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

40th Quarter Monitoring Report

Monitoring Period: February 2024 – April 2024

September 2024

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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	mg	Milligram
hr	Hour	MW	Mega Watt
Kg	Kilogram	Nm	Normal Meter
Km	Kilometre	ppm	parts per million
KV	Kilo Volt	ppt	parts per trillion
KW	Killo Watt	ton/year	Ton Per Year
m	Meter	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 40th quarterly monitoring report covers the status of EMP (Environmental Management Plan) implementation for the concurrent period (during construction stage) and prepared as per the recommendation of the EIA (Environmental Impact Assessment) report 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, 2024 covering the Winter season, CEGIS team carried out the monitoring activities for 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.

Environmental Compliance Monitoring

The present environmental compliance monitoring includes the status of EMP implementation based on physical observation, investigation and interviews/discussion to the proponents, project officials, relevant authorities and overall staffs of the entire plant. A comprehensive and detailed checklist was prepared to cover 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, waste management and other relevant issues.

During 40th visit some issues were raised and found the same situation as found during the previous tiers. Along with the previous issues CEGIS would like to bring the following issues to the respective authorities for an earlier solution:

1. Waste management issues need to be solved as soon as possible. The lavatory waste sewerage facility at labour shed is inadequate that is causing environmental hazard in and around the camp area. Maidara river bank seems clean during 40th visit as the authority has removed the construction waste bulk from the bank.
2. Current Dredged material disposal practice seems unsustainable and harmful for the environment and the adjacent biodiversity. Proper dredged material disposal plan (DMDP) is highly recommended. The MSTPP authority assured that they would develop a SoP in this regard.
3. Coal Conveyor belt from jetty area to 1st TP (Transportation Point) (About 20 to 25 m) found still uncovered and lack of integrated dust control system allowing the coal ash to be dispersed in the air and nearby water body. Also, the grabber of the excavator was not enclosed which also was found causing the air and river water pollution.
4. Heap of Sand and other loose material were found uncovered at the labour shed and inside the plant premises.

Air Quality Monitoring

The concentration of Criteria pollutants ($PM_{2.5}$, PM_{10}, SPM, SO_2, NOx, CO, and O_3) at the project area and the project influence area changes over the seasonal shift and locations too. During the monitoring tier, the concentration of particulate matter especially $PM_{2.5}$ and PM_{10} was found to be higher in the Project adjacent area than in the other areas which might be due to the increased emissions from Power plant activities, combustion of gasoline, oil, diesel fuel which produce much of the $PM_{2.5}$ pollution found in outdoor air, as well as a significant proportion of PM_{10}. Seasonal effect reveals that winter is the worst season in terms of air pollution followed by pre-monsoon. The air pollution data show that the pollution is lower during the monsoon or post-monsoon time due to the wet wash of maximum rainy days. SO_2 and NO_2 along with the particulate matters are considerably lower particularly in Sundarbans areas. Maximum concentration was found in the Khan Jahan Ali Bridge area followed by the Project adjacent areas.

Land development works of the project during 2014 increased dust pollution. After finishing site development with grassy topsoil by the end of 2016 might be responsible for reduced dust levels in ambient air. Hiron Point, Akram Point, and Harbaria represent the locations of minimum pollution levels situated inside the Sundarbans Forest area and are away from the nuclei of the Mongla industrial zone and the project site.

Noise Level Monitoring

Observed noise level at Chalna (Commercial area) was recorded as 53.39 dB whereas at 51.92 dB Kaigar Daskati Gucchha Gram (a residential area located at north-west corner of the project area). Detected noise level at Shapmari (47.68 dB) located near the Township area did not exceed their corresponding standard limit. On the other hand, levels of noise at Chunkuri-2, Bajua & Moidara (SW corner of the Project area) were recorded as 48.23 dB & 50.97 dB respectively which also complies with their corresponding standard value (55 dB) in these respective locations. The level of noise at Barni (Gaurambha) was recorded as 57.21 dB which was 2.79 dB lower than that of its standard limit (60 dB) of noise level for this location. However, Harbaria, Akram Point and Hiron Points are three ecologically silent zones in the study area.

Observed sound levels at Harbaria (48.87 dB), Akram Point (37.98 dB) and Hiron point (42.47 dB) were also found to comnplied with their standard limit of noise level (std. 50 dB). Moreover, the level of observed noise at Khan Jahan Ali Bridge and at the Mongla port area were recorded as 62.78 dB and 57.24 dB respectively. Whereas, the standard noise limits for Khan Jahan Ali Bridge (a commercial zone) and Mongla port (an industrial zone) during the day are 70 dB and 75 dB, respectively.

Water Quality Monitoring

The physicochemical properties of Passur River change with the tidal intrusion in different seasons. During the 40th quarterly monitoring, pH was found slightly basic. Salinity, on the other hand, was found slightly higher compared to the other seasons. In general, salinity is found to be higher downstream i.e. in the Harbaria, the Akram point, and the Hiron point of Sundarbans compared to the upstream area i.e. near the power plant adjacent area because these locations are situated very close to the sea and tidal inflow from the sea. On the other hand, the temperature and Dissolved Oxygen level were found in fair and favorable for the aquatic life forms during the monitoring periods and completely complied with the ECR'2023. TDS and TH were found to be more in the Akram point area than the other sites as this site is a confluence point of Passur and Sibsa Rivers with an influence of tidal inflow from the sea. On the contrary, Nitrate (NO_3^-) and Phosphate (PO_4^{3-}) levels were found to exceed at most of the sites than the standard, set by the ECR'2023 which might be due to upstream anthropogenic activities probably the reason for this kind of trend along with the pattern of rainfalls and bio-geochemical cycles of nitrogen. Similarly, the Sulphate concentrations were found relatively higher in the post-monsoon and winter periods than in the monsoon seasons. In case of metal pollution, no significant variation was recorded for As and Pb and found to be not exceede the standard as set in the ER'2023. Oil & grease concentration was found less than 2.0 mg/L at all sites like the previous monitoring periods which is less than the recommended concentration.

Considering the quality of groundwater, it still good in condition with slight variations in pH and salinity. The reason is saline water intrusion and infiltration due to the excessive withdrawal of groundwater by the surrounding communities during the dry season but during the monsoon season, the water becomes less salinewith the recharge of aquifers . Among the periods during the monitoring tier in May 2023, TDS values were found to be higher than the ECR'2023 which might be because the water chemistry might be governed by the weathering of carbonate and silicate minerals, reverse ion exchange, and evaporation processes, which resulted in high EC, TDS, TH and major ions in the groundwater (Manikandan. E. et. al. 2020). On the other hand, during winter and pre-monsoon As concentration was found to breach the national water quality standard two times at Kapashdanga. The reason behind this exceedance is very hard to interpret but the most widely discovered two theories for the background of arsenic contamination of groundwater in Bangladesh may be the pyrite oxidation and iron oxyhydroxide reduction (Saha and Rahman, 2020).

Land and Agricultural Resources Monitoring

During the monitoring period soil samples were collected from monitoring plots and sent to Soil Resources Development Institute (SRDI), Dhaka laboratory for chemical analysis. The analysis report will be incorporated with next (41st monitoring) report. Boro (BRRIdhan 67) is exclusively cultivated in Baranpara, yielding 5.3 tons/ha and 2.1 tons total. Local Aman (Chapshail) is cvultivated in Chakgona and Basherhula, while HYV Aman (BRRIdhan 23) is cultivated in Baranpara, Chunkuri-2, and Bidyarbon. Total rice production is 7.29 tons, with Baranpara contributing 3.43 tons, including Aman and Boro. No crop damage was found during this monitoring field visit. On the other hand, the status of 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.

River bed Sediment Monitoring

Sediment sample analysis report of 39th monitoring (January, 2024 or Dry season, 2024) is incorporated in this report. Mercury exceeds average shale value at all sites but is within upper crust concentration; Pb and As stay within both limits. The maximum concentration for As and Pb is found in Akram point whereas Hg maximized at Harbaria. In project site (jetty point), none of these metal concentrations exceed this monitoring season average value.

Traffic Volume and Status Monitoring

The traffic survey results indicate that the Khulna Mongla Road at Khudir Bottola consistently receiving 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. The survey also suggests that the overall traffic volume has increased compared to the previous monitoring period. Since two of the survey days were weekdays, this could be a contributing factor to the higher traffic volume in these areas. Additionally, as the project is gradually approaching towards its full operational stage and the construction-related works are almost done but not completed yet, this could be another reason behind the overall high traffic volume in the mentioned areas during this monitoring period.

Fisheries Resources Monitoring

Monitoring of 40-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 12 sites as fishing in other sites in the river were not observed. Amongst the effective sites, seven (09) were in the river and three (03) were in the countryside (shrimp farms). The followings are the key findings of the 40th quarter monitoring in the fiscal year of 2023-24. 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, 2020-21, 2021-22 and 2022-23, 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) feeding and nursing ground and ii) omni ground including spawning, nursery and maturation ground. Shannon-Weiner diversity index has also been observed to vary between 40-quarter with that of all previous quarters. Highest Shannon-Weiner index was found at Chandpai (0.78) indicating high evenly distributed fish species. On the contrary, lowest evenness was found at Harbaria (0.51). However, maximum FSR was obtained at Chalna point (n=16), while very low FSR was recorded at Bhodra (n=04). Among the habitats in down-stream of the Passur River system, Akram point was home to rich assemblage of *Chaka Chingri and Tep paisa, Motka Chingri, Paissa and Java*, Haldikhali was rich of assemblace of Motka Chingri and Chaka Chingri, Charaputia was rich of *Chaka Chingri, Kain Magur and Paissa,* Bhodra was rich assemblage of *Chaka Chingri and Paissa*, Harbaria was rich of *Motka Chingri* and *chela.* Fish species like *Boiragi, Poma and Loittya* attain the maximum abundance among the migratory fish species. Moreover, among the migratory species *Paissa, Chela* and *Bele* were observed to migrate long distance. In this monitoring, the highest productivity was found at Haldikhali followed by Akram point. The present study revealed that the highest catch susceptibility was also found in case of Sutar Jal (11.54 kg/haul).

Ecological Monitoring

During this monitoring season, several key ecological indicators were assessed, including vegetation composition, plant diversity, canopy status, plant health, bird habitat conditions, and dolphin occurrences in the river systems. A total of 53 tree species were recorded across all monitoring sites, with a Shannon-Wiener diversity index of 3.5, indicating an increase in diversity compared to the previous monitoring period. Canopy cover at most sites showed a slight increase, attributed to the addition of new plants. No bird nests were observed at any of the sites. Dolphin occurrences remained relatively consistent across the Bhadra, Chandpai, Shela Gang, and Passur rivers.

Sundarbans Reserve Forest Health Monitoring

A comprehensive survey encompassing forty (40) assessments was meticulously conducted across five distinct locations as an integral component of the quarterly monitoring program for the Sundarbans Forest Health. The selection of these sites was strategically informed by a myriad of considerations, including their proximity to the designated project areas, the diversity of vegetation types, prevailing wind directions, coal transit corridors, and riverine systems. The locations under review include Karamjal, Harbaria, Akram Point, and Hiron Point, situated along the Passur River, with the Sutarkhali Forest representing the fifth site. The pneumatophore density, which is indicative of the root structures adapted for oxygen intake in mangroves, peaks at Sutar Khali (398,947 per hectare) and remains significantly higher than at Akram Point (114,803 per hectare), suggesting robust vegetative growth in Sutar Khali. Similarly, crab hole density is highest at Akram Point (153,213 per hectare), which may imply a greater presence of bioturbation activities there compared to the lower densities observed at Hiron Point (49,444 per hectare). Sutar Khali and Harbaria display higher canopy coverage and carbon sequestration, with Harbaria also showing better species diversity and a healthy sapling density. Karamjol and Hiron Point both have high species densities and carbon in wood debris, but Karamjol has better species diversity compared to Hiron Point. However, Akram Point presents a more varied picture with lower species diversity and sapling density but notable carbon storage capabilities.

Moreover, Hiron Point and Akram Point exhibit challenges in species diversity compared to others, with Hiron Point showing significant carbon storage but a less diverse species composition.Each location has its strengths and weaknesses, and the overall health of the forest varies by site, reflecting different stages of ecological development and other factor.In summary, the monitoring data yielded profound insights into the intricate dynamics of seedlings, pneumatophores, crab holes, canopy cover, Leaf Area Index, floral diversity, and carbon sequestration across various mangrove sites. This comprehensive analysis underscored the intricate interplay of environmental factors that collectively influence the health and ecological dynamics of the ecosystem.

Socio- economic Monitoring

The project is in operation phase where skilled labor requirements are increased in parallel to the less requirements of semi-skilled and non-skilled workforce. In this phase, environmental and social issues have been monitored under the regular quarterly inspection. Aim of this monitoring is to identify the shortfall in the project implementation regarding environmental and social issues, and to suggest necessary recommendation for its proper implementation following necessary standards.

In livelihood context, some disputes observe regarding recruitment of the local in different project activity but no grievance redressed mechanism is yet to be observed though it was repeatedly mentioned in previous quarterly monitoring reports as well as uttered in the meetings at BIFPCL office. The authority tried to ensure good working environment through providing necessary safety equipment and medical services for its workers in the project premises. However, coal dust and fly ash are not properly managed in all the time in the project area that is hazardous for the workers. According to the local people, this MSTPP supports in generating employment opportunities in transportations, small floating business and entrepreneurship within or surroundings of the project area.

The MSTPP tried to ensure safe environment for the community as well. As a result, they initiated tree plantation in the periphery of the project area to trap hazardous particles of the air, and increase the oxygen density in the surroundings of the project area. However, sometimes, the coal dust and fly ashes are not properly managed according to the standards. The authority also has arrangement to dispose the dredged material of regular maintenance dredging in the project area, and sold them in future for the interest of the community at low cost. For controlling the sand/dust flew within and outside of the project area, the authority initiates water splash in the project in this regard. In addition, under the CSR activity, the MSTPP authority involves in some voluntary and social activities in the project surrounding villages (i.e. providing school kids, blanket, wheel chair, free medical camping, installation of ROs for safe drinking water etc.). In the celebration of national events, the MSTPP authority also arranged some events for it in house members, and the neighbors.

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.

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, CEGIS team has carried out the 40th quarterly monitoring activities in April, 2024 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.

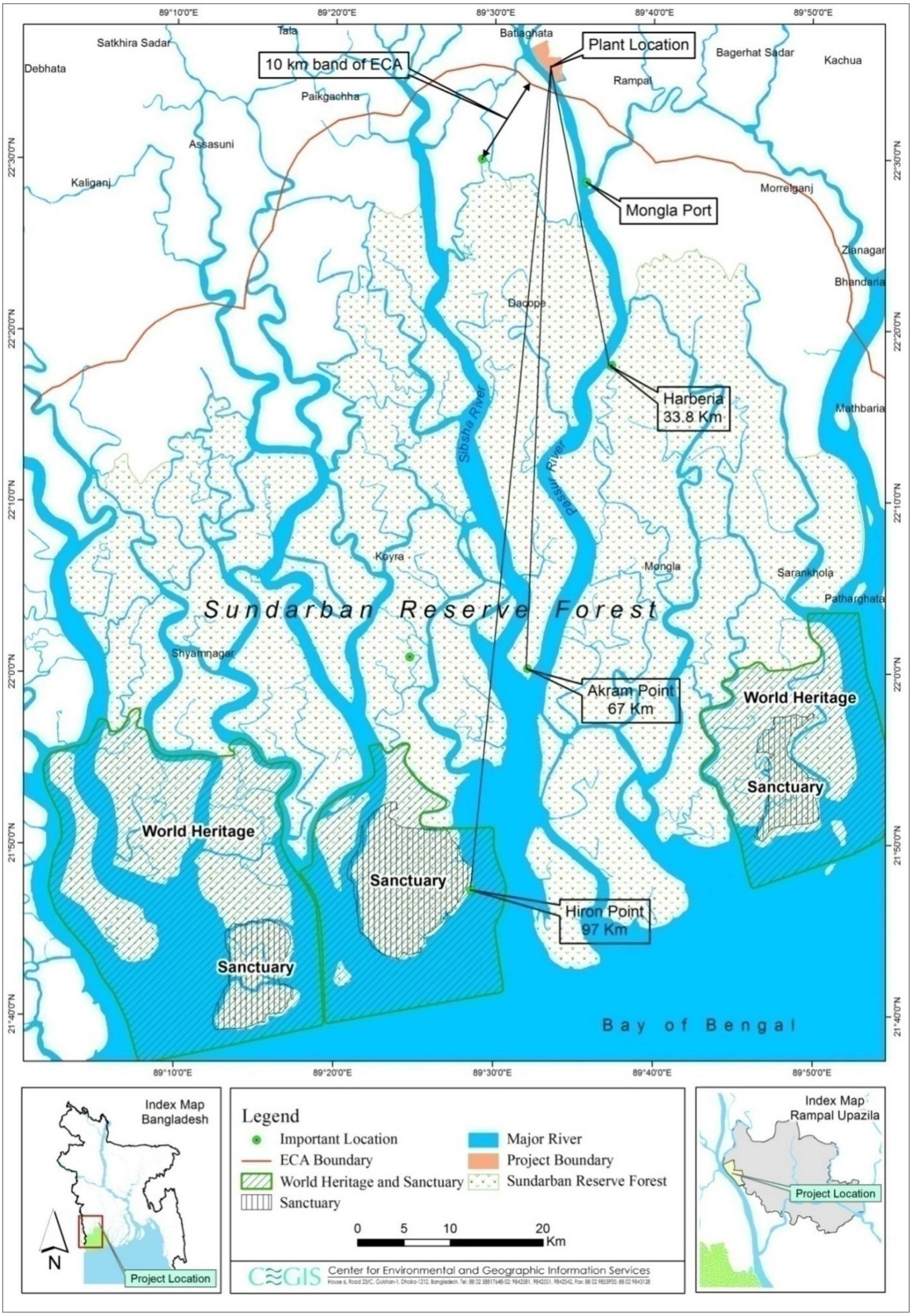


Figure 1.1: Location Map of the Study Area

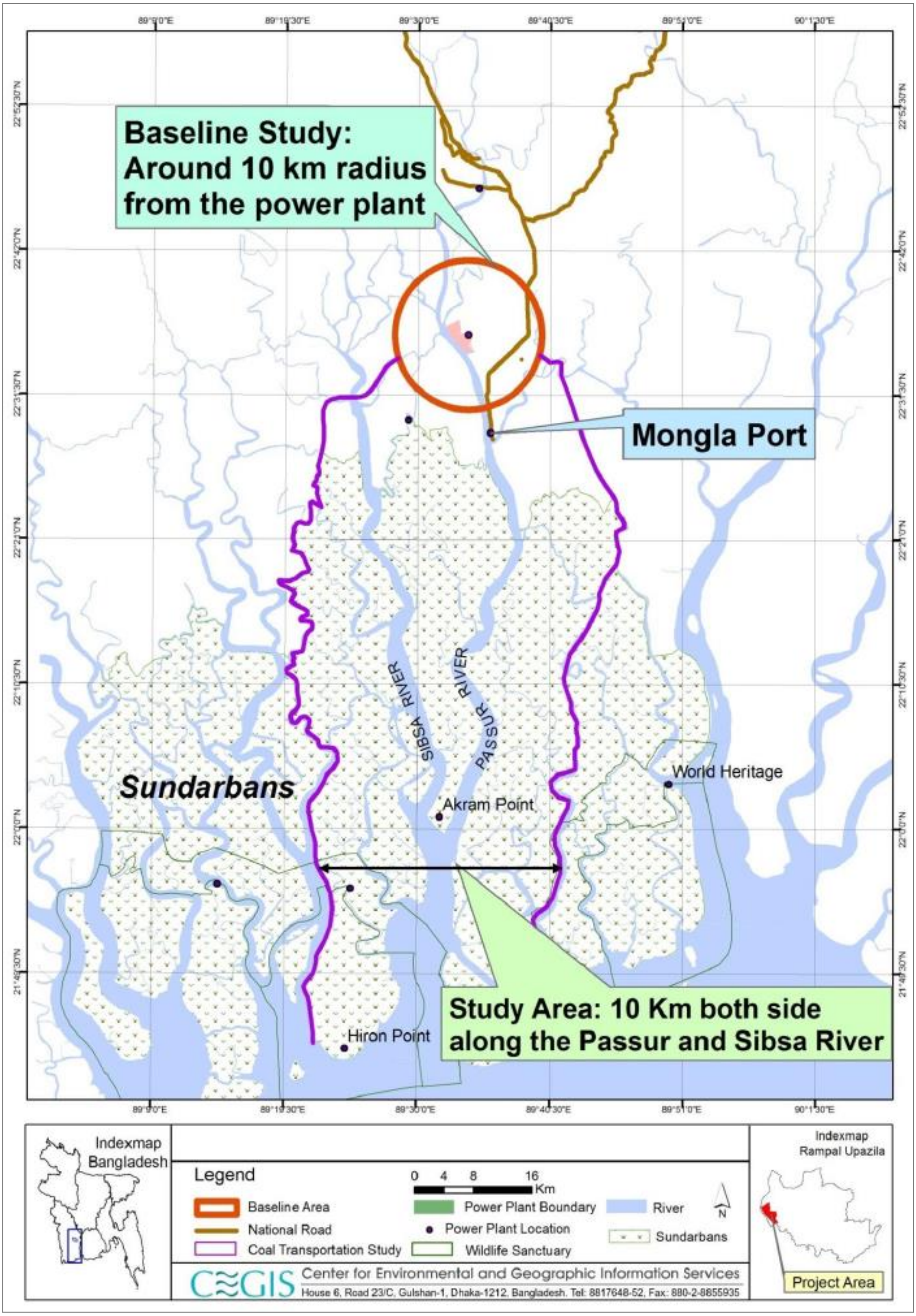


Figure 1.2: AOI of Environmental and Socio-economic Monitoring

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 39th 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 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 quality is considered one of the major indicators for assessing the environmental health of a certain area as this is important for improving and protecting public health, and ensuring compliance with regulations. During the EIA study, it was suggested that the air quality needs to be observed every quarter of a year to understand the air quality status in the project's adjacent areas and the Sunderbans Reserve Forest areas. Based on the recommendations, the air quality status at the suggested locations is monitored following the standard procedures and guidelines.

2.1.1 Methodology

During the EIA study, the criteria pollutants i.e., Particulate Matters (i.e., $PM_{2.5}$, PM_{10}, and SPM), SOx, NOx, CO, and O_3 were 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 also selected during the EIA study based on several measures e.g., the sensitivity of the receptors, project activities like the movement of coal-carrying vessels, coal trans-shipment activities; wind speed, wind direction, atmospheric deposition (Wet and Dry) and atmospheric stability classes, etc. However, the Continuous Ambient Air Quality Micro-Monitoring Station (caaqMMS) AirSENCE was used to collect the in-situ air quality data. The AirSENCE provides Concentrations for gaseous pollutants including NO, NO_2, CO, O_3, SO_2, VOC, H_2S, and CO_2 in addition to all particulate matter fractions such as PM_{10}, $PM_{2.5}$, and PM_1.

2.1.2 Pollution Sources in the Sundarbans

The key sources of air pollution around the Mongla Port area and project site can be considered as cement factories, LPG bottling plant, non-regulated mechanized boats, cargo vessels and ships plying to Mongla Port area 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 collection, 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**.

2.1.3 Monitoring Locations

Air quality status is assessed and monitored at the fixed locations for each monitoring quarter. As per trackingthe DoE and expert's panel's recommendations, two additional locations with the existing monitoring locations were included during the project's construction phase. The air quality monitoring locations as well as activity 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**.

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	AirSENCE Continuous Ambient Air Quality Micro monitoring station, model ELITE. It provides concentrations for criteria gaseous pollutants including NO, NO_2, CO, O_3, SO_2, VOC, and CO_2 and for all particulate matter pollutant, fraction sizes including PM_{10}, $PM_{2.5}$, and PM_1.
2		Proposed township area near Chimney location, Mauza: Sapmari Katakhali.	89°32'3.8"E; 22°36'32.5"N		
3		North West corner of the Project boundary (Kaigar Daskati)	89°33'51.8"E; 22°36'1.06"N		
4		Barni, Gaurambha Union (4km North East from the chimney location)	89°34'37.7"E; 22°38'51.8"N		
5		Chunkuri-2, Bajua Union (4km South West from the chimney location)	89°34'01.1"E; 22°32'3.3"N		
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		


Source: Field Survey, May, 2024

Figure 2.1: Acquisition of Ambient Air Quality Monitoring

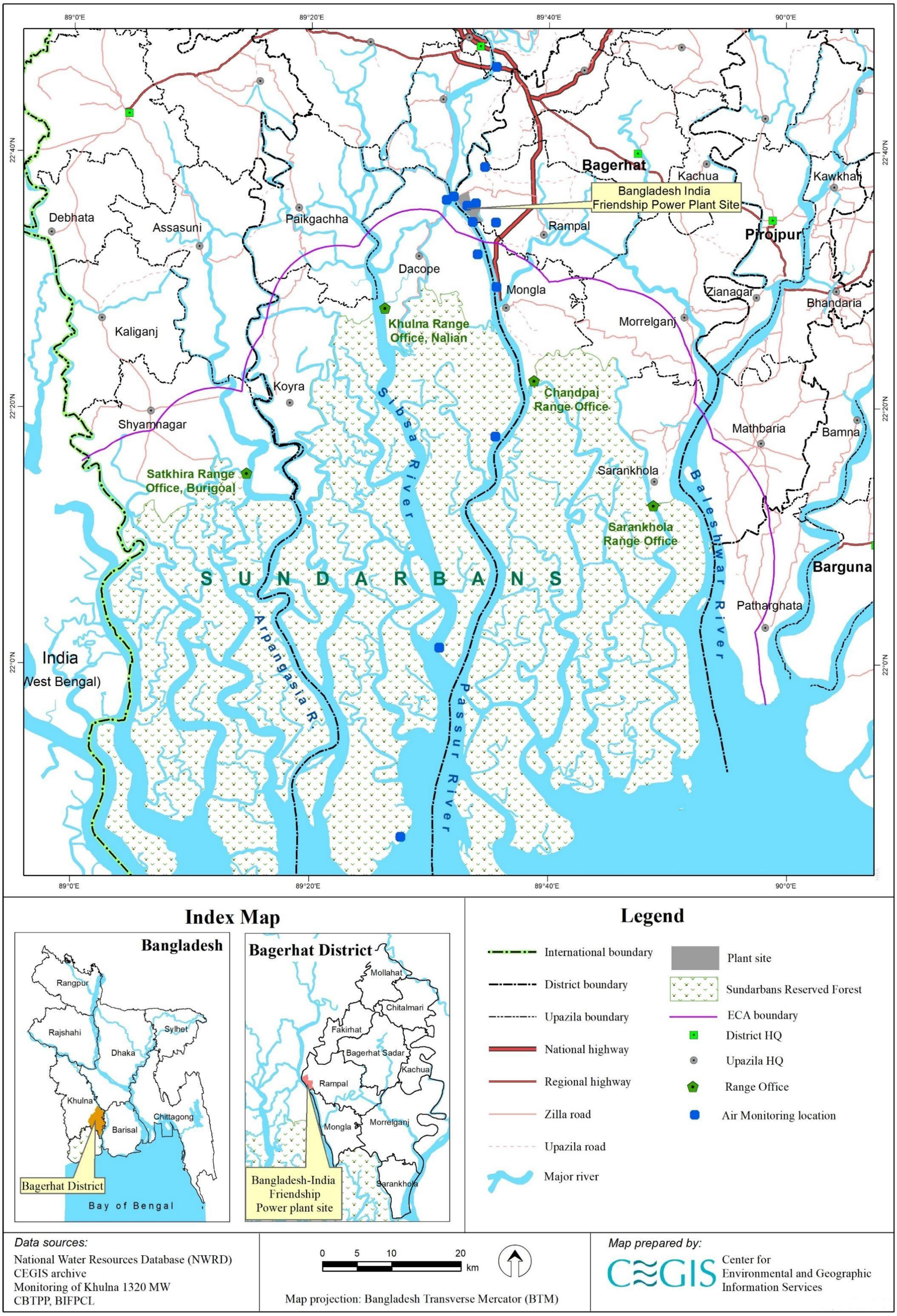


Figure 2.2: Air Quality Monitoring Locations

2.1.4 Status of Air Quality

During this monitoring tier, the maximum value (45.66 µg/m³) of $PM_{2.5}$ was found at the Akram point area whereas the minimum value (16.27 µg/m³) was recorded at the Shapmari area. On the other hand, the concentration of PM10 and SPM were also found to be highest (55.85 µg/m3 and 83.77 µg/m3) at the Akram Point area respectively and the lowest (17.25 µg/m³ and 27.6 µg/m³ at Shapmari area. On the contrary, the concentrations of Sulphur dioxide (SO_2) as observed in the ambient air were much lower than the Bangladesh standard limit of (80µg/m³) at all the sampling locations. Among those, the maximum concentration (11.06 µg/m³) was found at the Mongla Port area whereas the minimum concentration (1.11µg/m³) was recorded at the Shapmari area near the Power plant area. Similarly, the values of NO_2 were also observed much below than the Bangladesh standard value of 80 µg/m³. The maximum concentration (19.67 µg/m³) of NO_2 was found at the Gaurambha area whereas the lowest concentration (16.28 µg/m³) was recorded at the Maidhara area. The contributor to such NO_2 emissions may be from local human haulers, cars, buses, etc. Moreover, the maximum values of CO (0.54 mg/m³) and O3 (26.9 µg/m³) were found at the Harbaria and the Koigordashkatir char area respectively though the results were found much lower than the standard value (5 mg/m³ and 100 µg/m³ respectively) set in Air pollution control Rules, 2022. From the measured values, it can be concluded that the effect of seasonal variations on the surrounding environment may be the prominent reason for increasing or decreasing the concentrations of the criteria pollutants for the corresponding air sheds.

During the monitoring tier, all the criteria pollutants from all locations were observed to be within the standard limit set in Air Pollution Control Rules, 2022. This scenario will be further investigated during the next monitoring tier. The monitoring results of the 40th monitoring program are depicted 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**.

Table 2.2: Air Quality Monitoring Parameters and Observed Data (40th Quarterly Program)

Location	Parameters						
	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	SPM (µg/m³)	SO_2 (µg/m³)	NO_2 (µg/m³)	CO (mg/m³)	O_3 (µg/m³)
AQ-1	29.95	31.73	49.18	1.97	16.28	0.11	22.95
AQ-2	16.27	17.25	27.6	1.11	17.03	0.188	24.63
AQ-3	24.2	25.71	37.28	6.94	18.57	0.18	26.9
AQ-4	21.84	23.75	39.18	5.02	19.67	0.215	23.05
AQ-5	27.12	29.1	43.65	5.24	17.16	0.253	24.55
AQ-6	32.59	36.28	58.04	5.93	17.13	0.219	20.58
AQ-7	38.82	44.75	71.6	11.06	16.38	0.254	19.81
AQ-8	40.28	52.71	76.43	9.61	18.73	0.54	20.27
AQ-9	45.66	55.85	83.77	10.2	16.52	0.4	21
AQ-10	38.3	50.65	73.2	8.5	17.2	0.435	20.02
AQ-11	35.53	39.56	62.1	2.45	16.78	0.432	20.76
AQ-12	23.74	21.63	33.23	0.501	7	18.19	20.18
AQ-13	51.28	42.88	73.84)	0.036	6.79	17.53	24.66
Standard * (APCR, 2022)	**65**	**150**	**200 (ECR'97)**	**80**	**80**	**5**	**100**

Source: Field survey; Mayl 2024; Standard- Air Pollution Control Rules, 2022*

Seasonal Varriation

The values of all the criteria pollutants as averaged for the corresponding locations for the corresponding seasons were found to be higher in the Khan Jahan Ali Bridge area than the project influence area followed by Mongla area and the Sundarbans Reserve Forest (SRF) area. On the other hand, the concentration of the measured parameters was found to be higher in the winter seasons of the monitoring periods except for CO, SO_2, & and NO_2 which were found to be higher in Post-monsoon periods. The concentration of $PM_{2.5}$ was increased in the winter season over the monitoring periods as depicted in the **Appendix IV.** On the other hand, the concentration of PM_{10} mad SPM decreased over the monitoring periods especially after the construction phase and never crossed the standard value set in Air Pollution Control Rules, 2022. It is also to be noted that, the concentration of all criteria pollutants was observed to be decreased in the Sundarbans area than the previously monitored data of monsoon season. The concentration of $PM_{2.5}$, SPM, and O_3 increased compared to the same season of the previous year, and the remaining parameters were observed to be decreased The seasonal variations are shown in **Figure 2.3**.

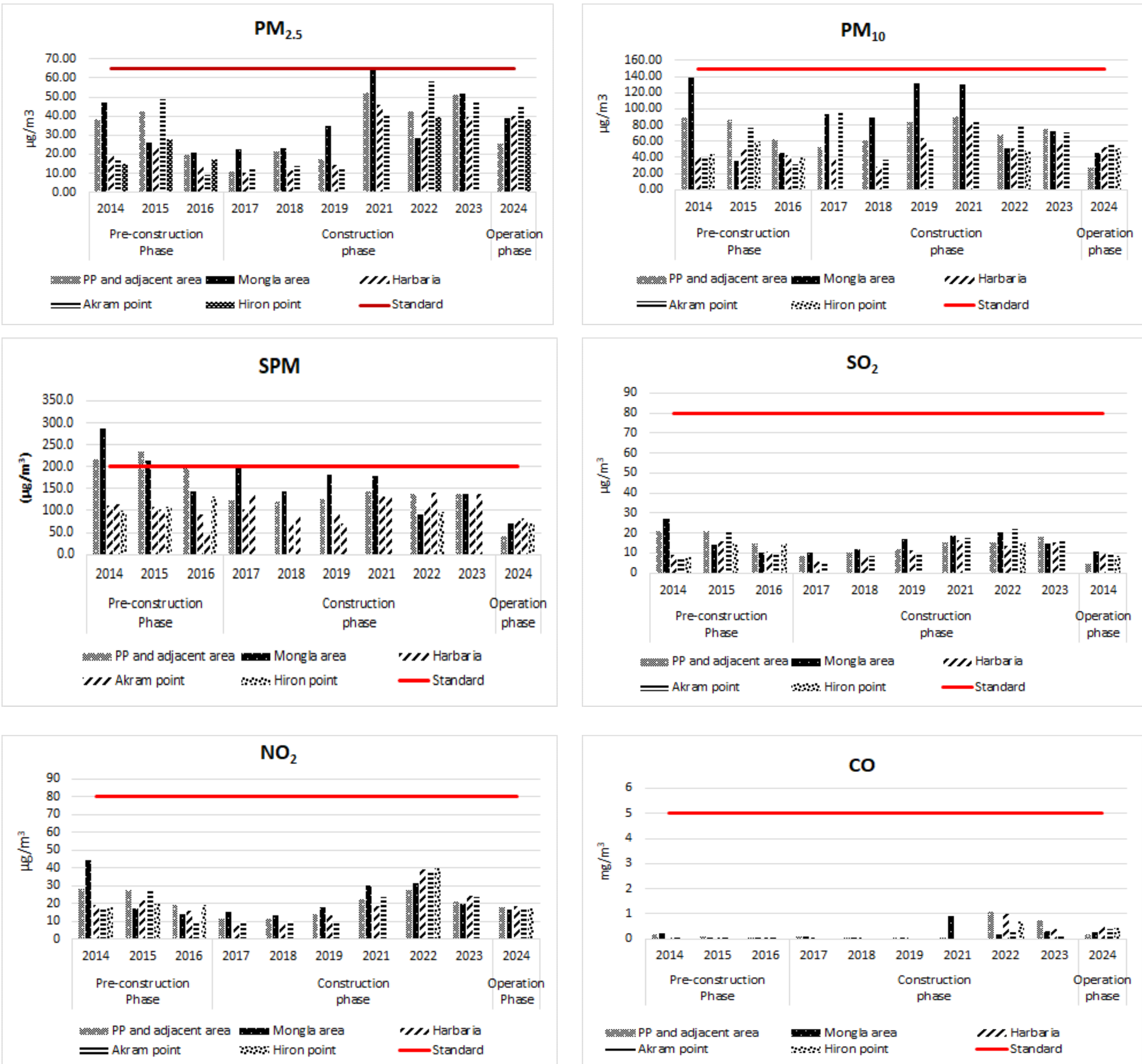


Figure 2.3: Seasonal Variation of the Air Quality Parameters

Cluster Analysis

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).**

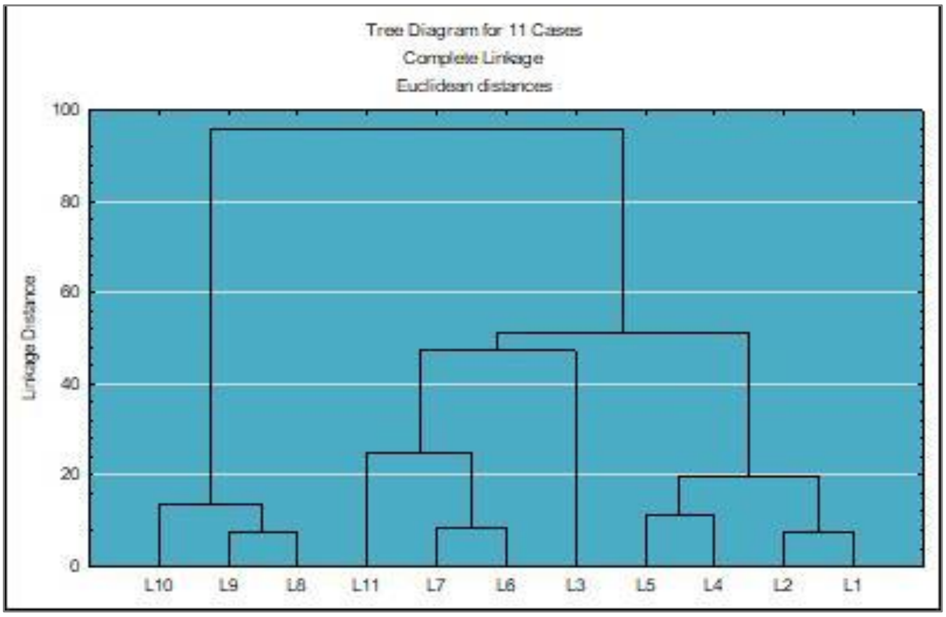


Figure 2.4: Dendogram of the Monitoring Stations using Euclidean Distance

2.1.5 Findings

The concentration of Criteria pollutants ($PM_{2.5}$, PM_{10}, SPM, SO_2, NOx, CO, and O_3) at the project area and the project influence area changes over the seasonal shift and location. During the monitoring tier, the concentration of particulate matter especially $PM_{2.5}$ and PM_{10} was found to be higher in the Project adjacent area than in the other areas which might be due to the increased emissions from combustion of gasoline, oil, diesel fuel or wood, which produce much of the $PM_{2.5}$ pollution found in outdoor air, as well as a significant proportion of PM_{10}. Winter is the worst season in terms of air pollution in that area followed by pre-monsoon. All of the air pollution remains lower during the monsoon or post-monsoon time due to the wet wash of maximum rainy days. SO_2 and NO_x are considerably lower, particularly in Sundarbans areas. It increases towards the project area and Khan Jahan Ali Bridge areas. Land development works of the project in 2014 increased dust pollution and finalized site development with grassy topsoil by the end of 2016 might be responsible for reduced dust levels in ambient air. Hiron Point, Akram Point, and Harbaria represent the locations of minimum pollution levels situated inside the Sundarbans Forest area and are away from the nuclei of the Mongla industrial zone and the project site.

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 eight locations and twice (morning & afternoon) at three locations around the project and study area. Each time, noise levels were recorded using noise level meter for five minutes of time span with an interval period of 30 second and the noise level machine 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**). the monitoring activities are shown in **Figure 2.6**.

2.2.2 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 **Table 2.3**.

Table 2.3: Noise Monitoring Plan

SL. No.	Monitoring locations	GPS points
1	South West corner of the Project boundary	89°33'34.5"E; 22°34'33.8"N
2	Proposed township area near Chimney location, Mauza: Sapmari Katakhali	89°32'3.8"E; 22°36'32.5"N
3	North West corner of the Project boundary (Kaigar Daskati)	89°33'51.8"E; 22°36'1.06"N
4	Barni, Gaurambha union (4km North East from the chimney location)	89°34'37.7"E; 22°38'51.8"N
5	Chunkuri-2, Bajua Union (4km South West from the chimney location)	89°34'01.1"E; 22°32'3.3"N
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"E21°46'27.60"N
11	Khulna city near Khan Jahan Ali Bridge	89°35'35.5"E; 22°46'36.8"N

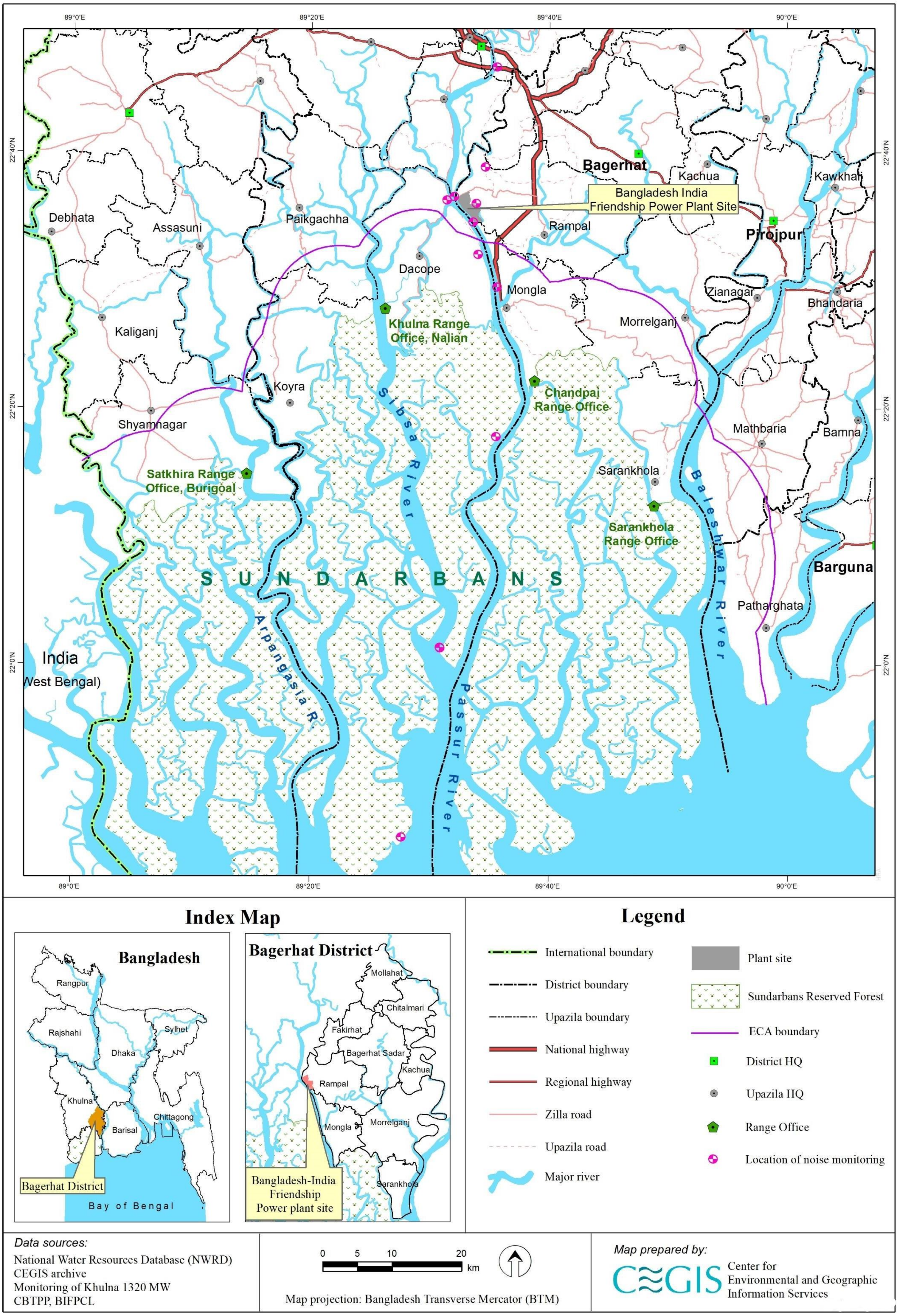


Figure 2.5: Noise Level Monitoring Locations

Source: Field Survey, May, 2024

Figure 2.6: Ambient Noise Acquisition in Study Area

2.2.3 Noise in the Study Area

Among the sources of noise generation engine boats, trawlers, small barges, ships plying along 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.

2.2.4 Status of Noise

In order to provide an overview of the observed level of noise, 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**, **C9**, and **C10** 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 level of noise at Chalna, a commercial area located at a distance of 4 km to the north-west direction of the chimney location was recorded as 53.39 dB whereas its standard level is 70 dB (**Table: 2.4**). Levels of noise at Kaigar Daskati (51.92 dB) situated at the Gucchha Gram (a residential area located at north-west corner of the project area) and at Shapmari (47.68 dB) located at Proposed

Township area did not exceed their corresponding standard limit. On the other hand, levels of noise at Chunkuri-2, Bajua & Moidara (SW corner of the Project area) are recorded as 48.23 dB & 50.97 dB respectively that denotes, the levels of noise didn't cross their corresponding standard value (55 dB) in these location (**Table: 2.4**). The level of noise at Barni (Gaurambha) was recorded as 57.21 dB which was 2.79 dB lower than that of its standard limit (60 dB) of noise level for this location (**Table: 2.4**). Harbaria, Akram Point and Hiron Points are three ecologically silent zones in the study area. Both of these locations, Harbaria (48.87 dB), Akram Point (37.98 dB) and Hiron point (42.47 dB) were not found to exceed their standard limit of noise level (std. 50 dB). The level of observed noise at Khan Jahan Ali Bridge and at the Mongla port area were recorded as 62.78 dB and 57.24 dB respectively. Whereas, the standard noise limits for Khan Jahan Ali Bridge (a commercial zone) and Mongla port (an industrial zone) during the day are 70 dB and 75 dB, respectively. Seasonal variation of the observed nose level are shown in **Figure 2.7**.

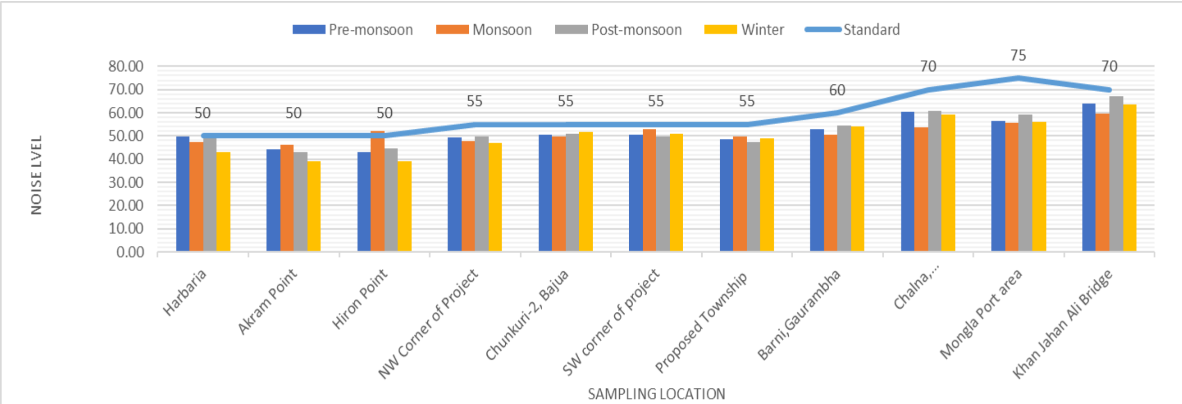


Figure 2.7: Status of Average Seasonal Variations of Noise Level at Different Monitoring Locations

2.3 Water Quality

An updated water quality status of the Passur-Sibsa River system and adjacent water bodies has been depicted in this section. Both national and international guidelines were followed, adopted, and compared for sample collection, analysis, and interpretation. This report includes physical water quality parameters collected during the 40th quarterly monitoring tier (April 2024) and the test results obtained from the laboratory up to January 2024 (39th quarterly monitoring program). Several parameters as well as locations were identified and assigned for the water quality monitoring to understand the effect of power plant activities and their corresponding impact on the surface and groundwater quality as well as on the aquatic life of the adjacent river, the Sundarbans Forest ecosystem, and community health in and around the power plant area.

2.3.1 Methodology

Standard approaches and methodologies were followed for the events mentioned above. 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 compared with the national standards (ECR, 2023, and all available amendments). The samples were collected from eighteen (18) pre-selected locations (15 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) with proper tagging at the time of sampling. The selected monitoring locations for the monitoring program are shown in **Figure 2.8**. 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 2.4** and **Table 2.5** respectively.

2.3.2 Selection of Parameters

The selected parameters for Groundwater 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.

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 analyzed data of the additional parameters are recorded and submitted to the DoE and other authorities periodically.

2.3.3 Sampling Procedure

The study area is highly influenced by tidal variation. Hence, temporal and spatial variations of tides were considered during the sampling procedure. Surface water samples were collected 50-100m away from the river bank and 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 collected heavy metal samples (As, Pb, Hg). On the contrary, the Analysis of BOD_5 has been discarded because of constraints to maintain the proper procedure to collect, preserve, and lab test the water samples at ideal conditions. All samples were preserved as per standard procedure. The in-situ testing of the selected water quality parameters is shown in **Figure 2.9**. 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 storage. Acidified sampling bottles were used for heavy metals (As, Pb, Hg) sample collection and were preserved following standard procedure.

Table 2.4: Groundwater Quality Monitoring Parameters, Locations and Plan

Sl. No.	Sampling Locations ID	Locations	GPS (Decimal Degree)		Frequency	Methods/Monitoring indicators/ Techniques
			Easting	Northing		
1	SL-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	SL-2	Rajnagar	89.576056˚E	22.612528˚N		
3	SL-3	Kapashdanga	89.563000˚E	22.622528˚N		

Table 2.5: Surface Water Quality Monitoring Parameters, Locations and Plan

Sl No	Monitoring Indicators	Sampling Locations ID	Locations	GPS (Decimal Degree)		Frequency	Methods/Tool/ 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	SL-1	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		SL-2	Middle of Passur River at 100m u/s of North West corner of the Project boundary	22.607222°N	89.528889°E		
3		SL-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		SL-4	Left Bank of Passur River at Project Site-Jetty	22.584833°N	89.543583°E		
5		SL-5	Middle of Passur River at Project Site-Jetty	22.587667°N	89.546472°E		
6		SL-6	Right Bank of Passur River at Project Site-Jetty	22.589333°N	89.548222°E		
7		SL-7	Left Bank of Passur River at South West corner of the Project boundary	22.572889°N	89.552583°E		
8		SL-8	Middle of Passur River at South West corner of the Project boundary	22.574611°N	89.557500°E		
9		SL-9	Right Bank of Passur River at South West corner of the Project boundary	22.575667°N	89.559861°E		

Sl No	Monitoring Indicators	Sampling Locations ID	Locations	GPS (Decimal Degree)		Frequency	Methods/Tool/ Techniques
				Easting	Northing		
10		SL-10	Maidara river at the South East corner of the project boundary at Ichamoti-Maidara confluence	22.600639°N	89.565611°E		
11		SL-11	Maidara river near proposed Township area	22.577472°N	89.569250°E		
12		SL-12	Passur river at Passur – Ghasiakhali confluence	22.473861°N	89.602361°E		
13		SL-13	Passur river at Harbaria of the Sundarbans Reserve Forest area	22.295250°N	89.593139°E		
14		SL-14	Passur river at Akram Point of the Sundarbans Reserve Forest Area	22.024120° N	89.514220°E		
15		SL-15	Passur river at Hiron point of the Sundarbans Reserve Forest Area	21.774183°N	89.464778°E		

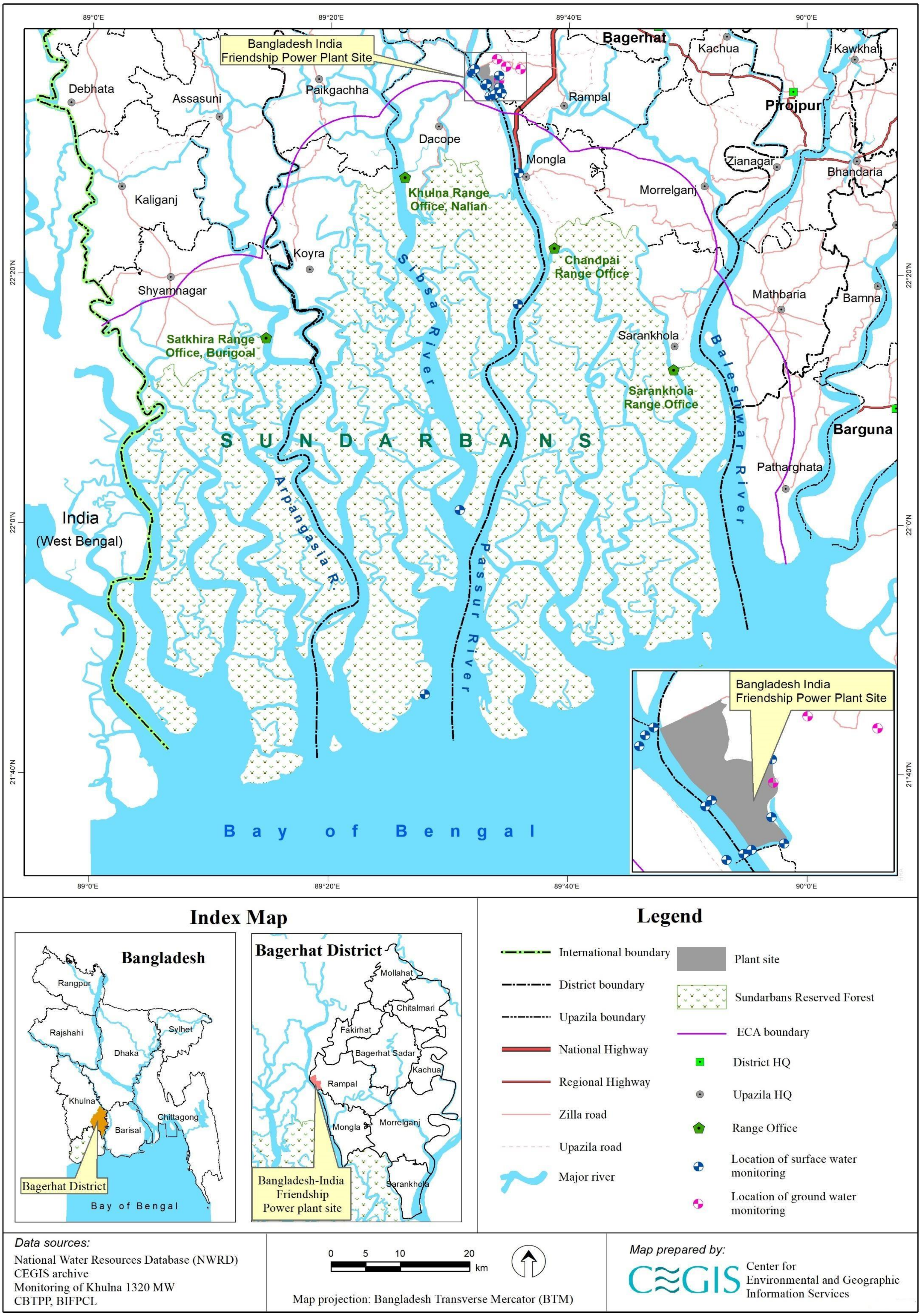


Figure 2.8: Surface Water and Groundwater Quality Monitoring Location

Source: Field Survey, May, 2024

Figure 2.9: 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 2.6**.

Table 2.6: Testing Methodology of Water Quality Parameter

Parameters	Methods/Measuring Tools	Unit	BD Standard (Drinking Water Quality; ECR' 2023)
Temperature	Horiba U-50 multimeter	0C	20 - 30
Salinity	Horiba U-50 multimeter	ppt	N/A
pH	Horiba U-50 multimeter	-	6.5-8.5
TDS	Horiba U-50 multimeter	ppm or mg/L	1000
TSS	Gravimetric method	ppm or mg/L	10
DO	Horiba U-50 multimeter	ppm or mg/L	6
TH	Titrimetic	ppm or mg/L	200-500
COD	CRM	ppm or mg/L	4
Nitrate (NO_3^-)	UV-VIS Spectrophotometers	ppm or mg/L	45
Phosphate (PO_4^{3-})	UV-VIS Spectrophotometers	ppm or mg/L	6

Parameters	Methods/Measuring Tools	Unit	BD Standard (Drinking Water Quality; ECR' 2023)
Sulphate (SO_4^{2-})	UV-VIS Spectrophotometers	ppm or mg/L	250
Oil and Grease	Liquid-liquid extraction with hexane, treatment with silica gel and gravimetric determination	ppm or mg/L	0.01
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	0.01
Mercury (Hg)	Mercury Analyzer	ppm or mg/L	0.001

2.3.5 Water Quality Reporting Arrangement

The water quality status of the adjacent water bodies of power plants and the Sundarbans Reserve Forest (SRF) has been observed since April 2014. This 40th quarterly report covers yearly variations of pre-monsoon up to April 2024 for physical water quality status and yearly variations for winter in chemical water quality status up to January 2024 and is presented as well as compared with the ECR' 2023 Standards. To do so, all sampling points are clustered in five different sampling sites considering the sampling points' homogenous characteristics and 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 **Table 2.7.**

Table 2.7: 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 are 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.

2.3.6 Monitoring Results and Discussion

Status of Surface Water Quality

<u>*In-situ Tested Parameters*</u>

The in-situ tested results obtained up to the 40th monitoring period (Pre-monsoon 2024) are described below:

- The observed pH values ranged between 7.81 and 7.4. The highest value (7.4) was found at Middle of Passur River at 100m u/s of North West corner from the Project boundary and the lowest (7.4) was observed at the Akram point of Sundarbans area. However, the values indicated are slightly basic during the Pre-monsoon periods. No specific trend was observed for the phases of the project i.e. pre-construction, construction, and operation phase at the monitoring locations and found to comply with the ECR'2023 at all locations. The variation might be due to the effect of the intrusion of saline water from the Bay of Bengal (Mitra et. al. 2011)[1]. Other factors i.e. removal of CO_2 by photosynthesis through bicarbonate degradation, dilution of seawater by the freshwater influx, low primary productivity, reduction of salinity and temperature, and decomposition of Organic matter (Paramasivam and Kannan, 2005)[2] might be attributed to the seasonal variations of pH. The monitoring results are attached in **Table B.1** in **Appendix -IV**.
- On the other hand, the water temperatures were found to be varied from 34.89^{0}C to 33.06^{0}C among the monitored sites. The highest temperature was recorded in April (Pre-monsoon) whereas the lowest value was recorded in January-February (Winter season). Factors such as seasonality, solar radiation, air temperature, or earth temperature might affect the variation in the water temperature. The monitoring results are attached in **Table B.2** in **Appendix -IV.** Salinity concentrations ranged between 7.5 ppt. to 11.7 ppt. among the monitoring sites. Maximum salinity was recorded at the Hiron point of Sundarbans. This higher salinity concentration was due to the tidal flow from the direction of downstream to upstream. The highest salinity at the Hiron point was because of complete seawater influence. Besides, in all the sampling locations close to the project site the salinity range was found 8.1-8.5 ppt. In the observed river system, the highest salinity was observed in the pre-monsoon season followed by the winter season. Freshwater unavailability from upstream and the dominant tidal factors are the main reasons for high salinity concentrations in pre-monsoon and winter. The monitoring results are attached in **Table B.3** in **Appendix -IV.**
- Among the sites, the DO level was found highest (8.7 mg/L) in the Passur River at the Maidara river near proposed Township area whereas the lowest DO concentration (5.2 mg/L) was found in the Left Bank of Passur River at South West corner from the Project boundary. In the case of seasonal variations, maximum concentrations were observed during monsoon and post-monsoon seasons. The presence of higher DO levels in monsoon and post-monsoon seasons depends on heavy rainfall and freshwater availability. During winter, high salinity increases the temperature, which in turn reduces the holding capacity of DO in water. However, still the DO concentration of the Passur-Sibsa RS (near

[1] Mitra, A., Mondal, K., & Banerjee, K. (2011). Hydrology of Sundarban Estuaries. Journal of Spatial Hydrology., Volume 11., page no. (52-69).

[2]Paramasivam,S., Kannan,L.(2005). Physico-chemical characteristics of Muthupettai mangrove environment, southeast coast of India. International Journal of Ecological Environment Sci., 31: 273278.

the project site and inside the Sundarbans), are complying with the ECR’2023 (≥5 mg/L). The monitoring results are attached in **Table B.4** in **Appendix -IV.**

The laboratory-tested results obtained up to the 39th monitoring period (January 2024: Winter season) are described below:

- TDS (Total Dissolved Solids) was found to be highest (16100 mg/L) at the Akram point of Sundarbans and lowest (560 mg/L) at the Right Bank of Passur River at South West corner from the Project boundary. 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)[3]. Other factors could also contribute to such variation in the TDS concentration in the Passur River water as TDS has both spatial and temporal variations. The Bay of Bengal contains many minerals, which in turn contribute to TDS concentration being high in the said river system during pre-monsoon and winter. Therefore, in monsoon and post-monsoon, the TDS concentration falls to less than 200 mg/L in most of the cases excluding the SRF. The monitoring results are attached in **Table B.7** in **Appendix -IV**.
- Similarly, the TH was also found to be highest (5450 mg/L) in the Akram point of Sundarbans and the lowest (2200 mg/L) was observed at the Passur Mongla Confluence. Unlike TDS, TH is affected by the insufficient freshwater supply due to low rainfall during winter and pre-monsoon periods and seawater i.e. saline water intrusion toward upstream (Rahman et al., 2013)[4] which contains a huge quantity of minerals including calcium and magnesium and ultimately make the water hard. The monitoring results are attached in **Table B.8** in **Appendix -IV.** TSS was also found to be higher in Pre-monsoon and winter seasons than those of monsoon and post-monsoon seasons 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, etc. During the monitoring period, TSS was found to be highest (13 mg/L) at the Passur Mongla confluence whereas lowest (3 mg/L) was found near the Project area. The monitoring results are attached in **Table B.9** in **Appendix -IV.**
- COD concentrations varied from 24 mg/L to 324 mg/L with an average of 162 mg/L in the project site while it increased a bit in the SRF with an average of 208 mg/L. The highest value was found at the Harbaria of Sundarbans area while the lowest was observed at the Right Bank of Passur River at Project Site-Jetty. The high values of COD indicate a high level of organic pollution in the river water (Sivasubramanium, 1999)[5]. SRF itself contributes a large quantity of organic loads in the river system while the contribution of upstream organic loads increases the concentration of organic matter hugely downstream of the RS. Over the last few years, COD concentration was found to be higher in the pre-monsoon season followed by winter as these seasons have insignificant rainfall compared to those of other seasons and which actually increased the density of organic matters. The concentrations of COD are for all of the monitoring sites complied with the permissible limit as per Draft ECR’ 2023 (8 mg/L) for inland surface water. The occurrence of

[3] 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.

[4] Rahman M., Rahman M T., Rahman M S., Rahman F., Ahmed J U., Shakera B., Halim M A., 2013; Water quality of the largest mangrove forest; Canadian Chemical Transactions; Volume, Issue 2., Page 141-156

[5] Sivasubramanium R (1999). Water quality of river Periyar (River Suruliyar) in Tamil Nadu. In: Mishra SR (Ed.). Limnological Research in India. Daya publishing house, Delhi

extremely high COD in 2014 and 2021 might be the reason of oil spillage of that year which led the death of planktons and other aquatic life forms ultimately increased the decomposition rate of organic matters. The monitoring results are attached in **Table B.5** in **Appendix -IV**.

- **NO_3^-** concentrations varied from 0.1 mg/L to 3.38 mg/L. The maximum concentration of 3.38 mg/L recorded at Middle Passur River at 100m u/s of North West corner from the Project boundary at the Ichamoti-Maidara confluence. It showed both temporal and spatial variations among different seasons as well as in the same season. The results obtained from all the monitoring sites were beyond the standard stated in ECR'2023 (0.3 mg/L for inland surface water). Increased nitrate level might be due to in coastal rivers, tides facilitate surface water-groundwater exchange and strongly coupled nitrification-denitrification near the fluctuating water table (Wallace, C. D et al. 2020)[6]. The monitoring results are attached in **Table B.10** in **Appendix -IV.** Naturally, SO_4^{2-} concentration is higher in seawater as well as in coastal rivers due to tidal interactions. The monitored dataset substantiates this fact i.e., SO_4^{2-} concentration of the 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. During the last winter period highest value (247.6 mg/L) of SO_4^{2-} was found at the Right Bank of Passur River at Project Site-Jetty while the lowest value (227.6 mg/L) was found at Harbaria. The monitoring results are attached in **Table B.11** in **Appendix -IV.** Furthermore PO_4^{3-} concentrations were found in the range of 0.08 mg/L and 1.05 mg/L during the last Winter. Based on this it is evident that the PO_4^{3-} concentration was found highest in 2016 but after that, a decreasing trend was observed with the minimal concentration found in the post-monsoon period. Upstream anthropogenic activities were probably the reason for this kind of trend along with the pattern of rainfalls and bio-geochemical cycles of nitrogen. Most of the sites complied with the permissible limit as per ECR' 2023 of PO_4^{3-}. The recorded low phosphate value during the dry season might be attributed to the limited flow of upstream freshwater, high salinity, and utilization of phosphate by phytoplankton, as stated by Rajasegar, 2003[7]. The monitoring results are attached in **Table B.12** in **Appendix -IV.**
- Arsenic (As) concentration varied between 0.001 to 0.003 mg/L during the monitoring period. Though there were some seasonal variations in As concentrations, still As concentration could not comply with the water quality standard (0.001mg/L) as stated in ECR' 2023 except at the Passur Mongla confluence. The monitoring results are attached in **Table B.13** in **Appendix -IV.** On the other hand, concentration of Pb was found less than 0.01 mg/L at all sites which completely complied with the water quality standard (0.05mg/L) as stated in ECR' 2023. Considering the heavy metal pollution, Lead (Pb) dissolved in water is very harmful to aquatic organisms; due to bioaccumulation, it increases in the body tissue of organisms (Rompas, 2010)[8]. The monitoring results are attached in **Table B.14** in **Appendix -IV.** Furthermore, 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. During the last winter period, the

[6] Wallace, C. D., Sawyer, A. H., Barnes, R. T., Soltanian, M. R., Gabor, R. S., Wilkins, M. J., & Moore, M. T. (2020). A model analysis of the tidal engine that drives nitrogen cycling in coastal riparian aquifers. Water Resources Research, 56(4).

[7] Rajasegar, M. 2003. Physico-chemical characteristics of the Vellar estuary in relation to shrimp farming. J. Environ. Biol. 24: 95-101.

[8] Rompas, R. M. (2010). Marine Toxicology. Indonesian Marine Council. Jakarta.

concentrations also remain the same. The monitoring results are attached in **Table B.15** in **Appendix -IV.**

- The concentration of Oil and grease was found to be <2.0 mg/L at all the monitoring sites in the last winter season. Indiscriminate discharge of bilge water (oil and grease mixed water) by the non-regulated mechanized boats particularly during seasonal fishing at sea, contributes oil and grease to the river water. Moreover, the increasing number of regulated and non-regulated mechanized vessels used for different purposes like cargo transport, and human transport including tourists could be another reasons for the oil and grease inside the Sundarbans in every year. The monitoring results are attached in **Table B.6** in **Appendix -IV.**

Findings

The physicochemical properties of Passur River change with the tidal intrusion in different seasons. During the 39th quarterly monitoring, pH was found slightly basic. Salinity, on the other hand, was found slightly higher compared to the other winter seasons. In general, salinity is found to be higher downstream i.e. in the Harbaria, the Akram point, and the Hiron point of Sundarbans compared to the upstream area i.e. near the power plant adjacent area because these locations are situated very close to the sea and tidal inflow from the sea. On the other hand, the temperature and Dissolved Oxygen level were found in fair and favourable for the aquatic life forms during the monitoring periods and completely complied with the ECR'2023. TDS and TH were found to be more in the Akram point area than the other sites as this site is a confluence point of Passur and Sibsa Rivers with an influence of tidal inflow from the sea. have been found relatively the same for the same seasons of the last consecutive years. On the contrary, Nitrate (NO_3^-) and Phosphate (PO_4^{3-}) levels were found to exceed at most of the sites than the standard, set by the ECR'2023 which might be due to Upstream anthropogenic activities probably the reason for this kind of trend along with the pattern of rainfalls and bio-geochemical cycles of nitrogen Similarly the Sulphate concentrations were found relatively higher in the post-monsoon and winter periods than in the monsoon seasons. In the case of metal pollution, no significant variation was recorded for As and Pb but this time the value was found to be 0.003 mg/L and exceeded the previously obtained values from all locations i.e. 0.001 mg/L which slightly exceeded the ECR' 2023 standard as set in the ER'2023. Oil & grease concentration was found less than 2.0 mg/L at all sites like the previous monitoring periods which is less than the recommended concentration.

2.3.7 Status of the Groundwater Quality

The in-situ tested results obtained up to the 40th monitoring period (Winter, 2024) are described below:

- The values of pH and temperature of groundwater in the monitoring sites complied with the drinking water quality standards as specified in ECR, 2023 (6.5-8.5 and 20-30^{0}C respectively). The pH values during the 40th monitoring scheme were found to vary from 7.6 to 8.1, while temperature ranges from 26.88^{0}C to 30.04^{0}C. No significant differences have been observed against the previous winter season monitoring data. Similarly, no significant variation was recorded in groundwater temperature over the monitoring periods. Both the results of pH and Temperature were found more or less consistent with all those to the previously obtained respective season's data. Groundwater salinity concentration in all the monitoring sites was found to be negligible but found to be increased during the last consecutive monitoring seasons. During this winter season, groundwater salinity of the monitored location varied from 0.2 to 0.6 ppt. DO results ranges from 2.5 to 7.0 mg/L during this monitoring season. DO concentrations were found within the recommended limit at all the three sites (ECR'1997: 6 mg/L) except at the Rajanagr area. 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.

- The highest TDS value (960 mg/L) was recorded in Project site and the lowest was in Kapashdanga area (370 mg/L). It is mentionable that, TDS concentrations in all monitoring periods were found within the permissible limit of 1000 mg/L as per ECR, 2023. However, during the pre-monsoon season of the year 2014, TDS showed extreme spatial variations. That variation was observed due to physical damage held in the pipe of Tube well for some days. Total Suspended Solids (TSS), also known as non-filterable residue, are the solids (minerals and organic material) which remain trapped on a 1.2 µm filter (U.S.EPA, 1998). During this monitoring period, the TSS concentration ranges in between 1-2 mg/L, which complied with the permissible limit for Drinking Water Quality, Bangladesh (TSS: 10 mg/L, ECR, 2023). Among all the monitoring seasons, the observed TSS concentrations were much lower in post-monsoon season than the winter season. These variations would be due to lack of freshwater availability for sufficient groundwater recharging. In addition, evaporation have also condensed the water along with its suspended matters. Total Hardness (TH) of the three groundwater monitoring sites varied from 240 mg/L to 1200 mg/L. Drinking water hardness complied with standard limit (200-500 mg/L) set by the ECR' 1997. The excessive amount of hardness in township area might be due to the concentration of calcium and magnesium ions in water which determines its hardness sedimentary rocks, seepage, and surface runoff from the soil contribute to water hardness by introducing polyvalent metallic ions, primarily calcium and magnesium[9].
- The Bangladesh standard for COD in drinking water is 4.0 mg/L (ECR' 1997). During the monitoring period COD values ranged between 48 mg/L to 72 mg/L. The concentration of COD at the observed monitoring wells were found to be exceeds the standards which might be due to the accumulation of solid waste, soluble organic compounds, antifreeze, residual food waste, emulsified oils and the dying bacterial cells that are responsible for the decomposition and release of DOC in the wastewater which in turn increases the COD (Sharma et. al. 2023)[10]. Nitrate (NO_3^-) values ranged between 0.044 mg/L and 6.1 mg/L in the last winter period. The maximum value was recorded in Kapashdanga while the lowest was in Rajnagar area. Though the NO_3^- in groundwater showed both spatial and temporal variations in post-monsoon seasons but never exceeded the corresponding standard limit as set in the ECR'2023. Groundwater sulphate (SO_4^{2-}) concentrations never exceeded the Bangladesh Standard for Drinking Water Quality (250 mg/L). SO_4^{2-} concentration in groundwater did not show any pattern yet except a trend of comparatively high concentrations in winter than all other monitoring seasons. On the other hand, concentrations of PO_4^{3-} were found between 0.1 mg/L and 1.3 mg/L, which was within the standard limit of 6.0 mg/L (ECR'1997). PO_4^{3-}concentration reached to its highest peak at 6.2 mg/L during the post-monsoon of 2014. PO_4^{3-} concentrations have both spatial and temporal variations but are minor in the interest of these monitoring objectives as well as drinking purposes by the community residing there.

[9] Manuel Entrambasaguas., Hardness variation in groundwater along Badelunda esker between Leksand and Avesta., Department of Earth Sciences, Uppsala University, Villavägen 16, SE- 752 36 Uppsala ISSN 1401-5675.

[10] Sharma, A., & Dahiya, P. (2023). Characterization of wastewater and effluents remediation through nanotechnology for efficient reclamation and reuse. In *Elsevier eBooks* (pp. 65–83). https://doi.org/10.1016/b978-0-323-99895-6.00009-5.

- According to Bangladesh Standard (ECR, 2023), the maximum acceptable concentration of Arsenic (As) in groundwater is 0.05 mg/L. during the last monitoring season the As concentrations among all the monitoring locations ranged between 0.002 mg/L and 0.620 mg/L. this excessive As concentration in Rajnagar well might be organic matter deposited in the sediments reduce the arsenic adsorbed on the oxyhydroxides and releases arsenic into the groundwater and dissolution occurs during recharge, caused by microbial oxidation of the organic matter as bacteria dissolves surrounding oxygen. Lead (Pb) and Mercury (Hg) concentrations were also measured and the values were found within the permissible limit specified in ECR'1997 (0.01 mg/L for Pb and 0.001 mg/L for Hg) as the observed values were found <0.01mg/L and <0.001 mg/L at all sites during the last monitoring period. However, the water from the tube wells was found suitable for drinking purposes in terms of heavy metal pollution status.

Remarks

This concluding remark represents that the physical characteristics of groundwater quality are still in good condition with slight variations in pH and salinity. The reason is saline water intrusion and infiltration due to the excessive withdrawal of groundwater by the surrounding communities during the dry season but during the monsoon season, the water becomes less saline as the aquifer recharges during the monsoon season. During the monitoring tier in May 2023, TDS values were found to be higher than the ECR'2023 which might be because the water chemistry is governed by the weathering of carbonate and silicate minerals, reverse ion exchange, and evaporation processes, which resulted in high EC, TDS, TH and major ions in the groundwater (Manikandan. E. et. al. 2020)[11]. On the other hand, during winter and pre-monsoon concentration was found to breach the national water quality standard two times at Kapashdanga. The exceedance is very hard to interpret but the most widely discovered two theories for the background of arsenic contamination of groundwater in Bangladesh may be the pyrite oxidation and iron oxyhydroxide reduction (Saha and Rahman, 2020)[12].The monitoring results are attached in **Table B.16** to **B.22** in **Appendix -IV.**

[11] Manikandan, E., Rajmohan, N., & Anbazhagan, S. (2020). Monsoon impact on groundwater chemistry and geochemical processes in the shallow hard rock aquifer. Catena, 195, 104766. https://doi.org/10.1016/j.catena.2020.104766.

