



**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*

## **34<sup>th</sup> Quarter Monitoring Report**

**Monitoring Period: Aug – Oct 2022**



January 2022



*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, Bagerhat*

## **34<sup>th</sup> Quarterly Monitoring Report**

**Monitoring Period: August, 2022 – October, 2022**





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# Table of Contents

<b>Acknowledgements .....</b>	<b>i</b>
<b>List of Tables.....</b>	<b>vi</b>
<b>List of Figures .....</b>	<b>vii</b>
<b>Abbreviations and Acronyms .....</b>	<b>xi</b>
<b>Units.....</b>	<b>xiii</b>
<b>Units Conversion Table.....</b>	<b>xiii</b>
<b>Glossary .....</b>	<b>xv</b>
<b>Executive Summary.....</b>	<b>xvii</b>
<b>1. Introduction .....</b>	<b>1</b>
1.1 Background .....	1
1.2 Objectives.....	1
1.3 Criteria for Selection of Monitoring Sites/Locations.....	1
1.4 Main Stakeholders.....	5
1.4.1 Forest Department.....	5
1.4.2 Department of Environment (DoE).....	5
1.4.3 Bangladesh India Friendship Power Company (Pvt.) Limited (BIFPCL).....	5
1.4.4 Local Community.....	5
1.4.5 Major Component of Monitoring Study .....	6
<b>2. Physical Environment.....</b>	<b>7</b>
2.1 Air Quality.....	7
2.1.1 Methodology.....	7
2.1.2 Method of Sampling and Laboratory Testing.....	7
2.1.3 Pollution Sources in the Sundarbans .....	7
2.1.4 Monitoring Locations.....	7
2.1.5 Status of Air Quality.....	11
2.2 Noise Quality.....	16
2.2.1 Methodology.....	16
2.2.2 Noise in the study area.....	16
2.2.3 Locations of Noise Level Monitoring.....	17
2.2.4 Status of Noise .....	17
2.2.5 Findings.....	22
2.3 Water Quality .....	22

2.3.1	Methodology .....	22
2.3.2	Selection of Parameters .....	27
2.3.3	Surface Water Sampling Procedure .....	27
2.3.4	Water Quality Parameter Analysis Techniques/Methods .....	28
2.3.5	Water Quality Reporting Arrangement .....	29
2.3.6	Status of the Groundwater quality .....	38
2.4	Land and Agricultural Resources Monitoring .....	40
2.4.1	Methodology of land resources monitoring .....	40
2.4.2	Process of Soil Samples Collection .....	45
2.4.3	Methodology for Agricultural resources monitoring .....	45
2.4.4	Present Cropping Patterns of Monitoring Plots .....	45
2.4.5	Crop production in the monitoring plots .....	46
2.4.6	Crop damage in the monitoring plots .....	46
2.4.7	Methodology for Livestock Resources Monitoring .....	47
2.5	Water resources monitoring .....	47
2.5.1	Methodology .....	47
2.5.2	Process of Sediment Samples Collection .....	51
2.5.3	Status of sediment quality .....	51
2.6	Transportation Monitoring .....	53
2.6.1	Location of Traffic Survey .....	53
2.6.2	Methodology .....	53
2.6.3	Traffic Volume Calculation .....	53
2.6.4	Results of Monitoring .....	54
<b>3.</b>	<b>Biological Environment .....</b>	<b>57</b>
3.1	Fisheries Resources .....	57
3.1.1	Methodology .....	57
3.1.2	Status of Monitoring .....	58
3.2	Monitoring of Ecosystem and Bio-diversity .....	72
3.2.1	Indicators Selection .....	72
3.2.2	Rationales for Selection of Locations .....	73
3.2.3	Terrestrial Ecosystem .....	73
3.2.4	Aquatic Ecosystem Monitoring .....	83
3.3	Sundarbans Forest Health monitoring .....	90
3.3.1	Background .....	90
3.3.2	Methodology .....	91

3.3.3	Monitoring Result and discussion of SRF Health.....	98
<b>4.</b>	<b>Social Environment.....</b>	<b>111</b>
4.1	Introduction.....	111
4.1.1	Methodology.....	111
<b>5.</b>	<b>Environmental Compliance .....</b>	<b>119</b>
5.1	Introduction.....	119
5.2	Compliance to the Conditions of DoE (EIA study of Coal Transportation) .....	154
	<b>References .....</b>	<b>165</b>
	<b>Appendix I: Checklist of Monitoring Environmental Compliances.....</b>	<b>173</b>
	<b>Appendix II: Photo Album.....</b>	<b>179</b>
	<b>Appendix III: Terms of References (ToR).....</b>	<b>183</b>
	<b>Appendix IV: Monitoring Data.....</b>	<b>189</b>

## List of Tables

Table 2.1: Air Quality Monitoring Plan.....	11
Table 2.2: Air Quality Monitoring Results (34 <sup>th</sup> Quarterly Program) .....	15
Table 2.3: Noise Monitoring Plan .....	17
Table 2.4: Summary of the Ambient Noise Levels Recorded in Consecutive Monitoring Periods .....	21
Table 2.5: Groundwater Quality Monitoring Parameters, Locations and Plan .....	23
Table 2.6: Surface Water Quality Monitoring Parameters, Locations and Plan.....	23
Table 2.7: Testing Methodology of Water Quality Parameter .....	28
Table 2.8: Monitoring Sites and Characteristics.....	29
Table 2.9: Land Resources Monitoring Plan .....	42
Table 2.10: Location and Sediment Monitoring Plan.....	48
Table 2.11: Reference level of different metals in sediment of the Passur River .....	51
Table 2.12: Vehicle Conversion Factors.....	53
Table 2.13: Calculated PCU in Three Locations at Three Different Time Period .....	54
Table 3.1: The Sampling Locations for Monitoring of Fisheries Resources .....	57
Table 3.2: Classification of habitat use of 10 sampling sites.....	61
Table 3.3: Site Wise Species Diversity using Shannon–Weiner Index (1 <sup>st</sup> to 13 <sup>th</sup> QM).....	65
Table 3.4: Site Wise Species Diversity using Shannon–Weiner Index (14 <sup>th</sup> to 34 <sup>th</sup> QM).....	65
Table 3.5: Site wise Rich Species Number (1 <sup>st</sup> to 12 <sup>th</sup> QM) .....	66
Table 3.6: Site wise Rich Species Number (13 <sup>th</sup> to 34 <sup>th</sup> QM) .....	66
Table 3.7: Stocking Pattern of Fish/Shrimp Farm.....	69
Table 3.8: Growth Rate and Mortality of Fish/Shrimp (1 <sup>st</sup> to 13 <sup>th</sup> QM) .....	70
Table 3.9: Growth Rate and Mortality of Fish/Shrimp (15 <sup>th</sup> to 34 <sup>th</sup> QM) .....	70
Table 3.10: Total Catch in Different Gears in the Sampling Sites.....	71
Table 3.11: Total Catch in the Sampling Sites .....	71
Table 3.12: Plant species composition of the sampled homesteads.....	75
Table 3.13: Proportion of healthy and unhealthy plants in studied homesteads.....	78
Table 3.14: Vegetation Canopy Cover in different studied homesteads.....	80
Table 3.15: Bird Nest Monitoring Datasheet .....	81
Table 3.16: Dolphin observation Datasheet.....	89
Table 3.17: General Description of Permanent Sampling Plots (PSPs).....	95
Table 3.18: Temporal variation of mean carbon density (30 <sup>th</sup> carbon density).....	104
Table 3.19: Temporal variation of mean carbon density (34 <sup>th</sup> carbon density).....	104

Table 3.20: Relevance of Key Soil Variables.....	106
Table 3.21: Mean soil properties among the Five monitoring sites in SRF .....	107
Table 5.1: Monitoring of Environmental and Social Management System Action Plan Implementation .....	121
Table 5.2: Monitoring of Labor and Working Condition.....	128
Table 5.3: Monitoring of Community Health, Safety and Security .....	133
Table 5.4: Monitoring of Biodiversity and Sustainable Management of Living Natural Resources....	137
Table 5.5: Status of Compliance to the Conditions of DoE.....	139
Table 5.6: Compliance conditions of DoE (EIA study of Coal transportation) .....	154

## List of Figures

Figure 1.1: Location Map of the Study Area .....	3
Figure 1.2: AOI of Environmental and Socio-economic Monitoring.....	4
Figure 2.1: Acquisition of Air Quality Monitoring data .....	8
Figure 2.2: Air Quality Monitoring Locations.....	9
Figure 2.3: Seasonal Variation of the Air Quality Parameters.....	13
Figure 2.4: Dendrogram of the Monitoring Stations using Euclidean Distance.....	14
Figure 2.5: Ambient Noise Acquisition.....	16
Figure 2.6: Noise Level Monitoring Locations.....	19
Figure 2.7: Status of average seasonal variations of noise level at different monitoring locations.....	21
Figure 2.8: Status of noise level of 34 <sup>th</sup> monitoring season at different locatons.....	21
Figure 2.9: Surface Water and Groundwater Quality Monitoring Location .....	25
Figure 2.10: Collection and Insitu testing of Groundwater .....	27
Figure 2.11: Water sample collection and Insitu Testing of Water Parameters .....	28
Figure 2.12: Seasonal Variations in pH values in different monitoring sites.....	31
Figure 2.13: Seasonal Variations in Temperature values in different monitoring sites .....	31
Figure 2.14: Seasonal Variations in Salinity values in different monitoring sites .....	31
Figure 2.15: Seasonal Variations in DO values in different monitoring sites .....	31
Figure 2.16: Seasonal Variations in TDS values in different monitoring sites.....	31
Figure 2.17: Seasonal Variations in TH values in different monitoring sites .....	31
Figure 2.18: Seasonal Variations in TSS values in different monitoring sites.....	31
Figure 2.19: Seasonal Variations in COD values in different monitoring sites .....	31
Figure 2.20: Seasonal Variations in Nitrate values in different monitoring sites.....	32



