	12	13	7	7	14	15	7	14	12	17	14
8	Middle of Passur River at South West corner from the Project boundary	27	112	536	530	147	40	90	7	10	43	18	58	44	16	17	19	14	13	13	11	12	6	8	13	8	6	15	9	4	12
9	Right Bank of Passur River at South West corner from the Project boundary	67	37	459	450	155	44	82	18	11	39	16	63	40	14	12	18	20	15	14	13	13	5	6	8	6	6	13	15	15	15
10	Maidara river of the South East corner of the project at Ichamoti-Maidara confluence	7	65	798	280	148	36	96	11	7	42	24	55	37	26	14	23	13	11	14	14	15	9	13	11	8	7	17	13	11	13
11	Maidara river near proposed township area	9	24	389	206	160	28	92	10	6	11	30	66	49	30	15	32	12	42	8	12	12	7	12	5	7	8	12	3	8	13
12	Passur river at Passur - Mongla confluence	50	310	203	280	165	24	60	15	13	47	27	61	38	**25**	13	14	17	27	15	13	13	15	14	9	8	6	3	7	13	14
13	Passur river at Harbaria of Sundarbans	65	90	869	400	160	42	74	22	18	31	18	**61**	33	27	17	15	13	22	12	11	12	11	11	17	5	8	14	9	15	15
14	Passur river at Akram point of Sundarbans	115	99	28	103	150	NS	110	16	23	16	41	34	28	22	14	18	14	15	11	10	7	7	10	18	8	11	11	16	12	16
15	Passur river at Hiron point of Sundarbans	91	72	267	200	180	NS	144	NS	15	NS	33	49	NS	16	13	NS	NS	6	9	NS	NS	5	10	NS	6	6	NS	13	13	13

Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring: NS – Not Surveyed.

Table B.10: Nitrate (NO_3^{2-}) (mg/L) concentration of Passur River System

Sl	Sampling Locations	Monitoring periods																													
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	0.9	2.89	0.32	3	33	9.1	4	6.3	3	3.9	0.25	3.62	4.35	5.8	3	6.8	0.8	2.8	3.5	0.3	0.1	3.5	1.3	3	3.2	4.3	3.3	2.1	3.5	2.06
2	Middle of Passur River at 100m u/s of North West corner from the Project boundary	0.7	2.4	1.57	1.5	13	7.5	7.1	4.3	2.9	6.2	0.39	2.89	5.05	6.8	4.2	4.9	1.7	0.1	2.6	0.3	1.1	2.7	1.7	3.3	1.3	2.2	2.1	2.2	3.8	1.43
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	0.1	3.2	1.84	4.3	39	6.2	5	3.9	2.5	4.3	0.42	1.87	4.55	4.5	3.6	5.1	2.1	0.11	1.9	3.7	1.2	3.4	3.2	9.5	4.7	1.2	1.3	1.3	6.7	2.0
4	Left Bank of Passur River at Project Site-Jetty	1.3	0.76	1.64	3.1	48	6.6	5.7	3.1	2	5.1	0.76	2.25	6.11	7.1	3	2.8	2.8	1.7	2.1	3.0	1.5	3.0	4.5	2.9	2.5	0.7	2.1	1.4	12.6	15.9
5	Middle Passur River at Project Site-Jetty	1.4	2.69	1.42	2.2	69	6.1	3.3	5.2	3.1	2.7	0.52	2.46	3.4	3.1	4.7	5.2	1.8	0.9	2.2	1.2	1.5	1.7	2.7	1.9	2.6	3.1	3.0	1.6	0.3	1.5
6	Right Bank of Passur River at Project Site-Jetty	1.1	2.98	1.33	8.5	8	6.6	4.7	4.1	3.6	3.9	0.31	3.01	3.16	5	7.6	5.5	3.2	0.1	3.5	4.8	2.1	2.1	5.1	1.8	1.0	2.7	1.5	1.4	7.4	6.8
7	Left Bank of Passur River at South West corner from the Project boundary	0.75	2.13	1.85	2.7	87	14.9	4.4	4.9	2.6	3.6	0.2	3.64	3.14	4.1	8.8	2.6	4	0.1	4.2	0.5	1.5	2.0	7.4	1	0.5	1.8	1.7	1.9	0.7	1.1
8	Middle of Passur River at South West corner from the Project boundary	1.1	2.43	2.09	1.8	48	4	6.2	3.7	2.9	5.1	0.41	1.93	3.34	3.4	8.5	4.5	3.7	3.4	3.0	3.4	1.7	1.3	3.9	1.5	2.1	3.0	2.0	2.1	9.2	ND
9	Right Bank of Passur River at South West corner from the Project boundary	1.2	2.05	2.21	1.9	128	4.9	4.4	4.4	2.6	4.9	0.63	2.17	2.00	3.1	2.8	5.3	3.8	0.7	3.1	4.1	0.5	2.2	4.1	1.3	3.0	1.9	2.3	2.5	1.7	1.5
10	Maidara river of the South East corner of the project at Ichamoti-Maidara confluence	0.3	2.18	2.26	6	62	7	4.9	5.6	2.7	5.2	0.4	2.46	3.61	2.3	1.6	5.9	4.4	2.3	2.1	5.0	3.1	2.9	4.7	3.9	1.5	3.0	4.2	3.1	0.5	16.2
11	Maidara river near proposed township area	0.5	0.88	1.98	4	48	3.1	2.9	3.9	3.1	5.3	0.32	3.1	1.60	3.2	3.4	3.9	3.1	0.12	1.3	2.9	2.5	1.6	4.9	2.1	1.3	4.9	1.0	2.1	0.1	5.7
12	Passur river at Passur - Mongla confluence	0.6	1.52	1.64	4.5	29	7.8	3.1	3.7	3	5.2	0.27	2.78	2.49	3.5	4.5	4.7	2.4	1.6	3.7	2.7	1.8	2.0	3.3	1.5	2.6	0.5	1.7	3.8	0.4	9.4
13	Passur river at Harbaria of Sundarbans	1.4	1.75	1.67	2.7	18	4.4	4.4	5.1	3.4	5.1	0.39	2.78	2.46	4.2	4.6	5.2	2.7	0.1	4.7	4.4	1.7	2.1	3.2	5.7	2.6	0.5	2.6	3.9	1.0	4.06
14	Passur river at Akram point of Sundarbans	2.7	3.32	0.59	1.5	25	NS	3.2	4.9	2.9	5.4	0.25	3.08	3.69	2.2	1.8	5.5	4.2	0.1	1.8	2.7	1.3	1.6	2.6	4	2.6	2.9	2.8	4.1	0.0	24.7
15	Passur river at Hiron point of Sundarbans	0.8	2.84	0.4	2	28	NS	11.5	NS	3.5	NS	0.38	2.28	NS	2.6	6.1	NS	NS	0.9	2.6	NS	NS	2.5	4.1	NS	2.6	3.9	NS	3.2	0.5	1.8

Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring: NS – Not Surveyed.

Table B.11: Sulphate (SO_4^{2-}) (mg/L) concentration of Passur River System

Sl	Sampling Locations	Monitoring periods																													
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	1840	20	26	580	1360	67	7	570	1080	18	5	230	422	29	630	1400	24	51	760	1460	23	37.0	490	4	3	270	1	21	99.4	**185.5**
2	Middle of Passur River at 100m u/s of North West corner from the Project boundary	1320	23	28	450	1260	11	8	590	1040	10	3	210	460	3	370	1320	18	49	756	1380	19	6.0	510	3	6	420	5	20	90.3	**188.57**
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	1280	36	34	480	1240	9	11	560	1020	13	4	200	1340	5	410	1440	20	46	764	1420	21	6.0	560	5	11	460	2	24	92.6	**197.77**
4	Left Bank of Passur River at Project Site-Jetty	1360	45	33	550	1240	26	10	550	1060	15	4	230	1380	2	310	1260	22	52	748	1410	16	5.0	530	8	5	410	1	18	89.3	**198.12**
5	Middle Passur River at Project Site-Jetty	1040	32	30	520	1120	6	8	580	980	17	6	280	1280	1	310	1200	21	38	760	1440	17	4.0	640	10	3	420	3	15	108.4	**186.22**
6	Right Bank of Passur River at Project Site-Jetty	1320	20	27	540	820	8	9	565	1100	14	5	230	1400	2	490	1400	16	42	762	1400	19	8.0	490	13	8	430	2	18	98.0	**180.76**
7	Left Bank of Passur River at South West corner from the Project boundary	1640	60	40	630	880	9	12	640	1060	15	6	230	880	2	700	1300	10	56	768	1500	15	25.0	520	16	6	450	3	19	118.7	**191.27**
8	Middle of Passur River at South West corner from the Project boundary	1520	40	35	560	1180	19	8	560	1020	18	5	231	1440	1	340	1380	24	52	760	1450	16	9.0	470	8	4	440	1	13	118.0	**189.35**
9	Right Bank of Passur River at South West corner from the Project boundary	1280	80	64	620	900	12	6	550	1080	12	8	250	1340	3	340	1240	22	39	770	1460	14	6.0	510	16	12	450	2	14	118.7	**185.03**
10	Maidara river of the South East corner of the project at Ichamoti-Maidara confluence	1120	20	63	570	1220	72	11	96	1040	11	14	160	1220	120	270	1200	21	65	758	1500	18	71.0	490	16	31	420	3	17	115.0	**199.7**
11	Maidara river near proposed township area	1320	210	63	460	840	27	9	480	1020	480	14	200	1340	76	350	1250	18	46	760	1490	12	55.0	565	21	26	190	15	39	91.1	**217.98**
12	Passur river at Passur - Mongla confluence	1360	620	44	630	980	39	13	482	1100	42	14	220	1220	**5**	280	1260	28	30	765	1446	14	33.0	580	12	21	260	13	39	106.8	**212.37**
13	Passur river at Harbaria of Sundarbans	1560	860	69	590	900	51	7	500	1080	60	19	220	1300	13	220	1300	35	20	756	1500	16	38.0	470	34	540	410	5	41	243.8	**227.53**
14	Passur river at Akram point of Sundarbans	2600	1400	1390	850	1540	NS	84	760	1650	620	190	230	1420	30	760	1460	620	250	764	1500	980	370.0	410	60	430	580	5	410	183.3	**245.62**
15	Passur river at Hiron point of Sundarbans	2080	1160	2360	1500	1920	NS	97	NS	2100	NS	320	1090	NS	2	510	NS	NS	780	769	NS	NS	540.0	445	NS	30	1240	NS	598	230.8	**985**

Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring: NS – Not Surveyed.

Table B.12: Phosphate (PO_4^{2-}) (mg/L) concentration of Passur River System

Sl	Sampling Locations	Monitoring periods																													
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	0.52	2.23	0.67	0.32	0.86	10	1.27	0.269	0.22	1.14	3.39	0.67	1.31	0.49	0.21	0.38	1.03	0.25	0.25	0.25	10.1	0.3	0.2	0.25	0.5	5.3	4.9	4.2	1.5	0.19
2	Middle Passur River at 100m u/s of North West corner from the Project boundary	0.5	1.99	1.12	0.61	0.53	0.23	1.97	0.269	0.36	1.76	4.11	0.31	1.72	2.5	0.16	0.25	0.83	0.3	0.30	0.32	0.6	0.3	0.2	0.27	0.5	3.5	2	0.6	0.9	0.33
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	1.1	2.55	0.95	0.7	0.72	0.67	1.94	0.179	0.27	1.77	4.58	0.09	2.73	2.8	0.3	0.29	0.76	0.22	0.17	0.40	0.5	0.4	0.3	0.3	0.5	3.2	1.9	0.54	1.3	0.13
4	Left Bank of Passur River at Project Site-Jetty	2.1	0.45	0.92	0.43	0.49	0.27	2.53	0.357	0.31	2.31	2.76	0.07	2.77	3.3	0.19	0.38	0.88	0.24	0.20	0.30	0.6	0.2	0.3	0.35	0.7	2.9	2.3	4.5	0.0	0.46
5	Middle Passur River at Project Site-Jetty	2.2	2.13	1.11	0.41	0.68	0.59	1.3	0.536	0.3	0.98	3.2	0.12	0.66	3.9	0.17	0.34	1.07	0.4	0.35	0.27	0.6	0.3	0.2	0.29	0.5	3.0	5.7	2.1	0.0	0.10
6	Right Bank of Passur River at Project Site-Jetty	2	2.42	0.99	0.55	0.61	0.13	1.32	0.269	0.43	1.01	2.48	0.16	0.62	3.9	0.47	0.27	0.67	0.53	0.27	0.25	0.9	0.4	0.3	0.36	0.8	5.4	4	3.4	0.0	0.40
7	Left Bank of Passur River at South West corner from the Project boundary	0.57	1.25	1.18	0.76	0.65	0.1	0.99	0.536	0.63	0.87	4.16	0.09	0.65	4.6	1.31	0.29	1.16	0.32	0.20	0.41	11.1	0.5	0.4	0.4	0.7	3.0	1.2	5.4	0.3	0.04
8	Middle of Passur River at South West corner from the Project boundary	1.2	1.51	1.25	0.85	0.53	0.18	1.02	0.625	0.21	0.96	2.76	0.04	0.37	0.41	0.39	0.29	0.86	0.43	0.20	0.35	0.8	0.7	0.4	0.43	0.4	2.5	2.4	3.7	0.4	0.03
9	Right Bank of Passur River at South West corner from the Project boundary	1.5	1.1	1	0.53	0.6	0.1	1.39	0.536	0.33	1.123	2.71	0.07	0.45	0.63	0.62	0.42	1.03	0.57	0.37	0.27	0.8	0.5	0.4	0.52	1.3	3.2	6.3	2.7	0.1	0.14
10	Maidara river of the South East corner of the project at Ichamoti-Maidara confluence	0.55	2.1	1.27	0.59	0.7	0.5	1.27	0.351	0.19	1.06	2.836	0.07	0.61	0.51	0.38	0.24	0.83	0.27	0.40	0.28	0.5	0.6	0.5	0.25	1.2	13.1	8	3.4	0.2	0.59
11	Maidara river near proposed township area	1.1	0.53	1.04	0.64	0.55	0.29	1.28	0.269	0.13	1	5.23	0.2	0.47	15.3	0.71	0.28	1.2	0.22	0.28	0.30	0.8	0.4	0.3	0.56	0.7	4.1	0.76	0.2	0.4	0.35
12	Passur river at Passur - Mongla confluence	1.3	0.35	0.86	0.42	0.71	0.59	0.95	0.179	0.31	0.78	4.01	0.09	0.18	1.3	0.63	0.37	0.86	0.33	0.29	0.31	0.6	0.6	0.4	0.53	0.8	9.6	0.79	0.27	0.2	0.3
13	Passur river at Harbaria of Sundarbans	1.1	0.56	1.22	0.61	0.59	0.89	0.35	0.269	0.42	0.53	1.16	**0.09**	0.21	3.15	0.81	0.26	0.5	0.25	0.30	0.52	0.6	0.7	0.2	0.4	0.3	2.6	0.6	1.9	0.7	0.48
14	Passur river at Akram point of Sundarbans	1.3	0.29	0.8	0.42	0.61	NS	0.43	0.357	0.26	0.47	9.08	0.1	0.19	0.36	0.97	0.20	0.67	0.5	0.19	0.63	0.5	0.3	0.1	0.37	0.4	7.1	3	0.87	0.4	0.45
15	Passur river at Hiron point of Sundarbans	7.51	0.29	1.09	0.44	0.47	NS	0.45	NS	0.36	NS	5.9	0.23	NS	0.55	1.45	NS	NS	0.61	0.18	NS	NS	0.3	0.2	NS	0.4	1.1	NS	0.5	0.2	1.03

Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring: NS – Not Surveyed.

Table B.13: Arsenic (As) (mg/L) concentration of Passur River System

Sl	Sampling Locations	Monitoring periods																													
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	0.002	0.003	0.004	0.003	0.002	0.002	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.004	0.003	0.002	0.003	0.002	0.002	0.002	0.003	0.003	0.002	0.003	0.003	0.003	0.003
2	Middle Passur River at 100m u/s of North West corner from the Project boundary	0.002	0.003	0.004	0.003	0.002	0.002	0.001	0.001	0.003	0.003	0.003	0.001	0.002	0.001	0.002	0.001	0.005	0.002	0.001	0.002	0.002	0.003	0.003	0.003	0.003	0.002	0.004	0.002	0.002	0.003
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	0.001	0.003	0.004	0.003	0.003	0.002	0.001	0.001	0.003	0.005	0.002	0.001	0.001	0.002	0.003	0.001	0.004	0.002	0.003	0.003	0.002	0.002	0.002	0.003	0.003	0.002	0.003	0.003	0.002	0.003
4	Left Bank of Passur River at Project Site-Jetty	0.002	0.004	0.004	0.004	0.002	0.002	0.001	0.002	0.002	0.004	0.002	0.002	0.001	0.002	0.002	0.002	0.005	0.002	0.001	0.003	0.002	0.003	0.003	0.002	0.003	0.002	0.002	0.003	0.002	0.002
5	Middle Passur River at Project Site-Jetty	0.002	0.004	0.004	0.003	0.002	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.003	0.002	0.001	0.003	0.002	0.003	0.002	0.002	0.004	0.003	0.002	0.002	0.002	0.002
6	Right Bank of Passur River at Project Site-Jetty	0.002	0.003	0.003	0.003	0.002	0.002	0.001	0.001	0.002	0.002	0.002	0.001	0.002	0.003	0.002	0.002	0.002	0.001	0.002	0.003	0.002	0.002	0.002	0.002	0.003	0.003	0.004	0.003	0.002	0.002
7	Left Bank of Passur River at South West corner from the Project boundary	<0.001	0.003	0.006	0.003	0.002	0.002	0.001	0.002	0.001	0.003	0.002	0.002	0.002	0.003	0.001	0.002	0.005	0.002	0.003	0.003	0.003	0.003	0.002	0.005	0.004	0.002	0.003	0.003	0.002	0.003
8	Middle of Passur River at South West corner from the Project boundary	<0.002	0.004	0.004	0.003	0.002	0.002	0.001	0.001	0.002	0.003	0.003	0.001	0.002	0.002	0.001	0.001	0.003	0.002	0.001	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.003	0.002	0.002	0.002
9	Right Bank of Passur River at South West corner from the Project boundary	0.002	0.003	0.006	0.003	0.002	0.003	0.001	0.001	0.002	0.004	0.002	0.002	0.003	0.002	0.001	0.001	0.004	0.002	0.001	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.003	0.002	0.002	0.002
10	Maidara river of the South East corner of the project at Ichamoti-Maidara confluence	<0.001	0.003	0.006	0.004	0.003	0.002	0.001	0.002	0.002	0.005	0.002	0.001	0.003	0.003	0.002	0.002	0.004	0.001	0.002	0.003	0.003	0.003	0.003	0.004	0.004	0.003	0.003	0.002	0.002	0.003
11	Maidara river near proposed township area	0.002	0.002	0.003	0.003	0.003	0.002	0.001	0.001	0.002	0.002	0.002	0.001	0.003	0.001	0.001	0.001	0.003	0.001	0.005	0.003	0.004	0.004	0.003	0.002	0.004	0.002	0.004	0.002	0.003	0.003
12	Passur river at Passur - Mongla confluence	0.002	0.004	0.003	0.003	0.004	0.002	0.001	0.002	0.003	0.004	0.003	0.002	0.002	0.002	0.001	0.002	0.003	0.001	0.007	0.003	0.002	0.004	0.003	0.002	0.002	0.003	0.002	0.002	0.002	0.003

Sl	Sampling Locations	Monitoring periods																													
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM
13	Passur river at Harbaria of Sundarbans	0.004	0.003	0.004	0.004	0.004	0.002	0.001	0.002	0.005	0.002	0.003	0.002	0.001	0.003	0.002	0.001	0.003	0.002	0.001	0.002	0.001	0.002	0.003	0.002	0.002	0.002	0.002	0.002	0.003	0.002
14	Passur river at Akram point of Sundarbans	0.004	0.002	0.002	0.003	0.002	NS	0.001	0.002	0.006	0.001	0.003	0.001	0.002	0.002	0.001	0.002	0.002	0.001	0.002	0.002	0.001	0.002	0.002	0.003	0.002	0.002	0.002	0.003	0.003	0.002
15	Passur river at Hiron point of Sundarbans	0.003	0.002	0.003	0.002	0.002	NS	0.001	NS	0.004	NS	0.002	0.002	NS	0.002	0.001	NS	NS	0.001	0.001	NS	NS	0.002	0.002	NS	0.009	0.002	NS	0.003	0.002	0.002

Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring: NS – Not Surveyed

Table B.14: Pb (mg/L) concentration of Passur River System

Sl	Sampling Locations	Monitoring periods																													
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	0.053	0.004	0.002	0.104	0.098	0.0059	0.007	0.168	0.203	0.01	0.009	0.024	0.002	0.003	0.001	0.002	0.002	0.003	0.004	0.003	0.001	0.001	**0.008**	0.006	**0.002**	0.016	0.029	0.017	0.009	0.013
2	Middle Passur River at 100m u/s of North West corner from the Project boundary	0.055	0.002	0.003	0.104	0.102	0.0038	0.006	0.092	0.302	0.009	0.007	0.034	0.001	0.003	0.001	0.001	0.001	0.007	0.005	0.002	0.003	0.002	**0.007**	0.004	**0.005**	0.017	0.029	0.019	0.019	0.01
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	0.055	0.005	0.002	0.111	0.138	0.0058	0.008	0.176	0.347	0.017	0.01	0.03	0.003	0.003	0.002	0.004	0.02	0.017	0.007	0.004	0.002	0.001	**0.009**	0.007	**0.006**	0.018	0.036	0.019	0.002	0.011
4	Left Bank of Passur River at Project Site-Jetty	0.057	0.002	0.003	0.154	0.142	0.011	0.01	0.115	0.336	0.014	0.007	0.036	0.001	0.002	0.002	0.001	0.018	0.013	0.005	0.003	0.009	0.001	**0.008**	0.005	**0.008**	0.015	0.016	0.012	0.003	0.009
5	Middle Passur River at Project Site-Jetty	0.06	0.002	0.002	0.139	0.135	0.002	0.009	0.148	0.317	0.006	0.006	0.046	0.003	0.002	0.001	0.003	0.008	0.01	0.003	0.003	0.003	0.001	**0.006**	0.007	**0.006**	0.017	0.014	0.012	0.002	0.007
6	Right Bank of Passur River at Project Site-Jetty	0.058	0.002	0.002	0.138	0.156	0.0021	0.007	0.112	0.298	0.01	0.005	0.041	0.002	0.001	0.001	0.001	0.041	0.012	0.007	0.002	0.009	0.003	**0.004**	0.008	**0.005**	0.019	0.012	0.016	0.002	0.011
7	Left Bank of Passur River at South West corner from the Project boundary	0.053	0.002	0.003	0.16	0.142	0.0076	0.01	0.134	0.396	0.007	0.006	0.048	0.003	0.001	0.001	0.007	0.012	0.011	0.003	0.002	0.120	0.001	**0.006**	0.019	**0.018**	0.019	0.0140.	0.022	0.003	0.014
8	Middle of Passur River at South West corner from the Project boundary	0.054	0.003	0.004	0.153	0.148	0.002	0.011	0.099	0.323	0.006	0.007	0.044	0.009	0.002	0.001	0.003	0.015	0.014	0.004	0.003	0.006	0.002	**0.008**	0.009	**0.008**	0.017	0.003	0.015	0.004	0.006
9	Right Bank of Passur River at South West corner from the Project boundary	0.056	0.005	0.004	0.139	0.163	0.002	0.009	0.093	0.331	0.012	0.007	0.056	0.003	0.002	0.002	0.005	0.03	0.019	0.006	0.002	0.004	0.001	**0.007**	0.01	**0.004**	0.022	0.014	0.016	0.005	0.007
10	Maidara river of the South East corner of the project at Ichamoti-Maidara confluence	0.053	0.004	0.004	0.143	0.135	0.002	0.07	0.023	0.35	0.008	0.008	0.038	<LOQ	0.003	0.002	0.002	0.01	0.008	0.004	0.002	0.003	0.002	**0.008**	0.013	**0.003**	0.019	0.013	0.022	0.004	0.008
11	Maidara river near proposed township area	0.048	0.004	<0.002	0.133	0.14	0.002	0.008	0.067	0.275	0.015	0.007	0.056	0.001	0.011	0.001	0.003	0.016	0.017	0.005	0.003	0.004	0.003	**0.006**	0.005	**0.006**	0.007	0.015	0.002	0.005	0.01
12	Passur river at Passur - Mongla confluence	0.05	0.032	<0.002	0.141	0.14	0.002	0.009	0.078	0.258	0.098	0.011	0.05	0.0001	0.011	0.001	0.002	0.015	0.009	0.007	0.003	0.002	0.002	**0.005**	0.003	**0.007**	0.015	0.014	0.023	0.008	0.013
13	Passur river at Harbaria of Sundarbans	0.043	0.044	0.004	0.137	0.13	0.002	0.012	0.135	0.228	0.02	0.01	0.05	0.001	0.005	0.003	0.003	0.017	0.009	0.015	0.002	0.006	0.014	**0.007**	0.009	**0.004**	0.002	0.014	0.011	0.019	0.01
14	Passur river at Akram point of Sundarbans	0.194	0.071	0.032	0.309	0.297	NS	0.084	0.302	0.359	0.142	0.126	0.033	0.009	0.004	0.169	0.001	0..062	0.018	0.013	0.002	0.001	0.019	**0.043**	0.011	**0.020**	0.001	0.018	0.005	0.004	0.011
15	Passur river at Hiron point of Sundarbans	0.224	0.05	0.07	0.309	0.291	NS	0.073	NS	0.607	NS	0.151	0.129	NS	0.019	0.175	NS	NS	0.014	0.017	NS	NS	0.008	**0.056**	NS	**0.013**	0.001	NS	0.5	0.005	0.009

Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring: NS – Not Surveyed.

Table B.15: Hg (mg/L) concentration of Passur River System

Sl	Sampling Locations	Monitoring periods																													
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.004	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
2	Middle Passur River at 100m u/s of North West corner from the Project boundary	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
4	Left Bank of Passur River at Project Site-Jetty	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
5	Middle Passur River at Project Site-Jetty	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
6	Right Bank of Passur River at Project Site-Jetty	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
7	Left Bank of Passur River at South West corner from the Project boundary	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
8	Middle of Passur River at South West corner from the Project boundary	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
9	Right Bank of Passur River at South West corner from the Project boundary	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
10	Maidara river of the South East corner of the project at Ichamoti-Maidara confluence	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
11	Maidara river near proposed township area	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
12	Passur river at Passur - Mongla confluence	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
13	Passur river at Harbaria of Sundarbans	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
14	Passur river at Akram point of Sundarbans	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
15	Passur river at Hiron point of Sundarbans	< 0.00015	NS	< 0.00015	< 0.00015	< 0.00015	< 0.00015	NS	NS	< 0.00015	NS	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	NS	NS	< 0.001	< 0.001	NS	< 0.001	< 0.001	< 0.001	NS	<0.001	<0.001	NS	<0.001	<0.001	<0.001

Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring: NS – Not Surveyed.

Parameters for ground water quality monitoring

Table B.16: pH and Temperature (^0C) of Ground Water

Sl	Locations	Tube Well Type	Monitoring periods																													
			Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	July	Oct	Jan	Apr	Aug	Oct	Jan	May
			1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	2QM	26QM	27QM	28QM	29QM	30QM	31QM	32QM
1	Near Proposed Township	Deep (>600 ft)	7.6	7.7	7.9	8	TC	8.1	7.49	7.6	7.8	7.8	8.4	8.1	7.4	8.2	6.9	NF	NF	NF	7.1	8.3	8.2	7.2	7.8	**8.1**	7.4	**7.2**	8.0	5.6	8.0	7.7	7.7
2	Rajnagar	Deep (>600 ft)	7.6	7.8	8	8.2	7.8	8.3	7.93	8.1	8.3	8.1	7.9	7.5	7.8	8.1	7.4	6.9	7.9	7.3	6.9	8.4	7.9	7.6	7.3	**8.0**	8	**7.5**	8.3	6.2	8.6	8.1	7.4
3	Kapasdanga	Deep (>600 ft)	7.6	7.7	8	8.1	7.9	8.3	7.7	7.9	8.2	7.9	7.9	7.6	7.4	7.8	7.2	7.2	7.6	7.6	6.5	8.9	8.1	7.4	7.5	**8.0**	8	**7.5**	8.2	7.4	9.1	8.1	8.2
4	Kalekharber	Shallow (<250 ft)	6.3	6.5	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF

Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring: NF-Not Functional.

Locations	Tube Well Type	Monitoring periods																													
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	July	Oct	Jan	Apr	Aug	Oct	Jan	May
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	2QM	26QM	27QM	28QM	29QM	30QM	31QM	32QM
Near Proposed Township	Deep (>600 ft)	27.3	28.5	26	24.5	TC	31	30	24	29.8	28.6	29.1	25.1	28.7	27.2	22.9	NF	NF	NF	23.8	29	31.4	27	24	31	27	**22**	**23**	31.3	28.89	23	29
Rajnagar	Deep (>600 ft)	29.6	29.9	28	22.5	28.6	28	27.8	23	29.6	29.1	30.4	24.3	27.7	26.5	23.8	30.3	29.3	30	23.7	30	30.0	27	23	30	28	**25**	**23**	30.45	27.7	24	31.48
Kapasdanga	Deep (>600 ft)	29.2	28.9	28	25.1	28.8	30	28.7	25	30.1	29.4	29.8	24	28.4	26.4	23.6	30.1	29.7	29	23.2	30	31.2	26	23	30	27	**25**	**24**	30.72	28.04	25	29.37
Kalekharber	Shallow (<250 ft)	27.5	28.7	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF

*Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring: NF-Not Functional.; *Drinking water quality standards, The Environment Conservation Rules, 1997*

Table B.17: Salinity (ppt) and DO (mg/L) in Groundwater

Sl	Locations	Tube Well Type	Monitoring periods																													
			Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	July	Oct	Jan	Apr	Aug	Oct	Jan	May
			1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	2QM	26QM	27QM	28QM	29QM	30QM	31QM	32QM
1	Near Proposed Township	Deep (>600 ft)	0	0	0	1	TC	0	0	0	0	0	0	0	0	0	0	NF	NF	NF	0.1	0.1	0.1	0.0	0.1	0.1	0.18	**0.1**	0.1	0.1	0	0.1	0.3
2	Rajnagar	Deep (>600 ft)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.3	0.1	0.1	0.1	0.5	0.1	0.0	0.1	0.1	0.1	**0.2**	0.3	0.2	0	0.2	0.2
3	Kapashdanga	Deep (>600 ft)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0.2	0.1	0.1	0.1	0.7	0.1	0.0	0.1	0.1	0.1	**0.4**	0.3	0.4	0	0.4	0.4
4	Kalekharber	Shallow (<250 ft)	0	0	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF

Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring: NF-Not Functional.

Sl	Locations	Tube Well Type	Monitoring periods																													
			Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	July	Oct	Jan	Apr	Aug	Oct	Jan	May
			1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	2QM	26QM	27QM	28QM	29QM	30QM	31QM	32QM
1	Near Proposed Township	Deep (>600 ft)	4.4	5.2	6.5	6.7	TC	6	5.4	4.9	6.1	5.8	6.3	4.5	5.1	6.2	5.2	NF	NF	NF	6.0	6.0	6.1	6.0	6.0	6.0	6	**6.4**	6.4	6.0	6.5	6.2	4.0
2	Rajnagar	Deep (>600 ft)	6	6.2	7.7	6.3	6	5.9	6.1	5.2	5.8	6.1	5.8	4.8	5.3	5.8	4.47	6.0	6	5.9	6.1	6.5	6.0	6.2	6.1	6.1	6.2	**6.7**	6.3	6	7.7	4.7	2.99
3	Kapasdanga	Deep (>600 ft)	6.4	6.5	6.1	6.5	6.6	6	5.6	4.8	5.6	5.7	6.1	4.6	5.7	6.2	4.26	5.4	5.9	6.1	6.2	6.2	6.0	6.0	6.0	6.1	6	**4.9**	6.3	5	6.1	3.5	3.8
4	Kalekharber	Shallow (<250 ft)	4.4	6	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF

*Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring; NF=Non-functional *Drinking water quality standards, The Environment Conservation Rules, 1997*

Table B.18: TDS (mg/L) and TSS (mg/L) concentrations in Groundwater

SL	Locations	Type of tube wells	Monitoring periods																												
			Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan
			1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM
1	Township near project site	Deep (>600 ft)	1113	999	-	1021	NO	881	377	447	1025	1000	617	623	395	602	405	NF	NF	NF	1315	915	25	900	3080	1196	139	200	810	890	350	0.86
2	Rajnagar	Deep (>600 ft)	4090	371	-	378	390	574	1007	491	384	408	382	401	617	996	602	615	390	365	376	380	602	385	660	701	335	350	450	360	615	350
3	Kapasdanga	Deep (>600 ft)	643	635	-	600	600	328	611	284	645	607	636	998	558	390	994	370	608	610	927	610	360	603	370	316	202	610	570	610	860	620
4	Kalekharber	Shallow (<250 ft)	1055	970	-	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF

Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring: NS – Not Surveyed.

SL	Locations	Type of tube wells	Monitoring periods																												
			Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan
			1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM
1	Township near project site	Deep (>600 ft)	-	6	19	40	NF**	23	4	31	3	5	7	32	4	8	12	NF	NF	NF	3	3	2	4	2	1	**3**	**1**	**1**	1	1	1
2	Rajnagar	Deep (>600 ft)	-	6	2	28	4	16	5	46	4	4	4	28	10	10	6	12	2	6	3	2	1	3	3	3	**5**	**2**	**1**	1	4	1
3	Kapasdanga	Deep (>600 ft)	-	8	6	32	6	14	4	41	3	4	5	25	9	9	7	5	3	8	4	4	4	4	2	1	**2**	**5**	**1**	2	3	1
4	Kalekharber	Shallow (<250 ft)	-	48	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	Nf	NF	NF	NF	NF	NF	NF	NF	NF

Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring: NS=Not Surveyed; NF=Non-functional;

Table B.19: TH (mg/L) concentrations in Groundwater

Sl No	Locations	Type of tubewell	Monitoring periods																													
			Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan
			1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM
1	Township near project site	Deep (>600 ft)	425	250	300	235	NO	225	325	295	305	320	175	550	720	145	NF	NF	NF	NF	355	235	97	145	137	625	**232**	160	1400	160	70	180
2	Rajnagar	Deep (>600 ft)	220	175	180	110	138	125	450	195	263	248	295	510	420	240	265	195	235	178	215	182	167	245	118	210	**185**	145	1600	195	243	200
3	Kapasdanga	Deep (>600 ft)	190	140	180	125	216	115	480	225	163	28	183	620	654	215	305	215	170	138	270	167	212	137	145	237	**207**	130	1200	140	155	210
4	Kalekarber	Shallow (<250 ft)	780	450	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF

*Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring: NF=Nonfunctional; *Drinking water quality standards, The Environment Conservation Rules, 1997.*

Table B.20: COD (mg/L) concentrations of monitored ground water locations

Sl	Locations	Tube-well Type	Monitoring periods																													
			Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan
			1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM
1	Township near project site	Deep (>600 ft)	32	32	34	20	NO	12	4	4	4	4	4	4	4	8	NF	NF	NF	NF	4	352	4	4	4	4	4	4	16	32	4	12
2	Rajnagar	Deep (>600 ft)	28	28	18	16	14	10	8	4	4	4	4	4	4	8	4	4	4	4	3	4	4	4	4	4	4	4	32	28	20	8
3	Kapasdanga	Deep (>600 ft)	48	32	34	20	18	14	4	4	4	2	4	4	4	16	4	4	4	4	4	4	4	4	4	4	4	4	8	36	28	28
4	Kalekarber	Shallow (<250 ft)	32	36	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF

*Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring: NS=Not Surveyed; NF=Non-functional; N/A=Not Availability; *Drinking water quality standards, The Environment Conservation Rules, 1997*

Table B.21: NO_3^- (mg/L) Concentrations in Ground Water

Sl	Locations	Type of tube well	Monitoring periods *BD Standard (10 mg/L)																													
			Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan
			1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23rd QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM
1	Township near project site	Deep (>600 ft)	0.20	0.48	<0.10	28	-	7.6	4.3	2.1	1.7	3.8	6.1	4.65	9.32	3.3	5.9	NF	NF	NF	1.7	4.4	1.4	1.8	1.9	1.7	0.5	2.4	1	1.5	3.7	12.09
2	Rajnagar	Deep (>600 ft)	0.60	0.68	0.31	26	-	2.2	4.2	1.9	2.3	3.3	7.51	7.02	14.7	2.5	7.2	5.3	8.6	0.9	4.4	2.7	2.7	3.1	1.4	7.5	3.8	2.2	1	2.1	4.1	4.02
3	Kapasdanga	Deep (>600 ft)	0.80	0.40	0.80	13	-	4.7	3.8	2.8	1.9	3.7	10.16	4.65	10.2	4.6	1.7	5.7	7.8	1.4	2.1	8.3	1.7	1.6	2.7	1.7	3.1	4.9	2	2.1	2.6	8.83
4	Kalekarber	Shallow (<250 ft)	0.40	0.56	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF

*Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring: NF=Nonfunctional; *Drinking water quality standards, The Environment Conservation Rules, 1997;*

Table B.22: SO_4^{2-} (mg/L) Concentrations in Ground Water

Sl	Location	Typeof Tubewell	Monitoring periods *BD Standard (400 mg/L)																													
			Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan
			1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM
1	Township near project site	Deep (>600 ft)	-	3	-	-	-	-	1	5	1	1	1	1	5	1	8	NF	NF	NF	1	4	1	2	2	4	**9**	1	1	1	2.2	14.94
2	Rajnagar	Deep (>600 ft)	-	2	-	-	-	-	2	6	2	1	1	1	1	1	2	2	4	1	2	1	2	2	3	3	**3**	1	1	4	6.3	4.22
3	Kapasdanga	Deep (>600 ft)	-	10	-	-	-	-	2	2	8	1	1		3	2	6	4	6	1	1	4	1	1	2	4	**3**	7	1	3	2.6	9.51
4	Kalekarber	Shallow (<250 ft)	NF	3	NF	-	-	-	-	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF

*Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring: NF=Non-functional; *Drinking water quality standards, The Environment Conservation Rules, 1997*

Table B.23: PO_4^{3-} (mg/L) Concentrations in Ground Water

Sl	Location	Typeof Tubewell	Monitoring periods *BD Standard (6.0 mg/L)																													
			Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan
			1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM
1	Township near project site	Deep (>600 ft)	NF	2.2	-	0.74	NO	1.4	0.31	0.267	1.08	0.17	0.167	1.18	2.18	1.68	0.13	NF	NF	NF	2.1	2.3	0.3	1	1.1	0.3	0.7	2.0	1.4	1.7	0.9	1.0
2	Rajnagar	Deep (>600 ft)	-	2.5	-	0.44	1.98	1.6	0.27	0.179	1.53	0.29	0.67	1.21	1.8	3.5	0.17	4..5	2.9	0.15	1.3	2.5	4.0	0.5	0.4	1.5	6.3	1.8	0.98	1.2	1.4	0.6
3	Kapasdanga	Deep (>600 ft)	-	6.2	-	0.48	4.54	4.1	0.48	0.179	3.26	0.31	0.6	1.18	2.1	4.7	0.18	0.27	4.8	0.26	3.6	3.2	2.0	1.5	0.9	1.7	2.3	2.3	4	5	0.6	1.4
4	Kalekarber	Shallow (<250 ft)	NF	1.2	NF	NF	NF	NF	NF	NF	NF	NF	NF	1.23	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF

*Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring: NF=Nonfunctional; *Drinking water quality standards, The Environment Conservation Rules, 1997*