[12] Rahaman, M. S., Mise, N., & Ichihara, S. (2022). Arsenic contamination in food chain in Bangladesh: A review on health hazards, socioeconomic impacts and implications. Hygiene and Environmental Health Advances, 2, 100004. https://doi.org/10.1016/j.heha.2022.100004

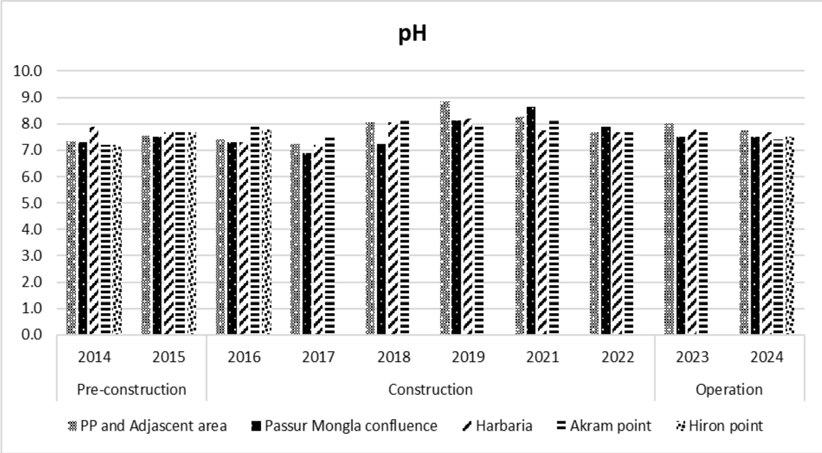


Figure 2.10: Variations in pH Values in Different Monitoring Sites

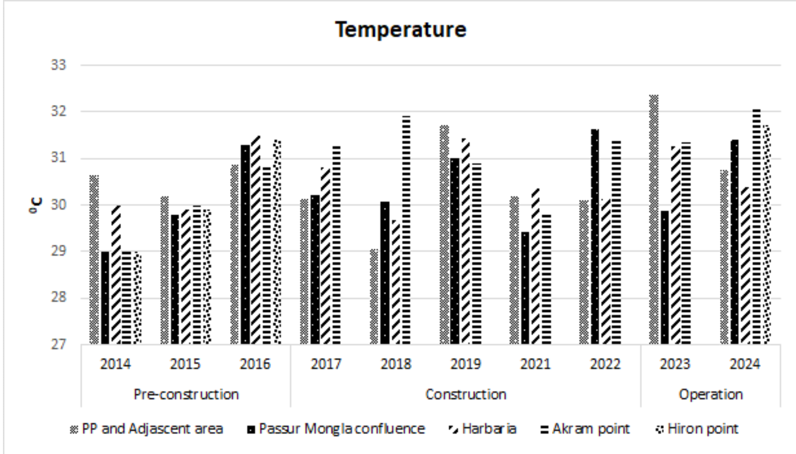


Figure 2.11: Variations in Temperature Values in Different Monitoring Sites

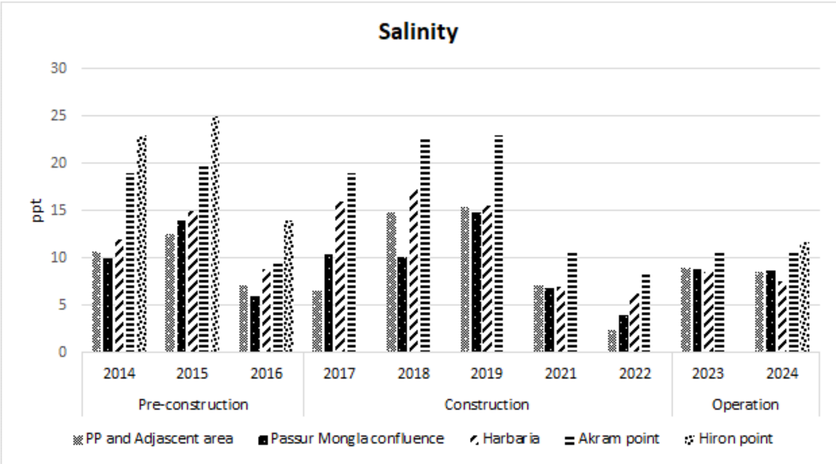


Figure 2.12: Variations in Salinity Values in Different Monitoring Sites

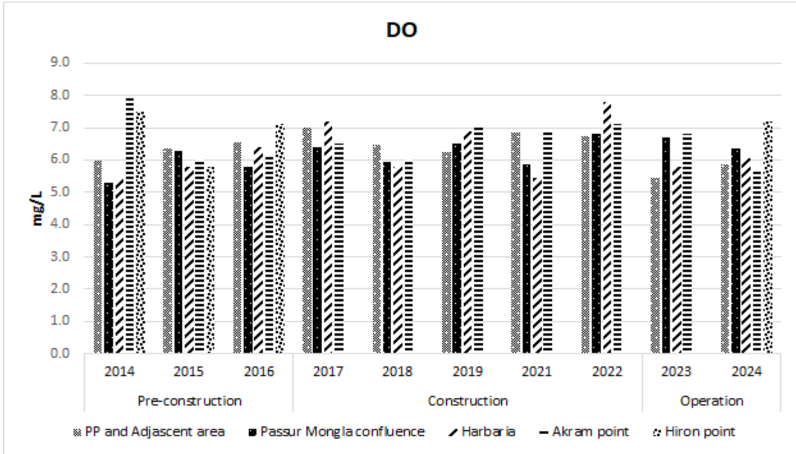


Figure 2.13: Variations in DO Values in Different Monitoring Sites

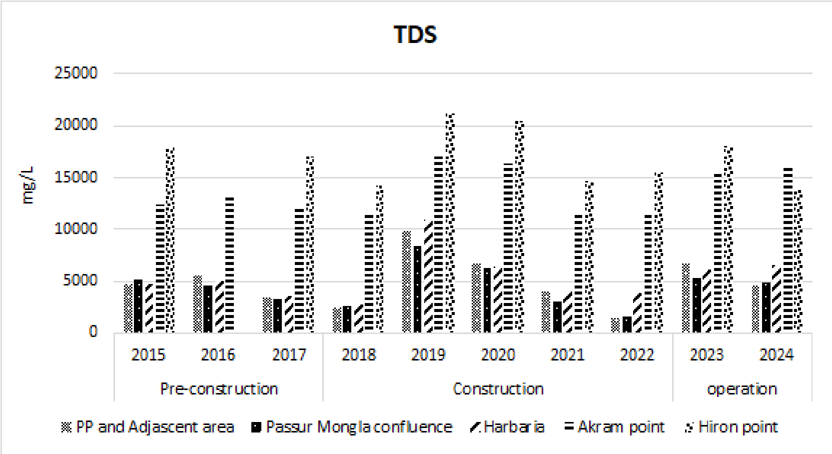


Figure 2.14: Variations in TDS values in Different Monitoring Sites

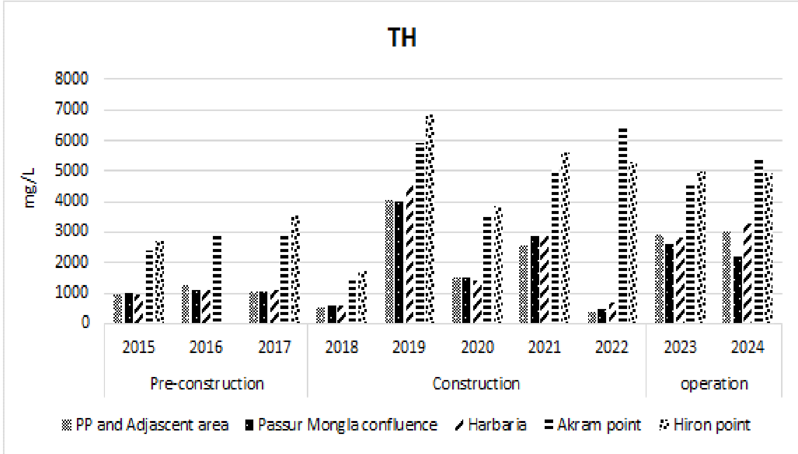


Figure 2.15: Variations in TH Values in Different Monitoring Sites

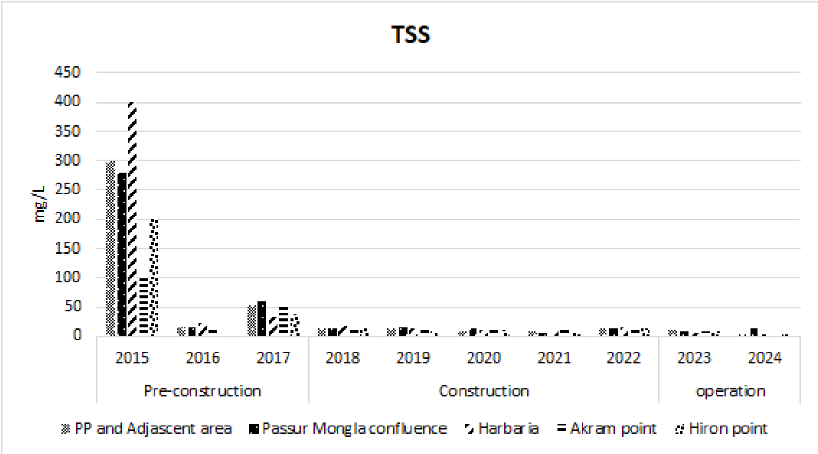


Figure 2.16: Variations in TSS Values in Different Monitoring Sites

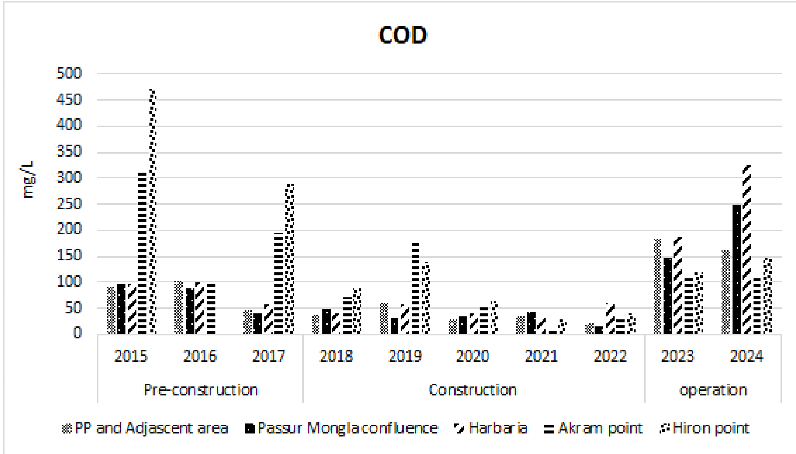


Figure 2.17: Variations in COD Values in Different Monitoring Sites

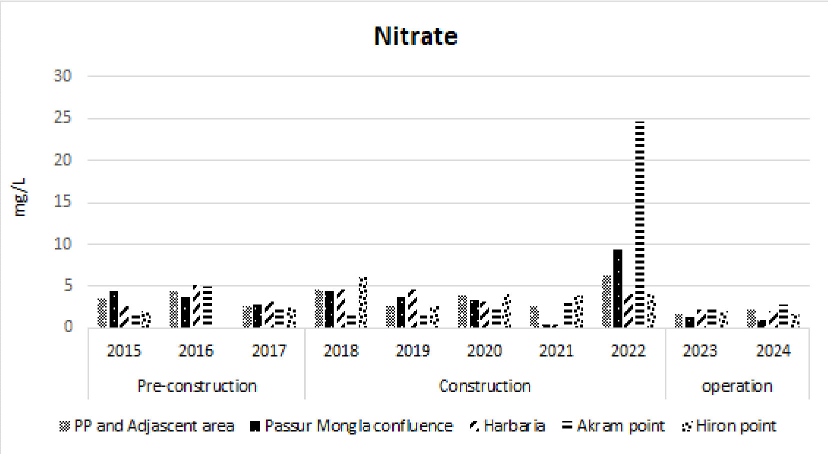


Figure 2.18: Variations in Nitrate Values in Different Monitoring Sites

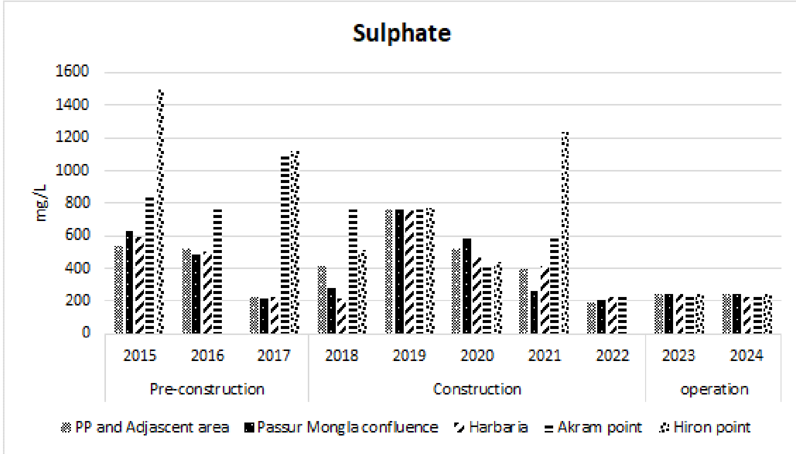


Figure 2.19: Variations in Sulphate Values in Different Monitoring Sites

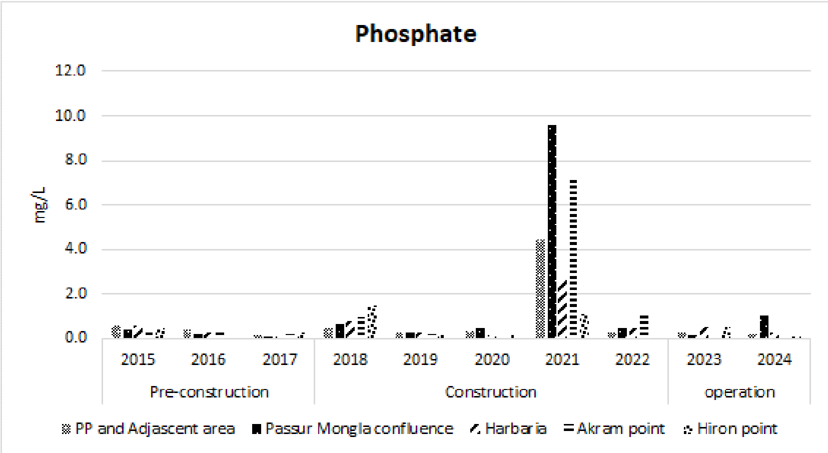


Figure 2.20: Variations in Phosphate Values in Different Monitoring Sites

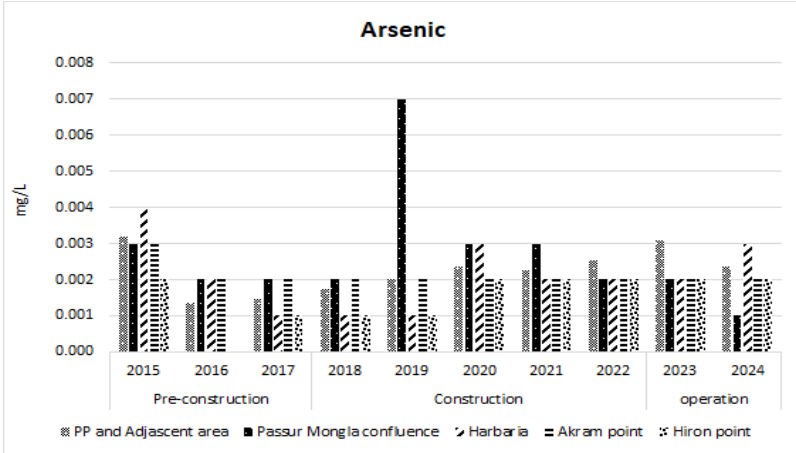


Figure 2.21: Variations in Arsenic Values in Different Monitoring Sites

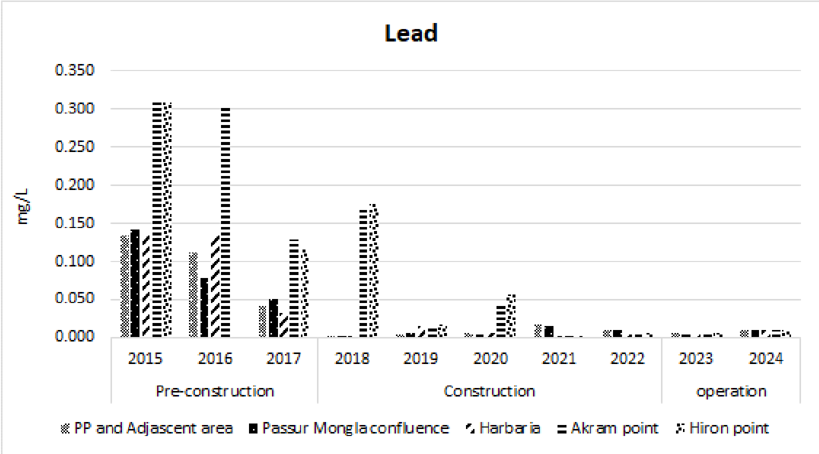


Figure 2.22: Variations in Lead Values in Different Monitoring Sites

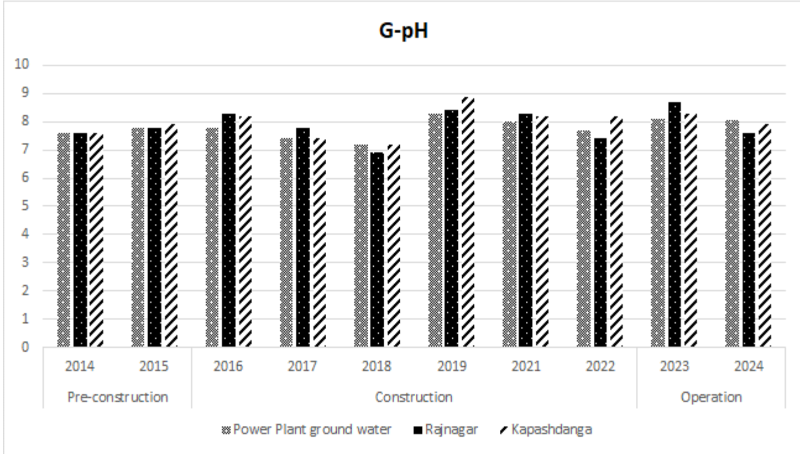


Figure 2.23: Variations in G-pH Values in Different Monitoring Sites

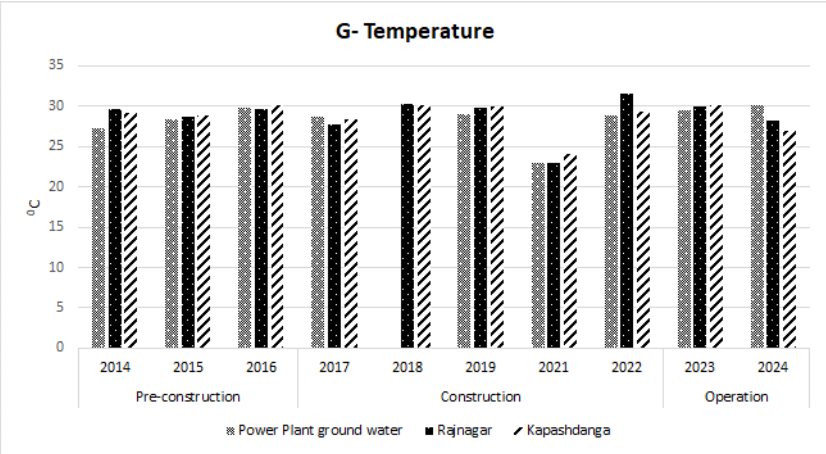


Figure 2.24: Variations in G-Temperature Values in Different Monitoring Sites

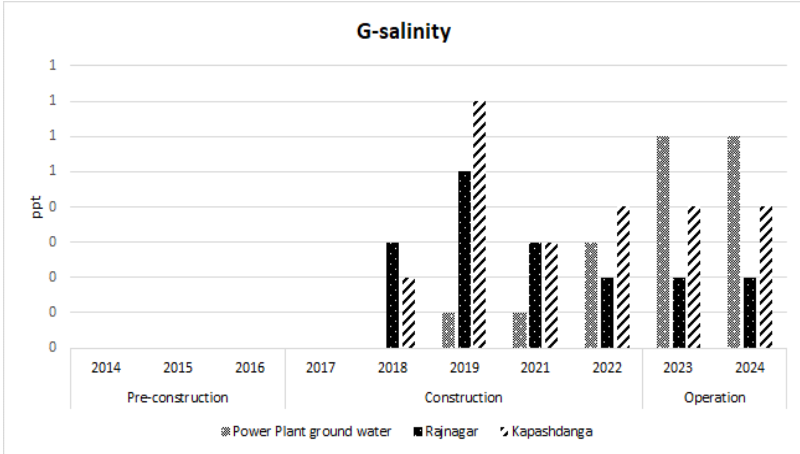


Figure 2.25: Variations in G-Salinity Values in Different Monitoring Sites

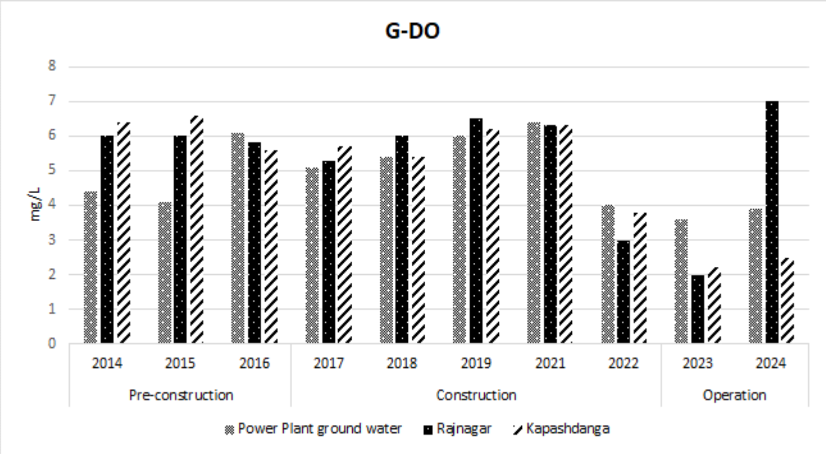


Figure 2.26: Variations in G-DO Values in Different Monitoring Sites

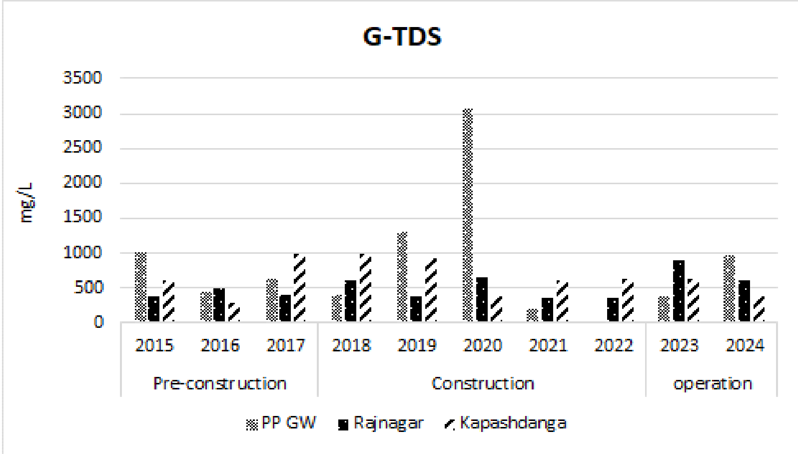


Figure 2.27: Variations in G-TDS Values in Different Monitoring Sites

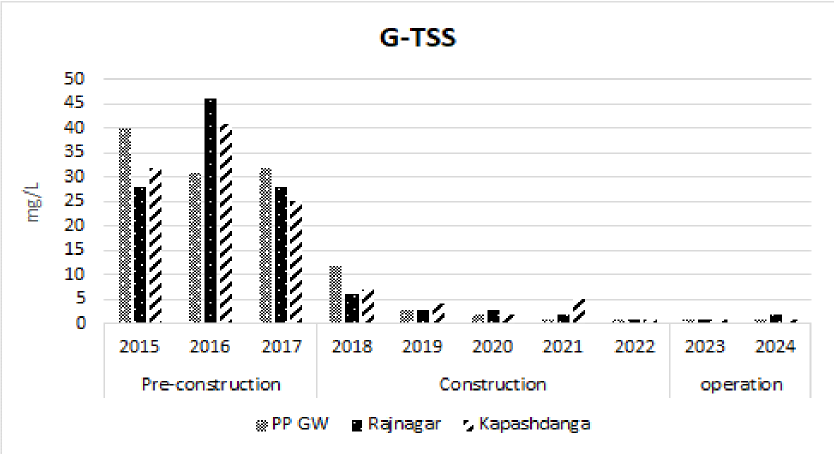


Figure 2.28: Variations in Monsoon G-TSS Values in Different Monitoring Sites

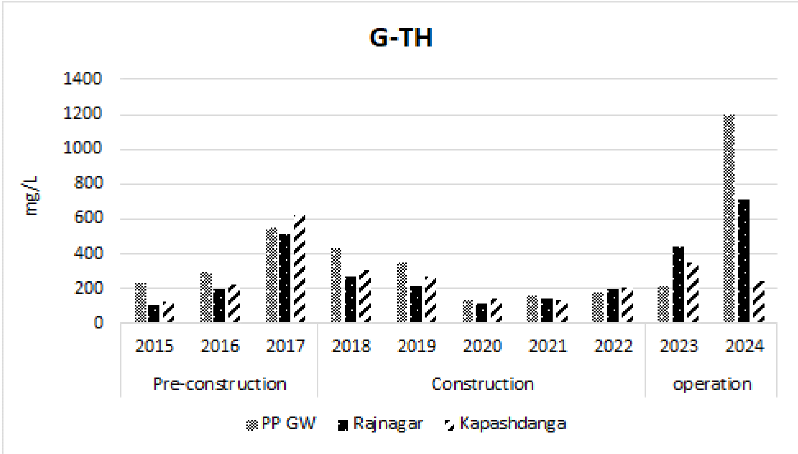


Figure 2.29: Variations in Monsoon G-TH Values in Different Monitoring Sites

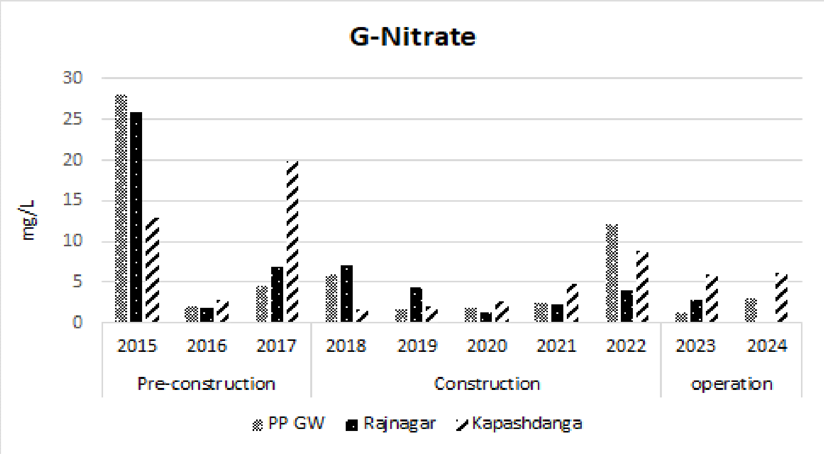


Figure 2.30: Variations in G-Nitrate Values in Different Monitoring Sites

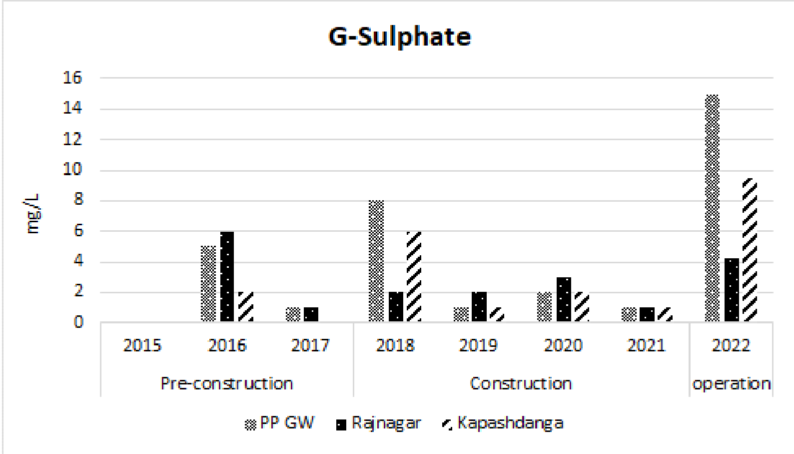


Figure 2.31: Variations in Monsoon G-Sulphate Values in Different Monitoring Sites

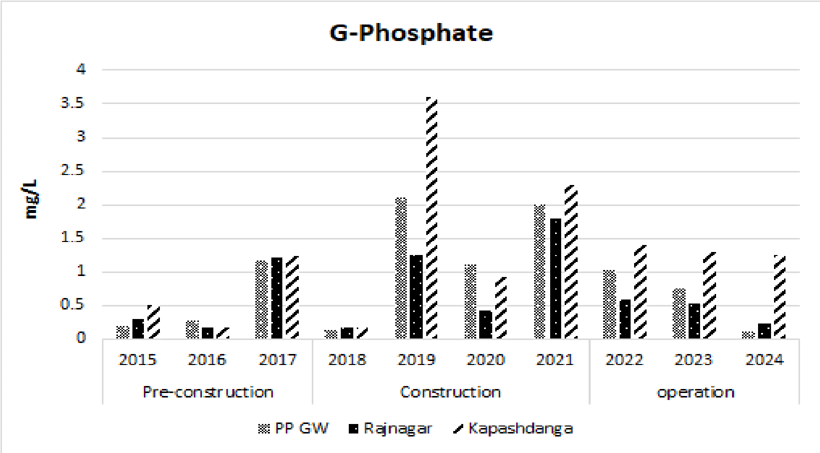


Figure 2.32: Variations in Monsoon G-Phosphate Values in Different Monitoring Sites

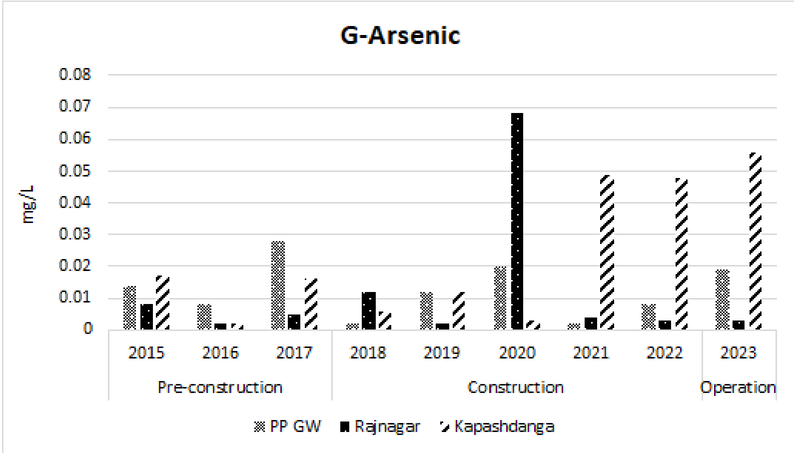


Figure 2.33: Variations in Monsoon G-Arsenic Values in Different Monitoring Sites

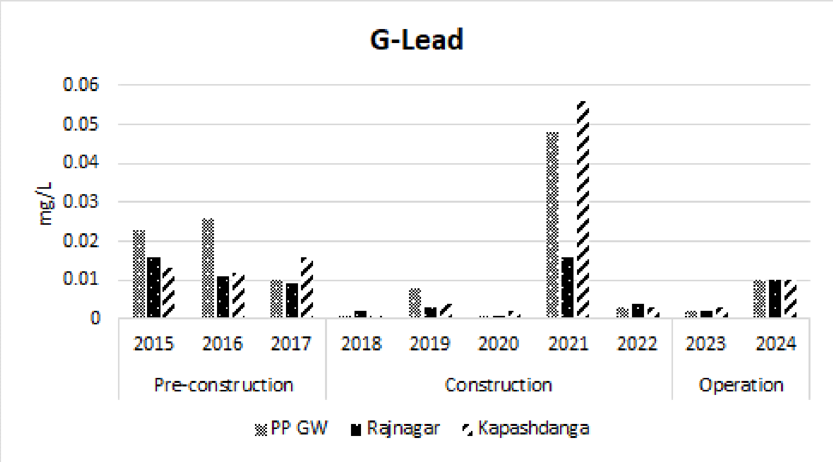


Figure 2.34: Variations in Monsoon G-Lead Values in Different Monitoring Sites

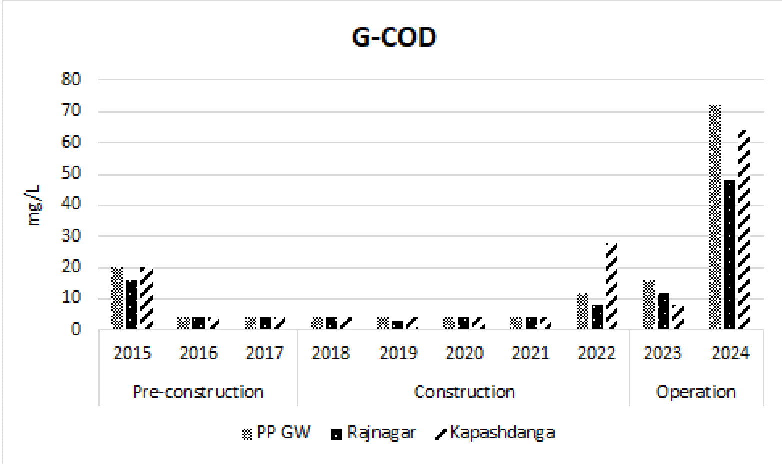


Figure 2.35: Variations in Monsoon G-COD Values in Different Monitoring Sites

2.4 Land and Agricultural Resources Monitoring

Monitoring of selected indicators is very crucial for better management of land in the study area. Plots/land use, soil fertility/nutrient status, soil contamination with heavy metals and soil salinity are considered as the major indicators for land 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.

2.4.1 Methodology

Sampling Frequency

The frequency of monitoring for land resources data collection has been considered twice n 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.

2.4.2 Location

The selected mauzas for monitoring are Baranpara of Batiaghata Upazila, Chunkuri-2 of Dacope Upazila, Kapalirmet of Mongla Upazila, Chakgona of Rampal Upazila and Basherhula of Rampal Upazila under Khulna and Bagerhat Districts. The sampling locations with their corresponding coordinates are stated in **Table 2.8**. Locations of collected soil samples are presented in **Figure 2.36**.

Table 2.8: 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	Baranpara, Batiaghata; Khulna	22°37′57.0″	89°30′59.1″	Half yearly (April and October)	In situ field sampling and Laboratory Testing in SRDI
2		Chunkuri-2, Bajua; Dacope, Khulna	22°34′51.0″	89°32′20.0″		
3		Kapalirmet, Mongla; Bagerhat	22°32′18.9″	89°36′8.8″		
4		Chakgona, Rampal, Bagerhat	22°34′18.3″	89°34′25.3″		
5		Basherhula, Rampal, Bagerhat	22°36′14.0″	89°34′25.0″		
6		Bidyarbon, Mongla, Bagerhat	22° 33′ 42.0″	89° 34′ 40.0″		

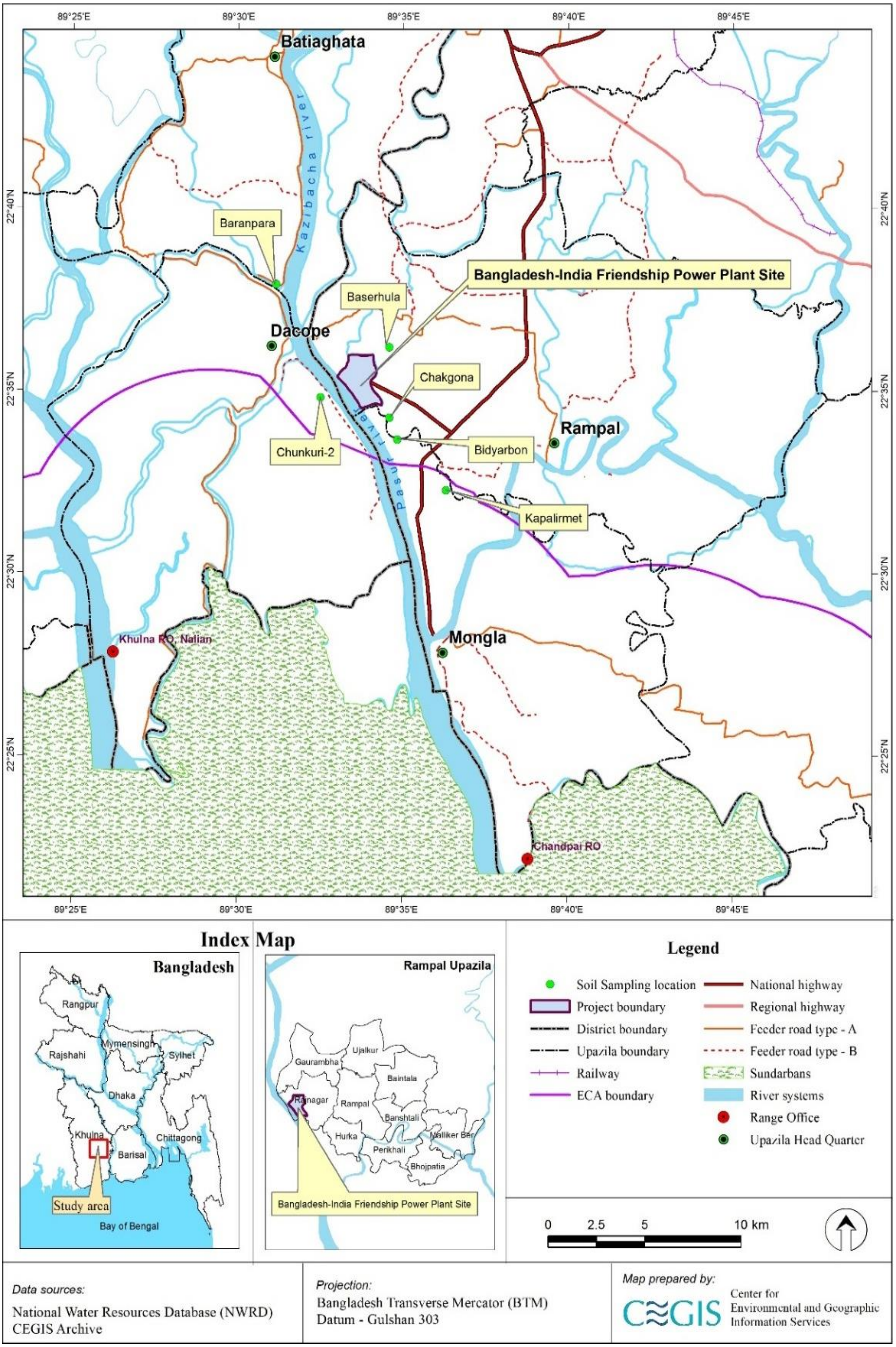


Figure 2.36: Location of Soil and Agricultural Resources Monitoring

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.

$$SAR=\frac{[Na^+]}{\sqrt{½\,([Ca^+]+[Mg^+])}}$$

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

$$ESP = \frac{[Na^+]}{CEC} X\,100$$

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:

$$ESP = \frac{[Na^+]}{[Ca^{2+}+Mg^{2+}+Na^++K^+]} \;X\,100$$

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

Soil Sample Collection Procedure

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 Agricultural 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 Samples 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: 2.37**). Collected soil samples were immediately sent to SRDI, Dhaka laboratory for chemical analysis. Analysis report will be incorporated with next (41st Monitoring) report.

Figure 2.37: Soil sample collection from monitoring plots

2.4.3 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.

2.4.4 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.

During 39nd quarterly visit, consultations and group discussions were organized with local people to know the use of agricultural inputs, present cropping patterns by land type, crop damages and other conditions like drainage congestion/water logging, salinity intrusion or other natural calamities induced impacts, diseases and pest infestation as well as management practices and crop production in the selected locations of the monitoring area.

2.4.5 Present Cropping Patterns of Monitoring Plots

Agriculture 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. During Rabi season BRRI 67 has been cultivated. The detailed cropping pattern is shown in **Table F.1** of **Appendix IV.**

Agriculture Plot-2 (Chunkuri-2)

This monitoring plot is located at Chunkuri-2 and the size of the plot is about 0.93 hectare. BRRI 23 was found to be cultivated in this plot in Kharif-II season. The cropping practice and management practice remain same as the previous monitoring. Detailed cropping pattern has been shown in **Table F1** of **Appendix IV.**

Agriculture Plot-3 (Kapalirmet)

This monitoring plot size is about 0.14 hectare at Kapalirmet. 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 F1** of **Appendix IV.**

Agriculture 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 (Chapshail) is found in the field during field visit where no chemical fertilizer is used. **Table F1** of **Appendix IV.**

Agriculture 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 F1** of **Appendix IV.**

Agriculture 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 F1** of **Appendix IV.**

2.4.6 Crop Production in Monitoring Plots

The information on crop production were collected after harvesting in April, 2024. 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.

HYV Boro is exclusively cultivated in Baranpara, yielding 5.3 tons/ha with a total production of 2.1 tons of rice. Among the six monitoring plots, local Aman is grown in two spots, Chakgona and Basherhula, while HYV Aman is cultivated in three locations: Baranpara, Chunkuri-2, and Bidyarbon. The monitoring plot at Kapalirmet was inundated by saline water in 2018-19, leading farmers to switch from traditional crop cultivation to shrimp culture due to the adverse impact of salinity.

In Baranpara, the highest yield for HYV Aman is observed at 3.33 tons/ha, whereas the lowest yield is found in Chunkuri-2 at 2.66 tons/ha. For local Aman, the highest yield is seen in Basherhula at 1.6 tons/ha, with the lowest in Chakgona at 1.33 tons/ha.

The total rice production across all monitoring plots is 7.29 tons, broken down as follows: 3.43 tons from Baranpara, 2.47 tons from Chunkuri-2, 0.31 tons from Chakgona, 0.75 tons from Basherhula, and 0.29 tons from Bidyarbon. The rice production figure for Baranpara includes the combined production of both Aman and Boro. Detailed information on crop production in monitoring plots is presented in the **Table F.2** of **Appendix IV and Figure 2.38.**

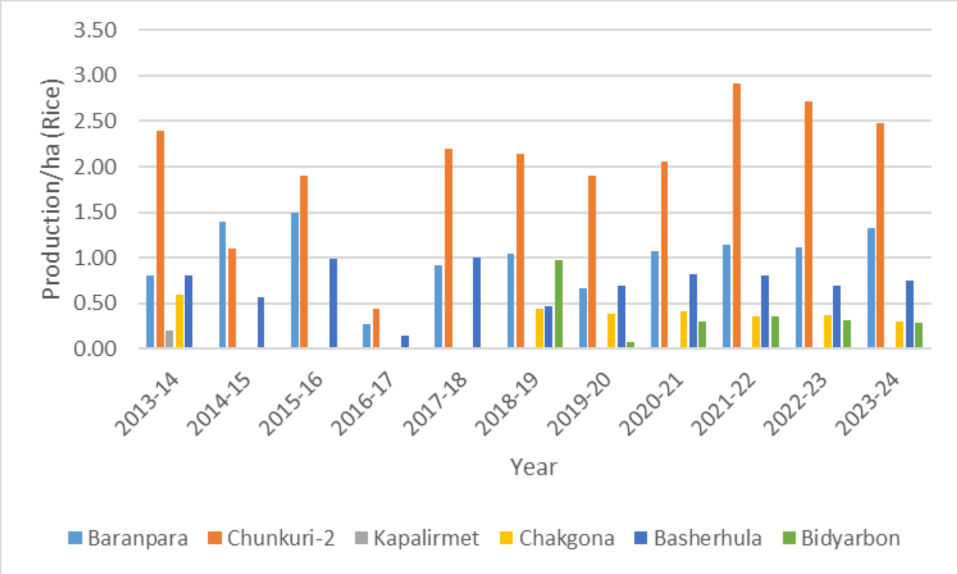


Figure 2.38: Trend of Crop Production in the Monitoring Year

Crop Damage in Monitoring Plots

No crop damage was observed during this monitoring field visit. Detailed crop damage information is presented in **Table F.3** of **Appendix IV.**

2.4.7 Monitoring of EMP during Construction Activities on Land and Agriculture Resources

At present, the activities on land and agriculture resources are in progress at project site and surrounding areas. The due diligence along with the mitigstion measures are depicted in **Table 2.9.** However, the monitoring indicators are mentioned as follows:

1 Soil fertility.
2 Soil and ground water quality.
3 Damage to surrounding crops.

Table 2.9: 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	Complied

Sl. No.	Impacts	Mitigation Measures	Remarks on Due Diligence
		• Treatment plant must be installed. • Provide training and awareness building program to the labors and professionals.	
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, 2024

2.4.8 Livestock Resources Monitoring

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 and Veterinary Surgeon (VS) 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 April, 2024.

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.

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 circumstance 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 **Water Resources Monitoring**

2.5.1 Methodology 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.

Sampling Frequency

The frequency of monitoring for sediment quality is considered twice in a year (January and July). Accordingly, sediment sampling has been carried out in 39th monitoring (February, 2024; considered as dry season, 2024). 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 Sulphate. 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 2.10**. Locations of collected samples are presented in **Figure 2.39**.

Table 2.10: Location and 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)	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″		

2.5.2 Process of Sediment Samples Collection

Plot Selection

The sampling locations were selected on the basis of potential route of coal transhipment and assumed major polluted area. Project site and Moidara River are beside the power plant, while Harbaria and Akram point are 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.

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.

Laboratory Analysis

Sediment samples are taken twice a year. Dry season samples are taken in January and wet season samples are taken in July. Accordingly, dry season, 2024 sample was taken in February, 2024 (39th monitoring field visit). Data analysis of dry season, 2024 is incorporated in this report.

2.5.3 Status of Sediment Quality of the Passur River

The data presented in this report represents dry season, 2024 which was collected in February, 2024 (39th monitoring). According to the analyzed data, only Mercury (Hg) exceed Average Shale VCalue (ASV) **(Marowsky** and **Wedepohl, 1971)** but remain within average upper crust value (AUCV) **(Rudnick** and **Gao, 2014)** whereas, Lead (Pb) and Arsenic (As) remains within AUCV and ASV. All As and Pb value found within the stated limits even in published reports (Ali *et al*., 2018). The maximum concentrations of arsenic (As) and lead (Pb) are found at Akram Point, while mercury (Hg) peaks at Harbaria. Conversely, the minimum concentration of arsenic and mercury are observed in the Moidara River, and lead is minimized in Mongla. The average concentration for As, Pb and Hg during this monitoring is 3.76 ppm, 6.68 ppm and 0.11 ppm respectively. Variations in concentrations of the selected parameters re shown in **Figure 2.40.** In project site (jetty point), none of these metal concentrations exceed this monitoring season average value **Table 2.11**.

Table 2.11: 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
01.	Arsenic (As)	4.8	14	8.87	12.4
02.	Lead (Pb)	17	20	21.9	33.6
03.	Mercury (Hg)	0.05	0.26	-	-

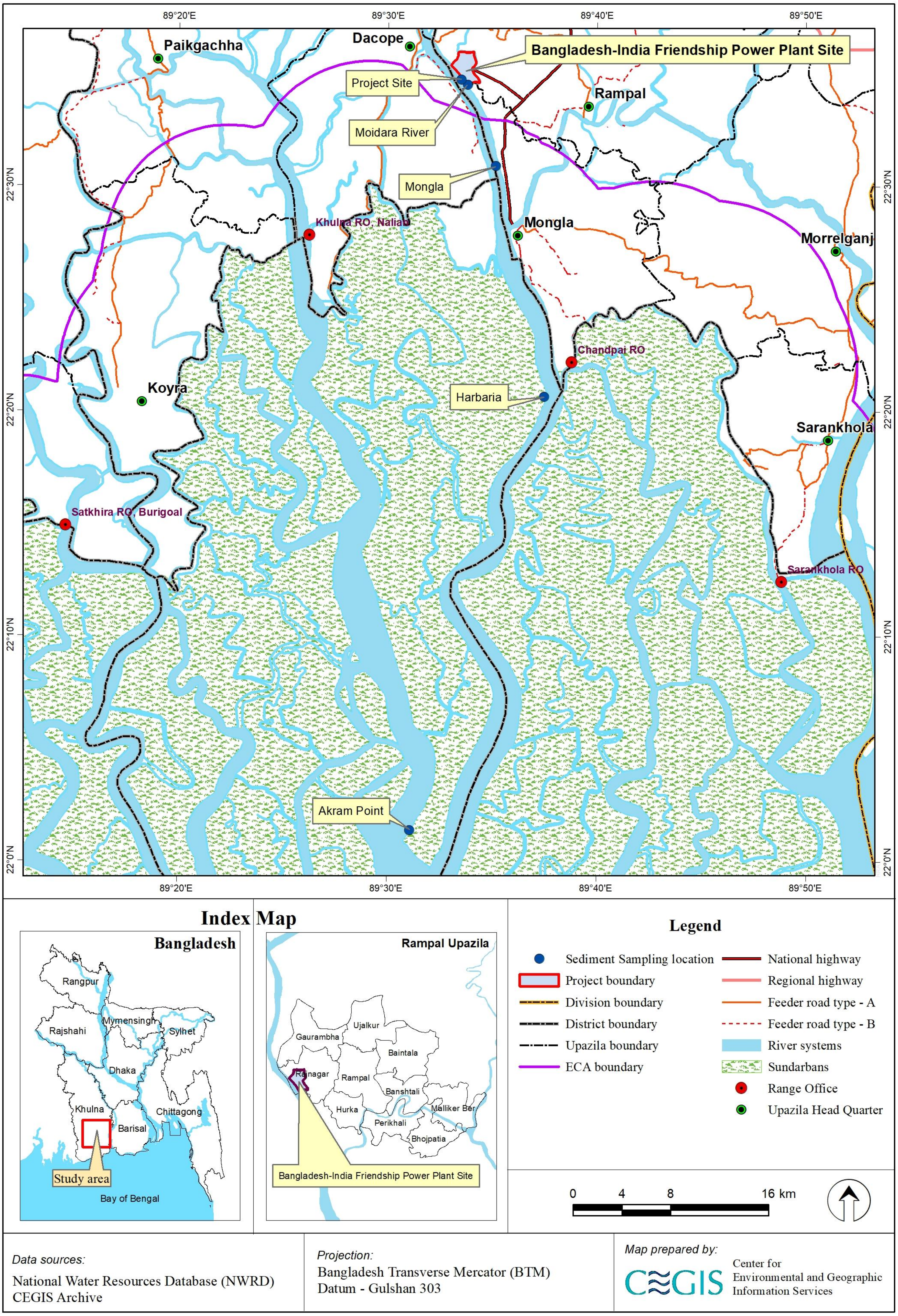
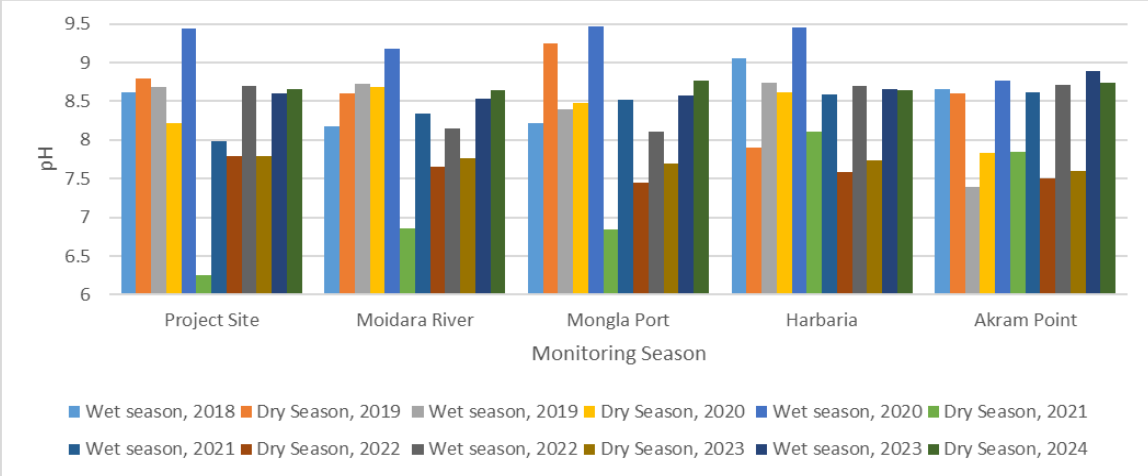
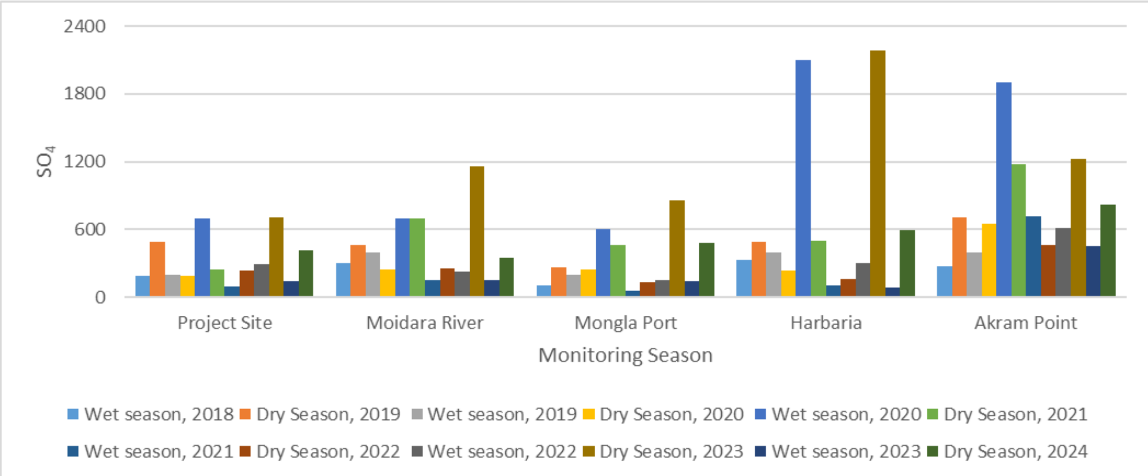
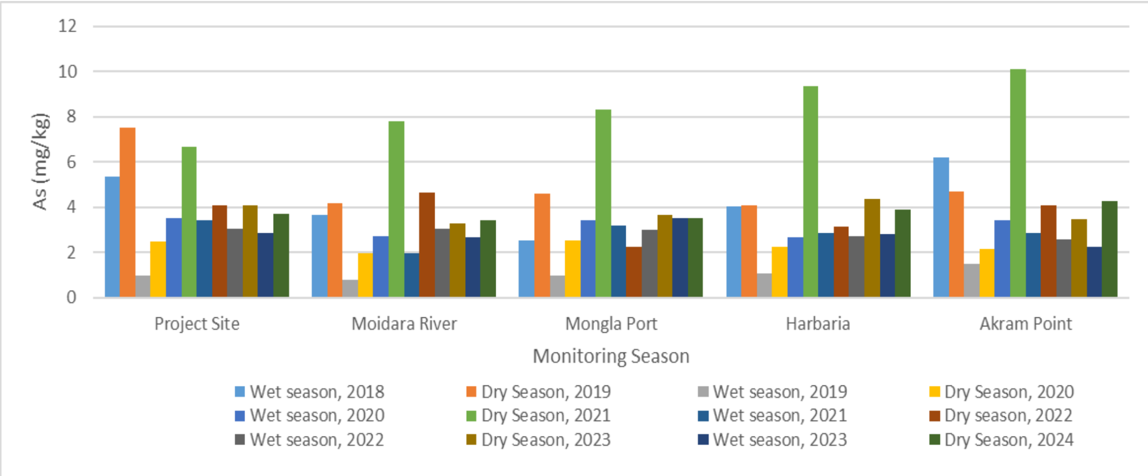
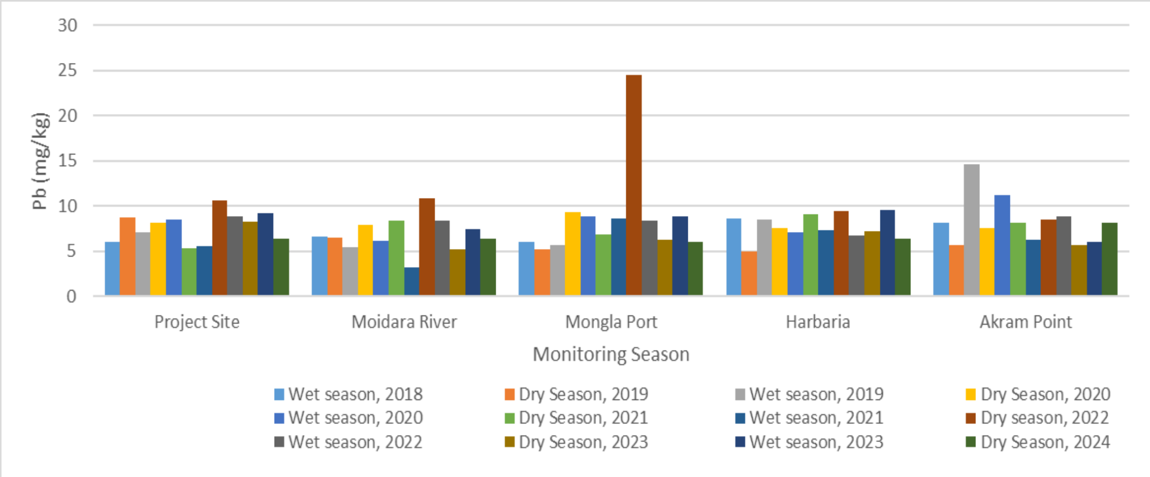


Figure 2.39: Location of Sedment Sampling


9.5
9
8.5
8
7.5
7
6.5
6
pH
Project Site
Moidara River
Mongla Port
Harbaria
Akram Point
Monitoring Season
Wet season, 2018
Dry Season, 2019
Wet season, 2019
Dry Season, 2020
Wet season, 2020
Dry Season, 2021
Wet season, 2021
Dry Season, 2022
Wet season, 2022
Dry Season, 2023
Wet season, 2023
Dry Season, 2024


2400
1800
1200
600
0
SO_4
Project Site
Moidara River
Mongla Port
Harbaria
Akram Point
Monitoring Season
Wet season, 2018
Dry Season, 2019
Wet season, 2019
Dry Season, 2020
Wet season, 2020
Dry Season, 2021
Wet season, 2021
Dry Season, 2022
Wet season, 2022
Dry Season, 2023
Wet season, 2023
Dry Season, 2024


12
10
8
6
4
2
0
As (mg/kg)
Project Site
Moidara River
Mongla Port
Harbaria
Akram Point
Monitoring Season
Wet season, 2018
Dry Season, 2019
Wet season, 2019
Dry Season, 2020
Wet season, 2020
Dry Season, 2021
Wet season, 2021
Dry season, 2022
Wet season, 2022
Dry Season, 2023
Wet season, 2023
Dry Season, 2024



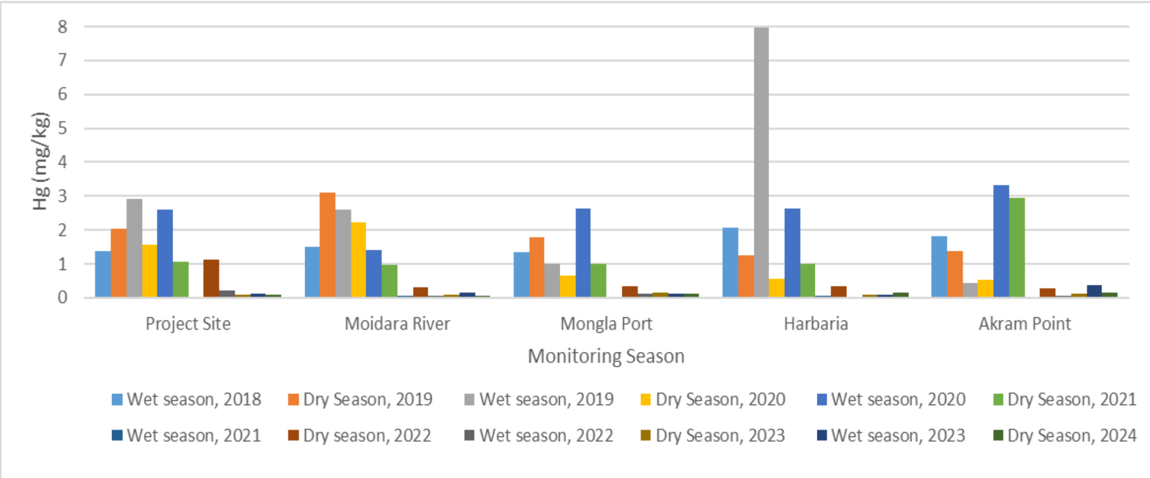


Figure 2.40: Sediment Quality Monitoring Data at Different Locations of the Passur River (Dry Season, 2024)

**Field sample collected by CEGIS and sample analysis in BCSIR in different seasons*

2.6 Transportation Monitoring

The traffic survey for this 40th monitoring was conducted from May 7th to May 9th, 2024 on weekdays at three pre-selected locations around the project site. Weather was mostly cloudy 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 2.41**

2.6.1 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.

2.6.2 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,

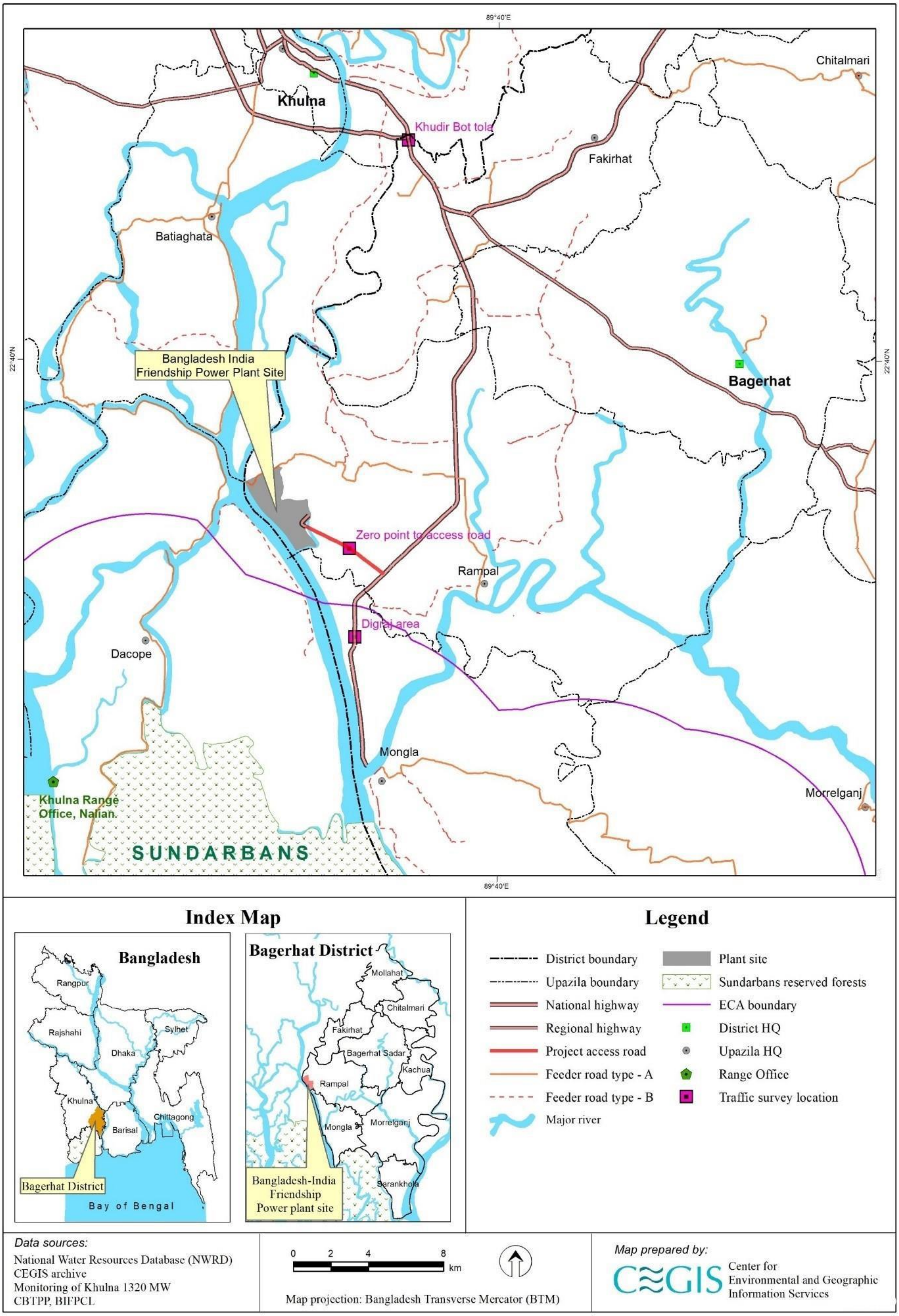


Figure 2.41: Locations of Traffic Survey

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 2.12**.

Table 2.12: Factors used for PCU Calculation

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

Source: Roads and Highway Department, Bangladesh

2.6.3 Results of Monitoring

The summary results of vehicular movements at three different locations presented in **Table 2.13** 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.

Table 2.13: 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	900	1048	777
Khulna Mongla Road at Gonai Bridge	677	582	853
Power Plant access road at Gonabelai Bridge	135	89	89

Source: Field Survey, May 2024

The traffic survey results indicate that the Khulna Mongla Road at Khudir Bottola consistently receiving 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. The survey also suggests that the overall traffic volume has increased compared to the previous monitoring period. Since two of the survey days were weekdays, this could be a contributing factor to the higher traffic volume in these areas. Additionally, as the project is gradually approaching towards its full operational stage and the construction-related works are almost done but not completed yet, this could be another reason behind the overall high traffic volume in the mentioned areas during this monitoring period. The detailed survey findings and calculations regarding the traffic volume surveys are attached in **Appendix E.1, E.2** and **E3.**

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 the proposed project in place. These groups include fisheries resources, ecological resources and Sundarbans Reserve Forest (SRF).

3.1 Fisheries Resources

The monitoring of 39 quarters for the session of 2014-15, 2015-16, 2016-17, 2017-18, 2018-2019, 2019-20, 2020-21, 2021-22 as well as of 2022-23 was completed and reported earlier. This chapter contains the findings of 40 quarter and a comparison with the earlier 39 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

Sampling Site	Capture Habitat Location	Sampling 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
Sl. No.	**Culture Habitat Location**	**Sl. No.**	**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, 2020-21, 2021-22, 2022-23 and 2023-24 (up to 39th quarter monitoring), 40th quarter monitoring of session 2023-24 was conducted during the period from 12-23 May, 2024. No fishing activities were observed at Jongra (G) point during the field visit in this quarter monitoring.

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.

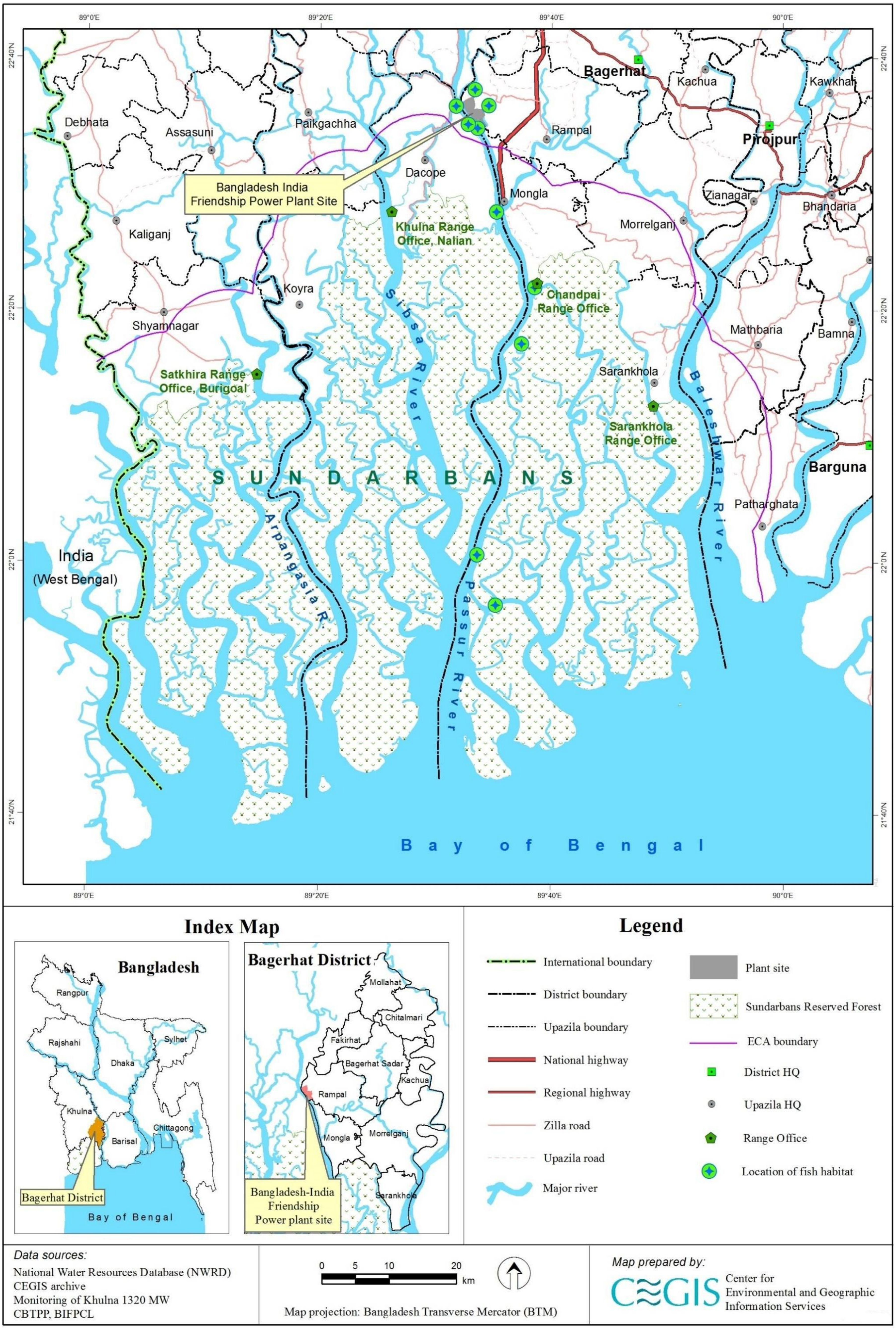


Figure 3.1: Fisheries Resources Monitoring Locations

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 show the classification of seven (07) sampling site for 1st to 15th quarter monitoring and ten (10) sampling sites from 16th to 39th quarter monitoring according to the ToR in respect of habitat uses for previous quarters of fisheries monitoring (**Table 3.2**).

Table 3.2: Classification of Habitat use

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

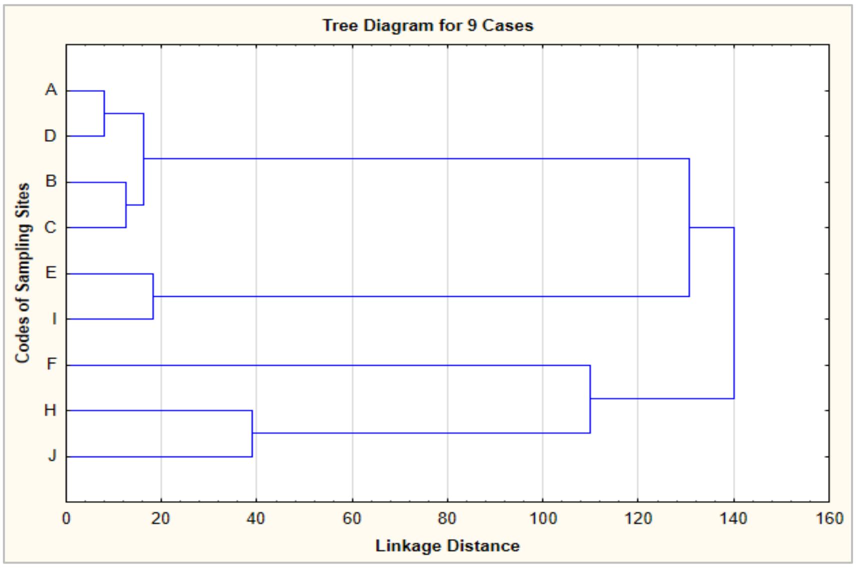
Monitoring Quarter	Type of Habitat Use
	• Nursing ground
17th (July, 2018)	• Spawning and Nursery Ground • Nursery Ground with Feeding and Growing Capacity • Growing and Feeding Ground • Omni-ground
18th (November, 2018)	• Ground for Maturation • Omni-Ground: Nursery and Feeding Ground/Migratory Route; 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
32nd (May, 2022)	• Spawning and Nursery Ground • Maturation Ground
33rd (July, 2022)	• Spawning and Nursery Ground • Feeding and Maturation Ground
34th (October, 2022)	• Feeding Ground • Ground for Maturation
35th (January, 2023)	• Spawning and Nursery Ground • Ground for Maturation and Feeding
36th (Jun, 2023)	• Spawning and Nursery Ground • Omni Ground including Nursery Ground, Maturation and Feeding Ground
37th (Sep, 2023)	• Spawning and Nursery Ground

Monitoring Quarter	Type of Habitat Use
	• Omni Ground including Nursery Ground, Maturation and Feeding Ground
38th (Nov, 2023)	• Feeding Ground • Omni Ground including Spawning, Nursery and Maturation Ground
39th (Feb, 2024)	• Feeding and Maturation Ground • Omni Ground including Spawning, Nursery and Maturation Ground

During the 40th quarterly monitoring conducted from 12-23 May in 2023-24 Session, the sampling sites were divided into two major classes- 1) Nursery Ground, and 2) Omni Ground including spawning, nursery and maturation ground. The classification of functional habitat on the basis of different life stage of fishes is shown in **Figure-3.2**. The classification of the functional habitats from 2014-15 to 2022-23 is attached in **Figure D1** of **Appendix IV.**

a) **Feeding ground:** The sampling sites, Akram Point (A), Haldikhali (B), Charaputia (C) Bhodra (D), Harbaria (E) and Maidara (I) were found to support mostly length groups of 3-5 cm and 5-10cm of available fish species. Field findings revealed that the mentioned sampling sites were found to be used as nursery and feeding grounds of observed fish species.

b) **Omni Ground including Spawning, Nursery and Maturation Ground:** The sampling sites, Chandpai (F), Mongla (H) and Chalna (J) were found to support mostly length groups of <2cm and 2-3cm of available fish species. The sampling sites reveal to be used as spawning ground of available fish species. Akram Point (A), Haldikhali (B), Charaputia (C), Bhodra (D) and Maidara (I) were found to support length groups of 10-20cm and >25cm of available fish species. Field findings revealed that the mentioned sampling sites were found to be used as maturation ground of observed fish species.



(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 2023-24, the JI value between Mongla (H) 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 nine (09) sampling sites of available fishing. Jaccard co-efficient of similarity of the habitats from 2014-15 to 2022-23 is shown in (**Figure-D2** of **Appendix-IV**).

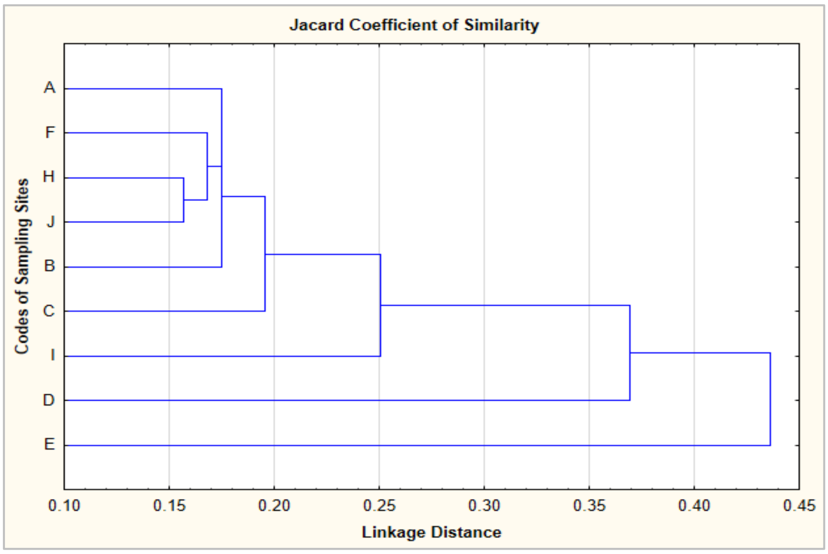


Figure 3.3: Dendogram Showing Similarity in Binary Species Composition in Three Sampling Sites

Fish Diversity

Shannon-Weiner Index

In this monitoring year of 2023-24, species evenness also varies among the sampling sites. Highest Shannon-Weiner index was found at Chandpai (0.78) indicating most evenly distributed fish species. On the contrary, lowest evenness was found at Harbaria (0.51) shown in **Table 3.3**. 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. The observed fish species during in-situ catch is shown in **Figure 3.4**. The Shannon-Weiner Index of earlier quarters from 2014-15 to 2022-23 is shown in **Table D.1** and **Table-D.2** of **Appendix-IV.**

Fish Species Richness (FSR)

Fish species richness was identified through Simpson's Index[13]. Considerable difference is noticed in the fish species richness (FSR) in different habitat classes (**Table 3.4** and **Figure-3.5**). Fish species richness in the earlier quarters from 2014-15 to 2022-23 is shown in **Figure D.3 of Appendix 1**.

In this monitoring phase, species richness varies with the sampling sites. Maximum FSR was obtained at two sites i.e. Mongla and Chalna point (n=16), while very low FSR was recorded at Bodra (n=04). Different scenarios of richness were found in this quarter in comparison to the previous monitoring years. Fish species richness in the earlier quarters from 2014-15 to 2022-23 is shown in **Table D.3 and Table D.4** of **Appendix IV**).

Among the habitats in the down-stream of the Passur River system, Akram point was home to rich assemblage of *Chaka Chingri*, *Motka Chingri* and *Teo Paissa.* Haldikhali was home to rich assemblage of Motka Chingri, Chaka Chingri, Boiragi and Loittya. Charaputia was rich to *Chaka Chingri, Kain*

[13]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.

Magur, Paissa and *Harina Chingri*. Harbaria was rich of *Motka Chingri* and *Chela*. The occurrence of fish species in the earlier quarters monitoring is shown in **Appendix-A (Table D.9 and Table D.10)**.

Table 3.3: Site Wise Species Diversity using Shannon-Weiner Index

Sampling Site	Species Number	Shannon-Weiner Index	Sampling Site	Species Number	Shannon-Weiner Index
A	13	0.76	F	14	0.78
B	12	0.53	G	-	-
C	3	0.73	H	16	0.65
D	4	0.65	I	8	0.69
E	10	0.51	J	16	0.55

**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).*

Table 3.4: Site Wise Rich Species Number

Sampling Site	No. of Rich Species	Sampling Site	No. of Rich Species
A	5	F	6
B	3	G	-
C	4	H	5
D	2	I	3
E	2	J	3

Source: Field Survey, May, 2024

Java-Johnius elongatus

Medh-Sciades sona

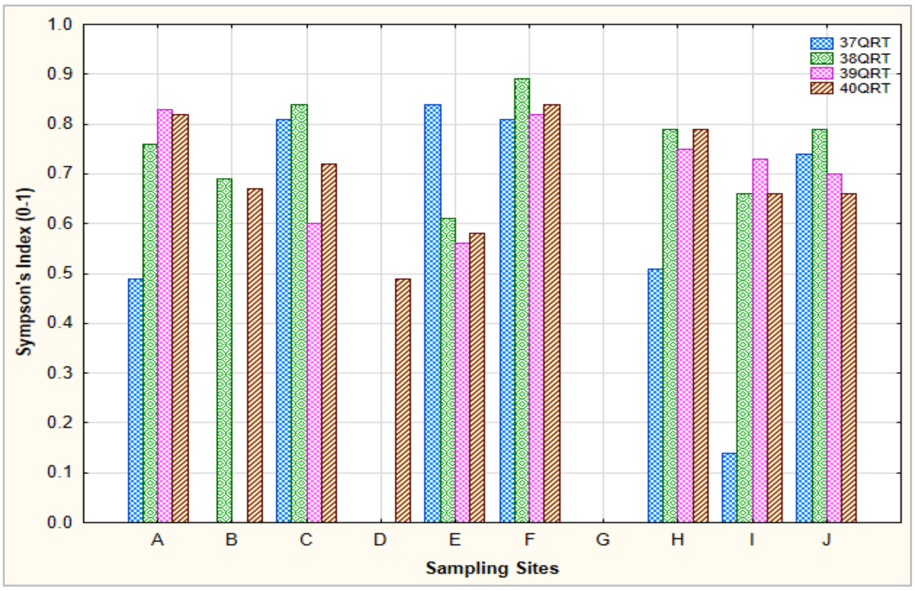
Bhetki-Lates calcarifer

Gagra-Arius gagora

Source: Field Survey, Mayy, 2024

Kain-Plotosus canius *Harina-Metapaeneus monoceros*

Figure 3.4: Photos of Some Observed Fish Species in 39th Quarter Monitoring



(FSR is identified though Simpson's Index)

Figure 3.5: Site-wise Fish Species Richness (FSR) in the Passur River System

<u>*Fish Community Structure*</u>

Fish community structure was analyzed through counting the length-wise fish individuals (**Figure 3.6**). The following Figure 3.6 shows that fry was dominant at Chandpai and Chalna point, Juvenile was dominant at Harbaria and Maidara point and adult age group were at Akram Point, Haldikhali, Charaputia and Bhodra. The length-wise fish individuals in different sampling sites from 2014-15 to 2022-23 is shown in **Figure D.4 of Appendix IV.** Length wise distribution of fish species in this quarter is shown in **Table D.11 in Appendix 1**.

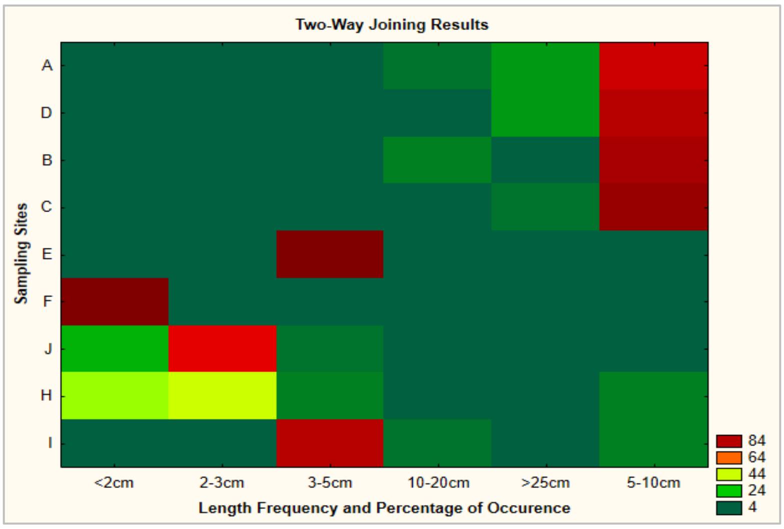


Figure 3.6: Habitat Distribution of Different Life Stages of Fish Species

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 Boiragi, Poma and Loittya attain the maximum abundance among the migratory fish species observed in the 40th quarter of monitoring. The relative abundance of the migratory species is given below in the **Figure 3.7**.

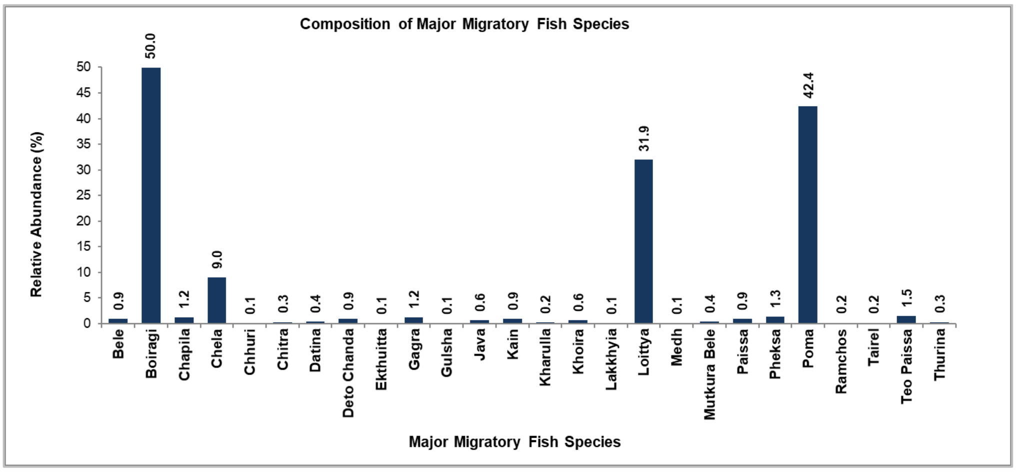


Figure 3.7: Relative Abundance of Major Migratory Fish Species in Sampling Sites

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, Paissa and Chela were observed to migrate long distance (**Figure 3.8**). The purpose, timing and extent of migration for migratory fish species from 2014-15 to 2022-23 is shown in **Appendix-1 (Table D.12).**

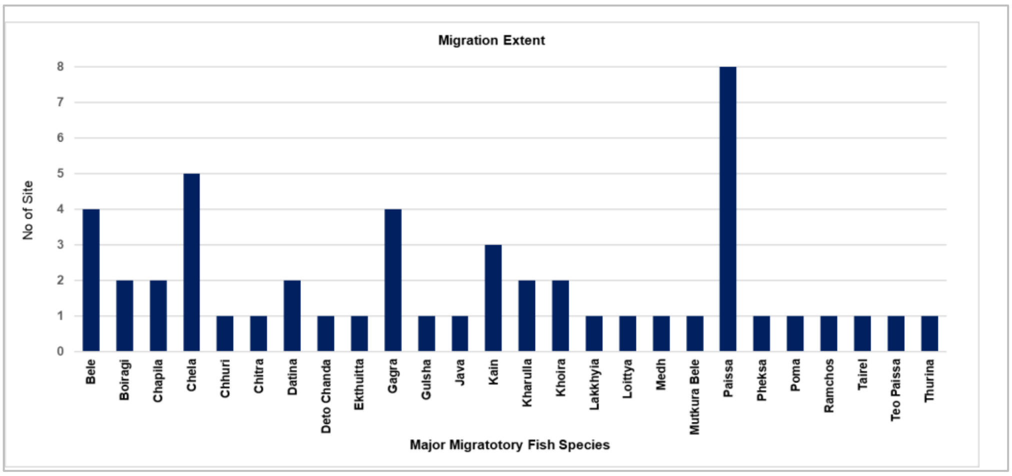


Figure 3.8: Migration Extent of Major Migratory Fish Species in Sampling Sites

Shrimp/Fish firm

Three farms situated in the direct impact zone of Power Plant were surveyed for monitoring shrimp/fish aquaculture. 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 was found at Rajnagar gher followed by Kapashdanga and Chunkuri-2. In case Paissa, the stocking density was only at Chunkuri-2 gher (**Table 3.5**).

Table 3.5: Stocking Pattern of Fish/Shrimp Farm

Name of shrimp farm	Name of species	Stocking Density (No/ha)	Stocking date
Rajnagar (42.09 ha)	Bagda	9,575	February, March and April, 2024
Kapashdanga-Muralia (115.7ha)	Bagda	1,785	March, 2024
	Harina	1,042	March, 2024
Chunkuri-2 (6.07ha)	Paissa	16,474	March, 2024
	Bagda	1,674	February, 2024
	Patari	16	March, 2024
	Kharsulla	82	March, 2024
	Harina	1647	February, 2024
	Golda	82	February, 2024
	Datina	659	March, 2024
	Kakra	132	March, 2024

Source: Field Survey, May, 2024

Shrimp/Fish Growth and Mortality Rate

During the 40th quarter of monitoring, maximum growth rate was observed in the Kapashdanga shrimp gher **(Table 3.6)**. Growth rate and mortality of fish/shrimp in the earlier quarters from 2014-2022-23 is shown in **Table D.5 and Table D.6 in Appendix 1.**

Table 3.6: Growth Rate and Mortality of Fish/Shrimp

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

Monitoring Quarters	Growth Rate and Mortality	Gher No.		
		1	2	3
17th QM	Growth Rate (cm/day)	0.38	0.3	0.2
	Mortality (%)	80	70	50
18th QM	Growth Rate (cm/day)	-	0.3	-
	Mortality (%)	-	80	-
19th QM	Growth Rate (cm/day)	-	-	-
	Mortality (%)	-	-	-
20th QM	Growth Rate (cm/day)	0.35	0.45	0.34
	Mortality (%)	50	80	40
21th QM	Growth Rate (cm/day)	0.38	0.44	0.36
	Mortality (%)	-	-	-
22st QM	Growth Rate (cm/day)	0.35	0.45	0.37
	Mortality (%)			
23nd QM	Growth Rate (cm/day)	-	-	-
	Mortality (%)	-	-	-
25rd QM	Growth Rate (cm/day)	0.38	0.48	0.32
	Mortality (%)	-	-	-
26th QM	Growth Rate (cm/day)	0.42	0.45	0.38
	Mortality (%)	35	30	90
27th QM	Growth Rate (cm/day)	-	-	-
	Mortality (%)	-	-	-
28th QM	Growth Rate (cm/day)	0.41	0.35	0.39
	Mortality (%)	20	90	30
29th QM	Growth Rate (cm/day)	0.38	0.42	0.4
	Mortality (%)			
30th QM	Growth Rate (cm/day)	0.36	0.44	0.37
	Mortality (%)	-	-	-
31st QM	Growth Rate (cm/day)	-	-	-
	Mortality (%)	-	-	-
32st QM	Growth Rate (cm/day)	0.36	0.43	0.33
	Mortality (%)	-	-	-
33 QM	Growth Rate (cm/day)	0.39	0.42	0.37
	Mortality (%)	20	25	60
34th QM	Growth Rate (cm/day)	0.38	0.41	0.35
	Mortality (%)	22	25	29
35th QM	Growth Rate (cm/day)	-	-	-
	Mortality (%)	-	-	-
36th QM	Growth Rate (cm/day)	0.34	0.39	0.37
	Mortality (%)	15	20	15

Monitoring Quarters	Growth Rate and Mortality	Gher No.		
		1	2	3
37th QM	Growth Rate (cm/day)	0.38	0.33	0.34
	Mortality (%)	10	30	15
38th QM	Growth Rate (cm/day)	0.41	0.32	0.36
	Mortality (%)	-	60	-
39th QM	Growth Rate (cm/day)	0.35	0.39	0.38
	Mortality (%)	80	30	40
40th QM	Growth Rate (cm/day)	0.35	0.38	0.34
	Mortality (%)	80	25	20

Source: CEGIS Field Survey, 2014-2024

Fish Production

<u>*Capture Fish Production*</u>

The present study revealed that the highest catch susceptibility was also found in case of Sutar Jal (11.54 kg/haul) shown in **Table 3.7.** The highest production was observed at Haldikhali followed by Akram Point **Table 3.8**. Total catch in the earler quarters from 2014-15 to 2022-23 is shown in **Table D.7 and Table D.8 of Appendix 1**.

Table 3.7: Total Catch in Different Gears in the Sampling Sites

Site	Habitat	Gear Name/Type	Haul Duration (hr)	No of Haul	kg/haul
A	Passur River	Khepla Jal	0.08	30	0.03
		Fash Jal	6.0	6	4.17
		Fash Jal	6.0	6	4.58
B	Passur River	Sutar Jal	6.0	12	11.54
		Khepla Jal	0.08	15	0.01
C	Passur River	Borshi	1.0	20	1.55
		Moi Jal	0.25	10	0.07
		Khepla Jal	0.08	15	0.02
D	Passur River	Borshi	1.0	12	0.88
		Moi Jal	0.25	8	0.06
E	Passur River	Net Jal	0.5	20	0.20
F	Passur River	Tana Jal	0.20	5	-
		Tana Jal	0.20	4	-
		Tana Jal	0.20	4	-
G	Passur River	-	-	-	-
H	Passur River	Bepdi Jal	4.0	2	5.63
I	Passur River	Khepla Jal	0.08	30	0.03
J	Passur River	Khepla Jal	0.08	20	0.01
		Net Jal	0.05	1	-

Source: Catch assessment survey, CEGIS; May 2024; Weight of Fry is not considered for catch assessment

Table 3.8: Total Catch in the Sampling Sites

Sampling Site	Total Catch (kg)	Sampling Site	Total Catch (kg)
A	53.4	F	0.0
B	138.6	G	-
C	31.93	H	11.25
D	11.0	I	0.75
E	4.0	J	0.22

**Average Weight 0.15kg/mud crab and average weight 0.6 kg/mud eel ** Weight of Fry is not considered for catch assessment*

Culture Fish Production

The present study on shrimp/fish farm in the 40th quarter monitoring phase observed few fish production in Chunkuri-2 and Kapashdanga gher but no fish production observed in Rajnagar Gher as this period was mostly stoking stage (**Table 3.9**). Shrimp/fish production in the previous monitoring quarters is shown in **(Table D.13 of Appendix-1).**

Table 3.9: The Present Catch in Three (03) Sampling Ghers

Sampling Site	Species	Total Catch (ton)
1	Bagda	0.02
	Sub-Total=	**0.02**
2	-	-
	Sub-Total=	-
3	Paissa	0.01
	Bagda	0.08
	Harina	0.02
	Golda	0.01
	Sub-Total=	**0.14**

Source: CEGIS Field survey, May 2024

3.2 Monitoring of Ecosystem and Bio-diversity

Plant Diversity has been determined through Random quadrate survey at selected homesteads. A total of 53 plant species (excluding undergrowth) have been recorded from 16 number of surveyed sample quadrates which Shanon-Winner Diversity Index was 3.50. Details of the survey result are presented in **Table 3.10** below.

Species diversity of homestead plants followed higher than in the previous monitoring period due to the plantation of more new plant species at different monitoring sites

3.2.1 Indicator 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 are 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.

Plant health

The vegetation community in this area is predominantly composed of tree species. However, uncontrolled saltwater shrimp farming poses a significant threat to plant health, leading to unsatisfactory conditions. The expansion of shrimp farming has contributed to increased soil salinity, which in turn has caused fluctuations in plant succession, growth, and overall productivity.

Plant Diseases and Symptoms in Homestead Vegetation

Observation of plant diseases in an area is essential for assessing plant health and productivity. During the initial field survey, certain tree species were selected for regular monitoring of plant diseases. In this context, a number of common tree species were observed in each homestead.

The study area is prone to several plant diseases, including leaf blast, leaf spot, lethal yellowing, nut fall, and mite damage on nut fruits. A brief discussion was held with homeowners regarding the diseases affecting selected economic plants in their homesteads. Most plant disease symptoms are descriptive. While not all symptoms are visible throughout the year, efforts were made to observe any existing signs of disease. Leaf spot and mite damage on fruits are common symptoms in *Cocos nucifera*. Additionally, bud/trunk rot (Heart Rot), lethal yellowing, and a reduction in diameter at the top portion of this monocot are also prevalent in all locations. Fungal or bacterial infections were not significant across the homesteads. *Phoenix sylvestris* was also found to be unhealthy due to leaf yellowing caused by manganese deficiency.

Number of Diseases Affected Trees

A total of 5 Coconut tree found disease affected from two sites out of four. Of which, two trees were recorded from Rajnagar, three at Borni sites those are followed the symptom of trunk narrowing and leaf yellowing. In addition to this, 9 Coconut trees has been died at Rajnagar site due to continuing the effect of land filling by sand. Here should be mentioned that, none of the plant health issues are revealed for the Project operation.