Figure 2.21: Seasonal Variations in Sulphate values in different monitoring sites .....	32
Figure 2.22: Seasonal Variations in Phosphate values in different monitoring sites.....	32
Figure 2.23: Seasonal Variations in Arsenic values in different monitoring sites.....	32
Figure 2.24: Seasonal Variations in Lead values in different monitoring sites.....	32
Figure 2.25: Seasonal Variations in G-pH values in different monitoring sites.....	32
Figure 2.26: Seasonal Variations in G-Temperature values in different monitoring sites.....	33
Figure 2.27: Seasonal Variations in G-Salinity values in different monitoring sites .....	33
Figure 2.28: Seasonal Variations in G-DO values in different monitoring sites.....	33
Figure 2.29: Seasonal Variations in G-TDS values in different monitoring sites .....	33
Figure 2.30: Seasonal Variations in monsoon G-TSS values in different monitoring sites.....	33
Figure 2.31: Seasonal Variations in monsoon G-TH values in different monitoring sites .....	33
Figure 2.32: Seasonal Variations in G-COD values in different monitoring sites.....	34
Figure 2.33: Seasonal Variations in G-Nitrate values in different monitoring sites .....	34
Figure 2.34: Seasonal Variations in monsoon G-Sulphate values in different monitoring sites .....	34
Figure 2.35: Seasonal Variations in monsoon G-Phosphate values in different monitoring sites.....	34
Figure 2.36: Seasonal Variations in monsoon G-Arsenic values in different monitoring sites .....	34
Figure 2.37: Seasonal Variations in monsoon G-Lead values in different monitoring sites.....	34
Figure 2.38: Land and Agricultural Resource Monitoring Locations .....	43
Figure 2.39: Locations of Sediment Sampling.....	49
Figure 2.40: Sediment quality monitoring data at different locations of the Passur River .....	53
Figure 2.41: Locations of Traffic Survey.....	55
Figure 3.1: Fisheries Resources Monitoring Locations .....	59
Figure 3.2: Habitat classification on the basis of different life stages of fish species.....	63
Figure 3.3: Dendrogram showing similarity in binary species composition in three sampling sites ....	63
Figure 3.4: Photos of some observed fish species in 34 <sup>th</sup> quarter monitoring .....	67
Figure 3.5: Site-wise fish species richness (FSR) in the Passur River System .....	67
Figure 3.6: Habitat Distribution of Different Life Stages of Fish Species.....	68
Figure 3.7: Relative abundance of major migratory fish species in sampling sites .....	68
Figure 3.8: Migration extent of major migratory fish species in sampling sites .....	69
Figure 3.9: Fishing gears observed during 34 <sup>th</sup> quarter monitoring.....	72
Figure 3.10: Overviews of the monitoring site of Rajnagar.....	77
Figure 3.11: Occurrence of dolphins in Passur and Maidara River along the project site .....	85
Figure 3.12: Location of dolphin occurrences in Dhangmari Khal.....	86
Figure 3.13: Location of dolphin occurrences in Chandpai .....	87
Figure 3.14: Location of dolphin occurrence in Bhadra Khal.....	88

Figure 3.15: Location Map of Sundarbans Forest Health Monitoring Plots (PSP).....	93
Figure 3.16: Layout of the Subplots and Transect Line Perpendicular from Ecotone (river or canal bank).....	95
Figure 3.17: Layout of the Survey Activities in each Subplot.....	96
Figure 3.18: Team members measuring DBH and Height of trees.....	96
Figure 3.19: Team members Counting Pneumatophores .....	97
Figure 3.20: Team members counting crab hole .....	97
Figure 3.21: Team member taking canopy cover and light intensity using Densitometer and Lux meter .....	98
Figure 3.22: Pneumatophore density among the four plots between two different time periods.....	99
Figure 3.23: Crab hole density among the four plots between two different time periods .....	99
Figure 3.24: Seedling density among the four plots between two different time periods.....	100
Figure 3.25: Canopy coverage among the four plots between two different time periods.....	100
Figure 3.26: Leaf Area Index between two different time periods .....	101
Figure 3.27: Temporal Variation of Mean DBH in five study plots in SRF .....	102
Figure 3.28: Temporal Variation of basal area ( $\text{m}^2\text{ha}^{-1}$ ) in five study plots in SRF .....	102
Figure 3.29: Temporal Variation of Mean Stem density (trees ( $\text{DBH} \geq 5$ )/ $\text{ha}^{-1}$ ) .....	103
Figure 3.30: Species diversity index, evenness index and richness index of the monitoring site in SRF .....	103
Figure 3.31: Soil Quality Parameters in the observed plots.....	109
Figure 4.1: Unsafe asbestos management.....	112
Figure 4.2: ICU arrangement in Niramoy Medical.....	112
Figure 4.3: Socio-Economic Environment Monitoring Location.....	113
Figure 4.4: RO treatment and filtering system installation in the study area .....	115
Figure 4.5: Medical Campaign from August 2022 to October 2022.....	116



## Abbreviations and Acronyms

AAS	Atomic Absorption Spectrophotometer
AECL	Adroit Environment Consultants Ltd
As, Pb, Hg	Arsenic, Lead and Mercury
BCSIR	Bangladesh 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

$1^{\circ}\text{C} = 274.15 \text{ K} = 33.8^{\circ} \text{ F}$   
 1 hectare =  $10^{-2} \text{ km}^2 = 2.471 \text{ acres}$   
 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  
 $1 \text{ mg/L} \approx 1 \text{ g/m}^3 \approx 1 \text{ ppm (w/w)}$   
 $1 \text{ mg/m}^3 = 1 \mu\text{g /L}$   
 $1 \text{ pascal} = 1 \text{ N/m}^2 = 0.01 \text{ millibar}$   
 1 square mile = 640 acre =  $2.590 \text{ km}^2$

### Energy Units

$1 \text{ GWyr} = 8.76 \times 10^9 \text{ kW}$   
 1 horsepower = 746 W  
 1 KWh = 3412 Btu  
 1 kWh = 859.85 kcal  
 $1 \text{ KWh} = 3.6 \times 10^6 \text{ J}$   
 $1 \text{ MW} = 1000 \text{ KW} = 10^6 \text{ W}$





## Glossary

<i>Aman:</i>	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.
<i>Aus:</i>	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.
<i>B Aus:</i>	Broadcast Aus
<i>Bazar:</i>	Market
<i>Beel:</i>	A saucer-shaped natural depression, which generally retains water throughout the year and in some cases seasonally connected to the river system.
<i>Boro:</i>	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.
<i>Haat:</i>	Market place where market exchanges are carried out either once, twice or thrice a week, however not every day.
<i>Gear/Jaal:</i>	Different types of fishing net to catch fish from the water bodies.
<i>Kutchra:</i>	A house made of locally available materials with earthen floor, commonly used in the rural areas.
<i>Khal:</i>	A drainage channel usually small, sometimes man-made through which the water flows. These may or may not be perennial.
<i>Kharif:</i>	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).
<i>Perennial Khal:</i>	Water available in the khal all the year round.
<i>Pacca:</i>	Well-constructed building using modern masonry materials.
<i>Rabi:</i>	Dry agricultural crop growing season; mainly used for the cool winter season between November and February.
<i>Seasonal Khal:</i>	Water not available in the khal all the year round.
<i>T. Aman:</i>	Transplanted Aman
<i>Upazila:</i>	Upazila is an administrative subdivision of a District.



## Executive Summary

This 34<sup>th</sup> quarterly monitoring report covers the status of EMP (Environmental Management Plan) implementation for the concurrent period (during construction stage) as recommended in the EIA (Environmental Impact Assessment) study of power plant vide Memo No: DoE/Clearance/5062/2011 dt. 05/08/2013 as well as EIA report of Coal Transportation vide Memo No: DoE/Clearance/5532/2016 dtd.31/01/2018. During the month of October, 2022 CEGIS team carried out the monitoring activities covering every monitoring aspects as assigned in the ToR (Terms of Reference) and approval conditions of DoE along with valuable suggestions and recommendations from different national and international organizations. In other words, the aspects can briefly be addressed as monitoring of the Environmental Compliances and monitoring of the selected environmental parameters such as ambient air quality, noise level, water quality, land resource, traffic management status, water resources management status, agricultural resources monitoring, fisheries resources, Socio-economic monitoring, aquatic & terrestrial ecosystem monitoring and the Sundarbans Reserve Forest (SRF) health monitoring.

However, the present environmental compliance monitoring includes the status of EMP implementation based on physical observation, investigation and interviews/discussion 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; Labour and Working Condition; Community Health, Safety and Security; Biodiversity and Sustainable Management of Living Natural Resources, waste management and other relevant issues. Unlike the 33<sup>rd</sup> environmental compliance monitoring report this quarterly report will focus again on waste generation and its management in and around of the main plant and labour shed. It is noted that during 33<sup>rd</sup> 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 34<sup>th</sup> visit we had a quick look on those issues again and found that all waste related issues are still unsolved. CEGIS raised this issue in the meeting to consider this issue as urgent and project management has assured us to take immediate step to resolve the issue. Along with the previous issues we would like to bring the following issues to the respective authorities for an earlier solution:

- a. The sensitive and critical issue has come in front is the Asbestos management issue. Plenty of Asbestos fibre were observed in the plant premises specially at the boiler and ESP plant site. Lack of proper management, Asbestos can be a serious health hazard causing the lung function decrease, lung cancer and even death if someone inhale plenty of Asbestos fibres. We strongly suggested to take necessary actions to manage the Asbestos as soon as possible.
- b. Waste management issues need to be solved as soon as possible. The lavatory waste sewerage facility is inadequate at labour shed that is causing substantial environmental hazard in and around the camp area. Also dumping the construction waste by the side of Maidara River and Coal-water slurry at the jetty area has become a significant threat for the aquatic ecosystem at Maidara and Pashur River respectively mixing by rain water and other ways.
- c. Coal Conveyor belt from jetty area to 1<sup>st</sup> Transportation Point (About 20 to 25 m) found uncovered and no integrated dust control system that is allowing 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.

- d. Heap of Sand and other loose material were found uncovered at the labour shed and inside the plant premises.

On the other hand, during the monitoring period, it was observed that the concentration of criteria pollutants was found to be much higher at Mongla ghat area than the other locations whereas lowest concentration was observed at the Gaurambha area. On the other hand, according to the observed data it can be concluded that the concentration of major air pollutants was found comparatively lower in the Sundarbans area than that of the other monitoring locations. But due to the seasonal effect the concentration of the particulate matters ( $PM_{2.5}$ ,  $PM_{10}$  and SPM) was found to be slightly higher at Khan Jahan Ali Bridge area comparing to the standards set by DOE (Air pollution control rules, 2022). On the contrary, the concentration of  $SO_2$ , &  $NO_x$  which found to be higher in monsoon periods and CO concentration was found higher in post monsoon seasons. Nevertheless, the concentration as averaged for the corresponding locations were found to be lower than the standards (air pollution control Rules, 2022). However, major sources of criteria pollutants generation in and around the project site as observed were the piling activities, digging, tunneling and burrowing works, jetty erection activities, major construction works, dust from unpaved roads and vehicle movement, construction materials and goods transportation activities through the roads and river Passur etc. Other sources of pollutants which may contribute to the existing pollution load are the small industries like cement works and refinery industries etc., diffuse sources like wood stoves, fires and wind generated dust etc.