Table B.24: As concentrations (mg/L) of monitored ground water locations

Sl	Locations	Monitoring periods																														
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM
1	Township near project site	0.013	0.020	0.012	0.014	NO	0.015	0.002	0.008	0.018	0.012	0.033	0.028	0.012	0.014	0.002	0.001	NF	NF	0.014	0.012	0.014	0.001	0.018	0.020	0.022	0.003	0.002	0.002	0.012	0.003	0.016
2	Rajnagar	0.006	0.009	0.006	0.008	0.01	0.014	0.012	0.002	0.007	0.018	0.011	0.005	0.022	0.004	0.012	0.022	0.012	0.007	0.003	0.012	0.006	0.027	0.006	0.068	0.045	0.053	0.004	0.003	0.003	0.063	0.003
3	Kalekarber	0.376	0.407	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
4	Kapasdanga	0.036	0.033	0.020	0.017	0.034	0.024	0.011	0.002	0.047	0.005	0.016	0.028	0.010	0.027	0.002	0.001	0.004	0.050	0.004	0.012	0.022	0.001	0.033	0.003	0.004	0.006	0.049	0.008	0.061	0.014	0.048

Source: CEGIS Field Survey

Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring: NS=Not Surveyed; NF=Non-functional; N/A=Not Availability; TC=temporarily closed, D=Damaged

**Drinking water quality standards, The Environment Conservation Rules, 1997.*

Table B.25: Pb concentrations (mg/L) of monitored ground water locations

Sl	Locations	Monitoring periods																														
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	22QM	23 QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM
1	Township near project site	0.002	<0.002	0.004	0.023	NO	0.002	0.006	0.026	0.019	0.002	0.001	0.01	0.001	0.003	0.001	0.001	0.001	NF	NF	0.008	0.004	0.018	0.002	0.001	0.001	0.004	0.048	0.003	0.009	0.001	0.003
2	Rajnagar	<0.002	<0.002	<0.002	0.016	0.013	0.0027	0.021	0.011	0.007	0.002	0.001	0.009	0.001	0.007	0.002	0.001	0.001	0.001	0.004	0.003	0.004	0.002	0.008	0.001	0.001	0.006	0.016	0.008	0.002	0.001	0.004
3	Kalekarber	0.002	0.008	NF	NF	D	D	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
4	Kapasdanga	<0.002	0.004	<0.002	0.013	0.017	0.002	0.005	0.012	0.008	0.002	0.001	0.016	0.001	0.002	0.001	0.001	0.001	0.001	0.056	0.004	0.006	0.001	0.001	0.002	0.001	0.002	0.056	0.002	0.001	0.001	0.003

Source: CEGIS Field Survey

Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring: NS=Not Surveyed; NF=Non-functional; N/A=Not Availability; TC=temporarily closed, D=Damaged

**Drinking water quality standards, The Environment Conservation Rules, 1997*

Table B.26: Hg concentrations (mg/L) of monitored ground water locations

Sl	Locations	Monitoring periods*BD Standard (0.001 mg/L)																														
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	21QM	22QM	23rd QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM
1	Township near project site	<0.00015	<0.00015	<0.0005	<0.0005	<0.0005	0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	**<0.001**	**<0.001**	**<0.001**	**<0.001**	<0.001	<0.001	<0.001	<0.001
2	Rajnagar	<0.00015	<0.00015	<0.0005	<0.0005	<0.00015	0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	<0.001	**<0.001**	**<0.001**	**<0.001**	**<0.001**	<0.001	<0.001	<0.001	<0.001
3	Kalekarber	<0.00015	<0.00015	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	**NF**	**NF**	**NF**	**NF**	NF	NF	NF	NF
4	Kapasdanga	<0.00015	<0.00015	<0.0005	<0.0005	<0.00015	0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	0.001	<0.0001	<0.001		<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	**<0.001**	**NF**	**<0.001**	**<0.001**	<0.001	<0.001	<0.001	<0.001

*Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring: NS=Not Surveyed; NF=Non-functional; N/A=Not Availability; TC=temporarily closed, D=Damaged; *Drinking water quality standards, The Environment Conservation Rules, 1997.*

Table B.27: PAH (mg/L) concentrations of monitored locations

PAH	July, 2018			January, 2019			July, 2019			February, 2020			July, 2020			January, 2021			August, 2021			January, 2022		
	Project Jetty	Majhar point	Hiron point	Project Jetty	Majhar point	Hiron point	Project Jetty	Majhar point	Hiron point	Project Jetty	Majhar point	Hiron point	Project Jetty	Majhar point	Hiron point	Project Jetty	Majhar point	Hiron point	Project Jetty	Majhar point	Hiron point	Project Jetty	Majhar point	Hiron point
Acenapthylene	ND	ND	NM	ND	ND	NM	ND	ND	NM	ND	ND	NM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	ND	ND	NM	ND	ND	NM	ND	ND	NM	ND	ND	NM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzlol (A) Anthracene	ND	ND	NM	ND	ND	NM	ND	ND	NM	ND	ND	NM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzlol (A) Pyrene	ND	ND	NM	ND	ND	NM	ND	ND	NM	ND	ND	NM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzlol (B) Fluoranthene	ND	ND	NM	ND	ND	NM	ND	ND	NM	ND	ND	NM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzol (G, H, I) Perilene	ND	ND	NM	ND	ND	NM	ND	ND	NM	ND	ND	NM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzol (K) Fluoranthene	ND	ND	NM	ND	ND	NM	ND	ND	NM	ND	ND	NM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	ND	ND	NM	ND	ND	NM	ND	ND	NM	ND	ND	NM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzol (A, H) Anthracene	ND	ND	NM	ND	ND	NM	ND	ND	NM	ND	ND	NM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	ND	ND	NM	ND	ND	NM	ND	ND	NM	ND	ND	NM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	ND	ND	NM	ND	ND	NM	ND	ND	NM	ND	ND	NM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	ND	ND	NM	ND	ND	NM	ND	ND	NM	ND	ND	NM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Source: CEGIS Field Survey; may 2022

Table B.28: TOC (mg/L) and TC (mg/L) concentrations of monitored locations

Monitoring sites	July, 2018		January, 2019		July, 2019		February, 2020		July, 2020		January, 2021		August, 2021		January, 2022	
	Total Carbon	Total Organic Carbon	Total Carbon	Total Organic Carbon	Total Carbon	Total Organic Carbon	Total Carbon	Total Organic Carbon	Total Carbon	Total Organic Carbon	Total Carbon	Total Organic Carbon	Total Carbon	Total Organic Carbon	Total Carbon	Total Organic Carbon
Project jetty site	26.4	19.5	20.7	14.3	17.2	13.6	37.5	26.4	152	9.17	1302	<5	250	<5	218	21.2
Majhar point or Harbaria area	21.9	25.1	24.8	18.8	21.7	18.1	21.7	18.1	200	9.48	1568	<5	200	20.2	686	19.7
Hiron point	NM	NM	6.8	5.7	NM	NM	8.1	6.7	NM	NM	9241	<5	544	<5	2901	15.2

Source: CEGIS Field Survey, May, 2022

(C) Noise Level monitoring data

Table C.1: Ambient noise monitoring status at the monitored locations

Sl No	Location	QM1 (Noise Level in dB (A)) Mar-14				QM2 (Noise Level in dB (A)) Jul-14				QM3 (Noise Level in dB (A)) Oct-14				QM4 (Noise Level in dB (A)) Jan-15				Std*
		Morning (9:00)	noon (13:00)	Evening (18:00)	Day time AVG	Morning (9:00)	noon (13:00)	Evening (18:00)	Day time AVG	Morning (9:00)	noon (13:00)	Evening (18:00)	Day time AVG	Morning (9:00)	noon (13:00)	Evening (18:00)	Day time AVG	Day time
1	Chalna, Dacope	80.32	60.86	63.22	68.13	52.71	55.62	50.27	52.87	53.37	53.52	57	54.63	51.92	53.7	54.21	53.28	70
2	NW Corner of the Project area	55.23	53	47.43	51.89	NM	NM	NM	NM	42.67	41.73	41.37	41.92	33.87	36.42	35.46	35.25	50
3	Chunkuri-2, Bajua	62.69	57.19	53.39	57.76	54.61	51.14	51.9	52.55	52.26	51.14	50.76	51.39	55.08	46.29	46.49	49.29	50
4	SW corner of the Project area	49.2	NM	NM	49.2	44.55	48.94	49.33	47.6	45.56	45.1	47.18	45.95	36.57	34.24	37.27	36.03	50
5	Proposed Township area, Project site	47.8	49.7	NM	48.75	46.15	47.21	NM	46.68	42.67	41.73	41.37	41.92	41.49	39.55	43.37	41.47	50
6	Barni, Gaurambha	64.95	50.93	60.65	58.84	48.73	50.37	50.75	49.95	50.18	50.89	48.27	49.78	43.36	38.56	48.86	43.6	50
7	Khan Jahan Ali Bridge, Khulna	76.12	66.72	72.25	71.7	55.97	64.68	61.75	60.8	72.24	58.3	68.3	66.28	61.34	63.4	60.41	61.72	70
8	Mongla Port area	69.38	54.55	59.79	61.24	54.75	54.2	52.58	53.84	66.8	55.2	59.5	60.5	40.26	35.04	40.76	38.69	75
9	Harbaria, Sundarbans	39.24	NM	42.51	40.88	59.25	60.52	48.62	56.13	54.08	56.51	NM	55.3	36.36	32.4	NM	34.38	45
10	Akram Point, Sundarbans	40.95	41.98	39.9	40.94	48.95	46.86	NM	47.9	45.27	42.69	NM	43.98	37.9	30.75	NM	34.32	45
11	Hiron Point, Sundarbans	35.99	40.75	39.16	38.63	51.29	NM	NM	51.29	47.98	39.42	NM	47.98	42.82	31.93	NM	37.37	45

*Note(s): NM – Not Monitored, *Std- Standard as defined in National Noise Control Rules 2006*

Table C.2: Ambient noise monitoring status at the monitored locations

Sl No	Location	QM 5(Noise Level in dB (A)) Apr-15				QM 6 (Noise Level in dB (A)) Jul-15				QM 7 (Noise Level in dB (A)) Oct-15				QM 8 (Noise Level in dB (A)) Jan-16				Std*
		Morning (9:00)	noon (13:00)	Evening (18:00)	Day time AVG	Morning (9:00)	noon (13:00)	Evening (18:00)	Day time AVG	Morning (9:00)	noon (13:00)	Evening (18:00)	Day time AVG	Morning (9:00)	noon (13:00)	Evening (18:00)	Day time AVG	Day time
1	Chalna, Dacope	57.27	54.31	59.65	57.08	43.52	54.23	51.56	49.77	68.32	66.09	60.96	65.12	67.84	61.25	66.31	66.07	70
2	NW Corner of the Project area	45.05	42.15	46.8	44.67	37.58	40.91	46.18	41.56	41.51	39.58	44.74	41.94	53.91	49.02	49.95	50.96	50
3	Chunkuri-2, Bajua	45.9	48.19	NM	47.05	40.57	42.23	39.17	40.66	47.53	45.48	49.28	47.43	56.84	48.12	55.90	53.62	50
4	SW corner of the Project area	40.6	43.25	46.89	43.58	44.57	44.30	42.36	43.75	36.15	48.26	43.68	42.70	60.32	55.30	63.70	60.44	50
5	Proposed Township area, Project site	41.49	39.55	43.37	41.47	43.41	50.86	45.99	46.75	46.89	49.47	55.20	50.52	54.79	52.22	54.29	53.77	50
6	Barni, Gaurambha	58.23	50.11	NM	54.17	46.76	44.83	46.95	46.18	56.40	54.19	54.88	55.16	60.62	60.00	56.86	59.16	50
7	Khan Jahan Ali Bridge, Khulna	75.2	72.75	72.42	73.45	52.95	52.18	53.34	52.82	64.43	61.65	66.65	64.25	69.96	64.81	70.56	68.45	70
8	Mongla Port area	46.02	49.29	49.15	48.15	36.72	38.56	43.54	39.61	45.39	NM	48.63	47.01	54.15	51.82	52.14	52.70	75
9	Harbaria, Sundarbans	67.06	64.05	64.99	65.37	39.33	30.74	NM	35.03	54.97	46.54	NM	50.75	45.72	44.69	*NM*	45.20	45
10	Akram Point, Sundarbans	53.35	56.37	NM	54.86	NM	NM	NM	NM	45.28	53.92	NM	49.60	45.60	40.29	*NM*	42.95	45
11	Hiron Point, Sundarbans	47.48	48.2	NM	47.84	NM	NM	NM	NM	54.44	37.69	NM	46.06	NM	NM	NM	NM	45

*Note(s): NM – Not Monitored, *Std- Standard as defined in National Noise Control Rules 2006.*

Table C.3: Ambient noise monitoring status at the monitored locations

Sl No	Location	QM9 (Noise Level in dB (A)) Apr-16				QM 10 (Noise Level in dB (A)) Jul-16				QM 11 (Noise Level in dB (A)) Oct-16				QM 12 (Noise Level in dB (A)) Jan-17				Std*
		Morning (9:00)	noon (13:00)	Evening (18:00)	Day time AVG	Morning (9:00)	noon (13:00)	Evening (18:00)	Day time AVG	Morning (9:00)	noon (13:00)	Evening (18:00)	Day time AVG	Morning (9:00)	noon (13:00)	Evening (18:00)	Day time AVG	Day time
1	Chalna, Dacope	67.71	61.23	66.31	65.08	50.92	50.04	52.3	51.42	60.1	68.6	67.8	65.5	54.4	61	61.46	58.95	70
2	NW Corner of the Project area	53.81	48.66	49.90	50.79	54.40	53.19	50.36	52.65	54.7	54.8	57.0	55.5	44.52	44.52	NM	44.52	50
3	Chunkuri-2, Bajua	43.30	43.35	46.84	44.49	56.29	49.4	54.51	53.4	50.4	47.7	56.6	51.6	55.73	56.2	NM	55.31	50
4	SW corner of the Project area	56.81	54.73	51.97	54.50	67.38	74.12	54.61	65.37	47.8	49.0	50.8	49.2	44.41	45.96	NM	45.19	50
5	Proposed Township area, Project site	55.02	52.41	52.69	53.37	62.71	52.98	51.67	55.79	45.8	41.6	48.7	45.4	NM	43.4	41.85	42.63	50
6	Barni, Gaurambha	50.63	54.19	57.09	53.97	51.2	59.54	59.53	56.75	52.4	57.3	55.0	54.9	49.75	48.35	NM	49.05	50
7	Khan Jahan Ali Bridge, Khulna	66.40	64.82	66.34	65.85	63.52	62.15	65.73	63.80	61.9	59.6	61.3	60.9	51.69	60.05	54.97	55.57	70
8	Mongla Port area	49.89	48.67	51.07	49.88	53.87	52.04	52.7	52.87	49.5	50.0	50.2	49.9	47.82	48.67	50.33	48.94	75
9	Harbaria, Sundarbans	44.40	44.69	NM	44.55	53.87	53.04	52.79	52.9	57.2	53.5	49.3	53.3	41.13	38.4	37.98	39.17	45
10	Akram Point, Sundarbans	45.60	40.29	NM	42.95	47.16	46.48	50.24	47.96	40.5	43.0	42.5	42.0	38.74	38.45	37.06	38.08	45
11	Hiron Point, Sundarbans	48.53	37.69	NM	43.11	NM	NM	NM	NM	46.1	42,08	41.9	44.0	43.62	40.96	42.29	42.29	45

*Note(s): NM – Not Monitored, *Std- Standard as defined in National Noise Control Rules 2006.*

Table C.4: Ambient noise monitoring status at the monitored locations

Sl No	Location	QM13 (Noise Level in dB (A)) Apr-17				QM 14 (Noise Level in dB (A)) Oct-17				QM 15 (Noise Level in dB (A)) Jan-18				QM 16 (Noise Level in dB (A)) April-18				Std*
		Morning (9:00)	noon (13:00)	Evening (18:00)	Day time AVG	Morning (9:00)	noon (13:00)	Evening (18:00)	Day time AVG	Morning (9:00)	noon (13:00)	Evening (18:00)	Day time AVG	Morning (9:00)	noon (13:00)	Evening (18:00)	Day time AVG	Day time
1	Chalna, Dacope	58.21	59.00	66.57	61.62	47.65	51.06	50.27	49.66	60.2	60.2	60.5	60.3	64.09	59.30	65.43	62.94	70
2	NW Corner of the Project area	44.97	49.30	47.31	47.19	47.65	45.12	46.65	46.47	47.8	48.1	49.2	48.37	47.92	54.32	61.14	54.46	55
3	Chunkuri-2, Bajua	45.60	52.29	53.42	50.44	39.82	45.60	41.73	42.38	51.1	51.2	52.1	51.47	44.77	46	63.14	51.30333	55
4	SW corner of the Project area	39.62	42.64	47.48	43.25	60.80	64.08	62.52	62.47	43.5	43.5	45.7	44.23	64.45	63.49	66.63	64.85667	55
5	Project site near Shapmari area	41.40	43.09	43.45	42.65	43.05	48.52	45.01	45.53	53.2	54	52.82	53.34	51.95	59.66	56.8	56.13667	55
6	Barni, Gaurambha	43.05	46.45	45.01	44.83	45.60	52.29	53.42	50.44	56.5	54.2	56.1	55.6	55.6	51.80	51.39	52.93	60
7	Khan Jahan Ali Bridge, Khulna	54.01	57.50	58.66	56.72	40.60	42.64	46.55	43.26	60.2	62.1	62.2	61.5	49.4	45.25	47.98	47.54333	70
8	Mongla Port area	47.78	47.45	45.25	47.61	41.40	44.68	45.71	43.93	60.2	60.2	58.4	59.6	50.84	48.33	53.25	50.80667	75
9	Harbaria, Sundarbans	50.79	53.67	57.84	54.10	44.25	46.67	47.31	46.08	45.8	44.7	43.8	44.7	50.23	45.55	65.43	53.73667	50
10	Akram Point, Sundarbans	43.41	45.60	43.89	44.30	58.21	58.59	58.70	58.50	39.4	40.5	41.1	40.3	58.31	60.93	64.87	61.37	50
11	Hiron Point, Sundarbans	NM	NM	NM	NM	39.92	39.79	33.5	37.74	37.2	39	38.4	38.2					50

*Source: CEGIS field Survey; NM-Not measured; *Std- Standard as defined in National Noise Control Rules 2006.*

Table C.5 Ambient noise monitoring status at the monitored locations

Sl No	Location	QM 17 (Noise Level in dB (A)) July-18				QM 18 (Noise Level in dB (A)) Nov-18				QM 19 (Noise Level in dB (A)) Feb-19				QM 20 (Noise Level in dB (A)) Apr-19				Std*
		Morning (9:00)	A. noon (13:00)	Evening (18:00)	Day time AVG	Morning (9:00)	A. noon (13:00)	Evening (18:00)	Day time AVG	Morning (9:00)	A. noon (13:00)	Evening (18:00)	Day time AVG	Morning (9:00)	A. noon (13:00)	Evening (18:00)	Day time AVG	Day time
1	Chalna, Dacope	57.64	56.94	58.03	57.54	61.3	56.3	57.1	70	56.14	59.28	53.95	56.45	62.02	61.91	61.08	61.67	70
2	NW Corner of the Project area	42.80	47.51	46.57	45.63	56.5	60.1	59.85	55	45.15	54.11	53	50.75	53.70	58.92	57.92	56.85	55
3	Chunkuri-2, Bajua	46.23	49.02	47.34	47.53	45.8	48.9	51.3	55	50.19	49.35	51	50.18	49.66	54.02	51.35	51.68	55
4	SW corner of the Project area	58.84	48.00	51.03	52.63	64.5	60.6	60.2	55	53.50	58.01	55.88	55.79	58.08	54.79	55.27	56.05	55
5	Project site near Shapmari area	42.66	45.82	48.78	45.75	45.1	51.2	55.8	55	58.48	61.21	54.70	58.13	61.35	58.97	56.16	58.83	55
6	Barni, Gaurambha	42.67	47.95	45.90	45.51	58.3	50.6	50.2	60	54.32	57.65	45.75	52.57	58.58	51.05	49.92	53.18	60
7	Khan Jahan Ali Bridge, Khulna	64.1	64.06	61.90	63.35	64.6	60.9	60.9	70	65.72	69.04	66.03	66.93	67.95	63.09	69.82	66.95	70
8	Mongla Port area	63.12	59.00	60.77	60.96	55.8	53.1	59.0	75	64.33	63.37	70.85	66.18	64.12	62.41	65.45	63.99	75
9	Harbaria, Sundarbans	51.98	48.58	50.28	50.28	49.9	47.6	NM	50	51.43	47.90	NM	49.67	49.42	47.45	NM	48.43	50
10	Akram Point, Sundarbans	46.52	43.88	45.2	45.20	41.9	40.1	NM	50	47.35	45.55	NM	46.45	46.16	38.49	NM	42.33	50
11	Hiron Point, Sundarbans	NM	NM	NM	57.54	39.7	39.1	NM	50	33.8	44.62	NM	39.21	NM	NM	NM	-	50

*Source: CEGIS field SurveyNote: NM-Not measured; *Std- Standard as defined in National Noise Control Rules 2006.*

Table C.6 Ambient noise monitoring status at the monitored locations

Sl No	Location	QM 21 (Noise Level in dB (A)) July-19				QM 22 (Noise Level in dB (A)) November-19				QM 23 (Noise Level in dB (A)) February 20				QM 25 (Noise Level in dB (A)) July, 20				Std*
		Morning (9:00)	A. noon (13:00)	Evening (18:00)	Day time AVG	Day time	A. noon (13:00)	Evening (18:00)	Day time AVG	Morning (9:00)	A. noon (13:00)	Evening (18:00)	Day time AVG	Morning (9:00)	A. noon (13:00)	Evening (18:00)	Day time AVG	Day time
1	Chalna, Dacope	55.92	60.88	61.23	59.34	70	61.03	55.78	58.60	56.24	54.09	53.45	54.59	52.00	51.11	50.56	51.28	70
2	NW Corner of the Project area	56.44	53.21	55.88	55.18	55	53.45	50.97	51.11	40.96	43.33	51.98	45.42	43.9	42.95	43.26	43.37	55
3	Chunkuri-2, Bajua	56.15	63.34	58.60	59.36	55	52.92	54.51	55.27	59.78	51.59	54.96	55.44	49.42	48.52	48.32	48.75	55
4	SW corner of the Project area	66.94	58.41	65.65	63.66	55	49.98	42.05	46.57	56.35	54.05	56.40	55.60	49.91	49.78	50.85	50.18	55
5	Project site near Shapmari area	53.14	55.40	55.05	54.53	55	55.80	54.77	54.86	51.02	47.91	47.93	48.95	54.55	53.21	52.88	53.72	55
6	Barni, Gaurambha	51.36	57.98	NM	54.67	60	49.37	48.53	50.53	57.37	60.48	68.05	61.97	56.53	40.65	49.21	48.80	60
7	Khan Jahan Ali Bridge, Khulna	63.38	60.55	66.44	63.46	70	67.65	65.32	66.05	60.75	62.81	63.05	62.20	65.55	66.86	66.52	66.31	70
8	Mongla Port area	60.49	62.10	63.43	62.01	75	55.66	55.85	57.25	59.74	62.38	61.07	61.06	64.92	67.90	63.71	66.41	75
9	Harbaria, Sundarbans	47.62	42.18	NM	44.90	50	44.71	NM	44.10	45.59	42.29	41.35	43.94	47.80	52.15	41.2	49.97	50
10	Akram Point, Sundarbans	44.05	45.62	NM	44.84	50	42.60	NM	44.86	NM	36.59	40.46	36.59	51.04	45.11	43.1	51.04	50
11	Hiron Point, Sundarbans	NM	NM	NM	NM	50	41.34	NM	40.28	41.3	39.41	NM	40.34	NM	NM	NM	NM	50

*Source: CEGIS field Survey; Note: NM-Not measured; *Std- Standard as defined in National Noise Control Rules 2006.*

Table C.7 Ambient noise monitoring status at the monitored locations

Sl No	Location	QM 26 (Noise Level in dB (A)) Oct, 2020				QM 27 (Noise Level in dB (A)) Jan, 2021				QM 28 (Noise Level in dB (A)) Apr, 2021				QM 29 (Noise Level in dB (A) Jul, 2021				Std*
		Morning (9:00)	A. noon (13:00)	Evening (18:00)	Day time AVG	Morning (9:00)	A. noon (13:00)	Evening (18:00)	Day time AVG	Morning (9:00)	A. noon (13:00)	Evening (18:00)	Day time AVG	Morning (9:00)	A. noon (13:00)	Evening (18:00)	Day time AVG	Day time
1	Chalna, Dacope	65.91	51.62	56.93	58.15	58.33	NM	62.68	60.50	61.35	61.74	61.22	61.44	50.96	51.08	51.57	51.21	70
2	NW Corner of the Project area	47.82	50.15	47.45	48.48	45.00	52.75	56.51	51.42	50.65	48.34	NM	49.50	49.60	51.64	49.09	50.11	55
3	Chunkuri-2, Bajua	43.58	47.68	46.45	45.91	48.75	45.45	46.96	47.05	50.22	52.90	50.81	51.31	49.93	51.65	49.52	50.36	55
4	SW corner of the Project area	49.50	48.83	49.22	49.18	NM	50.88	53.84	52.36	55.41	54.85	55.45	55.24	49.82	54.82	51.07	51.90	55
5	Project site near Shapmari area	50.23	41.71	41.43	44.45	49.19	47.07	51.00	49.09	52.23	51.24	52.67	52.05	53.45	54.35	53.71	53.84	55
6	Barni, Gaurambha	67.71	51.76	55.51	58.33	51.69	51.99	55.60	53.09	54.16	51.69	51.15	52.34	52.73	NM	49.28	51.00	60
7	Khan Jahan Ali Bridge, Khulna	81.72	81.45	82.25	81.81	61.95	NM	61.93	61.94	56.08	54.09	53.79	54.65	52.78	51.29	53.05	52.38	70
8	Mongla Port area	74.72	75.67	80.37	76.92	55.16	56.85	57.53	56.52	54.01	52.41	54.48	53.63	55.26	55.54	55.68	54.49	75
9	Harbaria, Sundarbans	59.01	NM	50.06	54.54	46.98	41.82	NM	44.40	48.54	47.54	NM	48.04	NM	NM	NM	NM	50
10	Akram Point, Sundarbans	NM	42.23	NM	42.23	40.34	35.35	NM	37.85	45.95	40.89	NM	43.42	46.31	42.94	NM	44.62	50
11	Hiron Point, Sundarbans	52.40	49.01	NM	50.70	42.50	35.23	NM	38.85	NM	NM	NM	NM	49.70	51.2	NM	50.94	50

*Source: CEGIS field Survey; Note: NM-Not measured; *Std- Standard as defined in National Noise Control Rules 2006.*

Table C.8 Ambient noise monitoring status at the monitored locations

Sl No	Location	QM 30 (Noise Level in dB (A)) Oct, 2021				QM 31 (Noise Level in dB (A)) Jan, 2022				Std*
		Morning (9:00)	A. noon (13:00)	Evening (18:00)	Day time AVG	Morning (9:00)	A. noon (13:00)	Evening (18:00)	Day time AVG	Day time
1	Chalna, Dacope	68.9	52.08	58.3	64.57	56	59.05	64.08	59.71	70
2	NW Corner of the Project area	47.99	51.61	48.17	49.59	49	48.90	48.56	48.82	55
3	Chunkuri-2, Bajua	45.31	48.07	46.8	46.87	49.85	47.48	49.70	49.01	55
4	SW corner of the Project area	49.66	49.49	48.95	49.37	63.74	49.95	50.25	54.65	55
5	Project site near Shapmari area	50.94	42.29	41.88	47.17	50.05	50.57	49.45	50.03	55
6	Barni, Gaurambha	68.37	51.5	56.61	63.96	47.60	49.57	49.51	48.89	60
7	Khan Jahan Ali Bridge, Khulna	77.75	80.58	81.43	80.18	61.04	63.52	62.44	62.33	70
8	Mongla Port area	73.94	75.15	79.45	76.86	NM	53.89	58.02	55.95	75
9	Harbaria, Sundarbans	59.51	50.62	NM	57.02	49.85	44.77	NM	47.31	50
10	Akram Point, Sundarbans	44.22	42.12	NM	43.29	38.66	36.15	NM	37.41	50
11	Hiron Point, Sundarbans	53.99	49.41	NM	52.27	39.5	33.08	NM	36.29	50

*Source: CEGIS field Survey; Note: NM-Not measured; *Std- Standard as defined in National Noise Control Rules 2006.*

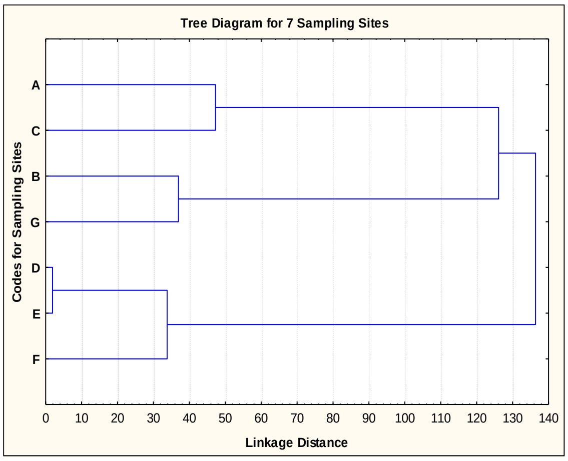
Table C.9 Ambient noise monitoring status at the monitored locations

Sl No	Location	QM 32(Noise Level in dB (A)) May, 2021				Std*
		Morning (9:00)	A. noon (13:00)	Evening (18:00)	Day time AVG	Day time
1	Chalna, Dacope	56	61.25	59.97	59.08	70
2	NW Corner of the Project area	48.63	48.64	48.64	48.60	55
3	Chunkuri-2, Bajua	48.32	48.72	49.70	48.91	55
4	SW corner of the Project area	50.31	50.05	51.24	50.53	55
5	Project site near Shapmari area	49.70	49.34	50.24	49.76	55
6	Barni, Gaurambha	47.60	45.05	49.04	47.23	60
7	Khan Jahan Ali Bridge, Khulna	56.46	56.93	62.42	58.60	70
8	Mongla Port area	55.95	56.99	59.19	57.38	75
9	Harbaria, Sundarbans	52.31	46.44	NM	49.37	50
10	Akram Point, Sundarbans	46.22	39.94	NM	43.08	50
11	Hiron Point, Sundarbans	NM	NM	NM	NM	50

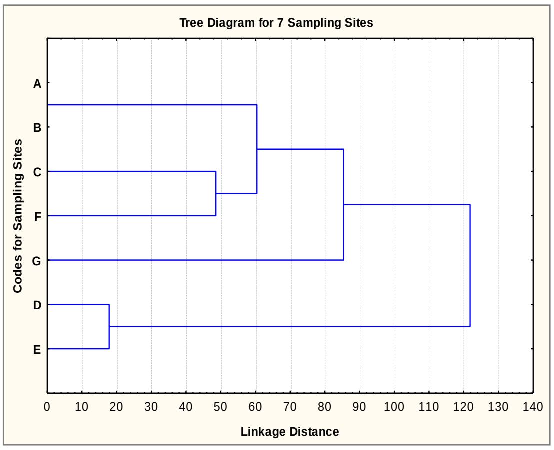
*Source: CEGIS field Survey; Note: NM-Not measured; *Std- Standard as defined in National Noise Control Rules 2006.*

(D) Fisheries resources monitoring data

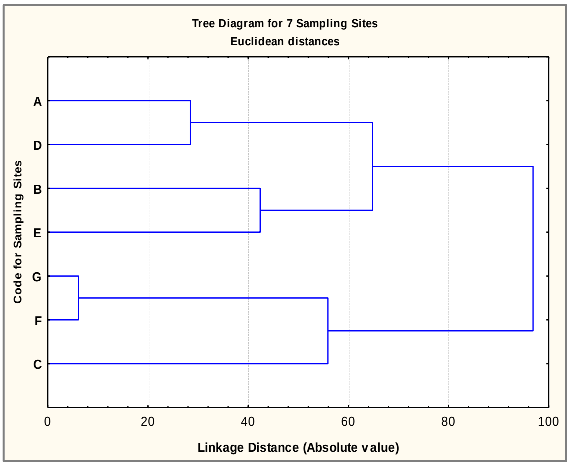
D1: Classification of functional habitat