Table 3.10: Plant Species Composition of the Sampled Homesteads

Sl. No.	Species Name	Local Name	Family	Rajnagar				Borni				Kalekarber				Chalkghona				Tot. No. of individuals	Biodiversity Index
				Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16		
1	*Albizia richardiana*	Chambol	Fabaceae									1	3	7	2	1				14	**3.50**
2	*Albizia saman*	Rendi Koroi	Fabaceae			1	1	2	11	5	3						6	1		30	
3	*Areca catechu*	Supari	Arecaceae					2	1	4	2		3	3						15	
4	*Azadirachta indica*	Neem	Meliaceae				2	1	7		15	1		9	9					44	
5	*Averrhoa carambola*	Kamranga	Oxalidaceae									1								1	
6	*Borassus flabeliffer*	Taal	Arecaceae					2		1	1	2		1	7			2		16	
7	*Citrus medica*	Lebu	Rutaceae		4															4	
8	*Cocos nucifera*	Narikel	Arecaceae	4			1	3	9			1	6	16	5	1	3		1	50	
9	*Diospyrus pregrina*	Gab	Ebenaceae									4				1				5	
10	*Elaeocarpus serratus*	Jalpai										1								1	
11	*Eucalyptus sp*	Eucalyptus	Myrtaceae						2											2	
12	*Excoecaria agallocha*	Gewa	Euphorbiaceae	11	60	8	45		1	11									20	156	
13	*Ficus benjamina*	Lokkho Pakur	Moraceae						1		2									3	
14	*Ficus hispida*	Dumur	Moraceae										1	2						3	
15	*Hibiscus rosa-sinensis*	Joba	Malvaceae														1	4		5	
16	*Hibiscus tiliaceus*	Bola	Malvaceae		18				4	2	1				24			1		50	
17	*lannea coromandelica*	Jiga	Anacardiaceae	17	11		16								2	1			1	48	
18	*Lawsonia inermis*	Mehedi	Lythraceae		4															4	
19	*Limonia acidissima*	Kotbel	Lamiaceae					1								1				2	
20	*Litchi cinensis*	Lichu										1								1	
21	*Malus pumila*	Apple	Rosaceae									1								1	

Sl. No.	Species Name	Local Name	Family	Rajnagar				Borni				Kalekarber				Chalkghona				Tot. No. of individuals	Biodiversity Index
				Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16		
22	*Mangifera indica*	Aam	Anacardiaceae					7				5	4			1		17		34	
23	*Manilkara zapota*	Safeda	Sapotaceae									2								2	
24	*Mimusops elengi*	Bokul	Sapotaceae										1							1	
25	*Musa sp*	Kola	Musaceae		22	28		2	32			42	40	1		3				170	
26	*Ocimum sanctum*	Tulshi	Lamiaceae															15		15	
27	*Phoenix sylvestris*	Khejur	Arecaceae		5	4								1	9		4	3	1	27	
28	*Phylanthus reticulatus*	Shitki								1										1	
29	*Phyllanthus acidus*	Orboroi	Phyllanthaceae							4		1								5	
30	*Pithecellobium dulce*	Babla	Fabaceae			1									1					2	
31	*Psidium guajava*	Peyara	Myrtaceae							1		2						4		7	
32	*Punica granatum*	Bedana	Punicaceae													1	1	1		3	
33	*Salmalia malabarica*	Shimul	0															1	2	3	
34	*Spondias mombin*	Amra	Anacardiaceae													1				1	
35	*Syzygium cumini*	Jaam	Myrtaceae										1			1		2		4	
36	*Swietenia mahagoni*	Mahagoni	Meliaceae				1	4	11		1	28	38	90	29	2	7	3		214	
37	*Tamarindus indica*	Tentul	Fabaceae							2							1			3	
38	*Terminalia arjuna*	Arjun	Combretaceae											1		1				2	
39	*Terminalia catapa*	Kathbadam	Combretaceae							2							1		2	5	
40	*Zizyphus sp*	Kul boroi	Rhamnaceae		1											1				2	
41	*Carica papaya*	Papaye	Caricaceae		1															1	
42	*Delonix regia*	Krisnochora	Fabaceae							1										1	
43	*Acacia auriculiformis*	Akashmoni	Fabaceae				1	2									1			4	

Sl. No.	Species Name	Local Name	Family	Rajnagar				Borni				Kalekarber				Chalkghona				Tot. No. of individuals	Biodiversity Index
				Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16		
44	*Jasminum grandiflorum*	Jasmin	Oleaceae						3											3	
45	Unknown		-							1										1	
46	*Moringa oleifera*	Sojina	Moringaceae					1						1	1	1		1		5	
47	*Phyllanthus emblica*	Amloki	Phyllanthaceae									1								1	
48	*Citrus maxima*	Jambura	Rutaceae									1						1		2	
49	*Areca*	Areca palm	Arecaceae															5		5	
50	*Leucaena leucocephala*	Ipilipil	Fabaceae															4		4	
51	*Neolamarckia cadamba*	Kadam	Rubiaceae												1					1	
52	*Colocasia esculenta*	Kochu	Araceae																1	1	
53	*Morinda citrifolia*	Nonifol	Rubiaceae			15			1	9	11									36	

Source: Field Survey, May, 2024

Table 3.11: Proportion of Healthy and Unhealthy Plants in Studied Homesteads

Location	Plant Name	Tot. 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	Jul, 2022	Dec, 2022	Feb, 2023	May, 2023	Sep, 2023	Nov, 2023	Feb, 2024	May, 2024
Rajnagar	*Cocos nucifera*	1714	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	2	4	5	7	1	2	152	2
	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	1	7	3	2	4*15	4		
	Manilkara zapota	1	NS	-	-	-	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	D	-				
	Albizia saman	2	NS	-	-	-	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	2	2	-	2	-	2	L	-		1	3	
	Excoecaria agallocha	1516	NS	-	1	1	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	10	-	-	-	-	12	3	1				
	Mangifera indica	3	NS	1	-	-	2	-	-	NS	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	2	2	-	-	-	3	D	-				
	Psidium guajava	2	NS	2	-	-	2	-	-	NS	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	D	-				
Borni	*Cocos nucifera*	10	7	3	-	-	3	1	2	NS	1	2	3	1	2		1	1	1	2	1	-	-	-	-	-	-	1	-	-	1	L	-				2
	Phoenix sylvestris	12	-	5	4	4	3	1	4	NS	4	3	4	2	1		-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	2				
	Borassus flabellifer	6	3	1	-	-	-	-	-	NS	-	-	-	-	-	1	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-				
	Mangifera indica	6	3	3	1	1	4	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	1				
	Excoecaria agallocha	18	-	-	-	-	-	-	-	NS	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	3	-		3	1	-	-	-				
	Swietenia mehogani	11	-	-	-	-	1	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-				
	Areca catechu	10	-	6	2	2	8	2	2	NS	-	1	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			4	
	Manilkara zapota	1	-	-	-	-	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-				
	Psidium guajava	2	2	1	-	-	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Kal	*Cocos nucifera*	56	35	5	1	1	2	2	3	NS	1	1	-	6	3	-	1	3	1	7	4	2	-	-	-	2	-	-	-	-	1	-	-				
	Phoenix sylvestris	10	-	3	-	-	1	-	1	NS	3	-	3	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	1	-	-				

[14] 1 *Cocos* have been cut

[15] 4 Phoenix death

[16] 30 *Excoecaria* have been cut

Location	Plant Name	Tot. 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	Jul, 2022	Dec, 2022	Feb, 2023	May, 2023	Sep, 2023	Nov, 2023	Feb, 2024	May, 2024
	Mangifera indica	5	1	1	-	-	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	1	-				
	Manilkara zapota	2	-	-	-	-	1	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-				
	Borassus flabellifer	8	-	-	-	-	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	Zizyphus sp	1	-	-	-	-	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-				
	Psidium guajava	8	-	-	-	-	-	-	-	NS	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	Tamarindus indica	2	-	-	-	-	1	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Chalkghona	*Cocos nucifera*	3017	25	19	5	5	34	20	-	NS	2	2	4	5	3	-	3	4	2	4	3	5	-	-	-	-	-	-	-	-	2	-	3			2	
	Phoenix sylvestris	10	-	10	1	1	6	5	1	NS	1	-	5	2	3	-	-	1	2	2	1	3	-	1	3	2	1	1	-	-	2	-	3	1		3	
	Albizia saman	3	-	-	-	-	1	-	-	NS	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	Excoecaria agallocha	36	-	-	1	1	-	-	-	NS	-	-	-	-	2	-	-	-	-	-	-	-	-	-	2	-	-	-	1	-	**	1	-		1		
	Manilkara zapota	1	-	-	-	-	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-		2		
	Psidium guajava	17	1	7	-	-	-	-	-	NS	-	-	-	-	-	1	3	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-				
	Mangifera indica	7	2	1	-	-	-	-	-	NS	-	1	-	1	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	3				
	Borassus flabellifer	2	-	-	-	-	-	-	-	NS	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1			
Note: L=Logged; NS = Not Surveyed; D=Dead																																					

[17] 9 *Cocos* have been cut

Vegetation canopy status

Species representation in Different Canopy Layers of Homestead Vegetation

In all the homestead vegetation studied, Coconut (*Cocos nucifera*) dominated the upper canopy. Date Palm (*Phoenix sylvestris*) was commonly found as the second canopy layer, followed by Gewa (*Excoecaria agallocha*). Fruit-bearing trees like Mango (*Mangifera indica*) were primarily present in the upper canopy. Smaller fruit trees, such as Guava (*Psidium guajava*) and Banana (Musa sp.), occupied the lower canopy. Only a few grass species and undergrowth plants were observed in the homesteads studied.

Estimated Canopy cover in Homestead Vegetation of Sampling Sites

Canopy cover is slightly improved at most sites. The historical canopy status shows that, the coverage has drastically fall down at Rajnagar site and it had been due to three causes; firstly, for land development with saline sand, secondly is due to increase soil salinity on homestead platform and third is due to felling of tree for construction of houses. Except Rajnagar, other three sites canopy status was more or less same. (**Figure 3.9**). **Table 3.12** presents the percentage of canopy cover at four different locations like Rajnagar, Borni, Kalekarber, and Chalkghona over the years from 2014 to till date. From the recorded data in the month of May for last three years, cnopy cover has been slightly improved in three sites except Chalkghona. In May 2022, canopy cover ranged from 5% in Rajnagar to 24% in Kalekarber, with Borni and Chalkghona having 20% and 23% respectively. By May 2023, Rajnagar saw a sharp decline to 2%, while Borni, Kalekarber, and Chalkghona exhibited relatively stable canopy cover at 18%, 23%, and 15% respectively. In May 2024, canopy cover rebounded in Rajnagar to 5%, while Borni increased to 25%, and both Kalekarber and Chalkghona showed slight increases to 25% and 21%, respectively. This data indicates fluctuating canopy cover in the regions over the observed period

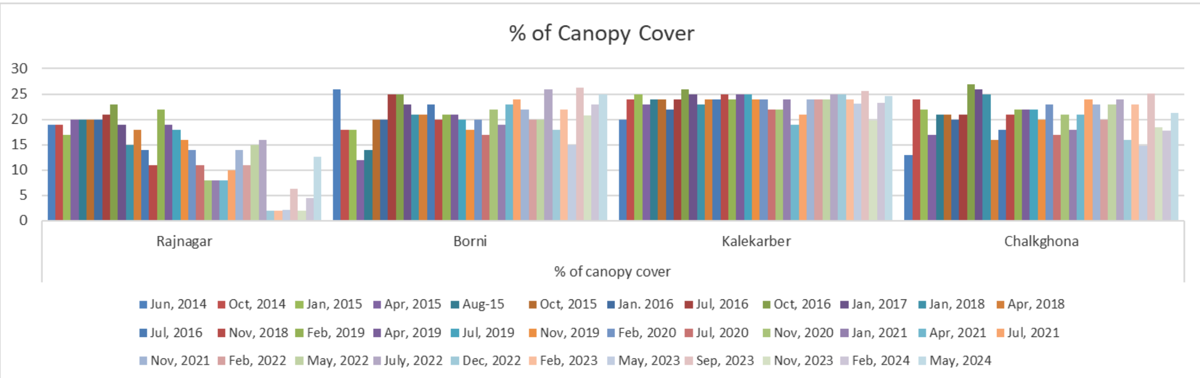


Figure 3.9: Historical Canopy Status of the Monitoring Sites

Table 3.12: Vegetation Canopy Cover in Different Studied Homesteads

Location	% of canopy cover			
	Rajnagar	Borni	Kalekarber	Chalkghona
Apr, 2014	NS	NS	NS	NS
Jun, 2014	19	26	20	13
Oct, 2014	19	18	24	24
Jan, 2015	17	18	25	22

Location	% of canopy cover			
	Rajnagar	Borni	Kalekarber	Chalkghona
Apr, 2015	20	12	23	17
Aug-15	20	14	24	21
Oct, 2015	20	20	24	21
Jan. 2016	20	20	22	20
Jul, 2016	21	25	24	21
Oct, 2016	23	25	26	27
Jan, 2017	19	23	25	26
Jan, 2018	15	21	23	25
Apr, 2018	18	21	24	16
Jul, 2016	14	23	24	18
Nov, 2018	11	20	25	21
Feb, 2019	22	21	24	22
Apr, 2019	19	21	25	22
Jul, 2019	18	20	25	22
Nov, 2019	16	18	24	20
Feb, 2020	14	20	24	23
Jul, 2020	11	17	22	17
Nov, 2020	8	22	22	21
Jan, 2021	8	19	24	18
Apr, 2021	8	23	19	21
Jul, 2021	10	24	21	24
Nov, 2021	14	22	24	23
Feb, 2022	11	20	24	20
May, 2022	15	20	24	23
July, 2022	16	26	25	24
Dec, 2022	2	18	25	16
Feb, 2023	2	22	24	23
May, 2023	2	18	23	15
Sep, 2023	6	26	26	25
Nov, 2023	2	21	20	18
Feb, 2024	4	23	23	18
May, 2024	5	25	25	21
Note: NS = Not Surveyed				

Source: Field Survey, May, 2024

Bird Habitat

<u>*Local Birds and their Nesting Behavior*</u>

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.

<u>*Bird Species and Number of Bird Nests in Sampling Sites*</u>

None of the bird nest observed during this monitoring tier. However, **Table 3.13** represent the bird nest monitoring datasheet over the monitoring periods.

Table 3.13: 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	Common Myna	RV Bulbul
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	-	-	-	-	-	-	-	-	-

Monitoring Tier	Location	Name of nesting Bird								
		Little Cormorant	Little Egret	Asian Pied Starling	Tailor Bird	Great Egret	Spotted Dove	Black R. Flameback	Common Myna	RV Bulbul
	B	-	-	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-
Jun 2016	R	10	5	-	-	3	-	-	-	-
	B	-	-	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-	-	-
	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	-	-	-	-	-	-	-	-	-

Monitoring Tier	Location	Name of nesting Bird								
		Little Cormorant	Little Egret	Asian Pied Starling	Tailor Bird	Great Egret	Spotted Dove	Black R. Flameback	Common Myna	RV Bulbul
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	-	-	-	-	-	-	-	-	-
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	-	-	-	-	-	-	-	-	-
July, 2022	R	-	-	-	-	-	-	-	-	-
	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**	**Common Myna**	**RV Bulbul**
	C	-	-	-	-	-	-	-	-	-
Dec, 2022	R	-	-	-	-	-	-	-	10	-
	B	-	-	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-
Feb 2023	R	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-
May 2023	R	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	1
	K	-	-	-	-	-	-	-	-	-
	C	-	-	2	-	-	-	-	-	-
Nov 2023	R	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-
Feb 2024	R	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-	-	-
	C	-	-	-	1	-	-	-	-	-
May 2024	R	-	-	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-
Note: Location R=Rajnagar, B=Borni, K=Kalekarber, C=Chalkghona										

Source: Field Survey, May, 2024

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 the 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 Midara River

Dolphin sightings were recorded in the Passur and Maidara Rivers around the project area (from Chalna Ghat to Maidara to Digraz Kheya Ghat) during a boat transect conducted at low tide. The transect covered a distance of 16.5 km, with a survey duration of 1 hour and 13 minutes. A total of two dolphins were observed, both within the Maidara River. The encounter rate was calculated at 0.04 individuals/km/hour, which is lower than the previous monitoring period. **Figure 3.10** illustrates the survey transect and the locations of dolphin sightings within the river channel.

Dolphin occurrence in Dhangmari, Shella Gang and Bhadra Khal

A total of 9 dolphins were observed during a 13.5 km boat transect survey in Dhangmari Khal, conducted during mid-tide. The survey lasted 108 minutes, with a recorded encounter rate of 0.37 individuals per km per hour, slightly higher than the previous monitoring phase. The distribution of dolphin sightings in Dhangmari Khal is illustrated in **Figure 3.11**. In a separate transect survey covering 12 km along the Shella Gang and a section of the Passur River at Chandpai, four dolphins were sighted. The survey, conducted from Joymonirghol to Jhongra Patrol Post and onward to Chandpai Forest Office and Joymoni Thota (**Figure 3.12**), lasted 55 minutes, yielding an encounter rate of 0.56 individuals per km per hour. At Bhadra Khal, 23 dolphins were recorded during a 39-minute survey conducted at high tide within the 2.5 km inner reach from Bhadra Patrol Post. The encounter rate here was 6.56 individuals per km per hour, lower than the previous monitoring. The distribution of dolphin sightings at Bhadra Khal is shown in **Figure 3.13**. Dolphins were observed at three of the six sites during the boat journey, with the survey results summarized in **Table 3.14**.

Figure 3.10: Occurrence of Dolphins in Passur and Maidara River along the Project Site

Figure 3.11: Location of Dolphin Occurrences in Dhangmari Khal

Figure 3.12: Location of Dolphin Occurrences in Chandpai

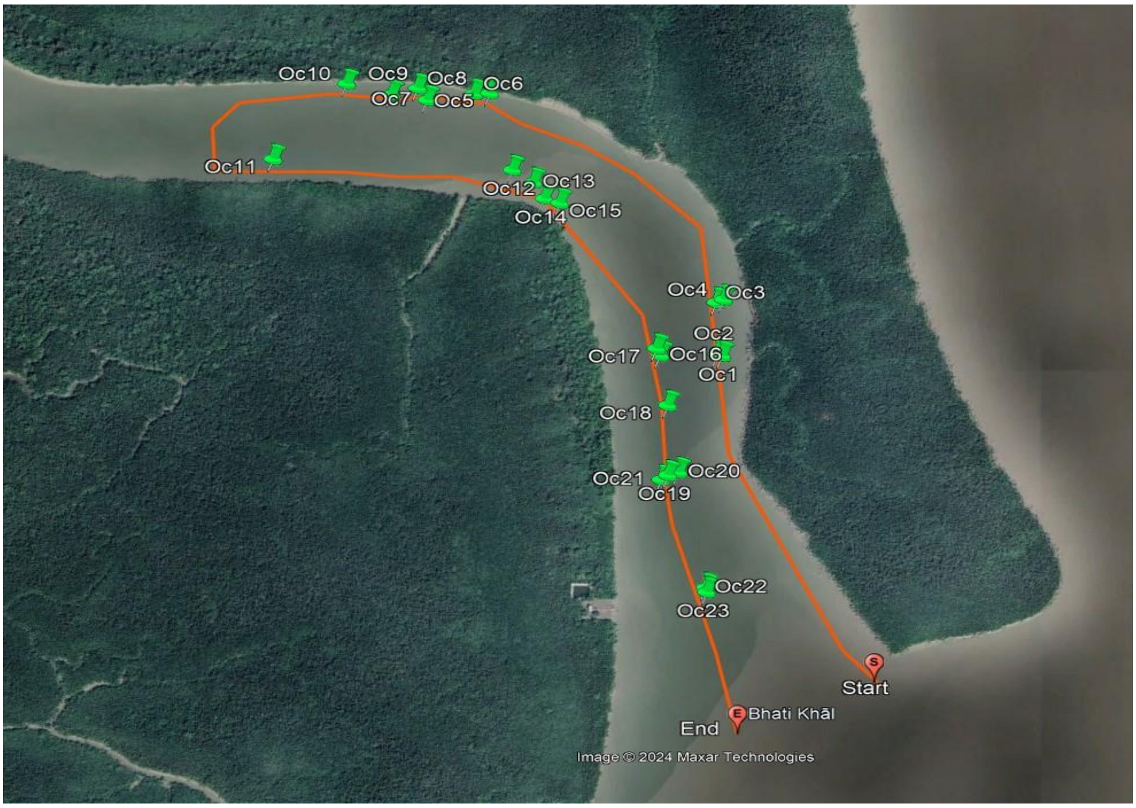


Figure 3.13: Location of Dolphin Occurrence in Bhadra Khal

Table 3.14: Dolphin Observation Datasheet

Monitoring Tier	Tidal Condition	Passur River at Project Site	Karamjal	Harbaria	Akram Point	Maidara 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

Monitoring Tier	Tidal Condition	Passur River at Project Site	Karamjal	Harbaria	Akram Point	Maidara River	Shella River at Chandpai
	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
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
July-22	FT	N	NS	N	N	Y	Y
	NT	NS	Y	N	N	NS	NS
Dec-22	FT	NS	N	N	N	Y	Y
	NT	Y	NS	NS	N	NS	NS
Feb, 23	FT	NS	Y	Y	NS	Y	Y
	NT	Y	NS	NS	Y	NS	NS
May, 23	FT	NS	NS	N	NS	Y	Y
	NT	Y	Y	NS	N	NS	NS
Sep, 23	FT	NS	Y	N	NS	Y	Y
	NT	NS	N	Y	N	NS	NS
Nov, 23	FT	NS	N	Y	N	NS	NS
	NT	Y	N	Y	N	Y	Y
Feb, 24	FT	y	N	N	N	Y	NS
	NT	N	Y	N	N	NS	Y
May, 24	FT	NS	N	N	N	Y	NS
	NT	N	Y	NS	N	NS	Y

Note: FT=Flood Tide, NT=Neap Tide, NS=Not Surveyed; Occurrence Status: Y = Occurred, N = Not occurred

3.3 Sundarbans Forest Health Monitoring

The Forest Health Monitoring Program, initiated by concerned citizens in the mid-1990s, integrates soil, vegetation, and epiphytic lichen monitoring with air quality and deposition monitoring to assess whether there are changes to biological, physical, and chemical indicators. The program aims to ascertain the present condition, detect any changes, and identify trends in indicators of forest health over a specific timeframe. To address issues that pose a threat to the sustainability of forest ecosystems, this program analyzes data from diverse sources, including long-term monitoring plots, aerial surveys, and other biotic and abiotic data sources.

Mangrove health index (MHI) has been developed to propose a single metric for estimating forest community healthiness based on three main stand structure parameters, i.e. diameter, canopy coverage and density. The index was considered for representing mangrove ecosystems on an ecosystem scale since mangrove plant communities have an important role in ecosystem productivity and stabilized food chain. Mangrove trees adapt to anaerobic and waterlogged environments by developing additional pneumatophores, which enhance the surface area available for gas exchange. The ecological stability of mangrove forest ecosystems is greatly influenced by crabs. As stated by Lee (1989), crab burrows effectively remove nitrogen in the form of gaseous nitrogen (N2) and nitrous oxide (N2O) from the aquatic ecosystem, while also increasing oxygen levels in the soil layer.

Soil quality is another crucial metric for assessing forest health (USDA Forest Service, 2007). Evaluating soil quality typically requires measurements of its physical, chemical, and biological composition at various depths. Additionally, the diversity of plant species presents serves as a bio-indicator of a healthy forest. Assessing the presence of mixed plant species of different sizes and ages, which create distinct forest "layers" that offer habitat for numerous species, helps evaluate this biodiversity (Greenleaf Forestry and Wood Products Inc., 2010). Another bio-indicator worth considering when monitoring forest health is the forest's regeneration capability.

The CEGIS team has been periodically monitoring the health of the Sundarbans Reserve Forest to evaluate the potential impacts of the ongoing Rampal Thermal Coal Power Plant Project. A robust ability to regenerate reflects a healthy forest ecosystem. The monitoring program is conducted at five locations within the Sundarbans Reserve Forest: Sutarkhali, Karamjal, Harbaria, Akram Point, and Hiron Point. The Sundarbans Forest health is evaluated quarterly according to a monitoring schedule, with forty surveys completed at these locations. With regards to the Rampal Power Plant installation, a comprehensive study of these bio-indicators will be conducted in the Sundarbans Reserve Forest (SRF).

3.3.1 Methodology

Permanent Sample Plot (PSP) Establishment and Layout

To set up permanent sample plots five sites have been selected on the basis of the preliminary survey (**Figure 3.14**). Among those, four sites are along the Passur River at Karamjal, Harbaria, Akram point and Hiron point, and the fifth one is near Sutarkhali forest office (**Table 3.15**). The sites have been selected considering the distance from the proposed Project site, wind directions, coal transportation route, river systems and vegetation types.

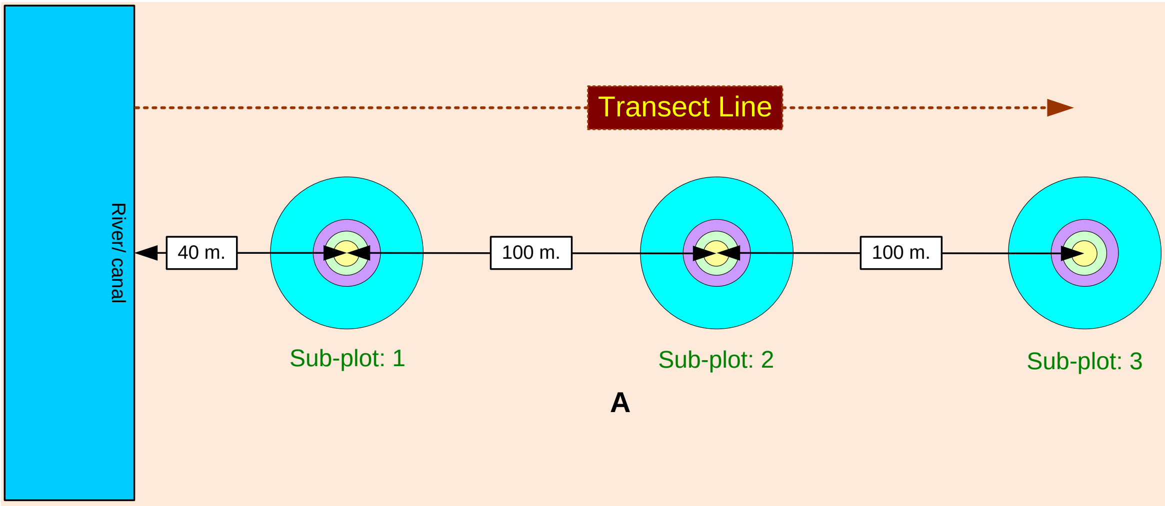


Figure 3.14: Layout of the Subplots and Transect Line Perpendicular from Ecotone (River or Canal Bank)

Bio-Indicators for Forest Health Monitoring

Monitoring of frequency for different indicators has been determined considering efficiency in time, cost and applicability. The indicators observed in this tier are as follows:

- Seedling Regeneration
- Pneumatophores
- Crab hole density
- Canopy cover
- Leaf area index (LAI)
- Species composition & diversity
- Biomass and carbon estimation
- Leaf phenology and phonological behaviour
- Pest and diseases identification

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 3.15**). 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 3.16**).

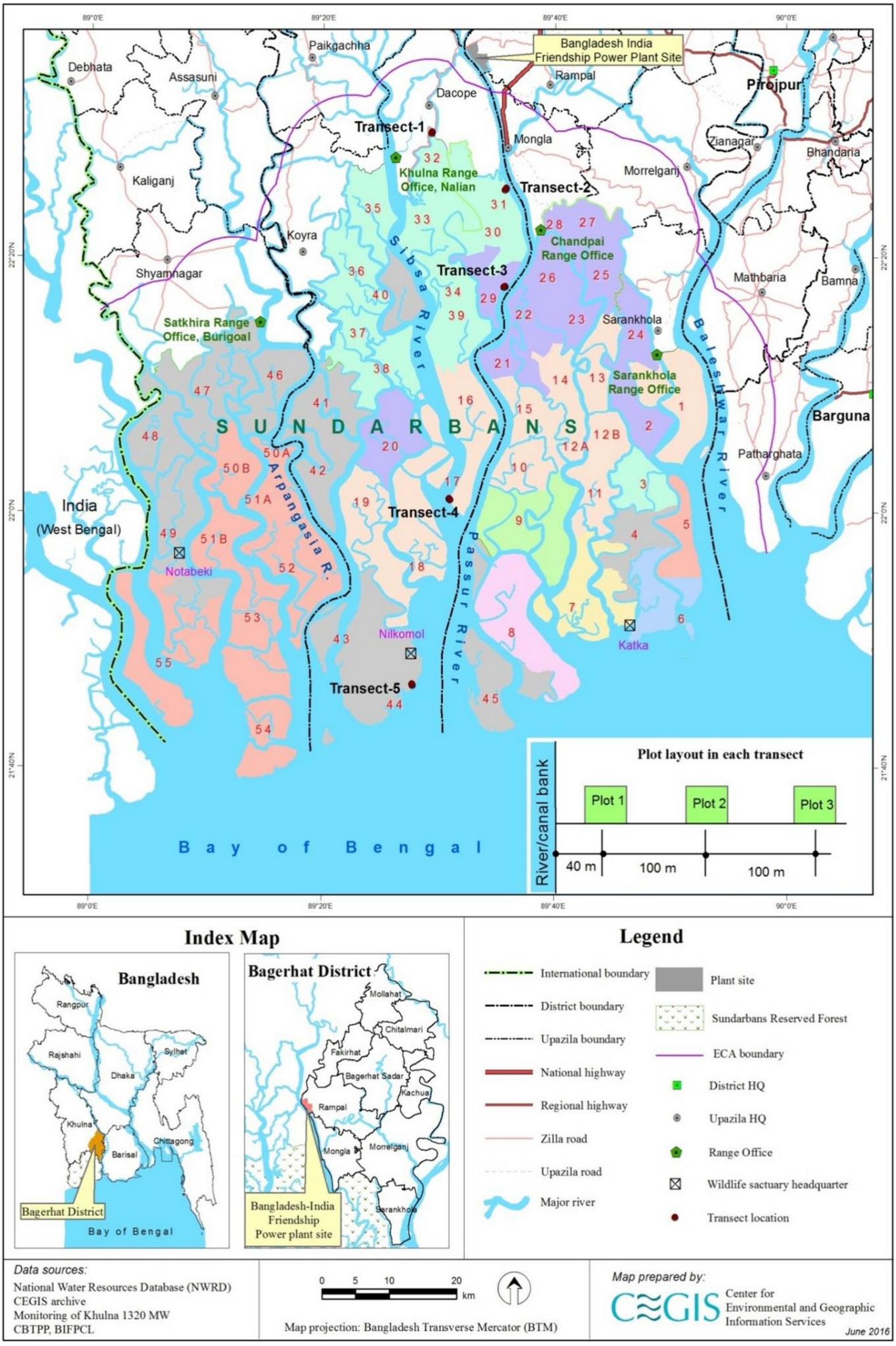


Figure 3.15: Location Map of Sundarbans Forest Health Monitoring Plots (PSP)

Table 3.15: 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 of Passur River
	3	Chandpai	31	22.4226	89.5925	Hard Clay	Plot center 240m west of Passur River
Herbaria	1	Chandpai	29	22.2061	89.5924	Hard Clay	40m west of Passur River
	2	Chandpai	29	22.2962	89.5917	Hard Clay	140m west of Passur River
	3	Chandpai	29	22.2962	89.5908	Muddy	240m west of Passur River
Akram Point	1	Khulna	17	22.0187	89.5134	Hard Clay	40m east of Shibsha River
	2	Khulna	17	22.0180	89.5140	Clay	140m east of Shibsha River
	3	Khulna	17	22.0168	89.5145	Hard Clay	240m east of Shibsha River
Hiron Point	1	Khulna	44	21.9166	89.2333	Sandy	350m east from Gogari Canal
	2	Khulna	44	22.1833	89.5000	Sandy	40m north of the Bay of Bengal
	3	Khulna	44	21.7775	89.4598	Hard Clay	648m southeast of Shibsha River

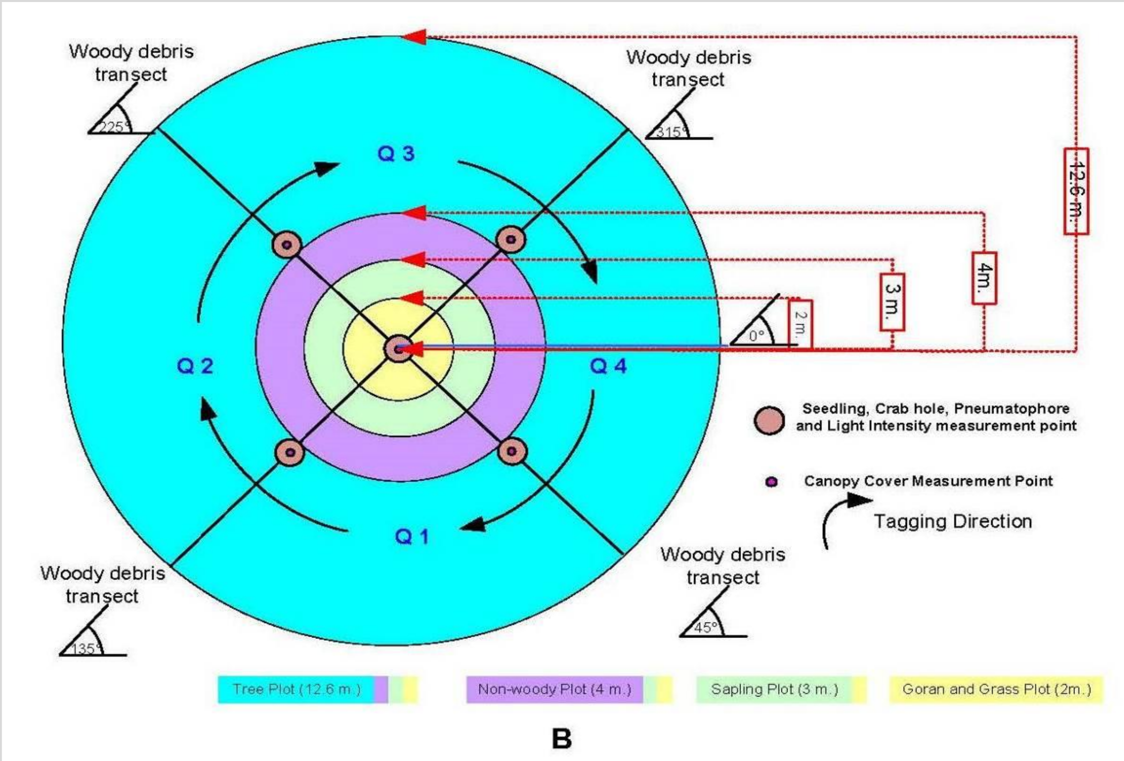


Figure 3.16: Layout of the Survey Activities in each Subplot

Tree Growth

The tag number of trees (DBH ≥ 5cm and lean angle greater than 45º) is monitored and rewritten if any new tree is found within 12.62 m radius circle of the Permanent Sample Plot (PSP). The tree height and diameter are also taken by the surveyor (**Figure 3.17**).

Figure 3.17: Mangrove Structure Monitoring by Team Members by DBH and Height Measurements

Seedling

Within a circle of a 1 m radius, seedlings (height 1.37 m) were evaluated in each PSP. The number of seedlings was determined each species, and their status was also noted. Within a circle of one-meter radius centered on each of the five points of all the subplots, the total number of living seedling has been counted. The first point was placed in the center of each subplot, while the other four were placed in the middle of the four transects made of woody debris that face 45°, 135°, 225°, and 315° respectively.

Pneumatophores

The total number of living pneumatophores also recorded within a circular area of 1 m radius centering each of the five points of all the subplots. The first point has been laid out in the centre of each subplot and other four have been in the midpoint of the four woody debris transects that are facing at 45°, 135°, 225° and 315°.

Crab Hole

Crab plays an important role in mangrove ecosystems such as decomposing litter fall thereby increasing fertility. In order to work out the crab density, usually crab hole abundance is monitored. For this purpose, the crab holes have been counted within an area of 1 m radius circle in each subplot's centre and in the midpoint of four woody debris transect (**Figure 3.18**).

Figure 3.18: Pneumetaphore and Crab Hole Status Inside the Plot at Harbaria

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 (**Figure 3.19**). 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 in each 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) **(Figure 3.19).** In this monitoring report, LAI was calculated as follows:

Leaf Area Index (LAI) = $\log_e$ (I/Io)/-K leaf area/area of ground (Where, I = Under Canopy Light Intensity, Io = Open Canopy Light Intensity, and K is Canopy light extension coefficient i.e., 0.5). LAI is represented by values ranging from 0 to 10, where 0 is equivalent to an area without a canopy or bare soil and 10 represents a dense canopy (BioScience, 2016).

Figure 3.19: Using a Densitometer and Lux Meter, the Team Member is Collecting Data on Canopy Cover and Light Intensity, Ensuring Accurate Documentation

Species Diversity and evenness

Tree species data were collected from all the PSPs to identify diversity. Individual tree DBH ≥5cm was considered. The following two indices of the Shannon’s index (MacArthur and MacArthur 1961) H' and Pielou’s (1969) index J' was used to measure woody species diversity or equitability (evenness)

$$H' = \sum_{i=1}^{s} \frac{n_i}{N} \log_2 \frac{N}{n_i}$$

$$J' = \frac{H'}{H'_{max}} (H'_{max} = \log_2 S)$$

Where N is the total number of individuals and the unit of H' is bit, or the unit of entropy (e.g. Goldman 2005)

Species richness R'

Species richness index was measured by Margalef (1958): R'= (S-1)/ Ln (N) Where, S= total species found and N= total number of Individuals

Biomass and carbon stock estimation

Aboveground biomass of tree and sapling was estimated by using Chave, et al., (2005) allomatric equation. Komiyama et al., (2008) equation was used to estimate belowground biomass.

- AGB (kg) = $\rho \times \exp(-1.349 + 1.980 \ln(dbh) + 0.207 \times (\ln(dbh))^2 - 0.0281(\ln(dbh))^3$
- BGB (kg) = $0.199 \times (\rho)^{0.899} \times (dbh)^{2.22}$

Where, ABG = above ground biomass; BGD = belowground biomass; DBH = diameter at breast height. After calculating biomass, carbon content was calculated based on the assumption that carbon content is 50 percent of the dry woody biomass (Brown 1997).

Statistical analysis

Different statistical analyzes were performed for different indicators. A one-way ANOVA analysis was tested for pneumatophores, crab hole, canopy coverage, light intensity and seedling density in order to find out whether any difference was made.

Leaf phenology and phonological behaviour

The phonological events such as leaf emergence, leaf shedding, flowering and fruiting and fruit/ propagule dropping time may have affected by Air pollution. Hence, Phonological behavior can be used as bio-indicator of forest health. During field visit leaf emergence, leaf shedding, flowering and fruiting and fruit/ propagule dropping time was investigated through visual observation and recorded for each plot.

Pest and diseases identification

Tree diseases play a pivotal role as bio-indicators, offering valuable insights into the overall health of a forest ecosystem. In the context of the Sundarbans mangroves, researchers, as highlighted by Rahman et al. in 2010, have identified key factors contributing to the population reduction of various tree species, including *Avicennia spp., Rhizophora spp., Heritiera spp., Pandanus spp., Phoenix spp., and Acanthus spp*. The spectrum of diseases affecting these species encompasses leaf blight, dieback, stump and collar rot, trunk gall, root rot, leaf necrosis, and powdery mildew.

Of particular concern is the prevalence of 'top dying' observed in Sundari trees across all Permanent Sample Plots (PSPs) in the current investigation. This disease has impacted a substantial portion, ranging between 30 and 40 percent, of Sundari trees. Understanding the specific diseases affecting mangrove species is crucial for effective forest management and conservation efforts. Pest and disease type of the Sundarbans mangrove forest was investigated through literature review, which was then verified in the field through visual observation. One vital aspect of this monitoring involves maintaining detailed records of pests and diseases. By keeping systematic records, forest managers can identify outbreaks of pests and diseases.

3.3.2 Monitoring Result and Discussion of SRF Health

Plot description – 40th monitoring

<u>*Sutarkhali*</u>

The first subplot in Sutarkhali is characterized by a relatively healthy mixed forest stand, with no signs of wildlife observed and a clean forest floor. This indicates a stable environment with minimal disturbances. In the second subplot, the forest floor is covered with Gewa plant leaves, in Sundori trees dominate the stand. Signs of deer presence suggest occasional wildlife activity. This subplot demonstrates typical forest conditions with a modest level of biodiversity and moderate wildlife interactions. The third subplot shows high bird activity and elevated crab activity compared to the other subplots. This suggests a dynamic ecosystem with notable avian and crab populations, contributing to the subplot's ecological richness. So that, Sutarkhali presents a generally stable and healthy forest condition, with notable wildlife activity and a balanced ecosystem.

<u>*Karamjol*</u>

The first subplot in Karamjol displays heavy litter fall and significant regeneration, predominantly of Sundori plants. This indicates active forest growth and a natural process of ecological replenishment. In the second subplot, stagnant water is present, alongside broken branches likely caused by a recent storm. Crab activity is noticeable, though regeneration is minimal, with only a few Viola plants thriving. Additionally, the death of Sundori plants has been observed, highlighting potential stressors affecting this area. The third subplot has Gewa and Sundori seedlings interspersed within areas dominated by Bayen and Kakra plants. There is an absence of saplings at the center, and seedling numbers are negligible. This subplot reflects limited regeneration and possibly less favorable conditions for new growth. Karamjol shows active regeneration but faces challenges such as storm damage and stagnant water, affecting its overall health.

Harbaria

The first subplot features a substantial amount of Sundori seeds on the forest floor and a considerable presence of plastic debris. Despite the dominant Sundori species, no wildlife signs were observed, and bank erosion of approximately one meter was noted, indicating possible environmental degradation. In the second subplot, notable seedling growth is observed, with minimal plastic debris present. Slight deer marks are evident, and the area supports a mixed plant stand. There is no new top-dying of Sundori trees, suggesting relatively stable conditions. The third subplot is relatively wet, with notable crab activity and evidence of Pic signs. The presence of buttress roots in Sundori trees indicates healthy growth, though the wet conditions may affect overall forest dynamics. Harbaria exhibits good seedling growth and minimal disturbance but is affected by plastic debris and bank erosion.

Akram Point

The first subplot at Akram Point shows evidence of illicit tree felling and deer presence. Seedling density is notably low across the stand, with Sundori trees being replaced by Goran and Gewa seedlings. High litter coverage from Gewa shedding and sedimentation issues are also observed, indicating potential disturbances and environmental stress. The second subplot features sedimentation and a Sundori-dominant stand. In third subplot, Bird chirping and bee activities are noted, alongside deer signs, suggesting some level of ecological activity and wildlife presence. Akram Point suffers from illicit activities, low seedling density, and sedimentation, indicating compromised forest health.

Hiron Point

The first subplot in Hiron Point is marked by heavy Gewa litter fall, plastic waste, and siltation. Medium-sized wood debris is present, and tiger pugmarks indicate the presence of large predators. This subplot reveals significant anthropogenic and natural disturbances affecting forest health. In the second subplot, Goran species dominate with minimal litter coverage, suggesting relatively stable conditions with less debris accumulation. The third subplot displays plastic waste and very little wood debris. Gewa leafing in open spaces is observed, reflecting a subplot that may be experiencing less structural complexity and possibly more environmental stress. Hiron Point is impacted by plastic waste and siltation but shows varying conditions with significant predator presence and sparse litter coverage.

Figure 3.20: Tiger Pugmarks

Figure 3.21: Illicit Felling at Akram Point

Figure 3.22: Litter Fall Coverage at Forest Floor

Comparative Analysis of different indicators in Sundarbans Forest Plots

The Sundarbans, a complex mangrove ecosystem, reveals intriguing variations in key ecological parameters across different subplots. This comparative analysis aims to elucidate the distinct characteristics of five specific locations: Sutar Khali, Karamjol, Harbaria, Akram Point, and Hiron Point.

- **Pneumatophores:** The pneumatophore density, which is indicative of the root structures adapted for oxygen intake in mangroves, peaks at Sutar Khali (398,947 per hectare) and remains significantly higher than at Akram Point (114,803 per hectare), suggesting robust vegetative growth in Sutar Khali.
- **Crab Holes:** Similarly, crab hole density is highest at Akram Point (153,213 per hectare), which may imply a greater presence of bioturbation activities there compared to the lower densities observed at Hiron Point (49,444 per hectare).
- **Seedling and Sapling:** Seedling density shows minimal variance across most locations, except for a stark decrease at Akram Point (4350 per hectare) and Hiron Point (5941 per hectare), potentially reflecting lower regeneration rates in these areas. Sapling density follows a similar trend, with Harbaria exhibiting an exceptional density of 15,798 per hectare, which contrasts sharply with the modest counts at Hiron Point (2,122 per hectare) and Akram Point (3,183 per hectare).
- **Canopy Coverage and light Intensity:** Canopy coverage is predominantly uniform across the regions, with Sutar Khali, Karamjol, and Harbaria each achieving a coverage of 99%, while Akram Point trails slightly at 93%. This consistency suggests well-developed forest structures, though the marginally lower coverage at Akram Point may signal some environmental stressors. Light intensity varies notably, being lowest at Sutar Khali and Akram Point (3%), which is typically associated with dense canopy and higher biomass, whereas Karamjol experiences the highest light penetration at 9%, possibly indicating more open or disturbed canopy conditions.
- **Carbon Sequestration:** In terms of carbon sequestration, a crucial indicator of the ecosystem's role in climate regulation, Sutar Khali leads with 145 MT/ha, followed closely by Harbaria (153 MT/ha). Akram Point and Hiron Point, however, sequester significantly less carbon, at 98 MT/ha and 88 MT/ha respectively, underscoring potential disparities in forest maturity and biomass.
- **Diversity:** Finally, species diversity is highest in Karamjol (1.53), followed by Harbaria (0.93), suggesting more complex ecological interactions in these areas. In contrast, Sutar Khali, Akram Point, and Hiron Point exhibit lower diversity indices (0.56, 0.74, and 0.38 respectively), which could reflect varying levels of habitat heterogeneity and environmental pressures.
- In summary, Sutar Khali and Harbaria demonstrate more favorable conditions for both vegetative density and carbon sequestration, while Karamjol excels in species diversity. Akram Point and Hiron Point show less promising metrics across several parameters, indicating potential areas of ecological concern.
- **Lichen Abundance:** According to the study, there were considerable differences in lichen abundance between plots and between tree species. Lichen was most abundant on Dahur and Sundri trees overall, with Kakra, Passur, Gewa, Amoor, Baen, and Goran trees following in order of abundance. (**Figure: 3.23**)

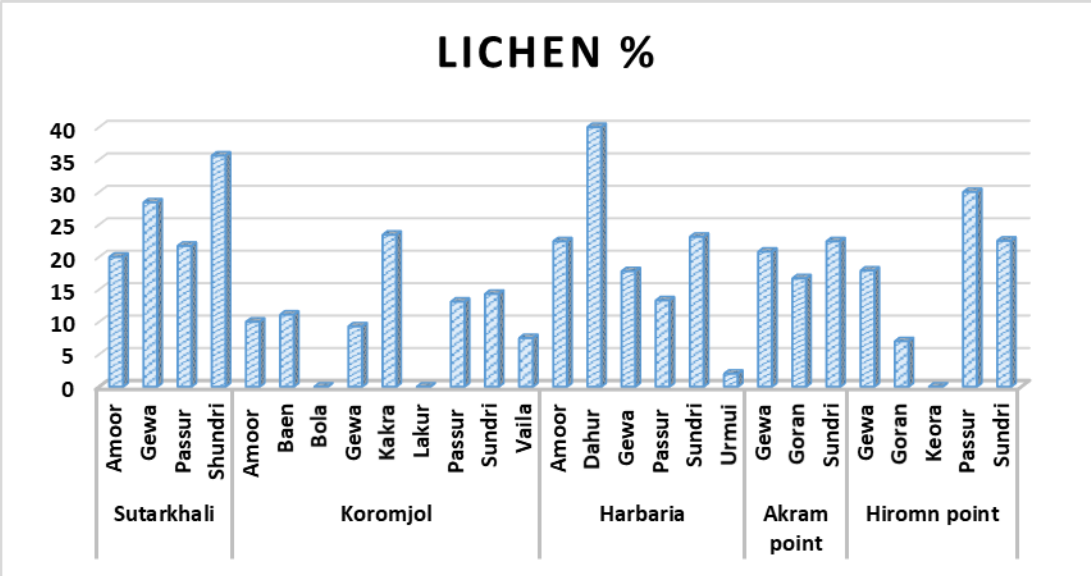


Figure 3.23: Lichen Abundance among the Plots

The Sutarkhali plot, where lichen coverage on Sundri trees reached 35%, had the highest lichen abundance. The lichen abundance in the Akram and Harbaria point plots is likewise significant; lichen covers up to 20% on Sundri trees in both points and 40% on Amoor trees in Harbaria. In the Koromjol plot, where lichen coverage on dominant Kakra trees reached just 23.4%, the lowest lichen abundance was observed. Lichen abundance was low in the Hiron Point plot; just 30% of the dominant Passur trees exhibited lichen coating.

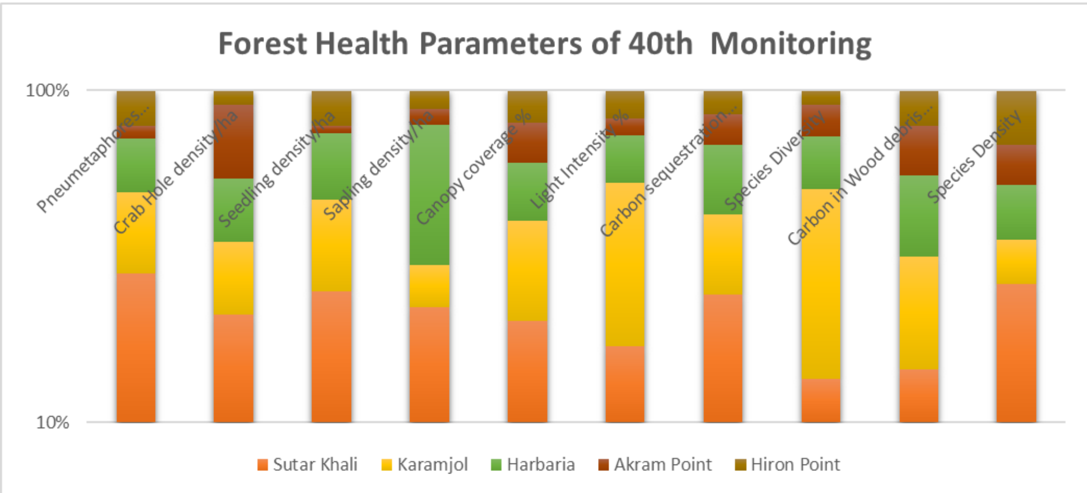


Figure 3.24: Multi Criteria Analysis of Different Parameters in 40th Monitoring Period

A comprehensive multi criteria analysis was conducted using the Arithmetic method (**Figure: 3.24**), evaluating 55 scores to assess the health of different forest plots. With the highest score, Harbaria emerged as the most healthful contender. This supremacy results from having the largest capacity for sequestering carbon dioxide, excellent species variety, and an extraordinary density of seedlings and saplings per hectare. It also emerged as the lichen king. Sutarkhali comes in right behind, earning the second-best score. Its strong condition can be attributed to its outstanding pneumatophore density as well as its impressive seedling, sapling, and tree density per hectare. Furthermore, of all the plots, Sutarkhali has the best potential for lichen abundance. Karomjol, whose score indicates stability, is ranked third. Although it displays a remarkable range of species, it is significantly less diverse than the other plots in terms of species density per hectare and lichen percentage. In comparison to the other plots, pneumatophore density, seedling density, and carbon sequestration potential are all still average. Karomjol and Hiron point while exhibiting balance in other parameters, showed a slightly lower lichen percentage. This subtle dip might be attributed to localized air quality variations or specific microclimatic conditions within the plot. Hiron Point receives the lowest score, reflecting its critical state. This vulnerability arises from the exceedingly low density of seedlings, crab holes, and saplings. Its carbon sequestration potential is minimal, and despite the surprisingly high species density, overall diversity suffers due to the plot's dominance by the Gewa tree. Its scant lichen cover attests to the low quality of the air in this beleaguered forest.

Time series Analysis

Figure 3.25 illustrates variations in seedling density across locations, peaking during the 5th and 6th years in all plots compared to the baseline. ANOVA analysis confirms significant variability ($P<0.05$) at 1000/ha throughout the year and across five Permanent Sample Plots (PSPs). Factors influencing seedling recruitment and survival include canopy cover, soil chemistry, pH, salinity, and organic matter. ANOVA results reveal significant differences ($P<0.05$) in pneumatophore density among plots, highlighting the intricate interplay of intrinsic and extrinsic factors in mangrove ecosystems. Plot-specific variations and the influence of environmental conditions and potential anthropogenic impacts contribute to fluctuations in pneumatophore density. Sutar Khali exhibits the highest canopy coverage and carbon sequestration rates among the locations, indicating robust forest structure and significant carbon storage capacity. However, the species diversity index is relatively low, suggesting a less diverse species composition. The high sapling density and significant carbon sequestration are positive indicators, but the low species diversity could imply ecological imbalances. Karamjol has high species diversity and relatively high carbon in wood debris, which suggests a healthier and more diverse forest community compared to Sutar Khali. The lower sapling density and carbon sequestration rates, combined with high light intensity, may indicate more open areas within the forest. The overall health is good, but the lower sapling density may need attention. Harbaria shows high sapling density and significant carbon sequestration, reflecting a well-established and potentially recovering forest structure. The high species diversity and carbon in wood debris indicate a robust and diverse ecosystem. The forest appears to be in very good health, with balanced ecological parameters. Akram Point has a lower species diversity and sapling density compared to other locations, indicating possible challenges in forest regeneration. However, it has relatively high carbon in wood debris and moderate carbon sequestration, which suggests ongoing carbon storage despite lower diversity and regeneration rates. The overall forest health is moderate, with some areas needing improvement in species diversity and seedling establishment. Hiron Point exhibits a high species density and carbon in wood debris, suggesting a significant amount of organic matter and possibly a dense forest structure. However, the very low species diversity index indicates a less diverse community, which could signal ecological stress or a lack of species variation. The overall health is mixed, with strong carbon storage capabilities but challenges in biodiversity.

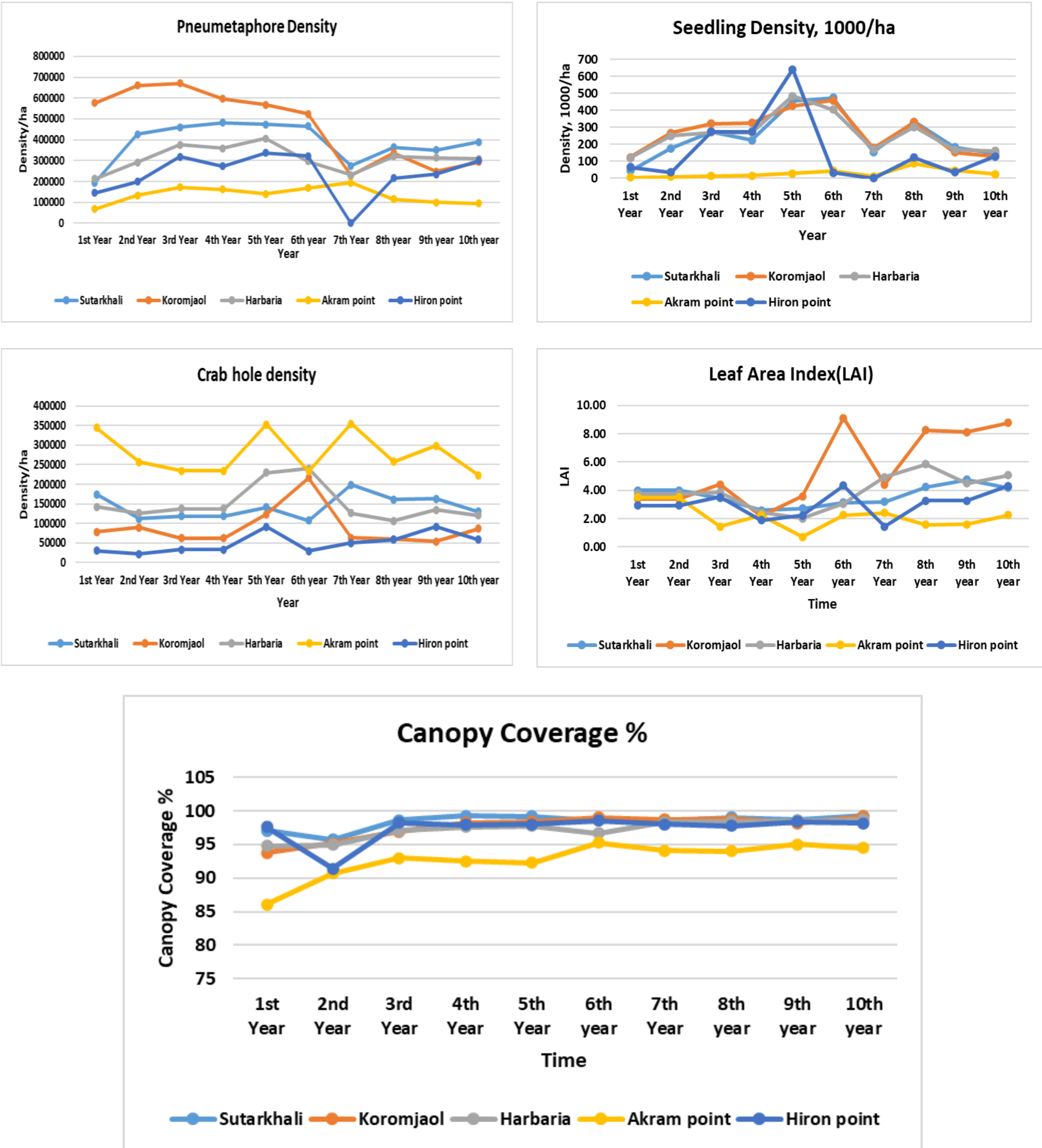


Figure 3.25: Time Series Analysis of Pneumetaphore, Seedling, Sapling Density, Light Intessity and Canopy Coverage among 5 Monitoriung Plots

3.4 Floral Diversity, Species Richness and Species Evenness

The resilience and functionality of ecosystems are greatly influenced by the richness and diversity of their flora, which in turn affects aspects like production, stability, nutrient dynamics, and community organization. Furthermore, the idea of species evenness offers insightful information about the homogeneity within a population. The comparative analysis Table 3.20) of species diversity, evenness, and richness indices between baseline and present monitoring data reveals notable changes across the sample sites in the Sundarbans Reserve Forest (SRF).

At Sutar Khali, a significant decline in species diversity is evident, with the diversity index (H') decreasing from 1.02 to 0.55, and the richness index (R') dropping from 1.24 to 0.50, while the evenness index (J') has slightly improved from 0.32 to 0.39. In contrast, Karamjol shows an increase in species diversity, with the diversity index rising from 1.57 to 2.00, the evenness index improving from 0.40 to 0.79, and the richness index decreasing marginally from 2.11 to 1.19. Harbaria also demonstrates a decrease in species diversity, with the diversity index declining from 1.41 to 0.94 and the richness index from 1.50 to 0.89, although the evenness index has increased from 0.41 to 0.52. At Akram Point, the diversity index has decreased from 1.03 to 0.74, the evenness index from 0.65 to 0.38, and the richness index from 0.34 to 0.67. Hiron Point, which was not included in the baseline data, has a diversity index of 0.36, an evenness index of 0.27, and a richness index of 0.50. These findings illustrate varying trends in ecological metrics across the sites, reflecting shifts in the biodiversity and community structure of the mangrove forest over time.

Table 3.16: Species Diversity Index, Evenness Index and Richness Index of the Monitoring Site in SRF

Baseline Status

Monitoring site	H'	J'	R'
Sutar Khali	1.02	0.32	1.24
Karamjol	1.57	0.40	2.11
Harbaria	1.41	0.41	1.50
Akram Point	1.03	0.65	0.34

Present Status

Monitoring site	H'	J'	R'
Sutar Khali	0.55	0.39	0.50
Karamjol	2	0.79	1.19
Harbaria	0.94	0.52	0.89
Akram Point	0.74	0.67	0.36
Hiron Point	0.38	0.27	0.50

Carbon density

The table 3.17 The illustrates the change in carbon stock density between the baseline and present conditions across four monitoring sites: Sutar Khali, Karamjol, Harbaria, and Akram Point, with an additional site, Hiron Point, included in the present assessment. In the baseline status, total carbon density was highest at Akram Point (123.36 Mg/ha) and lowest at Harbaria (71.44 Mg/ha). The total carbon density has increased in all locations except Karamjol, where it slightly decreased from 118.09 Mg/ha to 110.2 Mg/ha. Sutar Khali and Harbaria showed substantial increases, with Sutar Khali rising from 111.72 Mg/ha to 141.8 Mg/ha and Harbaria from 71.44 Mg/ha to 139.3 Mg/ha. The addition of Hiron Point in the present condition adds a site with a total carbon density of 88.2 Mg/ha. This data suggests a general increase in carbon stock density across most sites, indicating positive carbon sequestration trends in these areas. There are several reasons for this favorable change in carbon storage, which is essential to the health of the ecosystem. One important factor in coastal habitats is sediment deposition, which enriches the soil with organic matter and creates ideal circumstances for the growth of mangroves. Consequently, there is a significant rise in the amount of carbon stored in the soil matrix.

Table 3.17: Mean Carbon Density in Baseline and Present Condition of the four Monitoring Sites

Baseline Status

Area	Sutar Khali	Karamjol	Harbaria	Akram Piont
ABC Mg/ha per plot	70.51	79.47	45.95	82.10
BGC Mg/ha per plot	41.21	38.62	25.49	41.26
Total Carbon	**111.72**	**118.09**	**71.44**	**123.36**

Present Status

Area	Sutar Khali	Karamjol	Harbaria	Akram Piont	Hiron point
ABC Mg/ha per plot	89.6	71.8	89.9	60.5	55.6
BGC Mg/ha per plot	52.2	38.4	49.4	35.2	32.5
Total Carbon	**141.8**	**110.2**	**139.3**	**95.7**	**88.2**

<u>Phenological Behavior</u>

From the last visit, Phenological behavior of major mangrove species was summarized in **Table 3.18.**

Table 3.18: Phenological Behavior of Major Mangrove Species in the PSPs

Species	Months											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
						Leafing						
Sundari												
Gewa												
Kakra												
Goran												
Kewra												
Golpata												
						Leaf Shedding						
Sundari												
Gewa												
Amor												
Goran												
Kakra												
Hental												
Passur												
						Flowering						
Sundari												
Gewa												
Baen												
Amor												

Species	Months											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hetal												
Goran												
Kakra												
Passur												
Fruiting												
Sundari												
Gewa												
Goran												
Kakra												
Amor												
Kewra												
Hetal												
Passur												
Seed/Popagule dropping time												
Sundari												
Gewa												
Goran												
Kakra												
Passur												
Golpata												

Source: CEGIS field visit, May 2024

During field visit leaf emergence, leaf shedding, flowering and fruiting and fruit/propagule dropping recorded for each plot.

Figure 3.26: Flowering at Goran in Akram Point

Figure 3.27: Fruiting of Amor in Karamjol Point

Pest and diseases status

The following **Table 3.19** summarise the observation of disease from last visit.

Table 3.19: Observed Disease in the Sampling Sites

Sl. No.	Symptoms of disease or damage	Species name
1	Tree has ragged leaves with holes	Sundari, Passur, Gewa, Goran, Amor
2	Black or brown leaves	Hetal, Sundari, Goran, Gewa, Amor
3	Spots or bumps on leaves	Passur, Shundari, Goran, Gewa
4	Twisted or mail formed leaves	Sundari, Amor, Gewa
5	Leaves changing colour before fall	Sundari
6	Branch decay	Sundari, Passur
7	Peeling or broken bark or holes in the bark	Gewa, Sundari
8	Dying branches on one side of crown	Sundari, Hetal, Urmai
9	Canker	Passur, Sundar
10	Gull	Passur
11	Hollows	Sundari, Passur, Gewa, Amor, Goran
12	Fungi	Passur, Sundari
13	Green or brown spots	Goran

Source: CEGIS field visit, May 2024

Figure 3.28: Ragged Leaves at Goran in Akram point

Figure 3.29: Hollow of Gewa in Hiron Point

Based on the data presented, a significant number of trees show signs of damage, including hollows in their bark as well as leaves that are ragged, discolored, or perforated. However, the sundari tree is the most severely affected, displaying all the symptoms associated with pest infestations and diseases.

4. Social Environment

4.1 Introduction

Social safeguards refer to the policies, procedures, and measures intended to mitigate unexpected negative impacts of the development projects. This safeguard monitoring is a follow-up study that conducted following the guidelines of DoE and Environmental Management Plan (EMP), suggested in the Environmental Impact Assessment (EIA) Report.

The objective of the social safeguard monitoring is to ensure compliance during the project's construction and operation phases. Though the construction phase is not completed yet, MSTPP has already started its production of the operation phase. The monitoring was held to check the compliance status of the working environment, community safety and security, and impact on livelihoods (due to project intervention), and status of Corporate Social Responsibility (CSR). Additionally, the Corrective Action Plan (CAP) suggested addressing the non-compliance or partial compliance issues based on the findings of the safeguard monitoring.

4.1.1 Methodology

This monitoring was conducted using basic social data collection tools i.e. informal or formal consultation, key informant interviews, group discussions and physical observation applied to collect data from the study area as well as the project management unit. The consultations were held at the MSTPP office and Niramoy Medical Center, where relevant MSTPP project officials provided their feedback in response to the issues of the checklists. In addition, physical observation, group discussion and informal interviews were held with local people and LGIs at different location in the project site and in the study area i.e. Zero Point, Kapasdanga, Barni, Sapmari-Katakhali, Rajnagar and labor sheds in the project area for getting people's/labors views and opinions about the safeguard issues of MSTPP. The monitoring locations are shown in **Figure 4.3**.

4.1.2 Findings of Social Safeguard Monitoring

Impact on Livelihoods

At present, 313 employees are engaged in BIFPCL in which 254 are Bangladeshi including 10 of Rampal Upazila and 59 are Indian employees. In addition, 1322 contractual workers (342 skilled and 980 semi-skilled) are engaged for the operation of the project. Scope of local people engagement as contractual workers has been decreased after completion of the major construction activity of the proposed project. Because most of the local people were engaged in non-skilled and semi-skilled activities during construction phase but in present operation phase, scope of non-skilled worker engagement is quite negligible. According to the local inhabitants of the adjacent unions, they are not recruited in any kind of jobs in the MSTPP since last one years, and previously faced fraudulent in the recruitment of construction activity in the MSTPP.

Community contact person, charged an amount (BDT. 30,000) for recruiting each person in the MSTPP project but could not recruit the people according to the words. In some cases, the work tenure of the victim workers was suddenly shortening and terminated from the work at the middle of it contacted tenure. Sometimes, the recruiting post was much disgraceful than the expected committed post. Also, some of the local people claimed that they did not get the job even after paying the asking amount to that contact person. The MSTPP authority stated that they were not aware about these issues, even no single complain regarding this issue is yet to be received. They also stated that some local laborers are found to be involved in some unexpected occurrence in associate with the security guard at that time.

Therefore, at present, MSTPP management have outsourced a firm for the security force purpose, and that firm bear all sort of related responsibilities. And local people engagement scopes in security guard and other sensitive activities is saturated and questionable as well. However, scopes of engagement in other general activities is still opened for the potential local community.

The authority inaugurated market complexes at the residential area (1st week of November, 2023) where in total 39 shops are allocated for promoting different types of business. In addition, some shops are constructed near the main gate of the project site. During field visit, some of the shops are found to be opened and providing services in both the locations. Also, scope of employment for the wage earners and entrepreneurs are found to be developed near to the project site and it adjacent, especially for non-motorized vehicle operator, food and beverage supply, mobile recharge operator, vegetable/fish/meat supplier etc.

And the people earned well by involving in these activities. The MSTPP authority is also committed for the skill development of the PAPs. In previous, they conducted some trainings on computer literacy and sewing for the development of PAPs. They have planned to initiated some more training with a new dimension and design frame considering the local demand, and available job opportunities in the study area under the financial arrangement of the CSR activity of the MSTPP. But, the process is not yet started due to tremendous efforts of the management for the incessant operation of the plant

Working Environment

Tri-party coordination meeting was regularly held among BIFPCL, BHEL, and other sub-construction companies to ensure safety working environment for the workers. The MSTPP authority (BIFPCL) is committed to ensure necessary safety facilities for the workers. In this regard, before recruiting new employees/workers/labors, all necessary medical tests are conducted for those employees/workers/labors. Also, safety sense of the workers is tested and after passing all of those test and examination he/she has been recruited for assigned tasks. It is to be noted that the BIFPCL bears all the necessary costs of these medical and others tests. The Niramoy Medical Center located in the project area do all necessary support in this regard.

Even, the employees/labors of BIPPCL get necessary medical supports from here in a free or minimum of cost. Generally, the employees/labors have to pay for actual cost of lab test and medicine cost for the ICU (under a discounted rate), but the remaining cost of medicines, consultancy and ambulance services are provided in free by this medical center. In term of health hazard issues, debris are not properly managed yet which has continuously informed in previous phases monitoring report. Because it may cause accidental occurrences in unconscious movement of the workers/employees in the project area. In addition, it is observed that few workers are unwilling to use PPEs during handling the coals as well as work in other components of the plant. They may need proper motivation to use this PPEs and demonstrate it necessity in safety aspects.

Also, flying of the coal dust and ash to the surrounding of the coal handling and transportation sites, is hazardous for the workers, if they did not use PPEs properly. In dry season, sand blows in the project area from the road and open spaces which have been tried to be controlled by splashing the water in the internal roads twice in a day. In case of managing any fire accident in the project area the authority set up own firefighting unit by deployed potential 36 officials and firefighters as well as necessary all equipment including firefighting bus, dresses, helmets etc. A designated place for emergency assembly point is also defined though it might not sufficient to accommodate all the staffs of BIFPCL. In this regard, additional more points will be identified and designated soon for the assembly point. Also, 7 fire points are located at different points in the project area.

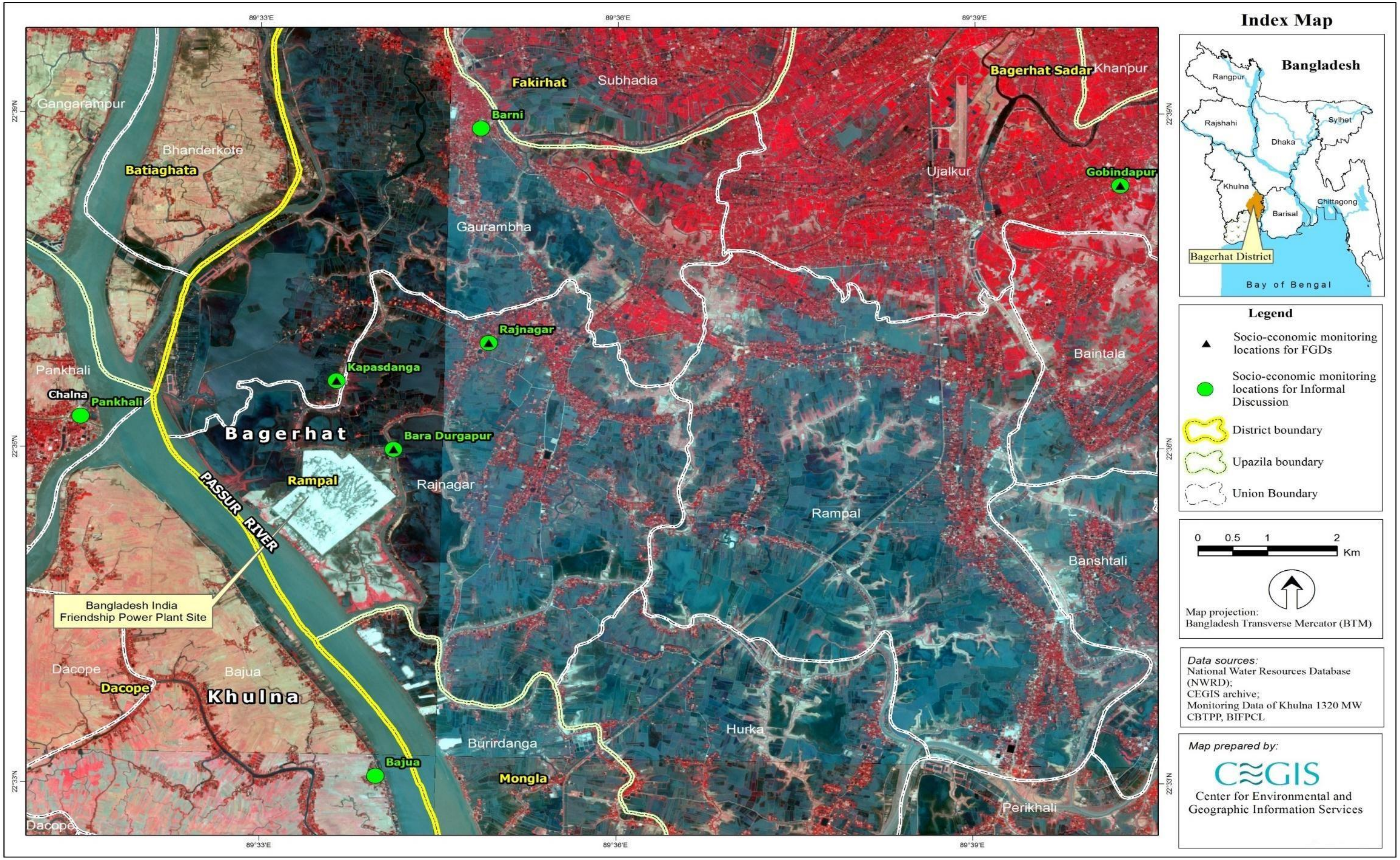


Figure 4.1: Socio-Economic Environment Monitoring Location

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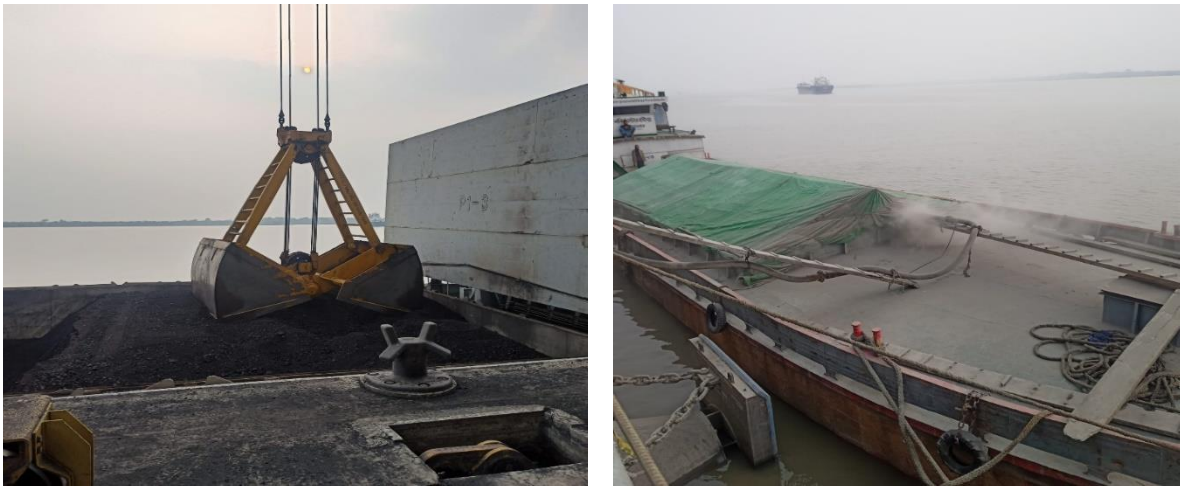
Grievance Redress mechanism

The project authority installed a grievance box for addressing the grievances of the workers but no single grievance yet to be recorded by the BIFPCL. Also, the community-level grievance redress mechanism is not yet developed whereas it's need has been regularly mentioned in the previous monitoring phases. Some grievances are raised in local level related to employment and livelihood issues those are narrated in 'Livelihood Impact' section but they could not able to aware the MSTPP authority in this regard, due the lack of accessibility toward the authority. The community officer of BIFPCL also could not able to communicate with the local people thus people could not able to place their grievances to him as well.

Most of the shop owners of the BIFPCL residential complex and near to the 2nd gate of the plant showed dissatisfaction about the financial returns of their business. They claimed the unauthorized shops located in the project site and it adjacent for this situation and complaint to the authority to evacuate those unauthorized shops. Also, claimed that rent of their shop is too high to arrange it through their existing business which they expressed to the manager of BIFPCL. The BIFPCL manager replied that they already evacuated the unauthorized shops in their premises, but there have limited scope of decreasing the rent because there was a written agreement under this rent for a certain timeline. So, after completion of the agreement scope of this negotiation can be possible however manager placed the issue to the high official and no decision is yet to be taken in this regard.

Community Health and Safety

The community people stated that at the beginning of the operation phase, they faced unbearable noise, and sudden acute liquid waste discharge to the canal which was occurred due to some fault in the power plant and mitigated immediately, and no such problem was found further. At present, flying of coal dust from coal loading - unloading and carrying activities is an issue of health hazard for the working labors and community. Some mitigation measures are found to be used by covering the coal in terms of it carrying and loading-unloading activity, but it is not up to the mark standard. Also, it requires 6 hours to carry and loading of fly ash and coal on a lighter vessel, and during this time huge noise is generated incessantly from the entire process that is harmful to the workers as well as human and biodiversity of the surroundings.



Source: Field Survey, May 2024.

Figure 4.2: Coal and Fly Ash Handling Process in the Project Area

Corporate Social Responsibility (CSR)

Under the CSR activity, the MSTPP authority arranged rallies in the national events during the tenure of this quarter and arranged school kits distribution at the school in Burirdanga Union adjacent to the project area. They also arranged a drawing competition for the children of the BIFPCL staff in the project premises. In addition, Labor camp has been arranged once every month during this tenure to provide free medical support for the project workers.

Apart from this, under the supervision of the project authority 11 ROs are operated which are initially installed by the BIFPCL to ensure safe drinking water for the local community. Among the 11 ROs, 2 are not functional due to lack of financial arrangement for it operation as well as technical default in operation.

It is noted that local people have limited skill in present livelihood scopes, generated to the project area and it surroundings, and requested to the project authority to arrange livelihood improvement training for them in considering those scopes under the CSR activity.

RO System Installation

Nine ROs out of 11 are found to be operated in this quarter. However, 1 RO in Prasadnagar village is temporarily non-functional due to non-cooperation of local people in electricity bill payment which is not yet resolved. And 1 RO in Burirdanga Union has been temporarily damaged during the road construction activity which causes temporal non-functional of that RO. The BIFPCL installed these ROs and have the responsibility of maintenance for a certain year whereas the operation costs were managed by the users which is sometimes difficult to arrange by them. It is noted that complain of illegal water connection from the Sayrabad RO is not addressed which cause interrupted water supply up to end of the water pipeline, though it was raised in previous monitoring reports.

Celebration of National Victory Day

In the National Children's Day of the country, school kits were distributed in GMS High School and a primary school in Burirdanga Union. The authority also arranged a drawing competition for the children of the BIFPCL staff in the project premises where about 60 children participated in the competition. At the end of the session, the prize - giving ceremony was held by the chair of GM, BIFPCL.

Figure 4.3: School Kits Distribution and Drawing Competition in National Children's Day

Source: Field Survey, May 2024.

Medical Facilities

Medical facilities are provided under the direct involvement and supervision of Niramoy Medical Center of BIFPCL. OPD, laboratory test, physiotherapy service and labor camp medical services were provided during this quarter. The services of the medical center remain same as previous.

Figure 4.4: Medical Services for the Community People in the Niramoy Medical Center

Source: Field Survey, May 2024.

According to the report of the Niramoy Medical Center, in total, 2531 patients receive medical services from February 24 to April 24, in which highest 1793 patient received services from the OPD. Detail of the gender specific service receiver in reflected in the Figure 03 & Figure 04.

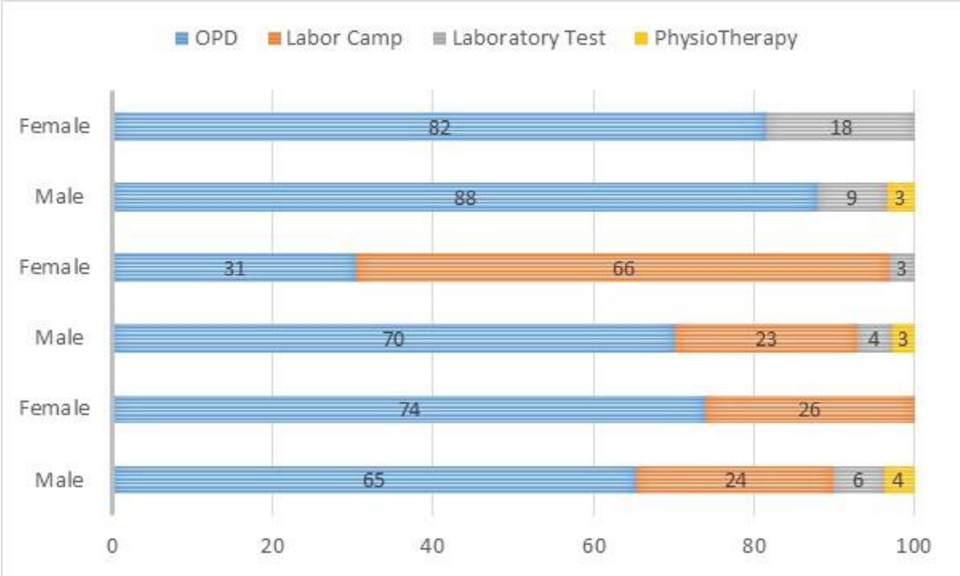


Figure 4.5: Medical Services from February 2024 to April 2024

Source: Niramoy medical center, May 2024

Autonomous Development People Expectation to MSTPP

The autonomous development scheme was same as previous. No such development project is found to be initiated in the project surrounding areas.

However, people of the Durgapur Village expecting construction supprot from the MSTPP authority regarding construction of safe bridge in two specific points (marked in the picture below and same in the previous quartarly report) for connecting the local inhabitents with the MSTPP Approach Road. It is beyond the scope of MSTPP, but the authority is the most powerful and influencial stakeholders in this upazila.

Recommendations

a. Recruitment of local laborers is limited at this operation phase, but, whenever local labors are required then it should be recruited through a proper process, by direct recruit under an open circular system without engaging by any mediator;

b. Local people have limited technical knowledge align with scope of works in the MSTPP, therefore authority should train up the local potential work force in the align scopes of the MSTPP i.e. training on driving, cooking and others;

c. The communication officer of BIFPCL was found less interactive compare to the performance of last 1-2 years. The communication officer should have intensive communication network with the representatives of unions to placed their necessary requirement in the community;

d. The MSTPP authority should place the scope of CSR services to the monthly coordination meeting of the respective unions so that it can be easily disseminate to the community. Because most of the local people are unaware about their support services and offers;

e. The households resettled at Foyla Shelter Home should also be given preference under CSR program (i.e. van distribution, providing floating businesses arrangements etc.) as they are seriously affected by the project, and still under livelihood rehabilitation;

f. A grievance box for the local community level is a must and it should be established to the main gate of MSTPP with maintaining proper security system. An authorized grievance redress committee (GRC) should be formed to monitor and resolve the locally raised problem related to the MSTPP;

g. Debris should be properly managed in the construction yard. These are harmful and may occur serious injuries in the project area;

h. The authority should have more careful in terms of coal handling issues, because coal dust and fly ash are found to be flew in loading and unloading locations, though the quantity is not in significant at all, however, it is a matter of caution;

i. Re-initiation of plantation program is undoubtedly a good step of the authority and it should be continuing according to the commitment of planting 3 lac trees within and surrounding of the project area; In ROs operation, more motivational activity is required for understanding about the scope of RO's operation. Because, in most of the place's user are not properly cooperate in electricity bill payment.

j. Problem in Sayrabad RO, Prosadnagar RO and Burirdanga RO should be solved through direct intervention of the project authority. In this regard, they should communicate with the Chairman to resolve this issue soon and ensure the service for potential communities. In emergencies, the authority can take support of the law enforcement agencies.;

k. The local people expecting some supports from the MSTPP authority, to construct two bridges over the Maidara Khal which may connect the villagers of Durgapur to the Approach road of MSTPP; and

l. The CSR activities should be audited by a third party to detect the engagement of potential members under the CSR activities.

5. Environmental Compliance

5.1 Introduction

The purpose of this environmental compliance report is to draw attention to any instances, real or imagined, in which Bangladesh-India Friendship Power Company Ltd. (BIFPCL) is trying their best level to comply the standards and guidelines and mitigation steps outlined in the EMP measures in the EIA report. The report will show the steps necessary to guarantee that all supply chain operations, from the deployment of raw materials to the production of electricity, are consistent and comply with DoE conditions as well as the Environmental Management Plan (EMP) requirements stated in the EIA report. It will do this by providing an operational translation of local laws, international standards, and company codes. However, on 7th May 2024, an E&S team from CEGIS comprised with diversified expertise, paid a routine inspection to the plant in order to gather the necessary data, considering the bio-physical and other relevant parameters. This was done through a thorough walk-in visit, meetings with plant officials, general laborers, and overall, close observation of the ongoing work at the plant.