In course of noise level monitoring, noise generation activities were observed to be higher in mongla port and mongla ghat area than in Khan Jahan Ali bridge area followed by power plant adjacent area i.e. Maidara, Koigordashkatir char, bajua and shapmari area. On the other hand, lowest noise level has been observed in the Sundarbans reserve forest area and completely complied with the Noise Control Rules 2006 the noise generation sources in the study area can mainly be divided into two types; one is natural and the other one is anthropogenic. Natural sources of noise generation were birds' chirping, stormy wind, wave breaking on the shoreline, howling of leaves and so on. On the other hand, traffic mobilization, industrial activities, vessels movement within the rivers and local vehicles were the anthropogenic sources of noise. However, the observed noise level was not found to exceed the Bangladesh standard limit of noise.

The physico-chemical properties of Passur iver changes with the tidal intrusion in different seasons. During 34<sup>th</sup> quarterly monitoring, pH was found slightly basic in nature. Salinity, Temperature and Dissolved oxygen level was found in fair and favourable for the aquatic life forms. During the 33<sup>rd</sup> quarter (monsoon, 2022), TDS and TH has been relatively same with respect to the same seasons of last consecutive years. Nitrate ( $NO_3^-$ ) level remained relatively lower. The phosphate ( $PO_4^{3-}$ ) was found within the safe limit of aquatic organisms. In case of metal pollution, no variation was recorded for As, Pb and Hg concentration and even no issues as well. Oil & grease concentration was found less than 2.0 mg/L at all sites which is less than the recommended concentration (10 mg/L) for Inland Surface Water. On the other hand, the physical characteristics of groundwater quality is still in good condition with slight variation in pH and salinity. The reason being saline water intrusion and infiltration due to excessive withdrawn of groundwater by the surrounding communities during the dry season. During the monitoring tier As concentration breached the national water quality standard. However, the owner of the tube well will be informed to and monitoring will be continued in order to understand the facts. In addition, evaporation also responsible for this slight salinity in groundwater. Project activities are not related to this sort of changes in salinity. Chemical characteristics of the groundwater quality are also found relatively good.

Again, soil samples were collected during October, 2022. The samples were immediately sent to SRDI, Dhaka laboratory for analysis. The result will be incorporated in next report. Local Aman was planted

in all monitoring locations except Baranpara and Bidyarban. Kapalimet and remain fallow as previous as aquaculture continues. However, agricultural practice and management remains similar to previous monitoring. Production and damage related data will be incorporated in 35<sup>th</sup> monitoring report. No specific impact was drawn for livestock during this monitoring. Agricultural and livestock data was not collected during this monitoring field visit as per TOR obligation. Next survey will be conducted in October, 2022 and report will be incorporated accordingly.

Similar to the earlier quarterly monitoring report, Khulna Mongla Road at Khudir Bottola received the highest traffic volume compared to the other two locations namely Khulna Mongla Road at Gonai Bridge and Power Plant access road at Taltola Bridge. On the other hand, Access road of the Power plant receives the lowest traffic load than the other monitoring locations. Moreover, during the noon time traffic loads were observed to be lower than the other time of the day. Vehicular movements at access road area were observed during the surveys were mostly for the regular construction activities of the Power Plant but decreasing than the previous time as one unit of 2x660 MW has already been completed. Furthermore, due to the completion of the Padma Bridge the Khulna mongla roads are receiving more traffic recently.

Sediment sample were collected during the 33<sup>rd</sup> monitoring (July, 2022 or wet season) and the analysis results are incorporated in this report. According to the analyzed data, Mercury (Hg) didn't cross average shale value (ASV) in any locations but crosses average upper crust value (AUCV) in three locations (Jetty site, Moidata River and Mongla port) and touches in one (Akram point). Both Arsenic (As) and Lead (Pb) concentration found to be lower than ASV and AUCV in all monitoring locations. Compared to previous wet season monitoring report (January, 2021), Pb and Hg concentration is increased in Jetty point while As concentration is decreased. The maximum concentration for As and Hg is found in Jetty site (project site) while Pb maximized in Akram point. All monitoring heavy metal (As, Pb and Hg) exceeds this monitoring average at jettry site.

Monitoring of 34-quarter for fisheries resources have been conducted at 13 sampling sites which were set at the inception stage. Out of these sites, effective samplings were done at 07 sites as fishing in other sites in the river were not observed. Amongst the effective sites, four (04) were in the river and three (03) were in the country side (shrimp farms). The followings are the key findings of the 34<sup>th</sup> quarter monitoring in the fiscal year of 2022-23. 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 and 2021-22), 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 ground and ii) ground for maturation. Shannon-Weiner diversity index has also been observed to vary between 34-quarter with that of all previous quarters. Highest Shannon-Weiner index was found at Charaputia (0.81) indicating high evenly distributed fish species. On the contrary, lowest evenness was found at the Akram Point (0.39). However, maximum FSR was obtained in the Charaputia (n=13), while very low FSR was recorded at the Haldikhali (n=07). Among habitats in the down-stream of the Passur River system, Akram point was home to rich assemblage of Chaka Chingri and Paissa, Haldikhali was rich of Kathali Chingri and Paissa, Charaputia was rich assemblage of Kathali Chingri, Gagra Tengra and Datina, Harbaria was rich of Chaka Chingri, Motka and Datina. Fish species like Paissa, Datina, Gagra Tengra and Chota Baila attain the maximum abundance among the migratory fish species observed in the 34<sup>th</sup> quarter of monitoring. Moreover, among the migratory species, Paissa, Chitra and Baila were observed to migrate long distance. In this monitoring, the highest productivity was found at Akram point followed by Harbaria. The present study revealed that the

highest catch susceptibility was also found in case of Borshi (3.75 kg/haul).

Vegetation composition, plant diversity, vegetation canopy status, plant health, bird habitat status, dolphin occurrence in aquatic ecosystems have been monitored for this monitoring season. A total of 64 tree species were recorded from all the monitoring sites with Shanon-Winner diversity index of 3.59 which shows the diversity has been improved than previous monitoring tier. Canopy status and plant health detected deteriorating trend and in Rajnagar site found drastically fall of canopy cover as well as plant health. 10 bird nest of resident avifauna was sighted at the studied homestead in Chalkghona. Occurrences of dolphin has been recorded higher in Passur-Maidara River, Dhangmari Khal, Shella Gang and Bhadra Khal with an encounter rate 0.26, 0.32, 0.56 and 4.26 individuals/km/hour respectively.

The Center for Environmental and Geographic Information Services (CEGIS) team has been periodically monitoring (34<sup>th</sup>) the Sundarbans Reserve Forest's health to oversee the probable impacts of the Rampal Thermal Coal Power Plant Project under implementation. Various bio-indicators such as tree growth, species diversity, seedling regeneration capacity, pneumatophore occurrence, carbon stock, crab hole density, canopy cover changes, Leaf Area Index, leaf phenology, pest, and diseases were observed in the permanent sample plots (PSPs) along the Passur River over time. Presently diverse change has been found in forest include gap phase dynamics, retrogression process, massive siltation and erosion in all PHPs. The complex species sundari have been affected in top dying in Harbaria point and Akram point. Koromjol have great species diversity with wealth regeneration process. Among the species, the height of Baen and Kakra is good in number. Lower species diversity in Hiron point indicates that it is ecologically less stable than other sites due to sand carpeting. Last visit, it was observed that crab hole density increased in Akram point and Hiron point. However, it is found that the Leaf Area Index has increased in Karamjol, Akram point and Hiron point from previous results. Generally, it tends to be said that forest health condition along the Passur River is in stable condition.

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

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

# 1. Introduction

## 1.1 Background

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

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

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

Monitoring of Environmental parameters and associated data collection is being continued considering the spatial as well seasonal variations. However, in October, 2022 CEGIS team has carried out the 34<sup>th</sup> quarterly monitoring activities covering all the preselected monitoring parameters.

## 1.2 Objectives

The prime objectives of the study are:

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

## 1.3 Criteria for Selection of Monitoring Sites/Locations

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

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



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





Figure 1.1: Location Map of the Study Area



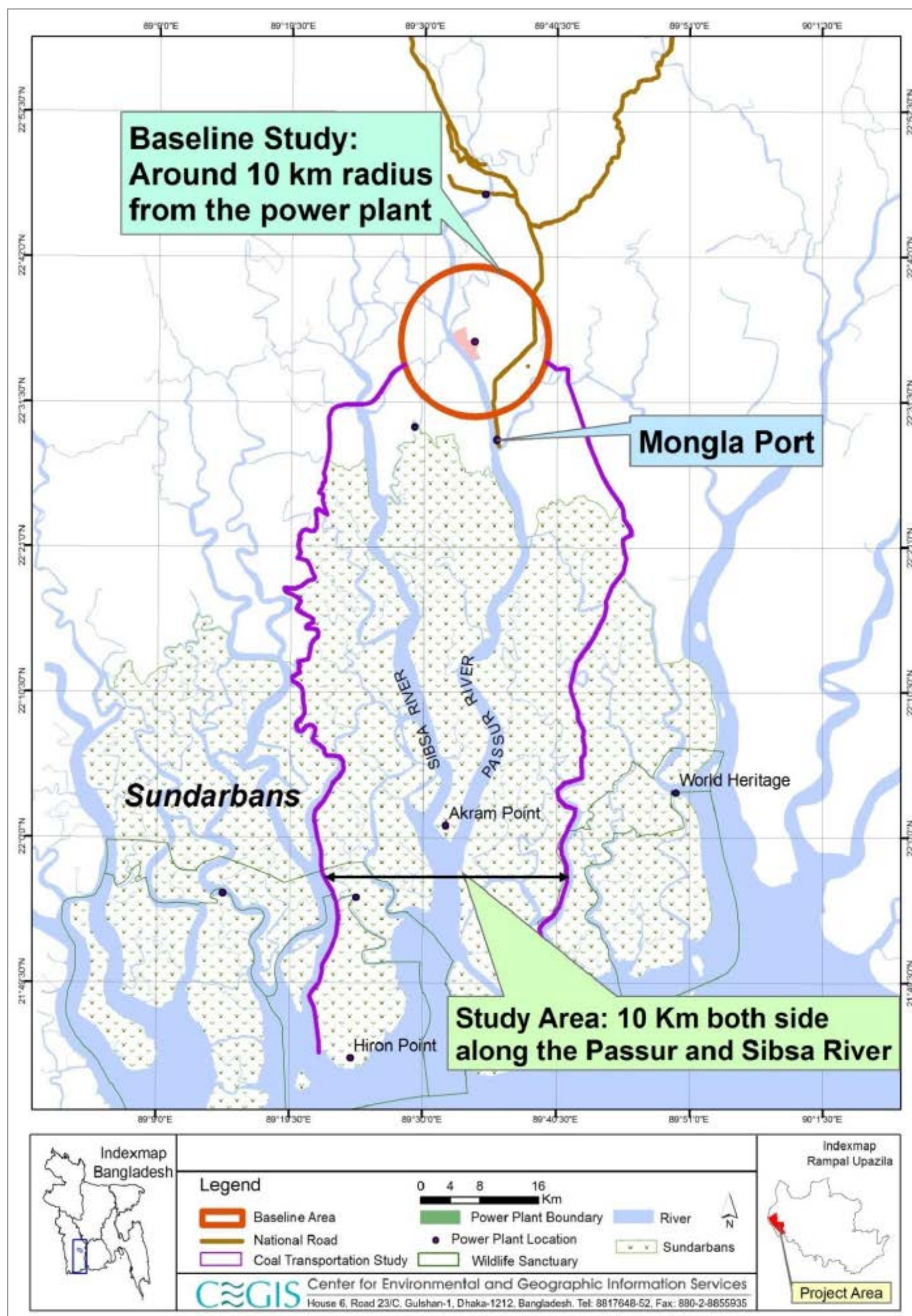


Figure 1.2: AOI of Environmental and Socio-economic Monitoring

## **1.4 Main Stakeholders**

### **1.4.1 Forest Department**

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

- Inclusion of a Soil Scientist and a Botanist in the monitoring team,
- Monitoring of regeneration, in growths (seedlings), diseases and pests (if necessary, to carry out laboratory analysis),
- Monitoring of soil nutrients (macro, micro) and heavy metals,
- Monitoring of floral diversity, species richness and dominance,
- 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 34<sup>th</sup> quarterly monitoring will also be forwarded to the same officials of the corresponding Departments.