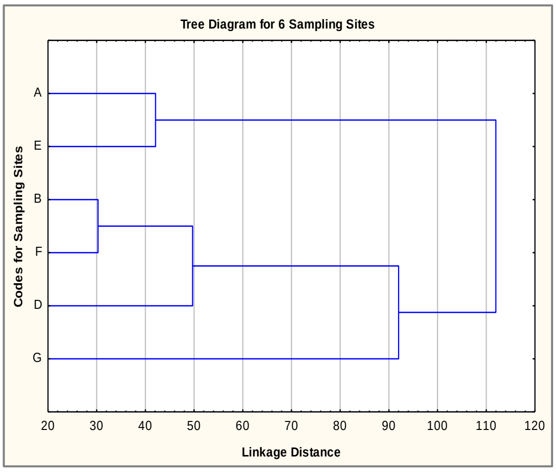
1st Monitoring, April, 2014



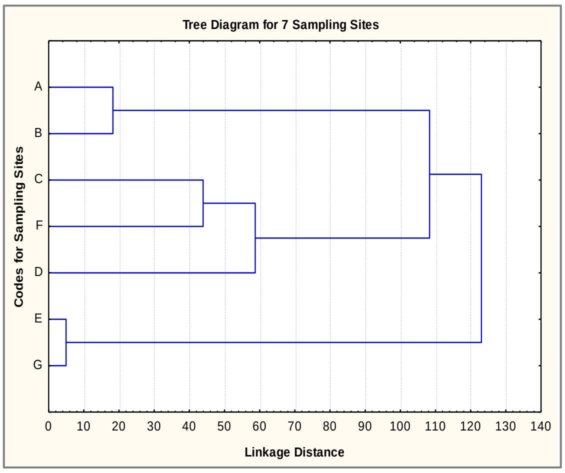
2nd Monitoring, July 2014



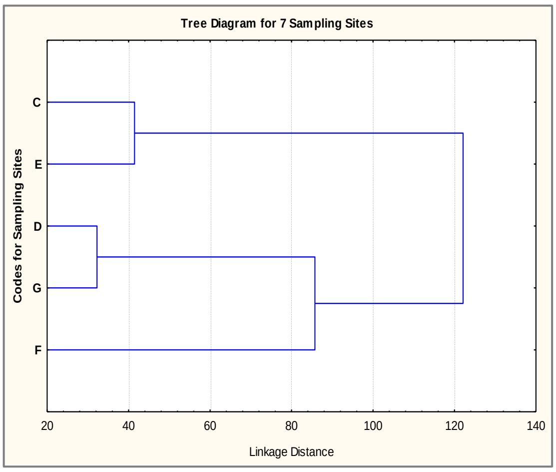
3rd Monitoring, October, 2014



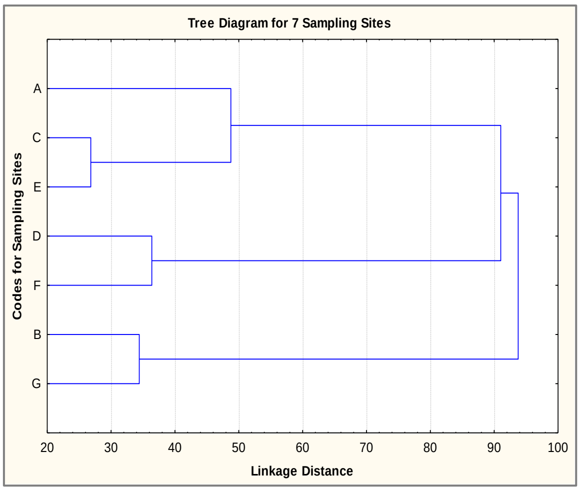
4th Monitoring, January 2015



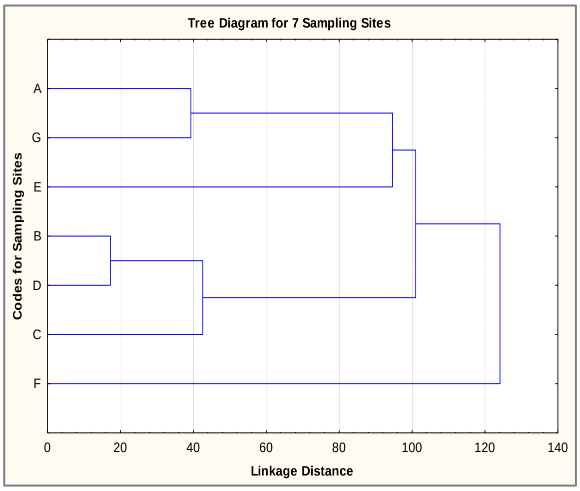
5th Monitoring, April, 2015



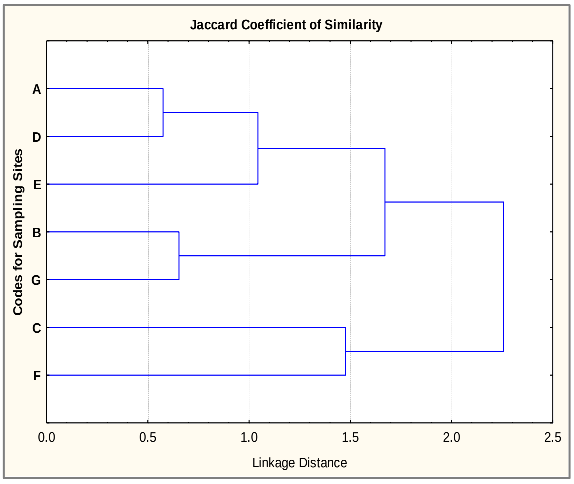
6th Monitoring, August, 2015

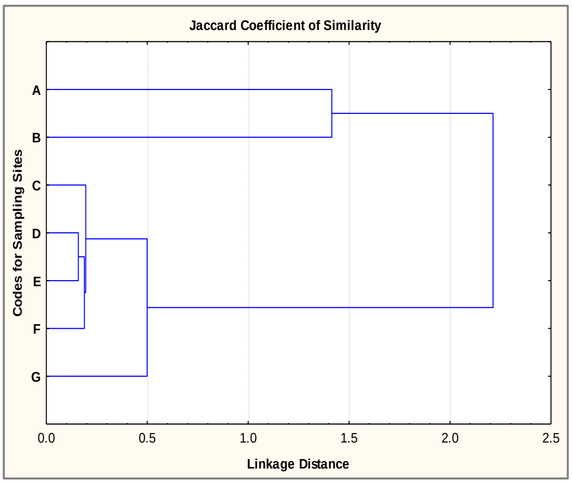


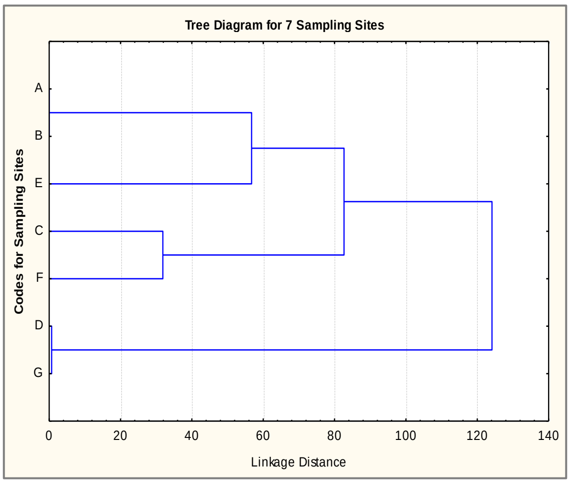
7th Monitoring, October, 2015



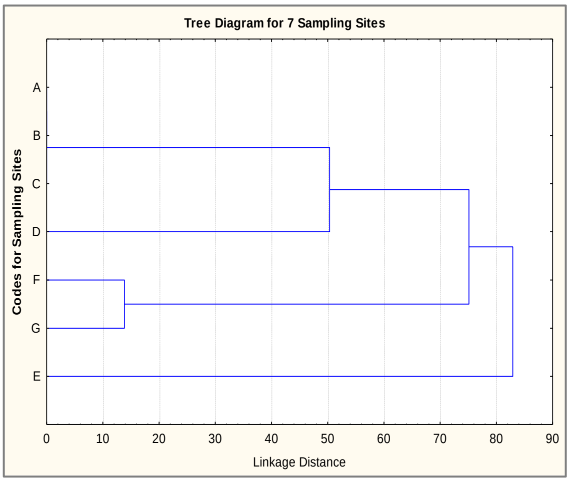
8th Monitoring, January, 2016



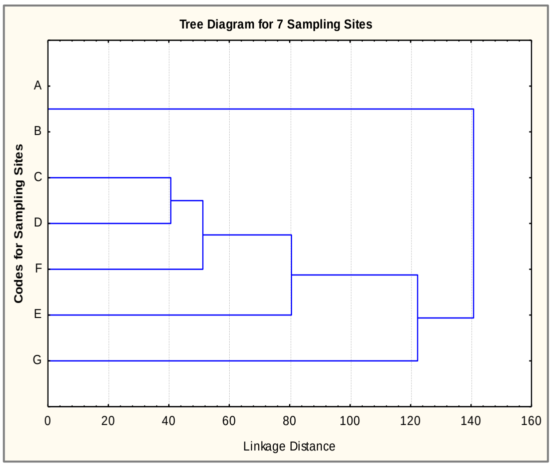




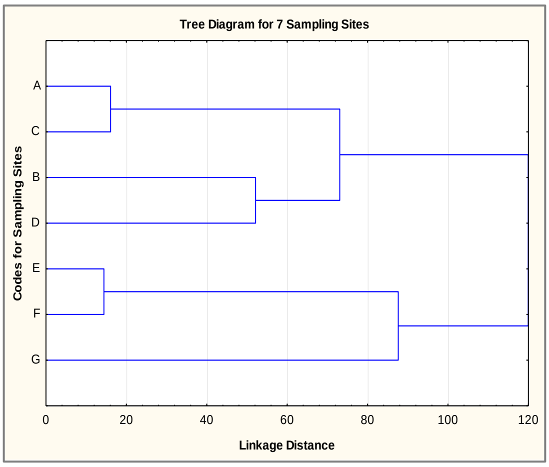
9th Monitoring, April, 2016



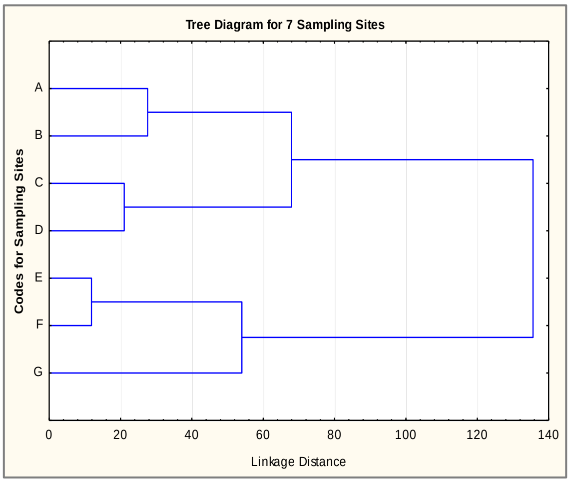
10th Monitoring, July, 2016



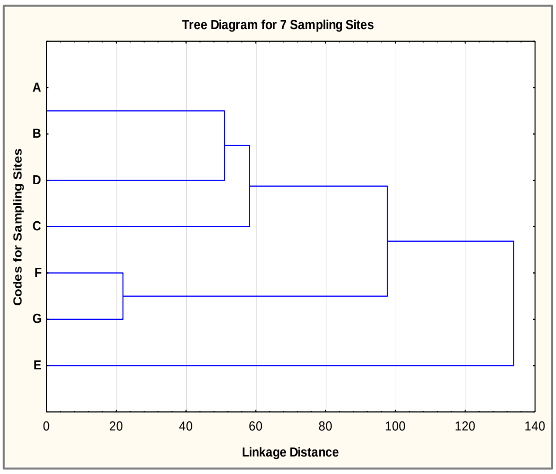
11th Monitoring, October, 2016



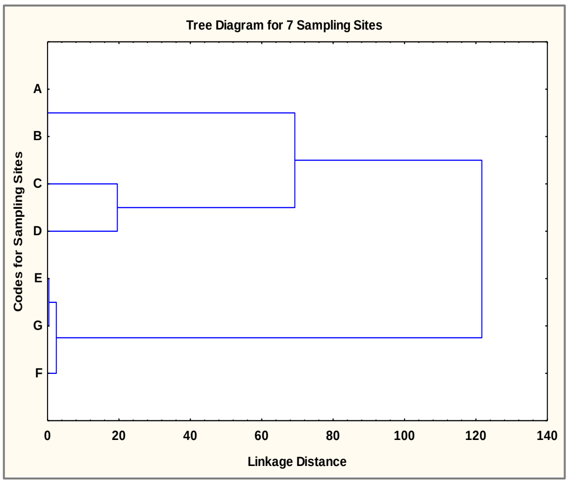
12th Monitoring, January, 2017



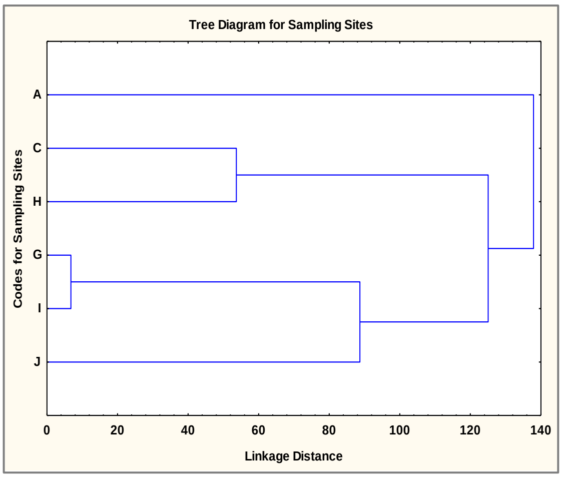
13th Monitoring, April, 2017



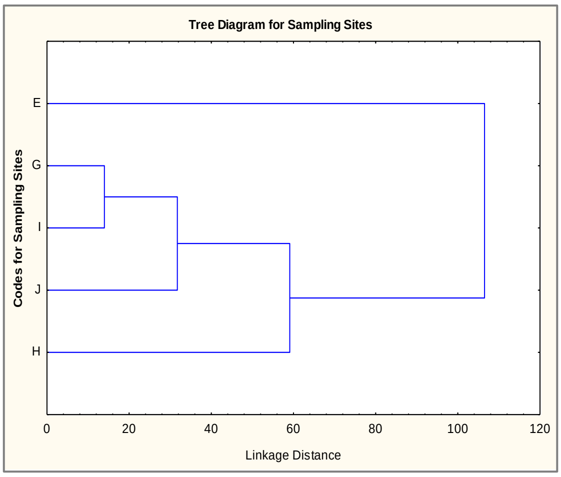
14th Monitoring, October, 2017



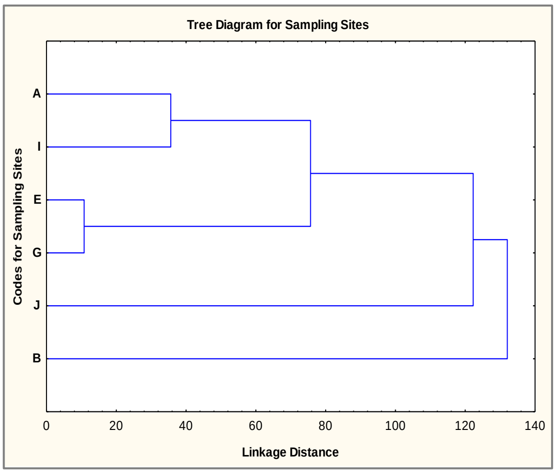
15th Monitoring, January, 2018



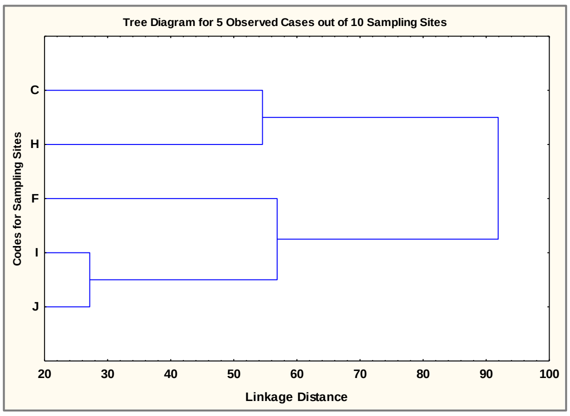
16th Monitoring, April, 2018



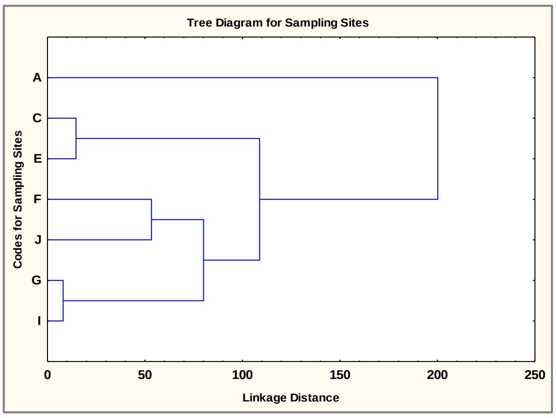
17th Monitoring, July, 2018



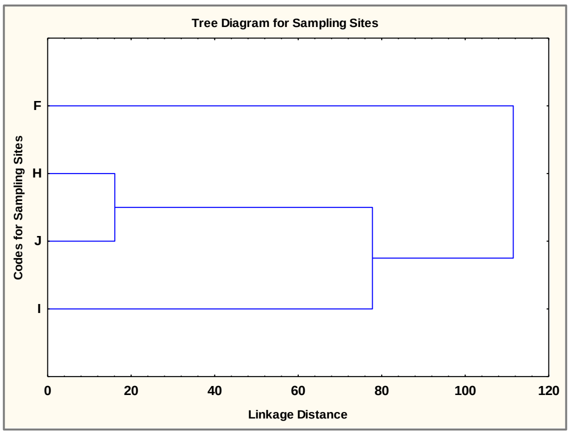
18th Monitoring, November, 2018



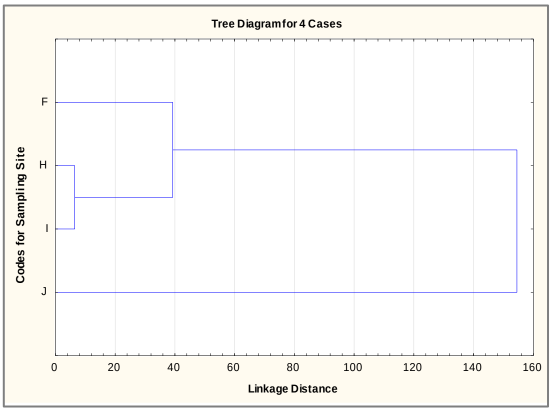
19th Monitoring, February, 2019



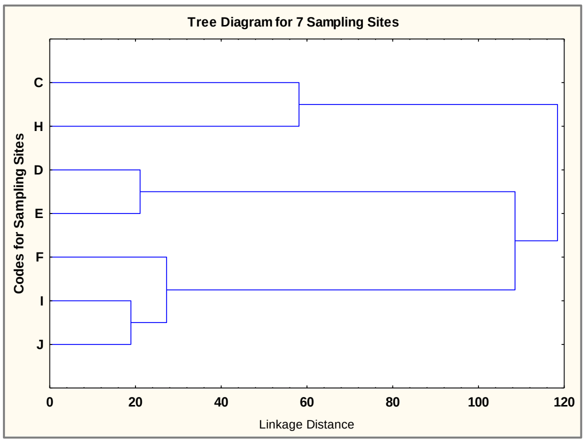
20th Monitoring, April, 2019



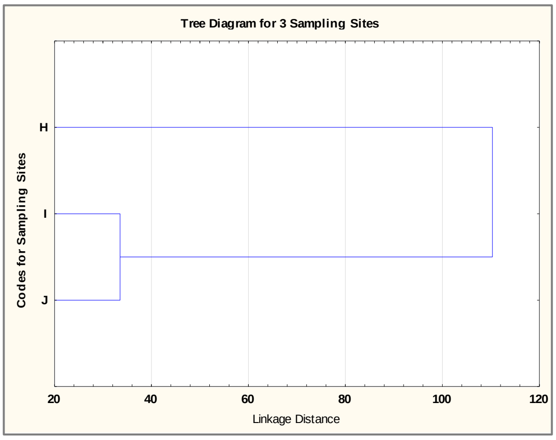
21st Monitoring, July 2019



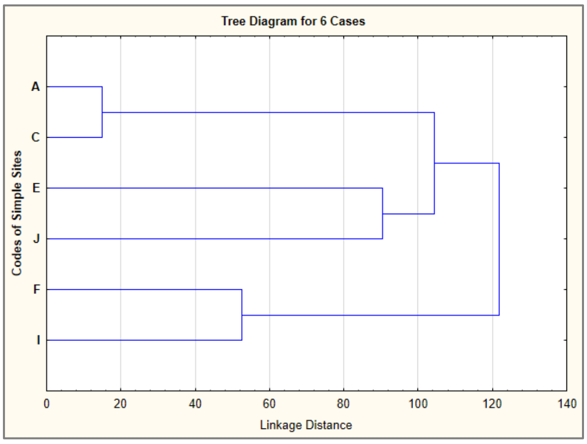
22nd Monitoring, November, 2019



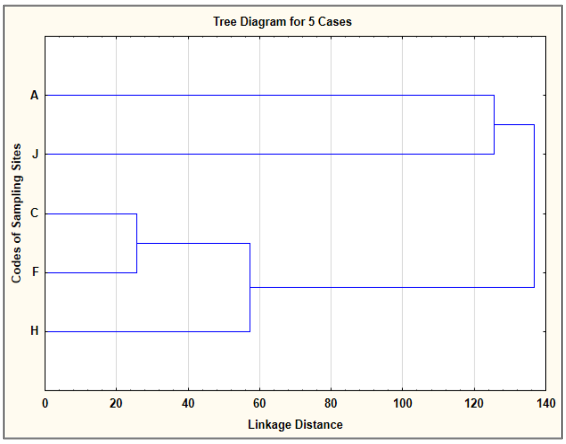
23rd Monitoring, February 2020



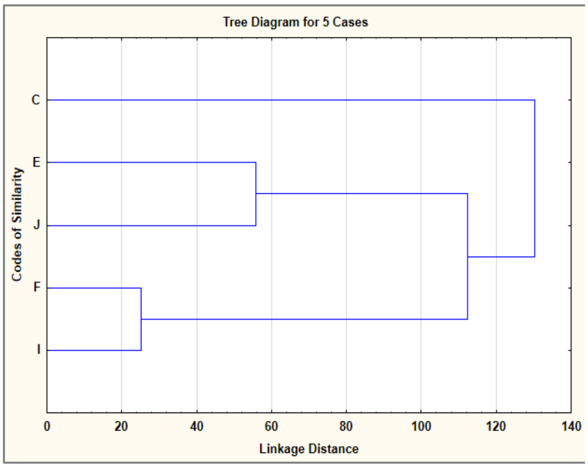
25th Monitoring, July 2020



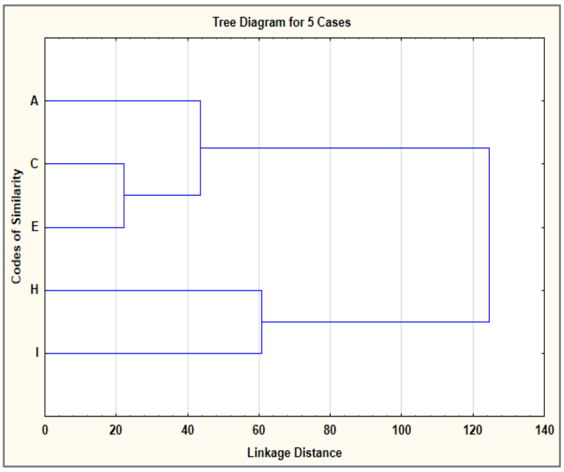
26th Monitoring, November 2020



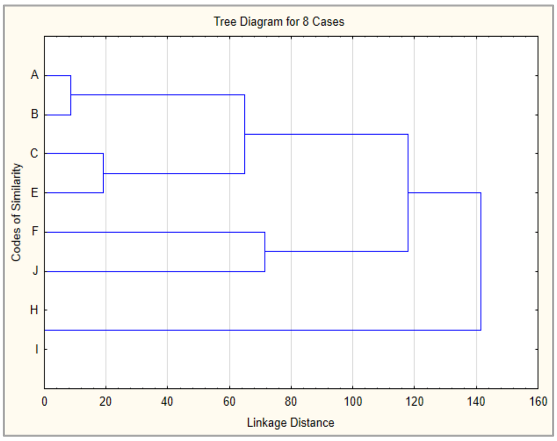
27th Monitoring, January 2021



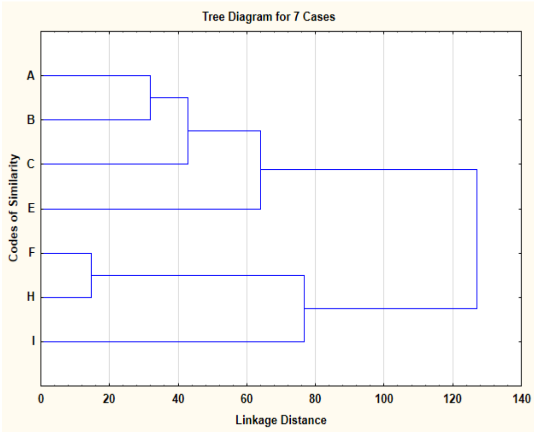
28th monitoring, April 2021



29th Monitoring, August 2021

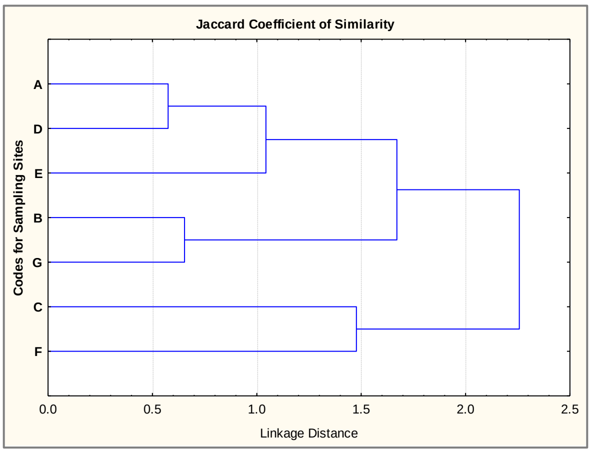


30th Monitoring, November 2021

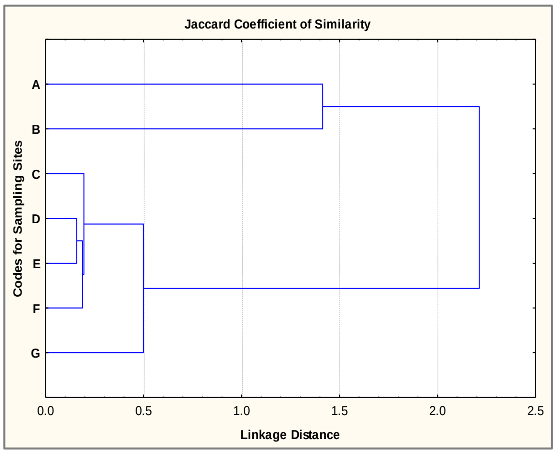


31st Monitoring, February, 2022

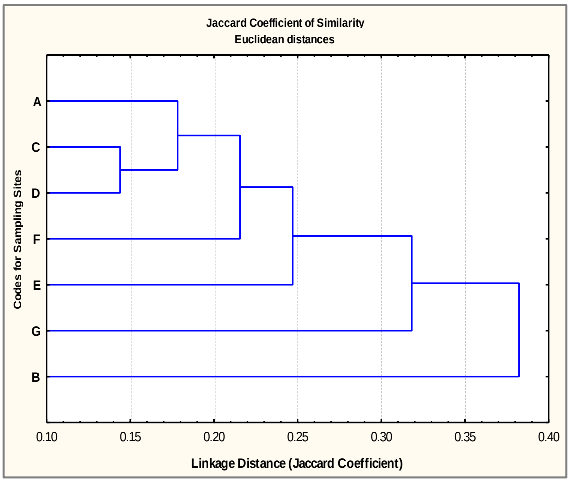
D2: Jaccard Co-efficient of Similarity of Habitats respecting fish species occurrence