The present environmental compliance monitoring includes the status of EMP implementation based on physical observation, investigation and interviews/discussion to the proponents, project officials, relevant authorities and overall staffs of the entire plant. A comprehensive and detailed checklist was prepared to cover environmental compliance of different components e.g., Environmental and Social Management System and Action Plan; Laborer and Working Condition; Community Health, Safety and Security; Biodiversity and Sustainable Management of Living Natural Resources, waste management and other relevant issues. Unlike the previous couple of environmental compliance monitoring report, this quarterly report will focus on waste generation and its management in and around of the main plant and laborer shed. It is noted that during 40th field visit we identified and requested to the respective authorities to take necessary measures for a set of anomalies regarding waste generation and its proper management. During 40th visit we went across again on those issues and found the same situation. Along with the previous issues the CEGIS team identified the following things that need an extra attention:

- Current Dredged material disposal practice seems unsustainable and harmful for the environment and the adjacent biodiversity. Proper dredged material disposal plan is highly recommended. We have discussed this issue in the meeting where a concurrence has made to develop the Dredged Material Disposal Plan (DMDP) as soon as possible. The MSTPP authority assured that they will develop a SoP in this regard soon
- Coal Conveyor belt from jetty area to 1st Transportation Point (About 20 to 25 m) found still uncovered and lack of integrated dust control system allowing the coal ash to be dispersed in the air and nearby water body. Also, the grabber of the excavator was not enclosed that is also causing the air and river water pollution.
- Coal transportation vessels was uncovered that may cause the deterioration of water quality of the river by dispersing the coal ash. While unloading the coal from the vessel, it is observed that there was no grabber that cause the coal ash flying and mixing with river water.
- Heap of Sand and other loose material were found uncovered at the laborer shed and inside the plant premises.
- Plantation program is still behind. Based on the discussion, CEGIS team came to know that plantation program will start soon within the plant premises.

- CEGIS raised this issue in the meeting to consider as urgent and the authority assured us to take immediate step to resolve these issues. In general, 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 sensitive areas (Labor colony, township) and compared with the ECR-2023 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. • Workers at heavy noise generating activities (i.e., piling, rod cutting etc.) have been provided PPE (ear plug and ear muff) and its usage are being ensured through safety audit. • Idle machines / equipment / generators are switched off / throttled down. • Generators with acoustic enclosures are only being used as and when required. • Signboards regarding noise permits were not observed at site. The workers at the coal unloading area seems reluctant to use the ear plugs though the proponent provides them, while CEGIS team talks with the workers and advised them to use these properly to avoid permanent hair impairment.	Complied	• 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 • CEGIS team talks with the workers at the jetty area and advised them to use the ear plugs properly to avoid permanent hair impairment.
2	Dust generation from construction works	• Limiting activities for producing fugitive dust particle within project area	• Monthly and quarterly air quality monitoring in and around the project sites is being	Mostly Complied	• It is strongly recommended to cover-up all the Stockpiles of sand or any type of loose

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/ Measures already Implemented	Compliance Status	Recommended Action
		• 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 • 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.	conducted and checked with ECR, 2023 standard. • Crushed material, stone chips were well covered and also noticed the water spraying at those areas. • Continuous water spraying on the dusty road was noticed. BHEL has contracted a company for 3 years for this job. • Unlike the previous visit, some stockpiles of sand and other loose material were noticed uncovered. • Now-a days, earthen stock piles are covered by natural green of tiny grasses. These are acting as shield cover for fugitive dust • No black smoke observed because of plant and equipment are well maintained. • Visual monitoring of dust is also being conducted. Appropriate freeboard was observed in the loaded truck		materials inside the plant premises and at the labor shed/camp. • Face musk should be use wear throughout the workplace.
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	• Surface water is regularly monitored. Most of the time the discharge water quality has been recorded within the standard limit (ECR, 2023) • Waste water discharge due to construction activities is minimum and need based only. They are also meeting effluent norms. • Most of the permanent drainage channel were found blocked by depositing earthen materials and other construction waste.	Mostly Complied at present	• Good housekeeping at workshop and construction site is strongly recommended • All the drainage channel must be cleaned immediately for proper and quick drainage of the stagnant water. • Waste water must have to be treated properly before final discharge into the river.

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/ Measures already Implemented	Compliance Status	Recommended Action
		• 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: 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 2023.	• There are two nos. of runoff settling ponds to settle the silt before discharge in to river. • Waste water is being discharged in to the Maidara river without any further treatment. • Temporary chemical lab has been established where turbidity, PH, alkalinity, conductivity, chlorine, iron (Fe) parameters are being tested and monitored. • Drinking water is being supplied from M/S ABM / Canopass (1m3) RO water processing plant that is also being complied with ECR 2023 (Bangladesh). • A dedicated RO plant (5 m3) has been placed at Padma Abasan (temporary township) for drinking water. • ETP plant construction is almost finished where the effluent will be further treated before final discharge. Training and awareness programs are being conducted 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.	• During the visit, CEGIS team found most of the construction waste are compiled at the demarcated place but more attention is required to manage this practice as some wastes were scattered here and there. • Most of the Laborer shed/camp area were found very dirty. Organic and inorganic waste were found on the roads/lanes inside the	Partially Complied with many lacking	• Strongly advised to keep the footpath of the laborer shed clean and waste free. • Proper and immediate step need to be taken for the lavatory sewerage waste management at laborer shed

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/ Measures already Implemented	Compliance Status	Recommended Action
		• 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. • 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	camp which are spreading the stench around the camp community. • 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 650 different colored waste containers 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.		• 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. But still there is no progress in this issue.

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/ Measures already Implemented	Compliance Status	Recommended Action
5	Compensation and Resettlement	• Proper resettlement action plan (RAP) 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 Compensation under Law (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 (women, children, ethnic minorities, indigenous people etc.)	• 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. • 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 12 affected families were stayed at Foyla cluster villages, at present 6 affected families are found to be resided and remaining are left this shelter because of unavailability of livelihood. • BIFPCL is giving priority to affected people in project employment or trained them as much possible. • 136 indirectly affected people were given compensation by the DC Office, Bagerhat. • In terms of generating new scope of employment, it is observed that about 300+ non-motorized vehicles move to the approach road of the MSTPP. Also, tea-stalls, mobile recharge services, food and beverages, restaurants, vegetable selling shops, fish market, meat shops and mobile banking services are found to be located beside the approach road and the residential and labor camps area of the MSTPP. In the market of the MSTPP, total 39 different types of shops have been constructed of which 25% of shops (9 in	In the process of Compliance	• The CSR activities should be oriented towards the affected people or household mostly; • CEGIS team advised several times to collect the original copy of compensation disbursement to the affected peoples from local DC office but this is not done yet. The CSR activities should be audited by a third party especially where the scope of engagement of community people may exist;

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/ Measures already Implemented	Compliance Status	Recommended Action
		Provision of monitoring the compensation and resettlement process	number) will be distributed among the local PAPs who were the owners of the project land. 17 families got their residence who have shifted their houses from project area to Kapashdanga.		
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). • At present, 313 employees are engaged in BIFPCL in which 254 are Bangladeshi including 10 of Rampal Upazila and 59 are Indian employees. In addition, 1322 contractual workers (342 skilled and 980 semi-skilled) are engaged for the operation of the project. • Provisions has been kept for health facilities to the labors as well as for the communities. • The wage of the labor was found compatible with the national standard. • The Khulna-Mongla Road Road and the approach road seems well developed. Roads inside the plant premises are paved by concrete. • Quantity of toilet compare to the laborer seems inadequate Inadequate drainage facility of lavatory waste made the whole workers camp very unhygienic.	Partially complied	• Drainage and sewerage facility must be improved for proper lavatory waste management. 1 toilet for 10 people should be ensured for the Laborer.
7	Green House Gas Controlling Measures	• Restriction of any kind of solid waste disposal	• The EPC Contractor is using relatively new equipment and vehicles to reduce the GHGs emission.	Partially Complied	• Segregation of the green and food waste must be the top

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/ Measures already Implemented	Compliance Status	Recommended Action
		• 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	• 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. • Transportation vehicles observed with the appropriate load. No waste burning activities noticed inside the plant premises.		priority for the waste management team. Solid Waste Management (SWM) system inside the plant should be enhanced

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;	• BIFPCL is running through the HR polices and switching their professionals as per demand of the project. • Based on the conversation with HR manager CEGIS team found all the agreement for the direct workers are well maintained. • No discrimination was recorded among at labor level between local or migrating labor in Bangladesh	Mostly Complied	• Create fund to support the laborer and his families in case of any fatalities • Community GRM box should be placed outside of the plant premises.

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual measures already Implemented	Compliance Status	Recommended Action
		• Grievance Redress Mechanism.	• BIFPCL has ensured minimum wage and working hours for the laborer as per GoB rules and regulation. • GRM procedure is available for the project workers and officials. • Community GRM box still absent.		
2	Protecting Work Force	• 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's education, or to be harmful to the child health or physical, mental, spiritual, moral, or social development. • No Forced Labor	• CEGIS team visited all part of the construction area and found no children involve in the construction and any other works. • No forced labor has been recorded during the project tenure. • Proper documentation of contract with the worker is being maintained which includes age limit, working hour, wage and benefit. • Workers get the safety clearance before initiating any work like. Routine checkup of the work places and administrative clearance is being Implemented	Complied	• Complied but this should be continued strictly till the end of the pandemic.
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	• 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, safety shoes, gloves and face masks. • Fire-fighting system: Fire extinguisher - Foam type-27 no's, Soda type -Nil, DCP type-327 no's and CO2 type- 215 no's have been kept at different places of sites.	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
		• 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 (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	• In addition to this, two (02) NOs of fire fighting vehicle, two (02) NOs of ambulance with doctors are also available at sites. • Induction trainings and awareness program were given to 355 NOs of participants work force during month. • Regular Safety talk, safety meetings are being organized at site and also in class rooms. Photo are being attached. • Through safety park, continuous training on different issues is being given. • 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. • Total Recordable Injury Frequency Rate (TRIFR) and Lost Time Injury Frequency Rate (LTIFR) are being followed.		

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual measures already Implemented	Compliance Status	Recommended Action
			• Warning sign, speed limit and convex mirror have been displayed at the strategic locations.		
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. • Zero major accident/ incident happened from 21st April 2021 till now except some minor injuries. • Regular Safety talk, safety meetings are being organized at site and also in class rooms. Photo are being attached.	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 laborer habituated 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	Complied	

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual measures already Implemented	Compliance Status	Recommended Action
			• 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 laborer association identified yet to look after workers 'well-being issues		

Table 5.3: Monitoring of Community Health, Safety and Security

Sl. no	Potential Impacts	EMP measures as proposed in the EIA	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 from Bridge area to Jetty 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 team from CEGIS is routinely communicating with the nearby communities for assessing impacts and related complaints on dust generation issue. • CEGIS team regularly monitors the noise level in the ambient area of the project site	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.

Sl. no	Potential Impacts	EMP measures as proposed in the EIA	Actual measures already Implemented	Compliance Status	Recommended Action
			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 in terms of Noise generation		
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. • 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.	Mostly complied	Recommend and advise in each quarterly meeting to initiate the community GRM procedure so that the local community could easily state any grievance properly. But this issue has yet to be done. Community GRM box can be placed outside of the main entrance.
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;	• Boundary wall construction is almost completed except some part from Bridge area to Jetty area. • Initiated 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 were observed. And if required entry pass is being checked	Complied	• Keep on tack about the communicable disease transmission between the labors and nearby communities • Again, a grievance Box is strongly recommended for the community to raise their complaints.

Sl. no	Potential Impacts	EMP measures as proposed in the EIA	Actual measures already Implemented	Compliance Status	Recommended Action
		• Maintaining open communication channel with the local community; • Training and instruction to the security personnel about their behavior and communication with the local people; • Aware the security personnel about the right of the community people.	by the security guard to enter the project site area. • 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. • 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.		
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; • OPD, laboratory test, physiotherapy service and free medical services are found to be continued in this quarter. In addition, free dengue test is recently included in the services. • In this quarter, 4 new RO/clean water distribution systems are added with the previous 5 ROs operated in Rajnagar, gaurambha and Burirdanga unions.	Complied	• BIFPCL may introduce awareness program for STD and other transmitted diseases from workers to the community.

Sl. no	Potential Impacts	EMP measures as proposed in the EIA	Actual measures already Implemented	Compliance Status	Recommended Action
			• BIFPCL arrange regular weekly health service program (medical consultation and free medicine) for the local community considering the Dengue situation. • EPC contractor is training up the labors about protective action taken to avoid vector borne diseases and HIV positives and any kind of pandemic to prevent transmission to the local community.		
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 • BIFPCL took initiatives and provided computer training for generating ICT skill among local people. Besides, BIFPCL have also plan to initiate skill development trainings on electric and electronics, driving, painting, welding, health and hazard safety, fittings, etc. • Feedback of the computer literacy training is not at all satisfactory where none of the trainees applied their training skill in income generating activities yet. Therefore, before arranging such training in further, local interest and demand should be assessed.	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 (24x7) continuously for developing relation with local communities.	Mostly Complied	• BIFPCL may use print media, social media, digital media for spreading the accurate updated project information

Sl. no	Potential Impacts	EMP measures as proposed in the EIA	Actual measures already Implemented	Compliance Status	Recommended Action
		• Organizing environmental and social awareness programs/meetings.	• Social expert from CEGIS also use to visit the nearby community at quarterly basis to get their opinions. • Regular consultation meetings are being carried out with the local government and administration • 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 the project related important issues to 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 to discharge waste water from the plant premises has blocked by earthen materials and other construction waste. • EPC Contractor is monitoring the water quality on monthly basis at every outlet of the project site and comply with the ECR 2023 standard • Though there are two settling ponds to settle the silt from Rainfall, runoff and other construction water but the waste water is being discharged to the Maidara river body	Partially complied	• Drainage channel should be cleaned immediately to run the stagnant water from the plant premises.

Sl No	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/ Measures already Implemented	Compliance Status	Recommended Action
			without any proper treatment. This is very concerning in terms of aquatic biodiversity and water quality.		
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 now a days. • Limiting the vegetation clearance within the Project boundary especially around the ash impoundment. • Based on the MoU signed with Forest Dept., Bangladesh out of 2 lac saplings in 3 years, 84,000 plantations have already done. 1000 plantation has done by the side of township area and another 2000 will be done soon. Recently, additional plantation of 105000 saplings have been permitted by the BIFPCL and execution of the plantation has been targeted to be accomplished by 2026 by the BFD, Bagerhat. • They are maintaining the EMP measures in a desired way for protecting the adjacent ecosystem. • No alien species has been recorded • 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	Being Complied	• Advised to finish the unfinished plantation ASAP. • Regular monitoring of the planted trees. • Reduce the rate of mortality at the sapling stages. • Top soil management should be strictly followed.

Sl No	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/ Measures already Implemented	Compliance Status	Recommended Action
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. • CEGIS team has observed lots of construction waste dumped by the side of Maidara river bank that may cause water pollution. • 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. • Maidara river bank side should be cleaned immediately • Proper protective measures must be taken to take care of Dolphin community

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. Both units are now under operation	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. The progress is as follow: • Effluent Treatment Plant (ETP): Civil works of ETP has completed and rest of the works are underway	Being Complied.

Sl. No	Condition of DoE	Compliance Status	Remarks
		• Electro Static Precipitator (ESP): Under operation • Flue Gas Desulfurization (FGD): Under operation. • Desalinization plant: Completed • Low NOx burner: Completed **Online air and water quality monitoring system:** Steam and water quality analysis system has already been developed. For air quality monitoring DoE has already installed one device to monitor the online air quality data at Padma Abashan area and four (04) other devices has installed by BIFPCL around the plant premises which is now fully functional where SPM, SO_x, CO, NO_x, O_3 etc. are being monitored. Along with those measures, environmental compliance monitoring is also being continued in the project site in order to assess the 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 were very satisfactory. Proper PPE and scaffolding structures were 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.

Sl. No	Condition of DoE	Compliance Status	Remarks
8	Environment friendly construction and development practices shall be followed that minimize loss of habitats and fish breeding, feeding & nursery sites.	Most of the construction activities has finished but still if any construction activities along with the coal transportation system will be followed through best practices and according to the EMPs of EIA Report. As the environmental monitoring survey does not have any noticeable 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. Along with that quarterly community visit is also being conducted by a CEGIS social expert. 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 sanitation facilities but not adequate for the workers. The ambient environment of the laborer camp seems unhygienic in terms of waste management. Drainage facility of Lavatory waste from the laborer camp is unsatisfactory.	Being Complied Proper Waste management around the laborer shed must be ensured as soon as possible.
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 operating machinery close to sensitive receptor like near the labor camps and residential areas are being avoided.	Being Complied

Sl. No	Condition of DoE	Compliance Status	Remarks
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.	Being Complied

Sl. No	Condition of DoE	Compliance Status	Remarks
		• As a part of emergency response plan emergency contact numbers contained laminated poster has noticed beside the construction site. • Proper PPE and scaffolding have been observed during the field visit.	
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 2023 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.	• Many parts of the permanent drainage channel have blocked by the earthen materials and other construction residuals. This has created the water logging in the drain and thus created an unhealthy situation for the workers and its ambient environment. • Sand piles and other construction loose materials were noticed uncovered. • Plenty of construction residuals has been kept by the side of the Maidara river bank.	Partially complied. • Proper housekeeping is strongly recommended. • Strongly advised to cover up the sand pile and other loose material • Construction residuals should be placed at the demarcated place. • Maidara River bank should be cleaned immediately.
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.	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 deposit the sediments coming with	Being Complied.

Sl. No	Condition of DoE	Compliance Status	Remarks
		the storm water and finally discharge relatively sediment free storm water through the drainage line.	
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 extraction and bag filters at unloading areas and at each transfer points on the conveyor system.	Entire coal handling system is designed and constructed as an enclosed conveyor system as per DoE requirement. During the field visit it is observed that about 20 to 25 m coal conveyor belt is still uncovered that is allowing dispersion of dry coal ash. 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 Main Plant EPC contract package. Refer Section (V), B4 of Technical Specification. During the 40thfield the authority assured the CEGIS team to complete the unfinished work as soon as possible.	Mostly Complied
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 for both units are now under operation that will control the dust emission.	Compliance action initiated.
21	Coal should be stored in a covered storage yard.	Based on the 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. Out of 4 coal stockyards, construction of 2 stockyard is fully completed and the construction of remaining 02 stackyards are about to finish.	Being complied

Sl. No	Condition of DoE	Compliance Status	Remarks
		Automated moisture sensor has observed to protect coal self-combustion.	
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. The ash dykes are in operation.	Being complied
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.
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 ash silos is underway.	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). **<u>Status:</u>** • Bottom Ash Intermediate Silo structural erection completed. • FA Pipe rack and piping work are almost completed.	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. BPDB prepared an assessment (Livelihood	Compliance action continued

Sl. No	Condition of DoE	Compliance Status	Remarks
		Restoration Plan) regarding the rehabilitees (including those who do not own land) for this Power Plant. As per the recommendation in the LRP, an NGO "SAMAHAR" has completed their assigned tasks regarding this issue. This monitoring has recorded that DC office has rehabilitated around 32 families at Foyla and 17 families at Koigardaskati.	
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 mechanical and construction residual are being kept at demarcated places. But during the field visit it is observed some unused construction materials are scattered in different places without any proper management. 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. 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. This is not done yet. For this purpose, the Induction training has been provided but not sufficient.	Compliance action initiated Establishment of WMC is behind

Sl. No	Condition of DoE	Compliance Status	Remarks
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.
34	Air, water, soil, biological and social data should be monitored regularly with a network monitoring	All these stipulations have been included in the technical specification of Main Plant EPC contract package. (Section-V,	Compliance action initiated.

Sl. No	Condition of DoE	Compliance Status	Remarks
	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.	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.	
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.	Steam and water quality analysis system has already been developed. Air monitoring system in under developing stage. DoE has already installed one device to monitor the online air quality data at Padma Abashan area which is now functional and four (04) other devices has installed by BIFPCL around the plant premises where SPM, SO_x, CO, NO_x, O_3 etc. are being monitored. • 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
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	Being complied

Sl. No	Condition of DoE	Compliance Status	Remarks
		items/events maintain the health and safety protocol of the construction site.	
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. Two (02) RO plant has already been constructed by project proponent to fulfill the demand of potable fresh water and construction purpose. Moreover a 1200 ft deep tube well has observed near the ABM RO plant. Based on the discussion with project authority this tube well is for the emergency usage. Proponent also 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 officer 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 is 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	Most of 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	Being complied

Sl. No	Condition of DoE	Compliance Status	Remarks
	to the Bagerhat District Office, Khulna Divisional Office and Headquarters of the Department of Environment simultaneously.	prescribed offices of DOE. This practice will be continued till the end of the project.	
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 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 available and its location (standby transport, medical facilities, etc.). Weather conditions Current operations (abandoning the site, firefighting, etc.)	No single emergency incident has occurred since April, 2021. Though the intensity of COVID-19 transmission is currently low, we recommended to use the primary precaution measures. But during 40th field visit we observed most of the workers were reluctant to use the face mask. Face mask is not only effective for anu kind of viruses but also for the fugitive dust generated from the construction and operation activities. 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	Complied at present Face-mask usage should be ensured Recommended to take Extensive preventive initiatives to control Dengue outbreak

Sl. No	Condition of DoE	Compliance Status	Remarks
		by the EPC and proponent significantly improve the safety system of the project. • Recent dengue outbreak has considered top priority by the authority. As a part to prevent the dengue outbreak proponent has taken some precaution measures like fogging for mosquito control, aware all project personnel to close their window after sunset, use mosquito net etc.	
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 any kind of pandemic or any emergencies. 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.	Being Complied CEGIS Team has strongly suggested to finish the unfinished plantation as soon as possible

Sl. No	Condition of DoE	Compliance Status	Remarks
		• 87,000 sapling plantations have already done. Recently 1000 plantation has completed by the side of township area and another 2000 will be planted soon.	
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 has 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. Under CSR activities, they provided free medical facilities, livelihood and skill development trainings, installation of ROs for ensuring safe drinking water for the community people, distribution of school bags, umbrella, blankets, wheel chairs etc for the local students and other people, and contributed in local cultural and national festivals. In the National Victory Day of the country, rally and discussion session were arranged in the MISTPP premises where the MSTPP officials and local people were participated. Country's victory and effort of the freedom fighters were discussed in the session and respected freedom fighters and their family members are rewarded by the project authority. Participants enjoyed and praised to the MSTPP authority for this arrangement.	• In the process of compliance • The CSR activities should be audited by a third party especially where the scope of engagement of community people may exist;

Sl. No	Condition of DoE	Compliance Status	Remarks
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	Being Complied
57	Any injunction on this Project from the Honorable Supreme Court/High Court Division shall render this approval void.	Noted by BIFPCL	Being Complied
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, 1st unit of the Plant is in operation phase and the 2nd unit in underway. 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 m+5 m flu-can= 275 Meter). Flue liner erection completed and ready for Boiler light up (pic attached). • **DM water plant:** DM water plant has completed. • **Effluent Treatment Plant (ETP):** Civil works of ETP has completed and now the mechanical and instrumental works are under way. • **Electro Static Precipitator (ESP):** Completed and ready for operation. Air Tightness test completed for all 04 pass. • **Flue Gas Desulfurization (FGD):** FGD for Unit-1 is ready for operation. Absorber tower structure under progress for unit 2 • **Desalinization plant:** Completed • **Low NOx burner:** Completed • **Online air and water quality monitoring system:** Steam and water quality analysis system has already been developed.	Compliance action initiated

Sl. No	Condition of DoE	Compliance Status	Remarks
		For air quality monitoring DoE has already installed one device to monitor the online air quality data at Padma Abashan area and four (04) other devices has installed by BIFPCL around the plant premises which is now fully functional where SPM, SO_x, CO, NO_x, O_3 etc. are being monitored. • **Settling pond:** Two (02) **s**ettling ponds has already been constructed to settle down the silt before discharge in to the river. Moreover, BIFPCL has got the Environmental Renewal Certificate each of the year through maintaining the conditions of DOE.	
59	This EIA Approval has been issued with the approval of the appropriate authority.	BPDB and BIFPCL are thankful to DoE.	Complied

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 about to finishing 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 is 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 related 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.	Coal Transportation for the Proposed 2x660 MW Maitree Super Thermal Power Plant Project has commenced. So far there is no issue noticed regarding impact on the surrounding environment or natural resources from the coal transportation activities.	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 for the entire jetty construction period. They have developed a skilled manpower and system for ensuring the EMP during operation stage as well.	Suggested to comply at operation stage.
6	Any heritage site, ecologically critical areas, and other environmentally, religious and	There is no Religious and Archaeological place in and around the Project site. As a third party, CEGIS is now monitoring the	Suggested to comply at operation phase.

Sl. No.	Conditions	Compliance status	Remarks
	archeologically sensitive places shall be kept protected during project operation.	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.	
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.	During 40th field visit the following anomalies were identified: • During the visit inside the laborer shed plenty of household waste were found on the road which was very unhygienic. • Lack of waste bin and lack of proper initiative of source segregation of the organic waste has made the laborer shed unhygienic • Lack of lavatory/toilet waste drainage and sewerage facilities causes waste accumulation and malodorous stench. During 40th field visit the team observed the same situation as before. Authority has been providing sufficient training, instruction and facilities for managing the construction and domestic waste at labor camps and workplaces.	Partially Complied CEGIS advised to take immediate step to clean the laborer camp and other waste related issues to make the environment healthy.
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 including the Jetty has been conducted 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	The mitigation measures in terms of environmental health and workers safety are being followed according to the EMP recommendations sated in EIA report.	Being complied

Sl. No.	Conditions	Compliance status	Remarks
	implemented and kept operative/functioning on a continuous basis.	Establishment of FGD, ESP, noise control measures are being implemented to keep the environment safe during the plant operation. To ensure the safety of the workers' health proponent is taking enough steps like using proper PPE, scaffolding, water sprinkling to arrest the dust flow, medical facilities etc.	
11	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 2023 standard. BHEL has contracted with an external company for three years (renewable) who is continuously spraying water as per schedule by three (03) water tankers to suppress fugitive dust from the plant premises. At jetty site the following issues were identified: • Coal stackyard was found hygienic where water was being sprayed at a regular interval to prevent coal self-combustion. From jetty to 1st transfer point (TP) about 20 to 25 m coal conveyor was observed uncovered that is dispersing coal ash around the environment and the adjacent river.	Being Complied During the meeting respective authority assured the CEGIS team to cover the uncovered part of the conveyor belt soon.
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. From jetty to 1st transfer point (TP) about 20 to 25 m coal conveyor was observed uncovered that is dispersing coal ash around the adjacent river. Also, there was no enclosure in the grabber while coal was unloading from the ship. These are causing dust dispersion which is harmful to the laborer and for nearest water body.	Compliance action initiated Conveyor belt and grabber must be enclosed and automatic water spray need to be functional
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). Construction of 04 coal stockyards have been completed where Coal Staggered and Reclaimer commissioned.	Compliance Action initiated.
14	The entire coal stockyard should be Covered with water sprinkler provided with automated	EIA study of the Power Plant suggested to install water sprinkler in coal stockyard which has been repeated in EIA study of	Compliance Action initiated.

Sl. No.	Conditions	Compliance status	Remarks
	moisture sensor to control self-combustion.	Coal transportation. However, all these stipulations have been included in the technical specification of Main Plant EPC contract package. Coal stackyard was found in good condition where coal was being sprinkled by water to prevent self-combustion	
15	Construction material should be properly disposed of after the construction work is over.	Lots of construction materials and construction waste were observed dumped inside the plant premises and by the side of the River in the jetty area.	Partially complied Good housekeeping is strongly recommended.
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	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	Being Complied.

Sl. No.	Conditions	Compliance status	Remarks
	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 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). Steam and water quality analysis system has already been developed. For air quality monitoring DoE has already installed one device to monitor the online air quality data at Padma Abashan area and four (04) other devices has installed by BIFPCL around the plant premises which is now fully functional where SPM, SO_x, CO, NO_x, O_3 etc. are being monitored. 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 and 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.	Proponent confirmed that the coal transported vessels are in good condition and covered. No spillage and ship breakage incident happened. Noise level was within the control level.	Being complied and suggested to follow this up throughout the project cycle.
23	Vessels of this project should follow the MPA guidelines and protocol to ensure no hindrance to other vessels.	The coal barges were found to sail at a haphazard situation that may hamper other regular route vessels movement. During 40th visit, CEGIS raised this issue and the authority ensured us to take care of this issue.	Being complied and suggested to sail the ships at a demarcated place where a navigation signboard should be placed.
24	The vessels used for this project should maintain IMO criteria to enable identification of substances harmful to the marine environment.	No anomalies were identified during the coal transportation so far as reported by the proponent. This should be strictly monitored by the project authority.	Being complied and suggested to follow this throughout the project cycle.

Sl. No.	Conditions	Compliance status	Remarks
25	All the vessels should follow applicable MARPOL Convention, Appendix V on the prevention of pollution by garbage from ships.	Proponent is strictly following this issue and informed us that all the barge are following rules of MARPOL convention and no garbage was dumped in the water body from the ship. Though the proponent said to follow the MARPOL convention properly, CEGIS team identified some coal transported ship was uncovered that may hamper the water quality and aquatic ecosystem.	Being complied and suggested to follow this throughout the project cycle. We recommended strongly to cover the coal carrier vessels properly. The grabber should be enclosed while unloading from the ship to conveyor belt.
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 approved conditions of DoE. The status of EMP implementation is also regularly monitored by CEGIS.	Being Complied
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.	Most of the development activities including jetty construction works are now completed. Beforehand, BIFPCL submitted the detailed work plan seven (7) days prior to 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 generated as per specific format provided in the EIA from the beginning till now. Report's content is 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:	The Monitoring report of CEGIS are maintaining all the records as suggested.	Being Complied

Sl. No.	Conditions	Compliance status	Remarks
	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.		
31	The results of any monitoring required to be conducted under this EIA report must be recorded.	CEGIS is maintaining database for 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.) 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.)	Emergency Reporting/ Emergency response Plan is being followed and maintained for the entire construction period including the Jetty construction (already finished) and will be followed in future. As Coal transportation and its management is very sensitive to Environment and human body, Health and safety management manual have been revised for better and precautious implementation of OHAS. 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 in the EIA study of coal transportation in association with the NOSCOP and NPDM for any future incidents as suggested.	Compliance Action initiated.
33	National Oil Spill Contingency Plan (NOSCOP) should be followed to establish an organizational structure to combat marine pollution	Proponent is committed to follow this issue and informed us that all the barge are following rules of National Oil Spill Contingency Plan (NOSCOP).	Being complied and suggested to follow this throughout the project cycle.
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. 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	BIFPCL has established a proper mechanism for recording such incidents as	Complied at Present.

Sl. No.	Conditions	Compliance status	Remarks
	simultaneously to the Bagerhat District Office, Khulna Divisional Office and Headquarters of the Department of Environment (DOE) in Dhaka.	suggested in the EMP. CEGIS has been engaged to monitor the social and environmental compliance monitoring on a regular interval.	
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 and constructed 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 which has been mentioned in the EIA Report.	based on the discussion, Proponent is abiding by this guideline accordingly.	Suggested to comply as and when required.
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

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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			

Sl No	Potential Impacts	Proposed EMP	Actual Implementation	Recommended Action	Compliance Status
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 • 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?			

Sl No	Potential Impacts	Proposed EMP	Actual Implementation	Recommended Action	Compliance Status
		• 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 • 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			

Sl No	Potential Impacts	Proposed EMP	Actual Implementation	Recommended Action	Compliance Status
		• 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			

Sl No	Potential Impacts	Proposed EMP	Actual Implementation	Recommended Action	Compliance Status
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 40th Monitoring Program (May, 2024)

Monitoring Team

Water Quality Monitoring

Monitoring of Air Quality

Monitoring of Noise Quality

Coal Handling Procesure at Jetty Site

Measuring Diameter of Saplings

Uncovered Coal Vessel

Forest health Monitoring Activities

Mesuring Light Intensity

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

<table>
<tr><td>Project Location:</td><td>Upazila: Rampal, District: Bagerhat
Site is located at 23 kms Southward of Khulna City and 14 kms. North-Eastward from Mongla Port.


</td></tr>
<tr><td>Project Capacity:</td><td>1320 MW (2x660 MW), based on Ultra Super-critical Technology</td></tr>
<tr><td>Mode of Operation:</td><td>Base Load</td></tr>
<tr><td>Fuel:</td><td>Imported Coal</td></tr>
</table>

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	Bangladesh (DoE) Standard (Air Pollution Control rules, 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	
SW Corner of the PP area	PM2.5	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	6524hr
	PM10	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	15024hr
	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	2008hr (ECR, 1997)
	SO2	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	8024hr
	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	8024hr
	CO	120	188	140	190	144	146	88	74	57	35	119	59	91	73	61	32	11.1	28	15	18	4	16	(5000) 8hr
	O3	27	26	19	22	26	12	5	4	1	1	1	5	03	10	03	9	13.2	7	9	6	25	10	1008hr
Shapmari area	PM2.5	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	6524hr
	PM10	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	15024hr
	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	2008hr (ECR, 1997)
	SO2	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	8024hr
	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	8024hr
	CO	165	210	230	164	136	127	102	77	22	31	108	66	78	79	69	27	25	30	21	20	4	11	(5000) 8hr
	O3	33	26	26	23	21	16	1	1	1	0	0	1	08	25	04	4	8	6	4	1	34	22	1008hr
	PM2.5	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	6524hr

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	Bangladesh (DoE) Standard (Air Pollution Control rules, 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	
NW Corner of the PP area	PM10	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	15024hr
	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	2008hr (ECR, 1997)
	SO2	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	8024hr
	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	8024hr
	CO	110	178	110	210	140	133	87	77	38	47	127	31	74	80	45	43	21	32	20	16	7	0	(5000) 8hr
	O3	25	19	17	36	44	11	8	2	0	1	1	3	05	10	05	7	6	8	1	5	18	2	1008hr
Barni, Gaurambha	PM2.5	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	6524hr
	PM10	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	15024hr
	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	2008hr (ECR, 1997)
	SO2	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	8024hr
	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	8024hr
	CO	175	210	190	150	196	96	96	81	73	41	98	63	85	77	59	24	20	20	17	18	6	0	(5000) 8hr
	O3	26	29	22	19	15	9	6	4	0	0	3	5	08	6	04	6	6	2	3	4	7	52	1008hr
Chunkuri-2, Bajua Dacope	PM2.5	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	6524hr
	PM10	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	15024hr
	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	2008hr (ECR, 1997)
	SO2	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	8024hr
	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	8024hr
	CO	190	205	170	170	33	133	75	70	33	38	79	36	94	69	58	42	23	27	25	20	10	0	(5000) 8hr
	O3	27	24	18	22	41	21	2	1	1	0	2	2	03	5	05	2	4	5	9	8	2	38	1008hr
	PM2.5	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	6524hr

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	Bangladesh (DoE) Standard (Air Pollution Control rules, 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	
Pankhali, Dacope	PM10	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	15024hr
	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	2008hr (ECR, 1997)
	SO2	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	8024hr
	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	8024hr
	CO	230	217	250	188	177	125	105	101	55	29	112	48	83	87	49	34	29	30	14	14	9	0	(5000) 8hr
	O3	49	38	36	27	11	13	5	2	2	0	0	3	06	0	06	6	8	8	8	3	22	26	1008hr
Mongla Port area	PM2.5	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	6524hr
	PM10	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	15024hr
	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	2008hr (ECR, 1997)
	SO2	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	8024hr
	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	8024hr
	CO	230	320	220	211	24	110	84	71	29	31	97	44	72	79	52	29	20	33	28	17	15	48	(5000) 8hr
	O3	57	52	37	26	09	15	8	3	1	2	1	4	04	9	02	3	1	9	7	3	5	40	1008hr
Harbaria, Sundarbans	PM2.5	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	6524hr
	PM10	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	15024hr
	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	2008hr (ECR, 1997)
	SO2	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	8024hr
	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	8024hr
	CO	65	58	70	64	56	112	81	62	47	32	110	67	73	84	57	31	20	20	25	16	16	48	(5000) 8hr
	O3	13	12	13	11	14	12	4	2	2	0	1	4	08	0	02	2	6	4	3	5	8	40	1008hr
	PM2.5	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	6524hr

Locations of Monitoring	Pollutants	1^{st} QM, Apr 2014	2^{nd} QM, Jul 2014	3^{rd} QM, Oct 2014	4^{th} QM, Jan 2015	5^{th} QM, Apr 2015	6^{th} QM, Jul2015	7^{th} QM, Oct 2015	8^{th} QM, Jan 2016	9^{th} QM, Apr 2016	10^{th} QM, Jul 2016	11^{th} QM, Oct 2016	12^{th} QM, Jan 2017	13^{th} QM, April, 2017	14^{th} QM, Oct, 2017	15^{th} QM Jan, 2018	16^{th} QM April, 2018	17^{th} QM, Jul 2018	18^{th} QM, Nov, 2018	19^{th} QM, Feb, 2019	20^{th} QM, Apr, 2019	21^{st} QM, Jul, 2019	22^{nd} QM, Jul, 2019	Bangladesh (DoE) Standard (Air Pollution Control rules, 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	
Akram Point, Sundarbans	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	15024hr
	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	2008hr (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	8024hr
	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	8024hr
	CO	49	60	50	46	163	NO	92	64	21	37	101	58	79	69	52	21	25	28	17	14	38	24	(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	1008hr
Hiron Point, Sundarbans	$PM_{2.5}$	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	6524hr
	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	15024hr
	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	2008hr (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	8024hr
	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	8024hr
	CO	52	62	65	60	60	NO	93	NO	40	NO	121	43	NO	72	71	NO	NO	22	21	NO	NO	2	(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	1008hr
	$PM_{2.5}$	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	6524hr

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	Bangladesh (DoE) Standard (Air Pollution Control rules, 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	
Khulna City, near Khan Jahan Ali Bridge	**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	15024hr
	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	2008hr (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	8024hr
	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	8024hr
	CO	330	370	330	296	101	89	94	98	68	36	104	66	79	81	69	36	28	121	19	23	11	24	(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	1008hr
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	6524hr
	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	15024hr
	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	2008hr (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	8024hr
	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	8024hr
	CO	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	46	32	30	18	21	9	0	(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	1008hr
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	6524hr
	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	15024hr
	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	2008hr (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	8024hr

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	Bangladesh (DoE) Standard (Air Pollution Control rules, 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	
	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	8024hr
	CO	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	38	34	32	23	21	8	0	(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	1008hr

Locations of Monitoring	Pollutants	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	33rd QM, July, 2022	34th QM, Oct, 2022	35th QM, Jan, 2022	36th QM, May, 2023	37th QM, Aug, 2023	38th QM, Oct, 2023	39th QM, Oct, 2023	40th QM, Oct, 2023	Bangladesh (DoE) Standard (Air Pollution Control rules, 2022; ECR, 1997 and subsequent amendments)
Weather		Sunny	Rainy/Cloudy	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny	Rainy/Cloudy	Rainy/Cloudy	Sunny	Sunny	Rainy/Cloudy	Rainy/Cloudy	Sunny	Sunny		
SW Corner of the PP area	PM2.5	27.12	18.71	44.18	55.35	49.13	38.25	56.83	46.83	41.78	34.84	39.63	56.81	44.72	53.38	44.24	203.64	29.95	6524hr
	PM10	68.1	80.28	107.16	106.13	103.88	59.17	83.46	91.25	74.32	56.18	57.26	81.45	66.62	67.47	55.03	233.70	31.73	15024hr
	SPM	108.4	98.26	149.73	163.48	155.14	99.44	144.48	159.45	139.42	106.28	109.27	144.17	112.77	52.28	58.69	362.33	49.18	2008hr (ECR, 1997)
	SO2	18.35	19.91	26.63	14.74	16.26	14.49	16.28	21.54	15.22	11.04	10.18	19.56	18.62	3.04	16.17	36.39	1.97	8024hr
	NOx	12.12	8.82	16.62	37.16	22.31	19.87	21.64	39.5	22.49	23.18	17.64	18.61	13.32	30.46	28.11	17.38	16.28	8024hr
	CO	28	0	2	0	0	1	0	1	1	0.3	0.6	0.8	0.7	0.438	0.21	1.10	0.11	(5000) 8hr
	O3	8	8	8	9	16	42	11	12	18	12	19	20	22	21.77	22.53	19.91	22.95	1008hr
Shapmari area	PM2.5	19.14	20.35	29.17	52.74	48.64	41.2	44.65	39.86	36.71	41.2	49.63	43.95	53.16	44.65	44.52	87.20	16.27	6524hr
	PM10	83.22	71.06	84.3	112.04	83.1	64.28	71.35	58.29	68.79	64.29	58.48	58.71	80.42	54.76	55.74	109.31	17.25	15024hr
	SPM	106.3	95.24	119.22	170.33	139.26	116.48	118.49	128.34	158.14	118.62	123.62	111.63	142.81	43.17	58.85	196.00	27.6	2008hr (ECR, 1997)
	SO2	27.41	17.44	14.15	18.32	14.06	11.77	14.55	14.48	13.96	12.58	16.71	17.48	16.51	7.21	10.16	9.97	1.11	8024hr
	NOx	18.77	10.17	14.18	29.9	21.65	21.394	20.85	20.44	20.47	18.4	25.45	15.72	27.41	33	30.16	21.77	17.03	8024hr
	CO	44	4	0.013	0	0	1	1.1	1	1	1	0.4	0.8	0.9	0.282	0.50	0.38	0.188	(5000) 8hr
	O3	9	6	2	6	9	28	41	49	8	16	14	21	28	21.83	25.87	25.75	24.63	1008hr
NW Corner of	PM2.5	21.61	21.93	46.73	68.26	58.81	22.66	41.98	42.81	54.16	39.36	46.32	55.86	52.33	46.66	49.92	90.71	24.2	6524hr

Locations of Monitoring	**Pollutants**	**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**	**33rd QM, July, 2022**	**34th QM, Oct, 2022**	**35th QM, Jan, 2022**	**36th QM, May, 2023**	**37th QM, Aug, 2023**	**38th QM, Oct, 2023**	**39th QM, Oct, 2023**	**40th QM, Oct, 2023**	**Bangladesh (DoE) Standard (Air Pollution Control rules, 2022; ECR, 1997 and subsequent amendments)**
Weather		**Sunny**	**Rainy/Cloudy**	**Sunny**	**Sunny**	**Sunny**	**Sunny**	**Sunny**	**Sunny**	**Rainy/Cloudy**	**Rainy/Cloudy**	**Sunny**	**Sunny**	**Rainy/Cloudy**	**Rainy/Cloudy**	**Sunny**	**Sunny**		
the PP area	PM10	77.69	76.76	110.43	131.84	97.61	48.19	61.48	73.42	63.26	58.03	64.18	81.08	70.84	58.91	59.62	106.20	25.71	15024hr
	SPM	100.04	101.33	160.3	180.43	161.8	77.149	104.73	123.76	132.77	108.2	139.24	146.79	140.73	45.76	64.79	174.00	37.28	2008hr (ECR, 1997)
	SO2	19.68	16.21	25.82	16.19	16.58	13.58	12.19	11.79	10.47	13.29	14.66	19.51	18.19	6.6	9.90	10.78	6.94	8024hr
	NOx	17.53	10.55	18.91	34.1	27.42	20.49	18.39	20.25	23.96	20.63	21.43	29.29	24.64	41.6	27.13	34.75	18.57	8024hr
	CO	30	2	0.012	0	0.2	1	1.4	1	0.6	0.4	0.2	0.7	0.8	0.234	0.17	0.44	0.18	(5000) 8hr
	O3	9	8	8	12	14	17	34	12	8	11	13	25	34	20.39	24.96	27.05	26.9	1008hr
Barni, Gaurambha	PM2.5	26.66	18.04	38.69	61.29	62.29	21.8	58.34	29.22	31.43	27.55	41.59	37.86	39.81	52.33	52.21	62.03	21.84	6524hr
	PM10	61.11	59.02	91.79	93.36	103.42	50.26	73.17	43.88	46.29	51.98	64.71	57.94	59.5	65.17	61.03	73.22	23.75	15024hr
	SPM	98.74	82.02	128.48	159.8	154.35	83.2	134.6	92.38	98.15	93.44	111.39	102.3	107.06	50.75	67.19	113.15	39.18	2008hr (ECR, 1997)
	SO2	18.88	24.29	20.17	16.47	13.52	14.44	21.39	14.36	18.42	10.57	13.88	12.69	13.91	8.82	4.41	5.20	5.02	8024hr
	NOx	11.58	10.62	14.47	21.18	19.371	19.48	38.46	21.92	40.28	16.4	20.31	15.78	14.18	34.68	26.83	22.49	19.67	8024hr
	CO	32	0	0	0	0	0	0	0.1	1	0.8	0.1	0.7	0.6	0.22	0.37	0.32	0.215	(5000) 8hr
	O3	12	8	0	6	2	19	28	6	10	14	33	16	19	22.45	25.83	22.80	23.05	1008hr
Chunkuri-2,	PM2.5	39.44	18.22	43.91	59.18	53.36	33.27	29.61	45.3	48.94	38.48	30.22	57.36	58.71	59.21	42.24	97.40	27.12	6524hr

Locations of Monitoring	Pollutants	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	33rd QM, July, 2022	34th QM, Oct, 2022	35th QM, Jan, 2022	36th QM, May, 2023	37th QM, Aug, 2023	38th QM, Oct, 2023	39th QM, Oct, 2023	40th QM, Oct, 2023	Bangladesh (DoE) Standard (Air Pollution Control rules, 2022; ECR, 1997 and subsequent amendments)
Weather		Sunny	Rainy/Cloudy	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny	Rainy/Cloudy	Rainy/Cloudy	Sunny	Sunny	Rainy/Cloudy	Rainy/Cloudy	Sunny	Sunny		
Bajua Dacope	PM10	100.08	59.91	88.93	117.42	86.44	61.9	44.28	66.54	86.48	53.19	39.66	96.94	79.6	73.88	51.93	112.16	29.1	15024hr
	SPM	146.72	146.72	139.04	188.27	128.36	104.29	77.88	134.71	165.58	103.72	77.36	161.53	147.84	57.88	55.81	185.00	43.65	2008hr (ECR, 1997)
	SO2	36.14	18.74	29.94	16.45	19.66	15.98	10.59	12.84	14.82	11.08	10.52	26.24	18.22	19.42	19.56	19.81	5.24	8024hr
	NOx	20.04	10.19	18.32	26.14	24.21	18.66	17.21	16.73	26.42	21.94	18.03	31.89	19.01	38.37	27.38	27.23	17.16	8024hr
	CO	18	10	0	0.1	0.1	0.8	1	1	1	0.2	0.1	0.9	0.6	0.442	0.36	0.81	0.253	(5000) 8hr
	O3	22	8	0	23	28	11	9	8	13	29	14	56	25	22.38	25.23	22.62	24.55	1008hr
Pankhali, Dacope	PM2.5	33.26	16.63	33.32	66.31	42.62	32.45	42.59	47.51	42.57	42.85	48.3	50.11	58.35	45.44	42.01	102.47	32.59	6524hr
	PM10	127.52	55.78	74.83	102.73	73.29	74.89	64.71	81.84	71.22	69.02	74.05	74.37	92.53	54.87	51.57	115.91	36.28	15024hr
	SPM	160.02	70.23	111.95	156.56	116.73	118.4	107.31	148.93	128.98	127.39	138.51	133.66	169.47	43.77	55.55	178.25	58.04	2008hr (ECR, 1997)
	SO2	30.89	16.73	21.39	16.16	13.1	14.61	12.8	21.4	19.71	12.71	15.42	16.42	24.74	12.22	23.14	10.17	5.93	8024hr
	NOx	19.02	10.52	12.12	28.54	17.18	20.27	19.33	38.27	29.44	23.16	22.14	23.94	28.77	28.75	29.58	28.04	17.13	8024hr
	CO	11	0	0	1	0	1	1.1	2.8	2	0.4	0.6	0.5	0.7	0.37	0.519	0.48	0.219	(5000) 8hr
	O3	2	2	4	20	2	10	19	48	39	37	24	37	61	18.41	24.85	28.12	20.58	1008hr
Mongla	PM2.5	38.92	41.33	40.75	74.19	65.37	22.54	51.83	26.39	28.19	43.8	58.46	53.71	51.81	49.15	59.68	63.62	38.82	6524hr

Locations of Monitoring	Pollutants	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	33rd QM, July, 2022	34th QM, Oct, 2022	35th QM, Jan, 2022	36th QM, May, 2023	37th QM, Aug, 2023	38th QM, Oct, 2023	39th QM, Oct, 2023	40th QM, Oct, 2023	Bangladesh (DoE) Standard (Air Pollution Control rules, 2022; ECR, 1997 and subsequent amendments)
Weather		Sunny	Rainy/Cloudy	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny	Rainy/Cloudy	Rainy/Cloudy	Sunny	Sunny	Rainy/Cloudy	Rainy/Cloudy	Sunny	Sunny		
Port area	PM10	119.61	126.13	114.61	118.67	129.71	64.44	72.4	61.63	51.66	62.53	93.43	69.26	72.55	74.7	66.93	77.71	44.75	15024hr
	SPM	173.36	166.16	152.76	201.16	180.22	85.2	128.3	100.53	92	120.3	170.28	130.48	138.02	47.16	76.21	123.52	71.6	2008hr (ECR, 1997)
	SO2	31.33	22.04	20.06	12.26	18.91	10.28	17.44	12.54	20.33	14.55	21.41	12.51	14.74	14.9	12.79	9.57	11.06	8024hr
	NOx	13.34	11.29	9.69	19.25	30.2	19.73	29.16	18.43	31.63	22.3	34	18.59	19.99	20.8	28.35	18.96	16.38	8024hr
	CO	29	24	0	2	0.9	2	2.4	2	0.2	0.1	1.9	0.2	0.3	0.4	0.35	0.30	0.254	(5000) 8hr
	O3	4	2	1	66	91	23	43	20	13	29	59	14	12	21.85	24.88	22.14	19.81	1008hr
Harbaria, Sundarbans	PM2.5	17.81	20.11	34.42	53.28	46.13	34.94	31.2	41.58	43.27	49.15	53.98	35.19	39.51	13.93	70.29	91.28	40.28	6524hr
	PM10	63.27	62.24	79.38	100.11	82.83	61.53	49.07	58.92	51.04	74.7	76.18	42.07	58.55	15.28	76.43	104.71	52.71	15024hr
	SPM	87.51	87.71	122.94	146.2	133.1	108.74	83.16	118.83	110.28	141.48	142.09	85.63	109.89	13.43	87.85	156.21	76.43	2008hr (ECR, 1997)
	SO2	16.47	13.31	19.74	14.66	16.58	14.75	12.68	22	13.76	14.9	12.37	13.27	15.36	7.7	9.17	6.61	9.61	8024hr
	NOx	9.9	8.13	10.16	21.44	0	23.28	22.27	27.2	39.23	20.82	20.41	20.18	24.22	35.17	26.33	17.63	18.73	8024hr
	CO	30	8	0	0	3	1	1	1	1	0.4	0.3	0.3	0.4	0.614	0.39	0.25	0.54	(5000) 8hr
	O3	12	22	3	6	46.13	9	11	41	24	31	41	11	13	17.73	20.56	19.27	20.27	1008hr
Akram Point,	PM2.5	23.04	13.16	22.74	48.2	41.33	39.16	23.6	29.65	58.43	30.22	35.35	54.94	47.74	2.63	87.94	70.50	45.66	6524hr

Locations of Monitoring	Pollutants	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	33rd QM, July, 2022	34th QM, Oct, 2022	35th QM, Jan, 2022	36th QM, May, 2023	37th QM, Aug, 2023	38th QM, Oct, 2023	39th QM, Oct, 2023	40th QM, Oct, 2023	Bangladesh (DoE) Standard (Air Pollution Control rules, 2022; ECR, 1997 and subsequent amendments)
Weather		Sunny	Rainy/Cloudy	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny	Rainy/Cloudy	Rainy/Cloudy	Sunny	Sunny	Rainy/Cloudy	Rainy/Cloudy	Sunny	Sunny		
Sundarbans	PM10	82.91	58.82	56.74	90.12	84.16	76.18	51.88	53.69	77.69	60.21	50.14	97.62	71.27	3.07	96.99	85.80	55.85	15024hr
	SPM	121.68	78.8	80.31	144.95	131.46	123.59	79.47	98.47	141.37	103.5	99.42	159.36	137.62	2.59	108.34	134.20	83.77	2008hr (ECR, 1997)
	SO2	24.21	15.06	12.74	15.05	17.44	16.55	15.89	15.53	21.81	12.59	11.06	25.7	17.2	1.08	4.67	0.85	10.2	8024hr
	NOx	16.74	10.47	6.64	20.6	23.5	21.28	21.39	19.38	38.3	19.69	18.2	27.24	23.83	17.88	21.64	18.90	16.52	8024hr
	CO	20	14	0	0.2	0	2	1	1.4	0.3	0.9	1	0.8	0.2	0.204	0.47	0.28	0.4	(5000) 8hr
	O3	2	4	6	8	8	11	8	16	41	24	19	63	32	8.32	26.81	19.40	21	1008hr
Hiron Point, Sundarbans	PM2.5	17.39	NO	28.15	55.71	NO	25.3	38.51	36.88	39.62	NO	57.2	47.31	NO	2.28	73.60	65.11	45.66	6524hr
	PM10	72.45	NO	59.31	99.64	NO	59.7	49.27	58.45	48.81	NO	89.22	70.5	NO	2.61	79.96	75.76	38.3	15024hr
	SPM	94.28	NO	91.06	155.39	NO	94.7	89.36	106.93	96.23	NO	164.2	124.46	NO	2.26	91.21	122.56	50.65	2008hr (ECR, 1997)
	SO2	13.33	NO	11.36	16.2	NO	13.92	14.33	12.76	15.38	NO	16.82	14.26	NO	1.27	2.87	2.90	73.2	8024hr
	NOx	8.65	NO	9.74	23.53	NO	20.06	16.27	19.66	39.72	NO	27.87	21.67	NO	17.53	15.80	18.49	8.5	8024hr
	CO	36	NO	0	0	NO	0	0	0.3	0.7	NO	0.5	0.1	NO	0.138	0.16	0.11	17.2	(5000) 8hr
	O3	7	NO	1	11	NO	14	22	22	38	NO	28	35	NO	9.17	12.23	10.23	0.435	1008hr
	PM2.5	40.22	46.73	48.32	88.71	71.2	29.47	65.66	61.57	67.33	69.28	63.57	51.17	53.57	86.08	50.49	69.09	35.53	6524hr

Locations of Monitoring	**Pollutants**	**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**	**33rd QM, July, 2022**	**34th QM, Oct, 2022**	**35th QM, Jan, 2022**	**36th QM, May, 2023**	**37th QM, Aug, 2023**	**38th QM, Oct, 2023**	**39th QM, Oct, 2023**	**40th QM, Oct, 2023**	**Bangladesh (DoE) Standard (Air Pollution Control rules, 2022; ECR, 1997 and subsequent amendments)**
Weather		**Sunny**	**Rainy/Cloudy**	**Sunny**	**Sunny**	**Sunny**	**Sunny**	**Sunny**	**Sunny**	**Rainy/Cloudy**	**Rainy/Cloudy**	**Sunny**	**Sunny**	**Rainy/Cloudy**	**Rainy/Cloudy**	**Sunny**	**Sunny**		
Khulna City, near Khan Jahan Ali Bridge	PM10	116.16	119.11	109.63	159.22	120.38	64.44	124.55	100.3	92.36	100.28	92.2	64.49	70.49	99.54	58.75	82.90	39.56	15024hr
	SPM	157.28	167.18	157.35	240.18	193.61	101.85	195.17	198.24	178.26	189.38	169.49	124.91	134.71	81.37	64.35	129.74	62.1	2008hr (ECR, 1997)
	SO2	28.31	30.73	29.58	18.8	20.64	12.73	26.18	28.52	19.29	23.66	21.71	17.32	14.05	22.14	8.10	8.67	2.45	8024hr
	NOx	24.14	24.24	20.44	34.2	28.35	20.45	38.58	41.59	37.91	39.12	36.56	23.09	21.89	34.49	30.13	19.27	16.78	8024hr
	CO	32	18	0.7	2	3	4	4.9	1.4	0.2	2.1	1.6	0.3	0.4	0.57	0.17	0.34	0.432	(5000) 8hr
	O3	10	4	0	80	63	21	59	53	36	66	64	12	15	22.91	23.40	24.06	20.76	1008hr
Township area	PM2.5	44.26	22.08	41.29	166.72	67.82	59.2	79.64	56.26	69.23	51.29	61.47	59.24	57.73	25.7	26.24	184.50	23.74	6524hr
	PM10	122.73	86.26	97.16	234.41	108.16	94.6	102.33	104.73	94.28	69.28	84.89	91.3	95.63	28.3	30.67	246.21	21.63	15024hr
	SPM	171.29	111.73	142.36	347.39	170.37	158	193.43	178.63	181.85	134.27	158.26	155.86	160.25	24.23	77.4	358.00	33.23	2008hr (ECR, 1997)
	SO2	34.12	20.61	21.73	18.61	23.72	19.7	16.92	38.36	27.45	14.56	23.49	16.26	18.34	7.57	24.35	52.47	0.501	8024hr
	NOx	21.72	11.17	13.36	33.48	34.49	27.3	48.41	44.77	39.56	20.23	39.35	31.49	32.53	30.51	25.52	19.59	7	8024hr
	CO	18	2	0	3	1	1	1	3.3	4	1.3	1	0.8	0.7	0.162	0.175	1.15	18.19	(5000) 8hr
	O3	4	2	0	212	108	92	68	93	59	38	49	38	36	18.58	16.95	18.28	20.18	1008hr
Access road bridge	PM2.5	26.26	20.16	38.72	94.23	64.73	52.2	55.31	57.29	31.28	28.43	42.84	40.29	42.34	28.36	28.84	120.96	51.28	6524hr
	PM10	91.39	78.69	93.48	188.64	119.73	96.1	69.4	69.89	59.15	53.42	71.49	74.81	78.77	33.23	33.53	134.97	42.88	15024hr
	SPM	126.13	102.03	136.66	269.3	173.92	151	129.45	137.46	98.74	89.45	127.77	121.17	126.63	27.24	84.84	209.20	73.84)	200^{8hr} (ECR, 1997)
	SO_2	16.16	18.82	18.11	20.23	19.16	13.3	20.76	16.93	19.3	11.39	13.27	11.09	15.88	4.64	18.54	32.43	0.036	80^{24hr}

Locations of Monitoring	Pollutants	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	33rd QM, July, 2022	34th QM, Oct, 2022	35th QM, Jan, 2022	36th QM, May, 2023	37th QM, Aug, 2023	38th QM, Oct, 2023	39th QM, Oct, 2023	40th QM, Oct, 2023	Bangladesh (DoE) Standard (Air Pollution Control rules, 2022; ECR, 1997 and subsequent amendments)
Weather		Sunny	Rainy/Cloudy	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny	Rainy/Cloudy	Rainy/Cloudy	Sunny	Sunny	Rainy/Cloudy	Rainy/Cloudy	Sunny	Sunny		
	NOx	9.04	9.22	9.92	26.3	23.74	20.1	31.69	21.62	33.62	20.47	20.63	23.25	22.67	26.49	25.56	16.61	6.79	8024hr
	CO	22	0	0	0.8	0.2	2	1	1	1	2	1.1	0.8	0.5	0.213	0.522	0.22	17.53	(5000) 8hr
	O3	6	8	2	68	46	16	29	72	31	23	14	17	18	18.65	18.85	20.74	24.66	1008hr

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	√
	PM	√	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
Chunkuri-2, Dacope	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	√
	GHGs	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
	SOx	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	√
	GHGs	X	X	X	X	X	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√
	PM	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
Hiron Point Sundarbans	SOx	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	√
	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	√
	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	√	√	√	√
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	√
	NOx	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

Monitoring period	Sampling Locations ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
1st QM	7.2	7.2	7.2	7.9	7.1	7.1	7.4	7.4	7.3	7.4	7.4	7.3	7.9	7.2	7.2
2nd QM	7	7	6.9	7.1	6.9	6.9	7	6.9	6.8	6.9	6.8	6.8	6.9	6.9	7
3rd QM	8.1	8.2	8	8.1	8.1	8.2	8.1	8	8	8.1	8.1	7.4	8	7.9	7
4th QM	7.9	8	8.1	7.9	7.9	7.9	7.6	7.5	7.8	7.7	7.3	8.2	8.1	8.1	8.1
5th QM	7.6	7.7	7.8	7.5	7.6	7.7	7.5	7.2	7.3	7.5	7.6	7.5	7.7	7.7	7.7
6th QM	7.8	7.9	7.8	7.9	8	8	8.1	8	8.1	8.1	6.9	7.9	7.9	NS	NS
7th QM	7.6	7.58	7.64	7.6	7.58	7.62	7.78	7.6	7.64	7.3	7.56	7.1	7.8	7.63	7.39
8th QM	7.1	7.3	7.3	7.1	7.5	7.6	8.1	8	7.9	7.3	7.1	7.4	8.2	8	NS
9th QM	7.5	7.8	7.2	7.4	7.8	7.4	7.6	7.1	7.2	7.1	7.4	7.3	7.3	7.9	7.8
10th QM	7.27	7.3	7.93	7.56	7.6	7.9	7.94	8.04	8.2	8.1	7.8	7.3	7.63	7.67	NS
11th QM	6.9	7	7.2	7.3	7	6.9	7.2	7.5	7.3	6.8	7.1	6.9	7.4	7.1	7.6
12th QM	7.6	7.5	7.8	8.2	8.5	8.7	8.1	8.6	8.9	8.1	7.6	7.2	7.8	8.2	8.5
13th QM	7.2	7.3	7.3	7.2	7.8	7.4	6.9	6.8	7.1	7.2	7.4	6.9	6.9	7.2	NS
14th QM	7.1	6.9	6.9	6.9	7.2	7.2	7.2	7.1	7	7.1	7	6.8	7.1	7.1	6.8
15th QM	8.28	8.25	8.17	8.2	8.21	8.2	8.39	8.15	8.16	8.4	7.92	7.48	8.19	8.22	8.2
16th QM	8.1	8.1	8.1	8.1	8.1	8.1	8	8.1	8.1	8.1	7.6	7.3	8.1	8.2	NS
17th QM	8.4	8.4	8.4	8.3	8.3	8.2	8.4	8.5	8.5	8.6	7.3	8.3	8.4	8.2	NS
18th QM	7.9	6.04	8.09	7.65	8.2	7.87	8.11	7.44	7.07	7.94	7.63	7.02	7.19	8	7.18
19th QM	8.18	8.03	8.06	7.78	7.97	8.04	7.89	7.85	8.06	8.05	7.8	8.65	7.71	7.77	7.79
20th QM	9	9.9	8.7	8.9	8.4	8.5	9.3	8.7	8.4	9.3	8.2	8.1	8.2	7.9	NS
21st QM	6.8	6.8	7.1	7.5	7.2	6.7	7.4	6.5	7.3	7.2	7	7	7.2	7.1	NS
22nd QM	7.9	7.8	7.8	7.5	7.4	7.4	7.3	7.2	7.2	7.4	7.3	8	8	7.8	7.8
23rd QM	8.4	8.3	8.8	8.3	8.3	8	8.6	8.2	8.3	8	7.9	8.3	8.4	8.2	8.2
25th QM	6.9	7	7.1	7	7.2	7.2	7.4	7.6	7.8	7.1	6.9	7.1	7.4	7.7	NS

Monitoring period	Sampling Locations ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
26th QM	6.9	6.66	6.59	6.6	6.77	6.88	7.13	6.82	6.8	6.85	6.83	7.06	6.1	6.6	6.7
27th QM	8.5	7.8	8	7.7	7.7	7.8	7.8	8	7.8	7.4	7.5	7.8	8.2	7.7	7.6
28th QM	8.3	8.1	8	8.6	8	8.9	8.2	8.4	8.3	8	8.3	8.6	7.8	8.2	NS
29th QM	5.5	6.5	8.5	7.4	8.4	5.8	6.7	8.6	8.5	5.9	6.9	7.3	6.6	6	8
30th QM	7.8	7.5	6.5	6.8	7.6	7.6	8.2	8.2	7.9	7.8	8.5	8.1	7.3	6.9	6.7
31st QM	8	7.6	7.7	8.1	7.7	7.8	7.9	7.8	7.7	8	7.7	7.9	7.7	7.6	7.5
32nd QM	7.77	7.8	7.7	7.63	7.72	7.81	7.63	7.64	7.8	7.61	7.5	7.9	7.7	7.69	NS
33rd QM	8.02	8	7.94	7.58	7.95	7.98	7.99	7.99	8.03	8.5	7.74	8.1	8.07	7.83	NS
34th QM	7.67	7.59	7.6	7.55	7.44	7.42	7.58	7.5	7.4	7.79	7.66	8.4	8.2	7.71	7.28
35th QM	8.3	8.25	8.2	8.24	8.23	8.18	8.2	8.27	8.2	8.3	8.35	8.01	8.13	7.2	8.1
36th QM	7.86	8.02	8.07	8.1	8.05	7.95	8.08	8.04	8.1	7.84	8.2	7.51	7.8	7.79	NS
37th QM	7.21	7.84	7.68	7.98	7.81	7.3	7.84	8.1	8.3	7.9	7.8	7.4	7.4	7.8	7.9
38th QM	7.78	7.83	7.81	7.62	7.63	7.61	7.67	7.69	7.62	7.5	8.02	8.27	7.9	7.6	7.86
39th QM	7.9	7.8	7.6	7.9	7.6	7.7	7.8	7.8.	7.9	7.6	7.4	7.6	8.2	8.1	7.9
40th QM	7.8	7.81	7.7	7.6	7.79	7.7	7.8	7.81	7.8	7.75	7.8	7.5	7.7	7.4	7.5
Standard (ECR'2023)	**6.5– 8.5 (Coastal area)**												**6.5– 8.5 (Reserved area)**		

Source: CEGIS Field Survey; 2014 up to 2023; Note: QM= Quarterly Monitoring, NS – Not Surveyed; SL-Sampling location

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

Monitoring period	Sampling Location ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
1st QM	31	31	31	31	30	30	31	31	31	30	30	29	30	29	29
2nd QM	33	33	33	33	32	32	32	31	31	31	32	30	30	29	30
3rd QM	31	31	30	31	31	31	30	29	29	28	27	32	27	30	29
4th QM	19	20	20	19	19	19	20	19	19	19	20	19	22	21	21
5th QM	30	30	30	31	30	30	31	30	31	30	30	30	30	30	30
6th QM	31.8	30.5	30.5	30.8	30.6	30.4	30.5	30.8	30.6	30.8	31.6	29.8	29	NS	NS
7th QM	31.2	31.8	30.9	31.3	31.6	31.1	30.3	30.5	30.8	31.8	31.2	30.7	30.8	30.2	30.4
8th QM	22	21	21	22	22	21	23	22	21	22	23	21	22	21	NS
9th QM	31.2	31.1	30.8	31.4	30.9	31	30.7	30.4	30.1	31.2	30.6	31.3	31.5	30.8	31.4
10th QM	29.6	29.1	29.4	30.1	30.5	30.5	30.7	29.8	29.8	30.4	30.7	30.7	30.9	30.4	NS
11th QM	30.1	30.8	30.4	30.1	31	31.1	30.4	30.2	31.1	31.1	31.2	30.38	29.9	30.4	31.3
12th QM	22.8	22.5	22.1	22.8	21.8	21.9	22.1	22	22.1	21.9	21.8	22.1	23.1	22.5	21.4
13th QM	30	30	29.8	31.3	30	30	29.9	29.8	30.1	30.3	30.1	30.2	30.2	30.8	NS
14th QM	29.8	30.1	30.2	30.1	29.8	29.9	30	30.1	30.1	29.9	30	30	29.8	29.9	29.4
15th QM	19.7	19.8	20.2	20.3	20.3	20.3	20.6	20.2	20.3	19.1	21.1	20.8	21	21.2	21.2
16th QM	30	30	31	28	29	28	28	28	28	28	31	30	30	32	NS
17th QM	30	30	30	30	30	31	31	31	31	31	31	29	29	30	NS
18th QM	28	26.9	27.5	28.4	28	28.1	27.9	28	28	27.62	30.2	26.82	27.62	27.21	28.66
19th QM	22	22	21.8	22.6	22.6	22.4	22.2	22.3	22.5	22.06	21	21.89	21.81	22.42	23.78
20th QM	31	31	31	31	31	31	33	31	32	33	32	31	31	31	NS
21st QM	30	30	30	30	31	30	30	30	30	30	30	30	31	31	NS
22nd QM	27	27	27	28	28	28	27	27	27	27	27	28	30	29	31
23rd QM	25	25	24	24	24	24	25	25	25	25	23	22	24	24	23
25th QM	30	30	31	30	30	30	30	30	30	30	30	30	31	31	NS
26th QM	27.7	27.7	27.7	27.8	27.8	27.7	28.4	27.9	27.8	28.67	28	28.07	28.35	29.48	29.02
27th QM	20	20	20	20	20	20	21	20	21	22	21	21	21	22	22
28th QM	31	30	30	30	30	30	30	30	30	31	31	29	30	30	NS

Monitoring period	Sampling Location ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
29th QM	30.3	30.5	30.5	30.6	30.4	30.5	30.4	30.5	30.5	30.39	30.5	30.15	29.6	29.75	30.66
30th QM	26	26	26	28	27	30	27	27	27	27	29	27	27	28	28
31st QM	22	22	22	21	22	22	23	22	22	23	22	22	24	21	22
32nd QM	30	30.2	30.2	30.1	30.3	30.2	30.1	30.2	30.2	30.45	29.2	31.63	30.13	31.36	NS
33rd QM	31.2	30.9	30.8	30.9	31	31.1	31.2	31	31.1	31.77	32.5	31.05	31.76	32.34	NS
34th QM	27.8	28	27.9	28.2	28.1	28.1	28.4	28.1	28.3	29.27	29.2	26.3	27.59	28.25	28.59
35th QM	25.29	24.3	23.6	24.2	23.86	24.4	24.8	23.95	24.57	26.54	28.1	21.91	25.38	22.28	23.6
36th QM	31.86	31.9	31.28	31.59	31.95	33.02	32.8	32.18	31.94	34.53	32.98	29.86	31.25	31.35	NS
37th QM	31.7	31.1	30.8	30.9	30.4	30.9	30.7	31	30.8	30.8	31.4	31.4	30.5	31.1	30.3
38th QM	28.0	28.3	28.5	28.0	28.5	28.0	28.4	28.5	28.6	28.2	29.3	30.6	31.1	29.5	29.4
39th QM	22	23	23	21	22	21	23	21	22	22	23	20	21	20	21
40th QM	34.2	33.41	33.2	33.5	33.65	33.7	33.9	34.1	33.06	34.89	30.58	31.39	30.37	32.07	31.72
Standard (ECR*2023)	N/A														

Source: CEGIS Field Survey; 2014 up to 2023; Note: QM= Quarterly Monitoring, NS – Not Surveyed; SL-Sampling location; N/A-Not available

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

Monitoring Periods	Sampling location ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
1st QM	11.5	11.5	11.5	12	12	12	9.5	9	10	10	9	10	12	19	23
2nd QM	2.5	0.3	0.2	2.2	0.3	0.5	4	0	2.5	0.5	4.5	9.5	10	15	19.5
3rd QM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
4th QM	4.5	4.1	4.5	4.7	5.1	5	5.2	5.2	5.1	5.2	4.5	5	6	16	23
5th QM	13	15	16	9	13	14	14	13	12	10	9	14	15	20	25
6th QM	0	0	0	0	0	0	0	0	0	0	0	0	0	NS	NS
7th QM	0	0	0	0	0	0	0	0	0	0	0	0	0	5	6.2
8th QM	4.1	4.3	4.3	4.4	5.1	5	5.2	4.9	5.5	3.8	2.5	4.8	5.3	11.3	NS
9th QM	8	7.4	7	6	6.2	9	8	7	6.8	7.1	6.3	6	8.9	9.4	14
10th QM	0	0	0	0	0	0	0	0	0	0	0	0	0	4	NS
11th QM	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5.8

Monitoring Periods	Sampling location ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
12th QM	3.7	3.8	3.6	4	3.9	4.2	4.2	4.1	4.1	3.9	3.8	6.7	8.9	16.3	21.4
13th QM	6.3	5.9	6.2	6.8	6.9	6.1	6.5	7.1	7	7	6.9	10.4	10.4	16	NS
14th QM	0	0	0	0	0	0	0	0	0	0	0	1.2	2.3	3.6	5.1
15th QM	2	2	2	2.6	2.6	2.7	2.8	2.8	2.8	2.6	2.52	10.8	2.8	13.1	16.45
16th QM	11.5	11.5	11.5	12	12	12	9.5	9	10	10	9	10	12	19	23
17th QM	0.2	0.2	0.4	0.3	0.2	0.2	0.2	0.3	0.3	0.3	0.2	0.6	2.2	2.8	NS
18th QM	0.9	0.1	0.8	0.9	0.8	0.8	1	0.2	0.3	0.9	0.02	1	1.8	9.1	13.9
19th QM	11.1	11.1	10.6	10.8	10.8	11	9.9	11.5	11.1	11.3	9.9	7.9	11.9	16.7	22.7
20th QM	16.6	16.2	16.5	16.6	16.9	16.9	12	16.7	16.9	16.5	8	14.9	15.6	22.9	NS
21st QM	0.5	0.2	0.3	0.2	0.2	1.2	0.3	0.2	0.3	0.3	1	0.4	0.3	0.9	NS
22nd QM	0.4	0.3	0.3	0.5	0.3	0.3	2.1	0.1	0.4	0.3	0.3	0.5	0.7	6.6	9.2
23rd QM	3.8	3.9	4	3.8	3.9	3.9	3.7	0.1	3.5	4	4	3.6	3.7	8.9	11
25th QM	0.2	0.3	0.2	0.1	0.2	0.1	0.2	0.2	0.3	0.3	0.5	0.4	1.5	4	NS
26th QM	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2	2	0.2	0.2	1.6	2.6
27th QM	2.4	2.7	2.7	2.5	2.7	2.4	2.6	2.5	2.7	2.5	2.5	1.8	2.6	7.1	8.2
28th QM	7.1	7.5	7.2	7.2	7.3	7.3	7	7.3	7.4	7	6.5	6.9	7	10.9	NS
29th QM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.8	0.1	0.1	1	0.9
30th QM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.1	0.2	2.2	2.6
31st QM	0.8	0.7	0.7	0.7	0.8	0.8	1	0.9	0.9	0.9	0.2	0.9	2.1	6.4	8
32nd QM	2.6	2.5	2.3	2.6	2.3	2.1	2.6	2.7	2.4	2.7	2.5	4	6.3	8.3	NS
33rd QM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.6	0.3	0.6	3.2	NS
34th QM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	1.7	2.9
35th QM	3.2	3.7	3.7	3.5	3.9	4	3.8	4.2	4	3.5	3.3	2.9	3	8.4	9.5
36th QM	8.8	9.1	9.2	8.9	9	9	8.9	9	9.1	8.8	9.2	8.8	8.6	10.8	NS
37th QM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.19	0.11	1.14	0.3	0.9	1.5	2.8
38th QM	0.1	0.1	0.1	0.1	0.1	0.1	0.3	0.1	0.1	0.1	0.1	0.1	0.2	2.5	3.5
39th QM	3.8	4.1	3.9	4	3.9	4	4.1	4	3.9	4.1	4.1	6.8	8.9	9.1	10.8
40th QM	8.5	8.1	8.6	8.5	8.5	8.5	8.7	8.8	8.7	8.5	8.8	8.7	7.5	10.6	11.7
Standard (ECR*2023)	N/A														

Source: CEGIS Field Survey;2014 up to 2023; Note: QM= Quarterly Monitoring, NS – Not Surveyed; SL-Sampling location; N/A-Not available

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

Monitoring Period	Sampling Locations ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
1st QM	5.9	4.9	5.2	5.7	5.9	5.8	6.6	6.5	6.5	6	6.7	5.3	5.4	7.9	7.5
2nd QM	6.1	6.8	6.7	6.8	6.9	6.6	7.3	7.1	7.2	6.5	6.8	6.2	5.9	6.4	6.5
3rd QM	5.6	7.7	7.7	7.6	7.2	8	5.6	5.6	5.8	8	8	7	7	7.7	7.8
4th QM	5.5	6.6	6.7	5.8	5.9	6.8	6.1	6.9	6.6	6	6.2	6.5	6.6	6.7	6.5
5th QM	6.2	6.4	6.2	6.2	6.6	6.4	6.3	6.5	6.4	6.2	6.5	6.3	5.8	6	5.8
6th QM	5.3	5	5	6.7	6.6	6	7.5	7.4	7.3	6	6.4	7	7.5	NS	NS
7th QM	6.8	6.4	7.1	6.8	7.2	7.6	6.4	6.1	6.3	7.1	7.1	6.6	7.1	7.3	7
8th QM	5.1	5.1	6.2	5.9	5.3	5.4	6	6.1	5.8	4.1	5.2	5.4	5.2	6.2	NS
9th QM	7.1	6.4	6.9	5.8	6.1	6.6	6.9	7.1	6.8	6.4	5.9	5.8	6.4	6.1	7.1
10th QM	6.2	5.7	5.6	6.1	6.3	5.8	6.3	6.4	5.6	5.2	5.4	5.4	5.4	6.2	6.8
11th QM	6	6.1	6	6.3	5.9	6.1	5.9	6	6	6.1	6.4	5.6	5.8	6.7	6.9
12th QM	6.1	5.9	6.1	6.2	5.9	5.9	6.3	6.4	6.4	6.7	6.7	5.9	6.1	6.5	6.8
13th QM	7.1	7.2	6.8	6.9	7.4	7.5	6.4	7.2	6.8	6.8	7.1	6.4	6.4	7.2	NS
14th QM	6.3	6.4	6.5	6.3	6.3	6.5	6.5	7.1	6.5	6.3	6.2	6.4	6.2	6.8	7.3
15th QM	5.19	5.03	5.06	5.1	5.03	4.9	5	4.98	5.11	5.17	5.11	5.23	5.03	5.4	5.4
16th QM	6.575	6.225	6.275	6.15	6.5	6.575	6.55	6.825	6.625	6.35	6.7	5.95	5.8	6	NS
17th QM	6	6.2	6.1	5.5	6	6.5	6.8	6.2	6	6.7	6.3	5.8	6.9	6.8	NS
18th QM	6.4	6.2	6.3	6	6.2	6	6.1	6.3	6.2	5.8	6	6	8.21	6.9	7.2
19th QM	8.7	7.9	7.3	8.7	7.3	7.4	7.8	7.1	6.9	7.5	6	6.9	7.5	7.7	8
20th QM	5.9	6.5	6.3	6.1	6.5	6	6.1	6.5	6.1	6.3	6.2	6.5	6.9	7	NS
21st QM	6	6	6.1	6.5	6.3	6.4	6.2	6.2	6.3	6.4	6	6.2	6	6.6	NS
22nd QM	7.7	7.8	7.8	8.6	8	8.2	9.9	10	10.5	7.1	7.7	7.9	8.4	7.7	8.6
23rd QM	8.4	8.6	7.6	8.1	8.2	7	6.9	7.2	7.8	9.7	7.5	8.6	6.9	9.7	6.7
25th QM	6.1	6.1	6	6	6.4	6.2	6.6	6.5	6.3	6.4	6.1	6	6.1	6.5	NS
26th QM	6.4	7.64	6.3	8.2	8.89	7.8	9.7	9.76	9.76	9.7		8.14	7.65	6.61	8.2
27th QM	9.2	9.6	7.8	9	8.9	9.3	9.6	7	6.4	8.1	8	9.2	7.6	7.2	9
28th QM	6.5	6	6.8	8.4	8	8.5	5.4	6.3	5.9	7.5	7	5.9	5.5	6.8	NS

Monitoring Period	Sampling Locations ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
29th QM	5.8	6	6.3	6.6	6.2	6.8	7.2	6.2	6.7	6.8	5.5	6.2	6.6	6.1	6.2
30th QM	7.8	7.5	6.5	6.7	5.6	6.5	6.7	6.5	6.1	6.7	6.2	5.8	6.8	6.5	6.9
31st QM	6.5	6.7	6.5	7.1	5.5	6.7	6.4	6.6	6.5	6.5	6.5	6.9	5.9	6.2	6.2
32nd QM	7.3	7.8	7.5	7.5	6	5	6.2	7.2	6.7	6.1	7	6.8	7.8	7.1	NS
33rd QM	8.1	8.5	7.8	7.5	8.8	8.1	7.5	8	8.1	8.5	7.6	7.1	7.6	7.6	NS
34th QM	6.2	8.4	8.5	7.7	5.7	5.8	7.5	8.2	5.9	5.7	7.5	8.1	8.4	8.2	7.5
35th QM	6.1	6.2	5.9	5.8	5.8	6.2	6	6.1	6.7	5.9	5.8	7.2	6.5	7.6	6.6
36th QM	5.3	6	5.2	4.9	5.4	5.6	5	5.3	5.2	5.75	6.1	6.7	5.8	6.8	NS
37th QM	6.7	6.8	6.7	6.4	6.6	6.7	6.6	6.8	6.7	6.3	7.2	7.4	7.8	7.6	7.9
38th QM	6.3	5.9	5.6	6.3	6.5	7	7	7.2	5.9	7.8	6.79	7.36	7.9	7.6	7.8
39th QM	6.9	7.1	7.2	7.2	7.1	6.9	7.3	7.3	7.4	7.1	7.2	7.4	7.5	7.7	8.0
40th QM	5.42	5.64	5.64	5.39	5.54	5.75	5.2	5.63	5.63	5.85	8.7	6.34	6.06	5.69	7.2
Standard (ECR*2023)	≥ 5 mg/L (Coastal area)												≥ 5 mg/L (Reserved area)		

Source: CEGIS Field Survey;2014 up to 2023; Note: QM= Quarterly Monitoring, NS – Not Surveyed; SL-Sampling location

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

Monitoring Periods	Sampling Location ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
1st QM	288	284	328	376	400	364	364	400	408	276	284	408	372	536	540
2nd QM	24	20	56	28	60	496	108	40	120	32	96	172	216	520	416
3rd QM	6	30	14	18	14	18	10	22	10	10	26	14	14	54	122
4th QM	128	68	92	84	116	108	104	16	100	116	84	96	96	316	472
5th QM	87	58	132	102	110	88	96	18	106	88	94	92	102	302	470
6th QM	42	43	18	26	21	24	32	25	25	51	36	30	26	NS	NS
7th QM	32	36	28	36	36	40	42	28	48	40	42	46	36	84	96
8th QM	124	100	96	100	108	80	100	100	124	100	108	88	100	96	NS
9th QM	220	240	280	280	240	260	240	180	200	160	210	220	140	156	160
10th QM	8	8	8	8	12	8	12	8	12	8	30	12	16	4	NS
11th QM	12	8	8	12	16	12	8	8	12	8	8	16	12	68	56

Monitoring Periods	Sampling Location ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
12th QM	56	40	44	48	52	42	56	52	44	36	48	40	40	56	196
13th QM	52	48	56	40	36	48	42	36	52	44	40	64	216	240	NS
14th QM	24	8	40	32	40	16	48	8	4	16	32	40	32	16	4
15th QM	48	28	40	36	32	28	40	44	36	40	32	48	40	72	88
16th QM	276	240	230	232	254	252	212	218	230	180	252	260	280	296	NS
17th QM	20	24	12	30	16	12	10	24	16	40	20	10	16	110	NS
18th QM	56	44	48	60	36	42	48	32	28	36	42	20	58	44	76
19th QM	72	60	48	44	56	64	88	36	68	72	68	32	56	180	140
20th QM	188	180	176	192	180	172	200	160	180	160	172	178	184	160	NS
21st QM	36	24	32	20	28	24	28	20	32	24	20	24	32	220	NS
22nd QM	56	40	26	40	28	24	20	32	20	24	36	40	32	92	72
23rd QM	24	28	32	24	40	24	26	20	28	44	36	36	40	56	64
25th QM	32	36	28	24	36	40	48	36	42	32	48	72	80	108	NS
26th QM	16	12	8	28	16	20	8	12	20	12	28	56	76	60	40
27th QM	56	32	20	48	20	56	48	56	8	12	24	32	12	28	NS
28th QM	508	404	400	304	412	390	408	424	448	400	380	472	424	392	NS
29th QM	4	4	4	4	4	12	8	8	12	16	48	32	16	80	32
30th QM	44	52	40	20	40	4	4	24	4	48	4	12	4	192	180
31st QM	24	12	8	40	32	12	16	36	12	12	32	16	60	36	40
32nd QM	24	28	48	36	24	20	24	48	52	56	96	96	240	36	NS
33rd QM	4	12	4	8	36	20	4	36	48	4	12	0.03	4	84	NS
34th QM	4	8	4	12	4	4	8	8	4	8	12	8	16	8	8
35th QM	144	256	148	212	188	264	220	144	192	112	144	148	188	112	120
36th QM	436	236	248	288	412	296	416	412	496	348	480	248	236	436	NS
37th QM	36	48	20	52	56	4	12	4	20	16	16	12	8	20	124
38th QM	36	24	48	36	20	28	48	36	48	92	56	48	52	56	36
39th QM	164	148	156	96	200	24	200	164	248	164	216	248	324	112	148
Standard (ECR*2023)	**5 mg/L (Coastal area)**												**8 mg/L (Reserved area)**		