### **1.4.2 Department of Environment (DoE)**

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

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

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

### **1.4.4 Local Community**

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

#### **1.4.5 Major Component of Monitoring Study**

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

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

## 2. Physical Environment

### 2.1 Air Quality

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

#### 2.1.1 Methodology

During the EIA study the criteria pollutants i.e. Particulate Matters (i.e., PM<sub>2.5</sub>, PM<sub>10</sub>, and SPM), SO<sub>x</sub>, NO<sub>x</sub>, CO and O<sub>3</sub> 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 a number of measures e.g., the sensitivity of the receptors, project activities like movement of coal-carrying vessels, coal trans-shipment activities; wind speed, wind direction, atmospheric deposition (Wet and Dry) and atmospheric stability classes etc.

#### 2.1.2 Method of Sampling and Laboratory Testing

In order to collect the air samples from the selected sites, Respirable Dust Sampler (Model-Envirotech India APM-460 BL) and Fine Particulate Sampler (Model-Envirotech India APM-550) were used. On the other hand, the PM<sub>2.5</sub>, PM<sub>10</sub>, and SPM were tested by gravimetric method and the concentration was analysed by West-Gaeke method. Likewise, the concentration of NO<sub>2</sub> was tested by Jacob and Hochheiser method. Moreover the concentration of Carbon Monoxide (CO) and Ozone (O<sub>3</sub>) were measured by Metravi CO-10 meter and Tongdy O<sub>3</sub> Monitor respectively.

#### 2.1.3 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, Golpata and timber collection; tourism etc. could be big contributing sources of air pollutants i.e., Particulate matters (PM<sub>2.5</sub>, PM<sub>10</sub> and SPM), Oxides of Sulphur (SO<sub>x</sub>), Oxides of Nitrogen (NO<sub>x</sub>) and Green House Gases (GHGs) in the study area as well as across the Passur channel. However, an inventory of the existing emission types and sources for the study area has been provided in **Table A2** of **Appendix IV**.

#### 2.1.4 Monitoring Locations

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





**Figure 2.1: Acquisition of Air Quality Monitoring data**



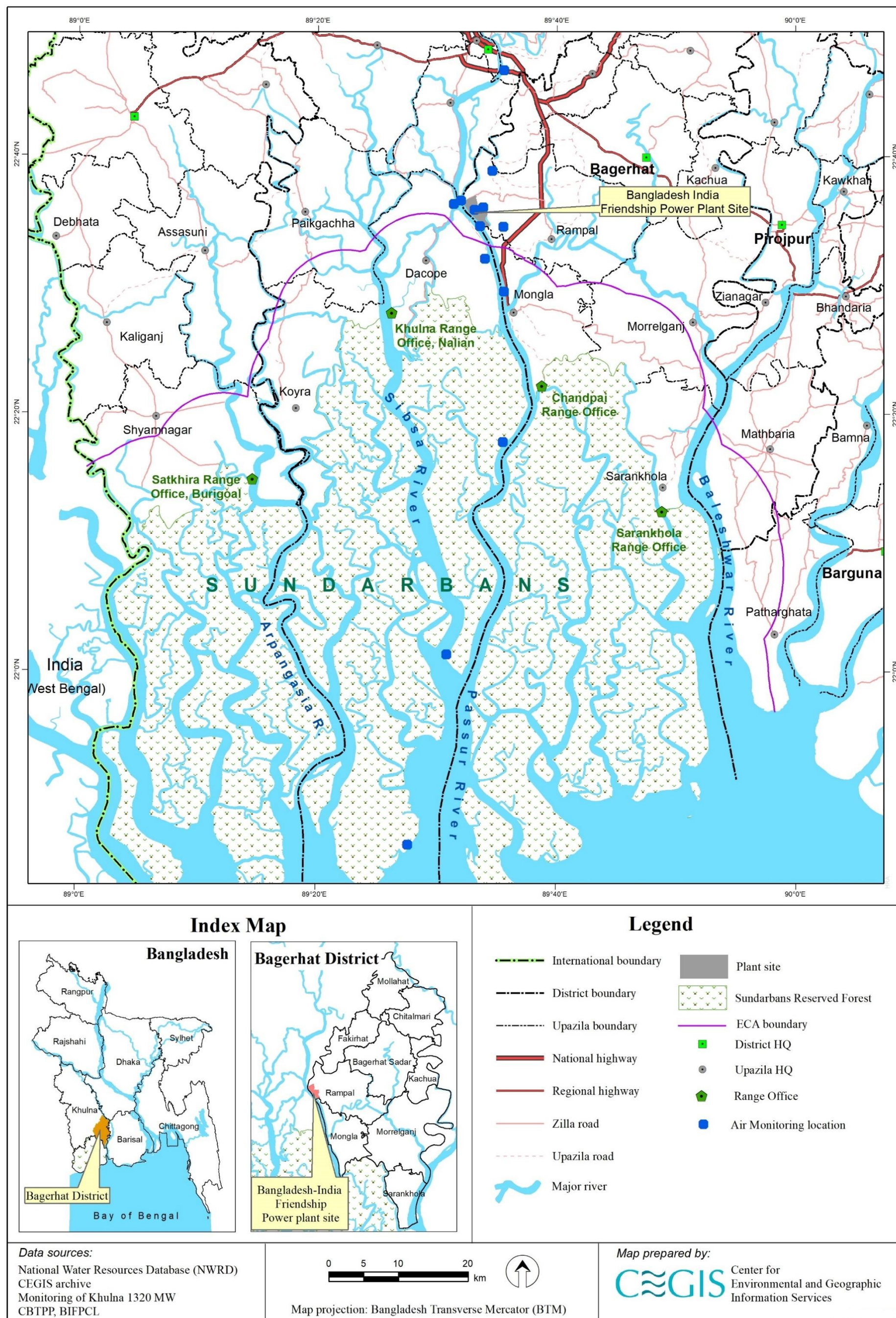


Figure 2.2: Air Quality Monitoring Locations





Table 2.1: Air Quality Monitoring Plan

Sl. No.	Monitoring Indicators	Locations	GPS Points	Frequency	Methods/Tools/ Techniques
1	Particulate Matter (PM <sub>2.5</sub> , PM <sub>10</sub> and SPM) SO <sub>x</sub> , NO <sub>x</sub> , CO and O <sub>3</sub> .	South West corner of the Project boundary	89°33'34.5"E; 22°34'33.8"N	Each Quarter of the year	Method of testing PM <sub>2.5</sub> : Gravimetric
2		Proposed township area near Chimney location, Mauza: Sapmari Katakali.	89°32'3.8"E; 22°36'32.5"N		Method of testing PM <sub>10</sub> : USEPA (1997) Method 201 or 201A (as appropriate)
3		North West corner of the Project boundary (Kaigar Daskati)	89°33'51.8"E; 22°36'1.06"N		Method of testing SO <sub>x</sub> : USEPA (2000) Method 6 or 6A or 6B or ISO (1998)
4		Barni, Gaurambha Union (4km North East from the chimney location)	89°34'37.7"E; 22°38'51.8"N		Method 11632 (as appropriate)
5		Chunkuri-2, Bajua Union (4km South West from the chimney location)	89°34'01.1"E; 22°32'3.3"N		Method of testing NO <sub>x</sub> : USEPA (2000) Method 7, 7A, 7B, 7C, 7D, or ISO (1993) Method 10396 (as appropriate).
6		Pankhali, Dacope, (4km North West from the Chimney location)	89°31'24.2"E; 22°36'6.7"N		
7		Mongla Port Area	89°35'50.4"E; 22°28'24.8"N		
8		Harbaria, Sundarbans	89°35'34.2"E; 22°17'43.1"N		
9		Akram point, Sundarbans	89°30'54.1"E; 22°23'50"N		
10		Hiron Point, Sundarbans	89°27'53.2"E; 21°46'27.60"N		
11		Khulna city near Khan Jahan Ali Bridge	89°35'35.5"E; 22°46'36.8"N		
12		Project site-1 (Proposed Township area)	89°33'13.7"E; 22°35'43"N		
13		Access road bridge area	89°35'16.49"E; 22°34'37.11"N		

### 2.1.5 Status of Air Quality

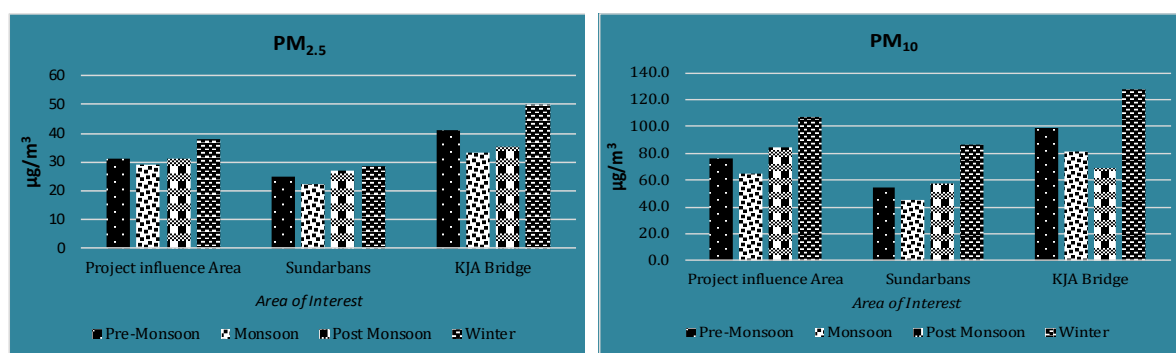
During this monitoring tier, the maximum value (63.57 µg/m<sup>3</sup>) of PM<sub>2.5</sub> was found at Khan Jahan Ali toll plaza area whereas the minimum value (30.22 µg/m<sup>3</sup>) was recorded at Bauja Union. On the other hand, the concentration of PM<sub>10</sub> was found highest (93.43 µg/m<sup>3</sup>) at Mongla Ghat area the and lowest (39.66 µg/m<sup>3</sup>) at the Bauja Union. Similarly, the concentration of SPM was also found highest (170.28 µg/m<sup>3</sup>) at Mongla Ghat area the and lowest (77.36 µg/m<sup>3</sup>) at the Bauja Union.