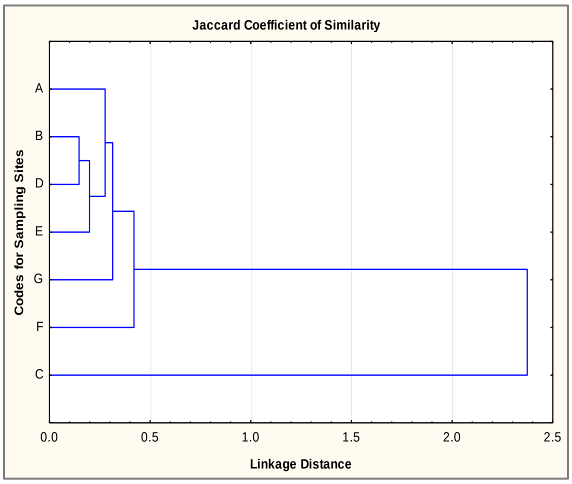
1st Monitoring, April, 2014



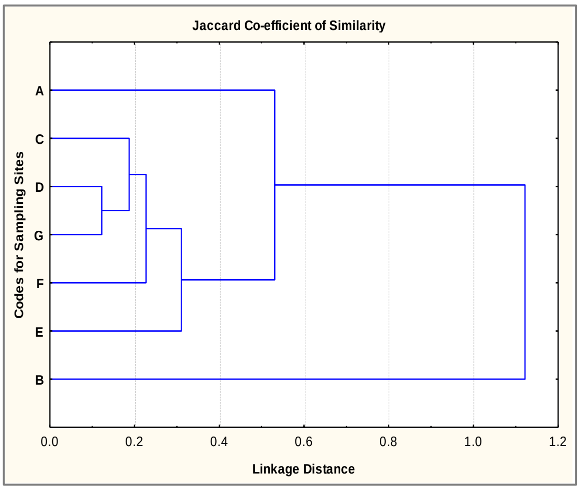
2nd Monitoring, July 2014



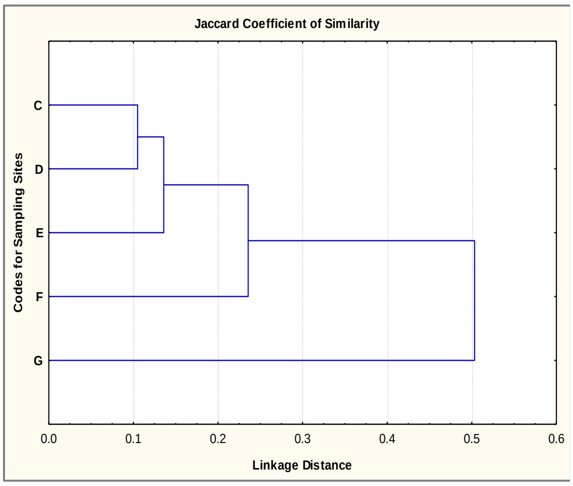
3rd Monitoring, October, 2014



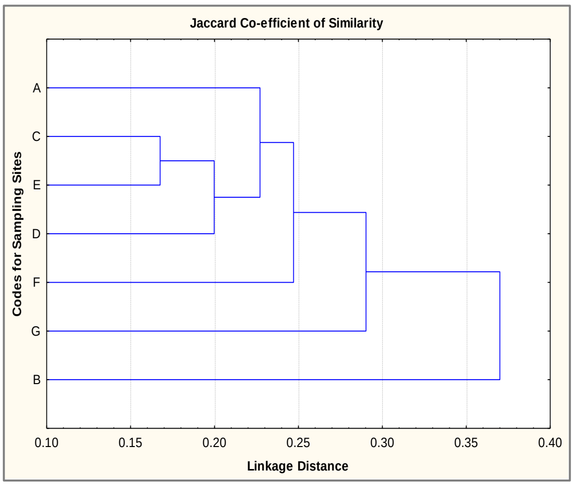
4th Monitoring, January 2015



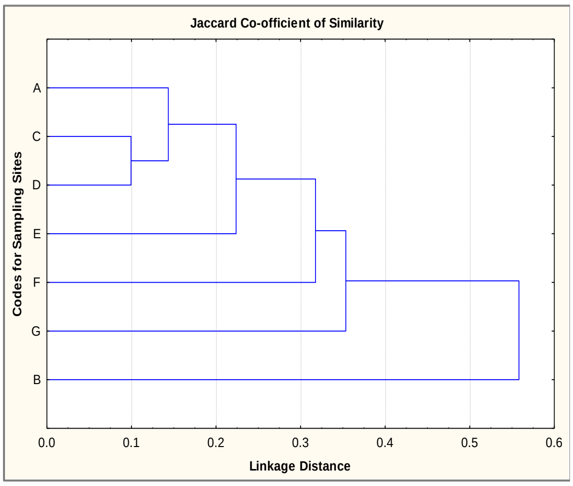
5th Monitoring, April, 2015



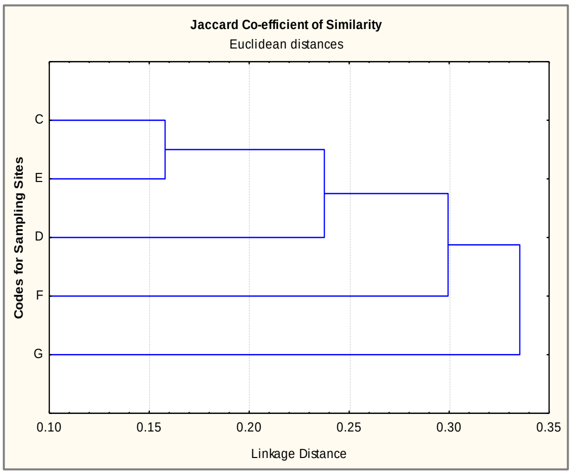
6th Monitoring, August, 2015



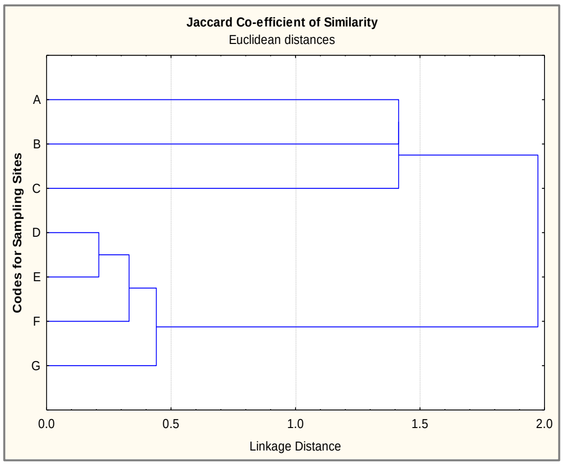
7th Monitoring, October, 2015



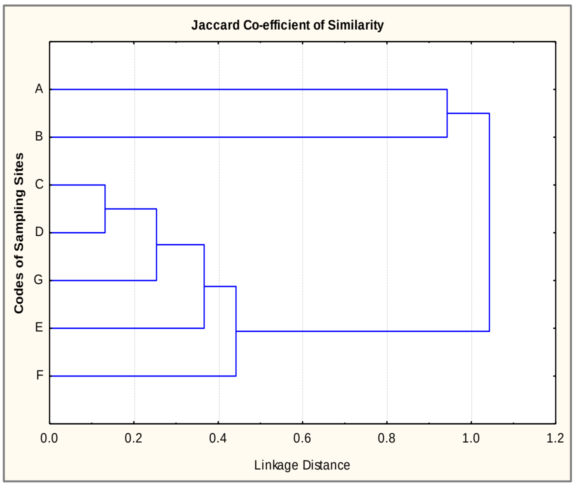
8th Monitoring, January, 2016



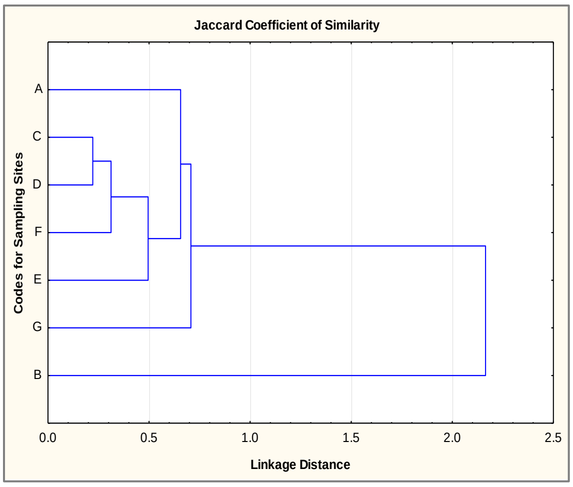
9th Monitoring, April, 2016



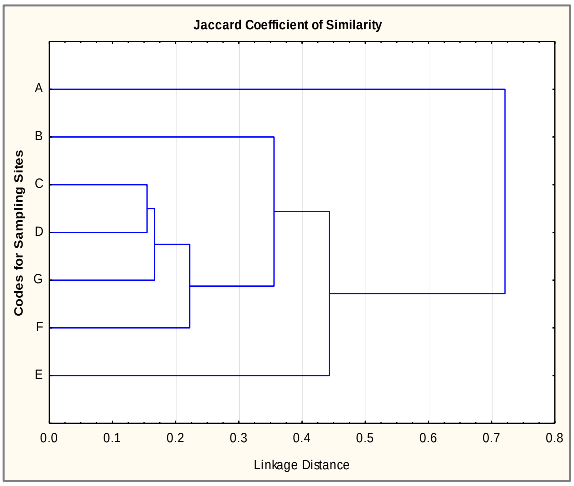
10th Monitoring, July, 2016



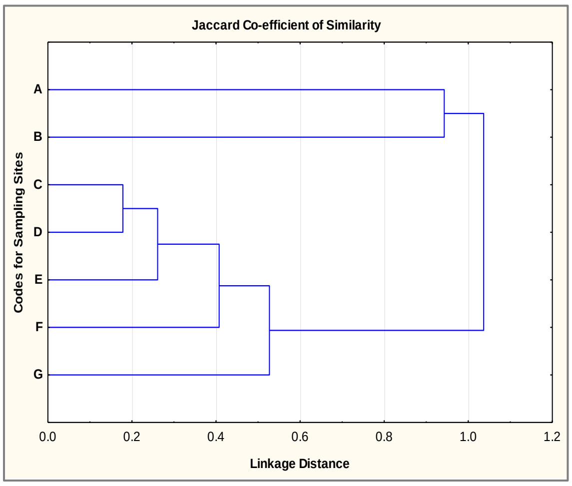
11th Monitoring, October, 2016



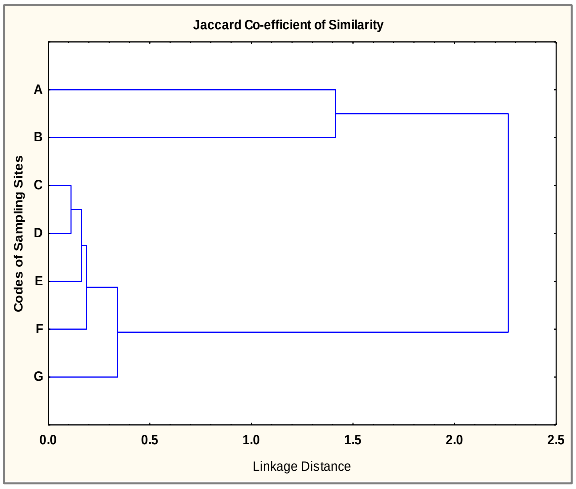
12th Monitoring, January, 2017



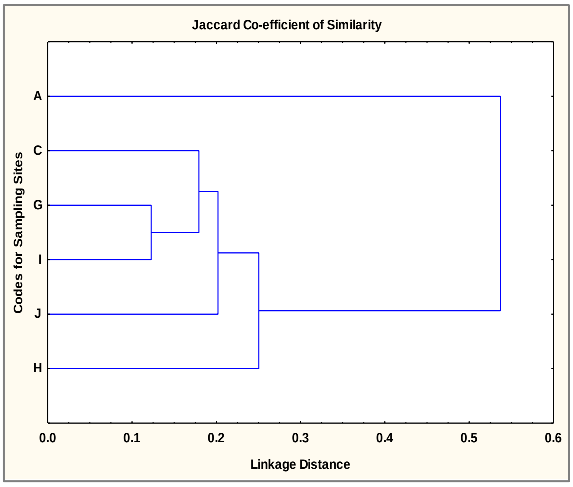
13th Monitoring, April, 2017



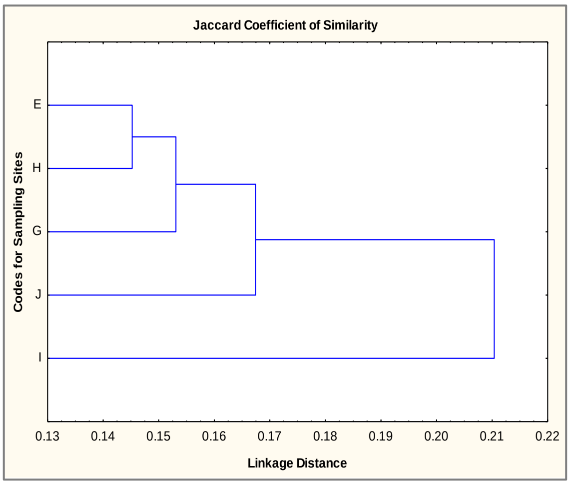
14th Monitoring, October, 2017



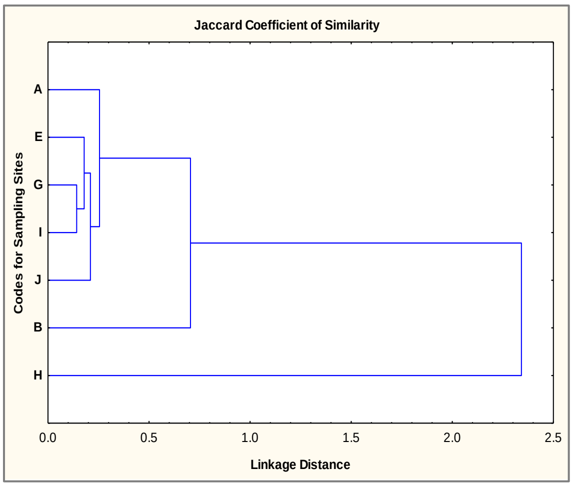
15th Monitoring, January, 2018



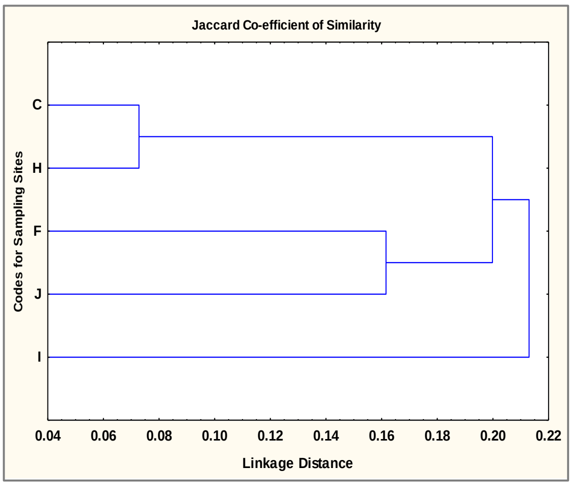
16th Monitoring, April, 2018



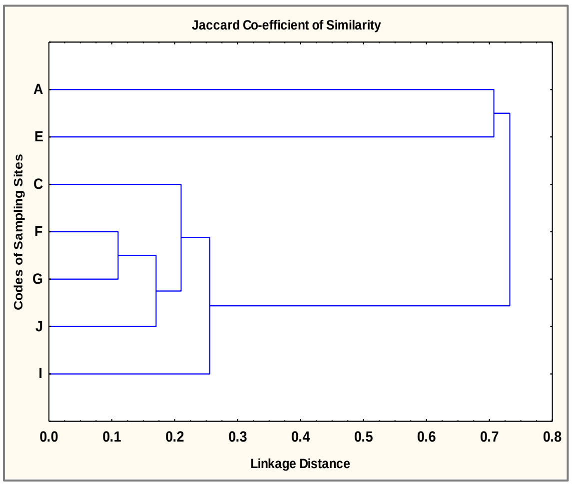
17th Monitoring, July, 2018



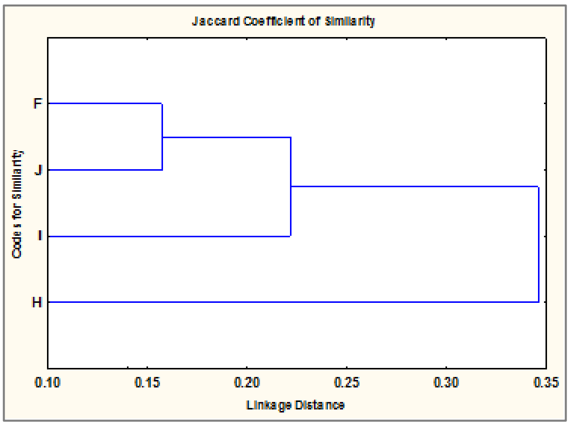
18th Monitoring, November, 2018



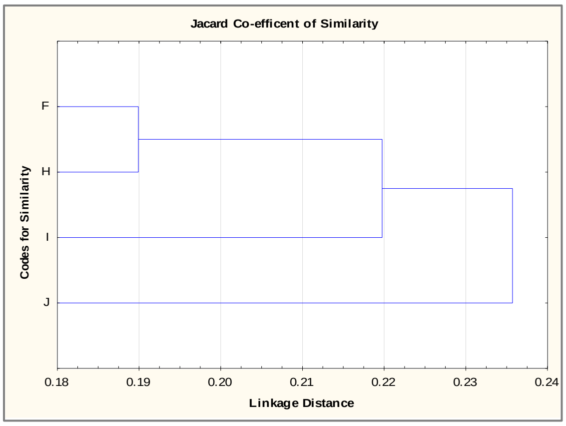
19th Monitoring, February, 2019



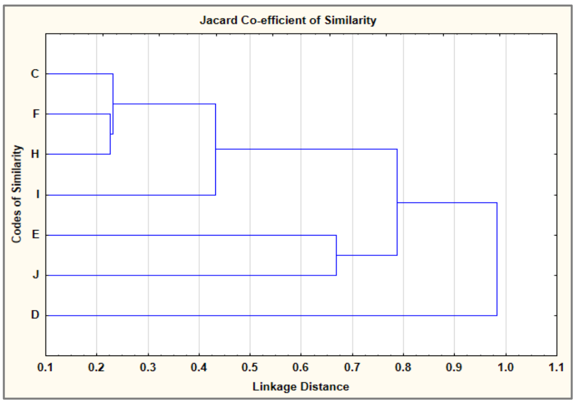
20th Monitoring, April, 2019



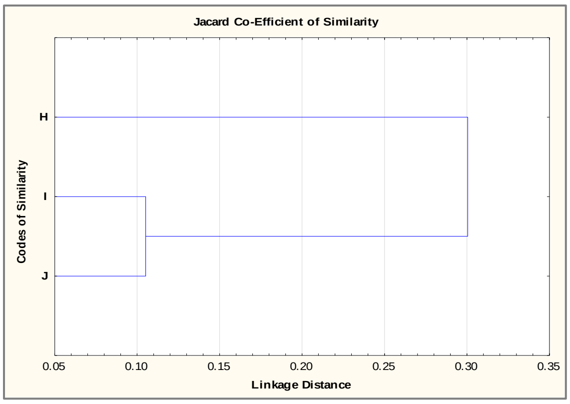
21st Monitoring, July 2019



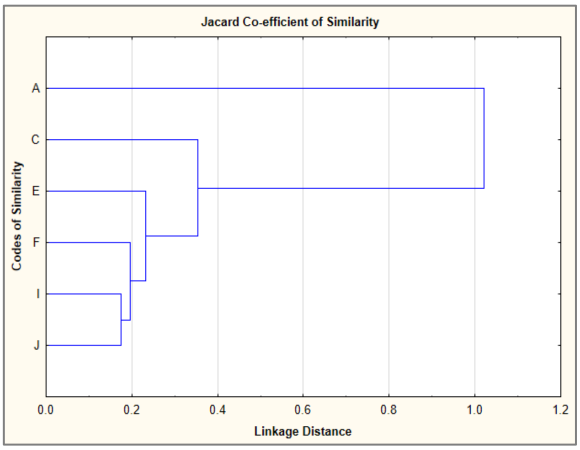
22nd Monitoring, November 2019



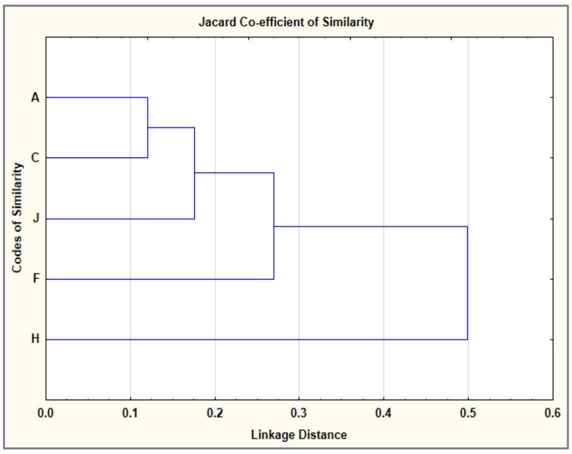
23rd Monitoring, February 2020



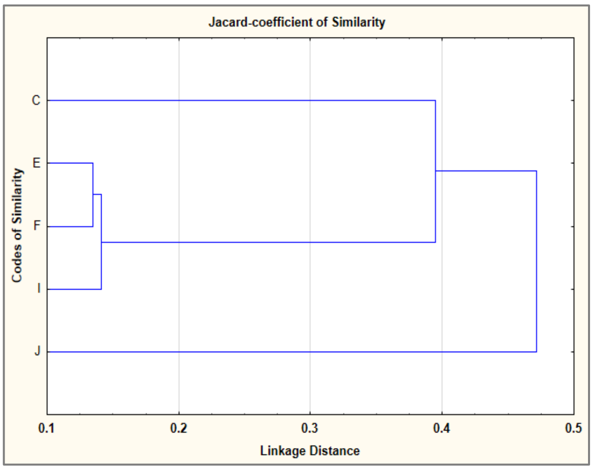
25th Monitoring, July 2020



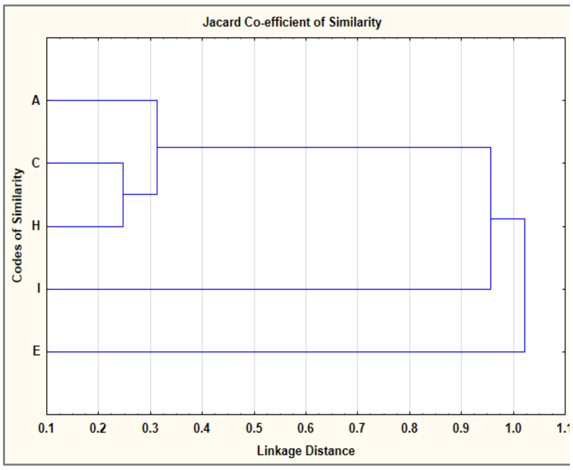
26th Monitoring, November, 2020



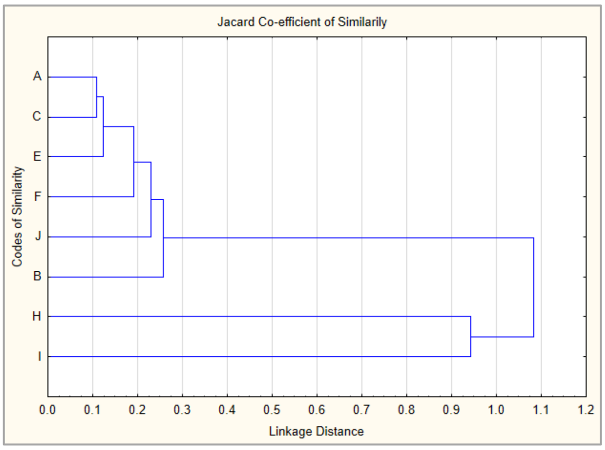
27th Monitoring, January, 2021



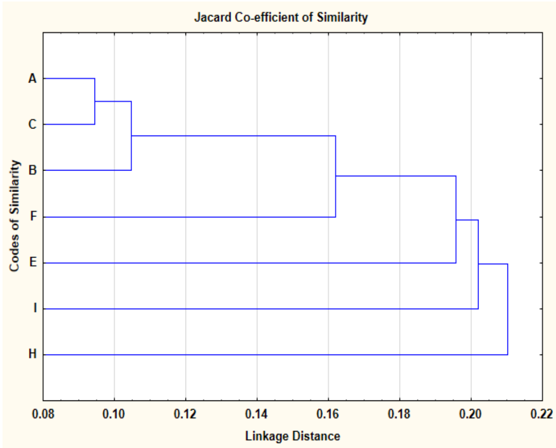
28th monitoring, April, 2021



29th monitoring, August, 2021

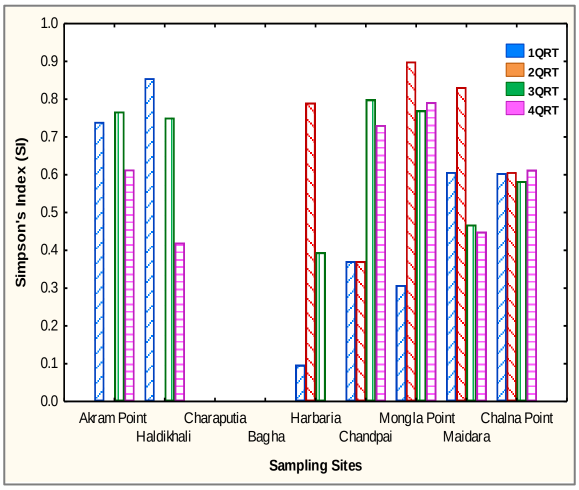


30th Monitoring, November 2021

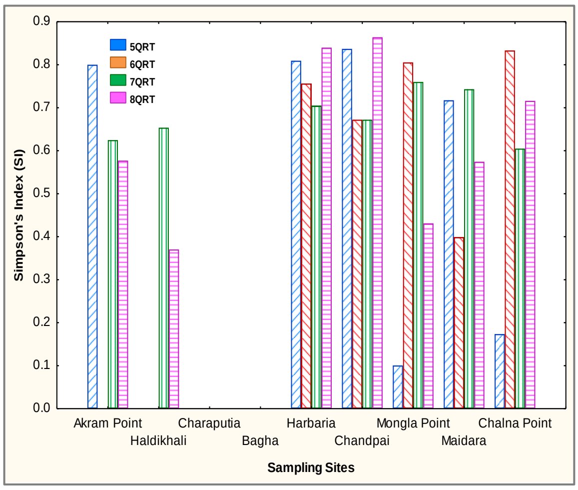


31st Monitoring, February, 2022

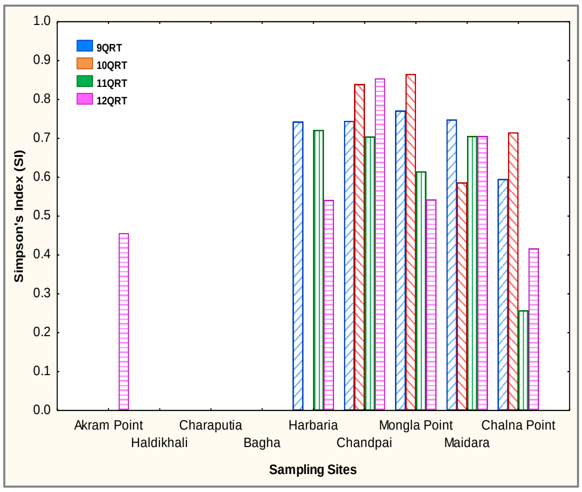
D.3: Site-wise fish species richness (FSR) in the Passur River System



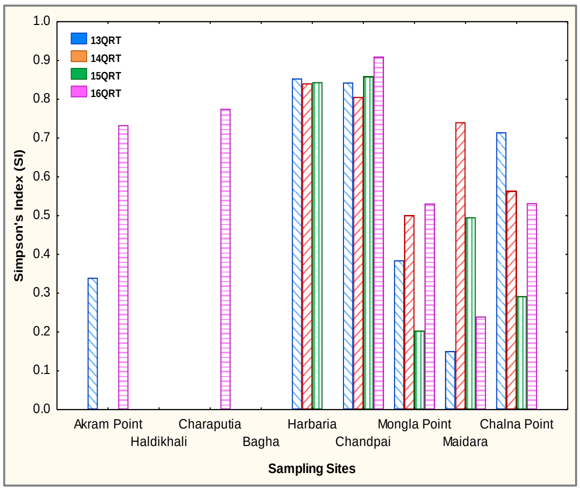
2014-2015



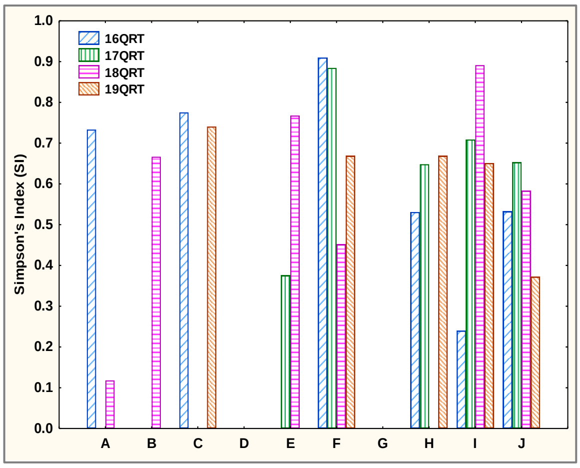
2015-2016



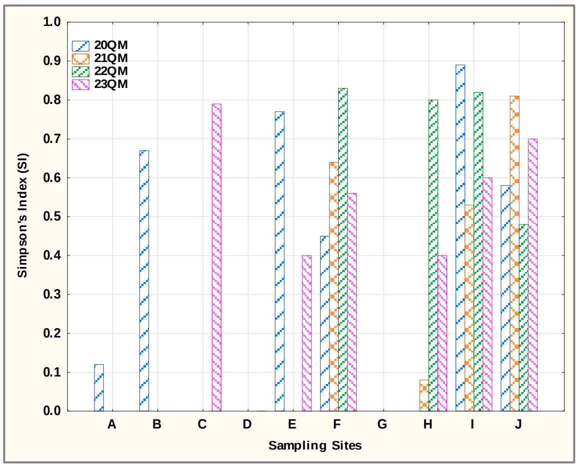
2016-2017



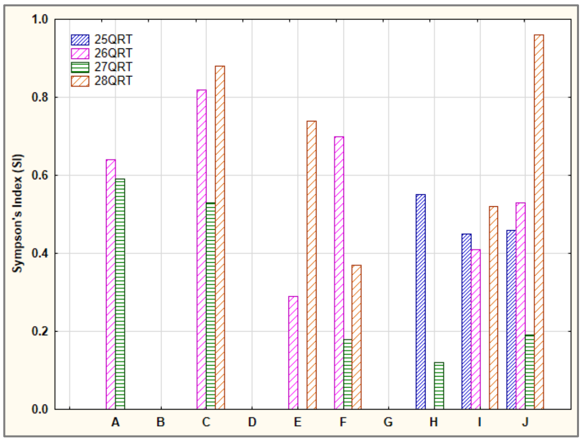
2017-18

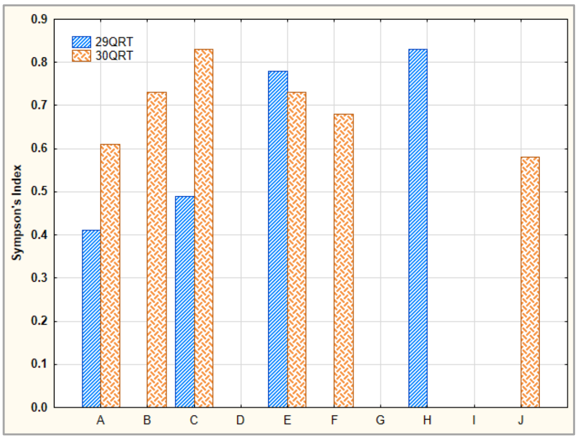


2018-19



2019-20

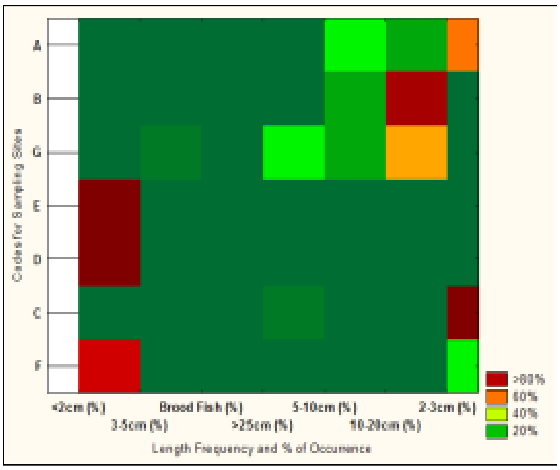




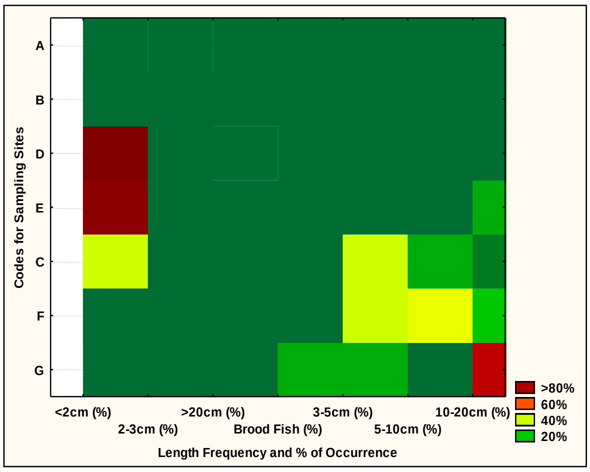
2020-21

2021-2022

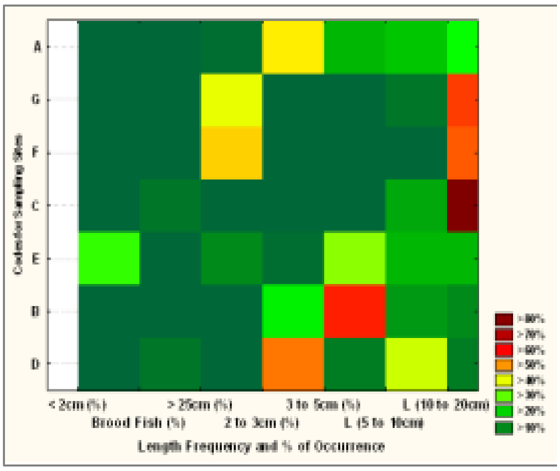
D4: Fish Community Structure



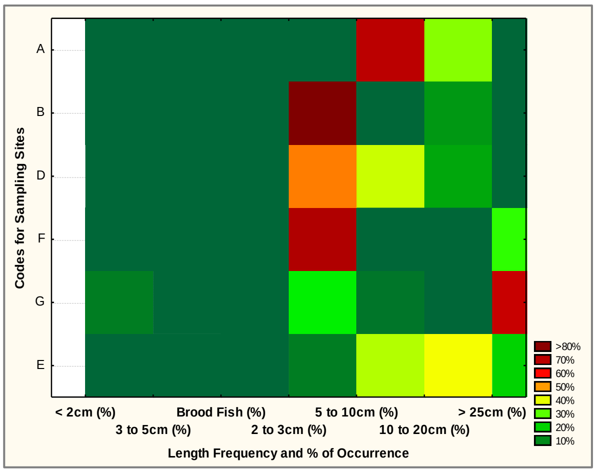
1st Monitoring, April, 2014



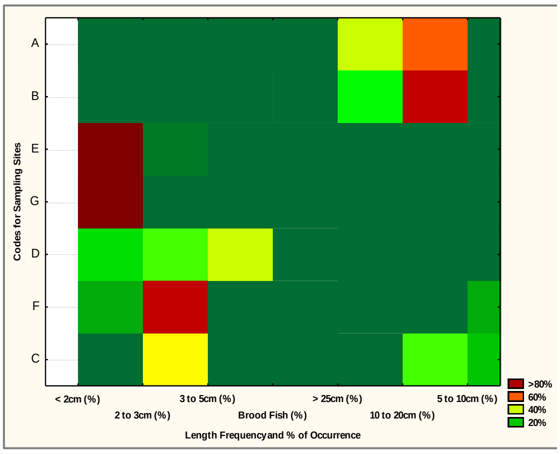
2nd Monitoring, July 2014



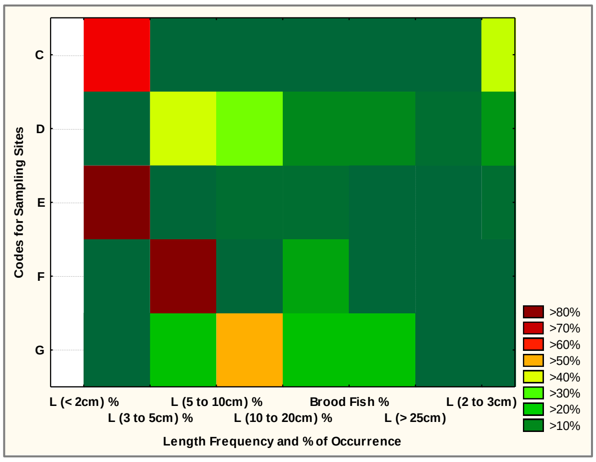
3rd Monitoring, October, 2014



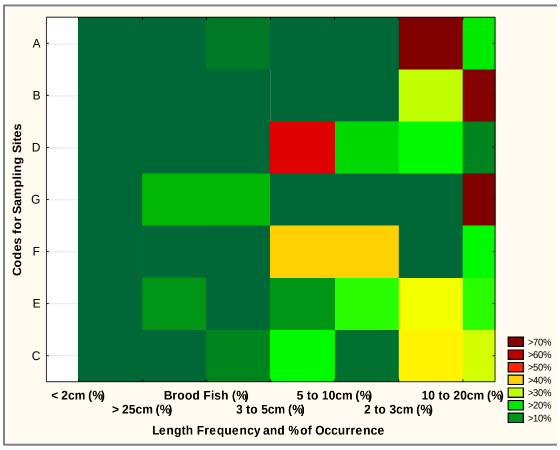
4th Monitoring, January 2015



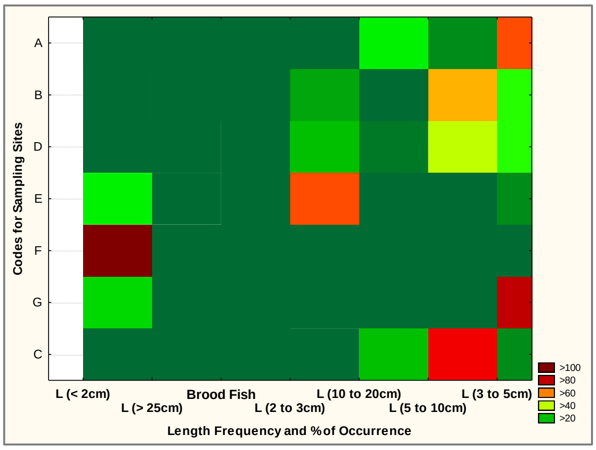
5th Monitoring, April, 2015



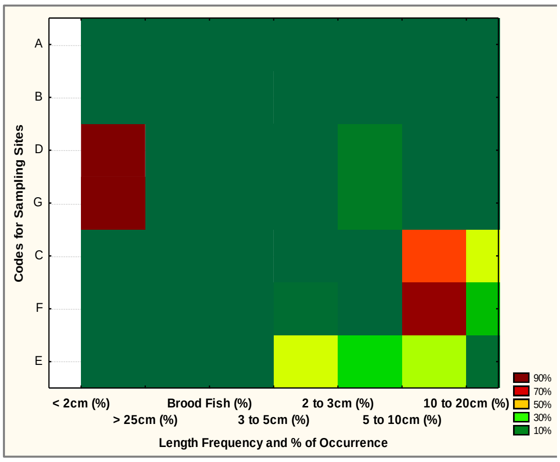
6th Monitoring, August, 2015



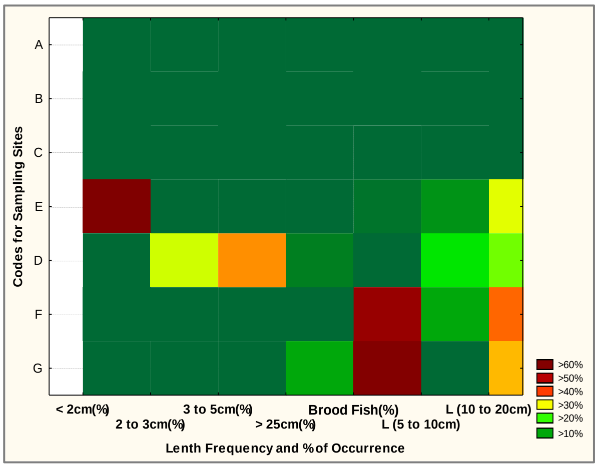
7th Monitoring, October, 2015



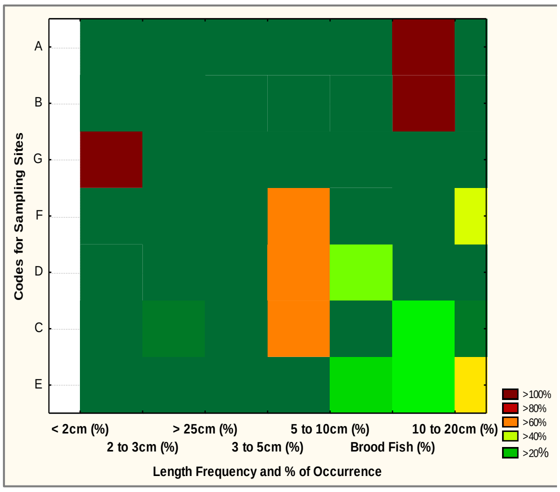
8th Monitoring, January, 2016



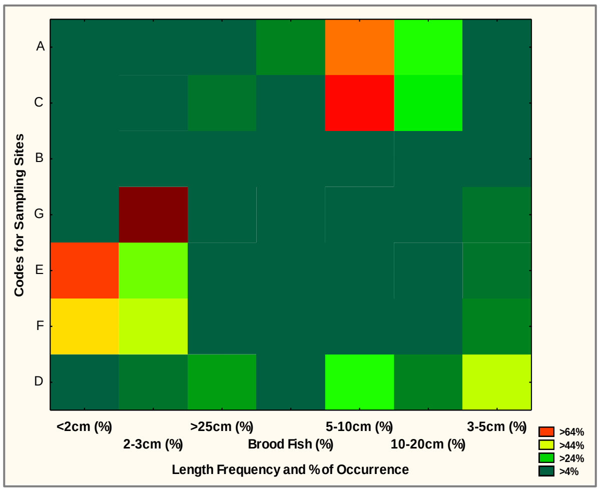
9th Monitoring, April, 2016



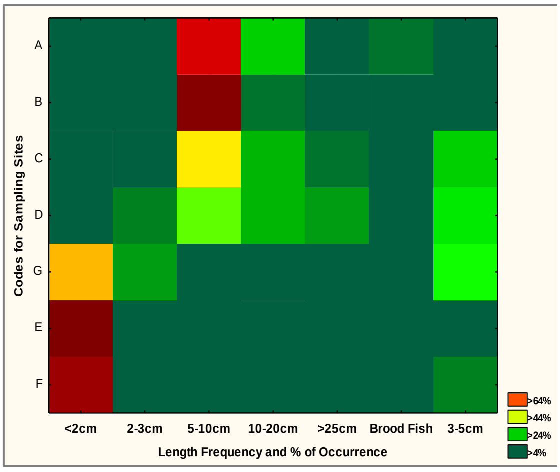
10th Monitoring, July, 2016



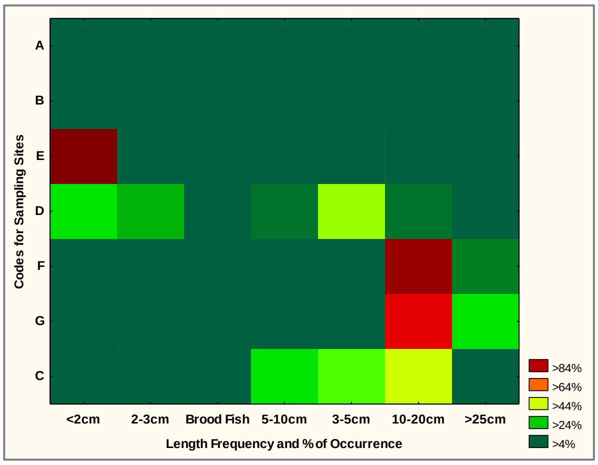
11th Monitoring, October, 2016



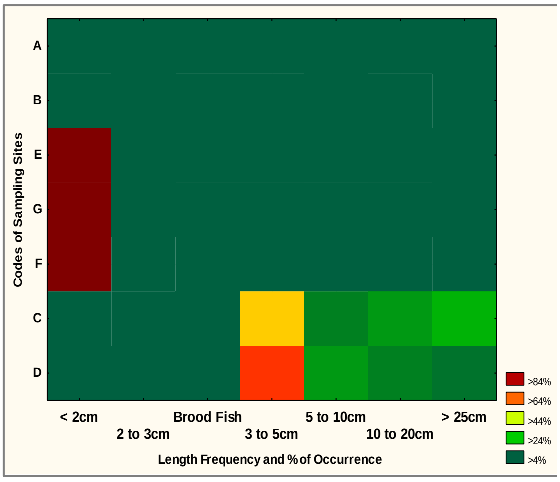
12th Monitoring, January, 2017



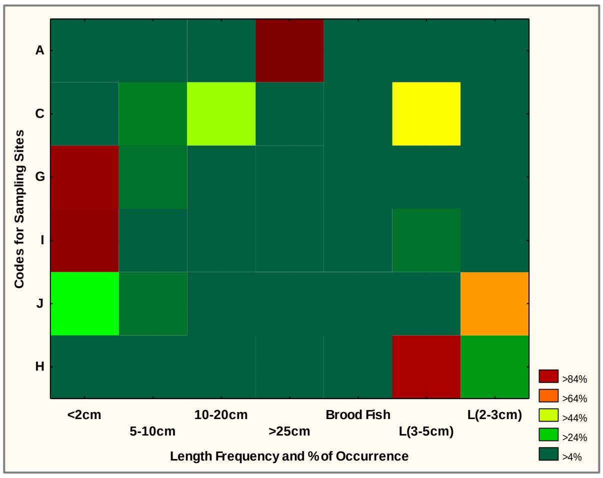
13th Monitoring, April, 2017



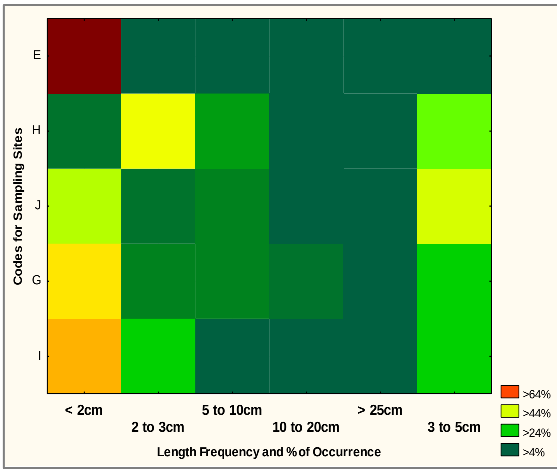
14th Monitoring, October, 2017



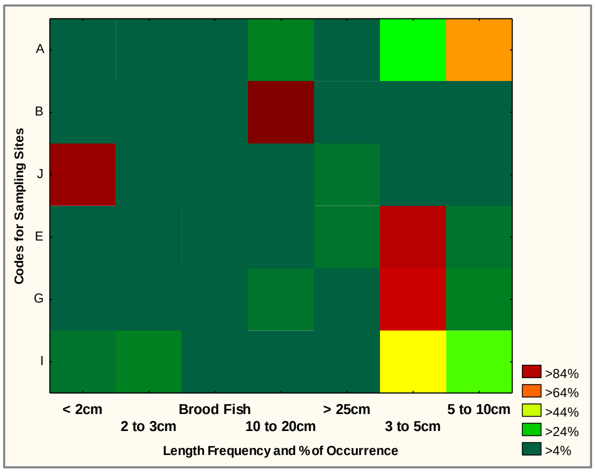
15th Monitoring, January, 2018



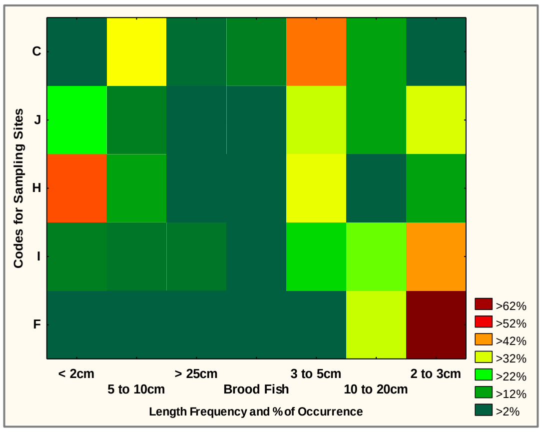
16th Monitoring, April, 2018



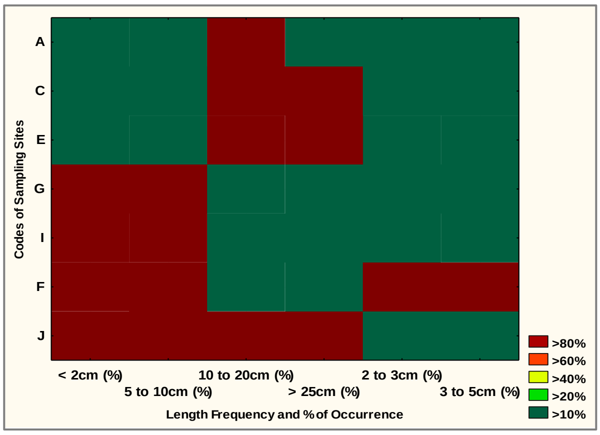
17th Monitoring, July, 2018



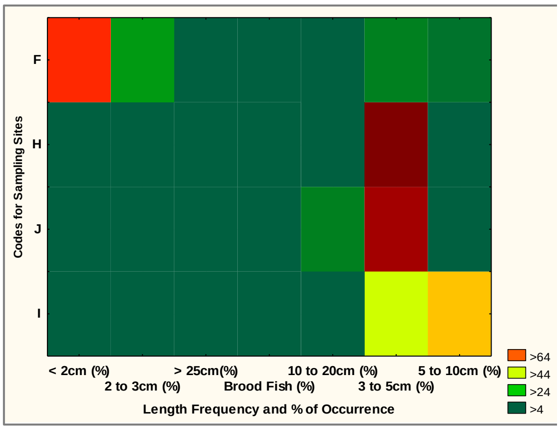
18th Monitoring, November, 2018



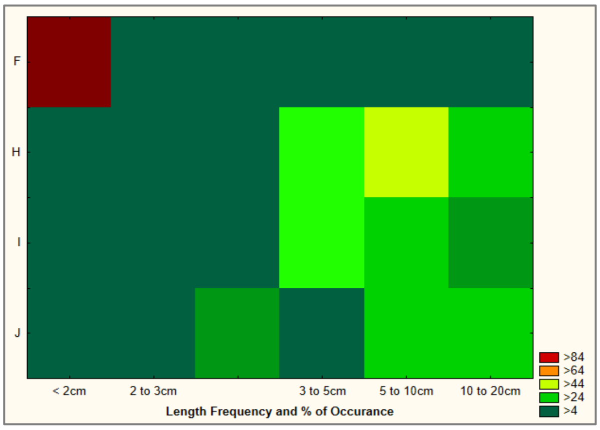
19th Monitoring, February, 2019



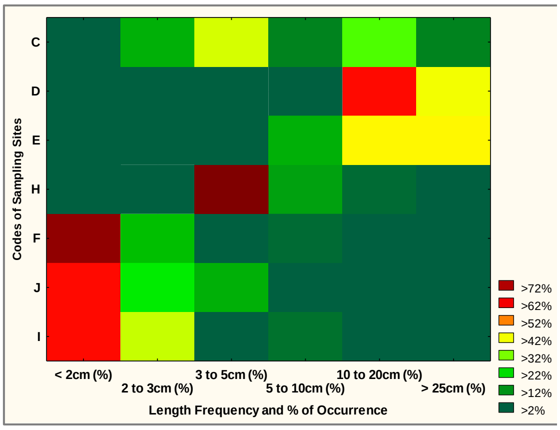
20th Monitoring, April, 2019



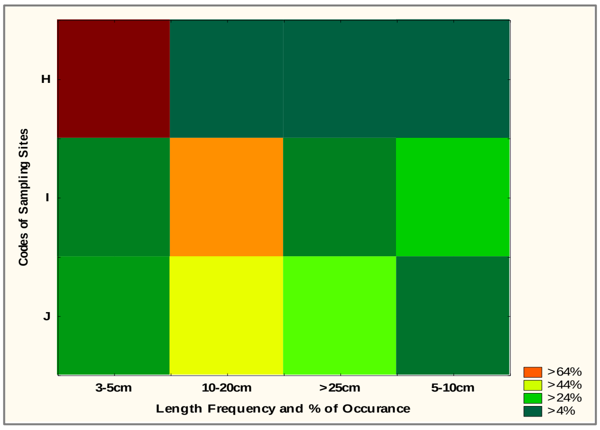
21st Monitoring, July 2019



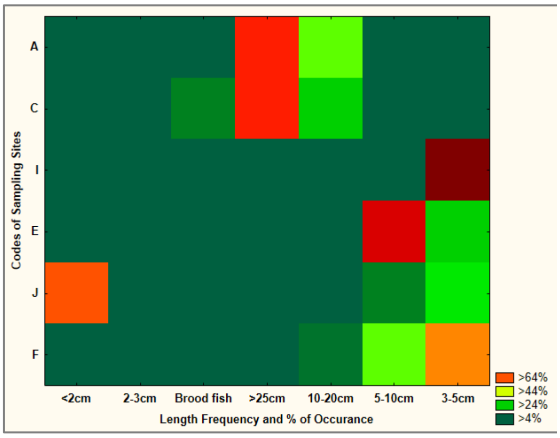
22nd Monitoring, November 2019



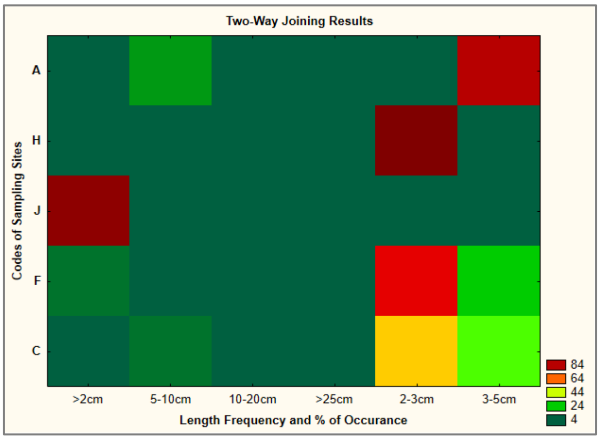
23rd Monitoring, February 2020



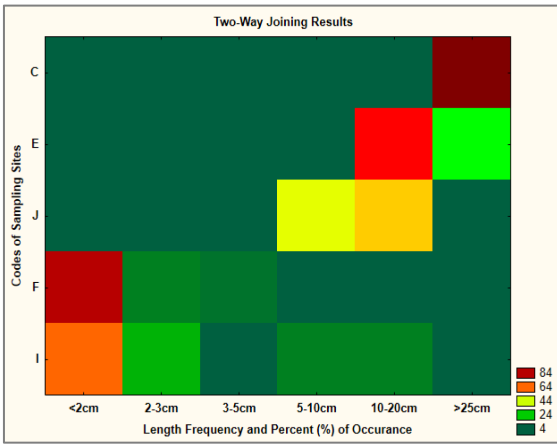
25th Monitoring, July 2020



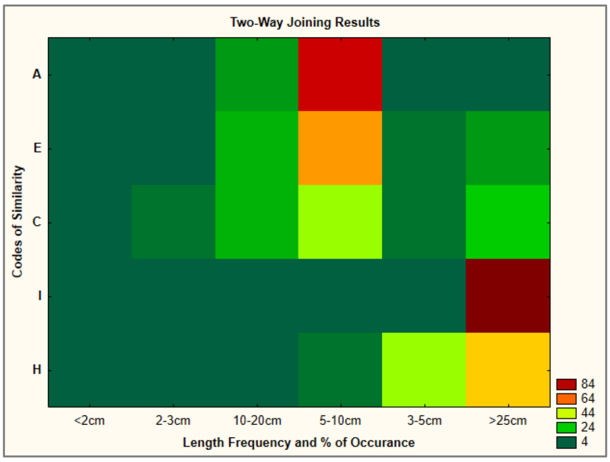
26th Monitoring, November 2021



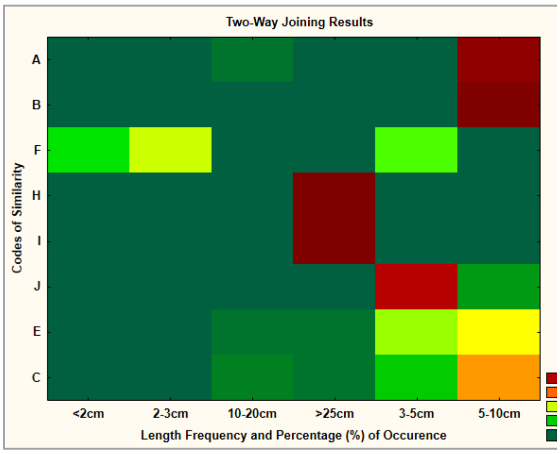
27th Monitoring, January, 2021



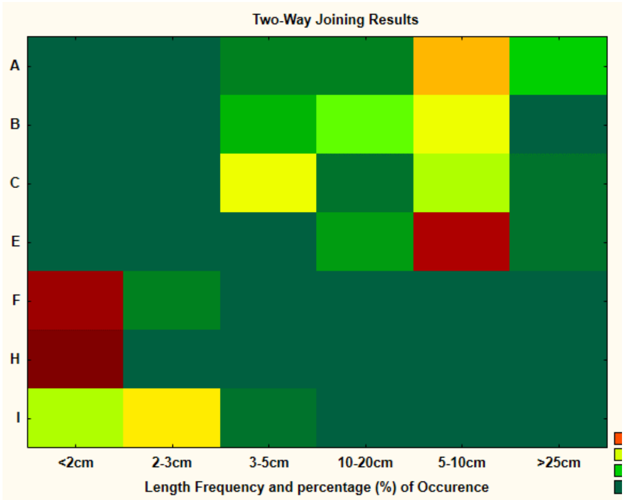
28th monitoring, April, 2021



29th monitoring, August, 2021



30th Monitoring, November, 2021



31st Monitoring, February, 2022

D.4: Occurrence of Species

Local Name	Scientific Name	Local Status*	1st QM	2nd QM	3rd QM	4th QM	5th QM	6th QM	7th QM	8th QM	9th QM	10th QM	11th QM	12th QM
			‘-‘ = No; ‘+’ = Occurrence											
Hilsa	*Tenualosa ilisha*	NO	-	-	+	-	-	+	+	-	-	-	+	-
Sagor Baim	*Anguilla bengalensis*	NT	+	-	-	-	-	+	-	-	-	-	-	-
Bacha	*Eutropiichthys vacha*	CR	+	-	-	-	-	-	-	-	-	+	-	-
Bagda Chingri	*Penaeus monodon*	DD	+	+	+	+	+	+	+	+	+	+	-	+
Banspata	*Brachypleura novae-zeelandiae*	NO	+	+	+	+	-	+	+	+	+	-	+	+
Kukurjib	*Cynoglossus lingua*	NO	+	-	-	-	-	-	-	+	+	+	-	+
Bele	*Glossogobius giuris*	NO	+	+	+	+	+	+	+	+	+	-	+	+
Aswine Bele	*Butis butis*	NO	-	-	-	-	-	-	+	+	+	+	+	+
Bairagi	*Coilia dussumieri*	NO	+	+	+	+	+	+	-	+	-	-	-	+
Boishakhi Chingri	*Macrobrachium* sp.	NO	-	+	-	-	+	+	+	+	+	-	-	-
Chammu Chingri	*Metapenaeus brevicornis*	DD	+	+	+	-	+	+	+	+	+	+	+	-
Chaka Chingri	*Penaeus indicus*	DD	+	+	-	+	+	+	+	+	+	-	+	-
Ghora Chela	*Securicula gora*	-	+	-	-	-	-	-	-	-	-	-	-	-
Chanda Chela	*Securicula* sp.	-	-	+	+	-	-	-	-	-	+	+	-	-
Sada Chewa	*Trepauchen vagina*	NO	+	-	+	-	-	+	-	-	-	+	-	-
Lal Chewa	*Taenioides cirratus*	NO	+	+	+	+	+	+	+	+	+	-	-	-
Chhuri	*Trichiurus muticus*	NO	+	-	+	-	-	-	-	-	-	-	-	-
Sagor Chela	*Megalops cyprinoids*	NO	+	-	-	-	-	-	-	-	-	-	-	-
Purabi Chela	*Thryssa purava*	NO	+	-	-	-	-	-	-	-	-	-	-	-
Kabashi Tengra	*Mystus cavasius*	DD	+	-	-	-	-	-	-	-	-	-	-	-
Gagra Tengra	*Nemapteryx nenga*	DD	-	+	+	-	+	-	+	-	+	+	+	+
Gulsha Tengra	*Mystus bleekery*	DD	+	+	-	+	-	+	+	+	+	+	+	+
Harina Chingri	*Metapenaeus ensis*	DD	+	+	+	+	+	+	+	+	+	-	+	-
Ekthuto	*Hyporhampus limbatus*	NO	+	-	+	+	-	-	-	+	+	-	+	-
Kakila	*Xenentodon cancila*	NO	+	-	-	-	-	-	-	-	-	-	+	-
Chapila	*Gudusia chapra*	NO	+	+	-	-	-	-	-	-	-	+	-	-
Kuchia	*Monopterus cuchia*	DD	+	+	-	+	+	+	+	+	+	+	+	+
Loitta	*Harpodon nehereus*	NO	+	+	+	-	+	-	-	-	+	+	-	-
Motka Chingri	*Macrobrachium villosimanusless*	DD	+	+	+	+	+	+	+	+	+	+	+	-