Source: CEGIS Field Survey; 2014 up to 2023; Note: QM= Quarterly Monitoring, NS – Not Surveyed; SL-Sampling location

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

Monitoring periods	Sampling Location ID				
	SL-7	SL-12	SL-13	SL-14	SL-15
1st QM	<5	<5	<5	<5	<5
2nd QM	<5	<5	6.3	<5	<5
3rd QM	<5	<5	<5	<5	<5
4th QM	>15	>15	>20	>20	>20
5th QM	16.9	13	39.1	<5	<5
6th QM	9	7.63	10.1	NS	NS
7th QM	<5	9.87	<5	10.8	9.73
8th QM	39	21	14	ND	36
9th QM	61	30.3	26	31	82
10th QM	5	13.5	5.73	NS	5.87
11th QM	<5	<5	<5	10.1	<5
12th QM	9.2	15.6	<5	13.8	14.2
13th QM	*5.73*	<5	<5	7.71	ND
14th QM	<5	<5	<5	<5	<5
15th QM	16.6	<5	<5	<5	<5
16th QM	<5	<5	<5	<5	<5
17th QM	<1	<5	<1	NS	<1
18th QM	<2.0	<2.0	<2.0	<2.0	<2.0
19th QM	<2.0	<2.0	<2.0	<2.0	<2.0
20th QM	<2.0	<2.0	<2.0	<2.0	<2.0
21st QM	<2.0	<2.0	<2.0	<2.0	<2.0
22nd QM	<2.0	<2.0	<2.0	<2.0	<2.0
23rd QM	2.3	<2.0	<2.0	4.4	2.3
25th QM	<2.0	<2.0	<2.0	<2.0	<2.0
26th QM	<2.0	<2.0	<2.0	<2.0	<2.0
27th QM	2.93	<2.0	<2.0	<2.0	NS
28th QM	<2.0	<2.0	<2.0	<2.0	3.2

Monitoring periods	Sampling Location ID				
	SL-7	SL-12	SL-13	SL-14	SL-15
29th QM	<2.0	<2.0	<2.0	<2.0	<2.0
30th QM	<2.0	<2.0	<2.0	<2.0	<2.0
31st QM	<2.0	<2.0	<2.0	<2.0	<2.0
32nd QM	<2.0	<2.0	<2.0	<2.0	<2.0
33rd QM	<2.0	<2.0	<2.0	<2.0	NS
34th QM	<2.0	<2.0	<2.0	<2.0	<2.0
35th QM	<2.0	<2.0	<2.0	<2.0	<2.0
36th QM	<2.0	<2.0	<2.0	<2.0	<2.0
37th QM	<2.0	<2.0	<2.0	<2.0	<2.0
38th QM	<2.0	<2.0	<2.0	<2.0	<2.0
39th QM	<2.0	<2.0	<2.0	<2.0	<2.0
Standard (ECR*2023)	**0.14 mg/L (Coastal area)**		**0.01 mg/L (Reserved area)**		

Source: CEGIS Field Survey;2014 up to 2023; Note: QM= Quarterly Monitoring, NS – Not Surveyed; SL-Sampling location; SL-Sampling location

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

Monitoring Periods	Sampling Location ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
1st QM	13060	12630	12900	13190	13330	13380	13180	13390	13240	12400	10970	12800	12280	21500	21500
2nd QM	251	246	383	445	353	402	655	587	916	455	2510	6410	9360	15960	14050
3rd QM	176	162	153	169	156	152	162	153	154	214	257	209	285	3400	5720
4th QM	4360	3950	4330	4750	4920	4870	5040	5050	5130	5050	4390	5130	4780	12350	17900
5th QM	14400	14700	14900	14600	14500	14200	14500	14600	14250	14000	13900	14050	13900	13600	25300
6th QM	937	941	127	175	132	156	336	158	160	2320	355	298	683	NS	NS
7th QM	158	169	152	172	162	160	192	164	164	183	176	227	205	4220	5830
8th QM	5570	5910	5490	5720	5850	5480	5650	5740	5650	5450	4420	4540	4940	13330	NS
9th QM	13400	13280	13560	12830	13100	13460	12820	12960	13590	13340	11700	11330	13580	20720	25500
10th QM	179	112	125	162	185	143	205	195	140	165	5170	893	1321	7330	NS
11th QM	138	106	108	147	110	112	113	108	146	196	238	162	301	2550	4120
12th QM	3100	3140	3330	3630	3600	3520	3470	3790	3770	2920	3960	3370	3370	3580	12210

Monitoring Periods	Sampling Location ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
13th QM	13400	13480	13400	13560	13490	13330	13640	13680	13360	13490	13110	12340	13600	19370	NS
14th QM	496	122	123	172	125	125	160	126	127	1616	1200	204	245	3270	4450
15th QM	1913	1919	1915	2500	2520	2500	2840	2710	2720	2500	2970	2570	2690	11390	14190
16th QM	14500	14420	14650	14300	14450	14540	14400	14500	14610	14160	14450	14500	15350	20600	NS
17th QM	315	224	232	328	235	208	205	286	296	265	340	580	2190	7680	NS
18th QM	855	733	722	824	716	732	945	784	786	992	827	940	1715	8100	12500
19th QM	9940	9950	9730	9860	9980	9800	10190	10280	10080	10040	8860	8350	10950	17200	21110
20th QM	15800	15600	15500	15700	16000	16100	15640	16000	15800	15700	15100	15722	15400	14800	NS
21st QM	290	150	152	205	142	150	208	145	154	940	365	172	560	12500	NS
22nd QM	480	175	170	190	175	174	325	180	172	1405	875	350	474	3950	5750
23rd QM	6800	6950	7300	6760	6760	6900	6740	6450	6700	7250	5800	6240	6430	16300	20400
25th QM	134	114	116	221	125	132	195	128	114	229	2893	740	489	4188	NS
26th QM	122	96	94	102	179	105	181	98	92	206	164	148	2260	1472	490
27th QM	3770	4410	4390	4150	4170	4060	4100	4210	4450	4170	2320	3010	4060	11400	14600
28th QM	12500	12700	12300	12800	13100	13200	13100	13300	13200	12500	11800	12100	12400	18500	NS
29th QM	58	105	106	74	97	110	158	110	100	216	1270	180	240	1700	1610
30th QM	160	150	147	158	150	153	155	153	156	160	780	203	275	3850	6300
31st QM	1380	1300	1210	1230	1510	1380	1850	1680	1650	1540	1350	1580	3850	11600	15500
32nd QM	4870	4800	4350	5250	4920	4060	5150	5070	4750	5100	8900	7820	12200	16400	NS
33rd QM	190	125	122	140	115	135	150	127	125	134	2850	460	1020	6200	
34th QM	155	150	136	158	135	133	235	136	132	210	140	210	315	2890	5300
35th QM	5700	6900	6850	6300	7400	7500	6800	7700	7600	5500	5600	5300	6100	15300	18100
36th QM	16900	17500	18000	17400	17800	17900	17600	17500	17800	17600	15200	16700	16800	21000	NS
37th QM	146	132	146	109	136	135	160	132	142	218	297	320	675	4200	5800
38th QM	280	195	190	210	192	190	525	215	192	950	350	226	430	4700	6800
39th QM	4100	4170	4200	5800	5300	5350	5500	5680	560	4150	5200	4900	6500	16100	14000
Standard (ECR*2023)	N/A														

Source: CEGIS Field Survey;2014 up to 2023; Note: QM= Quarterly Monitoring, NS – Not Surveyed; SL-Sampling location

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

Monitoring ID	Sampling Location ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
1st QM	2900	2500	2650	2550	2600	2625	2550	2800	2500	2500	2400	3150	2625	4500	4850
2nd QM	250	180	170	175	275	350	325	350	475	450	725	1400	2150	3625	3050
3rd QM	216	218	335	390	340	355	330	345	325	350	330	377	345	980	1440
4th QM	930	870	870	940	990	970	1045	1125	975	980	970	1000	970	2380	2690
5th QM	3000	3050	3250	3450	3250	3200	3600	3670	3540	3260	3190	3210	3080	3420	3640
6th QM	245	110	105	118	103	105	153	105	165	470	130	135	200	NS	NS
7th QM	250	330	360	365	355	350	345	390	445	183	340	410	430	1090	1460
8th QM	1270	1380	1240	1220	1300	1260	1370	1340	1270	950	1075	1090	1100	2850	NS
9th QM	3130	3090	3140	3010	3070	3100	3060	3130	3110	3180	3080	3060	3050	4520	5050
10th QM	240	205	205	220	232	218	235	242	224	220	875	405	415	1750	NS
11th QM	255	250	190	265	237	242	205	217	238	250	240	245	282	670	810
12th QM	1090	980	1030	1020	915	1070	935	1100	1110	1040	1170	1070	1070	1130	2870
13th QM	3640	3420	3300	3400	3440	3380	3540	3480	3600	1960	2300	2450	3560	4300	NS
14th QM	200	150	155	160	145	140	150	155	175	165	320	220	200	640	905
15th QM	430	510	498	570	590	480	505	530	512	505	478	1070	610	1475	1740
16th QM	3100	1040	1030	1060	1040	1085	1080	1110	1100	1300	1120	1410	1330	1440	NS
17th QM	210	205	185	200	210	215	205	212	205	210	220	245	530	2030	NS
18th QM	335	310	313	285	255	275	295	265	325	295	315	325	2550	2750	4200
19th QM	2050	3900	4100	4600	4200	4400	4400	4300	4600	4000	4100	4000	4500	5900	6900
20th QM	3000	5000	5000	5200	5000	4800	4400	5100	4900	5200	5000	4782	4500	4500	NS
21st QM	2100	1950	1900	1850	2500	2550	1700	1850	2000	2000	2200	1800	1400	4300	NS
22nd QM	215	125	190	175	178	155	175	150	115	350	285	200	185	830	1225
23rd QM	1540	1485	1530	1580	1560	1490	1530	1560	1485	1460	1440	1510	1390	3470	3850
25th QM	205	200	187	217	215	202	195	210	207	310	742	250	280	1000	NS
26th QM	272	195	225	210	235	200	240	235	243	198	217	265	225	210	230
27th QM	2800	2700	2750	3000	3100	2500	2550	3200	2800	1400	1200	2850	2870	5050	5600
28th QM	4500	4200	4300	4100	4500	4000	4400	4100	4400	4200	4100	4200	4400	4300	NS

Monitoring ID	Sampling Location ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
29th QM	140	200	180	200	175	175	140	130	100	145	400	150	160	480	470
30th QM	145	125	130	175	140	145	160	170	155	165	265	190	170	1000	1450
31st QM	370	385	310	375	325	340	375	420	430	380	435	500	680	6500	5300
32nd QM	2500	2400	2250	2500	2350	2100	2550	2400	2460	2450	3100	2300	4000	5000	NS
33rd QM	140	110	115	120	110	120	125	120	130	140	1000	215	930	2500	NS
34th QM	190	140	150	130	125	115	152	140	130	155	140	115	110	2000	2500
35th QM	2600	2800	2800	2900	3100	3200	3100	3300	3500	2500	2500	2600	2800	4500	5000
36th QM	4700	4800	4700	4500	4650	4750	4600	4850	4800	4550	4400	4600	4650	5250	NS
37th QM	110	120	125	90	120	110	125	110	125	170	185	190	800	1500	1900
38th QM	185	145	160	190	170	160	190	140	120	315	225	165	210	1400	1600
39th QM	2550	2600	3250	3300	2850	2950	3350	3200	2900	3000	3100	2200	3300	5450	4950
Standard (ECR*2023)	N/A														

Source: CEGIS Field Survey; 2014 up to 2023; Note: QM= Quarterly Monitoring, NS – Not Surveyed; SL-Sampling location

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

Monitoring Periods	Sampling Location ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
1st QM	598	45	53	54	60	55	24	27	67	7	9	50	65	115	91
2nd QM	126	92	112	99	100	105	116	112	37	65	24	310	90	99	72
3rd QM	234	193	174	227	232	186	185	536	459	798	389	203	869	28	267
4th QM	180	210	230	450	250	200	300	530	450	280	206	280	400	103	200
5th QM	160	167	170	160	165	155	150	147	155	148	160	165	160	150	180
6th QM	26	25	127	30	27	40	32	40	44	36	28	24	42	NS	NS
7th QM	76	80	65	92	85	97	104	90	82	96	92	60	74	110	144
8th QM	14	12	14	17	18	22	20	7	18	11	10	15	22	16	NS
9th QM	8	7	10	10	8	7	12	10	11	7	6	13	18	23	15
10th QM	61	48	56	62	45	49	51	43	39	42	11	47	31	16	NS
11th QM	20	18	16	20	24	19	20	18	16	24	30	27	18	41	33

Monitoring Periods	Sampling Location ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
12th QM	46	52	48	42	54	46	61	58	63	55	66	61	**61**	34	49
13th QM	51	42	48	52	43	38	32	44	40	37	49	38	33	28	NS
14th QM	18	15	22	16	20	17	15	16	14	26	30	**25**	27	22	16
15th QM	14	15	14	13	13	14	15	17	12	14	15	13	17	14	13
16th QM	18	17	22	20	19	21	17	19	18	23	32	14	15	18	NS
17th QM	17	16	15	18	16	15	16	14	20	13	12	17	13	14	NS
18th QM	14	11	15	11	13	12	14	13	15	11	42	27	22	15	6
19th QM	15	12	14	12	13	15	16	13	14	14	8	15	12	11	9
20th QM	12	14	13	11	12	15	12	11	13	14	12	13	11	10	NS
21st QM	14	11	13	12	13	14	13	12	13	15	12	13	12	7	NS
22nd QM	8	7	6	8	7	6	7	6	5	9	7	15	11	7	5
23rd QM	11	8	7	8	9	6	7	8	6	13	12	14	11	10	10
25th QM	14	6	11	12	9	12	14	13	8	11	5	9	17	18	NS
26th QM	7	11	8	7	6	9	15	8	6	8	7	8	5	8	6
27th QM	11	6	7	7	6	8	7	6	6	7	8	6	8	11	6
28th QM	15	23	20	13	12	16	14	15	13	17	12	3	14	11	NS
29th QM	12	14	9	12	11	8	12	9	15	13	3	7	9	16	13
30th QM	13	12	10	14	9	13	17	4	15	11	8	13	15	12	13
31st QM	15	14	17	12	13	11	14	12	15	13	13	14	15	16	13
32nd QM	7	10	11	12	9	11	18	13	12	19	16	15	13	17	NS
33rd QM	27	23	24	31	27	26	29	26	24	30	15	64	21	32	NS
34th QM	16	15	19	18	14	16	21	18	14	15	18	25	20	23	21
35th QM	11	14	12	11	8	13	12	7	11	8	7	8	6	7	9
36th QM	25	20	16	18	12	13	10	7	6	8	6	7	6	11	NS
37th QM	15	12	17	14	12	13	11	12	9	13	16	14	10	13	9
38th QM	5	4	5	4	5	3	6	4	3	7	13	11	7	4	3
39th QM	3	3	6	4	3	3	4	4	4	5	4	13	3	3	3
Standard (ECR'2023)	**50 mg/L (Coastal area)**												**25 mg/L (Reserved area)**		

Source: CEGIS Field Survey;2014 up to 2023; Note: QM= Quarterly Monitoring, NS – Not Surveyed.

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

Monitoring Periods	Sampling Location ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
1st QM	0.9	0.7	0.1	1.3	1.4	1.1	0.75	1.1	1.2	0.3	0.5	0.6	1.4	2.7	0.8
2nd QM	2.89	2.4	3.2	0.76	2.69	2.98	2.13	2.43	2.05	2.18	0.88	1.52	1.75	3.32	2.84
3rd QM	0.32	1.57	1.84	1.64	1.42	1.33	1.85	2.09	2.21	2.26	1.98	1.64	1.67	0.59	0.4
4th QM	3	1.5	4.3	3.1	2.2	8.5	2.7	1.8	1.9	6	4	4.5	2.7	1.5	2
5th QM	33	13	39	48	69	8	87	48	128	62	48	29	18	25	28
6th QM	9.1	7.5	6.2	6.6	6.1	6.6	14.9	4	4.9	7	3.1	7.8	4.4	NS	NS
7th QM	4	7.1	5	5.7	3.3	4.7	4.4	6.2	4.4	4.9	2.9	3.1	4.4	3.2	11.5
8th QM	6.3	4.3	3.9	3.1	5.2	4.1	4.9	3.7	4.4	5.6	3.9	3.7	5.1	4.9	NS
9th QM	3	2.9	2.5	2	3.1	3.6	2.6	2.9	2.6	2.7	3.1	3	3.4	2.9	3.5
10th QM	3.9	6.2	4.3	5.1	2.7	3.9	3.6	5.1	4.9	5.2	5.3	5.2	5.1	5.4	NS
11th QM	0.25	0.39	0.42	0.76	0.52	0.31	0.2	0.41	0.63	0.4	0.32	0.27	0.39	0.25	0.38
12th QM	3.62	2.89	1.87	2.25	2.46	3.01	3.64	1.93	2.17	2.46	3.1	2.78	2.78	3.08	2.28
13th QM	4.35	5.05	4.55	6.11	3.4	3.16	3.14	3.34	2	3.61	1.6	2.49	2.46	3.69	NS
14th QM	5.8	6.8	4.5	7.1	3.1	5	4.1	3.4	3.1	2.3	3.2	3.5	4.2	2.2	2.6
15th QM	3	4.2	3.6	3	4.7	7.6	8.8	8.5	2.8	1.6	3.4	4.5	4.6	1.8	6.1
16th QM	6.8	4.9	5.1	2.8	5.2	5.5	2.6	4.5	5.3	5.9	3.9	4.7	5.2	5.5	NS
17th QM	0.8	1.7	2.1	2.8	1.8	3.2	4	3.7	3.8	4.4	3.1	2.4	2.7	4.2	NS
18th QM	2.8	0.1	0.11	1.7	0.9	0.1	0.1	3.4	0.7	2.3	0.12	1.6	0.1	0.1	0.9
19th QM	3.5	2.6	1.9	2.1	2.2	3.5	4.2	3	3.1	2.1	1.3	3.7	4.7	1.8	2.6
20th QM	0.3	0.3	3.7	3	1.2	4.8	0.5	3.4	4.1	5	2.9	2.7	4.4	2.7	NS
21st QM	0.1	1.1	1.2	1.5	1.5	2.1	1.5	1.7	0.5	3.1	2.5	1.8	1.7	1.3	NS
22nd QM	3.5	2.7	3.4	3	1.7	2.1	2	1.3	2.2	2.9	1.6	2	2.1	1.6	2.5
23rd QM	1.3	1.7	3.2	4.5	2.7	5.1	7.4	3.9	4.1	4.7	4.9	3.3	3.2	2.6	4.1
25th QM	3	3.3	9.5	2.9	1.9	1.8	1	1.5	1.3	3.9	2.1	1.5	5.7	4	NS
26th QM	3.2	1.3	4.7	2.5	2.6	1	0.5	2.1	3	1.5	1.3	2.6	2.6	2.6	2.6
27th QM	4.3	2.2	1.2	0.7	3.1	2.7	1.8	3	1.9	3	4.9	0.5	0.5	2.9	3.9
28th QM	3.3	2.1	1.3	2.1	3	1.5	1.7	2	2.3	4.2	1	1.7	2.6	2.8	NS

Monitoring Periods	Sampling Location ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
29th QM	2.1	2.2	1.3	1.4	1.6	1.4	1.9	2.1	2.5	3.1	2.1	3.8	3.9	4.1	3.2
30th QM	3.5	3.8	6.7	12.6	0.3	7.4	0.7	9.2	1.7	0.5	0.1	0.4	1	0	0.5
31st QM	2.06	1.43	2	15.9	1.5	6.8	1.1	ND	1.5	16.2	5.7	9.4	4.06	24.7	1.8
32nd QM	8.41	13.52	12.75	10.8	8.71	9.39	11.15	8.5	11	14.42	6.41	8.05	15.35	10.85	NS
33rd QM	3.85	6.47	10.43	8.83	13.06	12.26	8.2	8.18	11.82	11.52	13.14	15.7	15.96	11.29	NS
34th QM	0.03	0.09	0.23	3.79	2.06	3.6	5.18	5.01	4.71	5.74	1.62	5.97	5.72	3.49	5.76
35th QM	1.13	1.45	2.06	1.3	1.7	1.7	1.8	1.3	2.4	2.2	2.2	1.3	2.2	2.7	2.1
36th QM	2.27	1.94	0.68	2.44	1.1	4.19	2	4.44	5.32	3.57	1.2	13.96	1.53	0.52	NS
37th QM	ND	0.2761	0.1289	ND	0.6546	0.8438	0.5915	1.2433	0.6756	1.1172	7.1	1.9162	3.6404	1.117	4.187
38th QM	1.54	1.39	0.93	1.41	0.42	0.61	0.99	0.13	0.1	3.98	0.11	0.42	0.1	0.51	0.72
39th QM	2.9	3.38	2.75	1.51	1.32	3.34	2.35	1.57	0.45	2.17	2.11	0.97	2.01	2.87	1.61
Standard (ECR'2023)	0.3 mg/L (Coastal area)												0.8 mg/L (Reserved area)		

Source: CEGIS Field Survey;2014 up to 2023; Note: QM= Quarterly Monitoring, NS – Not Surveyed; SL-Sampling location; ND-Not Detected.

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

Monitoring periods	Sampling Location ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
1st QM	1840	1320	1280	1360	1040	1320	1640	1520	1280	1120	1320	1360	1560	2600	2080
2nd QM	20	23	36	45	32	20	60	40	80	20	210	620	860	1400	1160
3rd QM	26	28	34	33	30	27	40	35	64	63	63	44	69	1390	2360
4th QM	580	450	480	550	520	540	630	560	620	570	460	630	590	850	1500
5th QM	1360	1260	1240	1240	1120	820	880	1180	900	1220	840	980	900	1540	1920
6th QM	67	11	9	26	6	8	9	19	12	72	27	39	51	NS	NS
7th QM	7	8	11	10	8	9	12	8	6	11	9	13	7	84	97
8th QM	570	590	560	550	580	565	640	560	550	96	480	482	500	760	NS
9th QM	1080	1040	1020	1060	980	1100	1060	1020	1080	1040	1020	1100	1080	1650	2100
10th QM	18	10	13	15	17	14	15	18	12	11	480	42	60	620	NS
11th QM	5	3	4	4	6	5	6	5	8	14	14	14	19	190	320
12th QM	230	210	200	230	280	230	230	231	250	160	200	220	220	230	1090

Monitoring periods	Sampling Location ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
13th QM	422	460	1340	1380	1280	1400	880	1440	1340	1220	1340	1220	1300	1420	NS
14th QM	29	3	5	2	1	2	2	1	3	120	76	**5**	13	30	2
15th QM	630	370	410	310	310	490	700	340	340	270	350	280	220	760	510
16th QM	1400	1320	1440	1260	1200	1400	1300	1380	1240	1200	1250	1260	1300	1460	NS
17th QM	24	18	20	22	21	16	10	24	22	21	18	28	35	620	NS
18th QM	51	49	46	52	38	42	56	52	39	65	46	30	20	250	780
19th QM	760	756	764	748	760	762	768	760	770	758	760	765	756	764	769
20th QM	1460	1380	1420	1410	1440	1400	1500	1450	1460	1500	1490	1446	1500	1500	NS
21st QM	23	19	21	16	17	19	15	16	14	18	12	14	16	980	NS
22nd QM	37	6	6	5	4	8	25	9	6	71	55	33	38	370	540
23rd QM	490	510	560	530	640	490	520	470	510	490	565	580	470	410	445
25th QM	4	3	5	8	10	13	16	8	16	16	21	12	34	60	NS
26th QM	3	6	11	5	3	8	6	4	12	31	26	21	540	430	30
27th QM	270	420	460	410	420	430	450	440	450	420	190	260	410	580	1240
28th QM	1	5	2	1	3	2	3	1	2	3	15	13	5	5	NS
29th QM	21	20	24	18	15	18	19	13	14	17	39	39	41	410	598
30th QM	99.4	90.3	92.6	89.3	108.4	98	118.7	118	118.7	115	91.1	106.8	243.8	183.3	230.8
31st QM	185.5	188.6	197.8	198.1	186.2	180.8	191.3	189.4	185	199.7	218	212.37	227.53	245.62	985
32nd QM	36.32	33.65	46.92	41.55	22.28	29.53	37.16	45.68	52.04	36.65	158.9	111.28	200.6	517.86	NS
33rd QM	28.35	19.51	21.31	23.56	21.32	22.27	30.07	14.26	21.18	35.24	33.71	92.53	79.75	172.39	NS
34th QM	200.77	206.51	200.31	202.27	208.03	211.48	198.41	202.02	211.53	199.39	193.21	198.8	185.87	232.06	236.27
35th QM	240	244	243	244	241	246.5	245	246.1	238.7	247.5	243	247	246	248	246
36th QM	20.7	13.22	33.64	20.52	24.94	17.49	24.13	36.43	12	39.89	38.22	54.14	59.7	194.84	NS
37th QM	15.47	7.93	7.26	6.70	7.65	8.73	28.83	9.22	7.99	43.73	41.95	24.84	35.06	103.85	211.27
38th QM	136.6	174.08	148.8	189.5	191.5	197.3	195.8	199.1	159.1	154.1	172.4	177.4	197.2	224	219.1
39th QM	242.8	237.3	242.6	243.7	238	247.6	234.7	241.1	243.4	242.6	242.9	245.1	227.6	240.4	246
Standard (ECR'2023)	**N/A**														

Source: CEGIS Field Survey;2014 up to 2023; Note: QM= Quarterly Monitoring, NS – Not Surveyed; SL-Sampling location

Table B.12: Phosphate (PO_4^{3-}) (mg/L) concentration of Passur River System

Monitoring periods	Sampling Location ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
1st QM	0.52	0.5	1.1	2.1	2.2	2	0.57	1.2	1.5	0.55	1.1	1.3	1.1	1.3	7.51
2nd QM	2.23	1.99	2.55	0.45	2.13	2.42	1.25	1.51	1.1	2.1	0.53	0.35	0.56	0.29	0.29
3rd QM	0.67	1.12	0.95	0.92	1.11	0.99	1.18	1.25	1	1.27	1.04	0.86	1.22	0.8	1.09
4th QM	0.32	0.61	0.7	0.43	0.41	0.55	0.76	0.85	0.53	0.59	0.64	0.42	0.61	0.42	0.44
5th QM	0.86	0.53	0.72	0.49	0.68	0.61	0.65	0.53	0.6	0.7	0.55	0.71	0.59	0.61	0.47
6th QM	10	0.23	0.67	0.27	0.59	0.13	0.1	0.18	0.1	0.5	0.29	0.59	0.89	NS	NS
7th QM	1.27	1.97	1.94	2.53	1.3	1.32	0.99	1.02	1.39	1.27	1.28	0.95	0.35	0.43	0.45
8th QM	0.269	0.269	0.179	0.357	0.536	0.269	0.536	0.625	0.536	0.351	0.269	0.179	0.269	0.357	NS
9th QM	0.22	0.36	0.27	0.31	0.3	0.43	0.63	0.21	0.33	0.19	0.13	0.31	0.42	0.26	0.36
10th QM	1.14	1.76	1.77	2.31	0.98	1.01	0.87	0.96	1.123	1.06	1	0.78	0.53	0.47	NS
11th QM	3.39	4.11	4.58	2.76	3.2	2.48	4.16	2.76	2.71	2.836	5.23	4.01	1.16	9.08	5.9
12th QM	0.67	0.31	0.09	0.07	0.12	0.16	0.09	0.04	0.07	0.07	0.2	0.09	0.09	0.1	0.23
13th QM	1.31	1.72	2.73	2.77	0.66	0.62	0.65	0.37	0.45	0.61	0.47	0.18	0.21	0.19	NS
14th QM	0.49	2.5	2.8	3.3	3.9	3.9	4.6	0.41	0.63	0.51	15.3	1.3	3.15	0.36	0.55
15th QM	0.21	0.16	0.3	0.19	0.17	0.47	1.31	0.39	0.62	0.38	0.71	0.63	0.81	0.97	1.45
16th QM	0.38	0.25	0.29	0.38	0.34	0.27	0.29	0.29	0.42	0.24	0.28	0.37	0.26	0.2	NS
17th QM	1.03	0.83	0.76	0.88	1.07	0.67	1.16	0.86	1.03	0.83	1.2	0.86	0.5	0.67	NS
18th QM	0.25	0.3	0.22	0.24	0.4	0.53	0.32	0.43	0.57	0.27	0.22	0.33	0.25	0.5	0.61
19th QM	0.25	0.3	0.17	0.2	0.35	0.27	0.2	0.2	0.37	0.4	0.28	0.29	0.3	0.19	0.18
20th QM	0.25	0.32	0.4	0.3	0.27	0.25	0.41	0.35	0.27	0.28	0.3	0.31	0.52	0.63	NS
21st QM	10.1	0.6	0.5	0.6	0.6	0.9	11.1	0.8	0.8	0.5	0.8	0.6	0.6	0.5	NS
22nd QM	0.3	0.3	0.4	0.2	0.3	0.4	0.5	0.7	0.5	0.6	0.4	0.6	0.7	0.3	0.3
23rd QM	0.2	0.2	0.3	0.3	0.2	0.3	0.4	0.4	0.4	0.5	0.3	0.4	0.2	0.1	0.2
25th QM	0.25	0.27	0.3	0.35	0.29	0.36	0.4	0.43	0.52	0.25	0.56	0.53	0.4	0.37	NS
26th QM	0.5	0.5	0.5	0.7	0.5	0.8	0.7	0.4	1.3	1.2	0.7	0.8	0.3	0.4	0.4
27th QM	5.3	3.5	3.2	2.9	3	5.4	3	2.5	3.2	13.1	4.1	9.6	2.6	7.1	1.1
28th QM	4.9	2	1.9	2.3	5.7	4	1.2	2.4	6.3	8	0.76	0.79	0.6	3	NS
29th QM	4.2	0.6	0.54	4.5	2.1	3.4	5.4	3.7	2.7	3.4	0.2	0.27	1.9	0.87	0.5
30th QM	1.5	0.9	1.3	0	0	0	0.3	0.4	0.1	0.2	0.4	0.2	0.7	0.4	0.2

Monitoring periods	Sampling Location ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
31st QM	0.19	0.33	0.13	0.46	0.1	0.4	0.04	0.03	0.14	0.59	0.35	0.3	0.48	0.45	1.03
32nd QM	0.048	0.025	0.069	0.051	0.02	0.021	0.02	0.061	0.008	0.006	0.003	0.0572	0.228	0.125	NS
33rd QM	1.02	0.67	1.2	1.74	0.49	0.4	0.44	0.3	0.5	0.71	0.68	2.53	1.7	1.04	NS
34th QM	2.14	1.2	0	0.08	0.04	0.07	0.07	0.13	0.11	0.08	0.08	0.61	0.6	0.02	0.03
35th QM	1.01	0.56	0.62	0.45	0.08	0.08	0.06	0.06	0.03	0.1	0.09	0.14	0.5	0.07	0.52
36th QM	0.97	1.42	1.25	2.53	0.01	0.09	0.002	0.0235	0.001	0.044	0.037	0.543	0.004	0.07	NS
37th QM	0.08	0.1046	0.1147	0.0285	0.1829	0.0964	0.0468	0.0838	0.0415	0.0733	0.9322	0.4559	0.4183	0.1134	0.2034
38th QM	0.12	0.06	0.04	0.08	0.09	0.07	0.09	0.08	0.78	0.05	0.02	0.08	0.05	0.08	0.1
39th QM	0.222	0.211	0.31	0.189	0.241	0.458	0.085	0.175	0.142	0.277	0.163	1.05	0.249	0.12	0.08
Standard (ECR'2023)	0.05 mg/L (Coastal area)												0.08 mg/L (Reserved area)		

Source: CEGIS Field Survey;2014 up to 2023; Note: QM= Quarterly Monitoring, NS – Not Surveyed; SL-Sampling location

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

Monitoring periods	Sampling Location ID														
	Sl-1	Sl-2	Sl-3	Sl-4	Sl-5	Sl-6	Sl-7	Sl-8	Sl-9	Sl-10	Sl-11	Sl-12	Sl-13	Sl-14	Sl-15
1st QM	0.002	0.002	0.001	0.002	0.002	0.002	<0.001	<0.002	0.002	<0.001	0.002	0.002	0.004	0.004	0.003
2nd QM	0.003	0.003	0.003	0.004	0.004	0.003	0.003	0.004	0.003	0.003	0.002	0.004	0.003	0.002	0.002
3rd QM	0.004	0.004	0.004	0.004	0.004	0.003	0.006	0.004	0.006	0.006	0.003	0.003	0.004	0.002	0.003
4th QM	0.003	0.003	0.003	0.004	0.003	0.003	0.003	0.003	0.003	0.004	0.003	0.003	0.004	0.003	0.002
5th QM	0.002	0.002	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.004	0.004	0.002	0.002
6th QM	0.002	0.002	0.002	0.002	0.001	0.002	0.002	0.002	0.003	0.002	0.002	0.002	0.002	NS	NS
7th QM	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
8th QM	0.001	0.001	0.001	0.002	0.002	0.001	0.002	0.001	0.001	0.002	0.001	0.002	0.002	0.002	NS
9th QM	0.001	0.003	0.003	0.002	0.002	0.002	0.001	0.002	0.002	0.002	0.002	0.003	0.005	0.006	0.004
10th QM	0.002	0.003	0.005	0.004	0.002	0.002	0.003	0.003	0.004	0.005	0.002	0.004	0.002	0.001	NS
11th QM	0.002	0.003	0.002	0.002	0.002	0.002	0.002	0.003	0.002	0.002	0.002	0.003	0.003	0.003	0.002
12th QM	0.002	0.001	0.001	0.002	0.002	0.001	0.002	0.001	0.002	0.001	0.001	0.002	0.002	0.001	0.002
13th QM	0.002	0.002	0.001	0.001	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.002	0.001	0.002	NS
14th QM	0.002	0.001	0.002	0.002	0.002	0.003	0.003	0.002	0.002	0.003	0.001	0.002	0.003	0.002	0.002

Monitoring periods	Sampling Location ID														
	Sl-1	**Sl-2**	**Sl-3**	**Sl-4**	**Sl-5**	**Sl-6**	**Sl-7**	**Sl-8**	**Sl-9**	**Sl-10**	**Sl-11**	**Sl-12**	**Sl-13**	**Sl-14**	**Sl-15**
15th QM	0.002	0.002	0.003	0.002	0.002	0.002	0.001	0.001	0.001	0.002	0.001	0.001	0.002	0.001	0.001
16th QM	0.001	0.001	0.001	0.002	0.001	0.002	0.002	0.001	0.001	0.002	0.001	0.002	0.001	0.002	NS
17th QM	0.004	0.005	0.004	0.005	0.003	0.002	0.005	0.003	0.004	0.004	0.003	0.003	0.003	0.002	NS
18th QM	0.003	0.002	0.002	0.002	0.002	0.001	0.002	0.002	0.002	0.001	0.001	0.001	0.002	0.001	0.001
19th QM	0.002	0.001	0.003	0.001	0.001	0.002	0.003	0.001	0.001	0.002	0.005	0.007	0.001	0.002	0.001
20th QM	0.003	0.002	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.003	0.003	0.003	0.002	0.002	NS
21st QM	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.002	0.002	0.003	0.004	0.002	0.001	0.001	NS
22nd QM	0.002	0.003	0.002	0.003	0.003	0.002	0.003	0.002	0.002	0.003	0.004	0.004	0.002	0.002	0.002
23rd QM	0.002	0.003	0.002	0.003	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.002	0.002
25th QM	0.003	0.003	0.003	0.002	0.002	0.002	0.005	0.003	0.003	0.004	0.002	0.002	0.002	0.003	NS
26th QM	0.003	0.003	0.003	0.003	0.004	0.003	0.004	0.003	0.003	0.004	0.004	0.002	0.002	0.002	0.009
27th QM	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.002	0.002	0.003	0.002	0.003	0.002	0.002	0.002
28th QM	0.003	0.004	0.003	0.002	0.002	0.004	0.003	0.003	0.003	0.003	0.004	0.002	0.002	0.002	NS
29th QM	0.003	0.002	0.003	0.003	0.002	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003
30th QM	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.002	0.003	0.003	0.002
31st QM	0.003	0.003	0.003	0.002	0.002	0.002	0.003	0.002	0.002	0.003	0.003	0.003	0.002	0.002	0.002
32nd QM	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.003	0.003	0.004	0.003	0.003	0.003	0.003	NS
33rd QM	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.002	0.003	0.002	0.003	0.002	0.002	0.003	NS
34th QM	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
35th QM	0.003	0.003	0.004	0.003	0.003	0.003	0.004	0.003	0.003	0.004	0.001	0.002	0.002	0.002	0.002
36th QM	0.003	0.002	0.002	0.002	0.002	0.002	0.003	0.002	0.002	0.002	0.001	0.001	0.002	0.002	NS
37th QM	0.003	0.003	0.003	0.002	0.001	0.003	0.003	0.002	0.002	0.004	0.003	0.003	0.003	0.004	0.003
38th QM	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.003	0.002	0.002
39TH QM	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.002	0.002	0.003	0.003	0.001	0.003	0.002	0.002
Standard (ECR'2023)	**0.001 mg/L (Coastal area)**												**0.003 mg/L (Reserved area)**		

Source: CEGIS Field Survey; 2014 up to 2023; Note: QM= Quarterly Monitoring, NS – Not Surveyed; SL-Sampling location

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

Monitoring Periods	Sampling Locations ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
1st QM	0.053	0.055	0.055	0.057	0.06	0.058	0.053	0.054	0.056	0.053	0.048	0.05	0.043	0.194	0.224
2nd QM	0.004	0.002	0.005	0.002	0.002	0.002	0.002	0.003	0.005	0.004	0.004	0.032	0.044	0.071	0.05
3rd QM	0.002	0.003	0.002	0.003	0.002	0.002	0.003	0.004	0.004	0.004	<0.002	<0.002	0.004	0.032	0.07
4th QM	0.104	0.104	0.111	0.154	0.139	0.138	0.16	0.153	0.139	0.143	0.133	0.141	0.137	0.309	0.309
5th QM	0.098	0.102	0.138	0.142	0.135	0.156	0.142	0.148	0.163	0.135	0.14	0.14	0.13	0.297	0.291
6th QM	0.0059	0.0038	0.0058	0.011	0.002	0.0021	0.0076	0.002	0.002	0.002	0.002	0.002	0.002	NS	NS
7th QM	0.007	0.006	0.008	0.01	0.009	0.007	0.01	0.011	0.009	0.07	0.008	0.009	0.012	0.084	0.073
8th QM	0.168	0.092	0.176	0.115	0.148	0.112	0.134	0.099	0.093	0.023	0.067	0.078	0.135	0.302	NS
9th QM	0.203	0.302	0.347	0.336	0.317	0.298	0.396	0.323	0.331	0.35	0.275	0.258	0.228	0.359	0.607
10th QM	0.01	0.009	0.017	0.014	0.006	0.01	0.007	0.006	0.012	0.008	0.015	0.098	0.02	0.142	NS
11th QM	0.009	0.007	0.01	0.007	0.006	0.005	0.006	0.007	0.007	0.008	0.007	0.011	0.01	0.126	0.151
12th QM	0.024	0.034	0.03	0.036	0.046	0.041	0.048	0.044	0.056	0.038	0.056	0.05	0.05	0.033	0.129
13th QM	0.002	0.001	0.003	0.001	0.003	0.002	0.003	0.009	0.003	<LOQ	0.001	0.0001	0.001	0.009	NS
14th QM	0.003	0.003	0.003	0.002	0.002	0.001	0.001	0.002	0.002	0.003	0.011	0.011	0.005	0.004	0.019
15th QM	0.001	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.001	0.003	0.169	0.175
16th QM	0.002	0.001	0.004	0.001	0.003	0.001	0.007	0.003	0.005	0.002	0.003	0.002	0.003	0.001	NS
17th QM	0.002	0.001	0.02	0.018	0.008	0.041	0.012	0.015	0.03	0.01	0.016	0.015	0.017	0..062	NS
18th QM	0.003	0.007	0.017	0.013	0.01	0.012	0.011	0.014	0.019	0.008	0.017	0.009	0.009	0.018	0.014
19th QM	0.004	0.005	0.007	0.005	0.003	0.007	0.003	0.004	0.006	0.004	0.005	0.007	0.015	0.013	0.017
20th QM	0.003	0.002	0.004	0.003	0.003	0.002	0.002	0.003	0.002	0.002	0.003	0.003	0.002	0.002	NS
21st QM	0.001	0.003	0.002	0.009	0.003	0.009	0.12	0.006	0.004	0.003	0.004	0.002	0.006	0.001	NS
22nd QM	0.001	0.002	0.001	0.001	0.001	0.003	0.001	0.002	0.001	0.002	0.003	0.002	0.014	0.019	0.008
23rd QM	0.008	0.007	0.009	0.008	0.006	0.004	0.006	0.008	0.007	0.008	0.006	0.005	0.007	0.043	0.056
25th QM	0.006	0.004	0.007	0.005	0.007	0.008	0.019	0.009	0.01	0.013	0.005	0.003	0.009	0.011	NS
26th QM	0.002	0.005	0.006	0.008	0.006	0.005	0.018	0.008	0.004	0.003	0.006	0.007	0.004	0.02	0.013
27th QM	0.016	0.017	0.018	0.015	0.017	0.019	0.019	0.017	0.022	0.019	0.007	0.015	0.002	0.001	0.001
28th QM	0.029	0.029	0.036	0.016	0.014	0.012	0.0140.	0.003	0.014	0.013	0.015	0.014	0.014	0.018	NS
29th QM	0.017	0.019	0.019	0.012	0.012	0.016	0.022	0.015	0.016	0.022	0.002	0.023	0.011	0.005	0.5
30th QM	0.009	0.019	0.002	0.003	0.002	0.002	0.003	0.004	0.005	0.004	0.005	0.008	0.019	0.004	0.005

Monitoring Periods	Sampling Locations ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
31st QM	0.013	0.01	0.011	0.009	0.007	0.011	0.014	0.006	0.007	0.008	0.01	0.013	0.01	0.011	0.009
32nd QM	0.009	0.009	0.01	0.008	0.003	0.008	0.004	0.007	0.009	0.01	0.012	0.017	0.01	0.009	NS
33rd QM	0.006	0.005	0.006	0.007	0.009	0.007	0.007	0.006	0.008	0.003	0.002	0.006	0.001	0.001	NS
34th QM	0.004	0.003	0.004	0.006	0.002	0.003	0.005	0.005	0.004	0.007	0.006	0.024	0.01	0.012	0.003
35th QM	0.006	0.007	0.007	0.006	0.007	0.005	0.007	0.008	0.006	0.004	0.006	0.005	0.006	0.008	0.007
36th QM	0.008	0.009	0.007	0.01	0.012	0.007	0.006	0.01	0.009	0.003	0.004	0.007	0.004	0.005	NS
37th QM	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
38th QM	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
39th QM	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Standard (ECR'2023)	**0.05 mg/L (Coastal area)**												**0.05 mg/L (Reserved area)**		

Source: CEGIS Field Survey;2014 up to 2023; Note: QM= Quarterly Monitoring, NS – Not Surveyed; SL-Sampling location

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

Monitoring Periods	Sampling Location ID														
	SL-1	SL-2	SL-3	SL-4	SL-5	SL-6	SL-7	SL-8	SL-9	SL-10	SL-11	SL-12	SL-13	SL-14	SL-15
1st QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
2nd QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	NS
3rd QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
4th QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
5th QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
6th QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
7th QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	NS
8th QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	NS
9th QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
10th QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	NS
11th QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
12th QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
13th QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
14th QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
15th QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015

Monitoring Periods	Sampling Location ID														
	SL-1	**SL-2**	**SL-3**	**SL-4**	**SL-5**	**SL-6**	**SL-7**	**SL-8**	**SL-9**	**SL-10**	**SL-11**	**SL-12**	**SL-13**	**SL-14**	**SL-15**
16th QM	0.004	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	NS
17th QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	NS
18th QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
19th QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
20th QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	NS
21st QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
22nd QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
23rd QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
25th QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	NS
26th QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
27th QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
28th QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	NS
29th QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
30th QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
31st QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
32nd QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
33rd QM	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
34th QM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
35th QM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
36th QM	<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	NS
37th QM	<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
38th QM	<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
39th QM	<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
Standards (ECR'2023)	**0.0001 mg/L (Coastal area)**												**0.0001 mg/L (Reserved area)**		

Source: CEGIS Field Survey;2014 up to 2023; Note: QM= Quarterly Monitoring, NS – Not Surveyed; SL-Sampling location

Parameters for Ground Water Quality Monitoring

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

pH					Temperature (^0C)				
Monitoring periods	Sampling location ID				Monitoring periods	Sampling location ID			
	SL-1	SL-2	SL-3	SL-4		SL-1	SL-2	SL-3	SL-4
1st QM	7.6	7.6	7.6	6.3	**1st QM**	27.3	29.6	29.2	27.5
2nd QM	7.7	7.8	7.7	6.5	**2nd QM**	28.5	29.9	28.9	28.7
3rd QM	7.9	8	8	NF	**3rd QM**	26	28	28	NF
4th QM	8	8.2	8.1	NF	**4th QM**	24.5	22.5	25.1	NF
5th QM	TC	7.8	7.9	NF	**5th QM**	TC	28.6	28.8	NF
6th QM	8.1	8.3	8.3	NF	**6th QM**	31	28	30	NF
7th QM	7.49	7.93	7.7	NF	**7th QM**	30	27.8	28.7	NF
8th QM	7.6	8.1	7.9	NF	**8th QM**	24	23	25	NF
9th QM	7.8	8.3	8.2	NF	**9th QM**	29.8	29.6	30.1	NF
10th QM	7.8	8.1	7.9	NF	**10th QM**	28.6	29.1	29.4	NF
11th QM	8.4	7.9	7.9	NF	**11th QM**	29.1	30.4	29.8	NF
12th QM	8.1	7.5	7.6	NF	**12th QM**	25.1	24.3	24	NF
13th QM	7.4	7.8	7.4	NF	**13th QM**	28.7	27.7	28.4	NF
14th QM	8.2	8.1	7.8	NF	**14th QM**	27.2	26.5	26.4	NF
15th QM	6.9	7.4	7.2	NF	**15th QM**	22.9	23.8	23.6	NF
16th QM	NF	6.9	7.2	NF	**16th QM**	NF	30.3	30.1	NF
17th QM	NF	7.9	7.6	NF	**17th QM**	NF	29.3	29.7	NF
18th QM	NF	7.3	7.6	NF	**18th QM**	NF	30	29	NF
19th QM	7.1	6.9	6.5	NF	**19th QM**	23.8	23.7	23.2	NF
20th QM	8.3	8.4	8.9	NF	**20th QM**	29	30	30	NF
21st QM	8.2	7.9	8.1	NF	**21st QM**	31.4	30	31.2	NF
22nd QM	7.2	7.6	7.4	NF	**22nd QM**	27	27	26	NF
23rd QM	7.8	7.3	7.5	NF	**23rd QM**	24	23	23	NF
25th QM	**8.1**	**8**	**8**	NF	**25th QM**	31	30	30	NF
26th QM	7.4	8	8	NF	**26th QM**	27	28	27	NF

pH					Temperature (^0C)				
Monitoring periods	Sampling location ID				Monitoring periods	Sampling location ID			
	SL-1	SL-2	SL-3	SL-4		SL-1	SL-2	SL-3	SL-4
27th QM	**7.2**	**7.5**	**7.5**	NF	**27th QM**	22	25	25	NF
28th QM	8	8.3	8.2	NF	**28th QM**	23	23	24	NF
29th QM	5.6	6.2	7.4	NF	**29th QM**	31.3	30.45	30.72	NF
30th QM	8	8.6	9.1	NF	**30th QM**	28.89	27.7	28.04	NF
31st QM	7.7	8.1	8.1	NF	**31st QM**	23	24	25	NF
32nd QM	7.7	7.4	8.2	NF	**32nd QM**	29	31.48	29.37	NF
33rd QM	7.26	7.8	7.7	NF	**33rd QM**	32	30	29	NF
34th QM	7.1	8.1	8	NF	**34th QM**	26	26.69	26	NF
35th QM	8.4	9.0	8.1	NF	**35th QM**	31	27.3	26.9	NF
36th QM	8.1	8.7	8.3	NF	**36th QM**	29	30	30.13	NF
37th QM	7.4	7.6	7.1	NF	**37th QM**	29	30	30.1	NF
38th QM	7.9	8.1	8.2	NF	**38th QM**	31.5	30.86	28.1	NF
39th QM	8.1	8.2	8.1	NF	**39th QM**	28	29	28	NF
40th QM	8.1	7.6	7.9	NF	**40th QM**	30	28.28	26.9	NF
Standard (ECR'2023)	**6.5-8.5**				**Standard (ECR'2023)**	**(20^0C-30^0C) mg/L**			

Source: CEGIS Field Survey;2014 up to 2023; Note: QM= Quarterly Monitoring, NF-Not Functional.

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

Salinity (ppt.)					DO (mg/L)				
Monitoring periods	Sampling location ID				Monitoring periods	Sampling location ID			
	SL-1	SL-2	SL-3	SL-4		SL-1	SL-2	SL-3	SL-4
1st QM	0	0	0	0	**1st QM**	4.4	6	6.4	4.4
2nd QM	0	0	0	0	**2nd QM**	5.2	6.2	6.5	6
3rd QM	0	0	0	NF	**3rd QM**	6.5	7.7	6.1	NF
4th QM	1	0	0	NF	**4th QM**	6.7	6.3	6.5	NF
5th QM	TC	0	0	NF	**5th QM**	TC	6	6.6	NF
6th QM	0	0	0	NF	**6th QM**	6	5.9	6	NF

Salinity (ppt.)					DO (mg/L)				
Monitoring periods	Sampling location ID				Monitoring periods	Sampling location ID			
	SL-1	SL-2	SL-3	SL-4		SL-1	SL-2	SL-3	SL-4
7th QM	0	0	0	NF	**7th QM**	5.4	6.1	5.6	NF
8th QM	0	0	0	NF	**8th QM**	4.9	5.2	4.8	NF
9th QM	0	0	0	NF	**9th QM**	6.1	5.8	5.6	NF
10th QM	0	0	0	NF	**10th QM**	5.8	6.1	5.7	NF
11th QM	0	0	0	NF	**11th QM**	6.3	5.8	6.1	NF
12th QM	0	0	0	NF	**12th QM**	4.5	4.8	4.6	NF
13th QM	0	0	0	NF	**13th QM**	5.1	5.3	5.7	NF
14th QM	0	0	0	NF	**14th QM**	6.2	5.8	6.2	NF
15th QM	0	0.3	0.4	NF	**15th QM**	5.2	4.47	4.26	NF
16th QM	NF	0.3	0.2	NF	**16th QM**	NF	6	5.4	NF
17th QM	NF	0.1	0.1	NF	**17th QM**	NF	6	5.9	NF
18th QM	NF	0.1	0.1	NF	**18th QM**	NF	5.9	6.1	NF
19th QM	0.1	0.1	0.1	NF	**19th QM**	6	6.1	6.2	NF
20th QM	0.1	0.5	0.7	NF	**20th QM**	6	6.5	6.2	NF
21st QM	0.1	0.1	0.1	NF	**21st QM**	6.1	6	6	NF
22nd QM	0	0	0	NF	**22nd QM**	6	6.2	6	NF
23rd QM	0.1	0.1	0.1	NF	**23rd QM**	6	6.1	6	NF
25th QM	0.1	0.1	0.1	NF	**25th QM**	6	6.1	6.1	NF
26th QM	0.18	0.1	0.1	NF	**26th QM**	6	6.2	6	NF
27th QM	0.1	0.2	0.4	NF	**27th QM**	6.4	6.7	4.9	NF
28th QM	0.1	0.3	0.3	NF	**28th QM**	6.4	6.3	6.3	NF
29th QM	0.1	0.2	0.4	NF	**29th QM**	6	6	5	NF
30th QM	0	0	0	NF	**30th QM**	6.5	7.7	6.1	NF
31st QM	0.1	0.2	0.4	NF	**31st QM**	6.2	4.7	3.5	NF
32nd QM	0.3	0.2	0.4	NF	**32nd QM**	4	2.99	3.8	NF
33rd QM	0.4	0.2	0.1	NF	**33rd QM**	2.6	5.9	6	NF

Salinity (ppt.)					DO (mg/L)				
Monitoring periods	Sampling location ID				Monitoring periods	Sampling location ID			
	SL-1	SL-2	SL-3	SL-4		SL-1	SL-2	SL-3	SL-4
34th QM	0.2	0.2	0.4	NF	**34th QM**	3.2	5	3.8	NF
35th QM	0.6	0.2	0.4	NF	**35th QM**	5.99	5.8	3.8	NF
36th QM	0.6	0.2	0.4	NF	**36th QM**	3.1	2	2.2	NF
37th QM	0.2	0.1	0.4	NF	**37th QM**	4.1	4	3.8	NF
38th QM	0.1	0.2	0.4	NF	**38th QM**	5.15	4.8	3.6	NF
39th QM	0.1	0.1	0.5	NF	**39th QM**	4.5	4.6	4.8	NF
40th QM	0.6	0.2	0.4	NF	**40th QM**	3.91	7	2.5	NF
Standard (ECR'2023)	N/A				**Standard (ECR'2023)**	N/A			

Source: CEGIS Field Survey;2014 up to 2023; Note: QM= Quarterly Monitoring, NF-Not Functional.

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

TDS (mg/L)					TSS (mg/L)				
Monitoring periods	Sampling location ID				Monitoring periods	Sampling location ID			
	SL-1	SL-2	SL-3	SL-4		SL-1	SL-2	SL-3	SL-4
1st QM	1113	4090	643	1055	**1st QM**	-	-	-	-
2nd QM	999	371	635	970	**2nd QM**	6	6	8	48
3rd QM	-	-	-	-	**3rd QM**	19	2	6	NF
4th QM	1021	378	600	NF	**4th QM**	40	28	32	NF
5th QM	NO	390	600	NF	**5th QM**	NF**	4	6	NF
6th QM	881	574	328	NF	**6th QM**	23	16	14	NF
7th QM	377	1007	611	NF	**7th QM**	4	5	4	NF
8th QM	447	491	284	NF	**8th QM**	31	46	41	NF
9th QM	1025	384	645	NF	**9th QM**	3	4	3	NF
10th QM	1000	408	607	NF	**10th QM**	5	4	4	NF
11th QM	617	382	636	NF	**11th QM**	7	4	5	NF
12th QM	623	401	998	NF	**12th QM**	32	28	25	NF
13th QM	395	617	558	NF	**13th QM**	4	10	9	NF

TDS (mg/L)					TSS (mg/L)				
Monitoring periods	**Sampling location ID**				**Monitoring periods**	**Sampling location ID**			
	SL-1	**SL-2**	**SL-3**	**SL-4**		**SL-1**	**SL-2**	**SL-3**	**SL-4**
14th QM	602	996	390	NF	**14th QM**	8	10	9	NF
15th QM	405	602	994	NF	**15th QM**	12	6	7	NF
16th QM	NF	615	370	NF	**16th QM**	NF	12	5	NF
17th QM	NF	390	608	NF	**17th QM**	NF	2	3	NF
18th QM	NF	365	610	NF	**18th QM**	NF	6	8	NF
19th QM	1315	376	927	NF	**19th QM**	3	3	4	NF
20th QM	915	380	610	NF	**20th QM**	3	2	4	NF
21st QM	25	602	360	NF	**21st QM**	2	1	4	NF
22nd QM	900	385	603	NF	**22nd QM**	4	3	4	Nf
23rd QM	3080	660	370	NF	**23rd QM**	2	3	2	NF
25th QM	1196	701	316	NF	**25th QM**	1	3	1	NF
26th QM	139	335	202	NF	**26th QM**	3	5	2	NF
27th QM	200	350	610	NF	**27th QM**	1	2	5	NF
28th QM	810	450	570	NF	**28th QM**	1	1	1	NF
29th QM	890	360	610	NF	**29th QM**	1	1	2	NF
30th QM	350	615	860	NF	**30th QM**	1	4	3	NF
31st QM	0.86	350	620	NF	**31st QM**	1	1	1	NF
32nd QM	1150	360	620	NF	**32nd QM**	2	1	2	NS
33rd QM	350	620	900	NF	**33rd QM**	1	2	1	NF
34th QM	885	620	510	NF	**34th QM**	1	1	3	NF
35th QM	370	900	630	NF	**35th QM**	1	1	1	NF
36th QM	890	350	1300	NF	**36th QM**	1	1	3	NF
37th QM	272	392	650	NF	**37th QM**	1	1	2	NF
38th QM	240	500	670	NF	**38th QM**	1	1	2	NF
39th QM	960	615	370	NF	**39th QM**	1	2	1	NF
Standard (ECR'2023)	**1000 mg/L**				**Standard (ECR'2023)**	**10 mg/L**			

Source: CEGIS Field Survey;2014 up to 2023; Note: QM= Quarterly Monitoring, NF-Not Functional.

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

TH (mg/L)					COD (mg/L)				
Monitoring periods	Sampling location ID				Monitoring periods	Sampling location ID			
	SL-1	SL-2	SL-3	SL-4		SL-1	SL-2	SL-3	SL-4
1st QM	425	220	190	780	**1st QM**	32	28	48	32
2nd QM	250	175	140	450	**2nd QM**	32	28	32	36
3rd QM	300	180	180	NF	**3rd QM**	34	18	34	NF
4th QM	235	110	125	NF	**4th QM**	20	16	20	NF
5th QM	NO	138	216	NF	**5th QM**	NO	14	18	NF
6th QM	225	125	115	NF	**6th QM**	12	10	14	NF
7th QM	325	450	480	NF	**7th QM**	4	8	4	NF
8th QM	295	195	225	NF	**8th QM**	4	4	4	NF
9th QM	305	263	163	NF	**9th QM**	4	4	4	NF
10th QM	320	248	28	NF	**10th QM**	4	4	2	NF
11th QM	175	295	183	NF	**11th QM**	4	4	4	NF
12th QM	550	510	620	NF	**12th QM**	4	4	4	NF
13th QM	720	420	654	NF	**13th QM**	4	4	4	NF
14th QM	145	240	215	NF	**14th QM**	8	8	16	NF
15th QM	NF	265	305	NF	**15th QM**	NF	4	4	NF
16th QM	NF	195	215	NF	**16th QM**	NF	4	4	NF
17th QM	NF	235	170	NF	**17th QM**	NF	4	4	NF
18th QM	NF	178	138	NF	**18th QM**	NF	4	4	NF
19th QM	355	215	270	NF	**19th QM**	4	3	4	NF
20th QM	235	182	167	NF	**20th QM**	352	4	4	NF
21st QM	97	167	212	NF	**21st QM**	4	4	4	NF
22nd QM	145	245	137	NF	**22nd QM**	4	4	4	NF
23rd QM	137	118	145	NF	**23rd QM**	4	4	4	NF
25th QM	625	210	237	NF	**25th QM**	4	4	4	NF
26th QM	232	185	207	NF	**26th QM**	4	4	4	NF
27th QM	160	145	130	NF	**27th QM**	4	4	4	NF

TH (mg/L)					COD (mg/L)				
Monitoring periods	**Sampling location ID**				**Monitoring periods**	**Sampling location ID**			
	SL-1	**SL-2**	**SL-3**	**SL-4**		**SL-1**	**SL-2**	**SL-3**	**SL-4**
28th QM	1400	1600	1200	NF	**28th QM**	16	32	8	NF
29th QM	160	195	140	NF	**29th QM**	32	28	36	NF
30th QM	70	243	155	NF	**30th QM**	4	20	28	NF
31st QM	180	200	210	NF	**31st QM**	12	8	28	NF
32nd QM	320	165	275	NF	**32nd QM**	32	28	32	NF
33rd QM	225	415	515	NF	**33rd QM**	4	4	4	NF
34th QM	265	130	110	NF	**34th QM**	4	4	4	NF
35th QM	215	445	348	NF	**35th QM**	16	12	8	NF
36th QM	237	190	1200	NF	**36th QM**	32	28	36	NF
37th QM	160	185	190	NF	**37th QM**	4	20	12	NF
38th QM	170	170	185	NF	**38th QM**	28	24	12	NF
39th QM	1200	715	240	NF	**39th QM**	72	48	64	NF
Standard (ECR'2023)	**N/A**				**Standard (ECR'2023)**	**20N/A**			

Source: CEGIS Field Survey;2014 up to 2023; Note: QM= Quarterly Monitoring, NF-Not Functional.

Table B.20: NO_3^- (mg/L) and SO_4^{2-} (mg/L) Concentrations in Groundwater

NO_3^- (mg/L)					SO_4^{2-} (mg/L)				
Monitoring periods	**Sampling location ID**				**Monitoring periods**	**Sampling location ID**			
	SL-1	**SL-2**	**SL-3**	**SL-4**		**SL-1**	**SL-2**	**SL-3**	**SL-4**
1st QM	0.2	0.6	0.8	0.4	**1st QM**	-	-	-	NF
2nd QM	0.48	0.68	0.4	0.56	**2nd QM**	3	2	10	3
3rd QM	<0.10	0.31	0.8	NF	**3rd QM**	-	-	-	NF
4th QM	28	26	13	NF	**4th QM**	-	-	-	-
5th QM	-	-	-	NF	**5th QM**	-	-	-	-
6th QM	7.6	2.2	4.7	NF	**6th QM**	-	-	-	-
7th QM	4.3	4.2	3.8	NF	**7th QM**	1	2	2	-
8th QM	2.1	1.9	2.8	NF	**8th QM**	5	6	2	NF

NO_3^- (mg/L)					SO_4^{2-} (mg/L)				
Monitoring periods	Sampling location ID				Monitoring periods	Sampling location ID			
	SL-1	SL-2	SL-3	SL-4		SL-1	SL-2	SL-3	SL-4
9th QM	1.7	2.3	1.9	NF	**9th QM**	1	2	8	NF
10th QM	3.8	3.3	3.7	NF	**10th QM**	1	1	1	NF
11th QM	6.1	7.51	10.16	NF	**11th QM**	1	1	1	NF
12th QM	4.65	7.02	4.65	NF	**12th QM**	1	1		NF
13th QM	9.32	14.7	10.2	NF	**13th QM**	5	1	3	NF
14th QM	3.3	2.5	4.6	NF	**14th QM**	1	1	2	NF
15th QM	5.9	7.2	1.7	NF	**15th QM**	8	2	6	NF
16th QM	NF	5.3	5.7	NF	**16th QM**	NF	2	4	NF
17th QM	NF	8.6	7.8	NF	**17th QM**	NF	4	6	NF
18th QM	NF	0.9	1.4	NF	**18th QM**	NF	1	1	NF
19th QM	1.7	4.4	2.1	NF	**19th QM**	1	2	1	NF
20th QM	4.4	2.7	8.3	NF	**20th QM**	4	1	4	NF
21st QM	1.4	2.7	1.7	NF	**21st QM**	1	2	1	NF
22nd QM	1.8	3.1	1.6	NF	**22nd QM**	2	2	1	NF
23rd QM	1.9	1.4	2.7	NF	**23rd QM**	2	3	2	NF
25th QM	1.7	7.5	1.7	NF	**25th QM**	4	3	4	NF
26th QM	0.5	3.8	3.1	NF	**26th QM**	9	3	3	NF
27th QM	2.4	2.2	4.9	NF	**27th QM**	1	1	7	NF
28th QM	1	1	2	NF	**28th QM**	1	1	1	NF
29th QM	1.5	2.1	2.1	NF	**29th QM**	1	4	3	NF
30th QM	3.7	4.1	2.6	NF	**30th QM**	2.2	6.3	2.6	NF
31st QM	12.09	4.02	8.83	NF	**31st QM**	14.94	4.22	9.51	NF
32nd QM	4.331	12.304	1.9372	NF	**32nd QM**	2.1054	6.83	1.76	NF
33rd QM	4.88	0.801	4.33	NF	**33rd QM**	1.41	1.36	3.31	NF
34th QM	15.51	1.22	4.82	NF	**34th QM**	0.2	1.9	1.0	NF
35th QM	1.34	1.34	1.34	NF	**35th QM**	5.25	5.57	11	NF

NO_3^- (mg/L)					SO_4^{2-} (mg/L)				
Monitoring periods	Sampling location ID				Monitoring periods	Sampling location ID			
	SL-1	SL-2	SL-3	SL-4		SL-1	SL-2	SL-3	SL-4
36th QM	2.003	0.7807	6.31	NF	**36th QM**	14.7	0.89	3.94	NF
37th QM	ND	1.9	10.5	NF	**37th QM**	5.4	1.8	5.0	NF
38th QM	8.56	0.1	4	NF	**38th QM**	1.34	3.11	3.03	NF
39th QM	3.001	3.001	3.001	NF	**39th QM**	2.39	143	5.68	NF
Standard (ECR'2023)	**45 mg/L**				**Standard (ECR'2023)**	**250 mg/L**			

Source: CEGIS Field Survey;2014 up to 2023; Note: QM= Quarterly Monitoring, NF-Not Functional.

Table B.21: PO_4^{3-} (mg/L) and as (mg/L) Concentrations in Groundwater

PO_4^{3-} (mg/L)					As (mg/L)				
Monitoring periods	Sampling location ID				Monitoring periods	Sampling location ID			
	SL-1	SL-2	SL-3	SL-4		SL-1	SL-2	SL-3	SL-4
1st QM	NF	-	-	NF	**1st QM**	0.013	0.006	0.036	0.376
2nd QM	2.2	2.5	6.2	1.2	**2nd QM**	0.02	0.009	0.033	0.407
3rd QM	-	-	-	NF	**3rd QM**	0.012	0.006	0.02	NF
4th QM	0.74	0.44	0.48	NF	**4th QM**	0.014	0.008	0.017	NF
5th QM	NO	1.98	4.54	NF	**5th QM**	NO	0.01	0.034	NF
6th QM	1.4	1.6	4.1	NF	**6th QM**	0.015	0.014	0.024	NF
7th QM	0.31	0.27	0.48	NF	**7th QM**	0.002	0.012	0.011	NF
8th QM	0.267	0.179	0.179	NF	**8th QM**	0.008	0.002	0.002	NF
9th QM	1.08	1.53	3.26	NF	**9th QM**	0.018	0.007	0.047	NF
10th QM	0.17	0.29	0.31	NF	**10th QM**	0.012	0.018	0.005	NF
11th QM	0.167	0.67	0.6	NF	**11th QM**	0.033	0.011	0.016	NF
12th QM	1.18	1.21	1.18	NF	**12th QM**	0.028	0.005	0.028	NF
13th QM	2.18	1.8	2.1	NF	**13th QM**	0.012	0.022	0.01	NF
14th QM	1.68	3.5	4.7	NF	**14th QM**	0.014	0.004	0.027	NF
15th QM	0.13	0.17	0.18	NF	**15th QM**	0.002	0.012	0.002	NF

PO_4^{3-} (mg/L)					As (mg/L)				
Monitoring periods	**Sampling location ID**				**Monitoring periods**	**Sampling location ID**			
	SL-1	**SL-2**	**SL-3**	**SL-4**		**SL-1**	**SL-2**	**SL-3**	**SL-4**
16th QM	NF	4..5	0.27	NF	**16th QM**	0.001	0.022	0.001	NF
17th QM	NF	2.9	4.8	NF	**17th QM**	NF	0.012	0.004	NF
18th QM	NF	0.15	0.26	NF	**18th QM**	NF	0.007	0.05	NF
19th QM	2.1	1.3	3.6	NF	**19th QM**	0.014	0.003	0.004	NF
20th QM	2.3	2.5	3.2	NF	**20th QM**	0.012	0.012	0.012	NF
21st QM	0.3	4	2	NF	**21st QM**	0.014	0.006	0.022	NF
22nd QM	1	0.5	1.5	NF	**22nd QM**	0.001	0.027	0.001	NF
23rd QM	1.1	0.4	0.9	NF	**23rd QM**	0.018	0.006	0.033	NF
25th QM	0.3	1.5	1.7	NF	**25th QM**	0.02	0.068	0.003	NF
26th QM	0.7	6.3	2.3	NF	**26th QM**	0.022	0.045	0.004	NF
27th QM	2	1.8	2.3	NF	**27th QM**	0.003	0.053	0.006	NF
28th QM	1.4	0.98	4	NF	**28th QM**	0.002	0.004	0.049	NF
29th QM	1.7	1.2	5	NF	**29th QM**	0.002	0.003	0.008	NF
30th QM	0.9	1.4	0.6	NF	**30th QM**	0.012	0.003	0.061	NF
31st QM	1	0.6	1.4	NF	**31st QM**	0.003	0.063	0.014	NF
32nd QM	0.8	1.4	0.3	NF	**32nd QM**	0.016	0.003	0.048	NF
33rd QM	1.2	0.5	1.36	NF	**33rd QM**	0.008	0.003	0.064	NF
34th QM	0.7548	0.5	1.5	NF	**34th QM**	0.02	0.00	0.05	NF
35th QM	0.757	0.5	1.3	NF	**35th QM**	0.019	0.003	0.056	NF
36th QM	0.0	0.4	1.3	NF	**36th QM**	0.005	0.002	0.042	NF
37th QM	0.00	0.7	1.4	NF	**37th QM**	0.00	0.00	0.1	NF
38th QM	0	0.6	4.39	NF	**38th QM**	0.001	0.002	0.056	NF
39th QM	0.1	0.1	0.1	NF	**39th QM**	0.004	0.004	0.004	NF
Standard (ECR'2023)					**Standard (ECR'2023)**	**0.05 mg/L**			

Source: CEGIS Field Survey;2014 up to 2023; Note: QM= Quarterly Monitoring, NF-Not Functional.

Table B.22: Pb (mg/L) and Hg (mg/L) Concentrations in Groundwater

PB (mg/L)					Hg (mg/L)				
Monitoring periods	Sampling location ID				Monitoring periods		Sampling location ID		
	SL-1	SL-2	SL-3	SL-4		SL-1	SL-2	SL-3	SL-4
1st QM	0.002	<0.002	<0.002	0.002	**1st QM**	<0.00015	<0.00015	<0.00015	<0.00015
2nd QM	<0.002	<0.002	0.004	0.008	**2nd QM**	<0.00015	<0.00015	<0.00015	<0.00015
3rd QM	0.004	<0.002	<0.002	NF	**3rd QM**	<0.0005	<0.0005	<0.0005	NF
4th QM	0.023	0.016	0.013	NF	**4th QM**	<0.0005	<0.0005	<0.0005	NF
5th QM	NO	0.013	0.017	D	**5th QM**	<0.0005	<0.00015	<0.00015	NF
6th QM	0.002	0.0027	0.002	D	**6th QM**	0.00015	0.00015	0.00015	NF
7th QM	0.006	0.021	0.005	NF	**7th QM**	<0.00015	<0.00015	<0.00015	NF
8th QM	0.026	0.011	0.012	NF	**8th QM**	<0.00015	<0.00015	<0.00015	NF
9th QM	0.019	0.007	0.008	NF	**9th QM**	<0.00015	<0.00015	<0.00015	NF
10th QM	0.002	0.002	0.002	NF	**10th QM**	<0.00015	<0.00015	<0.00015	NF
11th QM	0.001	0.001	0.001	NF	**11th QM**	<0.00015	<0.00015	<0.00015	NF
12th QM	0.01	0.009	0.016	NF	**12th QM**	<0.00015	<0.00015	<0.00015	NF
13th QM	0.001	0.001	0.001	NF	**13th QM**	0.001	0.001	0.001	NF
14th QM	0.003	0.007	0.002	NF	**14th QM**	<0.0001	<0.0001	<0.0001	NF
15th QM	0.001	0.002	0.001	NF	**15th QM**	<0.001	<0.001	<0.001	NF
16th QM	0.001	0.001	0.001	NF	**16th QM**	<0.001	<0.001		NF
17th QM	0.001	0.001	0.001	NF	**17th QM**	<0.001	<0.001	<0.001	NF
18th QM	NF	0.001	0.001	NF	**18th QM**	<0.001	<0.001	<0.001	NF
19th QM	NF	0.004	0.056	NF	**19th QM**	<0.001	<0.001	<0.001	NF
20th QM	0.008	0.003	0.004	NF	**20th QM**	<0.001	<0.001	<0.001	NF
21st QM	0.004	0.004	0.006	NF	**21st QM**	0.001	0.003	0.001	NF
22nd QM	0.018	0.002	0.001	NF	**22nd QM**	<0.001	<0.001	<0.001	NF
23rd QM	0.002	0.008	0.001	NF	**23rd QM**	<0.001	<0.001	<0.001	NF
25th QM	0.001	0.001	0.002	NF	**25th QM**	<0.001	<0.001	<0.001	NF
26th QM	0.001	0.001	0.001	NF	**26th QM**	<0.001	<0.001	NF	NF

PB (mg/L)					Hg (mg/L)				
Monitoring periods	**Sampling location ID**				**Monitoring periods**		**Sampling location ID**		
	SL-1	**SL-2**	**SL-3**	**SL-4**		**SL-1**	**SL-2**	**SL-3**	**SL-4**
27th QM	0.004	0.006	0.002	NF	**27th QM**	<0.001	<0.001	<0.001	NF
28th QM	0.048	0.016	0.056	NF	**28th QM**	<0.001	<0.001	<0.001	NF
29th QM	0.003	0.008	0.002	NF	**29th QM**	<0.001	<0.001	<0.001	NF
30th QM	0.009	0.002	0.001	NF	**30th QM**	<0.001	<0.001	<0.001	NF
31st QM	0.001	0.001	0.001	NF	**31st QM**	<0.001	<0.001	<0.001	NF
32nd QM	0.003	0.004	0.003	NF	**32nd QM**	<0.001	<0.001	<0.001	NF
33rd QM	0.8	1.4	0.3	NF	**33rd QM**	0.008	0.003	0.064	NF
34th QM	0.002	0.003	0.001	NF	**34th QM**	<0.001	<0.001	<0.001	NF
35th QM	0.002	0.002	0.003	NF	**35th QM**	<0.001	<0.001	<0.001	NF
36th QM	0.001	0.002	0.001	NF	**36th QM**	<0.001	<0.001	<0.001	NF
37th QM	<0.01	<0.02	<0.03	NF	**37th QM**	<0.001	<0.001	<0.001	NF
38th QM	<0.01	<0.01	<0.01	NF	**38th QM**	<0.001	<0.001	<0.001	NF
39th QM	<0.01	<0.01	<0.01	NF	**39th QM**	<0.001	<0.001	<0.001	NF
Standard (ECR'2023)	**0.01 mg/L**				**Standard (ECR'2023)**	**0.001 mg/L**			

Source: CEGIS Field Survey;2014 up to 2023; Note: QM= Quarterly Monitoring, NF-Not Functional.

Table B.23: PAH (mg/L) Concentrations of Monitored Locations

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

PAH		Acenapthylene	Anthracene	Benzlol (A) Anthracene	Benzlol (A) Pyrene	Benzlol (B) Fluoranthene	Benzol (G, H, I) Perilene	Benzol (K) Fluoranthene	Chrysene	Dibenzol (A, H) Anthracene	Fluorene	Phenanthrene	Pyrene
	Hiron point	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
February, 2020	**Project Jetty**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Majhar point	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Hiron point	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
July, 2020	**Project Jetty**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Majhar point	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Hiron point	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
January, 2021	**Project Jetty**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Majhar point	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Hiron point	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
August, 2021	**Project Jetty**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Majhar point	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Hiron point	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
January, 2022	**Project Jetty**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Majhar point	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Hiron point	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
July, 2022	**Project Jetty**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Majhar point	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Hiron point	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
January, 2023	**Project Jetty**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Majhar point	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Hiron point	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
August, 2023	**Project Jetty**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Majhar point	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Hiron point	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
January, 2024	**Project Jetty**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Majhar point	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Hiron point	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Source: CEGIS Field Survey; 2014 up to 2024; Note: ND-Not dected.