However, the concentration of Sulphur dioxide (SO<sub>2</sub>) in ambient air was found lower than the Bangladesh standard limit of (80 µg/m<sup>3</sup>) at all the sampling locations. Among those, the maximum concentration (23.49 µg/m<sup>3</sup>) was found at Padma Abashan area while the minimum concentration (10.18 µg/m<sup>3</sup>) was recorded at South-West corner of the project Boundary i.e. Maidara area. Similarly, the values of NO<sub>x</sub> were also observed well below than the Bangladesh standard value of 80 µg/m<sup>3</sup>. though the maximum concentration (39.35 µg/m<sup>3</sup>) of NO<sub>x</sub> was also found at Padma Abashan area whereas the lowest concentration (17.64 µg/m<sup>3</sup>) was recorded at South-West corner of the project

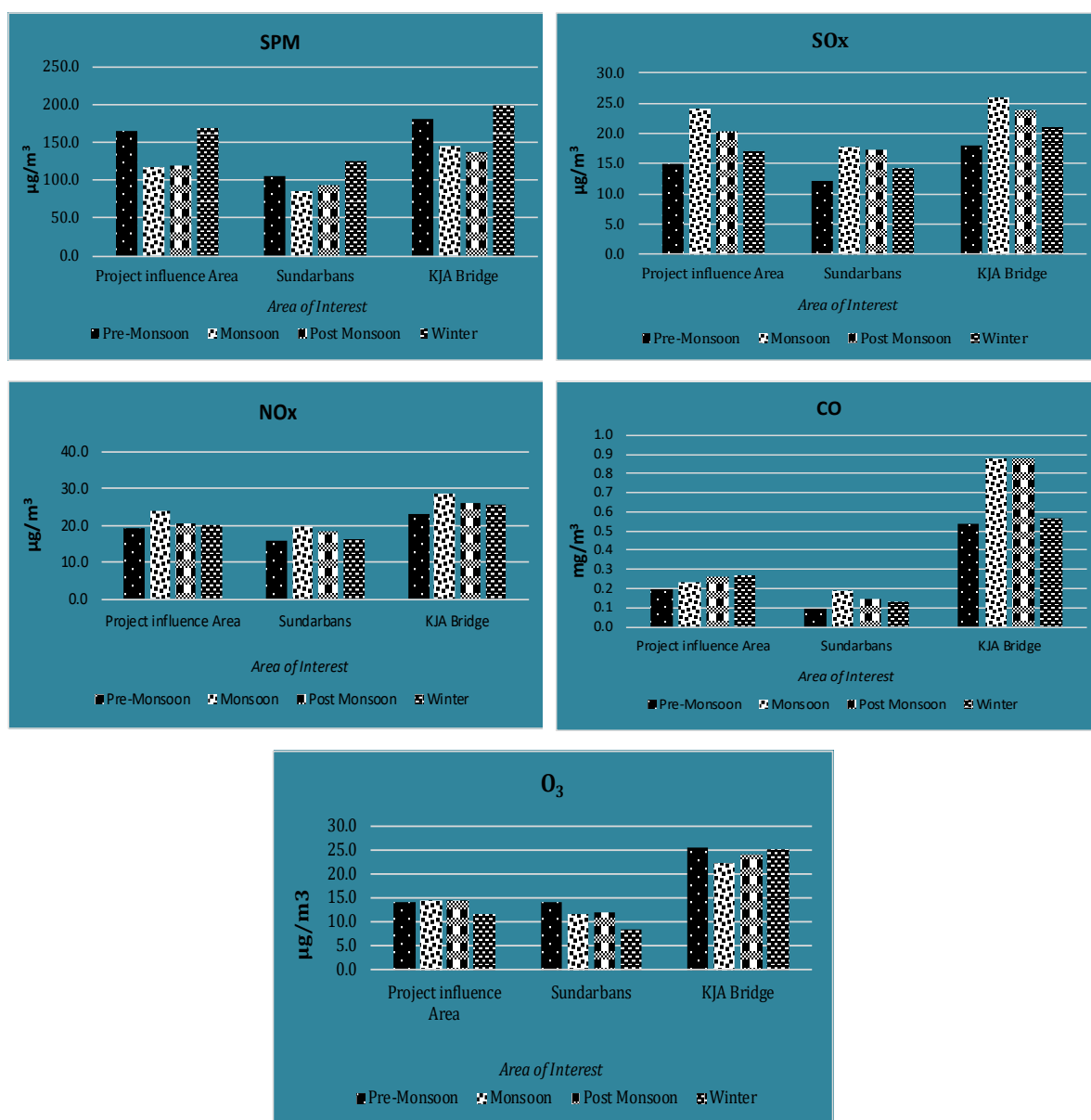
Boundary i.e. Maidara area. The contributor of such NO<sub>x</sub> emission may be from local human hauler, car, bus etc. Moreover, the maximum values of CO (1.9 mg/m<sup>3</sup>) and O<sub>3</sub> (64 µg/m<sup>3</sup>) were found at Mongla Ghat area and Khan Jahan Ali toll plaza area respectively though the results were found much lower than the standard value (5 mg/m<sup>3</sup> and 100 µg/m<sup>3</sup>) set in Air pollution control Rules, 2022.

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. Though the concentration were found to be within the standard limit but specially to minimize the particulate matter as well as the other criteria pollutant's concentration inside the power plant, the authority may take the necessary initiatives as suggested in the EMP of the EIA study e.g. continuous or periodic water spraying on the connected road networks inside the power plant area, install water sprinkler system at the prominent infrastructures like office areas, township area etc. and the major construction area, strictly maintain the vehicular speed at the sensitive areas and properly maintain the EMPs as stated in the EIA study of the power plant. The monitoring results of 34<sup>th</sup> monitoring program has been shown in **Table 2.2** and all the monitoring results across the monitoring periods are attached in **Table A1** of **Appendix IV**. The baseline emissions scenarios are appended in **Table A2** of **Appendix IV**.

The values of all the criteria pollutants as averaged for the corresponding locations for the corresponding seasons were found to be higher in Khan Jahan Ali Bridge area than the project influence area followed by the Sundarbans reserve Forest (SRF) area. On the other hand, the concentration of the measured parameters was found to be higher in winter seasons of the monitoring periods except for SO<sub>x</sub> & NO<sub>x</sub> which found to be higher in monsoon periods and CO concentration was found higher in post monsoon seasons as air pollutants may be covered with water vapor, which may more likely to cause the accumulation of pollutants, increase the concentration<sup>1</sup>. It can also be mentioned here that the concentration was always observed to be much lower in SRF area than the other areas and never exceeded comparing to the standards set by DoE (ECR, 1997). **Figure 2.3** showed the seasonal variations for the respective area of interest.



<sup>1</sup> Tian, X., Cui, K., Sheu, H.L., Hsieh, Y.K., Yu, F. (2021). Effects of Rain and Snow on the Air Quality Index, PM<sub>2.5</sub> Levels, and Dry Deposition Flux of PCDD/Fs. *Aerosol Air Qual. Res.* 21, 210158. <https://doi.org/10.4209/aaqr.210158>



**Figure 2.3: Seasonal Variation of the Air Quality Parameters**

Cluster analysis was performed to identify the grouping pattern of the criteria pollutants along with their corresponding locations. Euclidean distances were observed to measure the distances among the objects using as variables (annual average concentrations of the seven studied variables for every station). According to the dendrogram (**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**).

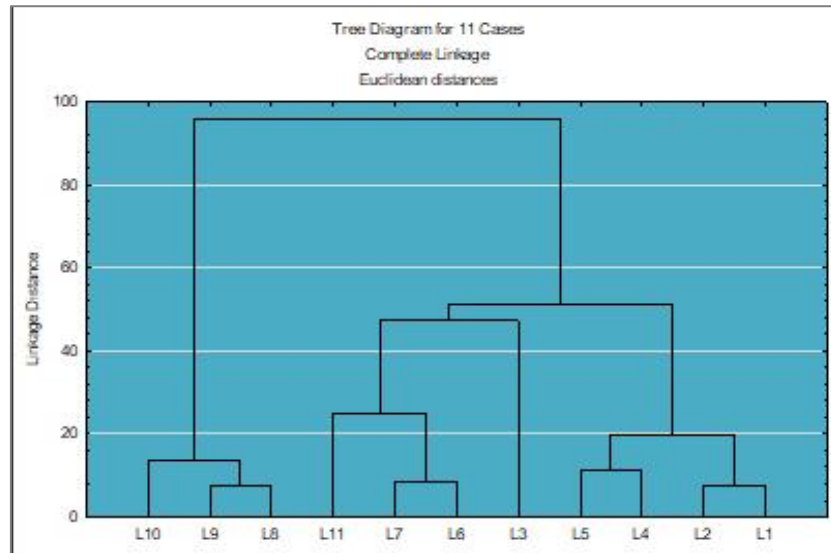


Figure 2.4: Dendrogram of the Monitoring Stations using Euclidean Distance

Table 2.2: Air Quality Monitoring Results (34<sup>th</sup> Quarterly Program)

Sl. No.	Location	Parameters						
		PM <sub>2.5</sub>	PM <sub>10</sub>	SPM	SO <sub>2</sub>	NO <sub>x</sub>	CO	O <sub>3</sub>
		(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(µg/m <sup>3</sup> )
1	South-West corner of the project Boundary, Moidara	39.63	57.26	109.27	10.18	17.64	0.6	19
2	Propose Township area near Chimney location, Mouza-Sapmari Katakhal	49.63	58.48	123.62	16.71	25.45	0.4	14
3	North west corner of the project boundary (Koigardas Kathir Char)	46.32	64.18	139.24	14.66	21.43	0.2	13
4	Barni, Gaurambha Union 4 KM North-West from the Chimney location	41.59	64.71	111.39	13.88	20.31	0.1	33
5	Bauja Union 4km south west from the chimney location	30.22	39.66	77.36	10.52	18.03	0.1	14
6	Chalna Bazar Area, Dacope	48.3	74.05	138.51	15.42	22.14	0.6	24
7	Mongla Port area	58.46	93.43	170.28	21.41	34	1.9	59
8	Harbaria, Sundarban	53.98	76.18	142.09	12.37	20.41	0.3	41
9	Akram Point (Sibsa River)	35.35	50.14	99.42	11.06	18.2	1	19
10	Hiron Point, Sundarban	57.2	89.22	164.2	16.82	27.87	0.5	28
11	Khulna Khan Jahan Ali Bridge near toll plaza area	63.57	92.2	169.49	21.71	36.56	1.6	64
12	Padma Abashan area	61.47	84.89	158.26	23.49	39.35	1	49
13	Taltola Bazar/BIFPCL (Project)	42.84	71.49	127.77	13.27	20.63	1.1	14
Std (Air pollution Control Rules, 2022)		65	150	200 (ECR'97)	80	80	5	100

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

## 2.2 Noise Quality

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

### 2.2.1 Methodology

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



**Figure 2.5: Ambient Noise Acquisition**

### 2.2.2 Noise in the study area

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



### 2.2.3 Locations of Noise Level Monitoring

Out of (11) locations, three (03) locations were inside the Sundarbans, six (06) locations were in and around the Project site, one at Khan Jahan Ali Bridge and the remaining one was at Mongla Ghat area (**Figure 2.6** and **Table 2.3**).