Local Name	Scientific Name	Local Status*	1st QM	2nd QM	3rd QM	4th QM	5th QM	6th QM	7th QM	8th QM	9th QM	10th QM	11th QM	12th QM
			‘-‘ = No; ‘+’ = Occurrence											
Mud Crab	*Scylla serrata*	NO	+	-	+	+	+	+	+	+	+	-	+	+
Tular Dandi	*Sillaginopsis panijus*	NO	+	-	+	-	+	-	+	-	-	-	+	-
Paira Chanda	*Scatophagus argus*	DD	+	-	-	-	-	-	-	-	-	+	-	-
Paissa	*Liza parsia*	NO	+	+	+	+	+	+	+	+	+	+	+	+
Pangas	*Pangasius pangasius*	CR	+	-	+	-	-	-	-	+	-	-	-	+
Tak Chanda	*Leiognathus equulus*	NO	+	-	-	-	-	-	+	-	-	+	-	-
Phessa	*Setipinna phasa*	NO	+	+	+	+	+	+	+	+	+	-	+	-
Teli Phessa	*Setipinna phasa*	DD	-	-	+	-	-	-	-	-	-	+	-	-
Poma	*Poma poma*	NO	+	+	+	+	+	+	+	+	+	+	+	+
Potka	*Chelonodon patoca*	NO	+	+	-	+	+	+	-	+	+	-	+	+
Shilong	*Silonia silondia*	EN	+	-	+	-	-	-	-	-	-	-	+	-
Tailla	*Eleutheronema tetradactylum*	DD	+	-	-	-	-	-	-	-	-	+	-	-
Tapse	*Polynemus paradiseus*	DD	+	+	+	-	-	+	+	+	-	-	+	+
Daitna	*Acanthopagrus latus*	DD	-	-	-	+	-	-	-	+	+	-	+	+
Shole	*Channa striatus*	DD	-	-	-	+	-	-	-	+	-	-	-	-
Magur	*Clarias batrachus*	DD	-	-	-	+	-	-	-	+	-	-	-	+
Koi	*Anabas testudineus*	DD	-	-	-	+	-	-	-	+	-	+	-	-
Vetki	*Lates calcarifer*	DD	-	-	-	+	+	+	+	+	+	-	+	+

Local Name	Scientific Name	Local Status*	13th QM	14th QM	15th QM	16th QM	17th QM	18th QM	19th QM	20th QM	21st QM	22nd QM	23rd QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31st QM	32nd QM
			‘-‘ = No; ‘+’ = Occurrence																		
Hilsa	*Tenualosa ilisha*	NO	-	-	-	-	-	+	-	-	-	+	-	-	-	-	-	+		+	-
Sagor Baim	*Anguilla bengalensis*	NT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
Bacha	*Eutropiichthys vacha*	CR	+	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-		-	-
Bagda Chingri	*Penaeus monodon*	DD	+	-	+	+	+	+	+	+	+	+	+	-	-	+	+	+		+	+
Banspata	*Brachypleura novae-zeelandiae*	NO	+	+	+	+	+	+	+	+	+	-	-	+	+	+	-	+		+	+
Kukurjib	*Cynoglossus lingua*	NO	-	-	+	-	-	-	+	-	+	+	-	+	-	+	-	+		+	-
Bele	*Glossogobius giuris*	NO	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+
Aswine Bele	*Butis butis*	NO	+	+	+	+	+	-	+	+	-	-	-	-	-	-	-	-		-	+
Bairagi	*Coilia dussumieri*	NO	+	+	+	+	+	+	+	+	+	-	+	+	-	+	+	+		+	+

Local Name	Scientific Name	Local Status*	13th QM	14th QM	15th QM	16th QM	17th QM	18th QM	19th QM	20th QM	21st QM	22nd QM	23rd QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31st QM	32nd QM
		'-' = No; '+' = Occurrence																			
Boishakhi Chingri	*Macrobrachium* sp.	NO	-	-	-	-	+	-	-	-	-	-	+	-	-	-	-	-		-	-
Chammu Chingri	*Metapenaeus brevicornis*	DD	-	+	+	+	+	+	+	+	+	+	+	-	+	+	+	-		+	+
Chaka Chingri	*Penaeus indicus*	DD	+	-	+	+	+	+	+	+	+	+	+	-	+	+	+	-		+	+
Ghora Chela	*Securicula gora*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
Chanda Chela	*Securicula* sp.	-	-	-	+	+	+	+	-	-	-	+	+	-	-	-	-	-		-	-
Sada Chewa	*Trepauchen vagina*	NO	-	-	-	+	-	-	-	+	-	+	-	-	-	-	-	+		+	+
Lal Chewa	*Taenioides cirratus*	NO	+	+	-	+	+	-	+	+	-	-	+	-	-	-	+	+		-	-
Chhuri	*Trichiurus muticus*	NO	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+		-	-
Sagor Chela	*Megalops cyprinoids*	NO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
Purabi Chela	*Thryssa purava*	NO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
Kabashi Tengra	*Mystus cavasius*	DD	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+	-	-
Gagra Tengra	*Nemapteryx nenga*	DD	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	-	+	+
Gulsha Tengra	*Mystus bleekery*	DD	+	+	+	+	+	-	+	+	+	-	+	-	-	+	-	-	-	+	-
Harina Chingri	*Metapenaeus ensis*	DD	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	-
Ekthuto	*Hyporhampus limbatus*	NO	+	+	-	-	+	+	+	+	+	+	-	-	-	+	-	-	+	-	-
Kakila	*Xenentodon cancila*	NO	-	+	-	-	+	-	-	-	-	+	-	-	+	-	-	-	+	+	-
Chapila	*Gudusia chapra*	NO	-	-	-	-	+	+	+	-	+	+	-	+	+	+	+	-	+	+	+
Kuchia	*Monopterus cuchia*	DD	+	+	+	+	+	+	-	+	+	-	+	+	-	+	+	+	-	+	-
Loitta	*Harpodon nehereus*	NO	+	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-	+	-	+
Motka Chingri	*Macrobrachium villosimanusless*	DD	+	+	+	+	+	+	+	+	+	+	+	-	-	+	+	-	-	+	+
Mud Crab	*Scylla serrata*	NO	+	+	+	+	-	+	+	+	-	+	+	-	-	-	-	-	+	+	+
Tular Dandi	*Sillaginopsis panijus*	NO	-	+	-	-	-	+	+	+	+	-	-	-	+	-	+	-	+	-	+
Paira Chanda	*Scatophagus argus*	DD	-	-	-	-	-	-	+	-	-	-	-	-	-	+	-	-	-	+	-
Paissa	*Liza parsia*	NO	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	-	+	+
Pangas	*Pangasius pangasius*	CR	-	-	-	-	-	+	+	+	+	+	-	-	-	-	-	+	+	+	-
Tak Chanda	*Leiognathus equulus*	NO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pheksa	*Setipinna phasa*	NO	+	+	-	+	-	-	+	+	+	+	+	-	+	-	+	+	-	+	-
Teli Pheksa	*Setipinna phasa*	DD	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
Poma	*Poma poma*	NO	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+
Potka	*Chelonodon patoca*	NO	+	+	+	+	+	+	+	+	-	-	-	-	-	+	+	+	-	+	+

Local Name	Scientific Name	Local Status*	13th QM	14th QM	15th QM	16th QM	17th QM	18th QM	19th QM	20th QM	21st QM	22nd QM	23rd QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31st QM	32nd QM
		‘-‘ = No; ‘+’ = Occurrence																			
Shilong	*Silonia silondia*	EN	+	+	-	-	-	-	-	-	-	+	-	+	-	-	-	+	+	-	-
Tailla	*Eleutheronema tetradactylum*	DD	-	-	-	-	-	+	-	+	+	-	-	-	+	+	-	+	+	-	-
Tapse	*Polynemus paradiseus*	DD	-	+	+	+	+	+	+	+	+	-	+	+	+	-	-	+	+	-	+
Daitna	*Acanthopagrus latus*	DD	-	+	+	+	-	+	+	+	-	-	+	-	+	+	-	-	-	+	-
Shole	*Channa striatus*	DD	-	+	+	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-
Magur	*Clarias batrachus*	DD	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
Koi	*Anabas testudineus*	DD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
Vetki	*Lates calcarifer*	DD	+	+	+	+	-	+	+	-	+	-	-	-	+	-	-	+	-	-	-

D.5: Length-wise species distribution (%) in sampling sites

Fish Species	Sampling	L (< 2cm)	L (2 to 3cm)	L (3 to 5cm)	L (5 to 10cm)	L (10 to 20cm)	L (> 25cm)	Brood Fish
Amadi	H	100.00	0.00	0.00	0.00	0.00	0.00	0.00
	I	0.00	0.00	0.00	0.00	100.00	0.00	0.00
	J	0.00	0.00	0.00	0.00	100.00	0.00	0.00
Bagda	F	100.00	0.00	0.00	0.00	0.00	0.00	0.00
Banspata	J	0.00	0.00	0.00	0.00	100.00	0.00	0.00
Bele	F	0.00	100.00	0.00	0.00	0.00	0.00	0.00
	H	100.00	0.00	0.00	0.00	0.00	0.00	0.00
Chaka Chingri	F	0.00	80.00	20.00	0.00	0.00	0.00	0.00
Chali Chingri	J	0.00	0.00	100.00	0.00	0.00	0.00	0.00
Chapila	H	0.00	0.00	100.00	0.00	0.00	0.00	0.00
	J	0.00	0.00	50.00	50.00	0.00	0.00	0.00
Chela	F	0.00	66.67	33.33	0.00	0.00	0.00	0.00
	H	100.00	0.00	0.00	0.00	0.00	0.00	0.00
Chemua	F	60.00	40.00	0.00	0.00	0.00	0.00	0.00
Chewa	F	0.00	50.00	50.00	0.00	0.00	0.00	0.00
	H	100.00	0.00	0.00	0.00	0.00	0.00	0.00
Chota Bele	J	0.00	0.00	0.00	50.00	50.00	0.00	0.00

Fish Species	Sampling	L (< 2cm)	L (2 to 3cm)	L (3 to 5cm)	L (5 to 10cm)	L (10 to 20cm)	L (> 25cm)	Brood Fish
Gagra Tengra	F	0.00	100.00	0.00	0.00	0.00	0.00	0.00
	J	0.00	0.00	0.00	100.00	0.00	0.00	0.00
Golda	F	100.00	0.00	0.00	0.00	0.00	0.00	0.00
	H	100.00	0.00	0.00	0.00	0.00	0.00	0.00
Gongoinna	F	0.00	100.00	0.00	0.00	0.00	0.00	0.00
Guila	F	0.00	100.00	0.00	0.00	0.00	0.00	0.00
	H	0.00	100.00	0.00	0.00	0.00	0.00	0.00
Harina Chingri	F	0.00	80.00	20.00	0.00	0.00	0.00	0.00
Kaldi	F	33.33	66.67	0.00	0.00	0.00	0.00	0.00
Khochkhoichcha chingri	H	100.00	0.00	0.00	0.00	0.00	0.00	0.00
Kumirer Khil	F	0.00	0.00	80.00	20.00	0.00	0.00	0.00
	H	100.00	0.00	0.00	0.00	0.00	0.00	0.00
Loittya	H	0.00	0.00	100.00	0.00	0.00	0.00	0.00
	I	0.00	0.00	0.00	0.00	100.00	0.00	0.00
Motka Chingri	F	0.00	100.00	0.00	0.00	0.00	0.00	0.00
Mutkura Bele	F	0.00	100.00	0.00	0.00	0.00	0.00	0.00
Phesa	J	0.00	0.00	0.00	0.00	100.00	0.00	0.00
Poma	F	25.00	50.00	25.00	0.00	0.00	0.00	0.00
	J	0.00	0.00	0.00	0.00	66.67	33.33	0.00
Potka	F	50.00	50.00	0.00	0.00	0.00	0.00	0.00
Ramchos	I	0.00	0.00	0.00	0.00	100.00	0.00	0.00
Rekha	F	0.00	100.00	0.00	0.00	0.00	0.00	0.00
Tiger Chingri	F	0.00	80.00	20.00	0.00	0.00	0.00	0.00
	H	0.00	100.00	0.00	0.00	0.00	0.00	0.00
	J	0.00	0.00	100.00	0.00	0.00	0.00	0.00
Topse	J	0.00	0.00	0.00	0.00	100.00	0.00	0.00
Tular Dandi	I	0.00	0.00	0.00	0.00	0.00	100.00	0.00
Vadi Chingri	H	100.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: CEGIS field survey, November 2020

D.6: Purpose, timing and extent of migration for different year-class of migratory fish species

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose											
			1st QM	2nd QM	3rd QM	4th QM	5th QM	6th QM	7th QM	8th QM	9th QM	10th QM	11th QM	12th QM
Tapsi	Haldikhali	Juvenile and Age-1 adult	Feeding and Growing	-	Feeding and Growing	-	-	-		-	-		-	-
	Akram Point	Juvenile and Age-1 adult	Feeding and Growing	-	-	-	-	-	Feeding	-	-		-	-
		Adult	-	-	-	-	-	-	-	Feeding	-		-	-
	Chalna Point	Age-1 adult and Brood fish	Feeding and Growing	Spawning	-	-	-	Feeding	Feeding and Spawning	-	-		Feeding and Growing	-
		Adult	-	-	Feeding and Growing	-	-	Feeding	Feeding	-	-			-
	Harbaria	Juvenile and Age-1 adult	Feeding and Growing	Feeding and Growing		-	-	-	-	-	-		-	Feeding
		Adult and Brood Fish	-	-	Breeding and Spawning	-	-	-	-	-	-		-	-
	Chandpai	Juvenile	-	-	Feeding and Growing	-	-	-	Feeding	-	-		Feeding	-
	Mongla Point	Adult	-	-	-	-	-	-	-	-	-			-
	South-west of the Project	Age-1 adult	Feeding and Growing	Feeding and Growing	Feeding and Growing	-	-	Feeding	-	-	-		-	-
		Brood Fish	-	-	-	-	-	Breeding and Spawning	-	-	-		-	-
Bairagi	Haldikhali	Juvenile and Age-1 adult	Feeding and Growing	-	Feeding and Growing	-	-	-	-	-	-		-	-
	Akram Point	Juvenile and Age-1 adult	Feeding and Growing	-	-	-	Feeding and Growing	-	-	-	-		-	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose											
			1st QM	2nd QM	3rd QM	4th QM	5th QM	6th QM	7th QM	8th QM	9th QM	10th QM	11th QM	12th QM
		Juvenile and Adult	-	-	-	-	-	-	-	Growing and Feeding	-		-	-
	Chandpai	Fry	Breeding and Spawning	Breeding and Spawning	Feeding and Growing	Feeding	-	Feeding	-	-	-		-	-
		Juvenile	-	-	-	-	-	-	-	-	-		-	-
	Chalna Point	Juvenile and Age-1 adult	Feeding and Growing	-	-	-	Feeding and Growing	-	-	-	-		-	-
		Fry	-	-	-	-	-	-	-	-	-		-	Nursing
	Harbaria	Juvenile	Feeding and Growing	-	-	-	-	Feeding	-	-	-		-	-
	Mongla Point	Fry	-	Nursing	-	Feeding	-	-	-	-	-		-	Nursing
		Juvenile	-	-	-	-	-	-	-	Feeding	-		-	-
	South-west of the Project	Juvenile	-	Feeding and Growing	-	-	-	-	-	-	-		-	-
		Fry	-	-	-	-	-	-	-	-	-		-	Nursing
Chapila	Haldikhali	Juvenile	Feeding and Growing	-	-	-	-	-	-	-	-		-	-
	Akram Point	Juvenile	Feeding and Growing	-	-	-	-	-	-	-	-		-	-
	Mongla Point	Fry	-	Nursing	-	-	-	-	-	-	-		-	-
	South-west of the Project	Age-1 adult	-	Feeding and Growing	-	-	-	-	-	-	-		-	-
Loitta	Haldikhali	Juvenile and Age-1 adult	Feeding and Growing	-	Feeding and Growing	-	-	-	-	-	-		-	-
	Akram Point	Juvenile	Feeding and Growing	-	-	-	Feeding and Growing	-	-	-	-		-	-

<table>
<tr><th rowspan="2">Migratory Fish Species</th><th rowspan="2">Sampling Sites</th><th rowspan="2">Year Class*</th><th colspan="12">Migration Purpose</th></tr>
<tr><th>1st QM</th><th>2nd QM</th><th>3rd QM</th><th>4th QM</th><th>5th QM</th><th>6th QM</th><th>7th QM</th><th>8th QM</th><th>9th QM</th><th>10th QM</th><th>11th QM</th><th>12th QM</th></tr>
<tr><td rowspan="5"></td><td>Akram Point</td><td>Age-1 adult</td><td>-</td><td>-</td><td>Feeding and Growing</td><td>-</td><td>Feeding and Growing</td><td>-</td><td>-</td><td>-</td><td>-</td><td></td><td>-</td><td>-</td></tr>
<tr><td>Chandpai</td><td>Juvenile</td><td>Feeding and Growing</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td></td><td>-</td><td>-</td></tr>
<tr><td>Harbaria</td><td>Fry, Juvenile and Age-1 adult</td><td>-</td><td>Nursing, Feeding and Growing</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td></td><td>-</td><td>-</td></tr>
<tr><td rowspan="2">Chalna Point</td><td>Age-1 adult</td><td>-</td><td>Feeding and Growing</td><td>-</td><td>-</td><td>Feeding and Growing</td><td>-</td><td>-</td><td>-</td><td>-</td><td></td><td>-</td><td>-</td></tr>
<tr><td>Fry</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>Nursing</td><td></td><td>-</td><td>-</td></tr>
<tr><td rowspan="11">Poma</td><td>Haldikhali</td><td>Juvenile</td><td>Feeding and Growing</td><td>-</td><td>-</td><td>Feeding</td><td>-</td><td>-</td><td>-</td><td></td><td>-</td><td></td><td>-</td><td>-</td></tr>
<tr><td rowspan="3">Akram Point</td><td>Juvenile</td><td>Feeding and Growing</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>Growing and Feeding</td><td>-</td><td></td><td>-</td><td>-</td></tr>
<tr><td>Age-1 adult</td><td>-</td><td>-</td><td>Feeding and Growing</td><td>-</td><td>-</td><td>-</td><td>Feeding</td><td rowspan="2">Feeding</td><td>-</td><td></td><td>-</td><td>-</td></tr>
<tr><td>Adult</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td></td><td>-</td><td></td><td>-</td><td>-</td></tr>
<tr><td rowspan="4">Chandpai</td><td>Fry and Juvenile</td><td>Breeding and Spawning</td><td>Nursing</td><td>-</td><td>-</td><td>-</td><td>Feeding</td><td>-</td><td>-</td><td>-</td><td></td><td>-</td><td>-</td></tr>
<tr><td>Juvenile</td><td>-</td><td>-</td><td>Feeding and Growing</td><td>Feeding</td><td>Feeding and Growing</td><td>-</td><td colspan="2">Feeding and Growing</td><td>-</td><td></td><td colspan="2" rowspan="2">Feeding and Growing</td></tr>
<tr><td>Adult</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="2">Feeding</td><td>-</td><td></td></tr>
<tr><td>Brood Fish</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="2">-</td><td>-</td><td></td><td>Spawning</td><td>-</td></tr>
<tr><td>Haldikhali</td><td>Fry and Juvenile</td><td>-</td><td>-</td><td>Nursing</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td></td><td>-</td><td>-</td></tr>
<tr><td rowspan="2">Harbaria</td><td>Adult and Brood Fish</td><td>-</td><td>-</td><td>Breeding and Spawning</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td></td><td>Feeding and Spawning</td><td>-</td></tr>
<tr><td>Adult</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="2">Feeding</td><td>-</td><td></td><td>-</td><td>Feeding</td></tr>
</table>