Table B.24: 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		July, 2022		January, 2023	
	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	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	65	10.5	1403	5
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	239	12.7	1058	5
Hiron point	NM	NM	6.8	5.7	NM	NM	8.1	6.7	NM	NM	9241	<5	NM	NM	2901	15.2	NM	NM	3759	5

Monitoring Sites	August 2023		January, 2024	
	Total Carbon	Total Organic Carbon	Total Carbon	Total Organic Carbon
Project jetty site	61	<5	Not Detectable	9.38
Majhar point or Harbaria area	47	<5	Not Detectable	5.1
Hiron point	134	<5	Not Detectable	5.38

Source: CEGIS Field Survey; 2014 up to 2024

(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

*Source: CEGIS Field Survey; 2014 up to 2024; 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

*Source: CEGIS Field Survey; 2014 up to 2024; 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

*Source: CEGIS Field Survey; 2014 up to 2024; 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; 2014 up to 2024; 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 Survey; 2014 up to 2024; Note: 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; 2014 up to 2024; 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; 2014 up to 2024; 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				QM 32(Noise Level in dB (A)) May, 2022				QM 33(Noise Level in dB (A)) Jul, 2022				
		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	Std*
1	Chalna, Dacope	68.9	52.08	58.3	64.57	56	59.05	64.08	59.71	56	61.25	59.97	59.08	52.71	52.62	53.30	52.88	70
2	NW Corner of the Project area	47.99	51.61	48.17	49.59	49	48.90	48.56	48.82	48.63	48.64	48.64	48.60	46.55	44.82	45.44	45.60	55
3	Chunkuri-2, Bajua	45.31	48.07	46.8	46.87	49.85	47.48	49.70	49.01	48.32	48.72	49.70	48.91	48.00	45.61	47.75	47.12	55
4	SW corner of the Project area	49.66	49.49	48.95	49.37	63.74	49.95	50.25	54.65	50.31	50.05	51.24	50.53	54.00	48.07	46.06	49.38	55
5	Project site near Shapmari area	50.94	42.29	41.88	47.17	50.05	50.57	49.45	50.03	49.70	49.34	50.24	49.76	44.50	45.75	43.49	44.58	55
6	Barni, Gaurambha	68.37	51.5	56.61	63.96	47.60	49.57	49.51	48.89	47.60	45.05	49.04	47.23	50.06	45.93	46.40	47.46	60
7	Khan Jahan Ali Bridge, Khulna	77.75	80.58	81.43	80.18	61.04	63.52	62.44	62.33	56.46	56.93	62.42	58.60	55.75	NM	NM	55.75	70
8	Mongla Port area	73.94	75.15	79.45	76.86	NM	53.89	58.02	55.95	55.95	56.99	59.19	57.38	55.41	55.09	54.75	55.08	75
9	Harbaria, Sundarbans	59.51	50.62	NM	57.02	49.85	44.77	NM	47.31	52.31	46.44	NM	49.37	42.95	38.59	NM	40.77	50
10	Akram Point, Sundarbans	44.22	42.12	NM	43.29	38.66	36.15	NM	37.41	46.22	39.94	NM	43.08	41.97	NM	41.01	41.49	50
11	Hiron Point, Sundarbans	53.99	49.41	NM	52.27	39.5	33.08	NM	36.29	NM	NM	NM	NM	NM	NM	NM	NM	50

*Source: CEGIS Field Survey; 2014 up to 2024; 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 34(Noise Level in dB (A)) Oct, 2022				QM 35 (Noise Level in dB (A)) Jan, 2023				QM 36 (Noise Level in dB (A)) Apr, 2023				QM 37 (Noise Level in dB (A)) Apr, 2023				Std* NCR, 2006
		Morning (9:00)	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	
1	Chalna, Dacope	78.1	72.2	76.2	75.5	69.5	67	62.7	66.4	62	55.2	57	58	57.69	55.83	57.87	57.13	**70**
2	NW Corner of the Project area	57	57.7	52.3	55.67	53.4	48.3	43.2	48.3	45.1	44.5	46	45.2	50.47	48.07	48.62	49.06	**55**
3	Chunkuri-2, Bajua	63.5	55.4	54.6	57.83	51.8	55.4	53.3	53.5	51.5	52.4	50.8	51.6	54.93	47.43	46.28	49.54	**55**
4	SW corner of the Project area	56.2	53.7	52.7	54.2	49.8	53.8	NM	51.8	58.7	49.7	50.9	54.2	50.55	55.53	53.87	53.32	**55**
5	Project site near Shapmari area	57.4	50.9	NM	54.15	56.3	53.8	46.4	52.2	46.7	46.4	51.2	48.1	47.07	45.4	47.54	46.67	**55**
6	Barni, Gaurambha	62.5	60.5	62.6	61.87	59.9	57	58.5	58.5	59.1	46.8	52.9	52.9	57.97	49.15	52.66	53.26	**60**
7	Khan Jahan Ali Bridge, Khulna	65.1	63.2	NM	64.15	70.2	68.9	75.9	71.7	65.9	62.1	NM	64	60.35	55.4	54.9	56.88	**70**
8	Mongla Port area	61.5	67.9	65.6	65	65.2	68.1	56.4	63.2	63.3	58.3	61.9	61.2	55.97	56.58	53.36	55.31	**75**
9	Harbaria, Sundarbans	49.6	50.4	NM	50	48.1	41.8	NM	44.9	48.7	51.4	NM	50	49.15	48.64	NM	48.89	**50**
10	Akram Point, Sundarbans	42.5	41.7	NM	42.1	42.9	37.6	NM	40.2	46.5	43.7	NM	45.1	40.49	55.69	NM	48.09	**50**
11	Hiron Point, Sundarbans	47.8	NM	NM	47.8	41.3	41.3	NM	41.3	NM	NM	NM	NM	55.8	52.51	NM	54.15	**50**

*Source: CEGIS Field Survey; 2014 up to 2024; Note: NM-Not measured; *Std- Standard as defined in National Noise Control Rules 2006.*

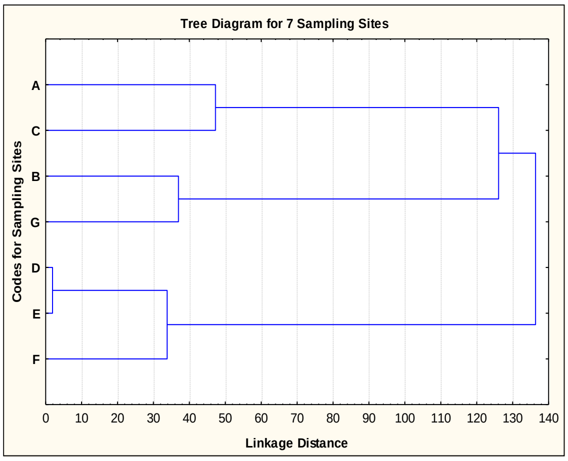
Table C.10: Ambient noise monitoring status at the monitored locations

Sl. No	Location	QM 38(Noise Level in dB (A)) Oct, 2022				QM 39(Noise Level in dB (A)) Jan, 2023				QM 40(Noise Level in dB (A)) Jan, 2023			
		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
1	Chalna, Dacope	55.56	52.75	54.53	54.28	51.74	55.18	57.78	54.90	53.88	52.39	53.90	53.39
2	NW Corner of the Project area	48.92	45.19	50.22	48.11	49.15	42.96	46.73	46.28	43.41	60.26	52.09	51.92
3	Chunkuri-2, Bajua	57.15	57.35	53.24	55.91	50.09	52.87	54.18	52.36	52.86	44.24	47.59	48.23
4	SW corner of the Project area	53.93	58.77	61.45	58.05	49.69	54.55	50.58	51.61	49.55	55.10	48.25	50.97
5	Project site near Shapmari area	45.91	44.70	44.98	45.20	57.42	58.04	58.79	58.08	48.68	47.25	47.09	47.68
6	Barni, Gaurambha	56.59	54.05	60.79	57.14	54.77	58.06	66.85	59.90	60.16	53.38	58.09	57.21
7	Khan Jahan Ali Bridge, Khulna	67.89	62.10	65.13	65.04	61.93	61.14	64.05	62.37	64.96	58.36	65.02	62.78
8	Mongla Port area	53.95	50.79	56.02	53.59	61.33	57.55	59.56	59.48	58.60	54.00	59.13	57.24
9	Harbaria, Sundarbans	49.46	49.74	NM	49.60	41.17	32.40	NM	36.79	51.44	46.31	NM	48.87
10	Akram Point, Sundarbans	40.68	37.45	NM	39.07	33.10	38.36	NM	35.73	37.96	37.99	NM	37.98
11	Hiron Point, Sundarbans	40.90	39.75	NM	40.34	35.40	35.59	NM	35.49	41.20	43.78	NM	42.47

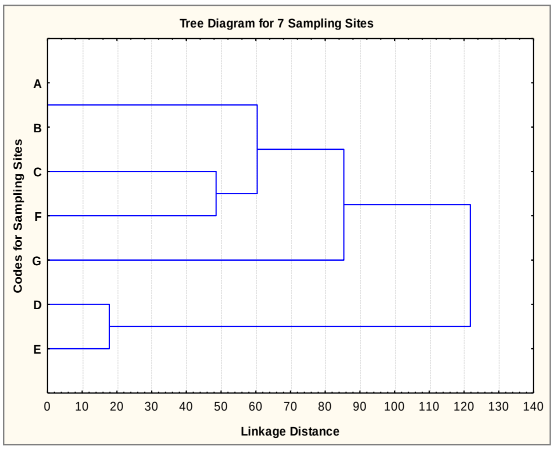
*Source: CEGIS Field Survey; 2014 up to 2024; Note: NM-Not measured; *Std- Standard as defined in National Noise Control Rules 2006.*

(D) Fisheries Resources Monitoring Data

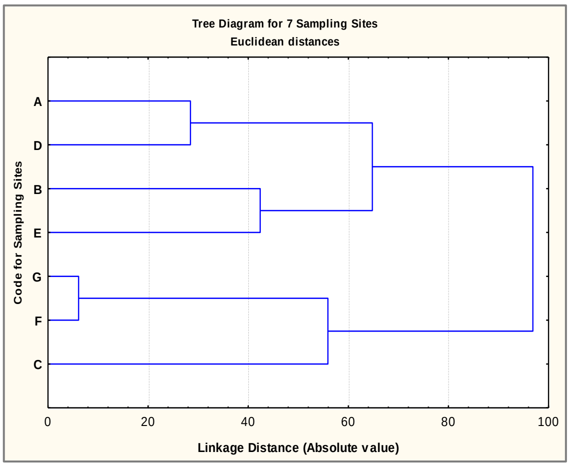
D1: Classification of Functional Habitats



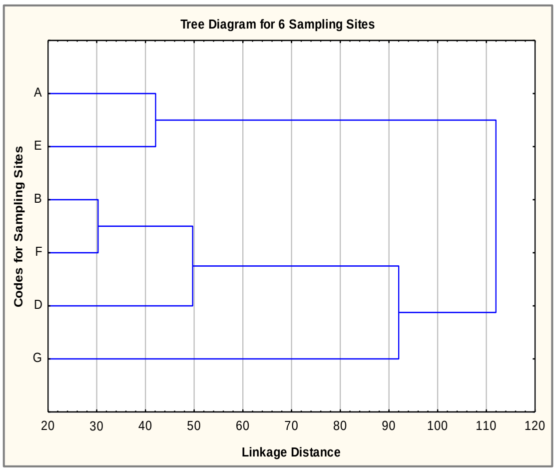
1st Monitoring, April, 2014



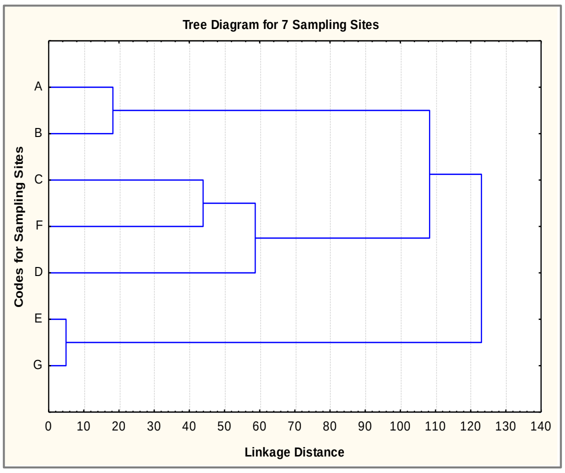
2nd Monitoring, July 2014



3rd Monitoring, October, 2014



4th Monitoring, January 2015



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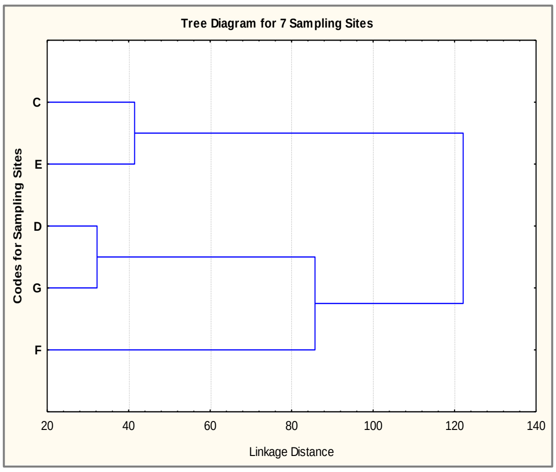
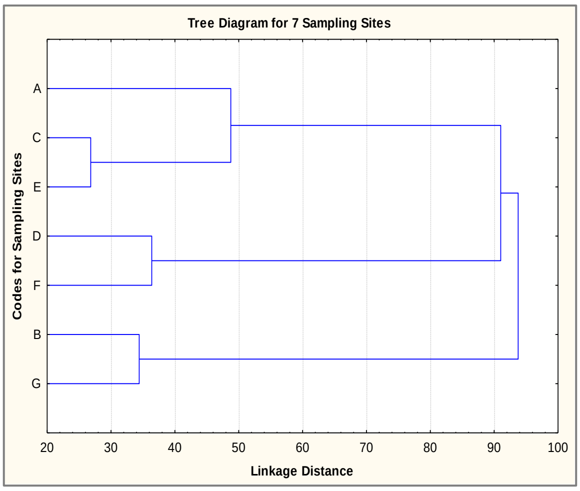
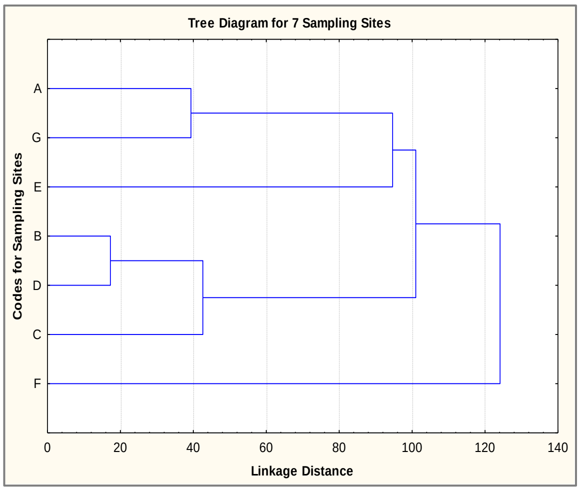


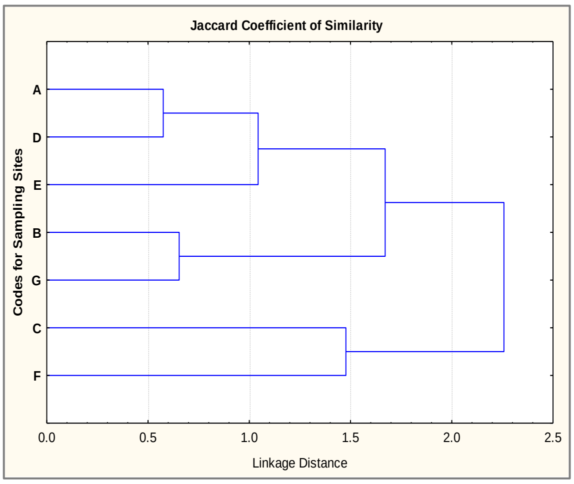
6th Monitoring, August, 2015

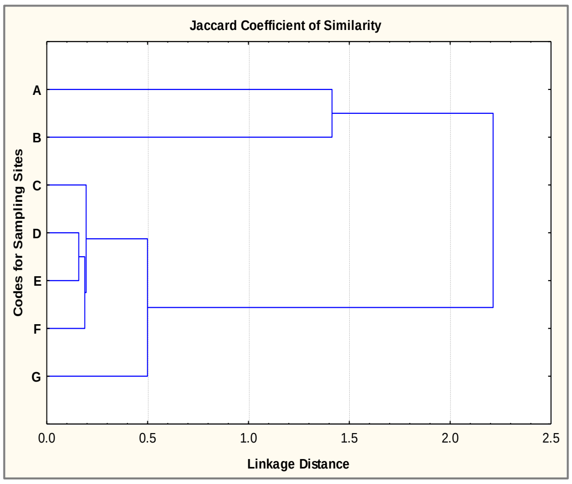


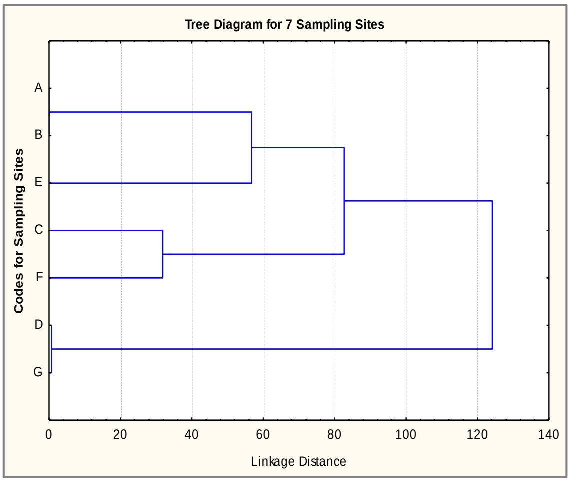
7th Monitoring, October, 2015



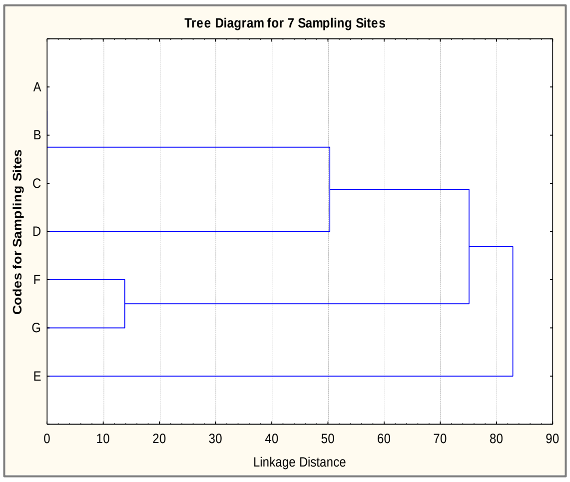
8th Monitoring, January, 2016



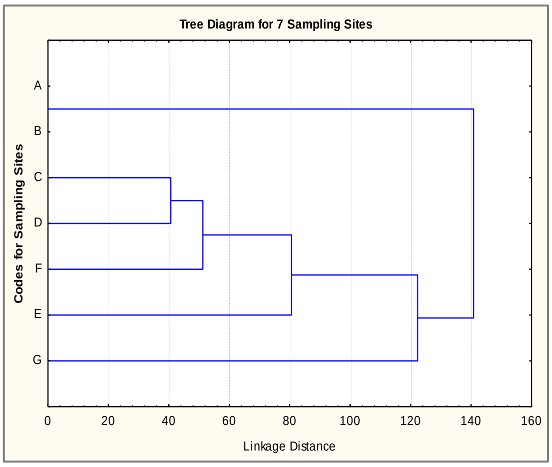




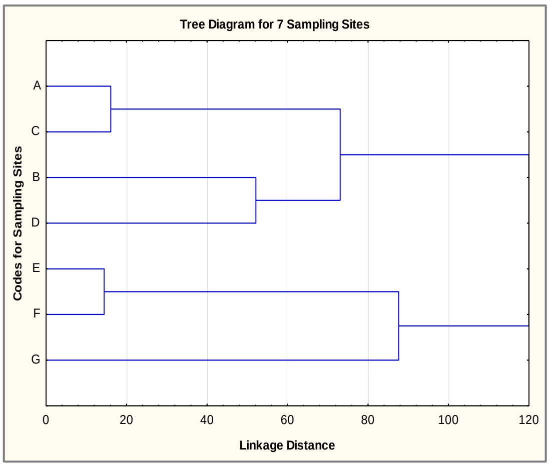
9th Monitoring, April, 2016



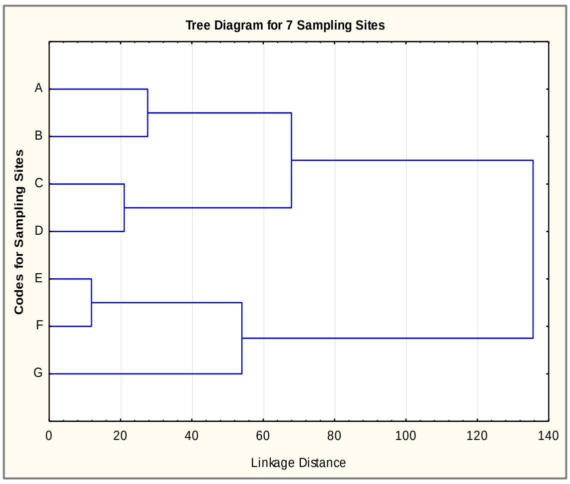
10th Monitoring, July, 2016



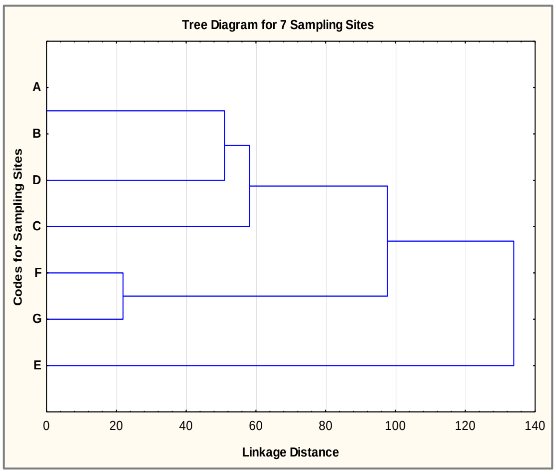
11th Monitoring, October, 2016



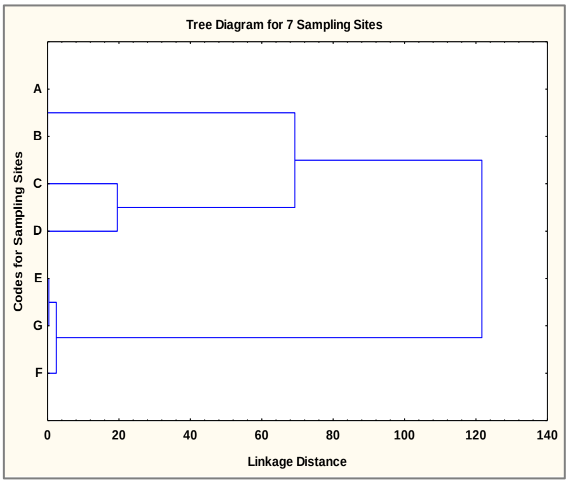
12th Monitoring, January, 2017



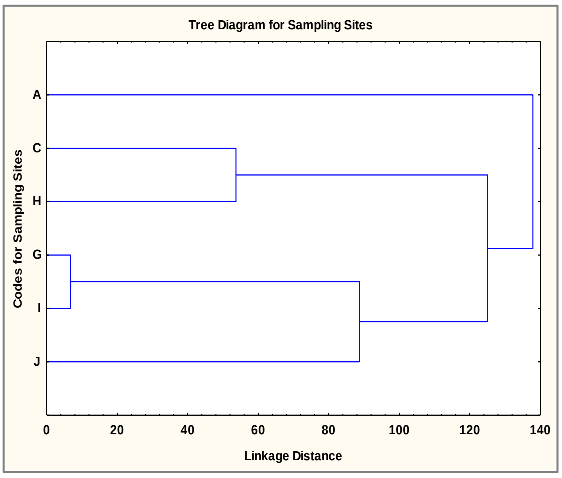
13th Monitoring, April, 2017



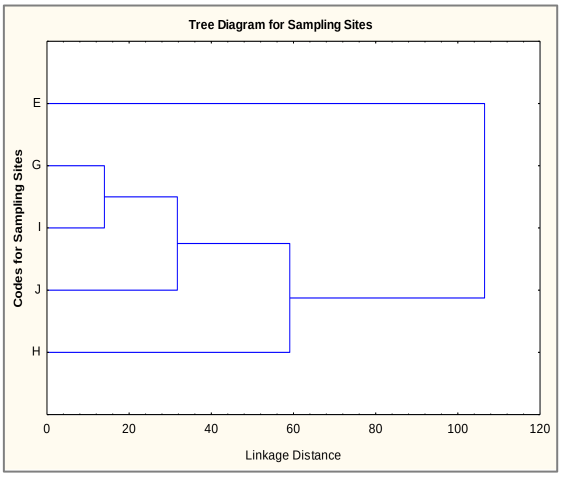
14th Monitoring, October, 2017



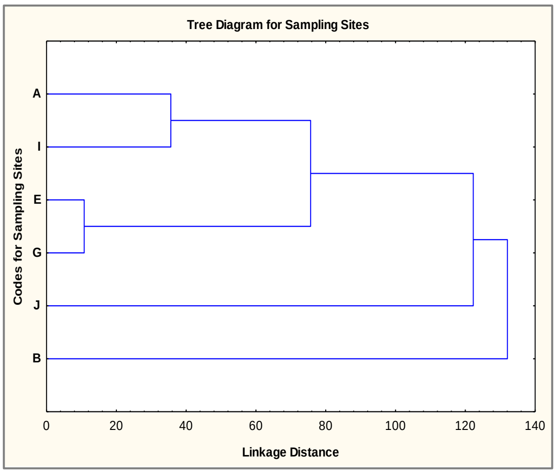
15th Monitoring, January, 2018



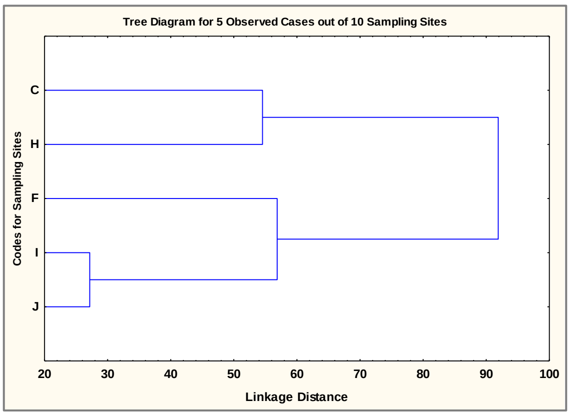
16th Monitoring, April, 2018



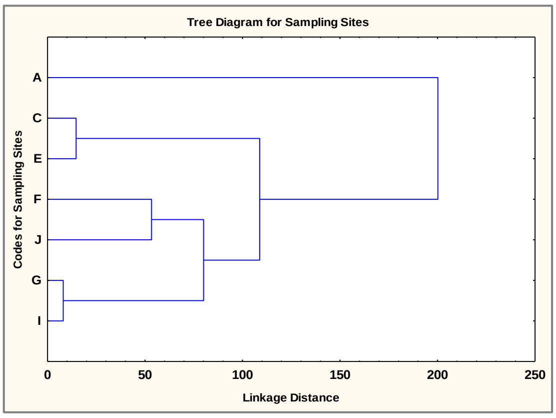
17th Monitoring, July, 2018



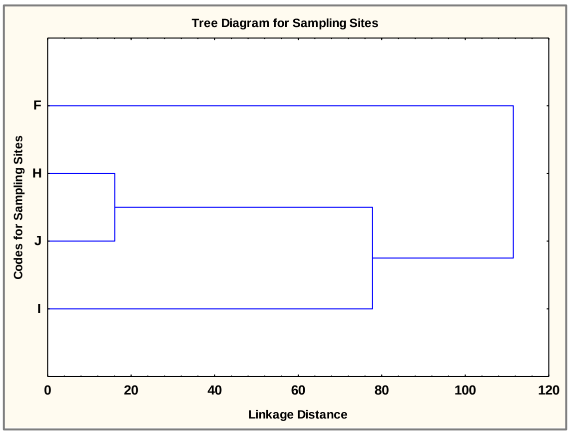
18th Monitoring, November, 2018



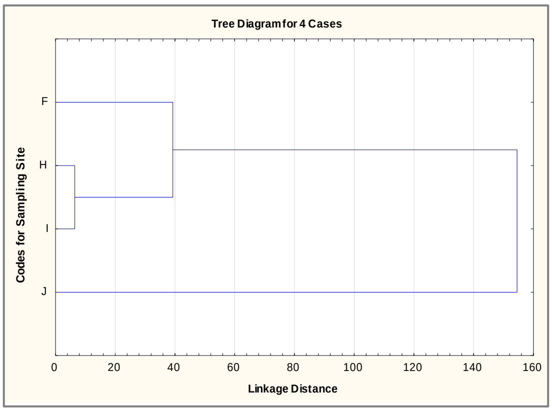
19th Monitoring, February, 2019



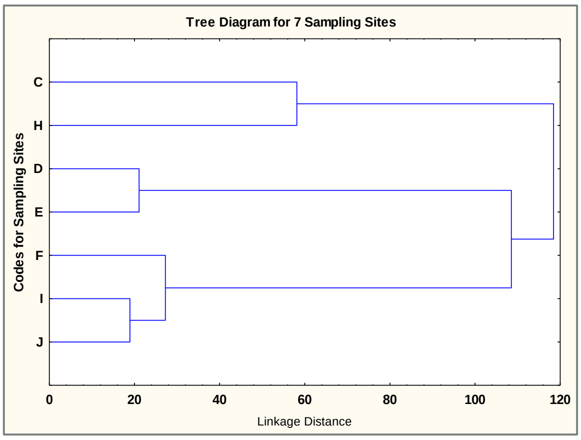
20th Monitoring, April, 2019



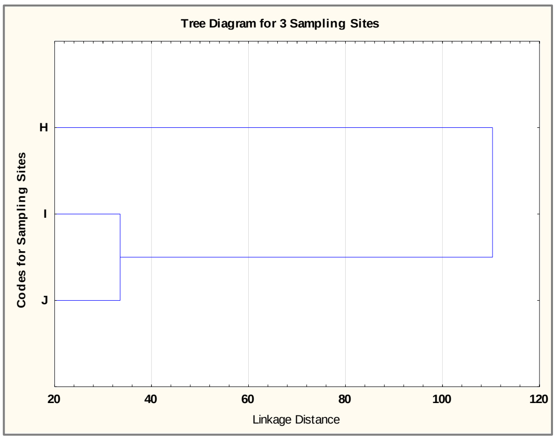
21st Monitoring, July 2019



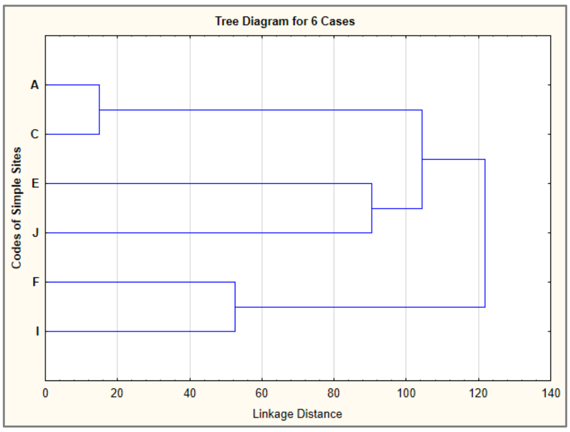
22nd Monitoring, November, 2019



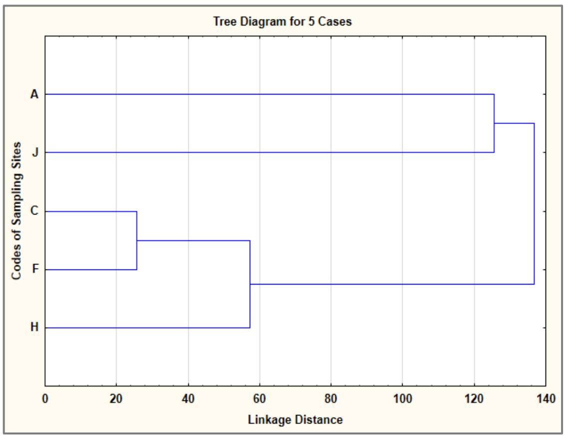
23rd Monitoring, February 2020



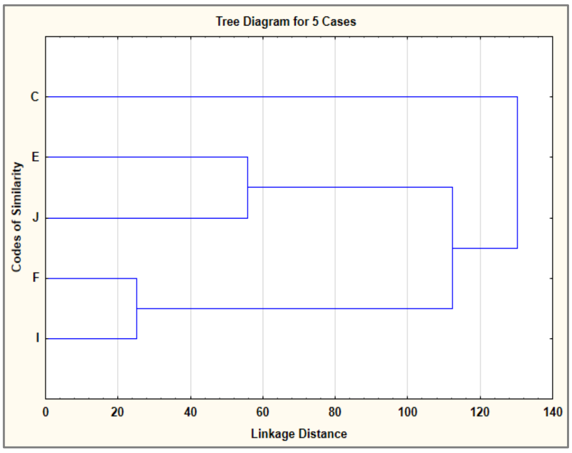
25th Monitoring, July 2020



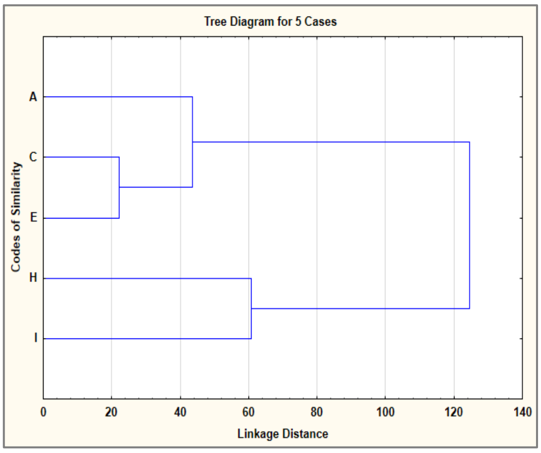
26th Monitoring, November 2020



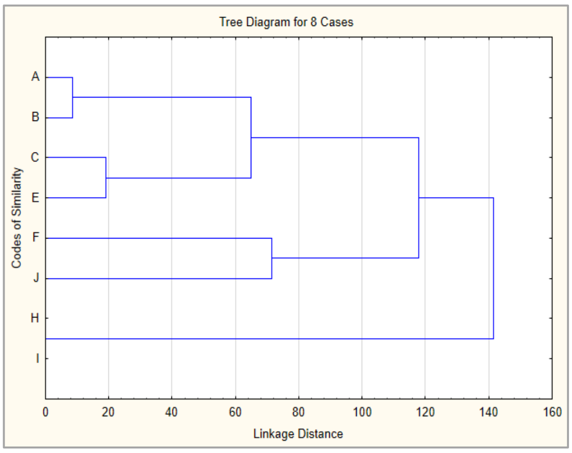
27th Monitoring, January 2021



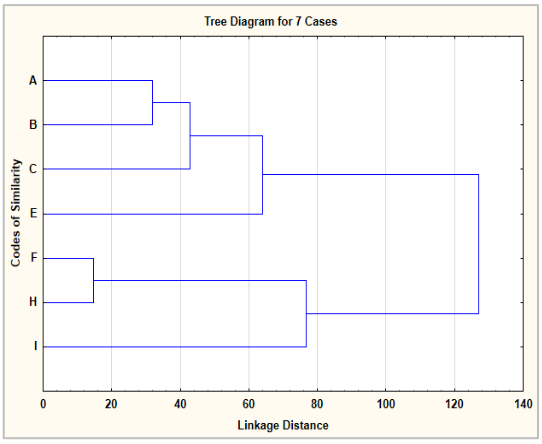
28th monitoring, April 2021



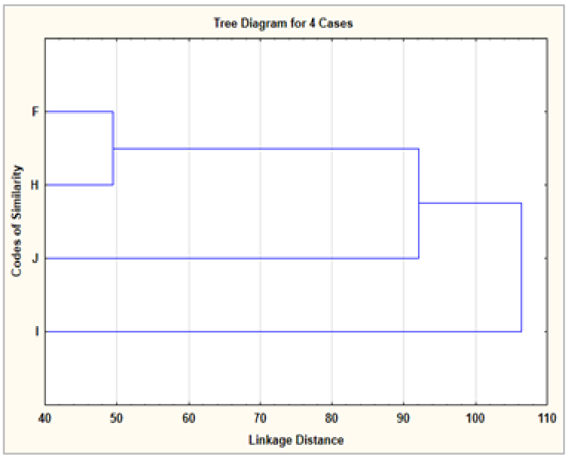
29th Monitoring, August 2021



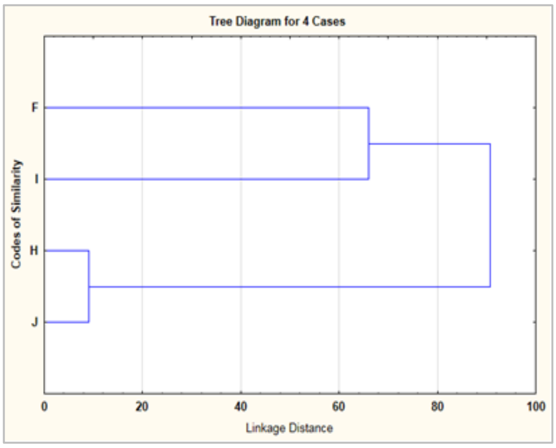
30th Monitoring, November 2021



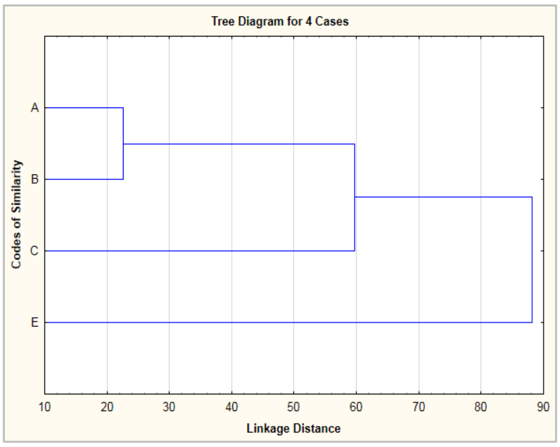
31st Monitoring, February, 2022



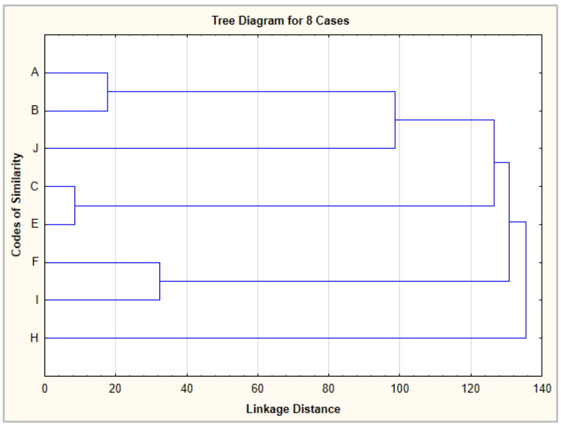
32nd Monitoring, May 2022



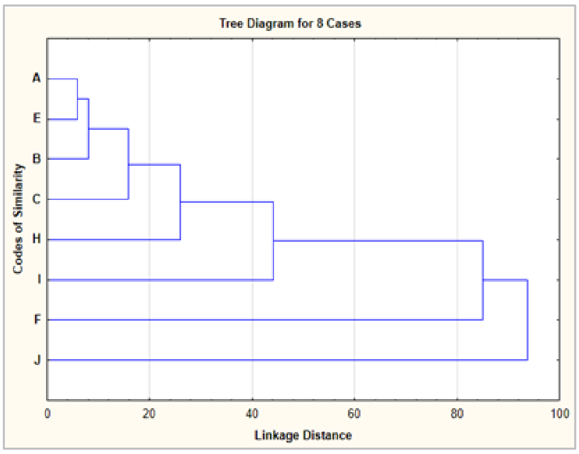
33rd Monitoring, July 2022



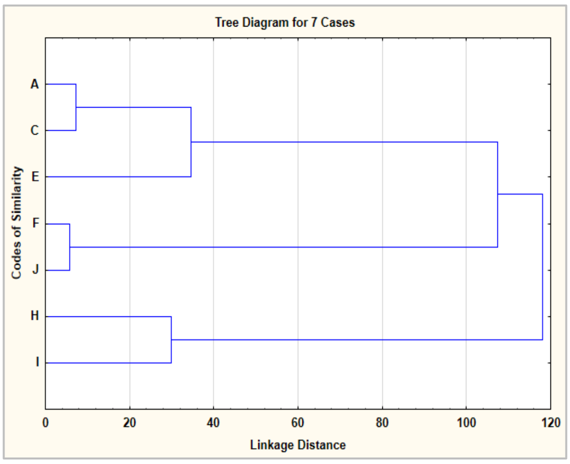
34th Monitoring, Oct 2022



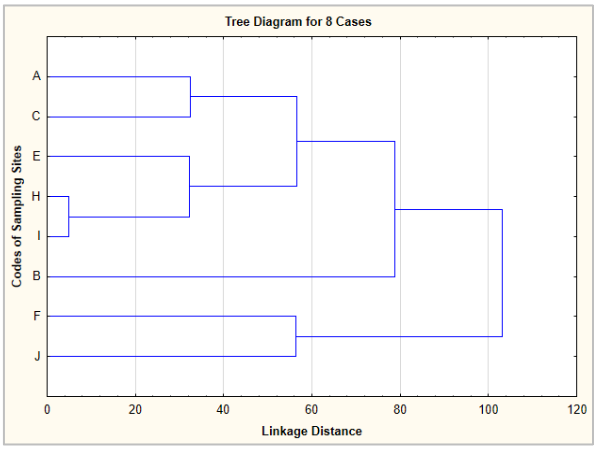
35th Monitoring Jan 2023



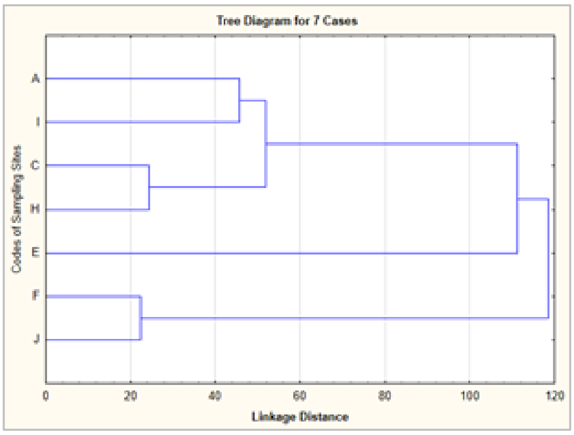
36th Monitoring, May 2023



37th Monitoring, September 2023

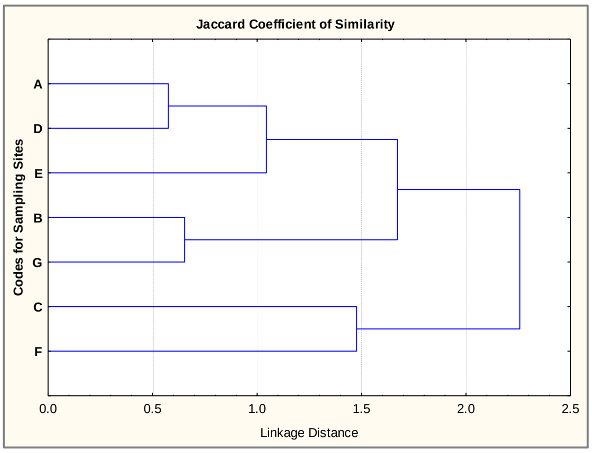


38th Monitoring, November 2023

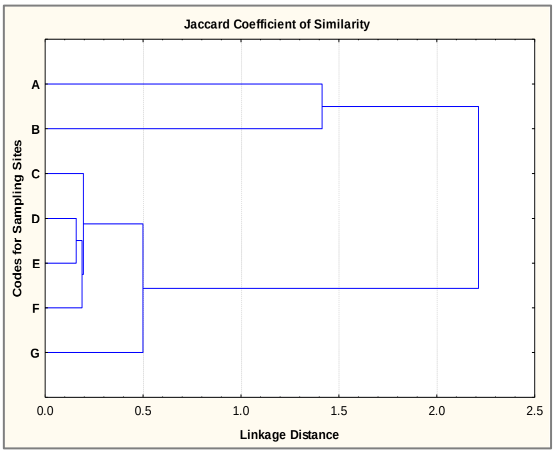


39th Monitoring, Feb 2024

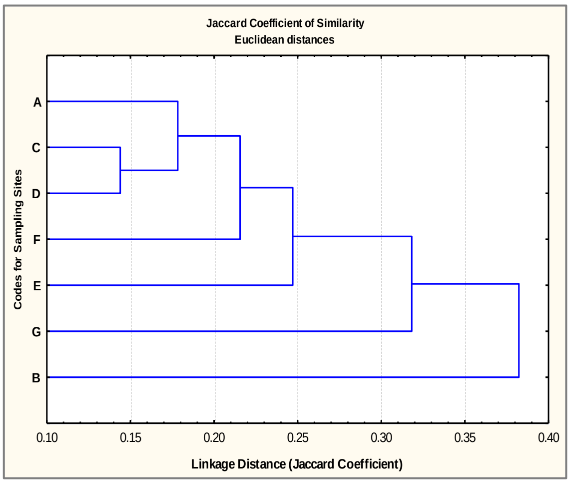
D2: Jaccard Co-efficient of Similarity of Habitats respecting fish species occurrence



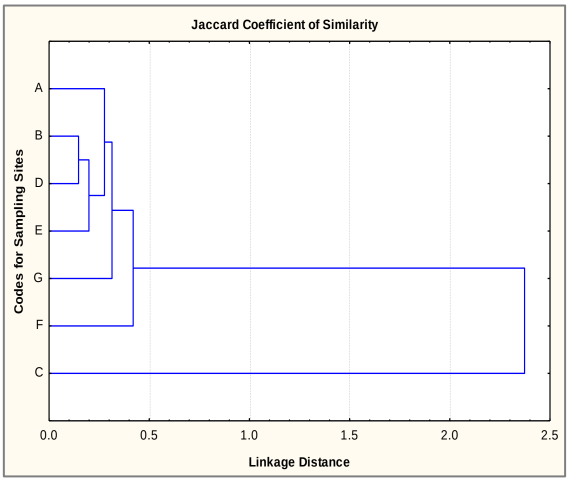
1st Monitoring, April, 2014



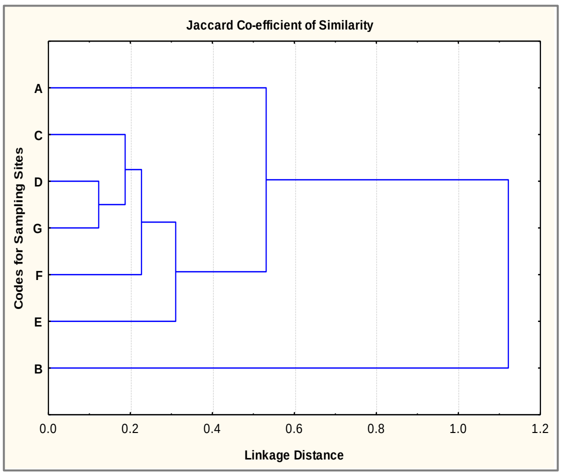
2nd Monitoring, July 2014



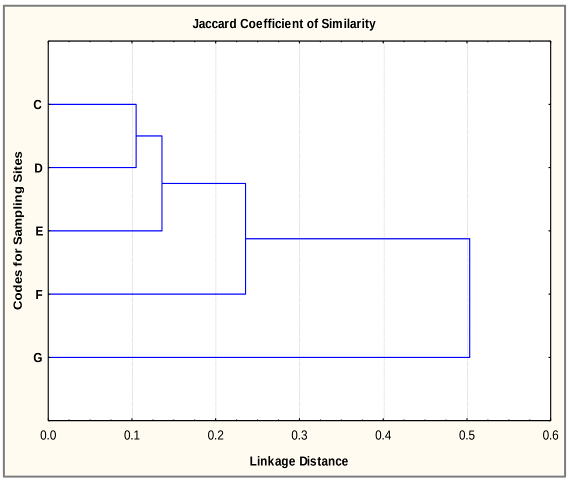
3rd Monitoring, October, 2014



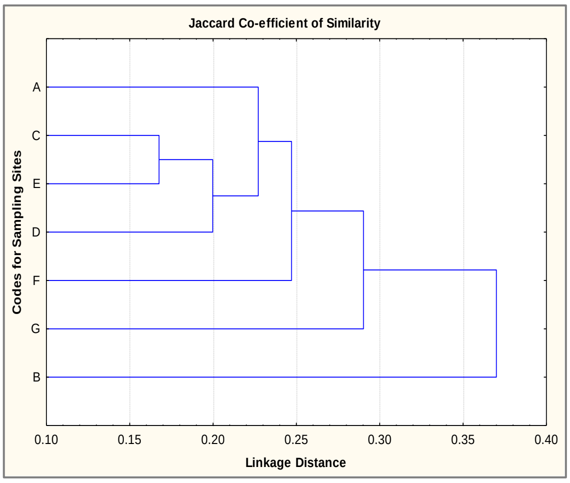
4th Monitoring, January 2015



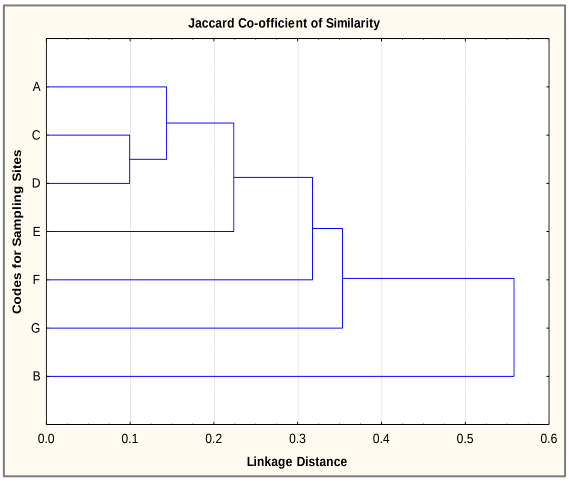
5th Monitoring, April, 2015



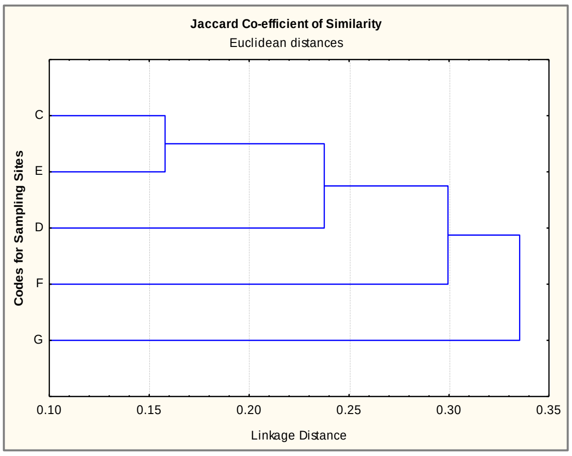
6th Monitoring, August, 2015



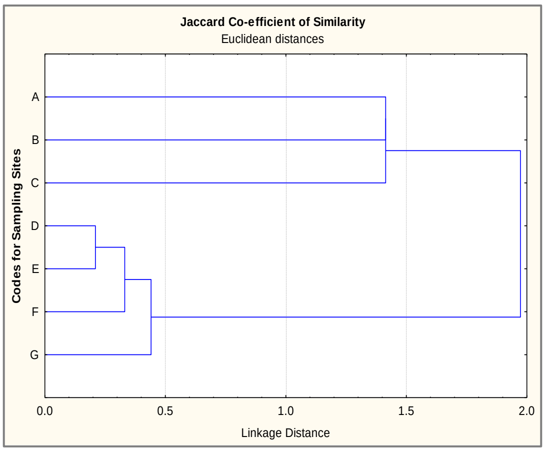
7th Monitoring, October, 2015



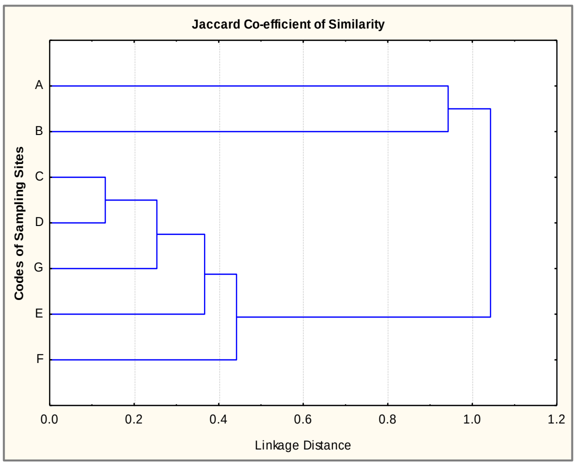
8th Monitoring, January, 2016



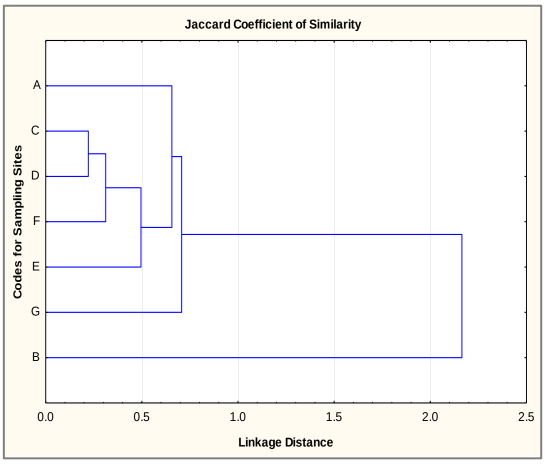
9th Monitoring, April, 2016



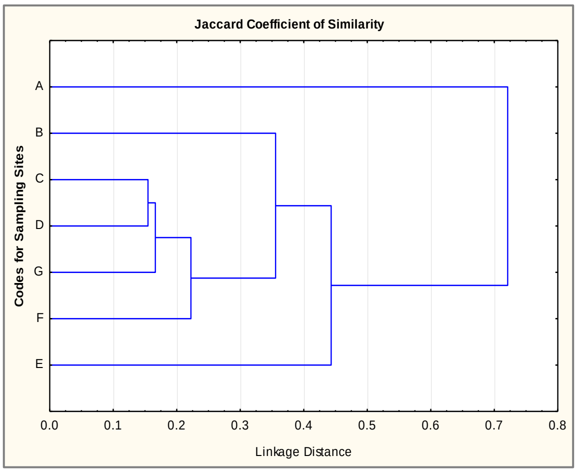
10th Monitoring, July, 2016



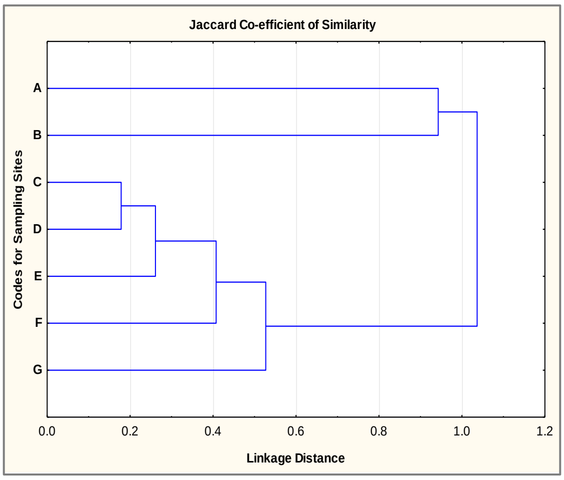
11th Monitoring, October, 2016



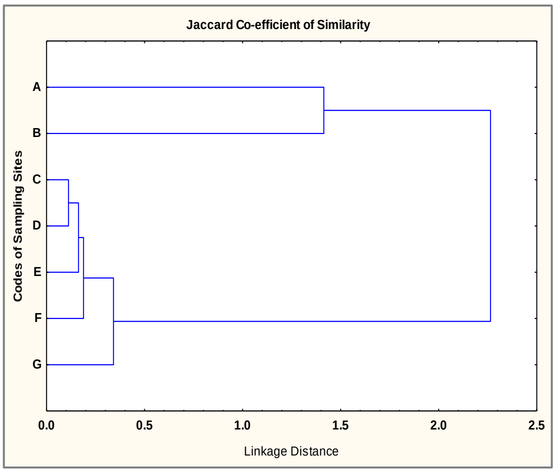
12th Monitoring, January, 2017



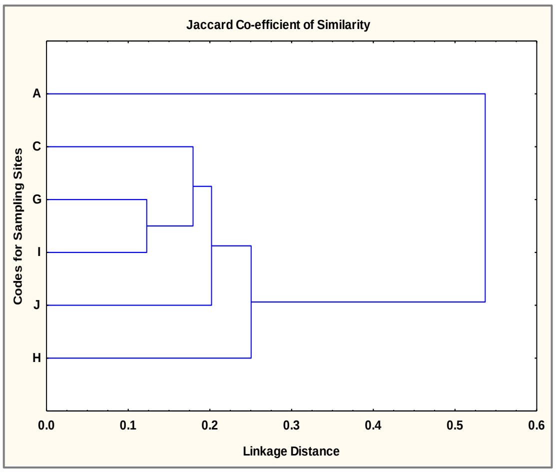
13th Monitoring, April, 2017



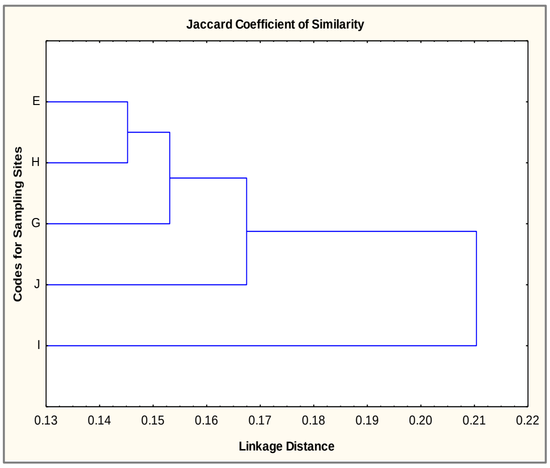
14th Monitoring, October, 2017



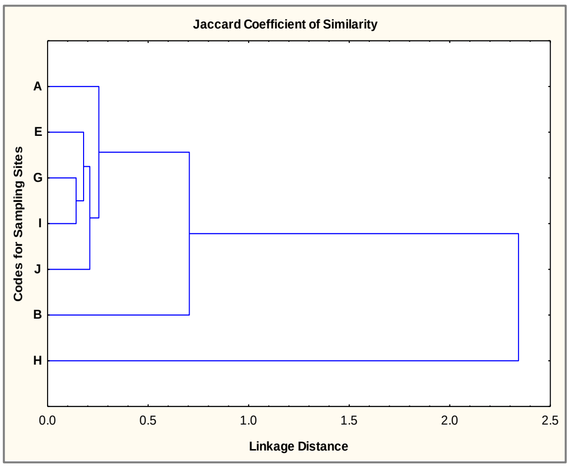
15th Monitoring, January, 2018



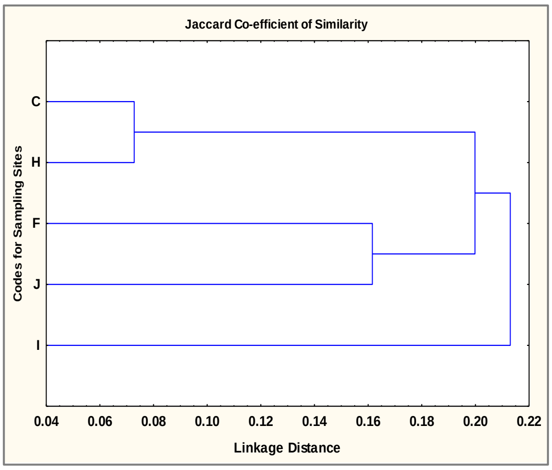
16th Monitoring, April, 2018



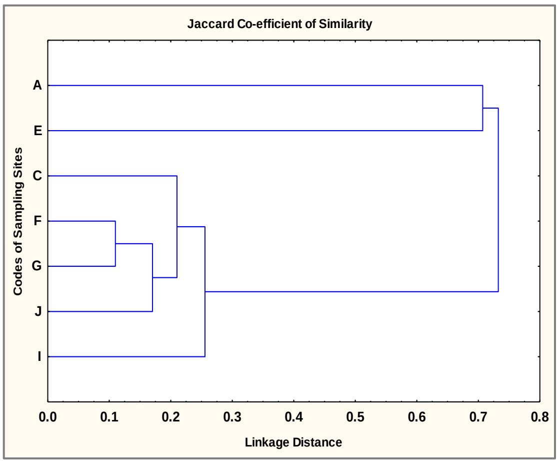
17th Monitoring, July, 2018



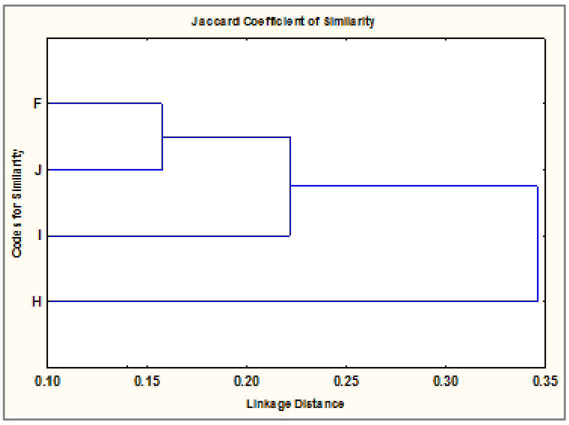
18th Monitoring, November, 2018



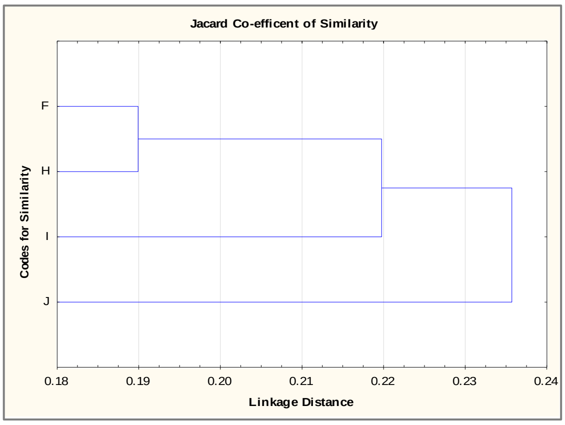
19th Monitoring, February, 2019



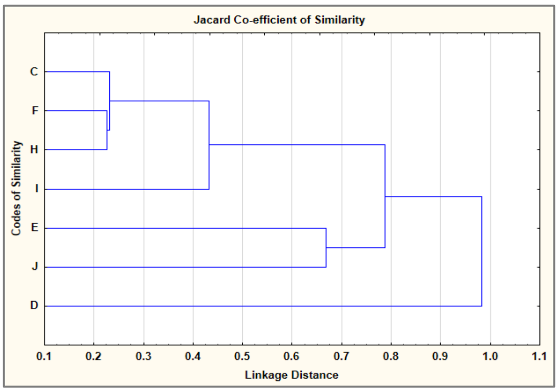
20th Monitoring, April, 2019



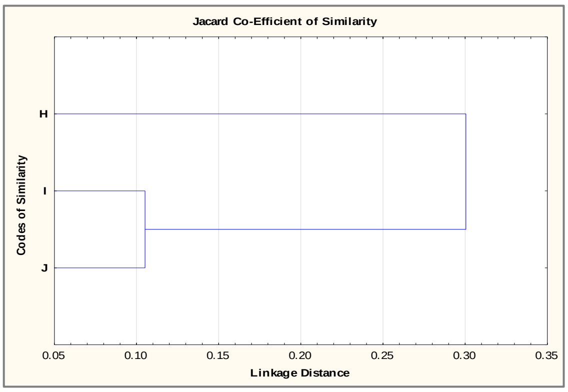
21st Monitoring, July 2019



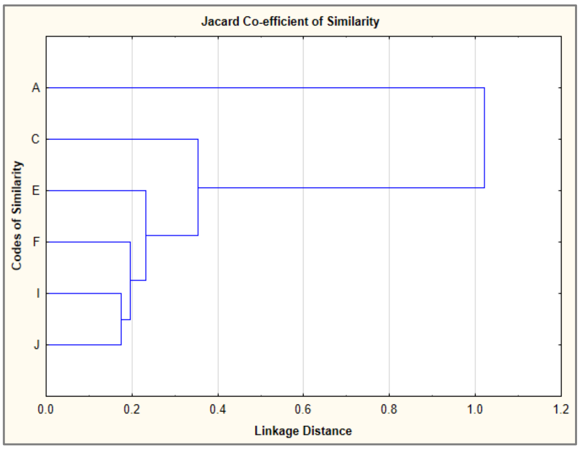
22nd Monitoring, November 2019



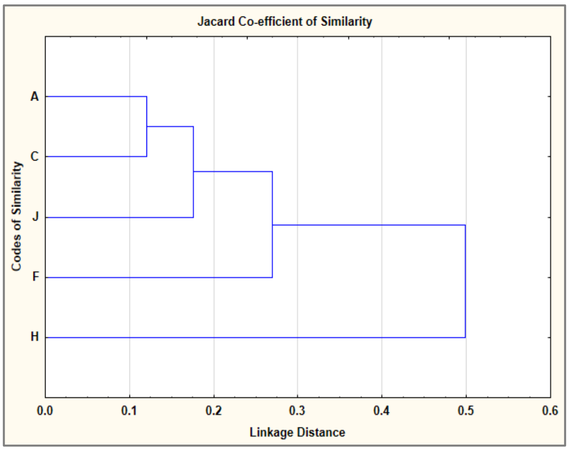
23rd Monitoring, February 2020



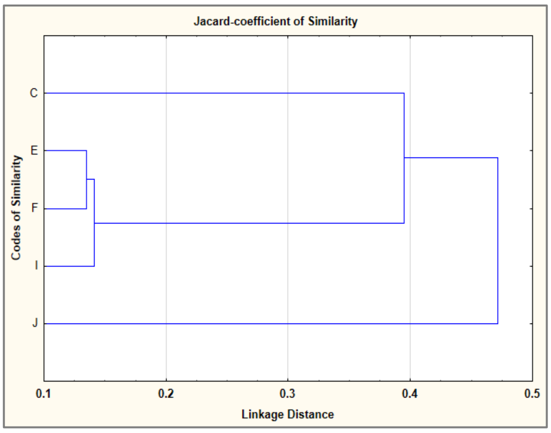
25th Monitoring, July 2020



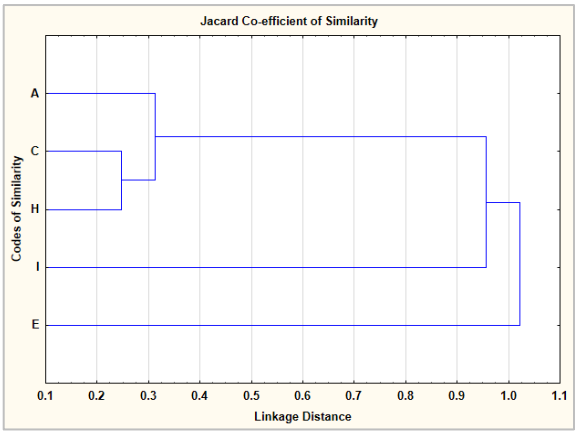
26th Monitoring, November, 2020



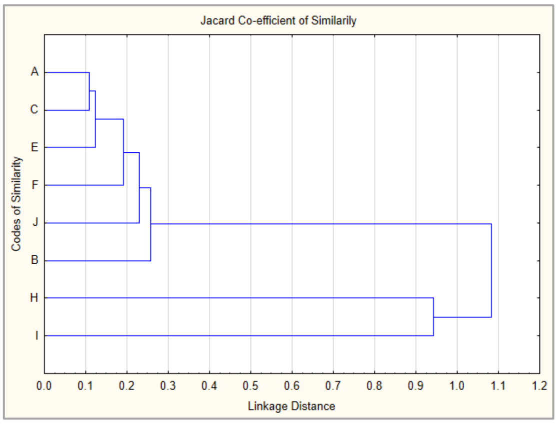
27th Monitoring, January, 2021



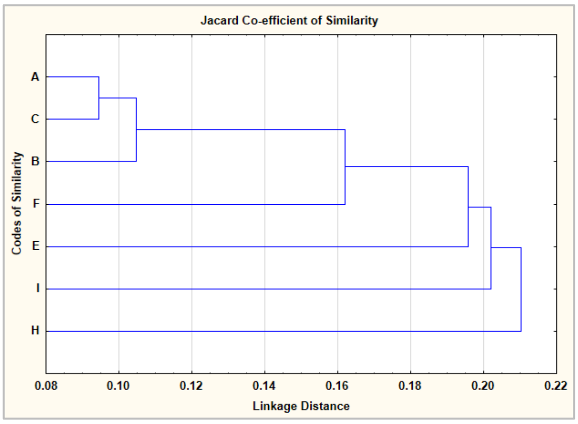
28th monitoring, April, 2021



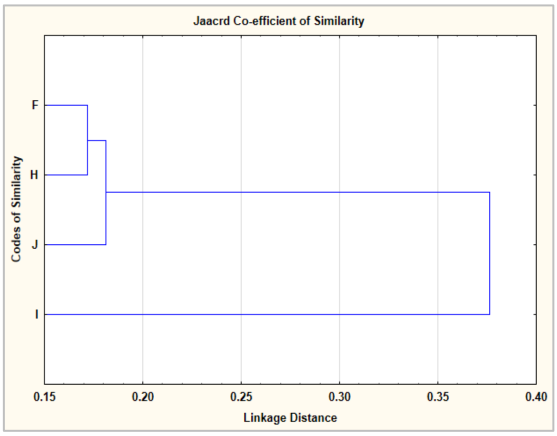
29th monitoring, August, 2021



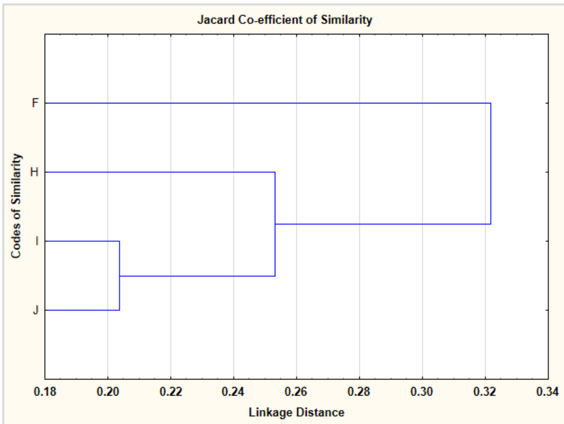
30th Monitoring, November 2021



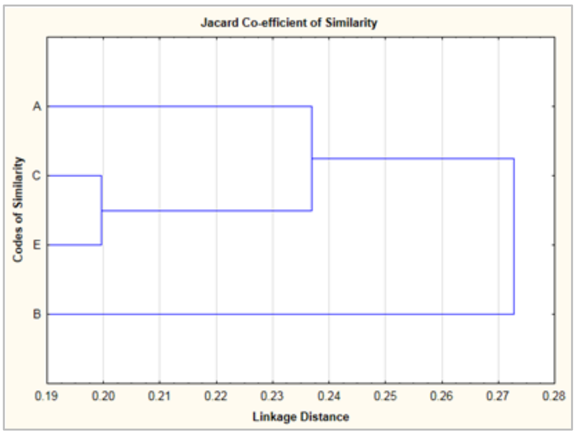
31st Monitoring, February, 2022



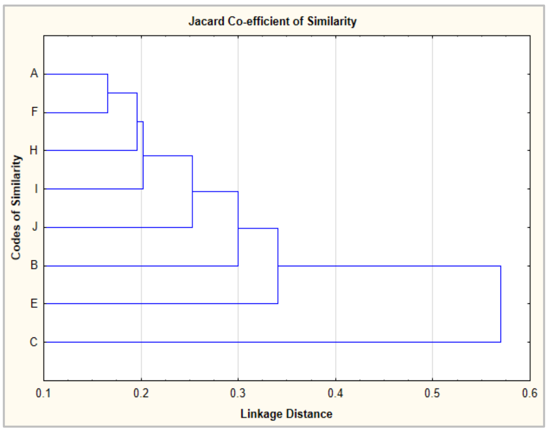
32nd Monitoring, May 2022



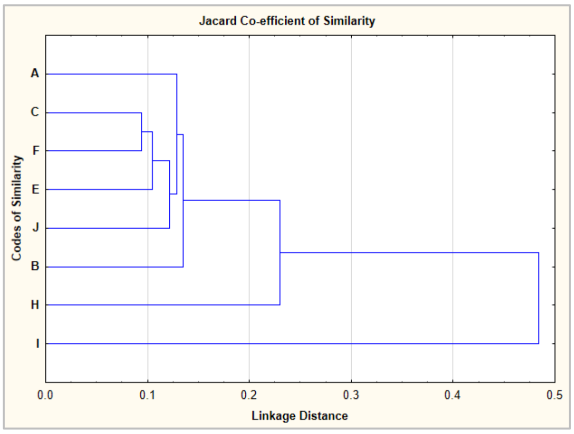
33rd Monitoring, July 2022



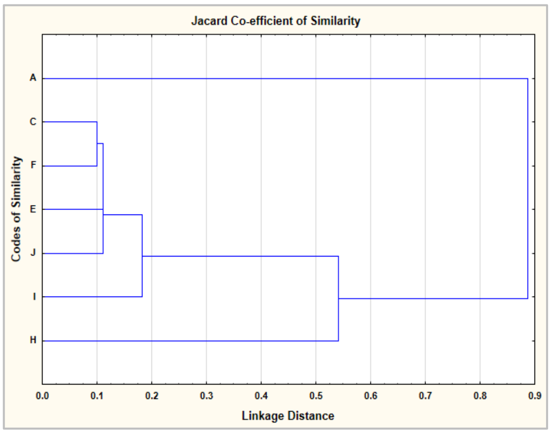
34th Monitoring, Oct 2022



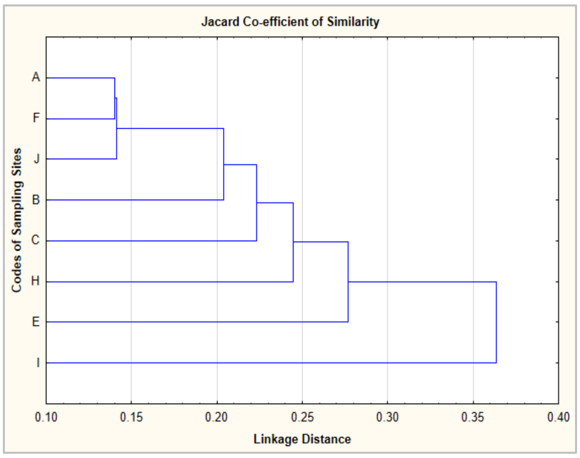
35th Monitoring, Feb 2023



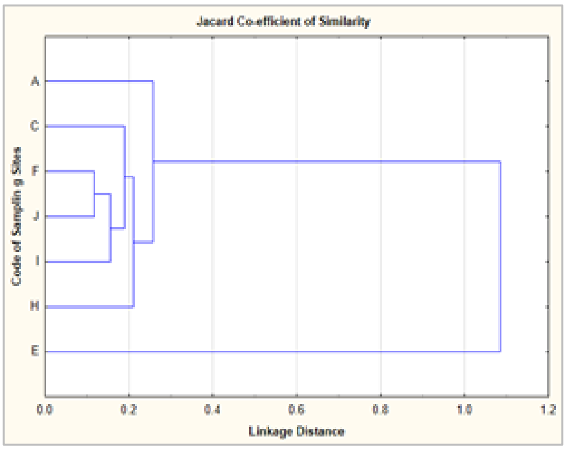
36th Monitoring, May 2023



37th Monitoring, September 2023

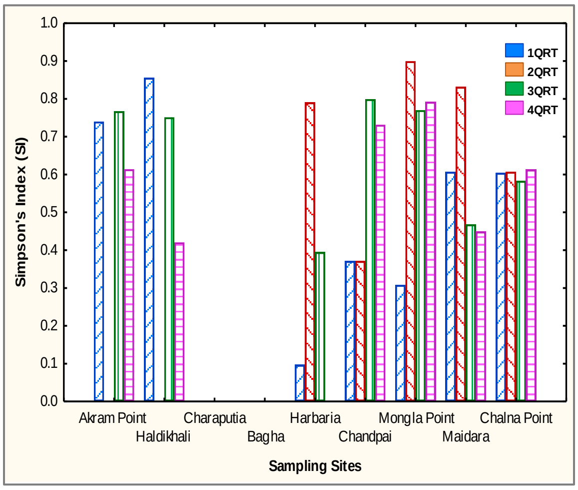


38th Monitoring, November 2023

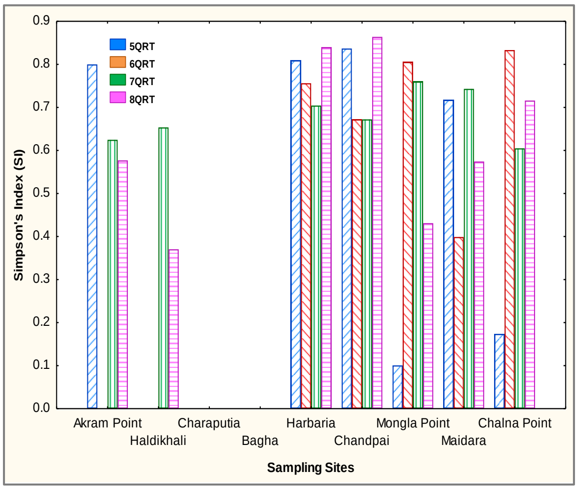


39th Monitoring, February 2024

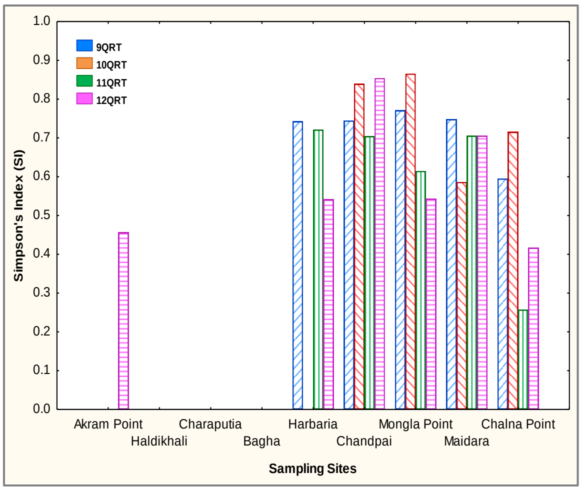
D3: Site-wise fish species richness (FSR) in the Passur River System