**Table 2.3: Noise Monitoring Plan**

SL. No.	Monitoring locations	GPS points	Time of noise monitoring
1	South West corner of the Project boundary	89°33'34.5"E; 22°34'33.8"N	Morning, Noon and evening
2	Proposed township area near Chimney location, Mauza: Sapmari Katakhal	89°32'3.8"E; 22°36'32.5"N	Morning, Noon and evening
3	North West corner of the Project boundary (Kaigar Daskati)	89°33'51.8"E; 22°36'1.06"N	Morning, Noon and evening
4	Barni, Gaurambha union (4km North East from the chimney location)	89°34'37.7"E; 22°38'51.8"N	Morning, Noon and evening
5	Chunkuri-2, Bajua Union (4km South West from the chimney location)	89°34'01.1"E; 22°32'3.3"N	Morning, Noon and evening
6	Pankhali, Dacope, (4km North West from the Chimney location)	89°31'24.2"E; 22°36'6.7"N	Morning, Noon and evening
7	Mongla Port Area	89°35'50.4"E; 22°28'24.8"N	Morning, Noon and evening
8	Harbaria, Sundarbans	89°35'34.2"E; 22°17'43.1"N	Morning and Noon
9	Akram point, Sundarbans	89°30'54.1"E; 22°23.50"N	Morning and Noon
10	Hiron Point, Sundarbans	89°27'53.2"E; 21°46'27.60"N	Not monitored
11	Khulna city near Khan Jahan Ali Bridge	89°35'35.5"E; 22°46'36.8"N	Morning, Noon and evening

### 2.2.4 Status of Noise

In order to provide an overview of the observed noise data set, the average values for the respective locations have been appended in Table 2.4 for ready reference; but the detailed noise level data have been attached in **Table C1, C2, C3, C4, C5, C6, C7, C8** and **C9** respectively in the **Appendix IV**.

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

Observed level of noise at *Chalna*, a commercial area located at a distance of 4 km to the north-west direction of the proposed chimney location was recorded as 75.50 dB whereas its standard level is 70 dB (**Table: 2.4**), i.e., the observed value is exceeded by 5.50 dB with respect to its standard value. Levels of noise at *Kaigar Daskati* (55.67 dB) situated at the Gucchha Gram (a residential area located at north-west corner of the project area) and *Chunkuri-2* (57.83 dB) located at 4km south-west direction from the chimney location exceeded their corresponding standard values by 0.67 dB and 2.83 dB respectively. On the other hand, levels of noise at *Maidara Khal* (the south-west corner of the project area and a residential area) and *Shapmari* (proposed township area) were recorded as 54.20 dB and 54.15 dB respectively that denotes, the levels of noise didn't cross their corresponding standard value (55 dB) (**Table: 2.4**). The level of noise at *Barni (Gaurambha)* was recorded as 61.87 dB which was 1.87 dB higher than that of standard limit (60 dB) of noise level for this location (**Table: 2.4**). *Harbaria* (50.00 dB) and *Akram Point* (42.10 dB), the two ecologically silent zones were not found to exceed the Bangladesh standard limit (50 dB) of their corresponding standard values (**Table: 2.4**).

On the other hand, observed noise levels at Khan Jahan Ali Bridge (64.15 dB), a commercial zone, and Mongla Port (65.00 dB), an industrial zone, were also not found to exceed the Bangladesh standard limit of noise (**Table: 2.4**). The standard noise limits for Khan Jahan Ali Bridge and Mongla Port during the day are 70 dB and 75 dB, respectively.



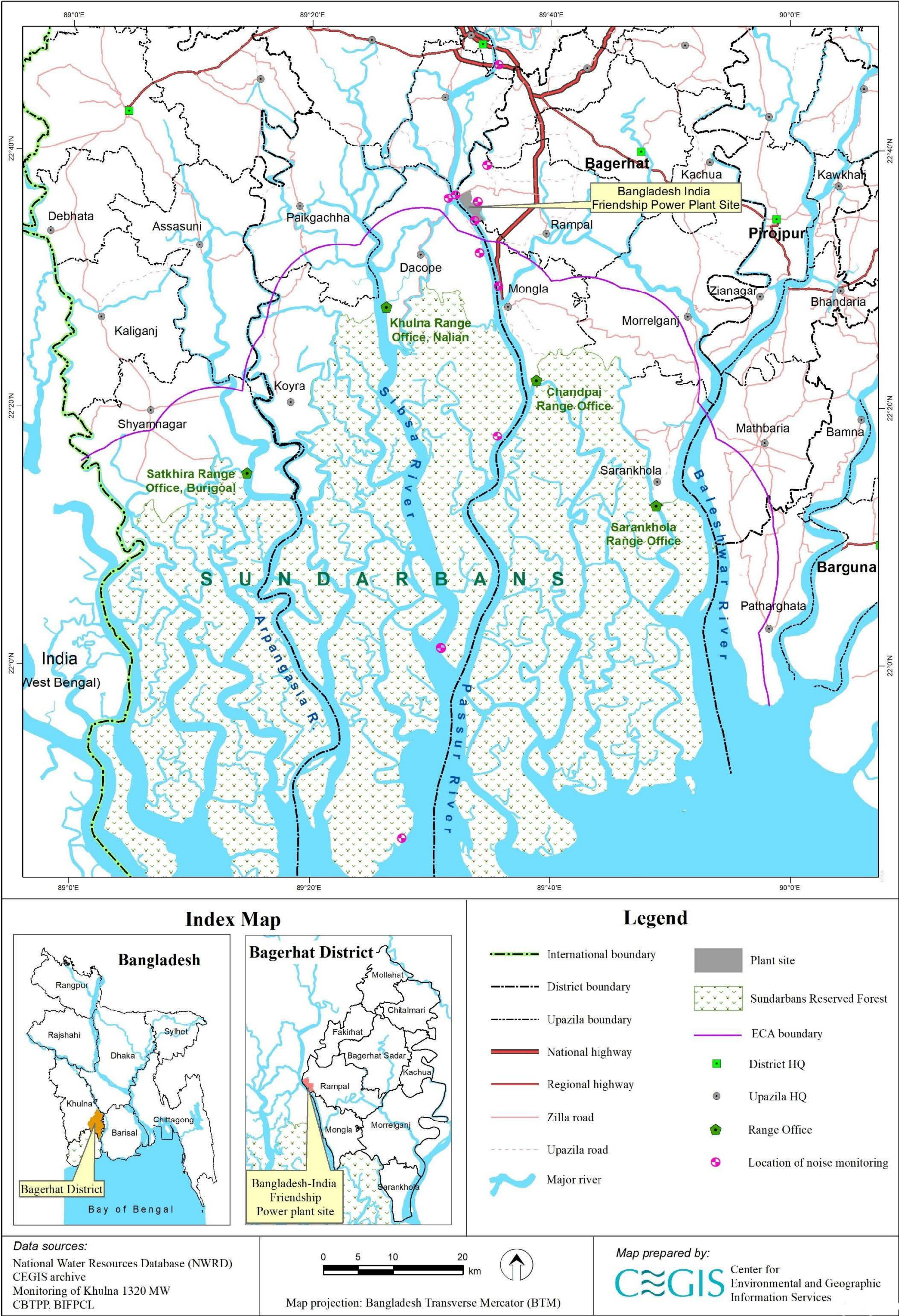


Figure 2.6: Noise Level Monitoring Locations





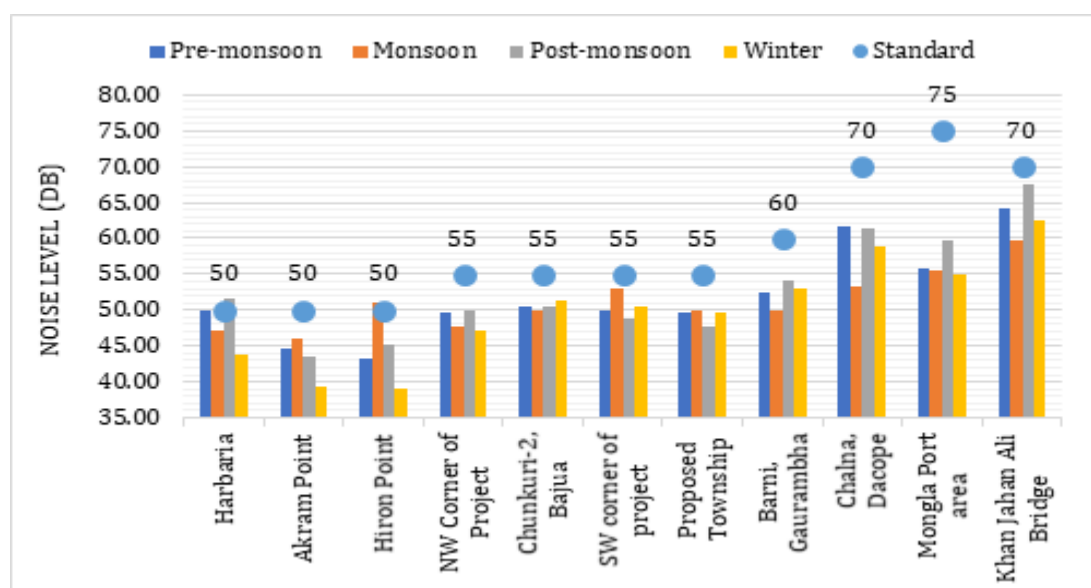


Figure 2.7: Status of average seasonal variations of noise level at different monitoring locations