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose											
			1st QM	2nd QM	3rd QM	4th QM	5th QM	6th QM	7th QM	8th QM	9th QM	10th QM	11th QM	12th QM
		Fry and Juvenile						Spawning and Nursery	-	-	Feeding and Growing		-	-
	Mongla Point	Fry, Juvenile and Age-1 adult	-	-	Spawning, Feeding and Growing	-	-	-	-	Nursing	-		-	Nursing
		Juvenile	-	-	-	-	-	-	Feeding and Growing		-		-	-
		Age-1 Adult	-	-	-	-	-	-	Feeding	Feeding	-		-	-
		Adult	-	-		Feeding	-	Feeding	-	-	-		Feeding	-
		Brood Fish	-	-	-	-	-	-	-	-	-		Spawning	-
	South-west of the Project	Adult	-	-	Feeding	Feeding	-	Feeding	-	-	-		-	-
	Chalna Point	Juvenile, Adult and Brood Fish	Breeding and Spawning	-	-	-	-	-	-	-	-		Feeding, Growing and Spawning	-
		Juvenile and Adult	-	-	Feeding and Growing	Feeding	Feeding and Growing	-	Feeding and Growing	-	-		-	-
		Fry	-	-	-	-	-	-	-	-	Nursery		-	Nursing
Chhuri	Haldikhali	Adult	Feeding	-	Feeding	-	-	-	-	-	-		-	-
	Akram Point		Feeding	-	Feeding	-	-	-	-	-	-		-	-
Chela	Haldikhali	Adult	Feeding	-	Feeding	-	-	-	-	-	-		-	-
	Akram Point	Juvenile and Adult	Feeding and Growing	-	-	-	-	-	-	-	-		-	-
	Harbaria	Fry and Juvenile	-	Feeding and Growing	-	-	-	Nursery	-	-	-		-	-
	Chandpai		-	-	-	-	-	-	-	Growing and Feeding	Nursery		-	-
Gang Tengra	Haldikhali	Adult	Feeding	-	Feeding	Feeding	-	-	-	-	-		-	-
	Akram Point	Adult	Feeding And Breeding	-	-	Feeding	-	-	-	-	-		-	-
	Harbaria	Adult	-	-	Feeding	-	-	-	-	-	-		-	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose											
			1st QM	2nd QM	3rd QM	4th QM	5th QM	6th QM	7th QM	8th QM	9th QM	10th QM	11th QM	12th QM
	Chandpai	Adult	-	-	Feeding	Feeding	-	-	-	-	-		-	-
Gagra Tengra	Chandpai	Juvenile and Age-1 adult	-	Feeding and Growing	-	-	Feeding and Growing	-	-	-	-		-	-
	Chalna Point	Age-1 adult	-	-	-	-	Feeding and Growing	-	-	-	-		-	-
	Mongla Point	Age-1 adult	-	Feeding And Growing	-	-	-	-	-	-	-		-	-
	Akram Point	Juvenile and Adult	-	-	Feeding and Growing	-	-	-	-	-	-		-	Feeding
		Adult	-	-	-	-	-	-	Feeding	-	-		-	-
	Haldikhali	Juvenile	-	-	-	-	-	-	Feeding and Growing	-	-		-	-
	Harbaria	Adult	-	-	Feeding	-	Feeding and Growing	-	-	-	Feeding		Feeding	
Gulsha Tengra	Haldikhali	Adult	Feeding and Breeding	-	-	-	-	-	-	-	-		-	-
	Akram Point	Adult		-	-	-	-	-	-	-	-		-	-
	Chandpai	Age-1 adult	-	-	-	Feeding	-	Feeding	Feeding and Growing	-	-		-	Feeding
		Juvenile	-	-	-	-	-	-	Feeding and Growing		-		Feeding and Growing	-
	Mongla Point	Age-1 adult	-	Feeding and Growing	-	Feeding and Growing	-	Feeding and Growing		-	Feeding and Growing		-	-
		Juvenile	-	-	-	-	-	-	Feeding and Growing		-		Feeding and Growing	-
	Harbaria	Juvenile	-	-	-	-	-	-	Feeding and Growing		-			-
		Age-1 adult	-	-	-	-	-	-	-	-	Feeding and Growing		-	-
	Maidara	Juvenile and Age-1 Adult	-	-	-	-	-	-	Feeding and Growing	-			-	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose											
			1st QM	2nd QM	3rd QM	4th QM	5th QM	6th QM	7th QM	8th QM	9th QM	10th QM	11th QM	12th QM
	Chalna Point	Juvenile	-	-	-	-	-	-	-	-	-		Feeding and Growing	-
Potka	Haldikhali	Adult	Feeding and Breeding	-	-	-	-	-	-	-	-		-	-
	Chandpai	Fry	Spawning	Spawning and Nursing	-	-	-	-	-	-	-		-	-
		Juvenile	-	-	-	-	-	-	-	Feeding and Growing	-		-	Feeding
		Adult	-	-	-	Feeding	-	-	-	-	-		Feeding	-
	Mongla Point	Fry	Spawning	-	-	-	-	-	-	-	-		-	-
		Juvenile	-	-	-	-	-	-	-	-	Feeding and Growing		-	-
	Harbaria	Fry	-	-	-	-	-	Nursery	-	-	-		-	-
		Juvenile	-	-	-	-	-	-	-	Feeding and Growing	-		-	-
Paira Chanda	Akram Point	Adult	Feeding	-	-	-	-	-	-	-	-		-	-
	Chandpai	Fry	Breeding and Spawning	-	-	-	-	-	-	-	-		-	-
Chewa	Akram Point	Juvenile and Adult	Feeding	-	Feeding and Growing	-	-	-	-	-			-	-
	Chandpai	Fry and Juvenile	Spawning	-	Feeding and Growing	-	Nursing and Grazing	Nursery	Feeding and Growing	-	Nursing		-	-
		Adult	-	-	-	Feeding	-	Feeding	-	Feeding	-		-	-
	Haldikhali	Juvenile and Adult	-	-	Feeding and Growing	-	-	-	-	-	-		-	-
	Harbaria	Juvenile and Adult	-	-	Feeding and Growing	-	-	Feeding and Nursery	-	Feeding	-		-	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose											
			1st QM	2nd QM	3rd QM	4th QM	5th QM	6th QM	7th QM	8th QM	9th QM	10th QM	11th QM	12th QM
	Mongla Point	Juvenile	-	Feeding and Growing	-	-	-	-	-	-	-		-	-
	South-west of the Project	Juvenile	-	Feeding and Growing	-	-	-	-	-	-	-		-	-
	Chalna Point	Adult	-	-	-	-	Feeding	-	-	-	-		-	-
		Age-1 Juvenile	-	-	-	-	-	-	-	-	Feeding and Growing		-	-
Bele	Akram Point	Adult	Feeding	-	Feeding	Feeding	-	-	-	-	-		-	-
		Juvenile	-	-	-	-	-	-	-	Feeding and Growing	-		-	-
	Haldikhali	Juvenile-1, Juvenile and Adult	-	-	Nursing and Growing	Feeding	-	-	-	-	-		-	-
	Harbaria	Juvenile and Adult	-	-	Feeding and Growing	-	Feeding and Growing	Nursery and Feeding	Feeding and Growing	-	-		-	-
	Chandpai	Fry	Breeding and Spawning	Nursing	-	-	Nursing	Nursery	-	-	Nursery		-	-
	Chandpai	Juvenile and Adult	-	-	Feeding and Growing	Feeding	-	Feeding	-	Feeding	-		Feeding and Growing	
	Harbaria	Juvenile and Age-1 Adult	-	-	-	-	-	-	Feeding and Growing				-	-
	Mongla Point	Fry	Breeding and Spawning	-	-	-	-	Nursery	-	-	-		-	-
	Mongla Point	Fry, Juvenile-1 and Juvenile			Nursing and Growing	-	-	-	-	-	-		-	-
	Mongla Point	Juvenile and Adult	-	-	-	Feeding	Feeding and Growing	Feeding	Feeding and Growing	-	-		-	-
	Chalna Point	Fry	Breeding and	Nursing	-	-	Nursing	-	-	Nursing	-		-	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose											
			1st QM	2nd QM	3rd QM	4th QM	5th QM	6th QM	7th QM	8th QM	9th QM	10th QM	11th QM	12th QM
			Spawning											
	Chalna Point	Adult	-	-	-	Feeding	-	-	-	-	-		-	-
	Maidara	Juvenile and Age-1 adult	-	Feeding and Growing	Feeding and Growing	Feeding	Feeding and Growing	-	-	-	Feeding and Growing		-	-
		Fry	-	-	-	-	-	-	-	Nursing	-		-	Nursing
Tular Dandi (Nona bele)	Akram Point	Adult	Feeding	-	-	-	-	-	-	-	-		-	-
	South-west of the Project	Adult	-	-	Feeding	-	-	-	-	-	-		Feeding	-
	Chalna Point	Adult	Feeding	-	Feeding	-	Feeding	-	Feeding	-	-		-	-
Tairel	Akram Point	Adult	Feeding	-	-	-	-	-	-	Feeding	-		-	-
	Harbaria	Age-1 Adult	-	-	-	-	-	-	-	-	Feeding and Growing		-	-
	Mongla Point	Juvenile	Feeding	-	-	-	-	-	-	-	-		-	-
Pheksa	Akram Point	Adult	Feeding	-	-	-	-	-	-	Feeding	-		-	-
		Juvenile	-	-	Feeding and Growing	-	-	-	-	-	-		-	-
	Haldikhali	Juvenile	-	-	Feeding and Growing	-	-	-	-	-	-		-	-
	Haldikhali	Adult	-	-	-	Feeding	-	-	-	-	-		-	-
	Harbaria	Juvenile	-	-	-	-	-	-	-	-	Feeding And Growing		-	-
	Chalna Point	Juvenile and Adult	Feeding	Feeding and Growing	-	-	-	-	Feeding and Growing	-			-	-
		Adult	-	-	Feeding	Feeding	Feeding	-	Feeding	-	-		-	-
	Mongla Point	Adult	-	-	Feeding	Feeding	-	-	Feeding and Growing	-	-		Feeding	-
	Chandpai	Juvenile and Adult	Feeding	Feeding and Growing	-	-	Feeding and Growing	-		-	-		-	-
	Maidara	Juvenile and Adult	Feeding	Feeding and Growing	-	-	-	-	-	-	-		-	-
		Juvenile	-	-	-	-	-	-	Feeding and Growing	-	-		-	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose											
			1st QM	2nd QM	3rd QM	4th QM	5th QM	6th QM	7th QM	8th QM	9th QM	10th QM	11th QM	12th QM
		Adult	-	-	Feeding	Feeding	-	Feeding	-	-	-		-	-
Paissa	Akram Point	Juvenile and Adult	Feeding	-	Feeding and Growing	Feeding	-	-	-	Feeding and Growing	-		-	Feeding
		Brood	-	-	-	-	-	-	-	-	-		-	Spawning
		Juvenile	-	-	-	-	-	-	Feeding and Growing			-	-	-
	Haldikhali	Juvenile and Adult	Feeding	-	Feeding And Growing	Feeding	-	-	-	-	-		-	-
		Juvenile	-	-	-	-	-	-	Feeding and Growing	-	-		-	-
	Harbaria	Juvenile-1 and Juvenile	-	-	Feeding	-	Feeding and Growing	-	Feeding and Growing	-	-		-	-
		Adult	-	-	-	-	-	-	-	Feeding	-		-	-
	Chandpai	Fry	Breeding and Spawning	-	-	-	Nursing	-	-	-	Nursery		-	-
	Chandpai	Juvenile and Adult	-	-	Feeding and Growing	-	-	Nursery and Feeding	-	-	-		Feeding and Growing	Feeding
	Harbaria	Juvenile	-	-	-	-	-	-	Feeding and Growing	-	-			-
	Mongla Point	Fry	Breeding and Spawning	-	-	-	-	Nursery	-	-	Nursery		-	-
		Age-1 Juvenile	-	-	-	-	-	-	Nursing, Feeding and Growing	-			-	-
		Age-1 Adult	-	-	-	-	Feeding and Growing	Feeding	-	-	Feeding and Growing		-	-
	Maidara	Fry, Juvenile and Age-1 adult	Breeding and Spawning	Feeding and Growing	-	-	Feeding and Growing	-	-	-			-	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose											
			1st QM	2nd QM	3rd QM	4th QM	5th QM	6th QM	7th QM	8th QM	9th QM	10th QM	11th QM	12th QM
		Age-1 Juvenile, Juvenile and Age-1 Adult	-	-	-	-	-	-	Nursing, Feeding and Growing	-	-		Feeding and Growing	-
		Adult	-	-	-	-	-	Feeding	-	-	-		-	-
Banshpata	Chandpai	Juvenile	Feeding	-	-	-	-	-	-	-	-		-	-
		Adult	-	-	-	Feeding	-	Feeding	-	-	-		-	-
	Akram Point	Juvenile	-	-	-	-	-	-	Feeding and Growing	-	-		-	-
		Adult	-	-	-	-	-	-	-	Feeding	-		-	-
	Haldikhali	Juvnile and adult	-	-	Feeding and Growing	Feeding	-	-	Feeding and Growing	-	-		-	-
	Harbaria	Adult	-	-	-	-	-	-	-	Feeding	Feeding		Feeding	-
	Mongla Point	Fry and Adult	Feeding	Nursing	-	-	-	-	-	-	-		-	-
		Adult	-	-	-	Feeding	-	-	-	-	Feeding		-	-
	Maidara	Adult	-	-	Feeding	Feeding	-	Breeding and Spawning	-	-	-		-	-
	Chalna Point	Adult	-	-	Feeding	Feeding	-	-	-	-	-		-	-
Hilsa	Akram Point	Brood Fish	-	-	-	-	-	-	-	-	-		Breeding and Spawning	-
	Haldikhali	Brood Fish	-	-	-	-	-	-	-	-	-			-
		Juvenile	-	-	Feeding and Growing	-	-	-	-	-	-		-	-
	Harbaria	Brood Fish	-	-	-	-	-	-	-	-	-		Breeding and Spawning	-
	Chandpai	Adult and Brood Fish	-	-	-	-	-	-	Feeding and Breeding	-	-		-	-
	Mongla Point	Adult	-	-	Feeding	-	-	-	-	-	-		-	-
		Brood Fish	-	-	-	-	-	-	-	-	-		Breeding and Spawning	-
	Maidara	Age-1 Adult	-	-	-	-	-	-	-	-	-		Feeding	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose											
			1st QM	2nd QM	3rd QM	4th QM	5th QM	6th QM	7th QM	8th QM	9th QM	10th QM	11th QM	12th QM
	Chalna Point	Brood fish	-	-	-	-	-	Breeding and Spawning	-	-	-		-	-
Pangas	Haldikhali	Juvenile	-	-	Feeding and Growing	-	-	-	-	-	-		-	-
	Harbaria	Adult	-	-	-	-	-	-	-	Feeding	-		-	-
	Mongla Point	Juvenile and Adult	-	-	Feeding	-	-	-	-	-	-		-	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																		
			13th QM	14th QM	15th QM	16th QM	17th QM	18th QM	19th QM	20th QM	21st QM	22nd QM	23rd QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31st QM	32nd QM
Tapsi	Haldikhali	Juvenile and Age-1 adult	-	-	Grazing	-	-	-	-	-	-		-	-	-	-	-	-	-	Fish Species	-
	Akram Point	Juvenile and Age-1 adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Bagda Chingri	-
		Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		M&F
	Chalna Point	Age-1 adult and Brood fish	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
		Adult	-	Feeding	-	-	Feeding	-	-	Feeding	Feeding		-	-	-	-	-	-	-		-
	Harbaria	Juvenile and Age-1 adult	Feeding	-	-	-	-	-	-	-	-		-	-	-	-	-	Feeding	Feeding		-
		Adult and Brood Fish	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Bairagi	-
	Chandpai	Juvenile	-	Feeding and Growing	-	Feeding and Growing	Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-		-
	Mongla Point	Juvenile	-	-	-	-	-	-	Feeding and Growing	-	-		-	-	-	-	-	-	-	Banshpata	-
		Adult	-	-	-	-		-	-	-	-		Feeding	-	-	-	-	-	-		-
		Age-1 adult	-	-	-	-	Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-		-
		Fry	-	-	Nursing	-	-	-	-	-	-		-	Nursing	-	-	-	-	-		-
	Maidara	Age-1 adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Bele	-
		Juvenile	-	-	-	-	-	Maturation	-	-	-		-	-	-	-	-	-	-		-
		Adult	-	-	-	-	Feeding	-	-	-	-		-	-	-	-	-	-	-		-
		Brood Fish	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
Bairagi/ Amadi	Haldikhali	Juvenile and Age-1 adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
	Akram Point	Juvenile and Age-1 adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	Feeding	Feeding		M&F
		Juvenile and Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
	Chandpai	Fry	-	Nursing	-	Nursing	-	-		Nursing	-		-	-	-	-	-	-	-	Bhol	-
		Juvenile	-	Feeding and Growing	Feeding and Growing	Feeding and Growing	-	Maturation	Feeding and Growing	-	Nursing		-	-	-	-	-	-	-	Bhut Bele	F&G
	Chalna Point	Juvenile and Age-1 adult	-	-	-	-	-	-	-	Feeding	-		-	-	-	-	-		-		-
		Fry	Nursing	-	-	-	-	Nursing	-	Nursing	-		-	-	-	-	-	-	-	Chaka Chingri	M
	Harbaria	Juvenile	-	-	Feeding and Growing	-	Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-		-
	Mongla Point	Fry	Nursing	-	Nursing	-	-	-	-	-	-		Nursing	Nursing	-	-	-	-	-		-
		Juvenile	-	-	-	-	Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-		-
	Maidara	Juvenile	-	-	-	-	-	Maturation	-	-	-	Feeding and Growing	-	-	-	-	Feeding and Growing	-	-	Chali Chingri	-
		Fry	Nursing	-	Nursing	-	-	Nursing	-	Nursing	-		-	-	-	-	-	-	-		-
	Charaputia	Adult	-	-	-	-	-	-	-	Feeding	-		-	-	-	-	-	-	-	Chamua Chingri	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																		
			13th QM	14th QM	15th QM	16th QM	17th QM	18th QM	19th QM	20th QM	21st QM	22nd QM	23rd QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31st QM	32nd QM
	Jongra	Fry	-	-	-	-	-	-	-	Nursing	-		-	-	-	-	-	-	-		-
Chapila	Haldikhali	Juvenile	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
	Akram Point	Juvenile	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
	Harbaria	Juvenile	-	-	-	-	Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-	Chanda	F&G
	Mongla Point	Fry	-	-	-	-	Nursing	-	-	-	-		-	-	-	-	-	-	-	Chapila	-
		Juvenile	-	-	-	-	Feeding and Growing	-	-	-	-		-	Feeding and Growing	-	-	-	-	-	Chela	-
		Adult	-	-	-	-	Feeding	-	Maturation	-	-		-	-	-	-	-	-	-		-
	Chalna Point	Adult	-	-	-	-	Feeding	-	Maturation	-	Maturation	Feeding	-	-	-	-	-	-	-		-
		Fry	-	-	-	-	-	Nursing	-	-	-		-	-	-	-	-	-	-	Chewa	-
	Maidara	Juvenile to Age-1 adult	-	-	-	-	-	Growing and Maturation	-	-	-		-	-	-	-	-	-	-		-
Loitta	Haldikhali	Juvenile and Age-1 adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Chhati Icha	-
	Akram Point	Juvenile	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Chitra	-
	Akram Point	Age-1 adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
	Chandpai	Juvenile	-	-	-	-	-	-	-	-	-		-	--	-	-	-	-	-		G
	Jongra	Fry	-	-	-	-	-	-	-	Nursing	-		-	-	-	-	-	-	-	Chota Bele	-
	Harbaria	Fry, Juvenile and Age-1 adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
	Mongla Point	Fry	-	-	Nursing	-	-	-	-	-	-		-	-	-	-	-	-	-		-
	Chalna Point	Age-1 adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
		Fry	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Datina	-
Poma	Haldikhali	Juvenile	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
	Akram Point	Juvenile	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
		Age-1 adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	Maturation	-		-
		Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Dogri	-
	Charaputia	Brood Fish	-	-	-	Spawning	-	-		-	-		-	-	-	-	-	-	Maturation	Ekthuitta	-
		Juvenile and Adult	-	-	-	Feeding	-	-	Growing and Maturation	Feeding	-		Growing and Maturation	-	-	Growing and Maturation	Maturation		Nursing		-
	Chandpai	Fry and Juvenile	-	-	-	Nursing	-	-	-	-	-		-	-	-	-	-	-	-		-
		Fry	-	-	-	-	Nursing	-	-	-	-		-	-	-	-	-	-	-	Gagra Tengra	-
		Juvenile	Feeding and Growing	-	-	Feeding and Growing	-	-	-	-	-		-	-	-	-	-	--	-		-
		Adult		Feeding	Feeding	Feeding	-	-	-	-	-		-	-	-	-	Feeding	-	-	Gangania	M&F
		Brood Fish	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
	Jongra	Fry	-	-	-	-	-	-	-	Nursing	-		-	-	-	-	-	-	-	Golda Chingri	-
	Haldikhali	Fry and Juvenile	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
	Harbaria	Adult and Brood Fish	-	-	-	-	-	-	-	-	-			-	-	-	-	Maturation	-		-
		Adult	Feeding	-	-	-	-	Feeding	-	-	-		-	-	-	-	-	-	-	Gulsha Tengra	-
		Fry and Juvenile	-	-	-	-	-	-	-	-	-		Nursing	-	-	-	-	-	-		-
	Mongla Point	Fry, Juvenile and Age-1 adult	Nursing	-	-	-	Nursing	-	Feeding and	-	-		Nursing and Maturation	-	-	-	-	-	-	Harina Chingri	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																		
			13th QM	14th QM	15th QM	16th QM	17th QM	18th QM	19th QM	20th QM	21st QM	22nd QM	23rd QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31st QM	32nd QM
									Growing												
		Fry	-	Nursing	-	-	-	-	-	-	-		-	Nursing	-	-	-	-	-		-
		Juvenile	-	-	-	-	-	-	-	-	Nursing		-	-	-	-	-	Maturation	-		-
		Age-1 Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
		Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
		Brood Fish	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Ilish	-
	Maidara	Adult	-	Feeding	-	-	-	-	Maturation and Feeding	-	-		Feeding	-	-	-	-	-	-	Java	-
		Juvenile	-	-	-	-	-	-	-	-	-	-	-	Maturation and Feeding	-	-	-	-	-		-
		Fry	-	-	-	-	-	Nursing	-	-	-	Nursing	-	-	-	-	-	-	-	Kain Magur	-
	Chalna Point	Juvenile and Adult	-	Feeding and Growing	-	-	-	Maturation and Feeding	Maturation and Feeding	-	Maturation and Feeding		-	Maturation and Feeding	-	-	-	-	-		-
		Fry	Nursing	-	-	-	-	-	-	-	-		-	-	-	-	-	Feeding	-	Kala Poa	-
Chhuri	Haldikhali	Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
	Akram Point		-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Kathali Chingri	-
Chela	Haldikhali	Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
	Akram Point	Juvenile and Adult	-	-	-	-	-	-	-	-	-		-	-	-	Maturation and Feeding	-	-	-	Khoira	-
	Harbaria	Fry and Juvenile	-	-	-	-	-	-	-	-	-		-	-	Nursing and Maturation	-	-	-	Feeding and Growing	Kholla	-
	Chalna Point		-	-	-	Nursing and Feeding	-	-	-	-	-	Nursing and Maturation	-	Nursing and Maturation	-	-	-	-	-		-
	Chandpai		-	-	Feeding and Growing		-	-	-	Nursing	Nursing		-	-	Nursing and Maturation	-	Feeding and Growing	-	-	Kuchia	-
	Mongla Point		-	Nursing	-	-	-	-	-	-	-	Nursing and Maturation	-	-	-	-	-		-		-
Gang Tengra	Haldikhali	Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
	Akram Point	Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
	Harbaria	Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Kukurjib	-
	Chandpai	Adult	-	-	-	-	Feeding	-	-	-	-		-	-	-	-	-	-	-	Kumirer Khil	-
	Maidara	Fingerling	-	-	-	-	Nursing	-	-	-	-		-	-	-	-	-	-	-		-
	Mongla Point	Fingerling					Nursing	-	-	-	-		-	-	-	-	-	-	-	Menua	-
		Age-1 Adult					Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-		-
Ghagra Tengra	Chandpai	Juvenile and Age-1 adult	-	-	-	-	-	Maturation		-	-		-	-	Maturation	-	Maturation	-	-		-
		Brood Fish	-	-	Breeding	-	-	-	-	-	-		-	-	-	-	-	-	-	Motka Chingri	-
		Fry	-	-	-	-	Nursing	-	-	-	-		-	-	-	-	-	-	-		-
	Chalna Point	Age-1 adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	Nursing	-		-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																		
			13th QM	14th QM	15th QM	16th QM	17th QM	18th QM	19th QM	20th QM	21st QM	22nd QM	23rd QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31st QM	32nd QM
	Mongla Point	Age-1 adult	-	-	-	-	-	-	Maturation and Feeding	-	Maturation and Feeding		-		-	-	-	-	-		-
		Juvenile	-	-	-	-	-	-	-	-	-	-	-	Feeding and Growing	-	-	-	-	-		-
	Akram Point	Juvenile and Adult	Feeding	-	-	-	-	-	-	Feeding and Growing	-		-	-	Maturation	-	-	-	Feeding and Growing	Mutkura Bele	-
		Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	Feeding	Maturation		-
	Haldikhali	Juvenile	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Nandi Bele	-
	Harbaria	Adult	Feeding	Breeding	-	-	-	-	Feeding	-		-	-	-	Maturation	-	Maturation	-	Maturation		-
		Juvenile	-	-	-	-	Maturation	-	Maturation	-		-	-	-	-	-	-	-	-	Paissa	-
	Charaputia	Juvenile and Age-1 adult	-					Maturation	-	-		Maturation	-	-	Maturation	-	Maturation	-	-		-
Gulsha Tengra	Haldikhali	Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
	Akram Point	Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	Feeding and Growing		-
	Chandpai	Age-1 adult	Feeding	-	Feeding and Growing	-	-	-	-	-	-		-	-	-	-	-	-	-		-
		Juvenile	-	Feeding and Growing	-	Feeding and Growing	-	-	-	-	-		-	-	-	-	-	-	Maturation		-
	Charaputia	Juvenile	-	-	-		-	-	Feeding and Growing	-	-		-	-	-	-	-	-	-	Pangas	-
		Age-1 adult	-	-	-	-	-	-	-	-	-	-	-	-	-	Maturation	-	-	-	Phesa	-
	Mongla Point	Age-1 adult	-	-	-	-	Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-		-
		Juvenile	-	-	-	-	Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-	Poa	-
	Harbaria	Juvenile	-	-	-	-	Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-		-
		Age-1 adult	-	-	-	-	Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-		-
	Maidara	Juvenile and Age-1 Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
	Chalna Point	Juvenile	-	-	-	-	-	-	-	-	-		-	Feeding and Growing		-	-	-	-		-
Potka	Haldikhali	Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Poikka	-
	Chalna Point	Fry	-	-	-	-	-	Nursing	-		-		-	-	-	-	-	-	-	Potka	-
	Chandpai	Fry	-	-	-	-	-	-	-	Nursing	-		-	-	-	-	-	-	-		-
		Juvenile	Feeding	-	-	-	-	-	Feeding and Growing	-	-		-	-	-	-	Feeding and Growing	-	-	Punti	-
		Adult	-	Feeding and Growing	Feeding	-	-	-	-	-	-		-	-	-	-	-	-	-	Rekha	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																		
			13th QM	14th QM	15th QM	16th QM	17th QM	18th QM	19th QM	20th QM	21st QM	22nd QM	23rd QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31st QM	32nd QM
	Jongra	Fry	-	-	-	-	-	-	-	Nursing	-		-	-	-	-	-	-	-		-
	Mongla Point	Fry	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Serboti	-
		Juvenile	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Tairel	-
	Maidara	Fry	-	-	-	Nursing	-	Nursing	-	Nursing	-		-	-	-	-	-	-	-	Tao Paissa	-
		Juvenile	-	-	-	-	-	Maturation	-	-	-		-	-	-	-	-	-	Feeding and Growing		-
	Harbaria	Fry	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
	Charaputia	Juvenile and adult	-	-	-	-	-	-	Feeding and Growing	-	-		-	-	-	Feeding and Growing	-	-	Feeding and Growing	Tengra	-
Paira Chanda	Akram Point	Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
Chewa	Akram Point	Juvenile and Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	Feeding and Growing	Thurina	-
	Chandpai	Fry and Juvenile	-	-	-	-	-	-	-	Nursing	-		-	-	-	-	Feeding and Growing	-	-	Tiger Chingri	-
		Juvenile	-	Feeding and Growing	-	-	-	-	-	-	Feeding and Growing		-	-	-	-	-	-	-		-
		Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
	Jongra	Fry	-	-	-	-	-	-	-	Nursing	-		-	-	-	-	-	Feeding	-	Topse	-
		Fry and Juvenile	-	-	-	-	-	-	-	-	-	-	Nursing	-	-	-	-	-	-	Fish Species	-
	Chandpai	Juvenile-1	-	-	-	-	Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-	Bagda Chingri	-
	Mongla Point	Juvenile	-	-	-	-	-	-	-	-	Nursing	Maturation	Maturation	-	-	-	-	-	-		-
		Fry	-	-	-	-	Nursing	-	-	-	-		-	-	-	-	Maturation	-	-		-
	Maidara	Juvenile	-	-	-	-	-	-	-	-	-	Maturation	-	-	-	-	-	-	-		-
		Fry	-	-	Nursing	-	-	-	-	-		-	-		-	-	-	-	-		-
	Chalna Point	Adult	-	-	-	-	Feeding	-	-	-	-	Feeding	-	Feeding	-	-	-	-	-	Bairagi	-
		Age-1 Juvenile	-	-	-	-	-	-	-	-	-		Maturation	-	-	-	-	-	Feeding and Maturation		-
Bele	Akram Point	Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Banshpata	-
		Juvenile	-	-	-	-	-	-	-				-	-	-	Feeding	Maturation	-	-		-
	Chandpai	Fry	-	-	-	Nursing	Nursing	-	-	Nursing	-	Nursing	-	-	-	-	-	-	-		-
		Juvenile and Adult	Feeding and Growing	-	Feeding and Growing	-	-	-	-	Feeding and Growing		-	-	-	Maturation and Feeding	-	-	-	Feeding and Maturation		-
	Jongra	Fry	-	-	-	-	-	-	Nursing	-		-	-	-	-	-	-	-	-	Bele	-
	Harbaria	Juvenile and Age-1 Adult	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-
	Mongla Point	Fry	-	Nursing	-	-	Nursing	-	-	-	-	-	-	-	-	-	-	-	-		-
		Juvenile and Adult	-	-	-	-	-	-	-	-	Maturation and Feeding	-	-	-	-	-	-		-		-
	Chalna Point	Fry	-	-	Nursing	Nursing	-	-	-	-			-		-	-	-	-	Feeding and Maturation		-
		Fingerling	-	-	-	-	Nursing	-	-	-	-		Nursing	Nursing	-	-	-	-	-		-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																		
			13th QM	14th QM	15th QM	16th QM	17th QM	18th QM	19th QM	20th QM	21st QM	22nd QM	23rd QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31st QM	32nd QM
		Juvenile and Age-1 adult	-	-	-	-	-	-	-	-	-	-	-	Maturation and Feeding	-	-	Feeding and Growing	Maturation	-		-
	Maidara	Juvenile and Age-1 adult	-	-	Feeding and Growing	-	Feeding and Growing	Feeding and Growing	-	-	Maturation and Feeding	Maturation and Feeding	Maturation and Feeding	-	-	-	-	-	-	Bhol	-
		Fry	Nursing	-	Nursing	-	-	-	-	-		-	-		-	-	-	-	-	Bhut Bele	-
	Charaputia	Juvenile and Age-1 adult	-	-	-	-	-	Maturation	-	-		-	-		-	-	-	-	-		-
Tular Dandi (Nona bele)	Akram Point	Adult	-	-	-	-	-	-	-	Feeding and Maturation	-		-	-	-	-	-	-	-	Chaka Chingri	-
	Chandpai	Age-1 Adult	-	-	Feeding	-	-	-	-	-	-		-	-	-	-	-	-	-		-
		Juvenile	-	-	-	-	-	Growing	-	-	-		-	-	-	-	-	-	-		-
		Fry	-	-	-	-	-	-	-	Nursing	-		-	-	-	-	-	-	-		-
	Jongra	Fry	-	-	-	-	-	-	-	Nursing	-	-	-	-	-	-	-	-	-	Chali Chingri	-
	Maidara	Adult	-	Feeding	-	-	-	-	Maturation	-	-	-	-	-	-	-	Maturation and Feeding	-	-		-
	Chalna Point	Adult	-	-	-	-	-	-	Maturation	Maturation	Maturation and Feeding	-	-	-	Maturation and Feeding	-	-	-	Maturation	Chamua Chingri	-
Tairel	Akram Point	Adult	-	-	-	Feeding	-	-	-	-	-	-	-	-	-		-	-	Maturation		-
		Age-1 Adult	-	-	-	-	-	-	-	-	-	-	-	-	-	Maturation	-	-	-		-
	Charaputia	Juvenile	-	-	-	-	-	-	-	Maturation	-		-	-	-	-	-	-	-		-
	Harbaria	Age-1 Adult	-	Feeding and Growing	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Chanda	-
	Chandpai	Juvenile	-	-	-	-	-	Growing	-	-	Feeding and Growing		-	-	-	-	-	Maturationg	-	Chapila	-
	Chalna Point	Juvenile	-	-	-	-	-	-	-	-	Growing		-	-	-	-	-	-	Maturating	Chela	-
	Maidara	Juvenile	-	-	-	-	-	Growing	-	-	-		-	-	-	-	-	-	-		-
Pheksa	Akram Point	Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
	Charaputia	Juvenile and Adult	-	-	-	-	-	-	-	Feeding and Maturation	-			-	-	-	Maturation	-	Maturating	Chewa	-
	Chalna Point	Juvenile and Adult	-	-	-	Feeding and Growing	-	-	-	Maturation	Maturation			-	Maturation	-	-	-	-		-
		Adult	-	Feeding	-	-	-	-	Maturation	-	-	Feeding		-	-	-	-	-	-	Chhati Icha	-
	Mongla Point	Adult	-	-	-	-	-	-	Maturation	-	-		Feeding	-	-	-	-	-	-	Chitra	-
		Juvenile	-	-	-	Growing	-	-		-	-	-	-	-	-	-	-	-	-		-
	Chandpai	Juvenile and Adult	-	-	-	Feeding and Growing	-	-	Maturation	--	-	-	-	-	-	-	-	-	Growing and Maturation		-
	Maidara	Adult	-	Feeding	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Chota Bele	-
Paissa	Akram Point	Juvenile and Adult	Feeding	-	-	-	-	Growing and Maturation	-	-	-	-	-	-	-	Growing and Maturation	-	-	-		-
		Brood	Spawning	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Growing and Maturation		-
	Charaputia	Brood Fish	-	-	-	Spawning	-	-	-	-	-	-	-	-	-	-	-	Feeding	-		-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																		
			13th QM	14th QM	15th QM	16th QM	17th QM	18th QM	19th QM	20th QM	21st QM	22nd QM	23rd QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31st QM	32nd QM
		Juvenile and Adult	-	-	-	-	-	-	-	-	-	-	-	-	-	Feeding	-	-	Growing and Maturation	Datina	-
		Fry	-	-	-	-	-	-	-	-	-	-	Nursing	-	-	-	-	-	-		-
	Harbaria	Juvenile-1 and Juvenile	-	Feeding and Growing	-	-	-	-	-	-	-		-	-	Feeding and Growing	-	-	-	-		-
		Adult	-	Feeding	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
	Chalna	Fry	-	-	-	-	-	-	Feeding and Growing	-	Feeding and Growing		Nursing	Nursing	-	Feeding	Feeding and Growing	-	-	Dogri	-
	Chandpai	Fry	-	-	-	Nursing	-	-	Feeding and Growing	Nursing	Nursing	Nursing	Nursing	-	Feeding and Growing	Feeding	-	-	-	Ekthuitta	-
		Juvenile and Adult	Feeding	Feeding and Growing	-	Feeding and Growing	-	Maturation	-	-			-	-	-	-	-	-	Feeding and Growing		-
	Jongra	Fry	-	-	-	-	-	-	-	Nursing			-	-	-	-	-	-	-		-
	Harbaria	Juvenile	-	-	Feeding and Growing	-	-	Maturation	-	-			-	-	Feeding and Growing	-	-	-	-	Gagra Tengra	-
	Mongla Point	Fry	-	-	Nursing	-	-	-	-	-			-	-	-	-	-	-	-		-
		Age-1 Adult	-	-	-	-	-	-	-	-		Maturation	-	-	-	-	-	-	-	Gangania	-
	Maidara	Fry, Juvenile and Age-1 adult	-	-	-	-	-	-	Feeding and Growing	-	Feeding and Growing		-	-	Feeding and Growing	-	-	-	-		-
		Juvenile	-	-	-	-	-	Growing	-	-	-		Maturation	-	-	-	-	-	-	Golda Chingri	-
Banshpata	Chandpai	Juvenile	-	-	-	Growing	Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-		M&F
		Adult	-	Feeding	Feeding	-	-	-	-	-	-		-	-	-	-	-	-	Growing and Maturation		-
	Jongra	Juvenile	-	-	-	-	-	-	-	Maturation	-		-	-	-	-	-	-	-	Gulsha Tengra	-
	Charaputia	Juvenile and Age-1 Adult	-	-	-	Feeding	-	-	Growing and Maturation	-	-		-	-	-	Growing and Maturation	-	-	-		-
	Akram Point	Juvenile	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	Feeding and growing	Harina Chingri	-
	Haldikhali	Juvenile and adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
	Harbaria	Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-
	Mongla Point	Juvenile	-	-	-	-	Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-		-
	Maidara	Juvenile and Age-1 Adult	-	-	-	-	-	Growing and Maturation	Growing and Maturation	-	-		-	-	Maturation	-	-	Maturation	-		-
		Adult	-	Feeding	-	-	-	Feeding	-	-	-		-	-	-	-	-	Maturation	-	Ilish	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																		
			13th QM	14th QM	15th QM	16th QM	17th QM	18th QM	19th QM	20th QM	21st QM	22nd QM	23rd QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31st QM	32nd QM
	Chalna Point	Juvenile and Age-1 Adult	-	-	-	-	-	-	Growing and Maturation	Feeding	Growing and Maturation		-	Growing and Maturation	-	-	-	-	Maturation	Java	-
Hilsa	Akram Point	Brood Fish	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	Maturation		-
	Maidara	Age-1 Adult	-	-	-	-	-	-	-	-	-	Maturation	-	-	-	-	-	-	Maturation	Kain Magur	-
	Chalna Point	Adult	-	-	-	-	-	Maturation	-	-	-	Feeding	-	-	-	-	-	Nursining	-		-
Pangas	Haldikhali	Juvenile	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	Maturation	Kala Poa	-
	Charaputia	Adult	-	-	-	-	-	-	-	Feeding	-		-	-	-	-	-	-	-		M&F
	Mongla Point	Juvenile	-	-	-	-	-	-	Feeding and Growing	-	Feeding and Growing		-	-	-	-	-	-	-	Kathali Chingri	-
	Maidara	Juvenile and Age-1 Adult	-	-	-	-	-	-	-	-	-	Feeding and Growing	-	-	-	-		-	-		-

*Source: Field findings at different times; *Only Age-1 to Brood fish was allowed to interpret the migration purpose; F = Feeding; Sp = Spawning*

D.7: The Present Catch in Three Sampling Ghers

Sampling Site	Total Catch (ton): 2014-2015							
	1st QM (April, 2014)		2nd QM (July, 2014)		3rd QM		4th QM	
	Species	ton	Species	ton	Species	ton	Species	ton
1	Bagda	5	Bagda	6.42	Bagda	4.8	-	-
	Vetki	1.57	Bele	0	Gusha Chingri	-	-	-
	Bele	0.98	Cheng	0	Harina Chingri	-	-	-
	Harina Chingri	0.78	Bhangan	0	Rui (kg)	-	-	-
	Chali Chingri	0.11	Chali Chingri	0	Catla (kg)	-	-	-
	Chaka Chingri	0.08	-	-	-	-	-	-
Sub-total =		**8.52**		**6.42**		**4.8**	**-**	**-**
2	Bagda	4	Bagda	1	Bagda	7	-	-
	Harina Chingri	2	Harina Chingri	0.33	Vetki	1	-	-
	Chali Chingri	0.18	Chali Chingri	0.08	Paissa	10	-	-
	-	-	Golda Chingri	0.01	Phessa	2.4	-	-
	-	-	Bele	0.08	Bhangan	1.7	-	-
	-	-	Tengra & Paissa	0.04	Golda Chingri	0.9	-	-
	-	-	-		Gulsha Tengra	0.2	-	-
Sub-total =		**6.00**		**2.00**		**23**		**-**
3	Bagda	1.38	Bagda	2.4	Bagda	1.5	-	-
	Harina Chingri	0.34	Harina Chingri	0.34	Paissa	10	-	-
	Chali Chingri	0.17	Chali Chingri	0.17	Tengra	10	-	-
	-	-	-	-	Bele	20	-	-
	-	-	-	-	Tilapia	22	-	-
	-	-	-	-	Rui	28	-	-
	-	-	-	-	Vetki	-	-	-
	-	-	-	-	Harina Chingri	-	-	-
	-	-	-	-	Chami Chingri	-	-	-
	-	-	-	-	Catla	56	-	-
	-	-	-	-	Mrigel	50	-	-
Sub-total =		**1.89**		**2.91**		**197.5**	**-**	**-**
Grand-total =		**17.00**		**11.33**		**226.5**	**-**	**-**

Source: CEGIS Field Survey, 2014-2015

Sampling Site	Total Catch (ton): 2015-2016							
	5th QM		6th QM		7th QM		8th QM	
	Species	ton	Species	ton	Species	ton	Species	ton
1	Bagda	-	Bagda	1.6	Bagda	2	Catla	2
	Horina Chingri	1	Horina Chingri	1	Horina Chingri	3.2	Glass Carp	0.1
	Tengra	-	Chali Chingri	0.5	Gusha Chingri	0.8	Horina Chingri	0.8
	Paissa	-	Paissa	0.25	Paissa	24	Minar Carp	0.1
	Chela	-	Bele	0.25	Vetki	0.2	Nilotica	1.6
	Vetki	-	-	-	Kailla	0.4	Paissa	0.6
	-	-	-	-	Bele	0	Rui	3
	-	-	-	-	Tilapia	0	Vetki	0.8
	-	-	-	-	Catla	0	-	0
	-	-	-	-	Minar Carp	0	-	0
	-	-	-	-	Glass Carp	0	-	0
	-	-	-	-	Kakra	0.4	-	0
Sub-total=	**-**	**1**	**-**	**3.06**	**-**	**31**	**-**	**9**
2	Bagda	-	Bagda	1.67	Bagda	0	-	0
	-	-	Chali Chingri	0.30	Horina Chingri	0	-	0
	-	-	Horina Chingri	0.50	Chali Chingri	0	-	0
	-	-	Bele	0.30	Tilapia	0	-	0
	-	-	Paissa	0.25	Vetki	0	-	0
	-	-	-	-	Tengra	0	-	0
	-	-	-	-	Paissa	0	-	0
Sub-total=	**-**	**0**	**-**	**3.02**	**-**	**0**	**-**	**0**
3	Bagda	-	Bagda	3.5	Bagda	0.4	-	0
	-	-	-	-	Paissa	3.2	-	0
	-	-	-	-	Vetki	0.4	-	0
	-	-	-	-	Tilapia	0.06	-	0
	-	-	-	-	Horina Chingri	0.35	-	0
	-	-	-	-	Chali Chingri	0.6	-	0
	-	-	-	-	Chaka Chingri	0.1	-	0
	-	-	-	-	Tengra	0	-	0
	-	-	-	-	Bele	0	-	0
	-	-	-	-	Tairel	0.06	-	0
	-	-	-	-	Bhangan	0	-	0
Sub-total =	**-**	**-**	**-**	**-**	**-**	**5.17**	**-**	**0**
Grand-total =	**-**	**1**		**3.5**		**36.17**	**-**	**9**

Source: CEGIS Field Survey, 2015-2016

Sampling Site	Total Catch (ton): 2016-2017							
	9th QM		10th QM		11th QM		12th QM	
	Species	ton	Species	ton	Species	ton	Species	ton
1	-	0	-	-	Bagda	3	-	0
	-	0	-	-	Tengra	0.1	-	0
	-	0	-	-	Horina Chingri	0.8	-	0
	-	0	-	-	Paissa	0.1	-	0
	-	0	-	-	Vetki	2	-	0
	-	0	-	-	-	0	-	0
	-	0	-	-	-	0	-	0
	-	0	-	-	-	0	-	0
	-	0	-	-	-	0	-	0
	-	0	-	-	-	0	-	0
	-	0	-	-	-	0	-	0
	-	0	-	-	-	0	-	0
Sub-total =	**-**	**0**	-	-	**-**	**6**	**-**	**0**
2	Bagda	1	-	-	Bagda	2	Bagda	0.0035
	Horina	0.14	-	-	Bele	1.6	Horina Chingri	0.288
	-	0	-	-	Chali Chingri	4	Paissa	0.22
	-	0	-	-	Horina Chingri	8	Tengra	0.305
	-	0	-	-	Paissa	0.28	Chela	0.45
	-	0	-	-	Tengra	0.8	Tilapia	0.53
	-	0	-	-	Tilapia	8	Vetki	0.06
	-	-	-	-	Vetki	2.4	Bele	0.15
Sub-total =		**1.14**	-	-	**-**	**9**	**-**	**0**
3	Bagda	2	-	-	Bagda	0.4	-	0
	-	0	-	-	Horina Chingri	0.35	-	0
	-	0	-	-	Paissa	0.06	-	0
	-	0	-	-	Tengra	0.4	-	0
	-	0	-	-	Tilapia	3.2	-	0
Sub-total =	**-**	**2**	**-**		**-**	**4**	**-**	**2.01**
Grand-total =	**-**	**3.14**	**-**		**-**	**19**	**-**	**2.01**

Source: CEGIS Field Survey, 2016-2017

Sampling Site	Total Catch (ton): 2017-2018 and 2018-19													
	13th QM		14th QM		15th QM		16th QM		17th QM		18th QM		19th QM	
	Species	ton	Species	ton	Species	ton	Species	ton	Species	ton	Species	ton	Species	ton
1	Bagda	0	Bagda	3	-	-	Bagda	2.00	Bagda	0.76	Bagda	0	Bagda	-
	Horina Chingri	1	Rui (kg)	1.3	-	-	Golda	0.10	Bele	0.20	Catla	1.2	Paissa	-
	Tengra	0	Catla (kg)	1	-	-	Rui	0.12	Chali	1.20	Common Carp	0.3	-	-
	Paissa	0	-	-	-	-	Grass Carp	0.20	Golda	0.00	Grass Carp	0.3	-	-
	Chela	0	-	-	-	-	Catla	0.30	Horina	1.60	Rui	4.2	-	-
	Vetki	0	-	-	-	-	Tilapia	0.45	Paissa	0.00			-	-
							Horina	0.10	Tilapia	12.80			-	-
							Gusha	0.00					-	-
							Paissa	0.00					-	-
							Khorulla	0.00					-	-
							Vetki	0.00					-	-
							Gulsha	0.00					-	-
							Bele	0.00					-	-
Sub-total =	**-**	**1**	**-**	**3.6**	-	-	=	**3.27**	=	**16.56**	**=**	**6**	**-**	**-**
2	Bagda	0	Bagda	5	-	-	Bagda	**3.93**	Bagda	1.48	Bagda	5	Bagda	-
	-	-	Vetki	0.5	-	-	Golda	**0.13**	Bele	0.06	Bhangan	0.05	Paissa	-
	-	-	Paissa	7	-	-	Rui	**8.41**	Bhangan	0.01	Catla	3	Datina	-
	-	-	Phessa	1	-	-	Tilapia	**5.90**	Catla	0.00	Chali	0.4		
	-	-	Bhangan	0.7	-	-	Nilotica	**0.00**	Chali	0.04	Golda	0.08		
							Khorulla	**0.00**	Chel	0.01	Horina	1.8		
							Mrigel	**0.00**	Golda	0.00	Paissa	0.8		
							Catla	**0.00**	Horina	0.50	Rui	3		
							Grass Carp	**0.11**	Motka	0.05	Tengra	0.8		
							Common Carp	**5.55**	Paissa	0.03	Tilapia	8		

Sampling Site	Total Catch (ton): 2017-2018 and 2018-19													
	13th QM		14th QM		15th QM		16th QM		17th QM		18th QM		19th QM	
	Species	ton	Species	ton	Species	ton	Species	ton	Species	ton	Species	ton	Species	ton
							Sarpunti	**0.53**	Rui	0.00	Vetki	2		
							Horina	**1.91**	Tengra	0.13				
							Chali Chingri	**1.16**	Tilapia	0.41				
							Bele	**0.43**	Vetki	0.01				
							Vetki	**1.96**						
							Tengra	**4.20**						
							Paissa	**0.14**						
							Tairel	**0.003**						
							Pheksa	**0.001**						
Sub-total =		**0**		**14.2**	-	-	=	**34.38**	=	**2.75**	**=**	**25**		
3	Bagda	0	Bagda	2	-	-	Bagda	**0.50**	Bagda	0.10	-	0	Bagda	-
	-	-	Paissa	8	-	-	Tilapia	**1.50**	Horina Chingri	0.00			Golda	-
	-	-	Tengra	2	-	-	Tengra	**0.12**	Paissa	0.00			Paissa	-
	-	-	Tilapia	5	-	-	Paissa	**0.00**	Tengra	0.00			Nilotica	-
	-	-	Rui	3	-	-	Horina Chingri	**0.60**	Tilapia	0.20			Khorsul	-
	-	-	Vetki	2	-	-								
	-	-	Catla	10	-	-								
Sub-total =	**-**	**0**	**-**	**32**	-	-								
Grand-total =	**-**	**1**	**-**	**49.8**	-	-	**=**	**2.72**	**=**	**0.30**	**=**	**0**		

Source: CEGIS Field Survey, 2017-18 and 2018-19

Sampling Site/ Location	Total Catch (ton): 2019-20, 2020-21 and 2021-22																					
	20th QM		21st QM		22nd QM		23rd QM		25th QM		26th QM		27th QM		28th QM		29th QM		30th QM		31st QM	
	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Fish Species	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)
Bhekatkhali Khal, Rajnagar	Bagda	32	Bagda	2.72	Bagda	0.8	Harina	0.02	Bagda	1.2	Patari	0.2	-	-	Bagda	0.7	Bagda	0.5	Patari	0.30	-	-
	Horina	48	Harina	3.44	Harina	1.0	-	-	Harina	2.0	Tilapia	0.5	-	-	Harina	0.15	Harina	0.6	Harina	0.10	-	-
	-	-	Tilapia	0.7	Chali	0.2	-	-	Tilapia	1.0	Paissa	0.05	-	-	-	-	Paissa	0.05	Tilapia	1.20	-	-
	-	-	Parse	0.17	Patari	0.3	-	-	-	-	Harina	0.2	-	-	-	-	Tilapia	2.0	Chali	0.10	-	-
	-	-	-	-	Tairel	0.03	-	-	-	-	Carpu	1.0	-	-	-	-	Chali	0.3				
	-	-	-	-	Tilapia	0.5	-	-	-	-	Rui	0.05	-	-	-	-						
	-	-	-	-	Datina	0.02	-	-	-	-	Grass Carp	0.05	-	-	-	-						
											Golda	0.02	-	-	-	-						
											Bagda	0.3	-	-	-	-						
Sub-total =		**80**		**7.0**		**2.8**		**0.02**		**4.2**		**2.37**	**-**	**-**		**0.85**		**3.45**		**1.70**		**-**
Kapashdanga-Muralia	Bagda	1.41	Bagda	6.74	Bagda	3.42	Harina	0.01	Bagda	4.84	Bagda	1.45	-	-	Bagda	0.04	Bagda	2.73	Bagda	0.07	-	-
	Paissa	0.60	Golda	0.01	Harina	3.96	-	-	Hatina	0.92	Hatina	1.08	-	-	Hatina	0.14	Harina	0.96	Harina	0.81	-	-
	Crab	0.00	Harina	0.65	Chali	0.38	-	-	Chali	0.20	Chali	0.30	-	-	Chali	0.03	Chali	0.11	Chali	0.01	-	-
	Tilapia	0.30	Chali	0.04	Bele	2.11	-	-	Bele	0.27	Bele	0.19	-	-			Bele	0.44	Bele	0.58		
	Golda	0.10	Bele	0.09	Paissa	2.62	-	-	Paissa	0.04	Paissa	1.80	-	-			Paissa	0.2	Paissa	0.34		
	Horina	2.92	Tilapia	0.22	Tilapia	9.85	-	-	Tilapia	3.87	Tilapia	6.93	-	-			Tilapia	12.9	Tilapia	7.82		
	Chali	1.52	Tengra	0.57	Golda	0.04	-	-	Golda	0.03	Golda	0.03	-	-			Tengra	0.01	Tengra	0.02		
	Bele	1.35	Bhangan	0.08	Tengra	0.17	-	-	Tengra	0.01	Tengra	0.17	-	-					Patari	1.76		
	Tengra	0.27	-	-	Patari	2.25	-	-	Patari	0.11	Patari	0.25	-	-					Datina	0.06		
	Major Carp	0.55	-	-	Chemo	0.02	-	-	Datna	0.01	Catol	0.04	-	-					Rui	0.27		
	-	-	-	-	Datina	1.01	-	-	Rui	0.47	Chemo	0.32	-	-					Kailla	0.03		
	-	-	-	-	Rui	1.27	-	-	Chaka	0.05			-	-								
	-	-	-	-	Chaka	0.01	-	-	-	1.56			-	-								
	-	-	-	-	Kailla	0.96	-	-	-	-			-	-								
	-	-	-	-	Nundi Bele	0.02	-	-	-	-			-	-								
	-	-	-	-	Kakra	0.49	-	-	-	-			-	-								

	Total Catch (ton): 2019-20, 2020-21 and 2021-22																					
Sampling Site/ Location	20th QM		21st QM		22nd QM		23rd QM		25th QM		26th QM		27th QM		28th QM		29th QM		30th QM		31st QM	
	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Fish Species	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)
	Sub-total =	**9**		**8.0**		**29**		**0.01**		**12.38**		**12.57**	**-**	**-**		**0.21**		**17.38**		**11.76**		**-**
Chunkuri-2	Bagda	0.04	Patari	0.01	Tilapia	0.02	-	-	Paissa	0.05	Sada Chingri	0.03	-	-	Bagda	0.01	Paissa	0.12	Paissa	0.08	-	-
	Paissa	0.00	Tair/Tailla	0.01	Paissa	0.066	-	-	Golda	0.03	Paissa	0.03	-	-	Harina	0.06	Bagda	0.04	Bagda	0.04	-	-
	Khorsula	0.00	Bhangan	0.01	Khorsul	0.009	-	-	Kharulla	0.01	Patari	0.02	-	-	Kakra	0.01	Tilapia	0.08	Tilapia	0.16	-	-
	Horina	0.10	Datina	0.03	Bagda	0.015	-	-	Bagda	0.10	Tengra	0.01	-	-			Harina	0.06	Harina	0.04		
	Motka	0.04	Bagda	0.02	Golda	0.006	-	-	Bele	0.03	Datina	0.02	-	-			Kakra	0.12	Patari	0.04		
	Chali	0.03	Golda	0.03	Patari	0.015	-	-	Harina	0.15	Ilish	0.005	-	-			Patari	0.02	Kala Chingri	0.04		
	Chaka	0.01	Faissa	0.01	Harina	0.008	-	-	Tengra	0.02	Golda	0.01	-	-			Kala Icha	0.04	Sada Chingri	0.04		
	Bele	0.01	Chaka Chingri	0.01	Chali	0.009	-	-	Tairu	0.03	Nilotica	0.06	-	-			Sada Icha	0.04	Golda	0.01		
	Crab	0.03	Harina	0.02	China Punti	0.047	-	-	Chaka	0.01	Baila	0.004	-	-			Bele	0.01				
	-	-	-	-	Tengra	0.008	-	-	Datina	0.02	Goda Chingri	0.001	-	-			Golda	0.01				
	-	-	-	-	Baila	0.003	-	-	-	-	Chaka Chingri	0..2	-	-								
	-	-	-	-	Datina	0.02	-	-	-	-	Harina	0.02	-	-								
											Chitra	0.004	-	-								
											Pheksa	0.01	-	-								
											Bhangan	0.004	-	-								
											Tairel	0.01	-	-								
											Golda	0.01	-	-								
											Bagda	0.02	-	-								
	Sub-total =	**0.24**		**0.15**		**0.46**		**0.00**		**0.44**		**0.25**	**-**	**-**		**0.08**		**0.54**		**0.45**		**-**