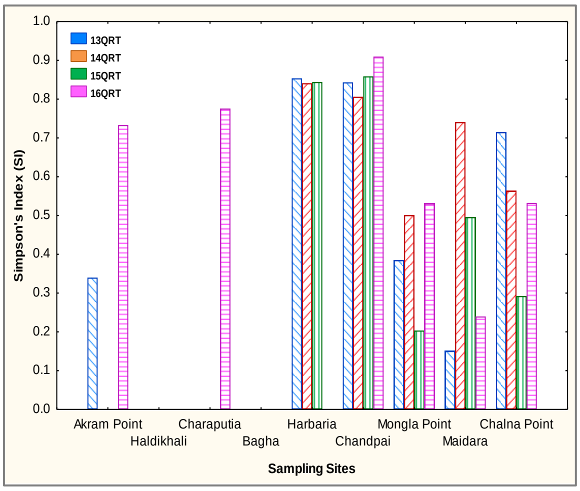
2014-2015



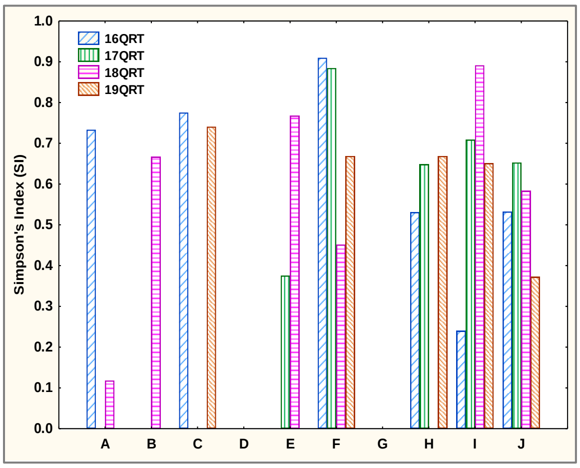
2015-2016



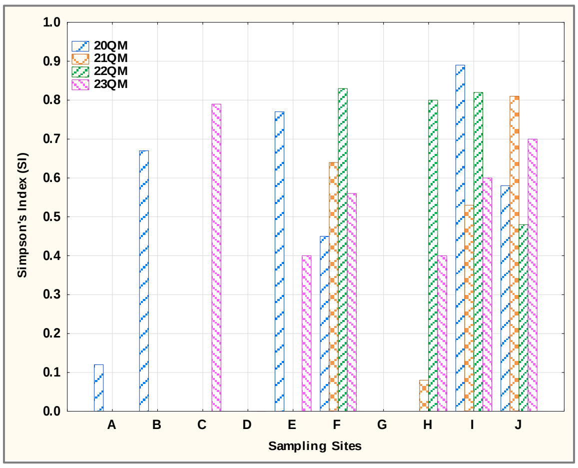
2016-2017



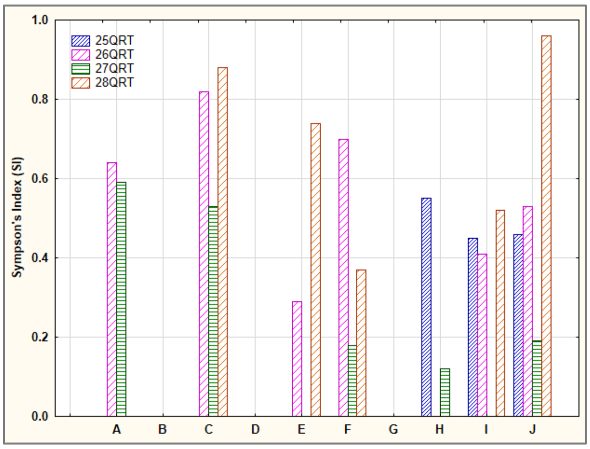
2017-18



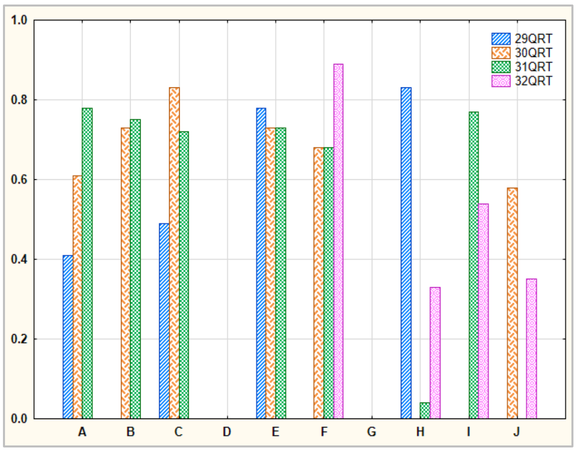
2018-19



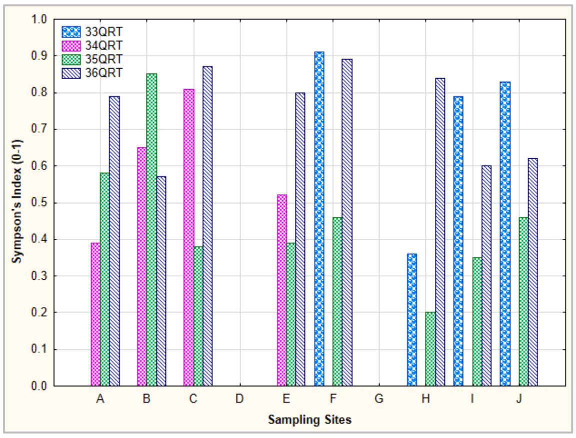
2019-20



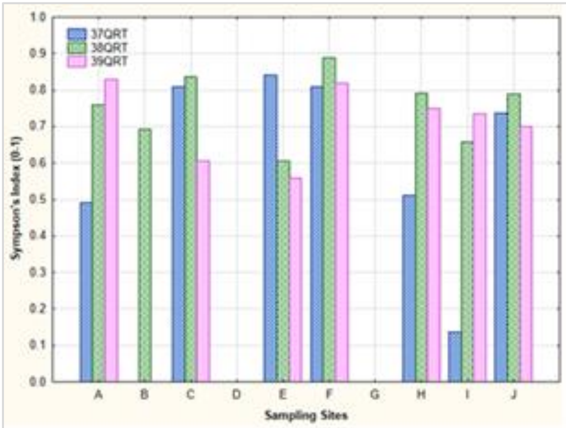
2020-21



2021-2022

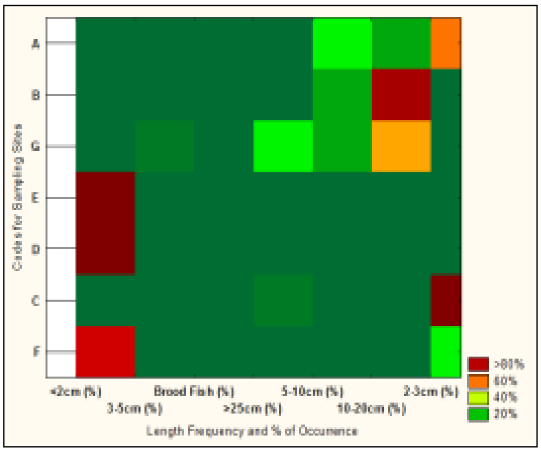


2022-23

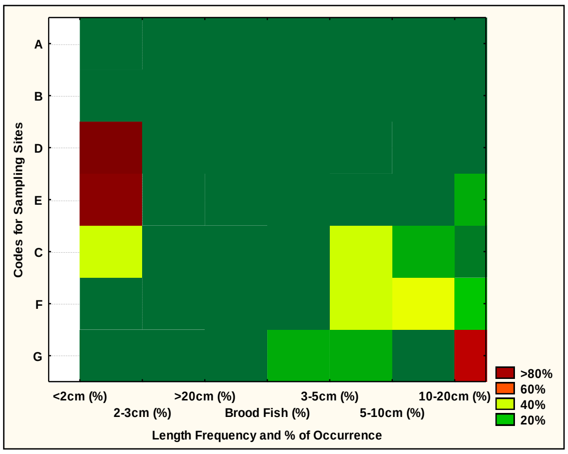


2023-2024

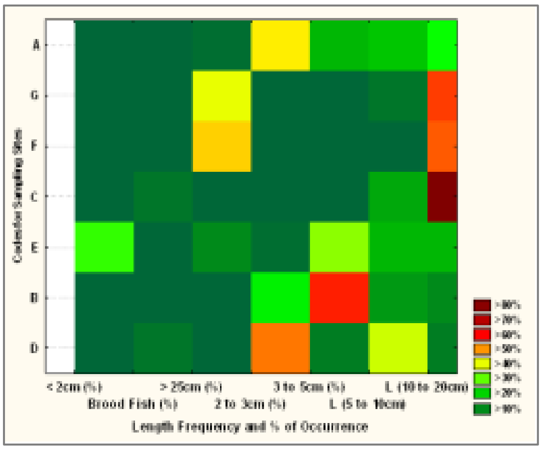
D4: Fish Community Structure



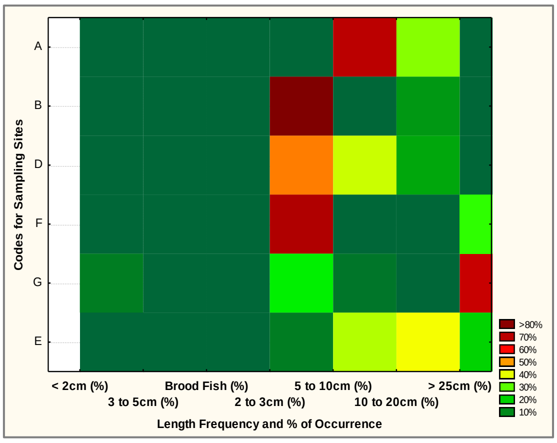
1st Monitoring, April, 2014



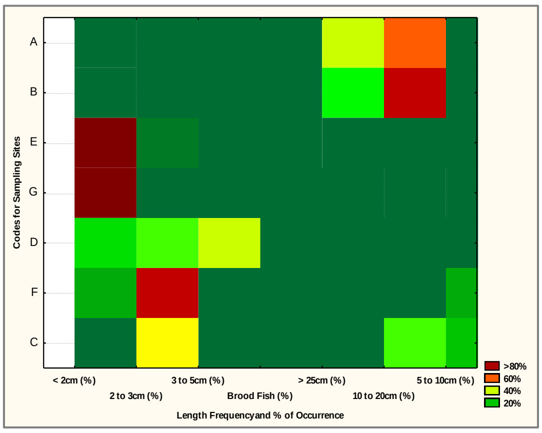
2nd Monitoring, July 2014



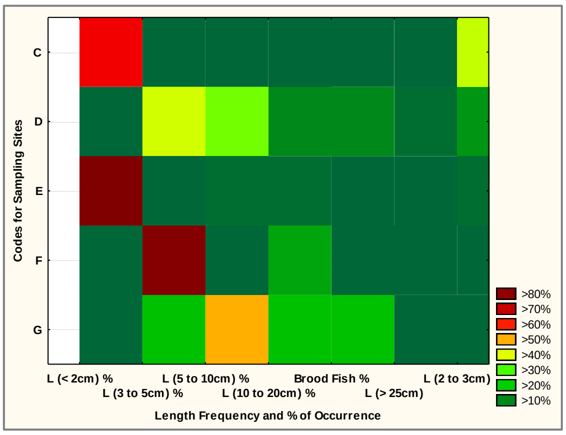
3rd Monitoring, October, 2014



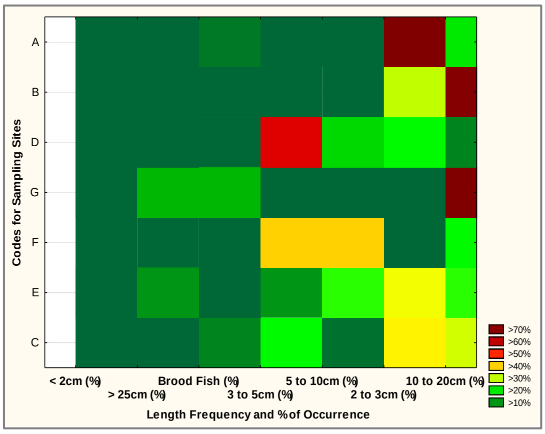
4th Monitoring, January 2015



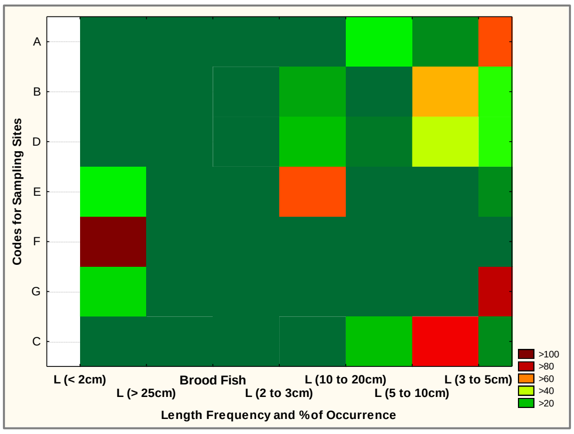
5th Monitoring, April, 2015



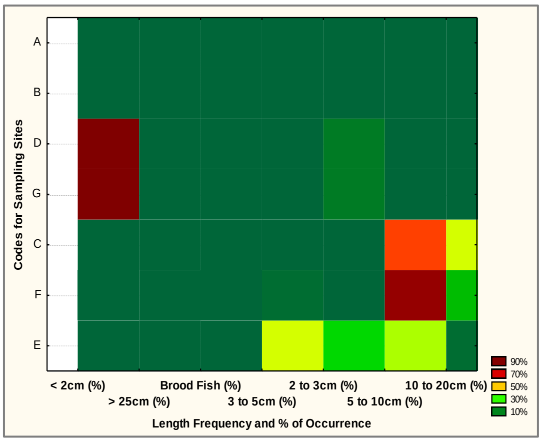
6th Monitoring, August, 2015



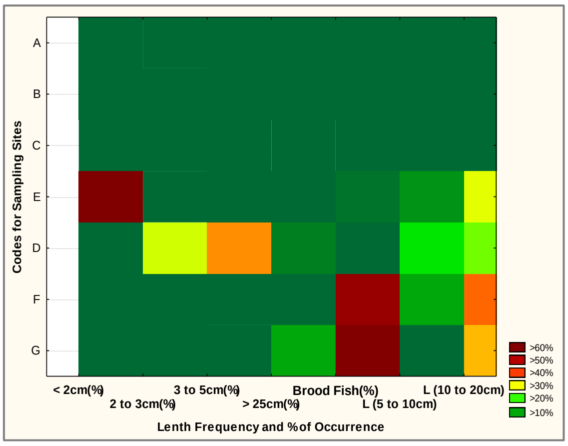
7th Monitoring, October, 2015



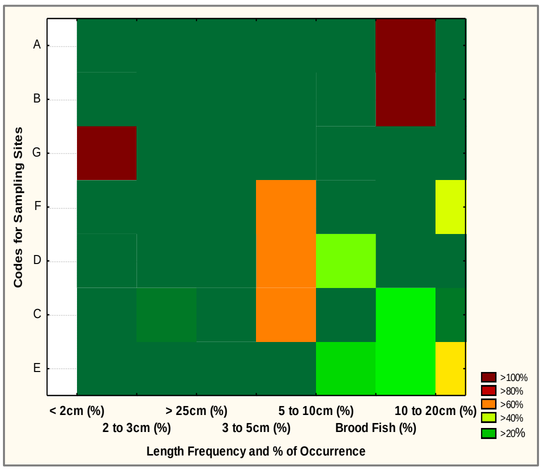
8th Monitoring, January, 2016



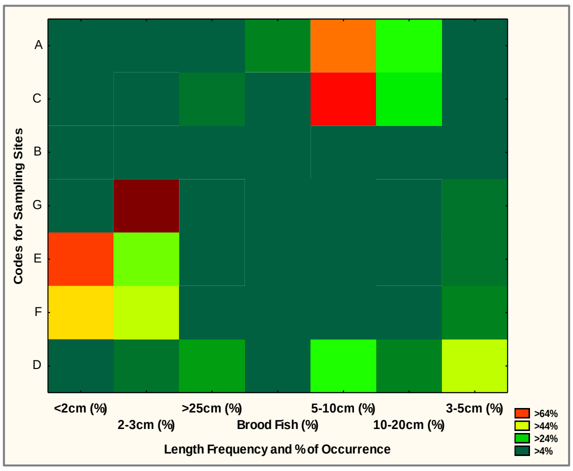
9th Monitoring, April, 2016



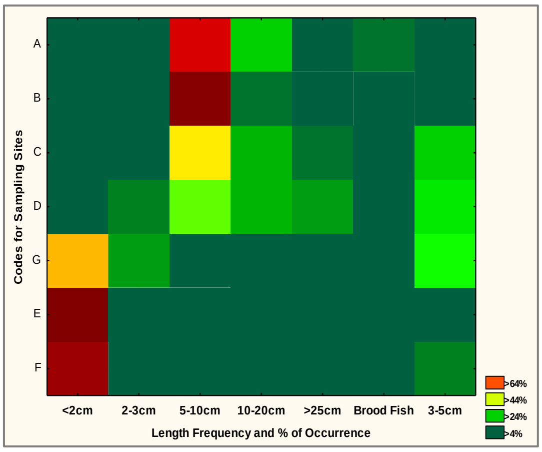
10th Monitoring, July, 2016



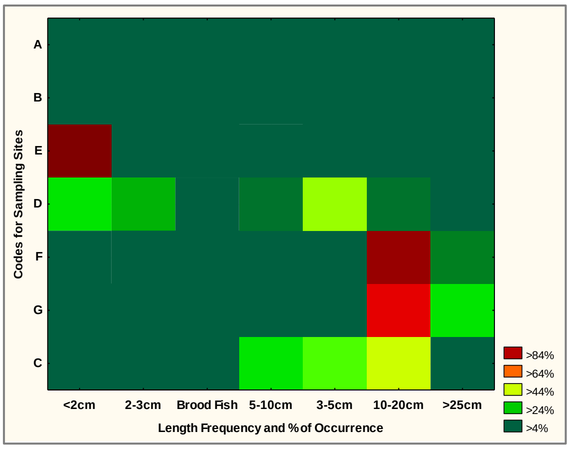
11th Monitoring, October, 2016



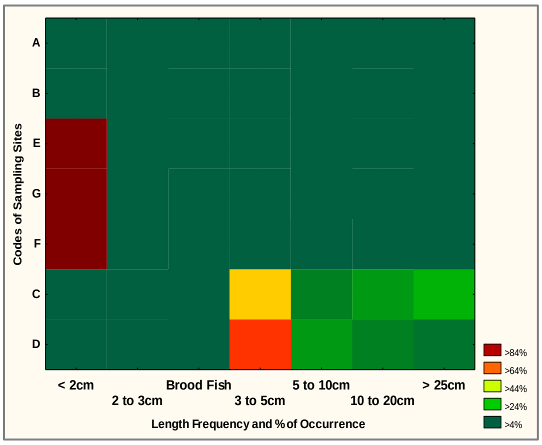
12th Monitoring, January, 2017



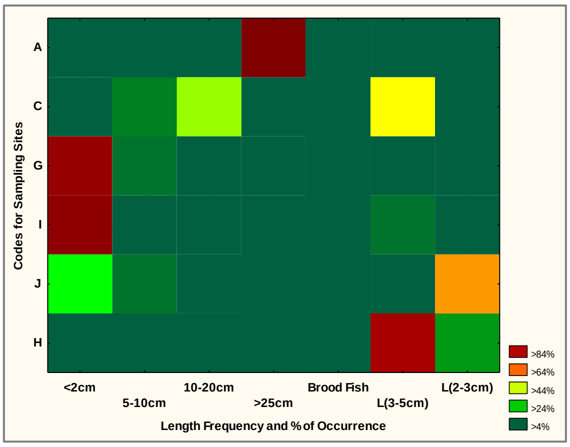
13th Monitoring, April, 2017



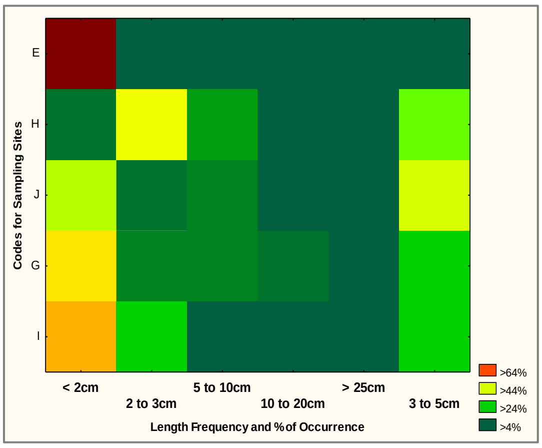
14th Monitoring, October, 2017



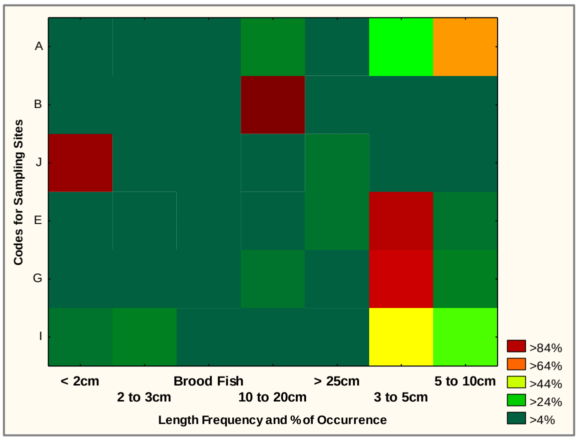
15th Monitoring, January, 2018



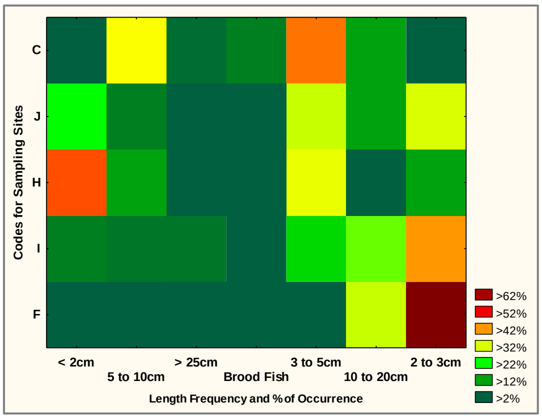
16th Monitoring, April, 2018



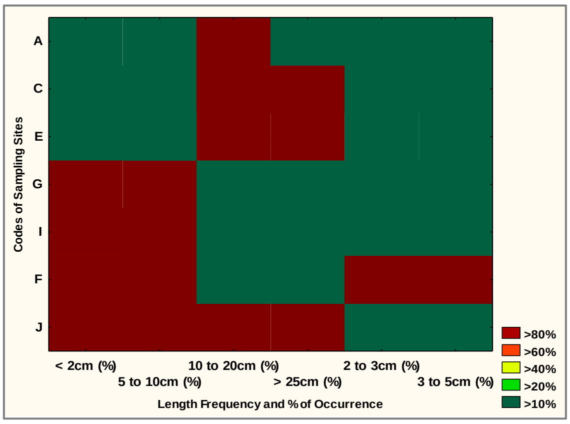
17th Monitoring, July, 2018



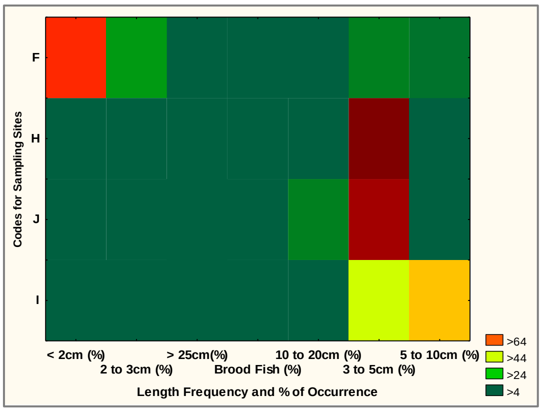
18th Monitoring, November, 2018



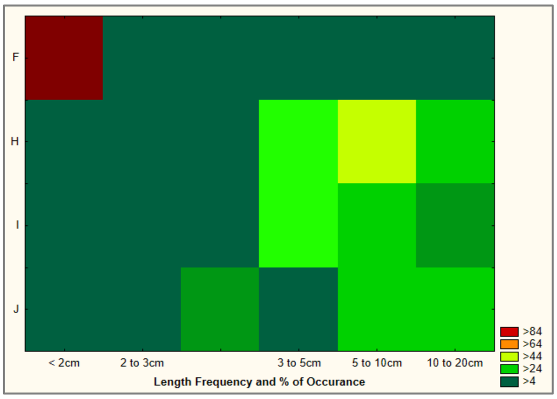
19th Monitoring, February, 2019



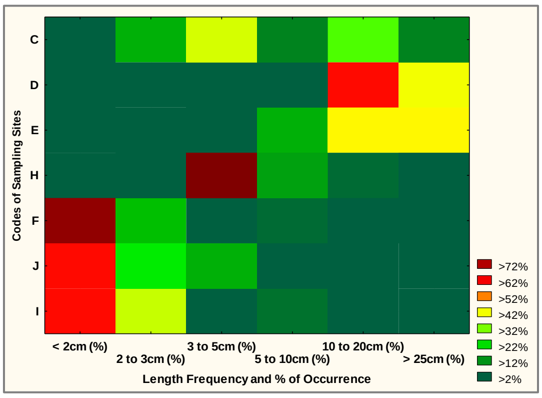
20th Monitoring, April, 2019



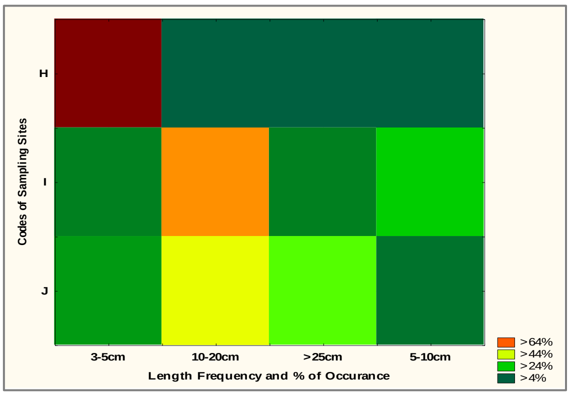
21st Monitoring, July 2019



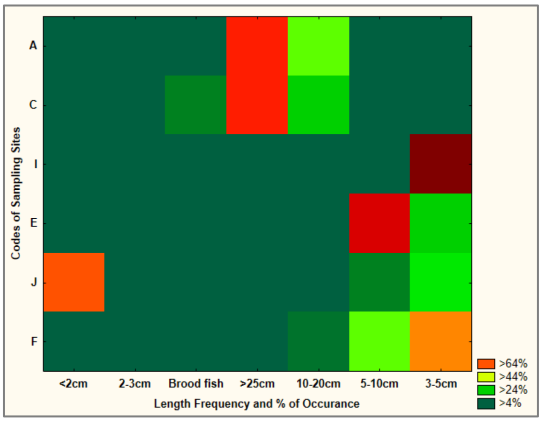
22nd Monitoring, November 2019



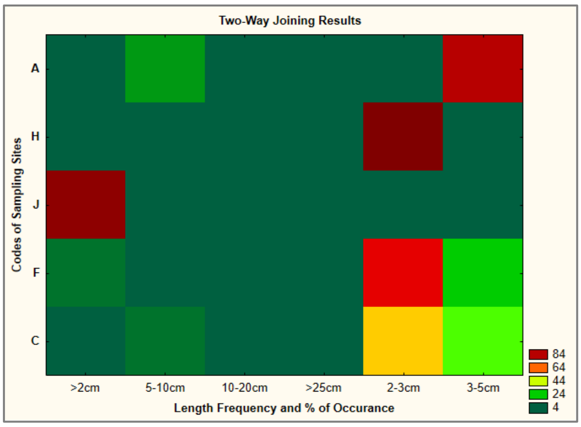
23rd Monitoring, February 2020



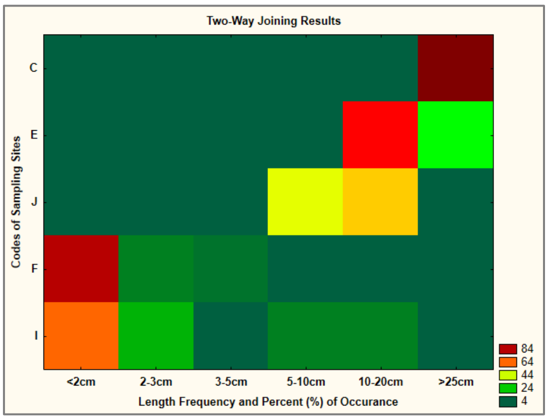
25th Monitoring, July 2020



26th Monitoring, November 2021

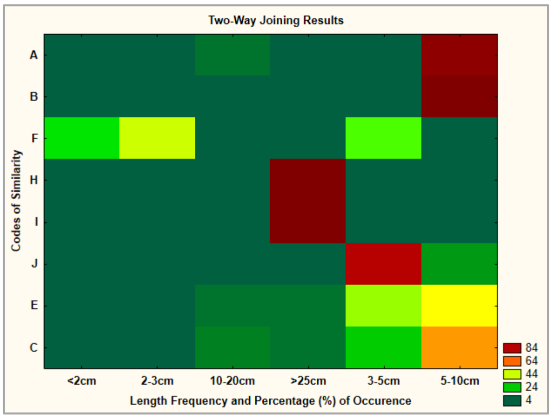


27th Monitoring, January, 2021

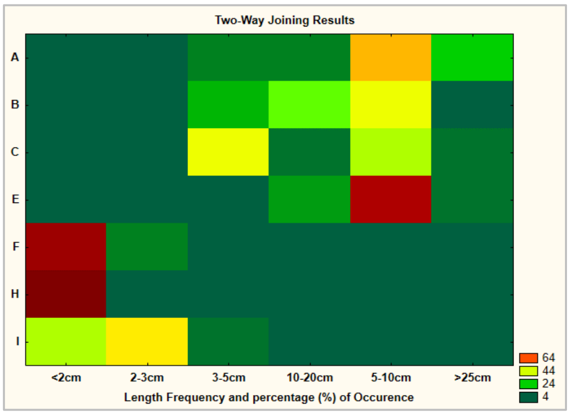


28th monitoring, April, 2021

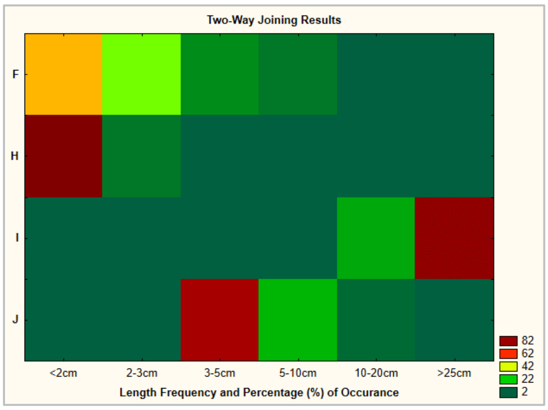
29th monitoring, August, 2021



30th Monitoring, November, 2021

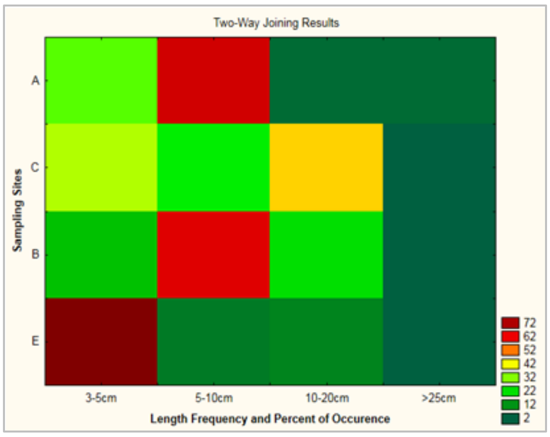


31st Monitoring, February, 2022



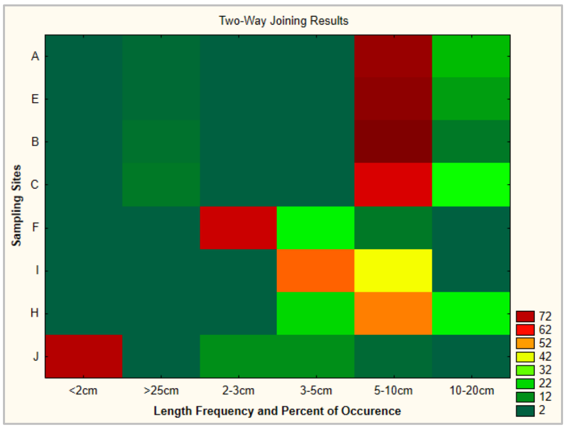
32nd Monitoring, May 2022

33rd Monitoring, July 2022

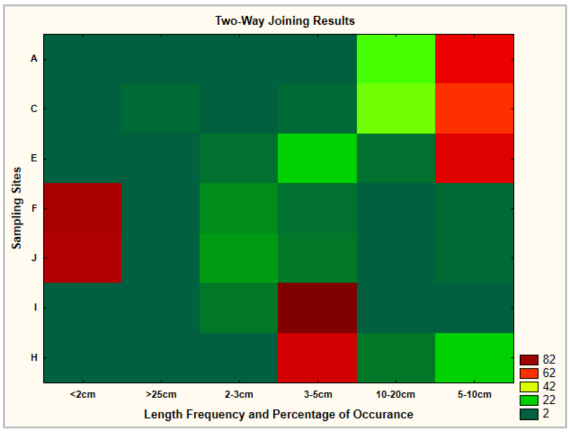


34th Monitoring, Oct 2022

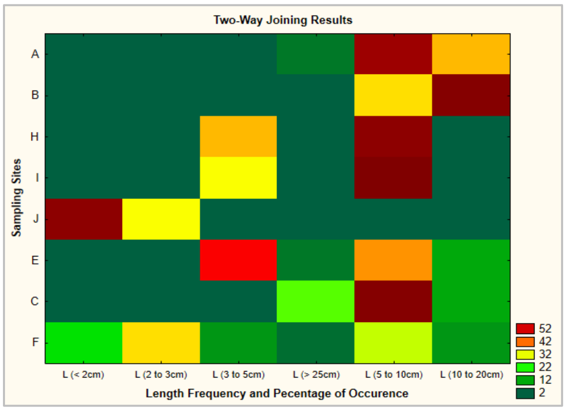
35th Monitoring, Feb 2023



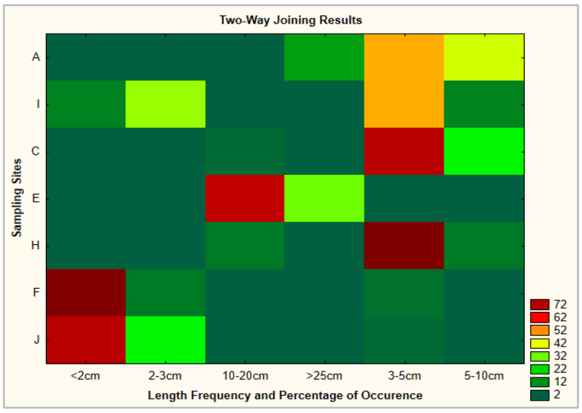
36th Monitoring, May 2023



37th Monitoring, September 2023



38th Monitoring, November 2023



39th Monitoring, February 2024

Source: CEGIS Field Survey, 2019-20, 2020-21, 2021-22, 2022-23

Table D.1: Site Wise Species Diversity using Shannon–Weiner Index (1st to 13th QM)

Site	Species Number													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	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	33	0	13	7	3	0	10	15	0	0	1	2	2	0.5	0	0.7	0.6	1	-	0.6	0.4	0	0	0	0.9	0.74
B	12	0	24	14	0	0	11	3	0	0	1	0	5	0.9	0	0.6	0.4	0	-	0.6	0.6	0	0	0	0	0.37
C	2	12	9	0	11	26	18	24	17	0	23	10	18	0.3	0.77	0.4	0	0.8	0.6	0.5	0.7	0.6	0	0.6	0.6	0.79
D	12	22	15	26	27	24	20	25	8	19	32	27	15	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
E	7	13	10	11	6	16	9	9	15	12	5	4	4	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
F	3	13	6	4	10	8	14	6	7	5	7	12	9	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
G	6	3	5	7	18	3	8	6	6	4	12	3	15	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

Table D.2: Site Wise Species Diversity using Shannon–Weiner Index (14th to 39th QM)

Species Number

Site	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	33th QM	34th QM	35th QM	36th QM	37th QM	38th QM	39th QM
A	0	0	3	0	8	0	2	0	0	0	0	7	18	0	6	20	25	0	0	11	13	20	9	16	8
B	0	0	0	0	2	0	-	0	0	0	0	0	0	0	0	7	2	0	0	7	7	1	0	1	0
C	0	0	12	0	0	24	11	0	0	10	0	4	28	4	10	34	33	0	0	13	3	5	32	9	12
D	0	0	0	0	0	0	-	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	17	12	0	2	0	0	2	0	9	0	3	13	25	12	0	0	12	7	23	20	7	3
F	6	17	0	0	0	13	22	19	11	11	0	12	7	20	0	10	13	19	6	-	20	22	23	31	22
G	81	29	21	16	19	0	26	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0
H	112	13	3	18	2	13	-	5	11	10	11	0	3	0	9	1	11	13	8	-	12	9	3	8	11

Shannon-Weiner Index

Site	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	33th QM	34th QM	35 QM	36th QM	37th QM	38th QM	39th QM
A	0	0	0.9	0	0.1	0	0.6	0	0	0	0	0.6	0.5	0	0.4	0.6	0.5	0	0	0.3	0.5	0.6	0.4	0.9	0.8
B	0	0	0	0	0.	0	-	0	0	0	0	0	0	0	0	0.	0.	0	0	0.	0.	0.	0	0.	0
C	0	0	0.6	0	0	0.5	0.8	0	0	0.7	0	0.8	0.5	0.8	0.8	0.8	0.5	0	0	0.8	0.3	0.7	0.6	0.8	0.4
D	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	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	0	0.52	0.39	0.66	0.85	0.66	0.81
F	0.85	0.81	0	0	0	0.56	0.74	0.50	0.81	0.56	0	0.70	0.18	0.37	0	0.68	0.59	0.84	0.91	0	0.46	0.75	0.75	0.75	0.64
G	0.62	0.74	0.78	0.85	0.34	0	0.58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H	0.54	0.21	0.55	0.49	0	0.40	0	0.14	0.76	0.40	0.55	0	0.12	0	0.85	0	0.06	0.31	0.36	-	0.20	0.90	0.81	0.81	0.71

Site	Species Number																								
	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	33th QM	34th QM	35th QM	36th QM	37th QM	38th QM	39th QM
I	3	13	12	10	17	11	8	9	11	12	6	16	0	18	1	1	12	4	11	-	12	4	11	5	14
J	4	5	10	14	11	21	12	14	9	8	15	11	12	4	0	8	0	10	13	-	7	20	20	15	24

Site	Shannon-Weiner Index																								
	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	33th QM	34th QM	35 QM	36th QM	37th QM	38th QM	39th QM
I	0.88	0.33	0.21	0.65	0.85	0.61	0.14	0.52	0.80	0.54	0.45	0.41	0	0.52	0	0	0.67	0.69	0.79	-	0.35	0.75	0.73	0.73	0.66
J	0.78	0.32	0.54	0.52	0.52	0.29	0.50	0.71	0.50	0.64	0.46	0.53	0.19	0.96	0	0.58	0	0.37	0.83	-	0.46	0.48	0.69	0.69	0.53

**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)*

Table D.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

Table D.4: Site wise Rich Species Number (13th to 39th QM)

Site	No. of Rich Species																									
	2017-18			2018-19				2019-20				2020-21				2021-22				2022-23				2023-24		
	13th	14th	15th	16th	17th	18th	19th	20th	21th	22th	23th	25th	26th	27th	28th	29th	30th	31th	32nd	33rd	34th	35th	36th	37th	38th	39th
A	2	-	-	4	-	1	-	2	-	-	-	-	2	4	-	1	3	5	-	-	2	3	5	2	4	6
B	1	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	4	4	-	-	3	1	2	-	-	-
C	-	-	-	4	-	-	4	7	-	-	5	-	3	3	2	2	6	4	-	-	6	1	8	5	5	3
D	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E	7	6	6	-	2	4	-	2	-	-	2	-	1	-	2	4	4	4	-	-	2	2	5	6	3	2

Site	No. of Rich Species																									
	2017-18			2018-19				2019-20				2020-21				2021-22				2022-23				2023-24		
	13th	14th	15th	16th	17th	18th	19th	20th	21th	22th	23th	25th	26th	27th	28th	29th	30th	31th	32nd	33rd	34th	35th	36th	37th	38th	39th
F	6	5	7	11	9	2	3	7	4	6	2	-	4	1	2	-	3	5	9	5	-	3	9	5	9	6
G	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
H	2	2	1	2	3	-	3	-	1	5	2	3	-	1	-	3	-	3	1	2	-	1	6	2	5	4
I	1	3	2	1	3	9	3	1	1	6	3	2	3	-	3	1	1	4	2	4	-	2	2	1	3	4
J	4	2	1	2	3	2	2	2	3	2	3	2	3	1	2	-	2	-	2	5	-	2	3	4	5	3

Source: CEGIS Field Survey, April 2014 - May 2024

Table D.5: Growth Rate and Mortality of Fish/Shrimp (1st to 18th QM)

Gher No.	Growth Rate (cm/day)																			Mortality (%)																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	0.3	15-	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	0.38	80	-	-	-
2	0.3	30-	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	0.30	70	0.30	80	-
3	0.2	25-	0.2	25	0.2	65	-	-	-	10	0.1	50	0.2	20	-	-	0.1	30	-	0.1	30	0.2	30	-	-	-	25	0.0	25	-	-	0.4	0.4	0.2	50	-	-	-

Table D.6: Growth Rate and Mortality of Fish/Shrimp (19th to 39th QM)

Gher No.	Growth Rate (cm/day)																			Mortality (%)																		
	20	21	22	23	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	20	21	22	23	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
1	0.35	0.38	0.35	-	0.38	0.42	-	0.41	0.38	0.36	-	0.36	0.39	0.38	-	0.34	0.38	-	0.35	50	-	-	-	-	35	-	20	-	-	-	-	20	22	-	15	10	-	80
2	0.45	0.44	0.45	-	0.48	0.45	-	0.35	0.42	0.44	-	0.43	0.42	0.41	-	0.39	0.33	-	0.39	80	-	-	-	-	30	-	90	-	-	-	-	25	25	-	20	30	-	30
3	0.34	0.36	0.37	-	0.32	0.38	-	0.39	0.4	0.37	-	0.33	0.37	0.35	-	0.37	0.34	-	0.38	40	-	-	-	-	90	-	30	-	-	-	-	60	29	-	15	15	-	40

Table D.7: 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

Table D.8: Total Catch in the Sampling Sites

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	33 QM	34 QM	35 QM	36 QM	37 QM	38 QM	39 QM
A	-	-	17	-	16	-	0.4	-	-	-	-	30.5	3.5	-	1.1	27	30	-	-	81	51.7	14.0	1.25	104.5	0.4
B	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	13	14.5	-	-	0.4	20.5	39.0	-	34.75	-
C	-	-	1.50	-	-	93	17.5	-	-	4.6	-	18.9	33	12.7	5.85	23	20	-	-	1.1	8	20.3	10.9	2.1	6.4
D	-	-	-	-	-	-	-	-	-	1.35	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-
E	1.5	2.56	-	0.1	2	-	0.5	-	-	1.17	-	2.07	-	47.5	11.34	52	4	-	-	5.7	27.5	18.5	10.6	5	13.0
F	0	-	-	-	-	-	-	-	-	-	-	0.6	-	2.3	-	-	-		0.6	-	0.8	0.8	1.1	9.85	-
G	10.5	37.67	3	4	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
H	-	-	0.33	22	-	5	-	11.5	0.2	20	10.5	-	4	-	6.1	0.25	1	-	0.8	-	0.2	1.3	0.2	0.3	0.72
I	0.4	0.67	0.13	3	5	1.2	-	0.5	1.7	0.4	3.0	5	-	3.5	7.75	2.5	0.1	1.2	1.25	-	-	0.2	0.25	0.25	1.3
J	0.3	-	1	0.25	1.2	0.6	0.17	1.6	0.8	-	6.3	7.5	-	0.3	-	3.25	-	1.3	3.1	-	0.5	0.3	0.5	0.4	3.16

Average Weight 0.15kg/mud crab and average weight 0.6 kg/mud eel Weight of Fry is not considered for catch assessment*

Table D.9: Occurrence of Species (1st to 18th QM)

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	13th QM	14th QM	15th QM	16th QM	17th QM	18th QM
			'-'= No; '+' = Occurrence																	
Hilsa	*Tenualosa ilisha*	NO	-	-	+	-	-	+	+	-	-	-	+	-	-	-	-	-	-	+
Sagor Baim	*Anguilla bengalensis*	NT	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
Bacha	*Eutropiichthys vacha*	CR	+	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-
Bagda Chingri	*Penaeus monodon*	DD	+	+	+	+	+	+	+	+	+	+	-	+	+	-	+	+	+	+
Banspata	*Brachypleura novae*	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	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+
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	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

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	13th QM	14th QM	15th QM	16th QM	17th QM	18th QM
			'-'= No; '+' = Occurrence																	
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	-	-	-	+	+	+	+	+	+	-	+	+	+	+	+	+	-	+

Table D.10: Occurrence of Species (19th to 40rd QM)

Local Name	Scientific Name	Local Status*	19th QM	20th QM	21st QM	22nd QM	23rd QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31th QM	32nd QM	33rd QM	34th QM	35rd QM	36th QM	37th QM	38th QM	39th QM	40th 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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Local Name	Scientific Name	Local Status*	19th QM	20th QM	21st QM	22nd QM	23rd QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31th QM	32nd QM	33rd QM	34th QM	35rd QM	36th QM	37th QM	38th QM	39th QM	40th QM
'-' = No; '+' = Occurrence																							
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	+	+	-	-	-	-	-	+	+	+	+	+	+	-	-	+	+	+	+	+	+
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 Status Source: IUCN Bangladesh, 2015*

Table D.11: 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
Bagda	B	50.00	0.00	0.00	0.00	50.00	0.00	0.00
	F	100.00	0.00	0.00	0.00	0.00	0.00	0.00
	J	50.00	0.00	0.00	50.00	0.00	0.00	0.00
Bele	A	0.00	0.00	0.00	0.00	100.00	0.00	0.00
	F	100.00	0.00	0.00	0.00	0.00	0.00	0.00
	I	0.00	0.00	0.00	100.00	0.00	0.00	0.00
	J	0.00	0.00	0.00	100.00	0.00	0.00	0.00
Boiragi	B	0.00	0.00	0.00	50.00	50.00	0.00	0.00
	H	0.00	0.00	50.00	50.00	0.00	0.00	0.00
Chaka Chingri	A	0.00	0.00	0.00	100.00	0.00	0.00	0.00
	B	0.00	0.00	0.00	50.00	50.00	0.00	0.00
	C	0.00	0.00	0.00	100.00	0.00	0.00	0.00
	D	0.00	0.00	0.00	100.00	0.00	0.00	0.00
	F	100.00	0.00	0.00	0.00	0.00	0.00	0.00
Chali Chingri	J	0.00	100.00	0.00	0.00	0.00	0.00	0.00
Chami Chingri	I	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	0.00	100.00	0.00	0.00	0.00
Chela	C	0.00	0.00	100.00	0.00	0.00	0.00	0.00
	E	0.00	0.00	100.00	0.00	0.00	0.00	0.00
	F	100.00	0.00	0.00	0.00	0.00	0.00	0.00
	I	0.00	0.00	0.00	100.00	0.00	0.00	0.00
	J	0.00	100.00	0.00	0.00	0.00	0.00	0.00
Chewa	C	0.00	0.00	0.00	100.00	0.00	0.00	0.00
	F	100.00	0.00	0.00	0.00	0.00	0.00	0.00
	H	0.00	0.00	0.00	100.00	0.00	0.00	0.00
	J	0.00	50.00	0.00	50.00	0.00	0.00	0.00
Chhuri	H	0.00	0.00	0.00	0.00	100.00	0.00	0.00
Chitra	F	100.00	0.00	0.00	0.00	0.00	0.00	0.00
Datina	C	0.00	0.00	0.00	0.00	100.00	0.00	0.00
	E	0.00	0.00	0.00	100.00	0.00	0.00	0.00
Deto Chanda	C	0.00	100.00	0.00	0.00	0.00	0.00	0.00
Dogri	I	0.00	0.00	0.00	100.00	0.00	0.00	0.00
	J	0.00	0.00	0.00	100.00	0.00	0.00	0.00
Ekthuitta	C	0.00	0.00	0.00	0.00	100.00	0.00	0.00
Gagra	B	0.00	0.00	0.00	0.00	100.00	0.00	0.00
	C	0.00	0.00	0.00	0.00	100.00	0.00	0.00
	D	0.00	0.00	0.00	0.00	0.00	100.00	0.00
	H	0.00	0.00	0.00	100.00	0.00	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
Goda Chingri	A	0.00	0.00	0.00	100.00	0.00	0.00	0.00
Golda	B	100.00	0.00	0.00	0.00	0.00	0.00	0.00
Gulsha	J	0.00	0.00	0.00	100.00	0.00	0.00	0.00
Harina	B	0.00	0.00	100.00	0.00	0.00	0.00	0.00
	C	0.00	0.00	0.00	100.00	0.00	0.00	0.00
	F	100.00	0.00	0.00	0.00	0.00	0.00	0.00
	H	0.00	0.00	100.00	0.00	0.00	0.00	0.00
	I	0.00	0.00	0.00	100.00	0.00	0.00	0.00
	J	0.00	0.00	0.00	100.00	0.00	0.00	0.00
Java	A	0.00	0.00	0.00	0.00	0.00	100.00	0.00
Kain	A	0.00	0.00	0.00	0.00	0.00	100.00	0.00
	C	0.00	0.00	0.00	0.00	50.00	50.00	0.00
	D	0.00	0.00	0.00	0.00	0.00	100.00	0.00
Kakra	H	0.00	100.00	0.00	0.00	0.00	0.00	0.00
Kharulla	I	0.00	0.00	0.00	0.00	100.00	0.00	0.00
	J	0.00	100.00	0.00	0.00	0.00	0.00	0.00
Khoira	E	0.00	0.00	0.00	100.00	0.00	0.00	0.00
	F	100.00	0.00	0.00	0.00	0.00	0.00	0.00
Kuchia	J	0.00	0.00	0.00	100.00	0.00	0.00	0.00
Kumirer Khil	J	0.00	0.00	100.00	0.00	0.00	0.00	0.00
Lakkhyia	A	0.00	0.00	0.00	0.00	0.00	100.00	0.00
Loittya	B	0.00	0.00	0.00	0.00	50.00	50.00	0.00
	H	0.00	0.00	0.00	50.00	50.00	0.00	0.00
Medh	A	0.00	0.00	0.00	0.00	0.00	100.00	0.00
Menua	A	0.00	0.00	0.00	0.00	100.00	0.00	0.00
	F	100.00	0.00	0.00	0.00	0.00	0.00	0.00
Motka Chingri	A	0.00	0.00	0.00	100.00	0.00	0.00	0.00
	B	0.00	0.00	0.00	50.00	50.00	0.00	0.00
	C	0.00	0.00	0.00	100.00	0.00	0.00	0.00
	F	100.00	0.00	0.00	0.00	0.00	0.00	0.00
	H	0.00	0.00	100.00	0.00	0.00	0.00	0.00
	J	100.00	0.00	0.00	0.00	0.00	0.00	0.00
Mutkura Bele	J	100.00	0.00	0.00	0.00	0.00	0.00	0.00
Paissa	A	0.00	0.00	0.00	100.00	0.00	0.00	0.00
	B	0.00	0.00	100.00	0.00	0.00	0.00	0.00
	C	0.00	0.00	50.00	50.00	0.00	0.00	0.00
	D	0.00	0.00	0.00	100.00	0.00	0.00	0.00
	E	0.00	0.00	0.00	100.00	0.00	0.00	0.00
	F	100.00	0.00	0.00	0.00	0.00	0.00	0.00
	I	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
Pheksa	H	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
Poma	H	50.00	50.00	0.00	0.00	0.00	0.00	0.00
Potka	B	0.00	0.00	0.00	0.00	100.00	0.00	0.00
	F	100.00	0.00	0.00	0.00	0.00	0.00	0.00
	H	50.00	0.00	0.00	50.00	0.00	0.00	0.00
Ramchos	B	0.00	0.00	0.00	0.00	100.00	0.00	0.00
	H	0.00	0.00	0.00	100.00	0.00	0.00	0.00
Sotka Icha	B	0.00	0.00	100.00	0.00	0.00	0.00	0.00
Tairel	A	0.00	0.00	0.00	100.00	0.00	0.00	0.00
Teo Paissa	A	0.00	0.00	0.00	100.00	0.00	0.00	0.00
Thurina	D	0.00	0.00	0.00	50.00	50.00	0.00	0.00
Tiger Chingri	B	0.00	0.00	0.00	0.00	100.00	0.00	0.00
	F	100.00	0.00	0.00	0.00	0.00	0.00	0.00
	H	0.00	0.00	50.00	50.00	0.00	0.00	0.00
	I	0.00	0.00	0.00	100.00	0.00	0.00	0.00
	J	0.00	0.00	100.00	0.00	0.00	0.00	0.00
Tilapia	H	100.00	0.00	0.00	0.00	0.00	0.00	0.00
Vetki	A	0.00	0.00	0.00	0.00	0.00	100.00	0.00
Vulo Chingri	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

Source: CEGIS field survey, May 2024

Table D.12: 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	13th QM	14th QM	15th QM	16th QM
Tapsi	Haldikhali	Juvenile and Age-1 adult	F&G	-	F&G	-	-	-		-	-	-	-	-	-	-	G	-
	Akram Point	Juvenile and Age-1 adult	F&G	-	-	-	-	-	F	-	-	-	-	-	-	-	-	-
		Adult	F&G	-	-	-	-	-	-	F	-	-	-	-	-	-	-	-
	Chalna Point	Age-1 adult and Brood fish	F&G	S	-	-	-	F	F&S	-	-	-	F&G	-	-	-	-	-
		Adult	-	-	F&G	-	-	F	F	-	-	-		-	-	F	-	-
	Harbaria	Juvenile and Age-1 adult	F&G	F&G		-	-	-	-	-	-	-	-	F	F	-	-	-
		Adult and Brood Fish	-	-	B&S	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chandpai	Juvenile	-	-	F&G	-	-	-	F	-	-	-	F	-	-	F&G	-	F&G
	Mongla Point	Adult	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-
		Fry										-					N	
	South-west of Project	Age-1 adult	F&G	F&G	F&G	-	-	F	-	-	-	-	-	-	-	-	-	-
		Brood Fish	-	-	-	-	-	B&S	-	-	-	-	-	-	-	-	-	-
Bairagi	Haldikhali	Juvenile and Age-1 adult	F&G	-	F&G	-	-	-	-	-	-	-	-	-	-	-	-	-
	Akram Point	Juvenile and Age-1 adult	F&G	-	-	-	F&G	-	-	-	-	-	-	-	-	-	-	-
		Juvenile and Adult	-	-	-	-	-	-	-	F&G	-	-	-	-	-	-	-	-
	Chandpai	Fry	B&S	B&S	F&G	F	-	F	-	-	-	-	-	-	-	N	-	N
		Juvenile	-	-	-	-	-	-	-	-	-	-	-	-	-	F&G	F&G	F&G
	Chalna Point	Juvenile and Age-1 adult	F&G	-	-	-	F&G	-	-	-	-	-	-	-	-	-	-	-
		Fry	-	-	-	-	-	-	-	-	-	-	-	N	N	-	-	-
		Juvenile	F&G	-	-	-	-	F	-	-	-	-	-	-	-	-	-	-
	Mongla Point	Fry	-	N	-	F	-	-	-	-	-	-	-	N	N	-	N	-
		Juvenile	-	-	-	-	-	-	-	F	-	-	-	-	-	-	-	-

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	13th QM	14th QM	15th QM	16th QM
	Harbaria	Juvenile										-					F&G	-
	South-west of the Project	Juvenile	-	F&G	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Fry	-	-	-	-	-	-	-	-	-	-	-	N	-	-	-	-
Chapila	Haldikhali	Juvenile	F&G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Akram Point	Juvenile	F&G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mongla Point	Fry	-	N	-	-	-	-	-	-	-	-	-	-	-	-	N	-
	South-west of the Project	Age-1 adult	-	F&G	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Loitta	Haldikhali	Juvenile and Age-1 adult	F&G	-	F&G	-	-	-	-	-	-	-	-	-	-	-	-	-
	Akram Point	Juvenile	F&G	-	-	-	F&G	-	-	-	-	-	-	-	-	-	-	-
	Akram Point	Age-1 adult	-	-	F&G	-	F&G	-	-	-	-	-	-	-	-	-	-	-
	Chandpai	Juvenile	F&G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Harbaria	Fry, Juvenile	-	N,F&G	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chalna Point	Age-1 adult	-	F&G	-	-	F&G	-	-	-	-	-	-	-	-	-	-	-
		Fry	-	-	-	-	-	-	-	-	N	-	-	-	-	-	-	-
Poma	Haldikhali	Juvenile	F&G	-	-	F	-	-	-		-	-	-	-	-	-	-	-
	Akram Point	Juvenile	F&G	-	-	-	-	-	-	G&F	-	-	-	-	-	-	-	-
		Age-1 adult	-	-	F&G	-	-	-	F	F	-	-	-	-	-	-	-	-
		Adult	-	-	-	-	-	-			-	-	-	-	-	-	-	-
	Chandpai	Fry and Juvenile	B&S	N	-	-	-	F	-	-	-	-	-	-	-	-	N	-
		Juvenile	-	-	F&G	F	F&G	-	F&G	-		F&G			F&G	-	F&G	-
		Adult	-	-	-	-	-	-	F	-					-	F	F	-
		Brood Fish	-	-	-	-	-	-	-	-		S	-		-	-	-	-
	Haldikhali	Fry and Juvenile	-	-	N	-	-	-	-	-	-	-	-	-	F	-	-	-
	Charaputia	Brood Fish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	S	-

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	13th QM	14th QM	15th QM	16th QM
		Juvenile and Adult	-	-	-	-	-	-	-	-	-	-	-	-	-	-	F	-
	Harbaria	Adult and Brood Fish	-	-	B&S	-	-	-	-	-	-	-	F&S	-	-	-	-	-
		Adult	-	-	-	-	-	-	F	-		-	F		-	-	-	-
		Fry and Juvenile	-	-	-	-	-	S&N	-	-	F&G		-	-	-	-	-	-
	Mongla Point	Fry	-	-	S,F&G	-	-	-	-	N	-		-	N	N	-	-	-
		Juvenile	-	-	-	-	-	-	F&G	-		-	-		-	N	-	-
		Age-1 Adult	-	-	-	-	-	-	F	F	-		-	-	-	-	-	-
		Adult	-	-		F	-	F	-	-	-		F	-	-	-	-	-
		Brood Fish	-	-	-	-	-	-	-	-	-		S	-	-	-	-	-
	South-west of the Project	Adult	-	-	F	F	-	F	-	-	-		-	-	-	-	-	-
	Chalna Point	Adult and Brood Fish	B&S	-	-	-	-	-	-	-	-		F,G&S	-	-	-	-	-
		Juvenile and Adult	-	-	F&G	F	F&G	-	F&G	-	-		-	-	-	-	-	-
		Fry	-	-	-	-	-	-	-	-	N		-	N	-	-	-	-
Chhuri	Haldikhali	Adult	F	-	F	-	-	-	-	-	-		-	-	-	-	-	-
	Akram Point		F	-	F	-	-	-	-	-	-		-	-	-	-	-	-
Chela	Haldikhali	Adult	F	-	F	-	-	-	-	-	-		-	-	-	-	-	-
	Akram Point	Juvenile and Adult	F&G	-	-	-	-	-	-	-	-		-	-	-	-	-	-
	Harbaria	Fry and Juvenile	-	F&G	-	-	-	N	-	-	-		-	-	-	-	-	-
	Chandpai		-	-	-	-	-	-	-	G&F	N		-	-	-	-	F&G	-
	Chalna Point	Fry and Juvenile															-	N&F
Gang Tengra	Chandpai	Juvenile and Age-1 adult	-	F&G	-	-	F&G	-	-	-	-		-	-	-	-	-	-
		Brood Fish															B	-
	Chalna Point	Age-1 adult	-	-	-	-	F&G	-	-	-	-		-	-	-	-	-	-

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	13th QM	14th QM	15th QM	16th QM
	Mongla Point	Age-1 adult	-	F&G	-	-	-	-	-	-	-		-	-	-	-	-	-
	Akram Point	Juvenile and Adult	-	-	F&G	-	-	-	-	-	-		-	F	-	-	-	-
		Adult	-	-	-	-	-	-	F	-	-		-	-	-	-	-	-
	Haldikhali	Juvenile	-	-	-	-	-	-	F&G	-	-		-	-	-	-	-	-
	Harbaria	Adult	-	-	F	-	F&G	-	-	-	F		F		-	-	-	-
Gulsha Tengra	Haldikhali	Adult	F&B	-	-	-	-	-	-	-	-		-	-	-	-	-	-
	Akram Point	Juvenile		-	-	-	-	-	-	-	-		-	-	F	-	-	-
	Chandpai	Age-1 adult	-	-	-	F	-	F	F&G	-	-		-	F	-	-	F&G	-
		Juvenile	-	-	-	-	-	-	F&G	-		F&G	-		-	F&G	-	F&G
	Mongla Point	Age-1 adult	-	F&G	-	F&G	-	F&G	-	F&G		-	-		-	-	-	-
		Juvenile	-	-	-	-	-	-	F&G	-		F&G	-		-	-	-	-
	Harbaria	Juvenile	-	-	-	-	-	-	F&G	-			-		-	-	-	-
		Age-1 adult	-	-	-	-	-	-	-	-	F&G		-	-	F	-	-	-
	Maidara	Juvenile and Age-1 Adult	-	-	-	-	-	-	F&G	-			-	-	-	-	-	-
	Chalna Point	Juvenile	-	-	-	-	-	-	-	-	-		F&G	-	-	-	-	-
Potka	Haldikhali	Adult	F&S	-	-	-	-	-	-	-	-		-	-	-	-	-	-
	Chandpai	Fry	S	S&N	-	-	-	-	-	-	-		-	-	-	-	F	-
		Juvenile	-	-	-	-	-	-	-	F&G	-		-	F	F	-	-	-
		Adult	-	-	-	F	-	-	-	-	-		F	-	-	F&G	-	-
	Mongla Point	Fry	S	-	-	-	-	-	-	-	-		-	-	-	-	-	-
		Juvenile	-	-	-	-	-	-	-	-	F&G		-	-	-	-	-	-
	Harbaria	Fry	-	-	-	-	-	N	-	-	-		-	-	-	-	-	-
		Juvenile	-	-	-	-	-	-	-	F&G	-		-	-	-	-	-	-
	Maidar	Fry															-	N
Paira Chanda	Akram Point	Adult	F	-	-	-	-	-	-	-	-		-	-	-	-	-	-
	Chandpai	Fry	B&S	-	-	-	-	-	-	-	-		-	-	-	-	-	-
Chewa	Akram Point	Juvenile and Adult	F	-	F&G	-	-	-	-	-			-	-	-	-	-	-

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	13th QM	14th QM	15th QM	16th QM
	Chandpai	Fry and Juvenile	S	-	F&G	-	N&G	N	F&G	-	N		-	-	F&G	F&G	F&G	-
		Adult	-	-	-	F	-	F	-	F	-		-	-	-	-	-	-
	Haldikhali	Juvenile and Adult	-	-	F&G	-	-	-	-	-	-		-	-	-	-	-	-
	Harbaria	Juvenile and Adult	-	-	F&G	-	-	F&N	-	F	-		-	-	-	-	-	-
	Mongla Point	Juvenile	-	F&G	-	-	-	-	-	-	-		-	-	-	-	-	-
	Maidara	Fry															N	-
	South-west of the Project	Juvenile	-	F&G	-	-	-	-	-	-	-		-	-	-	-	-	-
	Chalna Point	Adult	-	-	-	-	F	-	-	-	-		-	-	-	-	-	-
		Age-1 Juvenile	-	-	-	-	-	-	-	-	F&G		-	-	-	-	-	-
Bele	Akram Point	Adult	F	-	F	F	-	-	-	-	-		-	-	-	-	-	-
		Juvenile	-	-	-	-	-	-	-	F&G	-		-	-	-	-	-	-
	Haldikhali	Juvenile and Adult	-	-	N&G	F	-	-	-	-	-		-	-	-	-	-	-
	Harbaria	Juvenile and Adult	-	-	F&G	-	F&G	N&F	F&G	-	-	-	-	-	-	-	-	-
	Chandpai	Fry	B&S	N	-	-	N	N	-	-	N	-	-	-	-	-	-	N
		Juvenile and Adult	-	-	F&G	F	-	F	-	F	-	-	F&G	-	-	-	F&G	-
	Harbaria	Juvenile and Age-1 Adult	-	-	-	-	-	-	F&G		-	-	-	-	-	-	-	-
	Mongla Point	Fry	B&S	-	-	-	-	N	-	-	-		-	-	-	N	N	-
		Juvenile			N&G	-	-	-	-	-	-		-	-	-	-	-	-
		Juvenile and Adult	-	-	-	F	F&G	F	F&G	-	-		-	-	-	-	-	-
	Chalna Point	Fry	B&S	N	-	-	N	-	-	N	-		-	-	-	-	N	N
		Adult	-	-	-	F	-	-	-	-	-		-	-	-	-	-	-

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	13th QM	14th QM	15th QM	16th QM
	Maidara	Juvenile and Age-1 adult	-	F&G	F&G	F	F&G	-	-	-	F&G		-	-	-	-	F	-
		Fry	-	-	-	-	-	-	-	N	-		-	N	N	-	-	-
Tular Dandi (Nona bele)	Akram Point	Adult	F	-	-	-	-	-	-	-	-		-	-	-	-	-	-
	Maidara	Adult														F	-	-
	Chandpai	Age-1 Adult															F	-
	South-west of the Project	Adult	-	-	F	-	-	-	-	-	-		F	-	-	-	-	-
	Chalna Point	Adult	F	-	F	-	F	-	F	-	-		-	-	-	-	-	-
Tairel	Akram Point	Adult	F	-	-	-	-	-	-	F	-		-	-	-	-	-	F
	Harbaria	Age-1 Adult	-	-	-	-	-	-	-	-	F&G		-	-	-	F&G	F&G	-
	Mongla Point	Juvenile	F	-	-	-	-	-	-	-	-		-	-	-	-	-	-
Pheksa	Akram Point	Adult	F	-	-	-	-	-	-	F	-		-	-	-	-	-	-
		Juvenile	-	-	F&G	-	-	-	-	-	-		-	-	-	-	-	-
	Haldikhali	Juvenile	-	-	F&G	-	-	-	-	-	-		-	-	-	-	-	-
	Haldikhali	Adult	-	-	-	F	-	-	-	-	-		-	-	-	-	-	-
	Harbaria	Juvenile	-	-	-	-	-	-	-	-	F&G		-	-	-	-	-	-
	Chalna Point	Juvenile and Adult	F	F&G	-	-	-	-	F&G	-			-	-	-	-	-	F&G
		Adult	-	-	F	F	F	-	F	-	-		-	-	-	F	F	-
	Mongla Point	Adult	-	-	F	F	-	-	F&G	-	-		F	-	-	-	-	-
		Juvenile															-	G
	Chandpai	Juvenile and Adult	F	F&G	-	-	F&G	-		-	-		-	-	-	-	-	F&G
	Maidara	Juvenile and Adult	F	F&G	-	-	-	-	-	-	-		-	-	-	-	-	-
		Juvenile	-	-	-	-	-	-	F&G	-	-		-	-	-	-	-	-
		Adult	-	-	F	F	-	F	-	-	-		-	-	-	-	-	-
Paissa	Akram Point	Juvenile and Adult	F	-	F&G	F	-	-	-	F&G	-		-	F	F	-	-	-
		Brood	-	-	-	-	-	-	-	-	-		-	S	S	-	-	-

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	13th QM	14th QM	15th QM	16th QM
		Juvenile	-	-	-	-	-	-	F&G		-	-	-		-	-	-	-
	Haldikhali	Juvenile and Adult	F	-	F&G	F	-	-	-	-	-		-	-	-	-	-	-
		Juvenile	-	-	-	-	-	-	F&G	-	-		-	-	-	-	-	-
	Harbaria	Juvenile	-	-	F	-	F&G	-	F&G	-	-		-	-	-	F&G	F&G	-
		Adult	-	-	-	-	-	-	-	F	-		-	-	-	-	-	-
	Chandpai	Fry	B&S	-	-	-	N	-	-	-	N		-	-	-	-	-	N
		Juvenile and Adult	-	-	F&G	-	-	N&F	-	-	-		F&G	F	F	-	-	F&G
	Harbaria	Juvenile	-	-	-	-	-	-	F&G	-	-			-	-	-	-	-
	Mongla Point	Fry	B&S	-	-	-	-	N	-	-	N		-	-	-	-	N	-
		Age-1 Juvenile	-	-	-	-	-	-	F&G	-	F&G		-	-	-	-	-	-
		Age-1 Adult	-	-	-	-	F&G	F	-	-			-	-	-	-	-	-
	Maidara	Fry	B&S	F&G	-	-	F&G	-	-	-			-	-	-	-	-	-
		Juvenile	-	-	-	-	-	-	F&G	-	-		F&G	-	-	-	-	-
		Adult	-	-	-	-	-	F	-	-	-		-	-	-	-	-	-
Banshpata	Chandpai	Juvenile	F	-	-	-	-	-	-	-	-		-	-	-	-	-	G
		Adult	-	-	-	F	-	F	-	-	-		-	-	-	F	F	-
	Akram Point	Juvenile	-	-	-	-	-	-	F&G	-	-		-	-	-	-	-	-
		Adult	-	-	-	-	-	-	-	F	-		-	-	-	-	-	-
	Haldikhali	Juvenile and adult	-	-	F&G	F	-	-	F&G	-	-		-	-	-	-	-	-
	Charaputia	Juvenile and Age-1 Adult	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	F
	Harbaria	Adult	-	-	-	-	-	-	-	F	F		F	-	-	-	-	-
	Mongla Point	Fry and Adult	F	N	-	-	-	-	-	-	-		-	-	-	-	-	-
		Adult	-	-	-	F	-	-	-	-	F		-	-	-	-	-	-
	Maidara	Adult	-	-	F	F	-	B&S	-	-	-		-	-	-	F	-	-
	Chalna Point	Adult	-	-	F	F	-	-	-	-	-		-	-	-	-	-	-
Hilsa	Akram Point	Brood Fish	-	-	-	-	-	-	-	-	-		B&S	-	-	-	-	-
	Haldikhali	Brood Fish	-	-	-	-	-	-	-	-	-			-	-	-	-	-
		Juvenile	-	-	F&G	-	-	-	-	-	-		-	-	-	-	-	-

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	13th QM	14th QM	15th QM	16th QM
	Harbaria	Brood Fish	-	-	-	-	-	-	-	-	-		B&S	-	-	-	-	-
	Chandpai	Adult and Brood Fish	-	-	-	-	-	-	F&B	-	-		-	-	-	-	-	-
	Mongla Point	Adult	-	-	F	-	-	-	-	-	-		-	-	-	-	-	-
		Brood Fish	-	-	-	-	-	-	-	-	-		B&S	-	-	-	-	-
	Maidara	Age-1 Adult	-	-	-	-	-	-	-	-	-		F	-	-	-	-	-
	Chalna Point	Brood fish	-	-	-	-	-	B&S	-	-	-		-	-	-	-	-	-
Pangas	Haldikhali	Juvenile	-	-	F&G	-	-	-	-	-	-		-	-	-	-	-	-
	Harbaria	Adult	-	-	-	-	-	-	-	F	-		-	-	-	-	-	-
	Mongla Point	Juvenile and Adult	-	-	F	-	-	-	-	-	-		-	-	-	-	-	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																						
			17th QM	18th QM	19th QM	20th QM	21th QM	22th QM	23th QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31st QM	32nd QM	33rd QM	34th QM	35th QM	36th QM	37th QM	38th QM	39th QM	40th QM
Tapsi	Haldikhali	Juvenile and Age-1 adult	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	F	-	-	-	M&F
	Charaputia	Adult	-	-	-	-	-	-	-	-	-	-	-	-	-	F	-	-	-	-	-	-	-	-	-
	Chalna Point	Adult and Brood fish	-	-	-	-	-		-	-	-	-	-	-	-	-	M&F	-	-	-	-	M&F	-	-	-
		Adult	F	-	-	F	F		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Harbaria	Juvenile and Age-1 adult	-	-	-	-	-		-	-	-	-	-	F	F	-	-	-	-	-	F	-	-	-	-
	Chandpai	Juvenile	F&G	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mongla Point	Juvenile	-	-	F&G	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Adult		-	-	-	-		F	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	M&F
		Age-1 adult	F&G	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Fry	-	-	-	-	-		-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Maidara	Age-1 adult	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Juvenile	-	M	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																						
			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	33rd QM	34th QM	35th QM	36th QM	37th QM	38th QM	39th QM	40th QM
		Adult	F	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bairagi	Haldikhali	Juvenile and Age-1 adult	-	-	-	-	-		-	-	-	-	-	-	-	M	-	-	-	-	F	-	-	-	M&F
	Akram Point	Juvenile and Age-1 adult	-	-	-	-	-		-	-	-	-	-	F	F	-	-	-	-	F&G	F	-	-	-	-
	Chandpai	Fry	-	-		N	-		-	-	-	-	-	-	-	-	-	-	-	N	-	-	-	-	-
		Juvenile	-	M	F&G	-	N		-	-	-	-	-	-	-	F&G	-	-	-	-	-	-	M&F	-	-
	Chalna Point	Juvenile and Age-1 adult	-	-	-	F	-		-	-	-	-	-	-	-	-	M&F	-	-	-	-	-	F	-	-
		Fry	-	N	-	N	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Harbaria	Juvenile	F&G	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	F	-	-	-	-
	Mongla Point	Fry	-	-	-	-	-		N	N	-	-	-	-	-	-	F&G	-	-	-	-	F&G	-	-	-
		Juvenile	F&G	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	F&G
	Maidara	Juvenile	-	M	-	-	-	F&G	-	-	-	-	F&G	-	-	-	M	-	-	-	-	-	-	-	-
		Fry	-	N	-	N	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Charaputia	Adult	-	-	-	F	-		-	-	-	-	-	-	-	-	-	-	-	-	F	-	-	-	-
	Jongra	Fry	-	-	-	N	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chapila	Haldikhali	Juvenile	-	-	-	-	-		-	-	-	-	-	-	-	G	-	-	-	-	-	-	-	-	-
	Akram Point	Juvenile	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	M&F	-	-	-	-
	Harbaria	Juvenile	F&G	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mongla Point	Fry	N	-	-	-	-		-	-	-	-	-	-	-	N	-	-	-	-	-	N	-	-	-
		Juvenile	F&G	-	-	-	-		-	F&G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	F&G
		Adult	F	-	M	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chalna Point	Adult	F	-	M	-	M	F	-	-	-	-	-	-	-	-	F&G	F&G	-	-	-	-	-	-	M&F
		Fry	-	N	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Maidara	Juvenile to Age-1 adult	-	G&M	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jongra	Fry	-	-	-	N	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																						
			17th QM	18th QM	19th QM	20th QM	21th QM	22th QM	23th QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31st QM	32nd QM	33rd QM	34th QM	35th QM	36th QM	37th QM	38th QM	39th QM	40th QM
	Mongla Point	Fry	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Poma	Haldikhali	Age-1 adult	-	-	-	-	-		-	-	-	-	-	-	-	M	-	-	-	-	-	-	-		-
	Akram Point	Juvenile	-	-	-	-	-		-	-	-	-	-	-	-	G	-	-	-	F&G	-	-	-	F	-
		Age-1 adult	-	-	-	-	-		-	-	-	-	-	M	-	-	-	-	-	-	M&F	M&F	-	M&F	-
	Charaputia	Brood Fish	-	-		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Juvenile and Adult	-	-	G&M	F	-		G&M	-	-	G&M	M	-	M	G&M	-	-	-	-	M&F	M&F	-	-	-
	Chandpai	Fry	N	-	-	-	-		-	-	-	-	-	-	N	-	G	-	-	-	-	-	N	-	-
		Juvenile	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	G	-	-	-	-
		Adult	-	-	-	-	-		-	-	-	-	F	-	-	-	-	-	-	-	-	-	F	-	-
		Brood Fish	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jongra	Fry	-	-	-	N	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Haldikhali	Fry and Juvenile	-	-	-	-	-		-	-	-	-	-	-	-	G	-	-	-	-	-	-	-	-	-
	Harbaria	Adult and Brood Fish	-	-	-	-	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Adult	-	F	-	-	-		-	-	-	-	-	M	-	M	-	-	-	-	-	-	F	-	-
		Fry and Juvenile	-	-	-	-	-		N	-	-	-	-	-	-	-	-	-	-	F&G	-	-	-	-	-
	Mongla Point	Fry	N	-	F&G	-	N		N&M	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N
		Juvenile	-	-	-	-	N		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Age-1 Adult	-	-	-	-	-		-	-	-	-	-	M	-	-	-	-	-	-	-	-	-	-	-
	Maidara	Adult	-	-	M&F	-	-		F	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Juvenile	-	-	-	-	-	-	-	M&F	-	-	-	-	-	-	-	-	-	-	-	M&F	-	-	-
		Fry	-	N	-	-	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chalna Point	Juvenile and Adult	-	M&F	M&F	-	M&F		-	M&F	-	-	-	-	-	-	M&F	M&F	-	-	-	M&F	-	-	-
		Fry	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																						
			17th QM	18th QM	19th QM	20th QM	21th QM	22th QM	23th QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31st QM	32nd QM	33rd QM	34th QM	35th QM	36th QM	37th QM	38th QM	39th QM	40th QM
Chhuri	Akram Point	Adult	-	-	-	-	-	-	-	-	-	-	-	F	-	-	-	-	-	-	-	-	-	-	-
	Haldikhali	Adult	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	F	-	-	-	-
Chela	Akram Point	Juvenile and Adult	-	-	-	-	-	-	-	-	-	M&F	-	-	-	F	-	-	-	-	-	-	-	-	-
	Charaputia	Juvenile and Adult	-	-	-	-	-	-	-	-	-	-	-	-	-	G	-	-	-	-	-	-	-	-	M&F
	Harbaria	Fry and Juvenile	-	-	-	-	-	-	-	-	N&M	-	-	-	-	-	-	-	-	-	M&F	N&F	-	-	F&G
	Chalna Point	Fry and Juvenile	-	-	-	-	-	N&M	-	N&M	-	-	-	-	-	-	-	M&F	-	-	-	-	-	-	F&G
	Chandpai	Fry and Juvenile	-	-	-	N	N		-	-	N&M	-	F&G	-	F&G	-	-	-	-	-	-	M&F	-	-	-
	Mongla Point	Fry and Juvenile	-	-	-	-	-	N&M	-	-	-	-	-	-	-	-	F&G	-	-	-	-	-	-	-	-
Gang Tengra	Chandpai	Adult	F	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	M	-	-	-	-	-
	Maidara	Fingerling	N	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mongla Point	Fingerling	N	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Age-1 Adult	F&G	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ghagra Tengra	Chandpai	Juvenile and Age-1 adult	-	M		-	-		-	-	M	-	M	-	-	-	-	-	-	-	-	M&F	-	-	M&F
		Brood Fish	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Fry	N	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mongla Point	Age-1 adult	-	-	M&F	-	M&F		-		-	-	-	-	-	-	-	-	-	-	M&F	-	-	-	-
		Juvenile	-	-	-	-	-	-	-	F&G	-	-	-	N	-	-	-	-	-	-	-	-	-	-	-
	Akram Point	Juvenile and Adult	-	-	-	F&G	-		-	-	M	-	-	-	-	-	-	-	M&F		M&F	-	M&F	-	-
		Adult	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	F&G	-	-	-	-	-
	Haldikhali	Juvenile	-	-	-	-	-		-	-	-	-	-	-	F&G	-	-	-	-	M	-	-	-	-	-
		Adult	-	-	-	-	-	-	-	-	-	-	-	-	-	M	-	-	-	-	M&F	-	-	-	M&F

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																						
			17th QM	18th QM	19th QM	20th QM	21th QM	22th QM	23th QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31st QM	32nd QM	33rd QM	34th QM	35th QM	36th QM	37th QM	38th QM	39th QM	40th QM
	Harbaria	Adult	-	-	F	-		-	-	-	M	-	M	F	M	-	-	-	-	-	M&F	-	F	M&F	-
		Juvenile	M	-	M	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Charaputia	Juvenile and Age-1 adult		M	-	-		M	-	-	M	-	M	-	M	-	-	-	M&F	-	M&F	-	-	M&F	M&F
Gulsha Tengra	Haldikhali	Adult	-	-	-	-	-		-	-	-	-	-	-	-	M	-	-	-	-	-	-	-	-	-
	Akram Point	Adult	-	-	-	-	-		-	-	-	-	-	-	-	M	-	-	-	-	-	-	-	M&F	-
	Chandpai	Age-1 adult	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Juvenile	-	-	-	-	-		-	-	-	-	-	-	F&G	-	F&G	F&G	-	-	-	-	-	-	-
	Charaputia	Juvenile	-	-	F&G	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Age-1 adult	-	-	-	-	-	-	-	-	-	M	-	-	M	-	-	-	-	-	M&F	-	-	-	-
	Mongla Point	Age-1 adult	F&G	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Juvenile	F&G	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Harbaria	Juvenile	F&G	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Age-1 adult	F&G	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	M&F	-	-	-	-
	Chalna Point	Juvenile	-	-	-	-	-	-	-	F&G		-	-	-	-	-	-	M	-	-	-	-	-	-	M&F
Potka	Akram point	Adult		-	-	-	-	-	--		-	-	-	-	-	F	-	-	-	-	-	-	-	-	-
	Haldikhali	Adult	-	-	-	-	-	-	-	-	-	-	-	-	-	F	-	-	-	-	M&F	-	-	-	-
	Chalna Point	Fry	-	N	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	-	-
	Chandpai	Fry	-	-	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	-	-
		Juvenile	-	-	F&G	-	-		-	-	-	-	F and G	-	-	-	-	-	-	-	-	-	-	-	-
		Adult	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jongra	Fry	-	-	-	N	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mongla Point	Fry	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Juvenile	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																						
			17th QM	18th QM	19th QM	20th QM	21th QM	22th QM	23th QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31st QM	32nd QM	33rd QM	34th QM	35th QM	36th QM	37th QM	38th QM	39th QM	40th QM
	Maidara	Fry	-	N	-	N	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Juvenile	-	M	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Harbaria	Fry	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Charaputia	Juvenile and adult	-	-	F&G	-	-	-	-	-	-	F&G	-	-	F&G	-	-	-	-	-	M&F	M&F	-	-	-
Paira Chanda	Akram Point	Adult	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	M&F	-	-	-	-	-	-
		Juvenile and Adult	-	-	-	-	-	-	-	-	-	-	-	-	F&G	-	-	-	-	-	-	-	-	-	-
	Charaputia	Adult	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	M&F	-	-	-	-
Chewa	Chandpai	Fry and Juvenile	-	-	-	N	-		-	-	-	-	F&G	-	F&G	-	-	-	-	-	-	-	-	-	-
		Juvenile	-	-	-	-	F&G		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Adult	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jongra	Fry	-	-	-	N	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Fry and Juvenile	-	-	-	-	-	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mongla Point	Juvenile	-	-	-	-	N	M	M	-	-	-	-	F	-	-	-	-	-	-	-	-	-	-	-
		Fry	N	-	-	-	-		-	-	-	-	-	-	-	-	-	F&G	-	-	-	-	-	-	-
	Maidara	Juvenile	-	-	-	-	-	M	-	-	-	-	M	-	-	-	-	-	-	-	-	-	-	-	-
		Fry	-	-	-	-		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chalna Point	Adult	F	-	-	-	-	F	-	F	-	-	-	-	-	-	-	-	-	N	-	-	-	-	-
		Age-1 Juvenile	-	-	-	-	-		M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bele	Akram Point	Adult	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	M&F
		Juvenile and Adult	-	-	-				-	-	-	F	-	-	F&G	F&G	-	-	M&F	-	-	M&F	M&F	-	-
	Chandpai	Fry	N	-	-	N	-	N	-	-	-	-	M	-	-	-	-	-	-	N		-	N	N	N
		Juvenile and Adult	-	-	-	F&G		-	-	-	M&F	-	-	-	-	-	-	-	-	-	M&F	M&F	M&F	-	-
	Jongra	Fry	-	-	N	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																						
			17th QM	**18th QM**	**19th QM**	**20th QM**	**21th QM**	**22th QM**	**23th QM**	**25th QM**	**26th QM**	**27th QM**	**28th QM**	**29th QM**	**30th QM**	**31st QM**	**32nd QM**	**33rd QM**	**34th QM**	**35th QM**	**36th QM**	**37th QM**	**38th QM**	**39th QM**	**40th QM**
	Harbaria	Juvenile and Age-1 Adult	-	-	-	-	-	-	-	-	-	-	-	-	F&M	M	-	-	F	-	-	M&F	M&F	-	-
	Mongla Point	Fry	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Juvenile and Adult	-	-	-	-	M&F	-	-	-	-	-	-	-	-	-	M&F	M&F	-	-	M&F	-	M&F	M&F	-
	Chalna Point	Fry	-	-	-	-			-		-	-	-	-	-	-	-	-	-	N	-	-	N	-	-
		Fingerling	N	-	-	-	-		N	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Juvenile and Age-1 adult	-	-	-	-	-	-	-	M&F	-	-	-	-	F&M	-	-	-	-	-	-	M&F	-	M&F	M&F
	Maidara	Juvenile and Age-1 adult	F&G	F&G	-	-	M& F	M& F	M&F	-	-	-	F&G	-	-	-	-	-	-	-	-	M&F	-	M&F	M&F
		Fry	-	-	-	-		-	-		-	-	-	-	-	N	-	-	-	-	-	-	-	-	-
	Charaputia	Juvenile and Age-1 adult	-	M	-	-		-	-		-	-	-	M	-	M	-	-	-	-	M&F	-	-	-	-
Tular Dandi	Akram Point	Adult	-	-	-	F&M	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chandpai	Age-1 Adult	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Juvenile	-	G	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Fry	-	-	-	N	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jongra	Fry	-	-	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Maidara	Adult	-	-	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chalna Point	Adult	-	-	M	M	M&F	-	-	-	M&F	-	M&F	-	-	-	-	-	-	-	-	-	-	-	-
Tairel	Akram Point	Adult	-	-	-	-	-	-	-	-	-	M	-	-	M	-	-	-	-	-	M&F	-	-	-	M&F
	Haldikhali	Juvenile	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	G&M	-	-	-	-	-	-
	Charaputia	Juvenile	-	-	-	M	-		-	-	-	-	-	-	M	-	-	-	-	-	M	-	-	-	-
	Harbaria	Age-1 Adult	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	M&F	-	-	-	-
	Chandpai	Juvenile	-	G	-	-	F&G		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																						
			17th QM	18th QM	19th QM	20th QM	21th QM	22th QM	23th QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31st QM	32nd QM	33rd QM	34th QM	35th QM	36th QM	37th QM	38th QM	39th QM	40th QM
	Chalna Point	Juvenile	-	-	-	-	G		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Maidara	Juvenile	-	G	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pheksa	Akram Point	Adult	-	-	-	-	-		-	-	-	-	-	M	M	-	-	-	-	-	-	-	-	-	-
	Charaputia	Juvenile and Adult	-	-	-	F&M	-	-	-	-	-	-	-	-	-	M	-	-	-	-	M&F	-	-	-	-
	Harbaria	Adult	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	M&F	-	-	-	-
	Chalna Point	Juvenile and Adult	-	-	-	M	M			-	M	-	M	-	-	-	-	-	-	-	-	-	M&F	-	-
		Adult	-	-	M	-	-	F		-	-	-	-	-	M	-	-	-	-	-	-	-	-	-	-
	Mongla Point	Adult	-	-	M	-	-		M	-	-	-	-	-	-	M	-	-	-	G&M	-	-	-	-	-
		Juvenile	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	M&F	M&F
	Chandpai	Juvenile and Adult	-	-	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	M	-	
	Maidara	Adult	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paissa	Akram Point	Juvenile and Adult	-	G&M	-	-	-	-	-	-	-	G&M	-	-	G&M	G&M	-	-	G&M	-	-	M&F	M&F	M&F	M&F
		Brood	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Charaputia	Brood Fish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Juvenile and Adult	-	-	-	-	-	-	-	-	-	F	-	-	G&M	G&M	-	-	G&M	-	-	M&F	M&F	M&F	M&F
		Fry	-	-	-	-	-	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Harbaria	Juvenile and Adult	-	-	-	-	-		-	-	F&G	-	-	F	G&M M	G&M	-	-	G&M	-	-	M&F	-	M&F	-
		Adult	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chalna	Fry	-	-	F&G	-	F&G		N	N	-	F	-	-	-	-	-	G&M	-	-	-	M&F	F&G	-	-
	Chandpai	Fry	-	-	F&G	N	N	N	N	-	F&G	F	F&G	-	-	N	G&M	-	-	-	-	-	-	N	N
		Juvenile and Adult	-	M	-	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	F	-	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																						
			17th QM	18th QM	19th QM	20th QM	21th QM	22th QM	23th QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31st QM	32nd QM	33rd QM	34th QM	35th QM	36th QM	37th QM	38th QM	39th QM	40th QM
	Jongra	Fry	-	-	-	N			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Harbaria	Juvenile	-	M	-	-			-	-	F&G	-	-	-	F&G	F&G	-	-	G&M	-	-	M&F	-	M&F	-
	Mongla Point	Fry	-	-	-	-			-	-	-	-	-	-	-	-	-	-	-	N	-	-		-	-
		Age-1 Adult	-	-	-	-		M	-	-	-	-	-	-	-	-	-	G&M	-	-	-	-	F&G	-	-
	Maidara	Fry, Juvenile and Age-1 adult	-	-	F&G	-	F&G		-	-	F&G	-	-	-	-	-	M	G&M	-	-	-	G&M	-	-	-
		Juvenile	-	G	-	-	-		M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Banshpata	Chandpai	Juvenile	F&G	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	G&M	G&M	-	-	-	-
		Adult	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jongra	Juvenile	-	-	-	M	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Charaputia	Juvenile and Age-1 Adult	-	-	G&M	-	-		-	-	-	G&M	-	-	G&M	M	-	-	-	-	M&F	M&F	-	-	-
	Akram Point	Juvenile	-	-	-	-	-		-	-	-	-	-	-	-	G&M	-	-	-	-	M&F	-	-	-	-
	Haldikhali	Juvenile and adult	-	-	-	-	-		-	-	-	-	-	-	-	M	-	-	-	-	M&F	-	-	-	-
	Harbaria	Adult	-	-	-	-	-		-	-	-	-	-	-	F& G	-	-	-	-	-	M&F	-	-	-	-
	Mongla Point	Juvenile	F&G	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Maidara	Juvenile and Age-1 Adult	-	G&M	G&M	-	-		-	-	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Adult	-	F	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chalna Point	Juvenile and Age-1 Adult	-	-	G&M	F	G&M		-	G&M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hilsa	Akram Point	Brood Fish	-	-	-	-	-		-	-	-	-	-	M	-	-	-	-	-	-	-	-	-	-	-
	Maidara	Age-1 Adult	-	-	-	-	-	M	-	-	-	-	-	M	M	-	-	-	-	-	-	-	-	-	-
	Chalna Point	Adult	-	M	-	-	-	F	-	-	-	-	-	-	M	-	M	-	-	-	-	-	-	-	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																						
			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	33rd QM	34th QM	35th QM	36th QM	37th QM	38th QM	39th QM	40th QM
	Mongla	Age-1 Adult	-	-	-	-	-	-	-	-	-	-	-	-	M	M	M	-	-	-	-	-	-	-	-
Pangas	Akram Point	Adult	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	F	-	-	-	-	-	-
	Haldikhali	Juvenile	-	-	-	-	-	-	-	-	-	-	-	-	-	G	-	-	-	-	-	-	-	-	-
	Charaputia	Adult	-	-	-	F	-	-	-	-	-	-	-	-	M	-	-	-	-	-	-	-	-	-	-
	Mongla Point	Juvenile	-	-	F&G	-	F&G	-	-	-	-	-	-	N	-	-	-	-	-	-	-	-	-	-	-
	Maidara	Juvenile and Age-1 Adult	-	-	-	-	-	F&G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Source: Field findings at different times

**Only Age-1 to Brood fish was allowed to interpret the migration purpose; F = Feeding; B=Breeding, S= Spawning, N=Nursing, G=Growing, M=Maturation*

Table D.13: The Present Catch in Three (03) Sampling Ghers

Sampling Site	Species	Total Catch (Ton)																		
		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
1	Bagda	5.0	6.42	4.8	-	-	1.6	2.0		-	-	3.0	-	-	3.0	-	2.0	0.76	-	-
	Golda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-
	Harina	0.78	-	-	-	1	1	0.32	0.8	-	-	0.8	-	1.0	-	-	0.1	1.6	-	-
	Bele	0.98	-	-	-	-	0.25	-	-	-	-	-	-	-	-	-	-	0.2	-	-
	Chali	0.11	-	-	-	-	0.5	-	-	-	-	-	-	-	-	-	-	1.2	-	-
	Chaka	0.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Paissa	-	-	-	-		0.25	0.24	0.6	-	-	0.1	-	-	-	-	-	-	-	-
	Vetki	1.57	-	-	-	-	-	0.02	0.8	-	-	2.0	-	-	-	-	-	-	-	-
	Gulsha	-	-	-	-	-	-	0.08	-	-	-	0.1	-	-	-	-	-	-	-	-
	Kailla	-	-	-	-	-	-	0.04	-	-	-	-	-	-	-	-	-	-	-	-
	Tilapia	-	-	-	-	-	-	-	1.6	-	-	-	-	-	-	-	0.45	12.8	-	-
	Rui	-	-	-	-	-	-		3	-	-		-	-	1.3	-	0.12	0.12	4.2	-

Sampling Site	Species	Total Catch (Ton)																		
		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
	Catla	-	-	-	-	-	-	-	2	-	-	-	-	-	1.0	-	0.3	-	1.2	-
	Minar Carp	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	0.3	-
	Grass Carp	-	-	-	-	-	-	-	0.1	-	-		-	-	-	-	0.2	-	0.3	-
Sub-total =		**8.52**	**6.42**	**4.8**	**-**	**1.0**	**3.6**	**3.1**	**9.0**	**-**	**-**	**6.0**	**-**	**1.0**	**5.3**	**-**	**3.27**	**16.56**	**6.0**	**-**
2	Bagda	4	1	7	-	-	1.67	-	-	1.0	-	0.2	0.29	-	5	-	3.93	1.48	5.0	-
	Golda	-	0.01	0.9	-	-	-	-	-	-	-	-	-	-	-	-	0.13		0.08	-
	Harina	2	0.33	-	-	-	0.5	-	-	0.14	-	0.08	-	-	-	-	1.91	0.5	1.8	-
	Chali	0.18	0.08	-	-	-	0.3	-	-	-	-	0.04	-	-	-	-	1.16	0.04	0.4	-
	Motka																	0.05		-
	Bele	-	0.08	-	-	-	0.3	-	-	-	-	0.16	0.15	-	-	-	0.43	0.06		-
	Tengra	-	-	0.2	-	-	-	-	-	-	-	0.08	0.31	-	-	-	4.20	0.13	0.8	-
	Paissa	-	0.04	10	-	-	0.25	-	-	-	-	0.2	0.22	-	7	-	0.14	0.05	0.08	-
	Vetki	-	-	1	-	-	-	-	-	-	-	0.24	0.06	-	0.5	-	0.96	0.01	2.0	-
	Phessa	-	-	2.4	-	-	-	-	-	-	-	-	-	-	1.0	-				-
	Bhangan	-	-	1.7	-	-	-	-	-	-	-	-	-	-	0.7	-		0.01	0.05	-
	Tilapia	-	-		-	-	-	-	-	-	-	8.0	0.53	-	-	-	5.9	0.41	8.0	-
	Chela	-	-	-	-	-	-	-	-	-	-	-	0.45	-	-	-		0.01		-
	Rui																8.41		3.0	-
	Catla																		3.0	-
	Grass Carp																0.11			-
	Common Carp																5.55			-
	Sarpunti																0.53			-
	Tairel																0.003			-
	Pheksa																0.001			-
Sub-total =		**6.0**	**2.0**	**23**	**-**	**-**	**3.02**	**-**	**-**	**1.14**	**-**	**9.0**	**2.01**	**-**	**14.2**	**-**	**33.36**	**2.75**	**24.93**	**-**
3	Bagda	1.38	2.4	1.5	-	-	3.5	0.4	-	2	-	0.4	-	-	0.2	-	0.5	0.1	-	-
	Harina	0.34	0.34	-	-	-	-	0.35	-	-	-	0.3	-	-	-	-	0.6		-	-

Sampling Site	Species	Total Catch (Ton)																		
		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
	Chali	0.17	0.17	-	-	-	-	0.6	-	-	-	-	-	-	-	-	-		-	-
	Chaka							0.1	-	-	-	-	-	-	-	-	-		-	-
	Paissa	-	-	0.01	-	-	-	3.2	-	-	-	0.06	-	-	0.8	-	-		-	-
	Tengra	-	-	0.01	-	-	-	-	-	-	-	0.04	-	-	0.2	-	0.12		-	-
	Bele	-	-	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	Tilapia	-	-	0.22	-	-	-	0.06	-	-	-	3.2	-	-	0.5	-	1.5	0.2	-	-
	Rui	-	-	0.21	-	-	-	-	-	-	-	-	-	-	0.3	-	-		-	-
	Catla							-							1.0	-	-		-	-
	Vetki	-	-	-	-	-	-	0.4	-	-	-	-	-	-	0.2	-	-		-	-
	Chami	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	Tairel	-	-	-	-	-	-	0.06	-	-	-	-	-	-	-	-	-		-	-
Sub-total =		**1.89**	**2.91**	**1.97**	**-**	**-**	**3.5**	**5.17**	**-**	**2.0**	**-**	**4.0**	**-**	**-**	**3.2**	**-**	**2.72**	**0.3**	**-**	**-**
Grand-total =		**16.41**	**11.33**	**29.77**	**-**	**1.0**	**10.12**	**8.27**	**9.0**	**3.14**	**-**	**19.0**	**2.01**	**1.0**	**22.7**	**-**	**39.35**	**19.61**	**30.93**	

Source: CEGIS Field Survey, 2014-15, 2015-16, 2016-17, 2017-18, 2018-19

Table D.14: The Present Catch in Three (03) Sampling Ghers

Sampling Site	Species	Total Catch (Ton)																			
		20th QM	21tst QM	22nd QM	23rd QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31st QM	32nd QM	33rd QM	34th QM	35th QM	36th QM	37th QM	38th QM	39th QM	40th QM
1	Bagda	3.2	2.72	0.8	-	-	0.3	-	0.7	0.5	-	-	1.2	1.2	0.7	0.7	1.35	2.0	0.01	-	0.20
	Golda	-	-	-	-	-	0.02	-	-	-	-	-	-	-	-	-	-	-	0.01	-	-
	Harina	4.8	3.44	1.0	0.02	2.0	0.2	-	0.15	0.6	0.1	-	0.5	0.2	0.2	0.2	0.59	1.6	0.05	-	-
	Bele	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-
	Chali	-	-	0.2	-	-	-	-	-	0.3	0.1	-	-	-	-	-	-	-	-	-	-
	Chaka	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-
	Paissa	-	0.17	-	-	-	0.05	-	-	0.05	-	-	-	-	0.05	0.05	-	0.2	0.08	-	-
	Vetki/Patari	-	-	0.3	-	-	0.2	-	-	-	0.3	-	-	-	0.05	0.05	-	-	0.04	-	-
	Gulsha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Sampling Site	Species	Total Catch (Ton)																			
		20th QM	21tst QM	22nd QM	23rd QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31st QM	32nd QM	33rd QM	34th QM	35th QM	36th QM	37th QM	38th QM	39th QM	40th QM
	Kailla	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-
	Tilapia		0.7	0.5	-	-	0.5	-		2.0	1.2	-	-	-	2.0	0.2	0.53	4.0	2.4	-	-
	Rui	-	-	-	-	-	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Catla	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Minar Carp	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Grass Carp	-	-	-	-	-	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Tairel	-	-	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Datina	-	-	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Kakra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-
Sub-total =		**8.0**	**7.0**	**2.8**	**0.02**	**4.2**	**2.37**	**-**	**0.85**	**3.45**	**1.7**	**-**	**1.7**	**1.4**	**3.0**	**3.0**	**2.47**	**8.1**	**2.59**	**-**	**0.2**
2	Bagda	1.41	6.74	3.42	-	4.48	1.45	-	0.04	2.73	0.07	-	3.2	1.5	0.07	-	2.4	1.6	-	-	-
	Golda	0.1	0.01	0.4	-	0.03	0.3	-	-	-	-	-	-	-	-	-	0.22	0.4	-	-	-
	Harina	2.92	-	3.96	0.01	0.92	1.08	-	0.14	0.96	0.81	-	0.28	0.16	0.8	-	0.4	0.6	0.08	-	-
	Chali	1.52	0.04	0.38	-	0.20	0.3	-	0.03	0.11	0.01	-	0.12	0.1	0.12	-	-	-	-	-	-
	Bele	1.35	0.09	2.11	-	0.27	0.19	-	-	0.44	0.58	-	0.15	0.15	0.52	-	-	0.15	-	-	-
	Tengra	0.27	0.57	-	-	0.01	0.17	-	-	0.01	0.02	-	-	0.1	0.02	-	-	-	-	-	-
	Paissa	0.6	0.01	2.62	-	0.04	1.8	-	-	0.23	0.34	-	0.1	0.2	0.32	-	0.25	0.4	0.16	-	-
	Vetki/Patari	-	-	2.25	-	0.25	0.25	-	-	-	1.75	-	0.04	0.6	1.6	-	-	0.2	0.08	-	-
	Bhangan	-	0.08	0.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Tilapia	0.3	0.22	9.85	-	3.87	6.93	-	-	12.9	7.82	-	4.5	-	7.0	-	0.35	-	0.88	-	-
	Rui	0.35	-	1.27	-	1.95	-	-	-	-	0.27	-	-	0.6	0.24	-	-	2.0	0.20	-	-
	Catla	0.20	-	-	-	0.04	0.05	-	-	-	-	-	-	-	-	-	-	0.2	0.08	-	-
	Kailla	-	-	0.96	-	-	-	-	-	-	0.03	-	-	0.1	-	-	-	-	-	-	-
	Grass Carp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Kakra	-	0.65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Datina	-	-	1.01	-	-	-	-	-	-	0.06	-	-	0.14	0.06	-	-	-	-	-	-
	Chemo	-	-	0.02	-	0.32	0.32	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chaka	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Sampling Site	Species	Total Catch (Ton)																			
		20th QM	21tst QM	22nd QM	23rd QM	25th QM	26th QM	27th QM	28th QM	29th QM	30th QM	31st QM	32nd QM	33rd QM	34th QM	35th QM	36th QM	37th QM	38th QM	39th QM	40th QM
	Nundi Bele	-	-	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Kakra	-	-	0.49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sub-total =	**9.0**	**8.4**	**28.58**	**0.01**	**12.38**	**12.57**	**-**	**0.21**	**17.38**	**11.76**	**-**	**8.39**	**5.15**	**10.75**		**3.62**	**5.35**	**1.48**	**-**	**-**
3	Bagda	0.04	0.02	0.02	-	0.1	0.02	-	0.01	0.04	0.04	-	0.04	0.05	0.06	-	0.02	0.14	0.01	-	0.08
	Golda	-	0.03	0.01	-	0.03	0.01	-	-	0.01	0.01	-	-	-	-	-	0.01	0.04	0.01	-	0.02
	Harina	0.1	0.02	0.01	-	0.15	0.02	-	0.06	0.06	0.04	-	0.07	0.4	0.40	-	0.12	0.18	0.01	-	0.02
	Chali	0.03	-	0.01	-	-	0.02	-	-	-	-	-	-	-	-	-	-	0.02	0.02	-	-
	Chaka	-	0.01	-	-	0.01	0.02	-	-	0.04	0.04	-	-	-	-	-	-		-	-	-
	Paissa	-	0.01	0.06	-	0.05	0.03	-	-	0.12	0.08	-	-	-	0.8	-	0.02	0.1	0.02	-	0.01
	Kharsul	-	-	0.01	-	0.01	-	-	-	-	-		-	-	0.05	-	-	0.04	-	-	
	Tengra	-	-	0.01	-	0.02	0.01	-	-	-	-	-	-	-	-	-	-	0.12	-	-	
	Bele	0.01	-	-	-	0.03	-	-	-	0.01	-	-	-	-	-	-	-	0.02	0.01	-	
	Tilapia	-	-	0.24	-	-	0.06	-	-	0.08	0.16	-	-	-	0.12	-	-	0.11	0.01	-	
	Vetki/Patari	-	0.01	0.02	-	-	0.02	-	-	0.02	0.04	-	-	0.4	0.04	-	-	0.04	0.01	-	
	Chaina Punti	-	-	0.05	-	-	-	-	-	-	-		-	-	-	-	-		-	-	
	Chami	-	-	-	-	-	-	-	-	0.04	0.04	-	-	-	-	-	-		-	-	
	Ilish	-	-	-	-	-	0.005	-	-	-	-		-	-	-	-	-		-	-	
	Motka	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.02	0.01	-	
	Chaka	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	
	Kakra	0.03	-	-	-	-	-	-	0.01	0.12	-	-	-	-	-	-	-		-	-	0.01
	Tairu	-	0.01	-	-	0.02	0.01	-	-	-	-	-	-	-	-	-	-	0.02	-	-	
	Bhangan	-	0.01	-	-	-	0.005	-	-	-	-	-	-	-	-	-	-	0.02	-	-	
	Datina	-	0.03	0.02	-	0.02	0.02	-	-	-	-	-	-	-	-	-	-		-	-	
	Sub-total =	**2.4**	**0.15**	**0.46**	**-**	**0.44**	**0.25**	**-**	**0.08**	**0.54**	**0.45**	**-**	**0.11**	**0.85**	**1.47**	**-**	**0.17**	**0.87**	**0.09**	**-**	**0.14**
	Grand-total =	**19.4**	**15.55**	**31.84**	**0.03**	**17.02**	**15.19**	**-**	**1.14**	**21.37**	**13.91**	**-**	**10.2**	**7.40**	**15.22**	**3.0**	**6.26**	**14.32**	**4.16**	**-**	**0.34**

(E) Traffic Survey Data

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

Date: May 09, 2024 (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	38	35	0	43	19	0	72	29	0
Auto Rickshaw	0.8	0	1	1	0	1	0	0	0	0
Van	0.6	101	95	117	74	141	129	17	117	80
Cycle	0.2	27	32	12	6	25	6	1	21	4
Human Howler	0.6	16	14	17	2	16	11	1	12	8
CNG	0.5	16	12	14	15	17	16	3	29	16
Private Car	1	28	33	61	36	60	96	2	84	86
Motor Cycle	0.3	119	122	72	134	176	93	6	199	61
Jeep	1	3	5	8	4	7	10	0	8	8
Pick-up	2	12	13	50	24	22	92	10	32	84
Micro	1	14	38	52	14	49	62	1	42	43
Bus	2.5	49	55	259	47	61	268	0	78	194
Light Truck	2	9	17	51	13	13	52	0	24	48
Medium Truck	2	38	43	161	37	52	178	2	56	115
Heavy Truck	2	6	7	26	6	13	37	0	16	31
			Total	**900**			**1048**			**777**

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

Date: May 08, 2024 (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	11	9	0	9	8	0	7	4	0
Auto Rickshaw	0.8	0	0	0	0	0	0	0	0	0
Van	0.6	25	22	28	21	16	22	17	17	21
Cycle	0.2	35	4	8	15	14	6	1	6	1
Human Howler	0.6	11	3	8	7	3	5	1	2	2
CNG	0.5	6	8	7	8	6	7	3	3	3
Private Car	1	13	4	17	3	2	4	2	4	6
Motor Cycle	0.3	61	25	26	28	30	17	6	16	6
Jeep	1	1	0	1	1	1	2	0	1	1
Pick-up	2	3	2	9	2	1	6	10	5	30
Micro	1	5	4	8	4	1	5	1	5	6
Bus	2.5	1	0	3	1	2	5	0	1	3
Light Truck	2	1	0	1	0	1	1	0	0	0
Medium Truck	2	2	3	11	0	0	0	2	2	8
Heavy Truck	2	3	1	7	0	5	9	0	1	2
			Total	**135**			**89**			**89**

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

Date: May 07, 2024 (Tuesday)

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	10	28	0	11	10	0	7	30	0
Auto Rickshaw	0.8	0	0	0	0	0	0	1	0	0
Van	0.6	102	36	83	79	38	70	108	47	92
Cycle	0.2	20	11	6	9	2	2	12	10	4
Human Howler	0.6	15	9	14	7	17	14	4	12	9
CNG	0.5	14	42	28	4	8	6	10	28	19
Private Car	1	22	4	26	23	9	32	56	16	72
Motor Cycle	0.3	139	37	53	115	57	52	198	73	81
Jeep	1	11	1	12	5	5	10	9	6	15
Pick-up	2	19	7	51	11	12	44	11	12	44
Micro	1	29	3	33	10	4	14	19	10	29
Bus	2.5	66	11	193	41	10	126	63	24	215
Light Truck	2	22	0	45	18	1	37	6	12	34
Medium Truck	2	39	13	105	29	44	145	65	33	194
Heavy Truck	2	8	6	28	6	10	31	11	12	45
			Total	**677**			**582**			**853**

(F) Agricultural resources Monitorng Data

Table F.1: Existing Cropping Pattern of Monitoring Agriculture Plot

Monitoring agriculture plot	Cropping pattern (2023-2024)		
	Kharif-I (March-June)	Kharif-II (July-October	Rabi (November-February)
Monitoring Spot-1 (Baranpara)	Fallow	HYV Aman (BRRI-23)	HYV Boro (BRRI-67)
Monitoring Spot-2 (Chunkuri-2)	Fallow	HYV Aman (BRRI-23)	Fallow
Monitoring Spot-3 (Kapalirmet)	Fallow *	Fallow *	Fallow *
Monitoring Spot-4 (Chakgona)	Fallow	Local Aman (Chapshail)	Fallow

Monitoring agriculture plot	Cropping pattern (2023-2024)		
	Kharif-I (March-June)	Kharif-II (July-October	Rabi (November-February)
Monitoring Spot-5 (Basherhula)	Fallow	Local Aman (Chapshail)	Fallow
Monitoring Spot-6 (Bidyarbon)	Fallow	HYV Aman (BRRI-23)	Fallow

*Source: Based on field information and farmers interviewed, April, 2024. *previously cultivated. ** data was not collected due to unavailability/change of sampling plot.*

Table F.2: Results of Crop production in Monitoring Plots

Monitoring Agricultural Plot	Production and Yield	Cropping pattern (2023-2024)		
		Kharif-I (March-June)	Kharif-I (March-June)	Kharif-I (March-June)
Monitoring Spot-1 (Baranpara)	Production (ton/Plot)	-	1.33	2.1
	Yield (ton/Ha)	-	3.33	5.3
Monitoring Spot-2 (Chunkuri-2)	Production (ton/Plot)	-	2.47	-
	Yield (ton/Ha)	-	2.66	-
Monitoring Spot-3 (Kapalirmet)	Production (ton/Plot)	-	-	-
	Yield (ton/Ha)	-	-	-
Monitoring Spot-4 (Chakgona)	Production (ton/Plot)	-	0.31	-
	Yield (ton/Ha)	-	1.33	-
Monitoring Spot-5 (Basherhula)	Production (ton/Plot)	-	0.75	-
	Yield (ton/Ha)	-	1.6	-
Monitoring Spot-6 (Bidyarbon)	Production (ton/Plot)	-	0.29	-
	Yield (ton/Ha)	-	2.93	-

*Source: Based on field information and farmers interviewed, April, 2024. *previously cultivated. ** data was not collected due to unavailability/change of sampling plot. Yield is calculated for clean rice.*

Table F.3: Results of Crop Damage in Monitoring Plots

Monitoring site	Crop Damage (2023-2024)		
	Area (ha)	Production (tons)	Causes
Monitoring agriculture land-1	-	Not found	-
Monitoring agriculture land-2	-	Not found	-
Monitoring agriculture land-3	-	Not found	-
Monitoring agriculture land-4	-	Not found	-

Monitoring site	Crop Damage (2023-2024)		
	Area (ha)	Production (tons)	Causes
Monitoring agriculture land-5	-	Not found	-
Monitoring agriculture land-6	-	Not found	-
Total	-	-	-

Source: Based on field information and farmers interviewed, April, 2024 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.