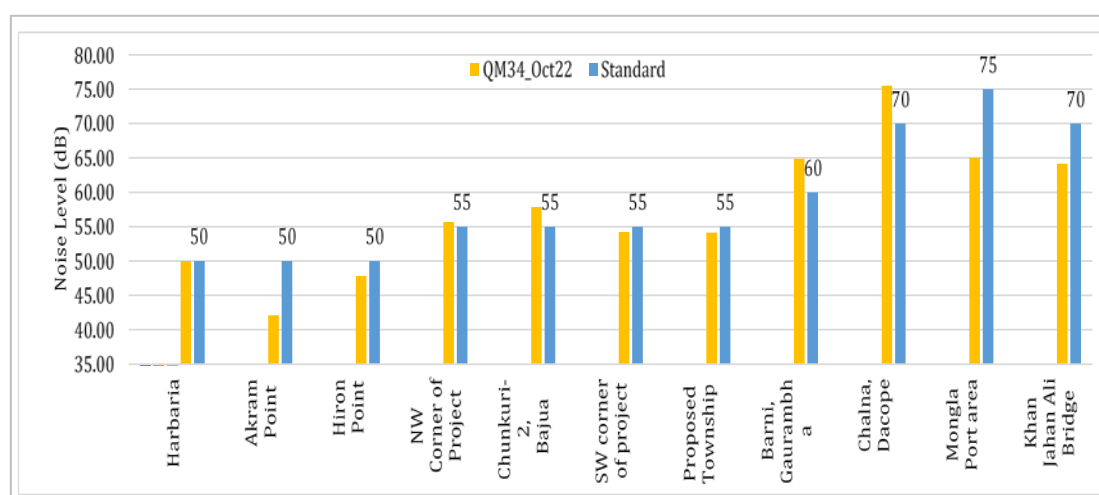


Figure 2.8: Status of noise level of 34<sup>th</sup> monitoring season at different locations

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

Sl No	Location	QM34 (Noise Level in dB (A) Oct 2022			
		Morning (9:00)	Afternoon (13:00)	Evening (18:00)	Day time AVG
1	Chalna, Dacope	78.10	72.20	76.20	75.50
2	NW Corner of the Project area (Kaigar Daskati)	57.00	57.7	52.3	55.67
3	Chunkuri-2, Bajua	63.50	55.40	54.6	57.83
4	SW corner of the Project area (Moidara)	56.20	53.70	52.70	54.20
5	Proposed Township area (Shapmari)	57.40	50.90	NM	54.15
6	Barni, Gaurambha	62.50	60.50	62.60	61.87
7	Khan Jahan Ali Bridge, Khulna	65.10	63.20	NM	64.15
8	Mongla Port area	61.50	67.9	65.60	65.00

Sl No	Location	QM34 (Noise Level in dB (A) Oct 2022			
		Morning (9:00)	Afternoon (13:00)	Evening (18:00)	Day time AVG
9	Harbaria, Sundarbans	49.60	50.40	NM	50.00
10	Akram Point, Sundarbans	42.50	41.70	NM	42.10
11	Hiron Point, Sundarbans	47.80	NM	NM	47.80

Source: CEGIS field survey, October 2022

### 2.2.5 Findings

As per the monitoring data, noise generation activities were observed to be higher in mongla port and mongla ghat area than in Khan Jahan Ali bridge area followed by power plant adjacent area i.e. Maidara, Koigordashkatir char, bajua and shapmari area. On the other hand, lowest noise level has been observed in the Sundarbans reserve forest area and completely complied with the Noise Control Rules 2006 (**Figure 2.7 and Figure 2.8**). The noise generation sources in the study area can mainly be divided into two types; one is natural and the other one is anthropogenic. Natural sources of noise generation were birds' chirping, stormy wind, wave breaking on the shoreline, howling of leaves and so on. On the other hand, traffic mobilization, industrial activities, vessels movement within the rivers and local vehicles were the anthropogenic sources of noise. However, the observed noise level was not found to exceed the Bangladesh standard limit of noise level.

## 2.3 Water Quality

An updated water quality status of the Passur-Sibsa River system and adjacent water bodies have been depicted in this section. Both the national and international guidelines were followed and adopted for sample collection as well as for analysis. This report includes physical water quality parameters collected during 34<sup>th</sup> quarterly monitoring tier (October, 2022) and the tested results obtained from the laboratory up to July, 2022 (33<sup>rd</sup> quarterly monitoring). A number of identical parameters as well for the selected locations to understand the effect of power plant activities on the surface and groundwater quality which may affect the aquatic life of the adjacent river, the Sundarbans Forest ecosystem and community health in and around the power plant area.

### 2.3.1 Methodology

The methodology covers selection of water quality parameters, identification of sampling locations, determination of sampling frequency and evaluation criteria of the monitoring parameters etc. Standard approaches and methodologies were followed for the above-mentioned events. Both the surface and groundwater quality status of the water bodies in and around the Power Plant and the Sundarbans area were examined. The monitoring results are presented and compared with the national standards (ECR, 1997 and all available amendments). Each sample was labelled at the time of sampling. The selected monitoring locations for the monitoring program are shown in **Figure 2.9**. The details of the monitoring plan covering sampling locations, geographical locations, frequency and analysis techniques of sampling for surface and groundwater are given in **Table 2.5** and **Table 2.6** respectively.

**Table 2.5: Groundwater Quality Monitoring Parameters, Locations and Plan**

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

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

Sl No	Monitoring Indicators	Locations	GPS (Decimal Degree)		Frequency	Methods/Tools/ Techniques
			Easting	Northing		
1	pH, Temperature, Salinity, DO, BOD <sub>5</sub> , TDS, TH, TSS, COD, Nitrate, Sulphate, Phosphate, Arsenic, Lead, Mercury, Oil & Grease, PAH, TOC, TC	Left Bank of Passur River at 100m u/s of North West corner of the Project boundary	22.604167°N	89.527222°E	Quarterly	In-situ testing of physical water quality parameters was done by Horiba U-50 multi-meter. Preservation of samples and Laboratory analysis were carried out at DPHE Central Laboratory and BCSIR
2		Middle of Passur River at 100m u/s of North West corner of the Project boundary	22.607222°N	89.528889°E		
3		Right Bank of Passur River at 100m u/s of North West corner of the Project boundary	22.609361°N	89.531417°E		
4		Left Bank of Passur River at Project Site-Jetty	22.584833°N	89.543583°E		
5		Middle of Passur River at Project Site-Jetty	22.587667°N	89.546472°E		
6		Right Bank of Passur River at Project Site-Jetty	22.589333°N	89.548222°E		
7		Left Bank of Passur River at South West corner of the Project boundary	22.572889°N	89.552583°E		
8		Middle of Passur River at South West corner of the Project boundary	22.574611°N	89.557500°E		
9		Right Bank of Passur River at South West corner of the Project boundary	22.575667°N	89.559861°E		
10		Maidara river at the South East corner of the project boundary at Ichamoti-Maidara confluence	22.600639°N	89.565611°E		

Sl No	Monitoring Indicators	Locations	GPS (Decimal Degree)		Frequency	Methods/Tools/ Techniques
			Easting	Northing		
11		Maidara river near proposed Township area	22.577472°N	89.569250°E		
12		Passur river at Passur – Ghasiakhali confluence	22.473861°N	89.602361°E		
13		Passur river at Harbaria of the Sundarbans Reserve Forest area	22.295250°N	89.593139°E		
14		Passur river at Akram Point of the Sundarbans Reserve Forest Area	22.024120° N	89.514220°E		
15		Passur river at Hiron point of the Sundarbans Reserve Forest Area	21.774183°N	89.464778°E		



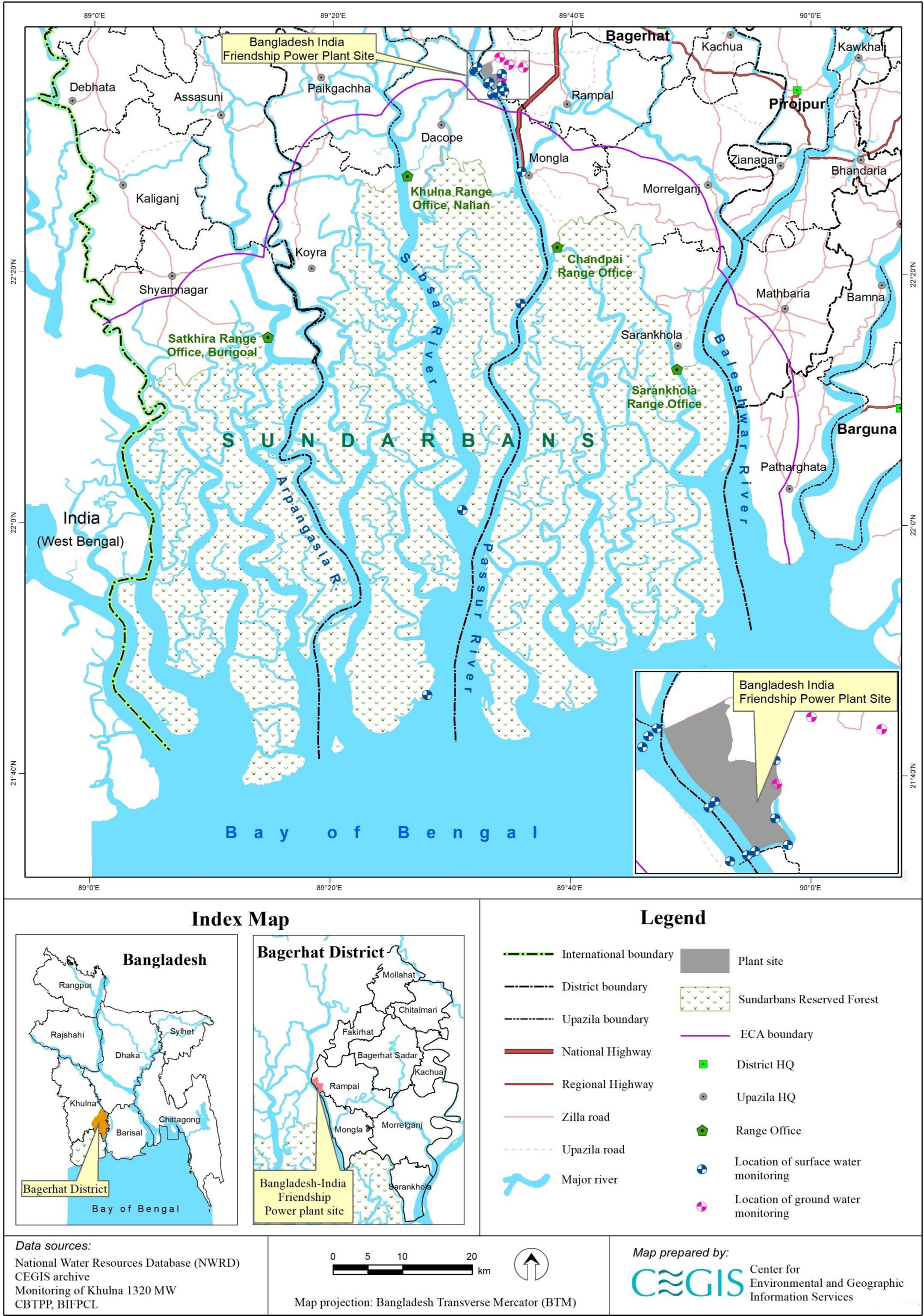


Figure 2.9: Surface Water and Groundwater Quality Monitoring Location





### 2.3.2 Selection of Parameters

The selected parameters for Ground water quality monitoring include pH, Temperature, Dissolved Oxygen (DO), Total Dissolve Solids (TDS), Total Hardness (TH), Chemical Oxygen Demand (COD), Salinity, Nitrate ( $\text{NO}_3^-$ ), Phosphate ( $\text{PO}_4^{3-}$ ), Sulphate ( $\text{SO}_4^{2-}$ ), 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 ( $\text{NO}_3^-$ ), Phosphate ( $\text{PO}_4^{3-}$ ), Sulphate ( $\text{SO}_4^{2-}$ ), 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,  $\text{NO}_3^-$ ,  $\text{PO}_4^{3-}$  and  $\text{SO}_4^{2-}$ ;
- Aggregate organic constituents i.e. COD and
- Heavy metals i.e. As, Pb and Hg;