Source: CEGIS Field Survey, 2019-2020 and 2020-2021

(E) Traffic Survey data

Table E.1: Traffic Volume Survey at Khulna Mongla Road (Khudir Bottola)

Date: May 26, 2022 (Thursday)

Vehicles		**7:00 AM to 10:00AM**			**12:00 PM to 2:00PM**			**17:00 PM to 19:00PM**		
Direction	**Factor**	**Khulna to Mongla**	**Mongla to Khulna**	**PCU**	**Khulna to Mongla**	**Mongla to Khulna**	**PCU**	**Khulna to Mongla**	**Mongla to Khulna**	**PCU**
Pedestrian	0	34	10	0	24	14	0	21	22	0
Auto Rickshaw	0.8	1	0	0	0	0	0	0	0	0
Van	0.6	154	89	146	170	64	140	23	100	73
Cycle	0.2	19	12	6	32	13	9	2	20	4
Human Howler	0.6	8	2	5	14	1	9	6	1	4
CNG	0.5	17	7	12	27	10	18	4	19	11
Private Car	1	23	30	52	39	18	57	5	33	38
Motor Cycle	0.3	113	150	79	226	118	103	16	212	68
Jeep	1	4	7	11	10	5	14	2	4	6
Pick-up	2	22	11	65	36	7	85	8	14	43
Micro	1	14	13	27	32	14	45	2	18	20
Bus	2.5	35	44	196	53	28	201	0	39	96
Light Truck	2	30	16	92	28	17	88	7	16	46
Medium Truck	2	31	39	139	66	67	266	4	77	162
Heavy Truck	2	19	7	50	38	14	102	0	18	36
			Total	**880**			**1137**			**607**

Table E.2: Traffic Volume Survey at Khulna Mongla Road (Gonai Bridge)

Date: May 25, 2022 (Wednesday)

Vehicles		7:00 AM to 10:00AM			12:00 PM to 2:00PM			17:00 PM to 19:00PM		
Direction	**Factor**	**Babubari to Plant site**	**Plant site to Babubari**	**PCU**	**Babubari to Plant site**	**Plant site to Babubari**	**PCU**	**Babubari to Plant site**	**Plant site to Babubari**	**PCU**
Pedestrian	0	15	7	0	6	9	0	30	15	0
Auto Rickshaw	0.8	0	0	0	0	0	0	0	0	0
Van	0.6	34	28	37	15	21	21	23	18	25
Cycle	0.2	19	7	5	7	2	2	2	5	1
Human Howler	0.6	10	9	11	3	8	6	6	4	6
CNG	0.5	9	9	9	2	3	3	4	8	6
Private Car	1	5	2	7	2	3	5	5	5	10
Motor Cycle	0.3	81	25	32	28	38	20	16	25	12
Jeep	1	2	1	2	1	2	3	2	4	6
Pick-up	2	2	2	8	3	4	13	8	7	30
Micro	1	8	3	11	3	3	6	2	6	8
Bus	2.5	1	1	5	1	0	1	0	5	13
Light Truck	2	2	0	4	1	1	4	7	2	18
Medium Truck	2	2	1	5	3	1	8	4	7	22
Heavy Truck	2	1	1	5	1	2	5	0	5	10
			Total	**141**			**95**			**166**

Table E.3: Traffic Volume Survey at Power Plant access road (Gonabelai Bridge)

Date: May 24, 2022 (Tuesday)

Vehicles		7:00 AM to 10:00AM			12:00 PM to 2:00PM			17:00 PM to 19:00PM		
Direction	**Factor**	**Khulna to Mongla**	**Mongla to Khulna**	**PCU**	**Khulna to Mongla**	**Mongla to Khulna**	**PCU**	**Khulna to Mongla**	**Mongla to Khulna**	**PCU**
Pedestrian	0	6	9	0	4	8	0	5	5	0
Auto Rickshaw	0.8	0	0	0	0	0	0	0	0	0
Van	0.6	47	31	47	26	28	32	40	39	47
Cycle	0.2	8	7	3	3	4	1	7	12	4
Human Howler	0.6	27	9	22	17	11	17	16	13	17
CNG	0.5	13	37	25	14	17	15	26	39	32
Private Car	1	12	6	18	10	8	18	5	32	37
Motor Cycle	0.3	88	40	38	65	53	35	60	114	52
Jeep	1	2	3	6	6	3	9	7	7	14
Pick-up	2	2	7	17	4	7	22	5	10	28
Micro	1	12	6	18	13	6	18	7	22	29
Bus	2.5	20	12	80	12	12	58	10	19	71
Light Truck	2	5	2	15	7	2	17	8	4	23
Medium Truck	2	22	7	58	38	14	104	19	37	111
Heavy Truck	2	7	9	31	17	8	49	12	18	59
			Total	**378**			**394**			**523**

Table E.4: Existing Cropping Pattern of Monitoring Agriculture Plot

Monitoring agriculture plot	Cropping pattern																										
	2013-14			2014-15			2015-16			(2016-17)			(2017-18)			(2018-19)			(2019-20)			(2020-21)			(2021-2022)		
	K-I	K-II	R	K-I	K-II	R	K-I	K-II	R	K-I	K-II	R	K-I	K-II	R	K-I	K-II	R	K-I	K-II	R	K-I	K-II	R	K-I	K-II	R
Monitoring Spot-1 (Baranpara)	F	L.A.	F	F	H.A.	F	F	H.A.	F	F	H.A.	F	F	L.A.	F	F	L.A.	F	F	L.A.	F	F	L.A.	F	F	23	67
Monitoring Spot-2 (Chunkuri-2)	F	H.A.	F	F	L.A.	F	F	H.A.	F	F	L.A.	F	F	L.A.	F	F	L.A.	F	F	L.A.	F	F	L.A.	F	F	23	F
Monitoring Spot-3 (Kapalirmet)	F	L.A.	F	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*	F*
Monitoring Spot-4 (Chakgona)	F	L.A.	F	F	F**	F	F	F**	F	F	F**	F	F	F**	F	F	L.A.	F	F	L.A.	F	F	L.A.	F	F	L.A.	F
Monitoring Spot-5 (Basherhula)	F	L.A.	F	F	L.A.	F	F	L.A.	F	F	L.A.	F	F	L.A.	F	F	L.A.	F	F	L.A.	F	F	L.A.	F	F	L.A.	F
Monitoring Spot-6 (Bidyarbon)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	F	L.A.	F	F	L.A.	F	F	L.A.	F	F	23	F

*Source: Based on field information and farmers interviewed, May, 2022. *previously cultivated. ** data was not collected due to unavailability/change of sampling plot.* ***K-I:*** *Kharif-I (March-June),* ***K-II:*** *Kharif-II (July-October) and* ***R:*** *Rabi (November-February).* ***Fallow****: F,* ***Local Aman****: L.A.,* ***BRRIdhan-23****: 23,* ***BRRIdhan-67****:67.* ***HYV Aman****: H.A.*

Table E.5: Results of Crop production in Monitoring Plots

Monitoring Agricultural Plot	Production and Yeild	Crop Production																										
		2013-14			2014-15			2015-2016			2016-17			2017-18			2018-19			2019-2020			2020-21			2021-2022		
		K-I	K- II	R	K-I	K- II	R	K-I	K- II	R	K-I	K- II	R	K-I	K- II	R	K-I	K- II	R	K-I	K- II	R	K-I	K- II	R	K-I	K- II	R
Monitoring Spot-1 (Baranpara)	Production (ton/Plot)	-	0.8	-	-	1.4	-	-	1.5	-	-	0.27	-	-	0.92	-	-	1.04	-	-	0.67	-	-	1.08	-	-	1.14	2.1
	Yield (ton/Ha)	-	1.9	-	-	3.5	-	-	3.8	-	-	2.5	-	-	2.3	-	-	2.6	-	-	2.5	-	-	2.6	-	-	2.9	5.3
Monitoring Spot-2 (Chunkuri-2)	Production (ton/Plot)	-	2.4	-	-	1.1	-	-	1.9	-	-	0.44	-	-	2.2	-	-	2.14	-		1.9	-	-	2.05	-	-	2.92	-
	Yield (ton/Ha)	-	2.6	-	-	1.7	-	-	2	-	-	2.4	-	-	2.4	-	-	2.3	-		2.25	-	-	2.25	-	-	3.1	-
Monitoring Spot-3 (Kapalirmet)	Production (ton/Plot)	-	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-
	Yield (ton/Ha)	-	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Monitoring Spot-4 (Chakgona)	Production (ton/Plot)	-	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.44	-	-	0.38	-	-	0.42	-	-	0.36	-
	Yield (ton/Ha)	-	1.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.92	-	-	1.85	-	-	1.87	-	-	1.6	-
Monitoring Spot-5 (Basherhula)	Production (ton/Plot)	-	0.8	-	-	0.57	-	-	0.99	-	-		-	-	1	-	-	0.47	-	-	0.7	-	-	0.82	-	-	0.80	-
	Yield (ton/Ha)	-	1.8	-	-	1.9	-	-	2.1	-	-	1.9	-	-	2.2	-	-	1.57	-	-	1.6	-	-	1.6	-	-	1.7	-
Monitoring Spot-6 (Bidyarbon)	Production (ton/Plot)	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.98	-	-	0.07	-	-	0.3	-	-	0.36	-
	Yield (ton/Ha)	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.1	-	-	2.1	-	-	2.1	-	-	3.6	-

*Source: Based on field information and farmers interviewed, May, 2022. *previously cultivated. ** data was not collected due to unavailability/change of sampling plot.* ***K-I:*** *Kharif-I (March-June),* ***K-II:*** *Kharif-II (July-October) and* ***R:*** *Rabi (November-February).* ***Yield is calculated for clean rice.***

Table E.6: Results of Crop Damage in Monitoring Plots

Monitoring site	2013-14			2014-15			2015-16			2016-17			2017-18			2018-19			2019-2020			2020-2021			2021-2022		
	Area (ha)	Prod. (tons)	Causes	Area (ha)	Prod. (tons)	Causes	Area (ha)	Prod. (tons)	Causes	Area (ha)	Prod. (tons)	Causes	Area (ha)	Prod. (tons)	Causes	Area (ha)	Prod. (tons)	Causes	Area (ha)	Prod. (tons)	Causes	Area (ha)	Prod. (tons)	Causes	Area (ha)	Prod. (tons)	Causes
Monitoring agriculture land-1	-	N.F.	-	-	-	-	-	N.F.	-	0.06	0.024*	E	-	N.F.	-	-	N.F.	-	0.13	0.33*	F	-	N.F	-	-	N.F	-
Monitoring agriculture land-2	-	N.F.	-	0.33*	0.4*	E	-	N.F.	-	-	-	-	-	N.F.	-	-	N.F.	-	0.08	0.19*	F	-	N.F	-	-	N.F	-
Monitoring agriculture land-3	-	N.F.	-	-	-	-	-	N.F.	-	-	-	-	-	N.F.	-	-	N.F.	-	-	N.F.	-	-	N.F	-	-	N.F	-
Monitoring agriculture land-4	-	N.F.	-	-	-	-	-	N.F.	-	-	-	-	-	N.F.	-	-	N.F.	-	0.03	0.05*	F	-	N.F	-	-	N.F	-
Monitoring agriculture land-5	-	N.F.	-	0.17*	0.12*	E	-	N.F.	-	0.09	0.019*	E	-	N.F.	-	-	N.F.	-	0.03	0.05*	F	-	N.F	-	-	N.F	-
Monitoring agriculture land-6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N.F.	-	0.07	0.14*	Both E and F	-	N.F	-	-	N.F	-
Total	-	-	-	0.50*	0.52*		-	-	-	0.15	0.043*	-	-	-	-				0.34	0.76*		-	-	-	-	-	-

*Source: Based on field information and farmers interviewed, May, 2022 * Crop damage, **N.F.-Not found*

Note: A: water logging due to heavy rainfall, B: water logging due to internal river water, C: water logging, D: Salinity, E: Other (Pest infestation), F: Tropical Cyclone.

(F) Monitoring results

Quarterly Ambient Air Quality Monitoring Report of 2×660 MW Maitree Super Thermal Project at Rampal, Bagherhat

Table 4- Air Quality Analysis Result

Sample Location ID	Concentration present of different parameter in ambient air							
	$PM_{2.5}$	PM_{10}	SPM	SO_2	NO_x	CO	O_3	Remarks
AQ1	69.23	94.28	181.85	27.45	39.56	4	59	Not comply
AQ2	31.28	59.15	98.74	19.3	33.62	1	31	Not comply
AQ3	41.78	74.32	139.42	15.22	22.49	1	18	Complies
AQ4	36.71	68.79	158.14	13.96	20.47	1	8	Complies
AQ5	54.16	63.26	132.77	10.47	23.96	0.6	8	Not comply
AQ6	48.94	86.48	165.58	14.82	26.42	1	13	Complies
AQ7	31.43	46.29	98.15	18.42	40.28	1	10	Not comply
AQ8	67.33	92.36	178.28	19.29	37.91	0.2	36	Not comply
AQ9	28.19	51.66	92.0	20.33	31.63	0.2	13	Not comply
AQ10	43.27	51.04	110.28	13.76	39.23	1	24	Complies
AQ11	39.62	48.81	96.23	15.38	39.72	0.7	38	Complies
AQ12	58.43	77.69	141.37	21.81	38.3	0.3	41	Complies
AQ13	42.57	71.22	128.98	19.71	29.44	2	39	Complies
Units	μg/m³	μg/m³	μg/m³	μg/m³	μg/m³	mg/ m³	μg/m³	
Test Duration (Hours)	24	24	8	8	8	8	8	
Method of Analysis	Gravimetric	Gravimetric	Gravimetric	West-Gaeke	Jacob & Hochheiser	CO Meter	O_3 Meter	
Bangladesh (DoE) Standard	65	150	200	365	100	10	157	
IFC/WB Standard	75	150	NF	125	200	NF	160	

7.0 Terminology

1. Fine Particulate Matter ($PM_{2.5}$), 2. Respirable Dust Content (PM_{10}), 3. Suspended Particulate Matter (SPM), 4 Oxides of Nitrogen (NO_X). 5. Sulphur Di-Oxide (SO_2), 6. Carbone Mono-Oxide (CO), 7. Ozone (O_3) & 8. DoE- Department of Environment, NF – Not found.

8.0 Comment

The above result reveals that fine particulate matter at township area (AQ1) doesn't conform to the standard limit.

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জীবনের জন্য বিজ্ঞান

"শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন"

বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর)

BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH(BCSIR)

Institute Name: Institute of National Analytical Research & Service (INARS)

Analysis Report

Analytical Service Cell Ref No: Mar2022032874	Unit (Lab/Inst.) Ref No: A-279-296
Lab ID: INS-279-296	Sample Receiving Date: 07/03/2022
Sample ID: A-279-296	Submission Date: 06 Mar 2022
	Report Delivery Date: 21/04/2022

Sample Description: Sample no (1,2,3,4,5,6,7,8,9,10,11,Mongla, Harbaria, Akram Point, Hiron Point, Rajnagar, Power Plant Ground water, Kapashdanga))

Client's Details: Mahadi Hassan
Center For Environmental And Geographic Information Services
House#House No. 06, , Road No. 23/C, Dhaka-1216

Number of Sample: 18

Report Details:

Lab ID	Particulars of supplied sample	Parameter	Concentration	Test Method (APHA)
A-279	Water (Sample-01)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
A-280	Water (Sample-02)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
A-281	Water (Sample-03)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
A-282	Water (Sample-04)	Mercury (Hg)	0.002 mg/L	3112.B
A-283	Water (Sample-05)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
A-284	Water (Sample-06)	Mercury (Hg)	0.003 0.001 mg/L	3112.B
A-285	Water (Sample-07)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
A-286	Water (Sample-08)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
A-287	Water (Sample-09)	Mercury (Hg)	Less than 0.001 mg/L	3112.B

Note:
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Analytical Service Cell
Dr. Qudrat-I-Khuda Road, Dhanmondi, Dhaka-1205,Bangladesh
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24th of April 2022 10:17 AM

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'শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন'

বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর)

BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH(BCSIR)

A-288	Water (Sample-10)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
A-289	Water (Sample-11)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
A-290	Water (Sample-12, Mongla)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
A-291	Water (Sample-13, Harbaria)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
A-292	Water (Sample-14, Akram Point)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
A-293	Water (Sample-15, Hiron Point)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
A-294	Water (Sample-16, Rajnagar)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
A-295	Water (Sample-17, Power Plant Ground water)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
A-296	Water (Sample-18, kapashdanga)	Mercury (Hg)	Less than 0.001 mg/L	3112.B

24.04.2022
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Section/Division In-Charge
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ইনস্টিটিউট অব ন্যাশনাল এনালাইটিক্যাল রিসার্চ এন্ড সার্ভিস (আইএনএআরএস)
বিসিএসআইআর, ঢাকা

24/04/22
In-Charge/Director
Shamim Ahmed
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'শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন'

বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর)

BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH(BCSIR)

Institute Name: Institute of National Analytical Research & Service (INARS)

Analysis Report

BAB

Analytical Service Cell Ref No: Mar2022032878	Unit (Lab/Inst.) Ref No: A-307-309
Lab ID: INS-307-309	Sample Receiving Date: 07/03/2022
Sample ID: A-307-309	Submission Date: 06 Mar 2022
	Report Delivery Date: 24/04/2022

Sample Description: Jetty site, Harbaria, Hiron point

Client's Details: Mahadi Hassan
Center For Environmental And Geographic Information Services
House#House No. 06, , Road No. 23/C, Dhaka-1216

Number of Sample: 3

Report Details:

Lab ID	Particulars of supplied sample	Parameters	Concentration	Test Method (APHA)
A-307	Water (Sample: 01, Jetty Site)	TOC (Total Organic Carbon)	21.2 mg/L	5310.B
		TOC (Total Organic Content)	218 mg/L	5310.B
A-308	Water (Sample: 02, Harbaria)	TOC (Total Organic Carbon)	19.7 mg/L	5310.B
		TOC (Total Organic Content)	686 mg/L	5310.B
A-309	Water (Sample: 03, Hiron Point)	TOC (Total Organic Carbon)	15.2 mg/L	5310.B
		TOC (Total Organic Content)	2901 mg/L	5310.B

24.4.22
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ইনস্টিটিউট অব ন্যাশনাল এনালাইটিক্যাল রিসার্চ এন্ড সার্ভিস (আইএনএআরএস)
বিসিএসআইআর, ঢাকা

24/04/22
In-Charge/Director
Shamim Ahmed
Director (In-Charge)
Institute of National Analytical Research & Service (INARS)
BCSIR, Dhaka-1205

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BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH(BCSIR)

Institute Name: Institute of National Analytical Research & Service (INARS)

Analysis Report

Analytical Service Cell Ref No: Mar2022032878	Unit (Lab/Inst.) Ref No: A-307-309
Lab ID: INS-307-309	Sample Receiving Date: 07/03/2022
Sample ID: A-307-309	Submission Date: 06 Mar 2022
	Report Delivery Date: 24/04/2022
Sample Description: Jetty site, Harbaria, Hiron point	
Client's Details: Mahadi Hassan Center For Environmental And Geographic Information Services House#House No. 06, , Road No. 23/C, Dhaka-1216	
Number of Sample: 3	

Report Details:

Lab ID	Particulars of supplied sample	Parameters	Concentration (mg/L)	Test Method (APHA)

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A-307	Water, Poly Aromatic Hydrocarbon (PAH) Sample: 01, Jetty Site	Acenapthylene	ND	6440.B
		Anthracene	ND	6440.B
		Benzo(A) Anthracene	ND	6440.B
		Benzo(A) Pyrene	ND	6440.B
		Benzo(B) Fluoranthene	ND	6440.B
		Benzo(G,H,I) Perilene	ND	6440.B
		Benzo(K) Fluoranthene	ND	6440.B
		Chrysene	ND	6440.B
		Dibenzo(A,H) Anthracene	ND	6440.B
		Fluorene	ND	6440.B
		Phenanthrene	ND	6440.B
		Pyrene	ND	6440.B
A-308	Water, Poly Aromatic Hydrocarbon (PAH) Sample: 02, Harbaria	Acenapthylene	ND	6440.B
		Anthracene	ND	6440.B
		Benzo(A) Anthracene	ND	6440.B
		Benzo(A) Pyrene	ND	6440.B
		Benzo(B) Fluoranthene	ND	6440.B
		Benzo(G,H,I) Perilene	ND	6440.B
		Benzo(K) Fluoranthene	ND	6440.B
		Chrysene	ND	6440.B
		Dibenzo(A,H) Anthracene	ND	6440.B
		Fluorene	ND	6440.B
		Phenanthrene	ND	6440.B
		Pyrene	ND	6440.B

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জীবনের জন্য বিজ্ঞান "শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন"

বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর)

BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH(BCSIR)

A-309	Water, Poly Aromatic Hydrocarbon (PAH) Sample: 03, Hiron Point	Acenapthylene	ND	6440.B
		Anthracene	ND	6440.B
		Benzo(A) Anthracene	ND	6440.B
		Benzo(A) Pyrene	ND	6440.B
		Benzo(B) Fluoranthene	ND	6440.B
		Benzo(G,H,I) Perilene	ND	6440.B
		Benzo(K) Fluoranthene	ND	6440.B
		Chrysene	ND	6440.B
		Dibenzo(A, H) Anthracene	ND	6440.B
		Fluorene	ND	6440.B
		Phenanthrene	ND	6440.B
		Pyrene	ND	6440.B

24/04/22
Analyst

A. H. M. Shofiul Islam Molla Jamal
Senior Scientific Officer
Institute of National Analytical Research & Service (INARS)
BCSIR, Dhaka-1205.

24.4.22
Section/Division In-Charge

মোঃ আহেদুল আকবর
ঊর্ধ্বতন বৈজ্ঞানিক কর্মকর্তা
ইনস্টিটিউট অব ন্যাশনাল এনালাইটিক্যাল রিসার্চ এন্ড সার্ভিস (আইএনএআরএস)
বিসিএসআইআর, ঢাকা

24/4/22
In-Charge/Director

Shamim Ahmed
Director (In-Charge)
Institute of National Analytical Research & Service (INARS)
BCSIR, Dhaka-1205

Note:
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জীবনের জন্য বিজ্ঞান "শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন"

বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর)

BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH(BCSIR)

Institute Name: Institute of National Analytical Research & Service (INARS)

Analysis Report

Analytical Service Cell Ref No: Mar2022032875	Unit (Lab/Inst.) Ref No: A-297-301
Lab ID: INS-297-301	Sample Receiving Date: 07/03/2022
Sample ID: A-297-301	Submission Date: 06 Mar 2022
	Report Delivery Date: 24/04/2022

Sample Description: River bed Sediment (Project jetty, Mongla, Maidara, Harbaria, Akram point))

Client's Details: Mahadi Hassan
Center For Environmental And Geographic Information Services
House#House No. 06, , Road No. 23/C, Dhaka-1216

Number of Sample: 5

Report Details:

Lab ID	Particulars of supplied sample	Parameters	Concentration	Test Method (APHA)
A-297	River Bed Sediment (Sample-01, Jetty Site)	Arsenic (As)	4.08 mg/kg	3114.C
		Lead (Pb)	10.6 mg/kg	3111.B
		Mercury (Hg)	1.14 mg/kg	3112.B
		pH at 24.8°C	7.79 (5% Solution)	4500-H$^+$.B
		Sulphate (SO_4)	240 mg/kg	4110.B

Note:
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জীবনের জন্য বিজ্ঞান 'শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন'

বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর)

BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH(BCSIR)

A-298	River Bed Sediment (Sample-02, Mongla)	Arsenic (As)	2.27 mg/kg	3114.C
		Lead (Pb)	24.5 mg/kg	3111.B
		Mercury (Hg)	0.34 mg/kg	3112.B
		pH at 25.2°C	7.45 (5% Solution)	4500-H⁺.B
		Sulphate (SO_4)	129 mg/kg	4110.B
A-299	River Bed Sediment (Sample-03, Maidara)	Arsenic (As)	4.67 mg/kg	3114.C
		Lead (Pb)	10.9 mg/kg	3111.B
		Mercury (Hg)	0.32 mg/kg	3112.B
		pH at 25.1°C	7.66 (5% Solution)	4500-H⁺.B
		Sulphate (SO_4)	253 mg/kg	4110.B
A-300	River Bed Sediment (Sample-04, Harbaria)	Arsenic (As)	3.16 mg/kg	3114.C
		Lead (Pb)	9.44 mg/kg	3111.B
		Mercury (Hg)	0.34 mg/kg	3112.B
		pH at 25.3°C	7.58 (5% Solution)	4500-H⁺.B
		Sulphate (SO_4)	162 mg/kg	4110.B
A-301	River Bed Sediment (Sample-05, Akram Point)	Arsenic (As)	4.09 mg/kg	3114.C
		Lead (Pb)	8.49 mg/kg	3111.B
		Mercury (Hg)	0.29 mg/kg	3112.B
		pH at 24.7°C	7.50 (5% Solution)	4500-H⁺.B
		Sulphate (SO_4)	464 mg/kg	4110.B

24-04-2022
Analyst
Md. Abu Bakar Siddique
Senior Scientific Officer
Institute of National Analytical Research and Service (INARS)
BCSIR, Dhaka-1205.

24.4.22
Section/Division In-Charge
মোঃ আহেদুল আকবর
উর্ধ্বতন বৈজ্ঞানিক কর্মকর্তা
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বিসিএসআইআর, ঢাকা

24/4/22
In-Charge/Director
Shamim Ahmed
Director (In-Charge)
Institute of National Analytical Research & Service (INARS)
BCSIR, Dhaka-1205

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জীবনের জন্য বিজ্ঞান 'শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন'

বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর)

BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH(BCSIR)

Institute Name: Institute of National Analytical Research & Service (INARS)

Analysis Report

BAB

Analytical Service Cell Ref No: Mar2022032877	Unit (Lab/Inst.) Ref No: A-302-306
Lab ID: INS-302-306	Sample Receiving Date: 07/03/2022
Sample ID: A-302-306	Submission Date: 06 Mar 2022
	Report Delivery Date: 21/04/2022

Sample Description: Oil and Grease sample (Project Jetty, Mongla, Harbaria, Akram point, Hiron point)

Client's Details: Mahadi Hassan
Center For Environmental And Geographic Information Services
House#House No. 06, , Road No. 23/C, Dhaka-1216

Number of Sample: 5

Report Details:

Lab ID	Particulars of supplied sample	Parameters	Concentration	Test Method (APHA)
A-302	Water (Sample:01, Project Jetty)	Oil and Grease	Less than 2.0 mg/L	5520.B
A-303	Water (Sample:02, Mongla)	Oil and Grease	Less than 2.0 mg/L	5520.B
A-304	Water (Sample:03, Harbaria)	Oil and Grease	Less than 2.0 mg/L	5520.B
A-305	Water (Sample:04, Akram Point)	Oil and Grease	Less than 2.0 mg/L	5520.B
A-306	Water (Sample:05, Hiron Point)	Oil and Grease	Less than 2.0 mg/L	5520.B

24-04-2022
Analyst
Dr. Sabina Yasmin
Senior Scientific Officer
Institute of National Analytical Research & Service (INARS)
BCSIR, Dhaka 1205

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Section/Division In-Charge
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বিসিএসআইআর, ঢাকা

24/04/22
In-Charge/Director
Shamim Ahmed
Director (In-Charge)
Institute of National Analytical Research & Service (INARS)
BCSIR, Dhaka-1205

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Phone: 88-02-9881927, Fax: 88-02-9882003 , Email: wqmsc_central_lab@yahoo.com

Lab Memo: 1027/ CC, DPHE, CL, Dhaka | Date: 22-06-2022

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2022060201	Sample Receiving date: 15-03-2022
Ref. Memo No: 42.06.2626.119.37.001.21- 0688 & Dated: 15-03-2022	Sample Source: Surface Water
Sent by:Md. Mutasim Billah ,Project Leader , Power & Energy Division, CEGIS, Dkaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS, Dhaka (Sample : SW- 01)	Union:, Vill.:2×660 MW MSTPP, Rampal
Sample Collection date: 13-03-2022	Date of Testing: 15/03/2022-31/05/2022

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.003	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00015	mg/L	AAS	0.00015
3	Calcium (Ca)	75	50	mg/L	AAS	0.17
4	Chemical Oxygen Demand (COD)	4.0	24	mg/L	CRM	-
5	Chloride	150-600	850	mg/L	Titrimetic	-
6	Bi-Carbonate (HCO3-)	0.0	35	mg/L	Titrimetic	-
7	Cr (Total)	0.05	0.022	mg/L	AAS	0.0003
8	Hardness	200-500	370	mg/L	Titrimetic	-
9	Iron (Fe)	0.3-1	6.29	mg/L	AAS	0.05
10	Lead (Pb)	0.05	0.013	mg/L	AAS	0.001
11	Magnesium (Mg)	30-35	84	mg/L	AAS	0.05
12	Phosphate	6.0	0.25	mg/L	UVS	0.10
13	Potassium (K)	12.0	33	mg/L	AAS	-
14	Total Dissolved Solid (TDS)	1000	1380	mg/L	Multimeter	-
15	Total Suspended Solid (TSS)	10	15	mg/L	Gravimetric Method	-
16	Turbidity	10	204	NTU	Turbidity Meter	-
17	Carbonate (CO3)	-	0.16	mg/L	Titrimetic	-

Comments: Sample was collected & supplied by client.
N.B: AAS- Atomic Absorption Spectrophotometer, UVS- UV-Visible Spectrophotometer, MFM- Membrane Filtration Method, CRM-Closed Reflex Methods, LOQ- Limit of Quantitation.

BHossain
22/06/2022
Md. Biplab Hossain
Chief Chemist
Department of Public Health Engineering
Central Laboratory Mohakhali, Dhaka

Page 1 of 2

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Lab Memo: 1027/ CC, DPHE, CL, Dhaka | Date: 22-06-2022

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2022060201	Sample Receiving date: 15-03-2022
Ref. Memo No: 42.06.2626.119.37.001.21- 0688 & Dated: 15-03-2022	Sample Source: Surface Water
Sent by:Md. Mutasim Billah ,Project Leader , Power & Energy Division, CEGIS, Dkaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS, Dhaka (Sample : SW- 01)	Union:, Vill.:2×660 MW MSTPP, Rampal
Sample Collection date: 13-03-2022	Date of Testing: 15/03/2022-31/05/2022

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.003	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00015	mg/L	AAS	0.00015
3	Calcium (Ca)	75	50	mg/L	AAS	0.17
4	Chemical Oxygen Demand (COD)	4.0	24	mg/L	CRM	-
5	Chloride	150-600	850	mg/L	Titrimetic	-
6	Bi-Carbonate (HCO3-)	0.0	35	mg/L	Titrimetic	-
7	Cr (Total)	0.05	0.022	mg/L	AAS	0.0003
8	Hardness	200-500	370	mg/L	Titrimetic	-
9	Iron (Fe)	0.3-1	6.29	mg/L	AAS	0.05
10	Lead (Pb)	0.05	0.013	mg/L	AAS	0.001
11	Magnesium (Mg)	30-35	84	mg/L	AAS	0.05
12	Phosphate	6.0	0.25	mg/L	UVS	0.10
13	Potassium (K)	12.0	33	mg/L	AAS	-
14	Total Dissolved Solid (TDS)	1000	1380	mg/L	Multimeter	-
15	Total Suspended Solid (TSS)	10	15	mg/L	Gravimetric Method	-
16	Turbidity	10	204	NTU	Turbidity Meter	-
17	Carbonate (CO3)	-	0.16	mg/L	Titrimetic	-

Comments: Sample was collected & supplied by client.
N.B: AAS- Atomic Absorption Spectrophotometer, UVS- UV-Visible Spectrophotometer, MFM- Membrane Filtration Method, CRM-Closed Reflex Methods, LOQ- Limit of Quantitation.

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22/06/2022
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Page 1 of 2

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Lab Memo: 1027/ CC, DPHE, CL, Dhaka

Date: 22-06-2022

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2022060201	Sample Receiving date: 15-03-2022
Ref. Memo No: 42.06.2626.119.37.001.21- 0688 & Dated: 15-03-2022	Sample Source: Surface Water
Sent by:Md. Mutasim Billah ,Project Leader , Power & Energy Division, CEGIS, Dkaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS, Dhaka (Sample : SW- 01)	Union:, Vill.:2×660 MW MSTPP, Rampal
Sample Collection date: 13-03-2022	Date of Testing: 15/03/2022-31/05/2022

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.003	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00015	mg/L	AAS	0.00015
3	Calcium (Ca)	75	50	mg/L	AAS	0.17
4	Chemical Oxygen Demand (COD)	4.0	24	mg/L	CRM	-
5	Chloride	150-600	850	mg/L	Titrimetic	-
6	Bi-Carbonate (HCO3-)	0.0	35	mg/L	Titrimetic	-
7	Cr (Total)	0.05	0.022	mg/L	AAS	0.0003
8	Hardness	200-500	370	mg/L	Titrimetic	-
9	Iron (Fe)	0.3-1	6.29	mg/L	AAS	0.05
10	Lead (Pb)	0.05	0.013	mg/L	AAS	0.001
11	Magnesium (Mg)	30-35	84	mg/L	AAS	0.05
12	Phosphate	6.0	0.25	mg/L	UVS	0.10
13	Potassium (K)	12.0	33	mg/L	AAS	-
14	Total Dissolved Solid (TDS)	1000	1380	mg/L	Multimeter	-
15	Total Suspended Solid (TSS)	10	15	mg/L	Gravimetric Method	-
16	Turbidity	10	204	NTU	Turbidity Meter	-
17	Carbonate (CO3)	-	0.16	mg/L	Titrimetic	-

Comments: Sample was collected & supplied by client.
N.B: AAS- Atomic Absorption Spectrophotometer, UVS- UV-Visible Spectrophotometer, MFM- Membrane Filtration Method, CRM-Closed Reflex Methods, LOQ- Limit of Quantitation.

B Hossain
22/06/2022
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Lab Memo: 1027/ CC, DPHE, CL, Dhaka

Date: 22-06-2022

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2022060204	Sample Receiving date: 15-03-2022
Ref. Memo No: 42.06.2626.119.37.001.21- 0688 & Dated: 15-03-2022	Sample Source: Surface Water
Sent by:Md. Mutasim Billah ,Project Leader , Power & Energy Division, CEGIS, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS, Dhaka (Sample : SW- 04)	Union:, Vill.:2×660 MW MSTPP, Rampal
Sample Collection date: 13-03-2022	Date of Testing: 15/03/2022-31/05/2022

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.002	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00016	mg/L	AAS	0.00015
3	Calcium (Ca)	75	54	mg/L	AAS	0.17
4	Chemical Oxygen Demand (COD)	4.0	40	mg/L	CRM	-
5	Chloride	150-600	720	mg/L	Titrimetic	-
6	Bi-Carbonate (HCO3-)	0.0	40	mg/L	Titrimetic	-
7	Cr (Total)	0.05	0.028	mg/L	AAS	0.0003
8	Hardness	200-500	375	mg/L	Titrimetic	-
9	Iron (Fe)	0.3-1	4.30	mg/L	AAS	0.05
10	Lead (Pb)	0.05	0.009	mg/L	AAS	0.001
11	Magnesium (Mg)	30-35	77	mg/L	AAS	0.05
12	Phosphate	6.0	0.27	mg/L	UVS	0.10
13	Potassium (K)	12.0	30	mg/L	AAS	
14	Total Dissolved Solid (TDS)	1000	1230	mg/L	Multimeter	-
15	Total Suspended Solid (TSS)	10	12	mg/L	Gravimetric Method	-
16	Turbidity	10	178	NTU	Turbidity Meter	-
17	Carbonate (CO3)	-	0.30	mg/L	Titrimetic	-

Comments: Sample was collected & supplied by client.
N.B: AAS- Atomic Absorption Spectrophotometer, UVS- UV-Visible Spectrophotometer, MFM- Membrane Filtration Method, CRM-Closed Reflex Methods, LOQ- Limit of Quantitation.

B Hossain
22/06/2022
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Lab Memo: 1027/ CC, DPHE, CL, Dhaka — Date: 22-06-2022

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2022060205	Sample Receiving date: 15-03-2022
Ref. Memo No: 42.06.2626.119.37.001.21- 0688 & Dated: 15-03-2022	Sample Source: Surface Water
Sent by:Md. Mutasim Billah ,Project Leader , Power & Energy Division, CEGIS, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS, Dhaka (Sample : SW- 05)	Union:, Vill.:2×660 MW MSTPP, Rampal
Sample Collection date: 13-03-2022	Date of Testing: 15/03/2022-31/05/2022

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.002	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00015	mg/L	AAS	0.00015
3	Chemical Oxygen Demand (COD)	4.0	32	mg/L	CRM	-
4	Cr (Total)	0.05	0.026	mg/L	AAS	0.0003
5	Hardness	200-500	325	mg/L	Titrimetic	-
6	Lead (Pb)	0.05	0.007	mg/L	AAS	0.001
7	Phosphate	6.0	0.37	mg/L	UVS	0.10
8	Total Dissolved Solid (TDS)	1000	1510	mg/L	Multimeter	-
9	Total Suspended Solid (TSS)	10	13	mg/L	Gravimetric Method	-

Comments: Sample was collected & supplied by client.
N.B: AAS- Atomic Absorption Spectrophotometer, UVS- UV-Visible Spectrophotometer, MFM- Membrane Filtration Method, 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	Alam 22.06.2022	1.) Name: Mita Sarker Designation: Senior Chemist	22/06/2022
2.) Name: Taslima Akhter Designation: Sample Analyzer	22.06.2022	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	22/06/2022 Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka

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Lab Memo: 1027/ CC, DPHE, CL, Dhaka — Date: 22-06-2022

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2022060206	Sample Receiving date: 15-03-2022
Ref. Memo No: 42.06.2626.119.37.001.21- 0688 & Dated: 15-03-2022	Sample Source: Surface Water
Sent by:Md. Mutasim Billah ,Project Leader , Power & Energy Division, CEGIS, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS, Dhaka (Sample : SW- 06)	Union:, Vill.:2×660 MW MSTPP, Rampal
Sample Collection date: 13-03-2022	Date of Testing: 15/03/2022-31/05/2022

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.002	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00015	mg/L	AAS	0.00015
3	Chemical Oxygen Demand (COD)	4.0	12	mg/L	CRM	-
4	Cr (Total)	0.05	0.030	mg/L	AAS	0.0003
5	Hardness	200-500	340	mg/L	Titrimetic	-
6	Lead (Pb)	0.05	0.011	mg/L	AAS	0.001
7	Phosphate	6.0	0.40	mg/L	UVS	0.10
8	Total Dissolved Solid (TDS)	1000	1380	mg/L	Multimeter	-
9	Total Suspended Solid (TSS)	10	11	mg/L	Gravimetric Method	-

Comments: Sample was collected & supplied by client.
N.B: AAS- Atomic Absorption Spectrophotometer, UVS- UV-Visible Spectrophotometer, MFM- Membrane Filtration Method, 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	Alam 22.06.2022	1.) Name: Mita Sarker Designation: Senior Chemist	22/06/2022
2.) Name: Taslima Akhter Designation: Sample Analyzer	22.06.2022	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	22/06/2022 Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka

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Lab Memo: 1027/ CC, DPHE, CL, Dhaka — Date: 22-06-2022

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2022060207	Sample Receiving date: 15-03-2022
Ref. Memo No: 42.06.2626.119.37.001.21- 0688 & Dated: 15-03-2022	Sample Source: Surface Water
Sent by:Md. Mutasim Billah ,Project Leader , Power & Energy Division, CEGIS, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS, Dhaka (Sample : SW- 07)	Union:, Vill.:2×660 MW MSTPP, Rampal
Sample Collection date: 13-03-2022	Date of Testing: 15/03/2022-31/05/2022

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.003	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00015	mg/L	AAS	0.00015
3	Calcium (Ca)	75	55	mg/L	AAS	0.17
4	Chemical Oxygen Demand (COD)	4.0	16	mg/L	CRM	-
5	Chloride	150-600	1140	mg/L	Titrimetic	-
6	Bi-Carbonate (HCO3-)	0.0	40	mg/L	Titrimetic	-
7	Cr (Total)	0.05	0.028	mg/L	AAS	0.0003
8	Hardness	200-500	375	mg/L	Titrimetic	-
9	Iron (Fe)	0.3-1	11.82	mg/L	AAS	0.05
10	Lead (Pb)	0.05	0.014	mg/L	AAS	0.001
11	Magnesium (Mg)	30-35	88	mg/L	AAS	0.05
12	Phosphate	6.0	0.45	mg/L	UVS	0.10
13	Potassium (K)	12.0	41	mg/L	AAS	
14	Total Dissolved Solid (TDS)	1000	1850	mg/L	Multimeter	-
15	Total Suspended Solid (TSS)	10	14	mg/L	Gravimetric Method	-
16	Turbidity	10	205	NTU	Turbidity Meter	-
17	Carbonate (CO3)	-	0.32	mg/L	Titrimetic	-

Comments: Sample was collected & supplied by client.
N.B: AAS- Atomic Absorption Spectrophotometer, UVS- UV-Visible Spectrophotometer, MFM- Membrane Filtration Method, CRM-Closed Reflex Methods, LOQ- Limit of Quantitation.