Appendix IV: Monitoring Results

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Environmental Laboratory

Memo No. ELAB202405003750

Date: 27 /06/2024

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio Economic Monitoring of 2x660 MW MSTPP at Rampal. Code: FPC008

Sample Type: Surface Water ID: FPC008_001 Collection Date: May/2024

Location: N/A

Received From: Md. Mutasim Billah Received Date: 28/05/2024 Testing Date: 28/05-/10/06/24

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard ECR/97		Bangladesh Standard ECR/2023		Concentration Present	Unit	Analysis Method	Remarks
			Drinking	Others	Drinking	Others				
01	SW$_1$	Sulphate (SO_4^{2-})	-	-	-	-	242.84	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		Nitrate (NO_3^-)	-	-	7	-	2.9045	ppm	UV-VIS	
03		Phosphate (PO_4^{3-})	-	-	0.5	-	0.2220	ppm	UV-VIS	

N.B: UV-VIS means Ultra Violet Visible UV-1800 Spectrophotometer.

Test Performed by & Checked by

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

Signature: 27.06.2024

Compiled & Approved by

Name: Md. Rafiqul Alam

Designation: Laboratory Expert

Signature: 27.06.2024

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Environmental Laboratory

Memo No. ELAB202405003751

Date: 27/06/2024

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio Economic Monitoring of 2x660 MW MSTPP at Rampal. Code: FPC008

Sample Type: Surface Water ID: FPC008_002 Collection Date: May/2024

Location: N/A

Received From: Md. Mutasim Billah Received Date: 28/05/2024 Testing Date: 28/05-/10/06/24

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard ECR/97		Bangladesh Standard ECR/2023		Concentration Present	Unit	Analysis Method	Remarks
			Drinking	Others	Drinking	Others				
01	SW$_2$	Sulphate (SO_4^{2-})	-	-	-	-	237.29	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		Nitrate (NO_3^-)	-	-	7	-	3.3881	ppm	UV-VIS	
03		Phosphate (PO_4^{3-})	-	-	0.5	-	0.2113	ppm	UV-VIS	

N.B: UV-VIS means Ultra Violet Visible UV-1800 Spectrophotometer.

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Environmental Laboratory

Memo No. ELAB202405003752

Date: 27/06/2024

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio Economic Monitoring of 2x660 MW MSTPP at Rampal. Code: FPC008

Sample Type: Surface Water ID: FPC008_003 Collection Date: May/2024

Location: N/A

Received From: Md. Mutasim Billah Received Date: 28/05/2024 Testing Date: 28/05-/10/06/24

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard ECR/97		Bangladesh Standard ECR/2023		Concentration Present	Unit	Analysis Method	Remarks
			Drinking	Others	Drinking	Others				
01	SW_3	Sulphate (SO_4^{2-})	-	-	-	-	242.59	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		Nitrate (NO_3^-)	-	-	7	-	2.7573	ppm	UV-VIS	
03		Phosphate (PO_4^{3-})	-	-	0.5	-	0.3104	ppm	UV-VIS	

N.B: UV-VIS means Ultra Violet Visible UV-1800 Spectrophotometer.

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Environmental Laboratory

Memo No. ELAB202405003753

Date:27 /06/2024

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio Economic Monitoring of 2x660 MW MSTPP at Rampal. Code: FPC008

Sample Type: Surface Water ID: FPC008_004 Collection Date: May/2024

Location: Jetty.

Received From: Md. Mutasim Billah Received Date: 28/05/2024 Testing Date: 28/05-/10/06/24

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard ECR/97		Bangladesh Standard ECR/2023		Concentration Present	Unit	Analysis Method	Remarks
			Drinking	Others	Drinking	Others				
01	SW_4	Sulphate (SO_4^{2-})	-	-	-	-	243.66	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		Nitrate (NO_3^-)	-	-	7	-	1.5167	ppm	UV-VIS	
03		Phosphate (PO_4^{3-})	-	-	0.5	-	0.1895	ppm	UV-VIS	

N.B: UV-VIS means Ultra Violet Visible UV-1800 Spectrophotometer.

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Environmental Laboratory

Memo No. ELAB202405003754

Date:27 /06/2024

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio Economic Monitoring of 2x660 MW MSTPP at Rampal. Code: FPC008

Sample Type: Surface Water ID: FPC008_005 Collection Date: May/2024

Location: N/A

Received From: Md. Mutasim Billah Received Date: 28/05/2024 Testing Date: 28/05-/10/06/24

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard ECR/97		Bangladesh Standard ECR/2023		Concentration Present	Unit	Analysis Method	Remarks
			Drinking	Others	Drinking	Others				
01	SW_5	Sulphate (SO_4^{2-})	-	-	-	-	237.95	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		Nitrate (NO_3^-)	-	-	7	-	1.3274	ppm	UV-VIS	
03		Phosphate (PO_4^{3-})	-	-	0.5	-	0.2419	ppm	UV-VIS	

N.B: UV-VIS means Ultra Violet Visible UV-1800 Spectrophotometer.

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Environmental Laboratory

Memo No. ELAB202405003755

Date: 27/06/2024

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio Economic Monitoring of 2x660 MW MSTPP at Rampal. Code: FPC008

Sample Type: Surface Water ID: FPC008_006 Collection Date: May/2024

Location: N/A

Received From: Md. Mutasim Billah Received Date: 28/05/2024 Testing Date28/05-/10/06/24

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard ECR/97		Bangladesh Standard ECR/2023		Concentration Present	Unit	Analysis Method	Remarks
			Drinking	I Others	Drinking	Others				
01	SW_6	Sulphate (SO_4^{2-})	-	-	-	-	247.60	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		Nitrate (NO_3^-)	-	-	7	-	3.3460	ppm	UV-VIS	
03		Phosphate (PO_4^{3-})	-	-	0.5	-	0.4581	ppm	UV-VIS	

N.B: UV-VIS means Ultra Violet Visible UV-1800 Spectrophotometer.

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Environmental Laboratory

Memo No. ELAB202405003756

Date: 27 /06/2024

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio Economic Monitoring of 2x660 MW MSTPP at Rampal. Code: FPC008

Sample Type: Surface Water ID: FPC008_007 Collection Date: May/2024

Location: N/A

Received From: Md. Mutasim Billah Received Date: 28/05/2024 Testing Date: 28/05-/10/06/24

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard ECR/97		Bangladesh Standard ECR/2023		Concentration Present	Unit	Analysis Method	Remarks
			Drinking	Others	Drinking	Others				
01		Sulphate (SO_4^{2-})	-	-	-	-	234.64	ppm	UV-VIS	S ample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02	SW_7	Nitrate (NO_3^-)	-	-	7	-	2.3578	ppm	UV-VIS	
03		Phosphate (PO_4^{3-})	-	-	0.5	-	0.0850	ppm	UV-VIS	

N.B: UV-VIS means Ultra Violet Visible UV-1800 Spectrophotometer.

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Environmental Laboratory

Memo No. ELAB202405003757

Date: 27 /06/2024

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio Economic Monitoring of 2x660 MW MSTPP at Rampal. Code: FPC008

Sample Type: Surface Water ID: FPC008_008 Collection Date: May/2024

Location: N/A

Received From: Md. Mutasim Billah Received Date: 28/05/2024 Testing Date: 28/05-10/06/24

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard ECR/97		Bangladesh Standard ECR/2023		Concentration Present	Unit	Analysis Method	Remarks
			Drinking	Others	Drinking	Others				
01		Sulphate (SO_4^{2-})	-	-	-	-	241.08	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02	SW_8	Nitrate (NO_3^-)	-	-	7	-	1.5798	ppm	UV-VIS	
03		Phosphate (PO_4^{3-})	-	-	0.5	-	0.1753	ppm	UV-VIS	

N.B: UV-VIS means Ultra Violet Visible UV-1800 Spectrophotometer.

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Environmental Laboratory

Memo No. ELAB202405003758 Date: 27 /06/2024

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio Economic Monitoring of 2x660 MW MSTPP at Rampal. Code: FPC008

Sample Type: Surface Water ID: FPC008_009 Collection Date: May/2024

Location: N/A

Received From: Md. Mutasim Billah Received Date: 28/05/2024 Testing Date: 28/05-/10/06/24

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard ECR/97		Bangladesh Standard ECR/2023		Concentration Present	Unit	Analysis Method	Remarks
			Drinking	Others	Drinking	Others				
01	SW₉	Sulphate (SO_4^{2-})	-	-	-	-	243.40	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		Nitrate (NO_3^-)	-	-	7	-	0.4443	ppm	UV-VIS	
03		Phosphate (PO_4^{3-})	-	-	0.5	-	0.1428	ppm	UV-VIS	

N.B: UV-VIS means Ultra Violet Visible UV-1800 Spectrophotometer.

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Environmental Laboratory

Memo No. ELAB202405003759 Date: 27 /06/2024

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio Economic Monitoring of 2x660 MW MSTPP at Rampal. Code: FPC008

Sample Type: Surface Water ID: FPC008_010 Collection Date: May/2024

Location: N/A

Received From: Md. Mutasim Billah Received Date: 28/05/2024 Testing Date: 28/05-/10/06/24

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard ECR/97		Bangladesh Standard ECR/2023		Concentration Present	Unit	Analysis Method	Remarks
			Drinking	Others	Drinking	Others				
01	SW_{10}	Sulphate (SO_4^{2-})	-	-	-	-	242.60	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		Nitrate (NO_3^-)	-	-	7	-	2.1685	ppm	UV-VIS	
03		Phosphate (PO_4^{3-})	-	-	0.5	-	0.2772	ppm	UV-VIS	

N.B: UV-VIS means Ultra Violet Visible UV-1800 Spectrophotometer.

Test Performed by & Checked by

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Environmental Laboratory

Memo No. ELAB202405003760 Date: 27 /06/2024

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio Economic Monitoring of 2x660 MW MSTPP at Rampal. Code: FPC008

Sample Type: Surface Water ID: FPC008_011 Collection Date: May/2024

Location: Shapmari.

Received From: Md. Mutasim Billah Received Date: 28/05/2024 Testing Date: 28/05-/10/06/24

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard ECR/97		Bangladesh Standard ECR/2023		Concentration Present	Unit	Analysis Method	Remarks
			Drinking	Others	Drinking	Others				
01	SW_{11}	Sulphate (SO_4^{2-})	-	-	-	-	242.92	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		Nitrate (NO_3^-)	-	-	7	-	2.1054	ppm	UV-VIS	
03		Phosphate (PO_4^{3-})	-	-	0.5	-	0.1633	ppm	UV-VIS	

N.B: UV-VIS means Ultra Violet Visible UV-1800 Spectrophotometer.

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Environmental Laboratory

Memo No. ELAB202405003761 Date: 27 /06/2024

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio Economic Monitoring of 2x660 MW MSTPP at Rampal. Code: FPC008

Sample Type: Surface Water ID: FPC008_012 Collection Date: May/2024

Location: Mongla.

Received From: Md. Mutasim Billah Received Date: 28/05/2024 Testing Date: 28/05-/10/06/24

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard ECR/97		Bangladesh Standard ECR/2023		Concentration Present	Unit	Analysis Method	Remarks
			Drinking	Others	Drinking	Others				
01	SW_{12}	Sulphate (SO_4^{2-})	-	-	-	-	245.09	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		Nitrate (NO_3^-)	-	-	7	-	0.9700	ppm	UV-VIS	
03		Phosphate (PO_4^{3-})	-	-	0.5	-	1.0569	ppm	UV-VIS	

N.B: UV-VIS means Ultra Violet Visible UV-1800 Spectrophotometer.

Test Performed by & Checked by

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Environmental Laboratory

Memo No. ELAB202405003762 Date: 27 /06/2024

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio Economic Monitoring of 2x660 MW MSTPP at Rampal. Code: FPC008

Sample Type: Surface Water ID: FPC008_013 Collection Date: May/2024

Location: Harbaria.

Received From: Md. Mutasim Billah Received Date: 28/05/2024 Testing Date: 28/05-/10/06/24

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard ECR/97		Bangladesh Standard ECR/2023		Concentration Present	Unit	Analysis Method	Remarks
			Drinking	Others	Drinking	Others				
01	SW13	Sulphate (SO_4^{2-})	-	-	-	-	227.58	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		Nitrate ($NO3^-$)	-	-	7	-	2.0003	ppm	UV-VIS	
03		Phosphate (PO_4^{3-})	-	-	0.5	-	0.2491	ppm	UV-VIS	

N.B: UV-VIS means Ultra Violet Visible UV-1800 Spectrophotometer.

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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. ELAB202405003763 Date: 27 /06/2024

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio Economic Monitoring of 2x660 MW MSTPP at Rampal. Code: FPC008

Sample Type: Surface Water ID: FPC008_014 Collection Date: May/2024

Location: Akrampoint.

Received From: Md. Mutasim Billah Received Date: 28/05/2024 Testing Date: 28/05-/10/06/24

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard ECR/97		Bangladesh Standard ECR/2023		Concentration Present	Unit	Analysis Method	Remarks
			Drinking	Others	Drinking	Others				
01	SW14	Sulphate (SO_4^{2-})	-	-	-	-	240.42	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		Nitrate (NO_3^-)	-	-	7	-	2.8624	ppm	UV-VIS	
03		Phosphate (PO_4^{3-})	-	-	0.5	-	0.1204	ppm	UV-VIS	

N.B: UV-VIS means Ultra Violet Visible UV-1800 Spectrophotometer.

Test Performed by & Checked by

Name: Rafiqul Islam & Md. Rafiqul Alam

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

Signature:

Compiled & Approved by

Name: Md. Rafiqul Alam

Designation: Laboratory Expert

Signature:

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Environmental Laboratory

Memo No. ELAB202405003764 Date: 27 /06/2024

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio Economic Monitoring of 2x660 MW MSTPP at Rampal. Code: FPC008

Sample Type: Surface Water ID: FPC008_015 Collection Date: May/2024

Location: Hiron Point.

Received From: Md. Mutasim Billah Received Date: 28/05/2024 Testing Date: 28/05-/10/06/24

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard ECR/97		Bangladesh Standard ECR/2023		Concentration Present	Unit	Analysis Method	Remarks
			Drinking	Others	Drinking	Others				
01	SW_{15}	Sulphate (SO_4^{2-})	-	-	-	-	245.97	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		Nitrate (NO_3^-)	-	-	7	-	1.6008	ppm	UV-VIS	
03		Phosphate (PO_4^{3-})	-	-	0.5	-	0.0803	ppm	UV-VIS	

N.B: UV-VIS means Ultra Violet Visible UV-1800 Spectrophotometer.

Test Performed by & Checked by
Name: Rafiqul Islam & Md. Rafiqul Alam
Designation: Research Associate & In-Charge of Scientific Equipment and Laboratory Expert
Signature:

Compiled & Approved by
Name: Md. Rafiqul Alam
Designation: Laboratory Expert
Signature:

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Environmental Laboratory

Memo No. ELAB202405003765 Date: 27 /06/2024

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio Economic Monitoring of 2x660 MW MSTPP at Rampal. Code: FPC008

Sample Type: Drinking Water ID: FPC008_016 Collection Date: May/2024

Location: PPJ RO drinking.

Received From: Md. Mutasim Billah Received Date: 28/05/2024 Testing Date: 28/05-/10/06/24

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard ECR/97		Bangladesh Standard ECR/2023		Concentration Present	Unit	Analysis Method	Rem arks
			Drinking	Others	Drinking	Others				
01	GW_1	Sulphate (SO_4^{2-})	400	-	250	-	2.3986	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		Nitrate (NO_3^-)	10	-	45	-	3,0096	ppm	UV-VIS	
03		Phosphate (PO_4^{3-})	6	-	-	-	0.1185	ppm	UV-VIS	

N.B: UV-VIS means Ultra Violet Visible UV-1800 Spectrophotometer.

Test Performed by & Checked by
Name: Rafiqul Islam & Md. Rafiqul Alam
Designation: Research Associate & In-Charge of Scientific Equipment and Laboratory Expert
Signature:.

Compiled & Approved by
Name: Md. Rafiqul Alam
Designation: Laboratory Expert
Signature:

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Environmental Laboratory

Memo No. ELAB202405003766 Date: 27 /06/2024

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio Economic Monitoring of 2x660 MW MSTPP at Rampal. Code: FPC008

Sample Type: Drinking Water ID: FPC008_017 Collection Date: May/2024

Location: Rajnagar.

Received From: Md. Mutasim Billah Received Date: 28/05/2024 Testing Date: 28/05-/10/06/24

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard ECR/97		Bangladesh Standard ECR/2023		Concentration Present	Unit	Analysis Method	Rem arks
			Drinking	Others	Drinking	Others				
01	GW$_2$	Sulphate (SO_4^{2-})	400	-	250	-	142.97	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		Nitrate (NO_3^-)	10	-	45	-	0.0448	ppm	UV-VIS	
03		Phosphate (PO_4^{3-})	6	-	-	-	0.2271	ppm	UV-VIS	

N.B: UV-VIS means Ultra Violet Visible UV-1800 Spectrophotometer.

Test Performed by & Checked by
Name: Rafiqul Islam & Md. Rafiqul Alam
Designation: Research Associate & In-Charge of Scientific Equipment and Laboratory Expert
Signature:

Compiled & Approved by
Name: Md. Rafiqul Alam
Designation: Laboratory Expert
Signature:

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Environmental Laboratory

Memo No. ELAB202405003767 Date: 27 /06/2024

Test Report

Physical/Chemical/Bacteriological Analysis of water

Project Name: Environmental and Socio Economic Monitoring of 2x660 MW MSTPP at Rampal. Code: FPC008

Sample Type: Drinking Water ID: FPC008_018 Collection Date: May/2024

Location: Kapashdanga.

Received From: Md. Mutasim Billah Received Date: 28/05/2024 Testing Date: 28/05-/10/06/24

Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard ECR/97		Bangladesh Standard ECR/2023		Concentration Present	Unit	Analysis Method	Rem arks
			Drinking	Others	Drinking	Others				
01	GW$_3$	Sulphate (SO_4^{2-})	400	-	250	-	5.6808	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		Nitrate (NO_3^-)	10	-	45	-	6.1847	ppm	UV-VIS	
03		Phosphate (PO_4^{3-})	6	-	-	-	1.2668	ppm	UV-VIS	

N.B: UV-VIS means Ultra Violet Visible UV-1800 Spectrophotometer.

Test Performed by & Checked by
Name: Rafiqul Islam & Md. Rafiqul Alam
Designation: Research Associate & In-Charge of Scientific Equipment and Laboratory Expert
Signature:

Compiled & Approved by
Name: Md. Rafiqul Alam
Designation: Laboratory Expert
Signature:

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Lab Memo: 1208/ CC, DPHE, CL, Dhaka

Date: 15-05-2024

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2024040076	Sample Receiving date: 28-02-2024
Ref. Memo No: 42.06.2626.119.37.001.24-00624 & Dated: 20-02-2024	Sample Source: Surface Water
Sent by:Mohammed Mukteruzzaman ,Director, P, E & Mineral Resources Division , CEGIS, Gulshan-1, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS (Sample ID : SW-01)	Union:, Vill.:
Sample Collection date:	Date of Testing: 28/02/2024-30/04/2024

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	Calcium (Ca)	75	186	mg/L	AAS	0.17
3	Chemical Oxygen Demand (COD)	4.0	164	mg/L	CRM	4.0
4	Chloride	150-600	2700	mg/L	Titrimetic	-
5	Bi-Carbonate (HCO3-)	0.0	40	mg/L	Titrimetic	-
6	Hardness	200-500	2550	mg/L	Titrimetic	-
7	Iron (Fe)	0.3-1	2.62	mg/L	AAS	0.05
8	Magnesium (Mg)	30-35	260	mg/L	AAS	0.05
9	Potassium (K)	12.0	127	mg/L	AAS	-
10	Sodium (Na)	200	1540	mg/L	AAS	0.34
11	Total Dissolved Solid (TDS)	1000	4100	mg/L	Multimeter	-
12	Total Suspended Solid (TSS)	10	3	mg/L	Gravimetric Method	-
13	Turbidity	10	25.1	NTU	Turbidity Meter	-
14	Carbonate (CO3)	-	0.28	mg/L	Titrimetic	-

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

Alam

15/05/2024

Md. Biplab Hossain
Chief Chemist
Department of Public Health Engineering
Central Laboratory Mohakhali, Dhaka

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Lab Memo: 1208/ CC, DPHE, CL, Dhaka

Date: 15-05-2024

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2024040077	Sample Receiving date: 28-02-2024
Ref. Memo No: 42.06.2626.119.37.001.24-00624 & Dated: 20-02-2024	Sample Source: Surface Water
Sent by:Mohammed Mukteruzzaman ,Director, P, E & Mineral Resources Division , CEGIS, Gulshan-1, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS (Sample ID : SW-02)	Union:, Vill.:
Sample Collection date:	Date of Testing: 28/02/2024-30/04/2024

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	Chemical Oxygen Demand (COD)	4.0	148	mg/L	CRM	4.0
3	Hardness	200-500	2600	mg/L	Titrimetic	-
4	Total Dissolved Solid (TDS)	1000	4170	mg/L	Multimeter	-
5	Total Suspended Solid (TSS)	10	3	mg/L	Gravimetric Method	-

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

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	Alam 15.05.2024	1.) Name: Mita Sarker Designation: Senior Chemist	15/05/2024
2.) Name: Taslima Akhter Designation: Sample Analyzer	15.05.2024	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka

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Lab Memo: 1208/ CC, DPHE, CL, Dhaka

Date: 15-05-2024

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2024040078	Sample Receiving date: 28-02-2024
Ref. Memo No: 42.06.2626.119.37.001.24-00624 & Dated: 20-02-2024	Sample Source: Surface Water
Sent by:Mohammed Mukteruzzaman ,Director, P, E & Mineral Resources Division , CEGIS, Gulshan-1, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS (Sample ID : SW-03)	Union:, Vill.:
Sample Collection date:	Date of Testing: 28/02/2024-30/04/2024

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	Chemical Oxygen Demand (COD)	4.0	156	mg/L	CRM	4.0
3	Hardness	200-500	3250	mg/L	Titrimetic	-
4	Total Dissolved Solid (TDS)	1000	4200	mg/L	Multimeter	-
5	Total Suspended Solid (TSS)	10	6	mg/L	Gravimetric Method	-

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

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	Alam 15.05.2024	1.) Name: Mita Sarker Designation: Senior Chemist	
2.) Name: Taslima Akhter Designation: Sample Analyzer	15.05.2024	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	15/05/2024 Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka

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Lab Memo: 1208/ CC, DPHE, CL, Dhaka.

Date: 15-05-2024

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2024040079	Sample Receiving date: 28-02-2024
Ref. Memo No: 42.06.2626.119.37.001.24-00624 & Dated: 20-02-2024	Sample Source: Surface Water
Sent by:Mohammed Mukteruzzaman ,Director, P, E & Mineral Resources Division , CEGIS, Gulshan-1, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS (Sample ID : SW-04)	Union:, Vill.:
Sample Collection date:	Date of Testing: 28/02/2024-30/04/2024

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	Calcium (Ca)	75	241	mg/L	AAS	0.17
3	Chemical Oxygen Demand (COD)	4.0	96	mg/L	CRM	4.0
4	Chloride	150-600	3760	mg/L	Titrimetic	-
5	Bi-Carbonate (HCO3-)	0.0	45	mg/L	Titrimetic	-
6	Hardness	200-500	3300	mg/L	Titrimetic	-
7	Iron (Fe)	0.3-1	3.55	mg/L	AAS	0.05
8	Magnesium (Mg)	30-35	306	mg/L	AAS	0.05
9	Potassium (K)	12.0	135	mg/L	AAS	-
10	Sodium (Na)	200	2485	mg/L	AAS	0.34
11	Total Dissolved Solid (TDS)	1000	5800	mg/L	Multimeter	-
12	Total Suspended Solid (TSS)	10	4	mg/L	Gravimetric Method	-
13	Turbidity	10	80	NTU	Turbidity Meter	-
14	Carbonate (CO3)	-	0.32	mg/L	Titrimetic	-

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

Alam

15/05/2024
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Date: 15-05-2024

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2024040080	Sample Receiving date: 28-02-2024
Ref. Memo No: 42.06.2626.119.37.001.24-00624 & Dated: 20-02-2024	Sample Source: Surface Water
Sent by:Mohammed Mukteruzzaman ,Director, P, E & Mineral Resources Division , CEGIS, Gulshan-1, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS (Sample ID : SW-05)	Union:, Vill.:
Sample Collection date:	Date of Testing: 28/02/2024-30/04/2024

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	200	mg/L	CRM	4.0
3	Hardness	200-500	2850	mg/L	Titrimetic	-
4	Total Dissolved Solid (TDS)	1000	5300	mg/L	Multimeter	-
5	Total Suspended Solid (TSS)	10	3	mg/L	Gravimetric Method	-

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

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	Alom 15.05.2024	1.) Name: Mita Sarker Designation: Senior Chemist	15/05/2024
2.) Name: Taslima Akhter Designation: Sample Analyzer	15.05.2024	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka

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Lab Memo: 1208/ CC, DPHE, CL, Dhaka

Date: 15-05-2024

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2024040081	Sample Receiving date: 28-02-2024
Ref. Memo No: 42.06.2626.119.37.001.24-00624 & Dated: 20-02-2024	Sample Source: Surface Water
Sent by:Mohammed Mukteruzzaman ,Director, P, E & Mineral Resources Division , CEGIS, Gulshan-1, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS (Sample ID : SW-06)	Union:, Vill.:
Sample Collection date:	Date of Testing: 28/02/2024-30/04/2024

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	224	mg/L	CRM	4.0
3	Hardness	200-500	2950	mg/L	Titrimetic	-
4	Total Dissolved Solid (TDS)	1000	5350	mg/L	Multimeter	-
5	Total Suspended Solid (TSS)	10	3	mg/L	Gravimetric Method	-

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

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	Alom 15.05.2024	1.) Name: Mita Sarker Designation: Senior Chemist	15/05/2024
2.) Name: Taslima Akhter Designation: Sample Analyzer	15.05.2024	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka

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Lab Memo: 1208/ CC, DPHE, CL, Dhaka

Date: 15-05-2024

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2024040082	Sample Receiving date: 28-02-2024
Ref. Memo No: 42.06.2626.119.37.001.24-00624 & Dated: 20-02-2024	Sample Source: Surface Water
Sent by:Mohammed Mukteruzzaman ,Director, P, E & Mineral Resources Division , CEGIS, Gulshan-1, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS (Sample ID : SW-07)	Union:, Vill.:
Sample Collection date:	Date of Testing: 28/02/2024-30/04/2024

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	Calcium (Ca)	75	226	mg/L	AAS	0.17
3	Chemical Oxygen Demand (COD)	4.0	200	mg/L	CRM	4.0
4	Chloride	150-600	3600	mg/L	Titrimetic	-
5	Bi-Carbonate (HCO3-)	0.0	35	mg/L	Titrimetic	-
6	Hardness	200-500	3350	mg/L	Titrimetic	-
7	Iron (Fe)	0.3-1	3.75	mg/L	AAS	0.05
8	Magnesium (Mg)	30-35	285	mg/L	AAS	0.05
9	Potassium (K)	12.0	147	mg/L	AAS	-
10	Sodium (Na)	200	2110	mg/L	AAS	0.34
11	Total Dissolved Solid (TDS)	1000	5500	mg/L	Multimeter	-
12	Total Suspended Solid (TSS)	10	4	mg/L	Gravimetric Method	-
13	Turbidity	10	71.7	NTU	Turbidity Meter	-
14	Carbonate (CO3)	-	0.24	mg/L	Titrimetic	-

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

15/05/2024

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Lab Memo: 1208/ CC, DPHE, CL, Dhaka

Date: 15-05-2024

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2024040083	Sample Receiving date: 28-02-2024
Ref. Memo No: 42.06.2626.119.37.001.24-00624 & Dated: 20-02-2024	Sample Source: Surface Water
Sent by:Mohammed Mukteruzzaman ,Director, P, E & Mineral Resources Division , CEGIS, Gulshan-1, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS (Sample ID : SW-08)	Union:, Vill.:
Sample Collection date:	Date of Testing: 28/02/2024-30/04/2024

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	Chemical Oxygen Demand (COD)	4.0	164	mg/L	CRM	4.0
3	Hardness	200-500	3200	mg/L	Titrimetic	-
4	Total Dissolved Solid (TDS)	1000	5680	mg/L	Multimeter	-
5	Total Suspended Solid (TSS)	10	4	mg/L	Gravimetric Method	-

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

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	15.05.2024	1.) Name: Mita Sarker Designation: Senior Chemist	15/05/2024
2.) Name: Taslima Akhter Designation: Sample Analyzer	15.05.2024	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka

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Lab Memo: 1208/ CC, DPHE, CL, Dhaka

Date: 15-05-2024

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2024040084	Sample Receiving date: 28-02-2024
Ref. Memo No: 42.06.2626.119.37.001.24-00624 & Dated: 20-02-2024	Sample Source: Surface Water
Sent by:Mohammed Mukteruzzaman ,Director, P, E & Mineral Resources Division , CEGIS, Gulshan-1, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS (Sample ID : SW-09)	Union:, Vill.:
Sample Collection date:	Date of Testing: 28/02/2024-30/04/2024

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	248	mg/L	CRM	4.0
3	Hardness	200-500	2900	mg/L	Titrimetic	-
4	Total Dissolved Solid (TDS)	1000	5560	mg/L	Multimeter	-
5	Total Suspended Solid (TSS)	10	4	mg/L	Gravimetric Method	-

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

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	Alam 15.05.2024	1.) Name: Mita Sarker Designation: Senior Chemist	15/05/2024
2.) Name: Taslima Akhter Designation: Sample Analyzer	15.05.2024	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka

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

Lab Memo: 1208/ CC, DPHE, CL, Dhaka

Date: 15-05-2024

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2024040085	Sample Receiving date: 28-02-2024
Ref. Memo No: 42.06.2626.119.37.001.24-00624 & Dated: 20-02-2024	Sample Source: Surface Water
Sent by:Mohammed Mukteruzzaman ,Director, P, E & Mineral Resources Division , CEGIS, Gulshan-1, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS (Sample ID : SW-10)	Union:, Vill.:
Sample Collection date:	Date of Testing: 28/02/2024-30/04/2024

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	164	mg/L	CRM	4.0
3	Hardness	200-500	3000	mg/L	Titrimetic	-
4	Total Dissolved Solid (TDS)	1000	4150	mg/L	Multimeter	-
5	Total Suspended Solid (TSS)	10	5	mg/L	Gravimetric Method	-

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

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	Alam 15.05.2024	1.) Name: Mita Sarker Designation: Senior Chemist	15/05/2024
2.) Name: Taslima Akhter Designation: Sample Analyzer	15.05.2024	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka

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Lab Memo: 1208/ CC, DPHE, CL, Dhaka

Date: 16-05-2024

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2024040086	Sample Receiving date: 28-02-2024
Ref. Memo No: 42.06.2626.119.37.001.24-00624 & Dated: 20-02-2024	Sample Source: Surface Water
Sent by:Mohammed Mukteruzzaman ,Director, P, E & Mineral Resources Division , CEGIS, Gulshan-1, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS (Sample ID : SW-11)	Union:, Vill.:
Sample Collection date:	Date of Testing: 28/02/2024-30/04/2024

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	216	mg/L	CRM	4.0
3	Hardness	200-500	3100	mg/L	Titrimetic	-
4	Total Dissolved Solid (TDS)	1000	5200	mg/L	Multimeter	-
5	Total Suspended Solid (TSS)	10	4	mg/L	Gravimetric Method	-

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

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	Alam 15.05.2024	1.) Name: Mita Sarker Designation: Senior Chemist	15/05/2024
2.) Name: Taslima Akhter Designation: Sample Analyzer	15.05.2024	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka

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Lab Memo: 1208/ CC, DPHE, CL, Dhaka

Date: 15-05-2024

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2024040087	Sample Receiving date: 28-02-2024
Ref. Memo No: 42.06.2626.119.37.001.24-00624 & Dated: 20-02-2024	Sample Source: Surface Water
Sent by:Mohammed Mukteruzzaman ,Director, P, E & Mineral Resources Division , CEGIS, Gulshan-1, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS (Sample ID : SW-12)	Union:, Vill.:Mongla Confluence
Sample Collection date:	Date of Testing: 28/02/2024-30/04/2024

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.001	mg/L	AAS	0.001
2	Chemical Oxygen Demand (COD)	4.0	248	mg/L	CRM	4.0
3	Hardness	200-500	2200	mg/L	Titrimetic	-
4	Total Dissolved Solid (TDS)	1000	4900	mg/L	Multimeter	-
5	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,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 15.05.2024	1.) Name: Mita Sarker Designation: Senior Chemist	15/05/2024
2.) Name: Taslima Akhter Designation: Sample Analyzer	15.05.2024	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka

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Lab Memo: 1208/ CC, DPHE, CL, Dhaka

Date: 15-05-2024

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2024040088	Sample Receiving date: 28-02-2024
Ref. Memo No: 42.06.2626.119.37.001.24-00624 & Dated: 20-02-2024	Sample Source: Surface Water
Sent by:Mohammed Mukteruzzaman ,Director, P, E & Mineral Resources Division , CEGIS, Gulshan-1, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS (Sample ID : SW-13)	Union:, Vill.:Harbaria
Sample Collection date:	Date of Testing: 28/02/2024-30/04/2024

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	324	mg/L	CRM	4.0
3	Hardness	200-500	3300	mg/L	Titrimetic	-
4	Total Dissolved Solid (TDS)	1000	6500	mg/L	Multimeter	-
5	Total Suspended Solid (TSS)	10	3	mg/L	Gravimetric Method	-

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

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	Alam 15.05.2024	1.) Name: Mita Sarker Designation: Senior Chemist	15/05/2024
2.) Name: Taslima Akhter Designation: Sample Analyzer	15.05.2024	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka

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Lab Memo: 1208/ CC, DPHE, CL, Dhaka

Date: 15-05-2024

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2024040089	Sample Receiving date: 28-02-2024
Ref. Memo No: 42.06.2626.119.37.001.24-00624 & Dated: 20-02-2024	Sample Source: Surface Water
Sent by:Mohammed Mukteruzzaman ,Director, P, E & Mineral Resources Division , CEGIS, Gulshan-1, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS (Sample ID : SW-14)	Union:, Vill.:Akram Point
Sample Collection date:	Date of Testing: 28/02/2024-30/04/2024

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	Chemical Oxygen Demand (COD)	4.0	112	mg/L	CRM	4.0
3	Hardness	200-500	5450	mg/L	Titrimetic	-
4	Total Dissolved Solid (TDS)	1000	16100	mg/L	Multimeter	-
5	Total Suspended Solid (TSS)	10	3	mg/L	Gravimetric Method	-

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

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	Alam 15.05.2024	1.) Name: Mita Sarker Designation: Senior Chemist	15/05/2024
2.) Name: Taslima Akhter Designation: Sample Analyzer	15.05.2024	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka

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

Lab Memo: 1208/ CC, DPHE, CL, Dhaka — Date: 15-05-2024

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2024040090	Sample Receiving date: 28-02-2024
Ref. Memo No: 42.06.2626.119.37.001.24-00624 & Dated: 20-02-2024	Sample Source: Surface Water
Sent by:Mohammed Mukteruzzaman ,Director, P, E & Mineral Resources Division , CEGIS, Gulshan-1, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS (Sample ID : SW-15)	Union:, Vill.:Hiron Point
Sample Collection date:	Date of Testing: 28/02/2024-30/04/2024

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	Chemical Oxygen Demand (COD)	4.0	148	mg/L	CRM	4.0
3	Hardness	200-500	4950	mg/L	Titrimetic	-
4	Total Dissolved Solid (TDS)	1000	14000	mg/L	Multimeter	-
5	Total Suspended Solid (TSS)	10	3	mg/L	Gravimetric Method	-

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

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	Alam 15.05.2024	1.) Name: Mita Sarker Designation: Senior Chemist	
2.) Name: Taslima Akhter Designation: Sample Analyzer	15.05.2024	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	BHossain 15/05/2024 Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka

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

Lab Memo: 1208/ CC, DPHE, CL, Dhaka — Date: 15-05-2024

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2024040093	Sample Receiving date: 28-02-2024
Ref. Memo No: 42.06.2626.119.37.001.24-00624 & Dated: 20-02-2024	Sample Source: Ground Water
Sent by:Mohammed Mukteruzzaman ,Director, P, E & Mineral Resources Division , CEGIS, Gulshan-1, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS (Sample ID : GW-03)	Union:, Vill.:Project Site
Sample Collection date:	Date of Testing: 28/02/2024-30/04/2024

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.004	mg/L	AAS	0.001
2	Chemical Oxygen Demand (COD)	4.0	72	mg/L	CRM	4.0
3	Hardness	200-500	1200	mg/L	Titrimetic	-
4	Total Dissolved Solid (TDS)	1000	960	mg/L	Multimeter	-
5	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,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 15.05.2024	1.) Name: Mita Sarker Designation: Senior Chemist	
2.) Name: Taslima Akhter Designation: Sample Analyzer	15.05.2024	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	BHossain 15/05/2024 Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka

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

Lab Memo: 1208/ CC, DPHE, CL, Dhaka

Date: 15-05-2024

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2024040092	Sample Receiving date: 28-02-2024
Ref. Memo No: 42.06.2626.119.37.001.24-00624 & Dated: 20-02-2024	Sample Source: Ground Water
Sent by:Mohammed Mukteruzzaman ,Director, P, E & Mineral Resources Division , CEGIS, Gulshan-1, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS (Sample ID : GW-02)	Union:, Vill.:Rajnagar
Sample Collection date:	Date of Testing: 28/02/2024-30/04/2024

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.062	mg/L	AAS	0.001
2	Chemical Oxygen Demand (COD)	4.0	48	mg/L	CRM	4.0
3	Hardness	200-500	715	mg/L	Titrimetic	-
4	Total Dissolved Solid (TDS)	1000	615	mg/L	Multimeter	-
5	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,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 15.05.2024	1.) Name: Mita Sarker Designation: Senior Chemist	15/05/2024
2.) Name: Taslima Akhter Designation: Sample Analyzer	15.05.2024	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka

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Lab Memo: 1208/ CC, DPHE, CL, Dhaka

Date: 15-05-2024

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2024040091	Sample Receiving date: 28-02-2024
Ref. Memo No: 42.06.2626.119.37.001.24-00624 & Dated: 20-02-2024	Sample Source: Ground Water
Sent by:Mohammed Mukteruzzaman ,Director, P, E & Mineral Resources Division , CEGIS, Gulshan-1, Dhaka.	Dist:Bagerhat, Upa:Rampal
Care Taker: CEGIS (Sample ID : GW-01)	Union:, Vill.:Karpasdanga
Sample Collection date:	Date of Testing: 28/02/2024-30/04/2024

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.004	mg/L	AAS	0.001
2	Chemical Oxygen Demand (COD)	4.0	64	mg/L	CRM	4.0
3	Hardness	200-500	240	mg/L	Titrimetic	-
4	Total Dissolved Solid (TDS)	1000	370	mg/L	Multimeter	-
5	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,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 15.05.2024	1.) Name: Mita Sarker Designation: Senior Chemist	15/05/2024
2.) Name: Taslima Akhter Designation: Sample Analyzer	15.05.2024	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka

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Form No. QSF-22 Revision No. 12 Revision Date: 04 November, 2022

জীবনের জন্য বিজ্ঞান

"শেখ হাসিনার দর্শন, সব মানুষের উন্নয়ন"

বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ

BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Institute of National Analytical Research and Service (INARS)

ANALYSIS REPORT

ASC Ref No. : IN-140 of Analytical Service Cell
BCSIR-27/02/2024

Lab/Sample ID : A-360-385

Client's Details : মোহাম্মদ মোক্তারুজ্জামান
ডিরেক্টও (ইন-চার্জ) এন্ড সিনিয়র স্পেশালিস্ট
পাওয়ার, এনার্জি এন্ড মিনারেল রিসোর্স ডিভিশন
Center For Environmental And Geographic Information Service (CEGIS)
House No. 06, Road No. 23/C, Gulshan-01, Dhaka-1212

Number of Sample : 25 (Twenty Five)

Sample Description : রামপাল ২x৬৬০ মেঃ ওঃ বিদ্যুৎ প্রকল্পের অধীনে পানির নমুনা পরীক্ষণ প্রসংগে,
তারিখঃ ২৭/০২/২০২৪ ইং।

Test Commencement Date : 27/02/2024

Test Completion Date : 08/04/2024

Lab ID	Particulars of supplied sample	Parameters	Results	Test Method (APHA)
A-360	Water (Akram Point)	Oil and Grease	Less than 2.0 mg/L	5520.B
A-361	Water (Jetty-04)	Oil and Grease	Less than 2.0 mg/L	5520.B
A-362	Water (Mongla-12)	Oil and Grease	Less than 2.0 mg/L	5520.B
A-363	Water (Harbaria-13)	Oil and Grease	Less than 2.0 mg/L	5520.B
A-364	Water (Hiron Point-15)	Oil and Grease	Less than 2.0 mg/L	5520.B

Page 1 of 6

Note:
a. The results reported here are based only on the supplied samples in this laboratory.
b. Any complain about test report will not be acceptable after one month from the date of issuing of the said report.
c. This report/result shall not be reproduced/published without prior approval of the authority.

Analytical Service Cell
Dr, Qudrat-I-Khuda Road, Dhanmondi, Dhaka-1205, Bangladesh
Telephone: 9671108, Fax: 88-02-9671108 E-mail:asc@bcsir.gov.bd Website: www.bcsir.gov.bd

Form No. QSF-22 Revision No. 12 Revision Date: 04 November, 2022

জীবনের জন্য বিজ্ঞান

"শেখ হাসিনার দর্শন, সব মানুষের উন্নয়ন"

বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ

BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Lab ID	Particulars of supplied sample	Parameter	Results	Test Method (APHA)
A-365	Water (Sample-01)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
		Lead (Pb)	Less than 0.01 mg/L	3111.B
A-366	Water (Sample-02)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
		Lead (Pb)	Less than 0.01 mg/L	3111.B
A-367	Water (Sample-03)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
		Lead (Pb)	Less than 0.01 mg/L	3111.B
A-368	Water (Jetty-04)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
		Lead (Pb)	Less than 0.01 mg/L	3111.B
A-369	Water (Sample-05)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
		Lead (Pb)	Less than 0.01 mg/L	3111.B
A-370	Water (Sample-06)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
		Lead (Pb)	Less than 0.01 mg/L	3111.B
A-371	Water (Sample-07)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
		Lead (Pb)	Less than 0.01 mg/L	3111.B
A-372	Water (Sample-08)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
		Lead (Pb)	Less than 0.01 mg/L	3111.B
A-373	Water (Sample-09)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
		Lead (Pb)	Less than 0.01 mg/L	3111.B
A-374	Water (Sample-10)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
		Lead (Pb)	Less than 0.01 mg/L	3111.B
A-375	Water (Shapmari-11)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
		Lead (Pb)	Less than 0.01 mg/L	3111.B

Page 2 of 6

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Form No. QSF-22 Revision No. 12 Revision Date: 04 November, 2022

জীবনের জন্য বিজ্ঞান "শেখ হাসিনার দর্শন, সব মানুষের উন্নয়ন"

বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ

BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Lab ID	Particulars of supplied sample	Parameter	Results	Test Method (APHA)
A-376	Water (Mongla-12)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
		Lead (Pb)	Less than 0.01 mg/L	3111.B
A-377	Water (Harbaria-13)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
		Lead (Pb)	Less than 0.01 mg/L	3111.B
A-378	Water (Hiron Point-15)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
		Lead (Pb)	Less than 0.01 mg/L	3111.B
A-379	Water (Rajnagar)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
		Lead (Pb)	Less than 0.01 mg/L	3111.B
A-380	Water (Akram Point)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
		Lead (Pb)	Less than 0.01 mg/L	3111.B
A-381	Water (Kapashdanga GW)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
		Lead (Pb)	Less than 0.01 mg/L	3111.B
A-382	Water (Power Plant)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
		Lead (Pb)	Less than 0.01 mg/L	3111.B

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BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Lab ID	Particulars of supplied sample	Parameters	Results (µg/L)	Test Method (APHA)
A-383	**Water, Jetty-04** Polynuclear Aromatic Hydrocarbon (PAH)	Acenaphthene	Not detectable	6440.B
		Acenapthylene	Not detectable	6440.B
		Anthracene	Not detectable	6440.B
		Benzo[A]Anthracene	Not detectable	6440.B
		Benzo[B]Fluoranthene	Not detectable	6440.B
		Benzo[K]Fluoranthene	Not detectable	6440.B
		Benzo[G,H,I]Perilene	Not detectable	6440.B
		Benzo[A]Pyrene	Not detectable	6440.B
		Chrysene	Not detectable	6440.B
		Dibenzo[A,H]Anthracene	Not detectable	6440.B
		Fluoranthene	Not detectable	6440.B
		Fluorene	Not detectable	6440.B
		Indeno[1,2,3-CD]Pyrene	Not detectable	6440.B
		Naphthalene	Not detectable	6440.B
		Phenanthrene	Not detectable	6440.B
		Pyrene	Not detectable	6440.B
	Water, Jetty-04	Total Carbon	Not detectable	Elemental Analyzer
		TOC (Total Organic Carbon)	9.38 mg/L	5310.B

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BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Lab ID	Particulars of supplied sample	Parameters	Results (µg/L)	Test Method (APHA)
A-384	**Water, Harbaria-13** Polynuclear Aromatic Hydrocarbon (PAH)	Acenaphthene	Not detectable	6440.B
		Acenapthylene	Not detectable	6440.B
		Anthracene	Not detectable	6440.B
		Benzo[A]Anthracene	Not detectable	6440.B
		Benzo[B]Fluoranthene	Not detectable	6440.B
		Benzo[K]Fluoranthene	Not detectable	6440.B
		Benzo[G,H,I]Perilene	Not detectable	6440.B
		Benzo[A]Pyrene	Not detectable	6440.B
		Chrysene	Not detectable	6440.B
		Dibenzo[A,H]Anthracene	Not detectable	6440.B
		Fluoranthene	Not detectable	6440.B
		Fluorene	Not detectable	6440.B
		Indeno[1,2,3-CD]Pyrene	Not detectable	6440.B
		Naphthalene	Not detectable	6440.B
		Phenanthrene	Not detectable	6440.B
		Pyrene	Not detectable	6440.B
	Water, Harbaria-13	Total Carbon	Not detectable	Elemental Analyzer
		TOC (Total Organic Carbon)	5.10 mg/L	5310.B

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BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Lab ID	Particulars of supplied sample	Parameters	Results (µg/L)	Test Method (APHA)
A-385	**Water, Hiron Point-15** Polynuclear Aromatic Hydrocarbon (PAH)	Acenaphthene	Not detectable	6440.B
		Acenapthylene	Not detectable	6440.B
		Anthracene	Not detectable	6440.B
		Benzo[A]Anthracene	Not detectable	6440.B
		Benzo[B]Fluoranthene	Not detectable	6440.B
		Benzo[K]Fluoranthene	Not detectable	6440.B
		Benzo[G,H,I]Perilene	Not detectable	6440.B
		Benzo[A]Pyrene	Not detectable	6440.B
		Chrysene	Not detectable	6440.B
		Dibenzo[A,H]Anthracene	Not detectable	6440.B
		Fluoranthene	Not detectable	6440.B
		Fluorene	Not detectable	6440.B
		Indeno[1,2,3-CD]Pyrene	Not detectable	6440.B
		Naphthalene	Not detectable	6440.B
		Phenanthrene	Not detectable	6440.B
		Pyrene	Not detectable	6440.B
	Water, Hiron Point-15	Total Carbon	Not detectable	Elemental Analyzer
		TOC (Total Organic Carbon)	5.38 mg/L	5310.B

08/04/2024 08/04/2024 8/4/24

Analyst
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Scientific Officer
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BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Institute of National Analytical Research and Service (INARS)

ANALYSIS REPORT

ASC Ref No. : IN-141 of Analytical Service Cell BCSIR-27/02/2024

Lab/Sample ID : A-386-390

Client's Details : মোহাম্মদ মোস্তারুজ্জামান
ডিরেক্টর (ইন-চার্জ) এন্ড সিনিয়র স্পেশালিস্ট
পাওয়ার, এনার্জি এন্ড মিনারেল রিসোর্স ডিভিশন
Center For Environmental And Geographic Information Service (CEGIS)
House No. 06, Road No. 23/C, Gulshan-01, Dhaka-1212

Number of Sample : 05 (Five)

Sample Description : রামপাল ২x৬৬০ মেঃ ওঃ বিদ্যুৎ প্রকল্পের অধীনে পানির নমুনা পরীক্ষণ প্রসংগে, তারিখঃ ২৭/০২/২০২৪ ইং।

Test Commencement Date : 27/02/2024

Test Completion Date : 08/04/2024

Lab ID	Particulars of supplied sample	Parameters	Results	Test Method (APHA)
A-386	**River Bed Sediment (Harbaria)**	pH at 25.1^{0}C	8.64 (5% Solution)	4500-H$^+$.B
		Sulphate (SO_4)	596 mg/kg	4110.B
		Arsenic (As)	3.88 mg/kg	3114.C
		Lead (Pb)	6.34 mg/kg	3111.B
		Mercury (Hg)	0.15 mg/kg	3112.B

Page 1 of 2

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Form No. QSF-22 Revision No. 12 Revision Date: 04 November, 2022

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BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Lab ID	Particulars of supplied sample	Parameters	Results	Test Method (APHA)
A-387	**River Bed Sediment (Mongla)**	pH at 24.7^{0}C	8.77 (5% Solution)	4500-H$^+$.B
		Sulphate (SO_4)	480 mg/kg	4110.B
		Arsenic (As)	3.52 mg/kg	3114.C
		Lead (Pb)	6.07 mg/kg	3111.B
		Mercury (Hg)	0.11 mg/kg	3112.B
A-388	**River Bed Sediment (Jetty Site)**	pH at 25.2^{0}C	8.66 (5% Solution)	4500-H$^+$.B
		Sulphate (SO_4)	415 mg/kg	4110.B
		Arsenic (As)	3.69 mg/kg	3114.C
		Lead (Pb)	6.37 mg/kg	3111.B
		Mercury (Hg)	0.08 mg/kg	3112.B
A-389	**River Bed Sediment (Maidara)**	pH at 24.8^{0}C	8.65 (5% Solution)	4500-H$^+$.B
		Sulphate (SO_4)	349 mg/kg	4110.B
		Arsenic (As)	3.44 mg/kg	3114.C
		Lead (Pb)	6.40 mg/kg	3111.B
		Mercury (Hg)	0.07 mg/kg	3112.B
A-390	**River Bed Sediment (Akram Point)**	pH at 24.7^{0}C	8.74 (5% Solution)	4500-H$^+$.B
		Sulphate (SO_4)	816 mg/kg	4110.B
		Arsenic (As)	4.25 mg/kg	3114.C
		Lead (Pb)	8.20 mg/kg	3111.B
		Mercury (Hg)	0.14 mg/kg	3112.B

08/04/2024 08/4/24

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CEGIS Center for Environmental and Geographic Information Services
(A Public Trust under the Ministry of Water Resources)
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Tel: 88 02 58817649-52; 9842581, 9842551 Fax: 88 02 9843128 e-mail: cegis@cegisbd.com http://www.cegisbd.com

Environmental Laboratory

Memo No. ELAB202405000087 **Date: 22/05/2024**

Test Report
Analysis of Ambient Air

Project Name: Monitoring of Environmental Parameter & Implementation of EMP along with engineering activities during construction period of 2x660 MW MSTPP at Rampal, Bagerhat. Code: FPC008

Sample Type: Ambient Air Quality ID: FPC008_001 Experiment Date: (04-05)/05/2024

Location: 89°33' 13.7"E; 22° 35' 43"N; Maitree Township Area, Khulna

Experiment Time: 09:30 AM to 09:30 AM Downloaded Date:05/05/2024

Pollutant Results:

SL. NO.	Sampling ID	Test Duration (min)	Name of the Criteria Pollutants	Method	Unit	Concentration Present	Bangladesh (DoE) Standard	IFC/ World Bank Standard
01	AQ-01	1440	Suspended Coarse Particulate matter (PM_{10})	Sensor based instrumentation	μg/m³	23.74	150 (24Hrs)	150
02		1440	Fine particulate matter ($PM_{2.5}$)		μg/m³	21.63	65 (24Hrs)	75
03		1440	Suspended Particulate matter (SPM)		μg/m³	33.23 (Calculated value)	200 (ECR'97)	150
04		480	Carbon Monoxide (CO)		mg/m³	0.501	05 (08 Hrs)	-
05		1440	Sulphur dioxide (SO_2)		μg/m³	7.00	80 (24Hrs)	120
06		1440	Nitrogen dioxide (NO_2)		μg/m³	18.19	80 (24Hrs)	200
07		480	Ozone (O_3)		μg/m³	20.18	100 (08Hrs)	-

Test Performed by & checked by
Name: Md. Rafiqul Islam
Designation: Research Associate & Scientific Instrument In-Charge (addl.)
Signature: 22.05.24

Compiled & Approved by
Name: Md. Rafiqul Alam
Designation: Laboratory Expert
Signature: 22.05.24

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Environmental Laboratory

Memo No. ELAB202405000088 **Date: 22/05/2024**

Test Report
Analysis of Ambient Air

Project Name: Monitoring of Environmental Parameter & Implementation of EMP along with engineering activities during construction period of 2x660 MW MSTPP at Rampal, Bagerhat. Code: FPC008

Sample Type: Ambient Air Quality ID: FPC008_002 Experiment Date: 05/05/2024

Location: 89°35'16.49"; 22°34'37.11"N; Access Road bridge area or Taltola Bazar/BIFPCL (Project)

Experiment Time: 10:00 AM to 18:00 PM Downloaded Date:05/05/2024

Pollutant Results:

SL. NO.	Sampling ID	Test Duration (min)	Name of the Criteria Pollutants	Method	Unit	Concentration Present	Bangladesh (DoE) Standard	IFC/ World Bank Standard
01	AQ-02	480	Suspended Coarse Particulate matter (PM_{10})	Sensor based instrumentation	μg/m³	51.28	150 (24Hrs)	150
02		480	Fine particulate matter ($PM_{2.5}$)		μg/m³	42.88	65 (24Hrs)	75
03		480	Suspended Particulate matter (SPM)		μg/m³	73.84 (Calculated value)	200 (ECR'97)	150
04		480	Carbon Monoxide (CO)		mg/m³	0.036	05 (08 Hrs)	-
05		480	Sulphur dioxide (SO_2)		μg/m³	6.79	80 (24Hrs)	120
06		480	Nitrogen dioxide (NO_2)		μg/m³	17.53	80 (24Hrs)	200
07		480	Ozone (O_3)		μg/m³	24.66	100 (08Hrs)	-

Test Performed by & Checked by
Name: Md. Rafiqul Islam
Designation: Research Associate & Scientific Instrument In-Charge (addl.)
Signature: 22.05.24

Compiled & Approved by
Name: Md. Rafiqul Alam
Designation: Laboratory Expert
Signature: 22.05.24

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Environmental Laboratory

Memo No. ELAB202405000089 **Date: 22/05/2024**

Test Report
Analysis of Ambient Air

Project Name: Monitoring of Environmental Parameter & Implementation of EMP along with engineering activities during construction period of 2x660 MW MSTPP at Rampal, Bagerhat. Code: FPC008

Sample Type: Ambient Air Quality ID: FPC008_003 Experiment Date: 06/05/2024

Location: 89˚31'24.2"E; 22˚36'6.7"N; Chalna Bazar Area, Dacope

Experiment Time: 9:30 AM to 17:30 PM Downloaded Date: 06/05/2024

Pollutant Results:

SL. NO.	Sampling ID	Test Duration (min)	Name of the Criteria Pollutants	Method	Unit	Concentration Present	Bangladesh (DoE) Standard	IFC/ World Bank Standard
01	AQ-03	480	Suspended Coarse Particulate matter (PM_{10})	Sensor based instrumentation	µg/m³	36.28	150 (24Hrs)	150
02		480	Fine particulate matter ($PM_{2.5}$)		µg/m³	32.59	65 (24Hrs)	75
03		480	Suspended Particulate matter (SPM)		µg/m³	58.04 (Calculated value)	200 (ECR'97)	150
04		480	Carbon Monoxide (CO)		mg/m³	0.219	05 (08 Hrs)	-
05		480	Sulphur dioxide (SO_2)		µg/m³	5.93	80 (24Hrs)	120
06		480	Nitrogen dioxide (NO_2)		µg/m³	17.13	80 (24Hrs)	200
07		480	Ozone (O_3)		µg/m³	20.58	100 (08Hrs)	-

Test Performed by & Checked by
Name: Md. Rafiqul Islam
Designation: Research Associate & Scientific Instrument In-Charge (addl.)
Signature: 22.05.24

Compiled & Approved by
Name: Md. Rafiqul Alam
Designation: Laboratory Expert
Signature: 22.05.2024

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Environmental Laboratory

Memo No. ELAB202405000090 **Date: 22/05/2024**

Test Report
Analysis of Ambient Air

Project Name: Monitoring of Environmental Parameter & Implementation of EMP along with engineering activities during construction period of 2x660 MW MSTPP at Rampal, Bagerhat. Code: FPC008

Sample Type: Ambient Air Quality ID: FPC008_004 Experiment Date: 07/05/2024

Location: 89˚33'34.5"E; 22˚34'33.8"N; South-West corner of the project Boundary, Moidara

Experiment Time: 07:00 AM to 15:00 PM Downloaded Date:07/05/24

Pollutant Results:

SL. NO.	Sampling ID	Test Duration (min)	Name of the Criteria Pollutants	Method	Unit	Concentration Present	Bangladesh (DoE) Standard	IFC/ World Bank Standard
01	AQ-04	480	Suspended Coarse Particulate matter (PM_{10})	Sensor based instrumentation	µg/m³	31.73	150 (24Hrs)	150
02		480	Fine particulate matter ($PM_{2.5}$)		µg/m³	29.95	65 (24Hrs)	75
03		480	Suspended Particulate matter (SPM)		µg/m³	49.18 (Calculated value)	200 (ECR'97)	150
04		480	Carbon Monoxide (CO)		mg/m³	0.110	05 (08 Hrs)	-
05		480	Sulphur dioxide (SO_2)		µg/m³	1.97	80 (24Hrs)	120
06		480	Nitrogen dioxide (NO_2)		µg/m³	16.28	80 (24Hrs)	200
07		480	Ozone (O_3)		µg/m³	22.95	100 (08Hrs)	-

Test Performed by & checked by
Name: Md. Rafiqul Islam
Designation: Research Associate & Scientific Instrument In-Charge (addl.)
Signature: 22.05.24

Compiled & Approved by
Name: Md. Rafiqul Alam
Designation: Laboratory Expert
Signature: 22.05.24

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Environmental Laboratory

Memo No. ELAB202405000091 **Date: 22/05/2024**

Analysis of Ambient Air

Project Name: Monitoring of Environmental Parameter & Implementation of EMP along with engineering activities during construction period of 2x660 MW MSTPP at Rampal, Bagerhat. Code: FPC008

Sample Type: Ambient Air Quality ID: FPC008_005 Experiment Date: 08/05/2024

Location: 89°32'3.8"E; 22°36'32.5"N; Propose Township area near Chimney location, Sapmari.

Experiment Time: 09:00 AM to 17:00 PM Downloaded Date: 08/05/2024

Pollutant Results:

SL. NO.	Sampling ID	Test Duration (min)	Name of the Criteria Pollutants	Method	Unit	Concentration Present	Bangladesh (DoE) Standard	IFC/ World Bank Standard
01	AQ-05	480	Suspended Coarse Particulate matter (PM_{10})	Sensor based instrumentation	µg/m³	17.25	150 (24Hrs)	150
02		480	Fine particulate matter ($PM_{2.5}$)		µg/m³	16.27	65 (24Hrs)	75
03		480	Suspended Particulate matter (SPM)		µg/m³	27.60 (Calculated value)	200 (ECR'97)	150
04		480	Carbon Monoxide (CO)		mg/m³	0.188	05 (08 Hrs)	-
05		480	Sulphur dioxide (SO_2)		µg/m³	1.11	80 (24Hrs)	120
06		480	Nitrogen dioxide (NO_2)		µg/m³	17.03	80 (24Hrs)	200
07		480	Ozone (O_3)		µg/m³	24.63	100 (08Hrs)	-

Test Performed by & checked by

Name: Md. Rafiqul Islam
Designation: Research Associate & Scientific Instrument In-Charge (addl.)
Signature: 22.05.24

Compiled & Approved by

Name: Md. Rafiqul Alam
Designation: Laboratory Expert
Signature: 22.05.24

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Memo No. ELAB202405000092 **Date: 22/05/2024**

Test Report
Analysis of Ambient Air

Project Name: Monitoring of Environmental Parameter & Implementation of EMP along with engineering activities during construction period of 2x660 MW MSTPP at Rampal, Bagerhat. Code: FPC008

Sample Type: Ambient Air Quality ID: FPC008_006 Experiment Date: 09/05/2024

Location: 89°33'51.8"E; 22°36'1.06"N; North west corner of the project boundary (Koigardas Kathir Char)

Experiment Time: 10:00 AM to 18:00 PM Downloaded Date: 09/05/2024

Pollutant Results:

SL. NO.	Sampling ID	Test Duration (min)	Name of the Criteria Pollutants	Method	Unit	Concentration Present	Bangladesh (DoE) Standard	IFC/ World Bank Standard
01	AQ-06	480	Suspended Coarse Particulate matter (PM_{10})	Sensor based instrumentation	µg/m³	25.71	150 (24Hrs)	150
02		480	Fine particulate matter ($PM_{2.5}$)		µg/m³	24.20	65 (24Hrs)	75
03		480	Suspended Particulate matter (SPM)		µg/m³	37.28 (Calculated value)	200 (ECR'97)	150
04		480	Carbon Monoxide (CO)		mg/m³	0.180	05 (08 Hrs)	-
05		480	Sulphur dioxide (SO_2)		µg/m³	6.94	80 (24Hrs)	120
06		480	Nitrogen dioxide (NO_2)		µg/m³	18.57	80 (24Hrs)	200
07		480	Ozone (O_3)		µg/m³	26.90	100 (08Hrs)	-

Test Performed by & checked by

Name: Md. Rafiqul Islam
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Signature: 22.05.24

Compiled & Approved by

Name: Md. Rafiqul Alam
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Environmental Laboratory

Memo No. ELAB202405000093 **Date: 22/05/2024**

Test Report
Analysis of Ambient Air

Project Name: Monitoring of Environmental Parameter & Implementation of EMP along with engineering activities during construction period of 2x660 MW MSTPP at Rampal, Bagerhat. Code: FPC008

Sample Type: Ambient Air Quality ID: FPC008_007 Experiment Date: 10/05/2024

Location: 89°34'01.1"E; 22°32'3.3"N; Bauja Union 4km south west from the chimney location

Experiment Time: 10:00 AM to 18:00 PM Downloaded Date: 10/05/2024

Pollutant Results:

SL. NO.	Sampling ID	Test Duration (min)	Name of the Criteria Pollutants	Method	Unit	Concentration Present	Bangladesh (DoE) Standard	IFC/ World Bank Standard
01	AQ-07	480	Suspended Coarse Particulate matter (PM_{10})	Sensor based instrumentation	µg/m³	29.10	150 (24Hrs)	150
02		480	Fine particulate matter ($PM_{2.5}$)		µg/m³	27.12	65 (24Hrs)	75
03		480	Suspended Particulate matter (SPM)		µg/m³	43.65 (Calculated value)	200 (ECR'97)	150
04		480	Carbon Monoxide (CO)		mg/m³	0.253	05 (08 Hrs)	-
05		480	Sulphur dioxide (SO_2)		µg/m³	5.24	80 (24Hrs)	120
06		480	Nitrogen dioxide (NO_2)		µg/m³	17.16	80 (24Hrs)	200
07		480	Ozone (O_3)		µg/m³	24.55	100 (08Hrs)	-

Test Performed by & checked by
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Compiled & Approved by
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Environmental Laboratory

Memo No. ELAB202405000094 **Date: 22/05/2024**

Test Report
Analysis of Ambient Air

Project Name: Monitoring of Environmental Parameter & Implementation of EMP along with engineering activities during construction period of 2x660 MW MSTPP at Rampal, Bagerhat. Code: FPC008

Sample Type: Ambient Air Quality ID: FPC008_008 Experiment Date: 11/05/2024

Location: 89°34'37.7"E; 22°38'51.8"N; Barni, Gaurambha 4 KM North-West from the Chimney location

Experiment Time: 10:00 AM to 18:00 PM Downloaded Date: 11/05/2024

Pollutant Results:

SL. NO.	Sampling ID	Test Duration (min)	Name of the Criteria Pollutants	Method	Unit	Concentration Present	Bangladesh (DoE) Standard	IFC/ World Bank Standard
01	AQ-08	480	Suspended Coarse Particulate matter (PM_{10})	Sensor based instrumentation	µg/m³	23.75	150 (24Hrs)	150
02		480	Fine particulate matter ($PM_{2.5}$)		µg/m³	21.84	65 (24Hrs)	75
03		480	Suspended Particulate matter (SPM)		µg/m³	39.18 (Calculated value)	200 (ECR'97)	150
04		480	Carbon Monoxide (CO)		mg/m³	0.215	05 (08 Hrs)	-
05		480	Sulphur dioxide (SO_2)		µg/m³	5.02	80 (24Hrs)	120
06		480	Nitrogen dioxide (NO_2)		µg/m³	19.67	80 (24Hrs)	200
07		480	Ozone (O_3)		µg/m³	23.05	100 (08Hrs)	-

Test Performed by & checked by
Name: Md. Rafiqul Islam
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Signature: 22.05.24

Compiled & Approved by
Name: Md. Rafiqul Alam
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Signature: 22.05.2024

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Environmental Laboratory

Memo No. ELAB202405000095 **Date: 22/05/2024**

Test Report
<u>Analysis of Ambient Air</u>

Project Name: Monitoring of Environmental Parameter & Implementation of EMP along with engineering activities during construction period of 2x660 MW MSTPP at Rampal, Bagerhat. Code: FPC008

Sample Type: Ambient Air Quality ID: FPC008_009 Experiment Date: 12/05/2024

Location: 89°35'35.5"E; 22°46'36.8"N; Khulna Khan Jahan Ali Bridge near toll plaza area

Experiment Time: 8:00 AM to 16:00 PM Downloaded Date: 12/05/2024

<u>Pollutant Results:</u>

SL. NO.	Sampling ID	Test Duration (min)	Name of the Criteria Pollutants	Method	Unit	Concentration Present	Bangladesh (DoE) Standard	IFC/ World Bank Standard
01	AQ-09	480	Suspended Coarse Particulate matter (PM_{10})	Sensor based instrumentation	µg/m³	39.56	150 (24Hrs)	150
02		480	Fine particulate matter ($PM_{2.5}$)		µg/m³	35.53	65 (24Hrs)	75
03		480	Suspended Particulate matter (SPM)		µg/m³	62.10 (Calculated value)	200 (ECR'97)	150
04		480	Carbon Monoxide (CO)		mg/m³	0.432	05 (08 Hrs)	-
05		480	Sulphur dioxide (SO_2)		µg/m³	2.45	80 (24Hrs)	120
06		480	Nitrogen dioxide (NO_2)		µg/m³	16.78	80 (24Hrs)	200
07		480	Ozone (O_3)		µg/m³	20.76	100 (08Hrs)	-

Test Performed by & checked by

Name: Md. Rafiqul Islam
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Compiled & Approved by

Name: Md. Rafiqul Alam
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Environmental Laboratory

Memo No. ELAB202405000096 **Date: 22/05/2024**

Test Report
<u>Analysis of Ambient Air</u>

Project Name: Monitoring of Environmental Parameter & Implementation of EMP along with engineering activities during construction period of 2x660 MW MSTPP at Rampal, Bagerhat. Code: FPC008

Sample Type: Ambient Air Quality ID: FPC008_010 Experiment Date: 13/05/2024

Location: 89°35'50.4"E; 22°28'24.8"N; Mongla Port Area

Experiment Time: 10:00 AM to 18:00 PM Downloaded Date: 13/05/2024

<u>Pollutant Results:</u>

SL. NO.	Sampling ID	Test Duration (min)	Name of the Criteria Pollutants	Method	Unit	Concentration Present	Bangladesh (DoE) Standard	IFC/ World Bank Standard
01	AQ-10	480	Suspended Coarse Particulate matter (PM_{10})	Sensor based instrumentation	µg/m³	44.75	150 (24Hrs)	150
02		480	Fine particulate matter ($PM_{2.5}$)		µg/m³	38.82	65 (24Hrs)	75
03		480	Suspended Particulate matter (SPM)		µg/m³	71.60 (Calculated value)	200 (ECR'97)	150
04		480	Carbon Monoxide (CO)		mg/m³	0.254	05 (08 Hrs)	-
05		480	Sulphur dioxide (SO_2)		µg/m³	11.06	80 (24Hrs)	120
06		480	Nitrogen dioxide (NO_2)		µg/m³	16.38	80 (24Hrs)	200
07		480	Ozone (O_3)		µg/m³	19.81	100 (08Hrs)	-

Test Performed by & checked by

Name: Md. Rafiqul Islam
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Signature: 22.05.24

Compiled & Approved by

Name: Md. Rafiqul Alam
Designation: Laboratory Expert
Signature: 22.05.24

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Environmental Laboratory

Memo No. ELAB202405000097 **Date: 22/05/2024**

Test Report
Analysis of Ambient Air

Project Name: Monitoring of Environmental Parameter & Implementation of EMP along with engineering activities during construction period of 2x660 MW MSTPP at Rampal, Bagerhat. Code: FPC008

Sample Type: Ambient Air Quality ID: FPC008_011 Experiment Date: 14/05/2024

Location: 89°35'34.2"E 22°17'43.1"N; Harbaria, Sundarban

Experiment Time: 06:00 AM to 14:00 PM Downloaded Date: 22/05/2024

Pollutant Results:

SL. NO.	Sampling ID	Test Duration (min)	Name of the Criteria Pollutants	Method	Unit	Concentration Present	Bangladesh (DoE) Standard	IFC/ World Bank Standard
01	AQ-11	480	Suspended Coarse Particulate matter (PM_{10})	Sensor based instrumentation	µg/m³	52.71	150 (24Hrs)	150
02		480	Fine particulate matter ($PM_{2.5}$)		µg/m³	40.28	65 (24Hrs)	75
03		480	Suspended Particulate matter (SPM)		µg/m³	76.43 (Calculated value)	200 (ECR'97)	150
04		480	Carbon Monoxide (CO)		mg/m³	0.540	05 (08 Hrs)	-
05		480	Sulphur dioxide (SO_2)		µg/m³	9.61	80 (24Hrs)	120
06		480	Nitrogen dioxide (NO_2)		µg/m³	18.73	80 (24Hrs)	200
07		480	Ozone (O_3)		µg/m³	20.27	100 (08Hrs)	-

Test Performed by & checked by
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Designation: Research Associate & Scientific Instrument In-Charge (addl.)
Signature: 22.05.24

Compiled & Approved by
Name: Md. Rafiqul Alam
Designation: Laboratory Expert
Signature: 22.05.24

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Environmental Laboratory

Memo No. ELAB202405000098 **Date: 22/05/2024**

Test Report
Analysis of Ambient Air

Project Name: Monitoring of Environmental Parameter & Implementation of EMP along with engineering activities during construction period of 2x660 MW MSTPP at Rampal, Bagerhat. Code: FPC008

Sample Type: Ambient Air Quality ID: FPC008_012 Experiment Date: 16/05/2024

Location: 89°27'53.2"E; 21°46'27.60"N; Hiron Point, Sundarban

Experiment Time: 06:00 AM to 14:00 PM Downloaded Date: 22/05/2024

Pollutant Results:

SL. NO.	Sampling ID	Test Duration (min)	Name of the Criteria Pollutants	Method	Unit	Concentration Present	Bangladesh (DoE) Standard	IFC/ World Bank Standard
01	AQ-12	480	Suspended Coarse Particulate matter (PM_{10})	Sensor based instrumentation	µg/m³	50.65	150 (24Hrs)	150
02		480	Fine particulate matter ($PM_{2.5}$)		µg/m³	38.30	65 (24Hrs)	75
03		480	Suspended Particulate matter (SPM)		µg/m³	73.20 (Calculated value)	200 (ECR'97)	150
04		480	Carbon Monoxide (CO)		mg/m³	0.435	05 (08 Hrs)	-
05		480	Sulphur dioxide (SO_2)		µg/m³	8.50	80 (24Hrs)	120
06		480	Nitrogen dioxide (NO_2)		µg/m³	17.20	80 (24Hrs)	200
07		480	Ozone (O_3)		µg/m³	20.02	100 (08Hrs)	-

Test Performed by & checked by
Name: Md. Rafiqul Islam
Designation: Research Associate & Scientific Instrument In-Charge (addl.)
Signature: 22.05.24

Compiled & Approved by
Name: Md. Rafiqul Alam
Designation: Laboratory Expert
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Environmental Laboratory

Memo No. ELAB202405000099 **Date: 22/05/2024**

Test Report
Analysis of Ambient Air

Project Name: Monitoring of Environmental Parameter & Implementation of EMP along with engineering activities during construction period of 2x660 MW MSTPP at Rampal, Bagerhat. Code: FPC008

Sample Type: Ambient Air Quality ID: FPC008_013 Experiment Date: 17/05/2024

Location: 89°30'54.1"E, 22° '23.50"N; Akram Point (Sibsa River)

Experiment Time: 06:00 AM to 14:00 PM Downloaded Date:22/05/24

Pollutant Results:

SL. NO.	Sampling ID	Test Duration (min)	Name of the Criteria Pollutants	Method	Unit	Concentration Present	Bangladesh (DoE) Standard	IFC/ World Bank Standard
01	AQ-13	480	Suspended Coarse Particulate matter (PM_{10})	Sensor based instrumentation	μg/m³	55.85	150 (24Hrs)	150
02		480	Fine particulate matter ($PM_{2.5}$)		μg/m³	45.66	65 (24Hrs)	75
03		480	Suspended Particulate matter (SPM)		μg/m³	83.77 (Calculated value)	200 (ECR'97)	150
04		480	Carbon Monoxide (CO)		mg/m³	0.40	05 (08 Hrs)	-
05		480	Sulphur dioxide (SO_2)		μg/m³	10.20	80 (24Hrs)	120
06		480	Nitrogen dioxide (NO_2)		μg/m³	16.52	80 (24Hrs)	200
07		480	Ozone (O_3)		μg/m³	21.00	100 (08Hrs)	-

Test Performed by & checked by
Name: Md. Rafiqul Islam
Designation: Research Associate & Scientific Instrument In-Charge (addl.)
Signature: 22.05.24

Compiled & Approved by
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Designation: Laboratory Expert
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