Alam   BHossain 22/06/2022

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Lab Memo: 1027/ CC, DPHE, CL, Dhaka — Date: 22-06-2022

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2022060208	Sample Receiving date: 15-03-2022
Ref. Memo No: 42.06.2626.119.37.001.21-0688 & Dated: 15-03-2022	Sample Source: Surface Water
Sent by:Md. Mutasim Billah ,Project Leader , Power & Energy Division, CEGIS, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS, Dhaka (Sample : SW- 08)	Union:, Vill.:2×660 MW MSTPP, Rampal
Sample Collection date: 13-03-2022	Date of Testing: 15/03/2022-31/05/2022

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.002	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00016	mg/L	AAS	0.00015
3	Chemical Oxygen Demand (COD)	4.0	36	mg/L	CRM	-
4	Cr (Total)	0.05	0.024	mg/L	AAS	0.0003
5	Hardness	200-500	420	mg/L	Titrimetic	-
6	Lead (Pb)	0.05	0.006	mg/L	AAS	0.001
7	Phosphate	6.0	0.30	mg/L	UVS	0.10
8	Total Dissolved Solid (TDS)	1000	1680	mg/L	Multimeter	-
9	Total Suspended Solid (TSS)	10	12	mg/L	Gravimetric Method	-

Comments: Sample was collected & supplied by client.
N.B: AAS- Atomic Absorption Spectrophotometer, UVS- UV-Visible Spectrophotometer, MFM- Membrane Filtration Method, 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	Alam 22.06.2022	1.) Name: Mita Sarker Designation: Senior Chemist	22/06/2022
2.) Name: Taslima Akhter Designation: Sample Analyzer	22.06.2022	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	BHossain 22/06/2022

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Lab Memo: 1027/ CC, DPHE, CL, Dhaka — Date: 22-06-2022

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2022060209	Sample Receiving date: 15-03-2022
Ref. Memo No: 42.06.2626.119.37.001.21-0688 & Dated: 15-03-2022	Sample Source: Surface Water
Sent by:Md. Mutasim Billah ,Project Leader , Power & Energy Division, CEGIS, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS, Dhaka (Sample : SW- 09)	Union:, Vill.:2×660 MW MSTPP, Rampal
Sample Collection date: 13-03-2022	Date of Testing: 15/03/2022-31/05/2022

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.002	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00015	mg/L	AAS	0.00015
3	Chemical Oxygen Demand (COD)	4.0	12	mg/L	CRM	-
4	Cr (Total)	0.05	0.024	mg/L	AAS	0.0003
5	Hardness	200-500	430	mg/L	Titrimetic	-
6	Lead (Pb)	0.05	0.007	mg/L	AAS	0.001
7	Phosphate	6.0	0.37	mg/L	UVS	0.10
8	Total Dissolved Solid (TDS)	1000	1650	mg/L	Multimeter	-
9	Total Suspended Solid (TSS)	10	15	mg/L	Gravimetric Method	-

Comments: Sample was collected & supplied by client.
N.B: AAS- Atomic Absorption Spectrophotometer, UVS- UV-Visible Spectrophotometer, MFM- Membrane Filtration Method, 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	Alam 22.06.2022	1.) Name: Mita Sarker Designation: Senior Chemist	22/06/2022
2.) Name: Taslima Akhter Designation: Sample Analyzer	22.06.2022	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	BHossain 22/06/2022

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Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2022060210	Sample Receiving date: 15-03-2022
Ref. Memo No: 42.06.2626.119.37.001.21-0688 & Dated: 15-03-2022	Sample Source: Surface Water
Sent by:Md. Mutasim Billah ,Project Leader , Power & Energy Division, CEGIS, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS, Dhaka (Sample : SW- 10)	Union:, Vill.:2×660 MW MSTPP, Rampal
Sample Collection date: 13-03-2022	Date of Testing: 15/03/2022-31/05/2022

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.003	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00015	mg/L	AAS	0.00015
3	Chemical Oxygen Demand (COD)	4.0	12	mg/L	CRM	-
4	Cr (Total)	0.05	0.023	mg/L	AAS	0.0003
5	Hardness	200-500	380	mg/L	Titrimetic	-
6	Lead (Pb)	0.05	0.008	mg/L	AAS	0.001
7	Phosphate	6.0	0.52	mg/L	UVS	0.10
8	Total Dissolved Solid (TDS)	1000	1540	mg/L	Multimeter	-
9	Total Suspended Solid (TSS)	10	13	mg/L	Gravimetric Method	-

Comments: Sample was collected & supplied by client.
N.B: AAS- Atomic Absorption Spectrophotometer, UVS- UV-Visible Spectrophotometer, MFM- Membrane Filtration Method, 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	Alam 22.06.2022	1.) Name: Mita Sarker Designation: Senior Chemist	22/06/2022
2.) Name: Taslima Akhter Designation: Sample Analyzer	22.06.2022	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	BHossain 22/06/2022

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Lab Memo: 1027/ CC, DPHE, CL, Dhaka

Date: 22-06-2022

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2022060211	Sample Receiving date: 15-03-2022
Ref. Memo No: 42.06.2626.119.37.001.21-0688 & Dated: 15-03-2022	Sample Source: Surface Water
Sent by:Md. Mutasim Billah ,Project Leader , Power & Energy Division, CEGIS, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS, Dhaka (Sample : SW- 11)	Union:, Vill.:2×660 MW MSTPP, Rampal
Sample Collection date: 13-03-2022	Date of Testing: 15/03/2022-31/05/2022

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.003	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00015	mg/L	AAS	0.00015
3	Chemical Oxygen Demand (COD)	4.0	32	mg/L	CRM	-
4	Cr (Total)	0.05	0.026	mg/L	AAS	0.0003
5	Hardness	200-500	435	mg/L	Titrimetic	-
6	Lead (Pb)	0.05	0.010	mg/L	AAS	0.001
7	Phosphate	6.0	0.34	mg/L	UVS	0.10
8	Total Dissolved Solid (TDS)	1000	1350	mg/L	Multimeter	-
9	Total Suspended Solid (TSS)	10	13	mg/L	Gravimetric Method	-

Comments: Sample was collected & supplied by client.
N.B: AAS- Atomic Absorption Spectrophotometer, UVS- UV-Visible Spectrophotometer, MFM- Membrane Filtration Method, 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	Alam 22.06.2022	1.) Name: Mita Sarker Designation: Senior Chemist	22/06/2022
2.) Name: Taslima Akhter Designation: Sample Analyzer	22.06.2022	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	B Hossain 22/06/2022 Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka

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Lab Memo: 1027/ CC, DPHE, CL, Dhaka

Date: 22-06-2022

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2022060212	Sample Receiving date: 15-03-2022
Ref. Memo No: 42.06.2626.119.37.001.21-0688 & Dated: 15-03-2022	Sample Source: Surface Water
Sent by:Md. Mutasim Billah ,Project Leader , Power & Energy Division, CEGIS, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS, Dhaka (Sample : SW- 12)	Union:, Vill.:2×660 MW MSTPP, Rampal
Sample Collection date: 13-03-2022	Date of Testing: 15/03/2022-31/05/2022

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.002	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00015	mg/L	AAS	0.00015
3	Chemical Oxygen Demand (COD)	4.0	16	mg/L	CRM	-
4	Cr (Total)	0.05	0.023	mg/L	AAS	0.0003
5	Hardness	200-500	500	mg/L	Titrimetic	-
6	Lead (Pb)	0.05	0.009	mg/L	AAS	0.001
7	Phosphate	6.0	0.40	mg/L	UVS	0.10
8	Total Dissolved Solid (TDS)	1000	1580	mg/L	Multimeter	-
9	Total Suspended Solid (TSS)	10	14	mg/L	Gravimetric Method	-

Comments: Sample was collected & supplied by client.
N.B: AAS- Atomic Absorption Spectrophotometer, UVS- UV-Visible Spectrophotometer, MFM- Membrane Filtration Method, 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	Alam 22.06.2022	1.) Name: Mita Sarker Designation: Senior Chemist	22/06/2022
2.) Name: Taslima Akhter Designation: Sample Analyzer	22.06.2022	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	B Hossain 22/06/2022 Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka

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Lab Memo: 1027/ CC, DPHE, CL, Dhaka Date: 22-06-2022

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2022060213	Sample Receiving date: 15-03-2022
Ref. Memo No: 42.06.2626.119.37.001.21-0688 & Dated: 15-03-2022	Sample Source: Surface Water
Sent by:Md. Mutasim Billah ,Project Leader , Power & Energy Division, CEGIS, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS, Dhaka (Sample : SW- 13)	Union:, Vill.:2×660 MW MSTPP, Rampal
Sample Collection date: 13-03-2022	Date of Testing: 15/03/2022-31/05/2022

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.002	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00015	mg/L	AAS	0.00015
3	Chemical Oxygen Demand (COD)	4.0	60	mg/L	CRM	-
4	Cr (Total)	0.05	0.030	mg/L	AAS	0.0003
5	Hardness	200-500	680	mg/L	Titrimetic	-
6	Lead (Pb)	0.05	0.005	mg/L	AAS	0.001
7	Phosphate	6.0	0.56	mg/L	UVS	0.10
8	Total Dissolved Solid (TDS)	1000	3850	mg/L	Multimeter	-
9	Total Suspended Solid (TSS)	10	15	mg/L	Gravimetric Method	-

Comments: Sample was collected & supplied by client.
N.B: AAS- Atomic Absorption Spectrophotometer, UVS- UV-Visible Spectrophotometer, MFM- Membrane Filtration Method, 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	Alam 22.06.2022	1.) Name: Mita Sarker Designation: Senior Chemist	22/06/2022
2.) Name: Taslima Akhter Designation: Sample Analyzer	22.06.2022	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	22/06/2022

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Lab Memo: 1027/ CC, DPHE, CL, Dhaka Date: 22-06-2022

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2022060214	Sample Receiving date: 15-03-2022
Ref. Memo No: 42.06.2626.119.37.001.21-0688 & Dated: 15-03-2022	Sample Source: Surface Water
Sent by:Md. Mutasim Billah ,Project Leader , Power & Energy Division, CEGIS, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS, Dhaka (Sample : SW- 14)	Union:, Vill.:2×660 MW MSTPP, Rampal
Sample Collection date: 13-03-2022	Date of Testing: 15/03/2022-31/05/2022

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.002	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00015	mg/L	AAS	0.00015
3	Chemical Oxygen Demand (COD)	4.0	36	mg/L	CRM	-
4	Cr (Total)	0.05	0.044	mg/L	AAS	0.0003
5	Hardness	200-500	6500	mg/L	Titrimetic	-
6	Lead (Pb)	0.05	0.006	mg/L	AAS	0.001
7	Phosphate	6.0	0.40	mg/L	UVS	0.10
8	Total Dissolved Solid (TDS)	1000	11600	mg/L	Multimeter	-
9	Total Suspended Solid (TSS)	10	16	mg/L	Gravimetric Method	-

Comments: Sample was collected & supplied by client.
N.B: AAS- Atomic Absorption Spectrophotometer, UVS- UV-Visible Spectrophotometer, MFM- Membrane Filtration Method, 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	Alam 22.06.2022	1.) Name: Mita Sarker Designation: Senior Chemist	22/06/2022
2.) Name: Taslima Akhter Designation: Sample Analyzer	22.06.2022	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	22/06/2022

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Lab Memo: 1027/ CC, DPHE, CL, Dhaka — Date: 22-06-2022

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2022060215	Sample Receiving date: 15-03-2022
Ref. Memo No: 42.06.2626.119.37.001.21- 0688 & Dated: 15-03-2022	Sample Source: Surface Water
Sent by:Md. Mutasim Billah ,Project Leader , Power & Energy Division, CEGIS, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS, Dhaka (Sample : SW- 15)	Union:, Vill.:2×660 MW MSTPP, Rampal
Sample Collection date: 13-03-2022	Date of Testing: 15/03/2022-31/05/2022

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.002	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00015	mg/L	AAS	0.00015
3	Chemical Oxygen Demand (COD)	4.0	40	mg/L	CRM	-
4	Cr (Total)	0.05	0.027	mg/L	AAS	0.0003
5	Hardness	200-500	5300	mg/L	Titrimetic	-
6	Lead (Pb)	0.05	0.006	mg/L	AAS	0.001
7	Phosphate	6.0	0.48	mg/L	UVS	0.10
8	Total Dissolved Solid (TDS)	1000	15500	mg/L	Multimeter	-
9	Total Suspended Solid (TSS)	10	13	mg/L	Gravimetric Method	-

Comments: Sample was collected & supplied by client.
N.B: AAS- Atomic Absorption Spectrophotometer, UVS- UV-Visible Spectrophotometer, MFM- Membrane Filtration Method, 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	Alam 22.06.2022	1.) Name: Mita Sarker Designation: Senior Chemist	22/06/2022
2.) Name: Taslima Akhter Designation: Sample Analyzer	22.06.2022	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	B Hossain 22/06/2022

Md. Biplab Hossain
Chief Chemist
Department of Public Health Engineering
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: 1027/ CC, DPHE, CL, Dhaka — Date: 22-06-2022

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2022060216	Sample Receiving date: 15-03-2022
Ref. Memo No: 42.06.2626.119.37.001.21- 0688 & Dated: 15-03-2022	Sample Source: Deep Tube Well
Sent by:Md. Mutasim Billah ,Project Leader , Power & Energy Division, CEGIS, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS, Dhaka (Sample : GW- 01)	Union:, Vill.:Kapashdanga
Sample Collection date: 13-03-2022	Date of Testing: 15/03/2022-31/05/2022

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.048	mg/L	AAS	0.001
2	Chemical Oxygen Demand (COD)	4.0	28	mg/L	CRM	-
3	Hardness	200-500	210	mg/L	Titrimetic	-
4	Lead (Pb)	0.05	0.003	mg/L	AAS	0.001
5	Phosphate	6.0	0.50	mg/L	UVS	0.10
6	Total Dissolved Solid (TDS)	1000	620	mg/L	Multimeter	-
7	Total Suspended Solid (TSS)	10	2	mg/L	Gravimetric Method	-

Comments: Sample was collected & supplied by client.
N.B: AAS- Atomic Absorption Spectrophotometer, UVS- UV-Visible Spectrophotometer, MFM- Membrane Filtration Method, 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	Alam 22.06.2022	1.) Name: Mita Sarker Designation: Senior Chemist	22/06/2022
2.) Name: Taslima Akhter Designation: Sample Analyzer	22.06.2022	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	B Hossain 22/06/2022

Md. Biplab Hossain
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Phone: 88-02-9881927, Fax: 88-02-9882003 , Email: wqmsc_central_lab@yahoo.com

Lab Memo: 1027/ CC, DPHE, CL, Dhaka — Date: 22-06-2022

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2022060217	Sample Receiving date: 15-03-2022
Ref. Memo No: 42.06.2626.119.37.001.21- 0688 & Dated: 15-03-2022	Sample Source: Deep Tube Well
Sent by:Md. Mutasim Billah ,Project Leader , Power & Energy Division, CEGIS, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS, Dhaka (Sample : GW- 02)	Union:, Vill.:Rajnagar
Sample Collection date: 13-03-2022	Date of Testing: 15/03/2022-31/05/2022

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.003	mg/L	AAS	0.001
2	Chemical Oxygen Demand (COD)	4.0	8	mg/L	CRM	-
3	Hardness	200-500	200	mg/L	Titrimetic	-
4	Lead (Pb)	0.05	0.004	mg/L	AAS	0.001
5	Phosphate	6.0	0.80	mg/L	UVS	0.10
6	Total Dissolved Solid (TDS)	1000	350	mg/L	Multimeter	-
7	Total Suspended Solid (TSS)	10	1	mg/L	Gravimetric Method	-

Comments: Sample was collected & supplied by client.
N.B: AAS- Atomic Absorption Spectrophotometer, UVS- UV-Visible Spectrophotometer, MFM- Membrane Filtration Method, 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	Alam 22.06.2022	1.) Name: Mita Sarker Designation: Senior Chemist	22/06/2022
2.) Name: Taslima Akhter Designation: Sample Analyzer	22.06.2022	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	22/06/2022

Md. Biplab Hossain
Chief Chemist
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Phone: 88-02-9881927, Fax: 88-02-9882003 , Email: wqmsc_central_lab@yahoo.com

Lab Memo: 1027/ CC, DPHE, CL, Dhaka — Date: 22-06-2022

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2022060218	Sample Receiving date: 15-03-2022
Ref. Memo No: 42.06.2626.119.37.001.21- 0688 & Dated: 15-03-2022	Sample Source: Deep Tube Well
Sent by:Md. Mutasim Billah ,Project Leader , Power & Energy Division, CEGIS, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS, Dhaka (Sample : GW- 03)	Union:, Vill.:Project Site, Rampal
Sample Collection date: 13-03-2022	Date of Testing: 15/03/2022-31/05/2022

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.016	mg/L	AAS	0.001
2	Chemical Oxygen Demand (COD)	4.0	12	mg/L	CRM	-
3	Hardness	200-500	180	mg/L	Titrimetic	-
4	Lead (Pb)	0.05	0.003	mg/L	AAS	0.001
5	Phosphate	6.0	0.86	mg/L	UVS	0.10
6	Total Dissolved Solid (TDS)	1000	880	mg/L	Multimeter	-
7	Total Suspended Solid (TSS)	10	1	mg/L	Gravimetric Method	-

Comments: Sample was collected & supplied by client.
N.B: AAS- Atomic Absorption Spectrophotometer, UVS- UV-Visible Spectrophotometer, MFM- Membrane Filtration Method, 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	Alam 22.06.2022	1.) Name: Mita Sarker Designation: Senior Chemist	22/06/2022
2.) Name: Taslima Akhter Designation: Sample Analyzer	22.06.2022	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	22/06/2022

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Environmental Laboratory

Memo No. ELAB202206001388 Date: 01/08/2022

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio-economic Monitoring of Rampal Power Plant. Code: FPC006

Sample Type: Surface Water ID: FPC006_001 Collection Date: May/2022

Location: N/A

Received From: Md. Mutasim Billah Received Date: 05/06/2022 Testing Date: (18-31)/07/22

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-01	$NO3^-$	10	2.063	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		$PO4^{3-}$	6	0.1942	ppm	UV-VIS	
03		$SO4^{2-}$	400	185.50	ppm	UV-VIS	

N.B: UV-VIS means UV-1800 Spectrophotometer

Test Performed by

Name: Rafiqul Islam & Rafiqul Alam

Designation: Research Associate & In-Charge of Scientific Equipment and Laboratory Expert

Signature: RAlam 01/08/2022

Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature: RAlam 01/08/2022

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Environmental Laboratory

Memo No. ELAB202206001389 Date: 01/08/2022

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio-economic Monitoring of Rampal Power Plant. Code: FPC006

Sample Type: Surface Water ID: FPC006_002 Collection Date: May/2022

Location: N/A

Received From: Md. Mutasim Billah Received Date: 05/06/2022 Testing Date: (18-31)/07/22

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-02	$NO3^-$	10	1.4326	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		$PO4^{3-}$	6	0.3255	ppm	UV-VIS	
03		$SO4^{2-}$	400	188.57	ppm	UV-VIS	

N.B: UV-VIS means UV-1800 Spectrophotometer

Test Performed by

Name: Rafiqul Islam & Rafiqul Alam

Designation: Research Associate & In-Charge of Scientific Equipment and Laboratory Expert

Signature: RAlam 01/08/2022

Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature: RAlam 01/08/2022

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Environmental Laboratory

Memo No. ELAB202206001390

Date: 01/08/2022

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio-economic Monitoring of Rampal Power Plant. Code: FPC006

Sample Type: Surface Water ID: FPC006_003 Collection Date: May/2022

Location: N/A

Received From: Md. Mutasim Billah Received Date: 05/06/2022 Testing Date: (18-31)/07/22

Laboratory Test Results:

SL #	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-03	$NO3^{-}$	10	2.0423	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		$PO4^{3-}$	6	0.1279	ppm	UV-VIS	
03		$SO4^{2-}$	400	197.77	ppm	UV-VIS	

N.B: UV-VIS means UV-1800 Spectrophotometer

Test Performed by

Name: Rafiqul Islam & Rafiqul Alam

Designation: Research Associate & In-Charge of Scientific Equipment and Laboratory Expert

Signature: 01/08/2022

Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature: 01/08/2022

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Environmental Laboratory

Memo No. ELAB202206001391

Date: 01/08/2022

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio-economic Monitoring of Rampal Power Plant. Code: FPC006

Sample Type: Surface Water ID: FPC006_004 Collection Date: May/2022

Location: Jetty.

Received From: Md. Mutasim Billah Received Date: 05/06/2022 Testing Date: (18-31)/07/22

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-04	$NO3^{-}$	10	15.878	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		$PO4^{3-}$	6	0.4628	ppm	UV-VIS	
03		$SO4^{2-}$	400	198.12	ppm	UV-VIS	

N.B: UV-VIS means UV-1800 Spectrophotometer

Test Performed by

Name: Rafiqul Islam & Rafiqul Alam

Designation: Research Associate & In-Charge of Scientific Equipment and Laboratory Expert

Signature: 01/08/2022

Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature: 01/08/2022

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Environmental Laboratory

Memo No. ELAB202206001392 Date: 01/08/2022

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio-economic Monitoring of Rampal Power Plant. Code: FPC006

Sample Type: Surface Water ID: FPC006_005 Collection Date: May/2022

Location: N/A

Received From: Md. Mutasim Billah Received Date: 05/06/2022 Testing Date: (18-31)/07/22

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-05	NO_3^-	10	1.5377	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO_4^{3-}	6	0.1049	ppm	UV-VIS	
03		SO_4^{2-}	400	186.22	ppm	UV-VIS	

N.B: UV-VIS means UV-1800 Spectrophotometer

Test Performed by

Name: Rafiqul Islam & Rafiqul Alam

Designation: Research Associate & In-Charge of Scientific Equipment and Laboratory Expert

Signature: RAlam 01/08/2022

Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature: RAlam 01/08/2022

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Environmental Laboratory

Memo No. ELAB202206001393 Date: 01/08/2022

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio-economic Monitoring of Rampal Power Plant. Code: FPC006

Sample Type: Surface Water ID: FPC006_006 Collection Date: May/2022

Location: N/A

Received From: Md. Mutasim Billah Received Date: 05/06/2022 Testing Date: (18-31)/07/22

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-06	NO_3^-	10	6.8385	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO_4^{3-}	6	0.4003	ppm	UV-VIS	
03		SO_4^{2-}	400	180.76	ppm	UV-VIS	

N.B: UV-VIS means UV-1800 Spectrophotometer

Test Performed by

Name: Rafiqul Islam & Rafiqul Alam

Designation: Research Associate & In-Charge of Scientific Equipment and Laboratory Expert

Signature: RAlam 01/08/2022

Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature: RAlam 01/08/2022

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Environmental Laboratory

Memo No. ELAB202206001393 Date: 01/08/2022

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio-economic Monitoring of Rampal Power Plant. Code: FPC006

Sample Type: Surface Water ID: FPC006_006 Collection Date: May/2022

Location: N/A

Received From: Md. Mutasim Billah Received Date: 05/06/2022 Testing Date: (18-31)/07/22

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-06	$NO3^-$	10	6.8385	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		$PO4^{3-}$	6	0.4003	ppm	UV-VIS	
03		$SO4^{2-}$	400	180.76	ppm	UV-VIS	

N.B: UV-VIS means UV-1800 Spectrophotometer

Test Performed by

Name: Rafiqul Islam & Rafiqul Alam

Designation: Research Associate & In-Charge of Scientific Equipment and Laboratory Expert

Signature: RAlam 01/08/2022

Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature: RAlam 01/08/2022

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Environmental Laboratory

Memo No. ELAB202206001394 Date: 01/08/2022

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio-economic Monitoring of Rampal Power Plant. Code: FPC006

Sample Type: Surface Water ID: FPC006_007 Collection Date: May/2022

Location: N/A

Received From: Md. Mutasim Billah Received Date: 05/06/2022 Testing Date: (18-31)/07/22

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-07	$NO3^-$	10	1.0751	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		$PO4^{3-}$	6	0.0371	ppm	UV-VIS	
03		$SO4^{2-}$	400	191.27	ppm	UV-VIS	

N.B: UV-VIS means UV-1800 Spectrophotometer

Test Performed by

Name: Rafiqul Islam & Rafiqul Alam

Designation: Research Associate & In-Charge of Scientific Equipment and Laboratory Expert

Signature: RAlam 01/08/2022

Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature: RAlam 01/08/2022

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Environmental Laboratory

Memo No. ELAB202206001395 Date: 01/08/2022

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio-economic Monitoring of Rampal Power Plant. Code: FPC006

Sample Type: Surface Water ID: FPC006_008 Collection Date: May/2022

Location: N/A

Received From: Md. Mutasim Billah Received Date: 05/06/2022 Testing Date: (18-31)/07/22

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-08	$NO3^{-}$	10	Undetectable	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		$PO4^{3-}$	6	0.0320	ppm	UV-VIS	
03		$SO4^{2-}$	400	189.35	ppm	UV-VIS	

N.B: UV-VIS means UV-1800 Spectrophotometer

Test Performed by

Name: Rafiqul Islam & Rafiqul Alam

Designation: Research Associate & In-Charge of Scientific Equipment and Laboratory Expert

Signature:

Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature:

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Environmental Laboratory

Memo No. ELAB202206001396 Date: 01/08/2022

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio-economic Monitoring of Rampal Power Plant. Code: FPC006

Sample Type: Surface Water ID: FPC006_009 Collection Date: May/2022

Location: N/A

Received From: Md. Mutasim Billah Received Date: 05/06/2022 Testing Date: (18-31)/07/22

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-09	$NO3^{-}$	10	1.4956	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		$PO4^{3-}$	6	0.1380	ppm	UV-VIS	
03		$SO4^{2-}$	400	185.03	ppm	UV-VIS	

N.B: UV-VIS means UV-1800 Spectrophotometer

Test Performed by

Name: Rafiqul Islam & Rafiqul Alam

Designation: Research Associate & In-Charge of Scientific Equipment and Laboratory Expert

Signature:

Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature:

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Environmental Laboratory

Memo No. ELAB202206001397 | Date: 01/08/2022

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio-economic Monitoring of Rampal Power Plant. | Code: FPC006

Sample Type: Surface Water | ID: FPC006_010 | Collection Date: May/2022

Location: N/A

Received From: Md. Mutasim Billah | Received Date: 05/06/2022 | Testing Date: (18-31)/07/22

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-10	NO_3^-	10	16.151	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO_4^{3-}	6	0.5945	ppm	UV-VIS	
03		SO_4^{2-}	400	199.70	ppm	UV-VIS	

N.B: UV-VIS means UV-1800 Spectrophotometer

Test Performed by

Name: Rafiqul Islam & Rafiqul Alam

Designation: Research Associate & In-Charge of Scientific Equipment and Laboratory Expert

Signature: RAlam 01/08/2022

Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature: RAlam 01/08/2022

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Environmental Laboratory

Memo No. ELAB202206001398 | Date: 01/08/2022

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio-economic Monitoring of Rampal Power Plant. | Code: FPC006

Sample Type: Surface Water | ID: FPC006_011 | Collection Date: May/2022

Location: Shapmari

Received From: Md. Mutasim Billah | Received Date: 05/06/2022 | Testing Date: (18-31)/07/22

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-11	NO_3^-	10	5.7010	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO_4^{3-}	6	0.3492	ppm	UV-VIS	
03		SO_4^{2-}	400	217.98	ppm	UV-VIS	

N.B: UV-VIS means UV-1800 Spectrophotometer

Test Performed by

Name: Rafiqul Islam & Rafiqul Alam

Designation: Research Associate & In-Charge of Scientific Equipment and Laboratory Expert

Signature: RAlam 01/08/2022

Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature: RAlam 01/08/2022

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Environmental Laboratory

Memo No. ELAB202206001399 Date: 01/08/2022

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio-economic Monitoring of Rampal Power Plant. Code: FPC006

Sample Type: Surface Water ID: FPC006_012 Collection Date: 28/05/2022

Location: Mongla.

Received From: Md. Mutasim Billah Received Date: 05/06/2022 Testing Date: (18-31)/07/22

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-12	NO_3^-	10	9.4439	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO_4^{3-}	6	0.4821	ppm	UV-VIS	
03		SO_4^{2-}	400	212.37	ppm	UV-VIS	

N.B: UV-VIS means UV-1800 Spectrophotometer

Test Performed by

Name: Rafiqul Islam & Rafiqul Alam

Designation: Research Associate & In-Charge of Scientific Equipment and Laboratory Expert

Signature: RAlam 01/08/2022

Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature: RAlam 01/08/2022

CEGIS Center for Environmental and Geographic Information Services
(A Public Trust under the Ministry of Water Resources)
House 6, Road 23/C, Gulshan-1, Dhaka-1212, Bangladesh.
Tel: 88 02 58817649-52; 9842581, 9842551 Fax: 88 02 9843128 e-mail: cegis@cegisbd.com http://www.cegisbd.com

Environmental Laboratory

Memo No. ELAB202206001400 Date: 01/08/2022

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio-economic Monitoring of Rampal Power Plant. Code: FPC006

Sample Type: Surface Water ID: FPC006_013 Collection Date: 29/05/2022

Location: Harbaria

Received From: Md. Mutasim Billah Received Date: 05/06/2022 Testing Date: (18-31)/07/22

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-13	NO_3^-	10	4.0609	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO_4^{3-}	6	0.4512	ppm	UV-VIS	
03		SO_4^{2-}	400	227.53	ppm	UV-VIS	

N.B: UV-VIS means UV-1800 Spectrophotometer

Test Performed by

Name: Rafiqul Islam & Rafiqul Alam

Designation: Research Associate & In-Charge of Scientific Equipment and Laboratory Expert

Signature: RAlam 01/08/2022

Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature: RAlam 01/08/2022

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Environmental Laboratory

Memo No. ELAB202206001401 Date: 01/08/2022

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio-economic Monitoring of Rampal Power Plant. Code: FPC006

Sample Type: Surface Water ID: FPC006_014 Collection Date: May/2022

Location: Akram Point.

Received From: Md. Mutasim Billah Received Date: 05/06/2022 Testing Date: (18-31)/07/22

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-14	NO_3^-	10	24.688	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO_4^{3-}	6	1.0304	ppm	UV-VIS	
03		SO_4^{2-}	400	245.62	ppm	UV-VIS	

N.B: UV-VIS means UV-1800 Spectrophotometer

Test Performed by

Name: Rafiqul Islam & Rafiqul Alam

Designation: Research Associate & In-Charge of Scientific Equipment and Laboratory Expert

Signature: 01/08/2022

Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature: 01/08/2022

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Environmental Laboratory

Memo No. ELAB202206001402 Date: 01/08/2022

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio-economic Monitoring of Rampal Power Plant. Code: FPC006

Sample Type: Ground Water ID: FPC006_015 Collection Date: May/2022

Location: PPJ

Received From: Md. Mutasim Billah Received Date: 05/06/2022 Testing Date: 20/03-07/04/22

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	GW-~~15~~ 01 Power plant	NO_3^-	10	12.093	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO_4^{3-}	6	1.0162	ppm	UV-VIS	
03		SO_4^{2-}	400	14.937	ppm	UV-VIS	

N.B: UV-VIS means UV-1800 Spectrophotometer

Test Performed by

Name: Rafiqul Islam & Rafiqul Alam

Designation: Research Associate & In-Charge of Scientific Equipment and Laboratory Expert

Signature: 01/08/2022

Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature: 01/08/2022

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Environmental Laboratory

Memo No. ELAB202206001403 Date: 01/08/2022

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio-economic Monitoring of Rampal Power Plant. Code: FPC006

Sample Type: Ground Water ID: FPC006_016 Collection Date: May/2022

Location: Kapashdanga.

Received From: Md. Mutasim Billah Received Date: 05/06/2022 Testing Date: (18-31)/07/22

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	GW-~~16~~ 02 R	NO_3^-	10	8.8341	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO_4^{3-}	6	1.3918	ppm	UV-VIS	
03		SO_4^{2-}	400	9.5114	ppm	UV-VIS	

N.B: UV-VIS means UV-1800 Spectrophotometer

Test Performed by

Name: Rafiqul Islam & Rafiqul Alam

Designation: Research Associate & In-Charge of Scientific Equipment and Laboratory Expert

Signature: RAlam 01/08/2022

Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature: RAlam 01/08/2022

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Environmental Laboratory

Memo No. ELAB202206001404 Date: 01/08/2022

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio-economic Monitoring of Rampal Power Plant. Code: FPC006

Sample Type: Ground Water ID: FPC006_017 Collection Date: May/2022

Location: Rajanagar.

Received From: Md. Mutasim Billah Received Date: 05/06/2022 Testing Date: (18-31)/07/22

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	GW-~~17~~ 03	NO_3^-	10	4.0189	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO_4^{3-}	6	0.5910	ppm	UV-VIS	
03		SO_4^{2-}	400	4.2211	ppm	UV-VIS	

N.B: UV-VIS means UV-1800 Spectrophotometer

Test Performed by

Name: Rafiqul Islam & Rafiqul Alam

Designation: Research Associate & In-Charge of Scientific Equipment and Laboratory Expert

Signature: RAlam 01/08/2022

Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature: RAlam 01/08/2022

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

প্রাপকঃ

Mr. Md. Mutasim Billah
Project leader (PL)
Environmental and socio-economic monitoring of 2 X 660MW MSTPP
PEMRD, CEGIS.

প্রেরিত মৃত্তিকা নমুনার বিশ্লেষিত ফলাফল

ক্রমিক নম্বর	ল্যাব নম্বর	উপাদানের নাম														
		পিএইচ	লবণাক্ততা	জৈব পদার্থ	মোট নাইট্রোজেন	ফসফরাস (ওলসেন)	পটাশিয়াম	ক্যালসিয়াম	ম্যাগনেসিয়াম	সালফার	বোরণ	দস্তা	লৌহ	ম্যাঙ্গানিজ	লেড	ক্যাডমিয়াম
			ডিএস/মিটার	(%)		সহজলভ্য (ppm)	বিনিময়যোগ্য (meq/100g soil)			সহজলভ্য (ppm)					মোট (ppm)	
১.	৬৩৩৩	৮.১	১.৭৮	২.৪৮	০.১৪	৯.৮০	০.৪৭	২৬.৭২	৫.৩৭	২৫০.১৬	১.১৪	০.৬৯	৪৫.১৪	২.০৭	২৬.৪১	০.০৮
২.	৬৩৩৪	৭.৮	১.৫৭	২.০৮	০.১২	৭.২৬	০.৬৫	১৮.৭১	৬.৮০	১৪৭.৫০	০.৩৯	০.৭৯	৪৯.৫৯	৪.৭৭	৩২.৯৪	০.১১
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৫.	৬৩৩৭	৬.৮	৩.৯২	১.৫২	০.০৯	৪.৮৯	১.১০	৫.৯০	৫.৯৫	৫৭.১৫	১.৩৩	০.৩২	৩৮.৯৪	৫.৬১	৪৯.৫৬	২.৮২
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১১.	৬৩৪৩	৮.৩	৪.৯৭	১.৩৮	০.০৮	৪.১৮	১.১৭	৩০.৫৬	৬.০৪	৪৭৬.৭৫	০.৮০	০.৬৭	৭৬.৮৬	৭.৭৬	১৭.৮৬	০.০২
১২.	৬৩৪৪	৮.৩	৪.০৮	১.৩৬	০.০৮	৭.২৮	১.২৪	৩৫.১৭	৬.৩৯	৪৯৮.২৪	০.৬১	০.৮৫	৭৯.৯২	১১.০৫	২৫.৪১	২.০০
১৩.	৬৩৪৫	৮.৫	২.৫৬	০.৮০	০.০৫	৭.৬৯	০.৯০	১৮.৪৫	৬.৬৯	৬০.১৬	০.৫৮	০.২০	৪০.৫০	১৩.০৪	৩০.৩১	০.১০
১৪.	৬৩৪৬	৮.৮	৩.৮৫	১.০৪	০.০৬	৬.৯৩	০.৯৭	৩২.৯২	৭.১৭	৬৪.০৯	২.৯৫	০.১১	২৮.০৬	১২.০৭	৩৭.৮৮	০.০৫
১৫.	৬৩৪৭	৮.৭	৩.২৪	০.৮৪	০.০৫	৭.৬৬	১.১৭	২২.২৮	৬.৪০	৭৪.২৯	০.৯৭	০.২৯	৫২.১৪	১৭.৮৯	৫৯.০২	০.০৫
১৬.	৬৩৪৮	৮.৫	৫.৬৩	১.৫৬	০.০৯	৯.০৭	১.৩১	৩৭.৬৮	১০.২৫	৮৭.৩৮	০.৮৫	৪.৫৮	৩৮.৫৫	৭.২৫	৩৯.৯২	BDL
১৭.	৬৩৪৯	৮.৬	৩.২৬	১.৩৭	০.০৮	১২.৫৭	১.৩১	৩৫.৬৭	৭.৩৮	৭৬.৩৪	১.১১	০.৩০	২২.৩২	৫.৬৭	৪৩.৫৫	০.৫৫
১৮.	৬৩৫০	৮.৫	৩.৮০	১.৪০	০.০৮	৭.৭১	১.২৪	৩৩.৯২	৬.১৭	৮৫.৩০	০.৯৬	০.৩২	২৬.০৩	৫.৬১	৩৪.৬৪	BDL

*BDL- Below the Detection Limit

02/07/2022
(ড. মাসুদা বেগম)
উর্ধ্বতন বৈজ্ঞানিক কর্মকর্তা
ফোন ঃ ০২-৪১০২৫০৬৬ ।