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

### 2.3.3 Surface Water Sampling Procedure

The study area is highly influenced by tidal variation. Hence, temporal and spatial variations of tides were considered in sampling procedure. Surface water samples were collected at a distance of 50-100m away from the river bank and at a depth of 6cm below the water surface during low tides or relative slag period after the low tide for all parameters except oil and grease. The non-acidified sampling bottles were rinsed with respective water samples before sampling. Acidified sampling bottles were used for heavy metal (As, Pb, Hg) sample collection. The in-situ testing of the selected water quality parameters is shown in **Figure 2.10** and **Figure 2.11**.

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



**Figure 2.10: Collection and Insitu testing of Groundwater**



**Figure 2.11: Water sample collection and Insitu Testing of Water Parameters**

### 2.3.4 Water Quality Parameter Analysis Techniques/Methods

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

**Table 2.7: Testing Methodology of Water Quality Parameter**

Parameters	Methods/Measuring Tools	Unit	BD Standard (ECR 1997)
Temperature	Horiba U-50 multimeter	°C	20 - 30
pH	Horiba U-50 multimeter	-	6.5-8.5
TDS	Horiba U-50 multimeter	ppm or mg/L	2100 (SW), 1000 (GW)
TSS	Horiba U-50 multimeter	ppm or mg/L	150 (SW), 10 (GW)
Salinity	Horiba U-50 multimeter	ppt	-
DO	Horiba U-50 multimeter	ppm or mg/L	6
BOD <sub>5</sub>	5-Day BOD Test at 20°C	ppm or mg/L	50 (SW)
COD	Closed Reflux Method	ppm or mg/L	200 (SW), 4.0 (GW)
Total Hardness(as CaCO <sub>3</sub> )	Titrimetric	ppm or mg/L	200-500
Ortho-Phosphate (PO <sub>4</sub> <sup>3-</sup> )	UV-VIS Spectrophotometers	ppm or mg/L	6
Nitrate (NO <sub>3</sub> <sup>-</sup> )	UV-VIS Spectrophotometers	ppm or mg/L	10
Sulphate (SO <sub>4</sub> <sup>2-</sup> )	UV-VIS Spectrophotometers	ppm or mg/L	400
Oil and Grease	Liquid-liquid extraction with hexane, treatment with silica gel and gravimetric determination	ppm or mg/L	10 (SW)
Arsenic (As)	Atomic Absorption Spectrophotometers–Hydride Vapor Generating (AAS-HVG)	ppm or mg/L	0.05
Lead (Pb)	Atomic Absorption Spectrophotometers–Graphite Furnace (AAS-GF)	ppm or mg/L	0.05
Mercury (Hg)	Mercury Analyzer	ppm or mg/L	0.001
PAH	APHA 5310.B	mg/L	N/A
TOC and TC	APHA 5310.B	mg/L	N/A

### 2.3.5 Water Quality Reporting Arrangement

Water quality status of the adjacent water bodies of power plants and the Sundarbans Reserve Forest (SRF) are being observed since April, 2014. The 34<sup>th</sup> quarterly report covers yearly variations of monsoon up to July, 2022 for chemical water quality status and yearly variations for post monsoon in physical water quality status up to October, 2022 and are presented and compared with the ECR' 1997 Standards. To do so, all sampling points are clustered in five different sampling sites considering homogenous characteristics of the sampling points as well as the type of ecosystem touching the sample points. The clustered sample monitoring sites and the logical explanation of the clusters are presented in the following **Table 2.8**.

**Table 2.8: Monitoring Sites and Characteristics**

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

#### *Status of Surface Water Quality*

##### In-situ tested parameters

The in-situ tested results obtained up to 34<sup>th</sup> monitoring period (October, 2022: post-monsoon season) are described below:

##### pH

During the visit, observed pH values were ranged between 8.4 and 7.28. The pH values of surface water monitoring data were found within the standard limit of ECR, 1997 Standard (6.5-8.5). The highest value (8.4) was found at Mongla area and lowest (7.28) was observed at Hiron point of Sundarbans area. However, the values indicated slightly basic in nature during this post-monsoon.

However, the pH values of monsoon and post-monsoon seasons were found to be comparatively lower than those of the pre-monsoon and winter seasons (**Table B.1: Appendix-IV**) which might be due to

the decreased river water level during pre-monsoon and winter season triggered by inadequate rainfall and insufficient inflow from U/S (upstream) of Passur-Sibsa RS (River System) which has also been reported by others (*Rahman et al., 2013*). Fluctuations in pH values during different season of the year can be attributed to factors like removal of CO<sub>2</sub> by photosynthesis through bicarbonate degradation, dilution of waste with freshwater, reduction in salinity and temperature, and decomposition of organic matter (*Rajasegar, 2003*).

Seasonal variations in pH concentrations among the selected monitoring sites during the quarterly monitoring programs of the previous years of Passur-Sibsa RS are presented in **Figure 2.12** and the observed dataset are attached in **Table B.1 of Appendix- IV**.

#### Temperature

During the monitoring period the temperature varied from 29.27°C -30.81°C among the monitored sites. The maximum water temperature (29.27°C) was recorded at Maidara River of the South East corner of the Project at Ichamoti-Maidara confluence. According to the ECR' 1997, 30°C water temperature is still be tolerable by the aquatic organisms in tropical environment. However, the surface water temperature largely depends on daily weather condition (*Bartram. J. et. al., 1996*). According to the seasonal weather pattern of Bangladesh the temperature drops to a minimum level during winter and reach to the maximum level which is also applicable for the water temperature. Recorded temperatures indicated that there was spatial variation among the monitoring sites even in the same seasons.

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

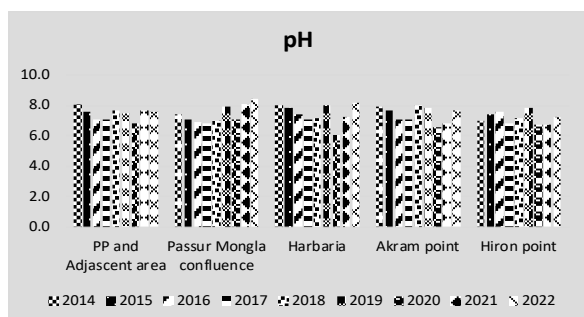
#### Salinity

The observed salinity concentration ranged between 2.9 ppt. and 0.1 ppt. during the last monitoring season. The maximum salinity (2.9 ppt.) was observed at Hiron point of the Sundarbans while minimum value was observed near the Power plant adjacent area. Sufficient fresh water flow from upstream section of the river system decrease the salinity concentrations during monsoon and post-monsoon seasons.

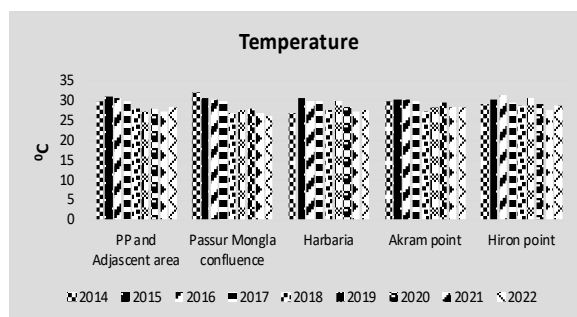
In general, high salinity from sea water increased water salinity in the direction of downstream to upstream. In the monitored river systems, the highest salinity was observed in pre-monsoon season followed by winter season where monsoon reflects the lowest. Freshwater flow from upstream and the dominated towards the sea water are the main reason of low salinity concentration in monsoon. However, the observed water salinity data periods are presented in **Figure: 2.13** and all the observed dataset are attached in **Table B.3 of Appendix- IV**.

#### Dissolved Oxygen

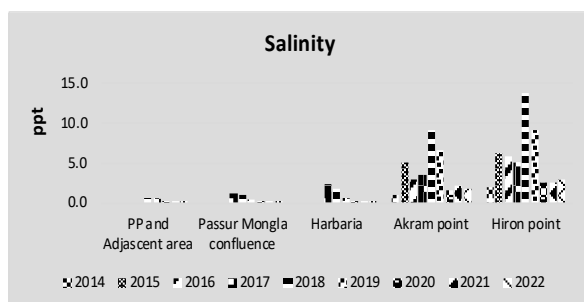
The standard DO level for the fisheries in aquatic environment is more than 8.5 mg/L (ECR'1997). During the last post-monsoon season, DO values ranged from 8.5 mg/L to 5.7 mg/L which was found within the permissible limit recommended by DoE. In general, higher DO levels are observed in monsoon and post-monsoon season basically for heavy rainfall and freshwater availability & upstream flow. Seasonal variations of DO at the monitoring sites of Passur-Sibsa RS for the monitoring periods are shown in **Figure: 2.14** and all the observed dataset are attached in **Table B.4 of Appendix- IV**.



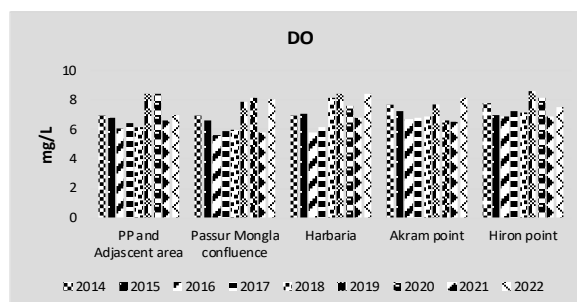
**Figure 2.12: Seasonal Variations in pH values in different monitoring sites**



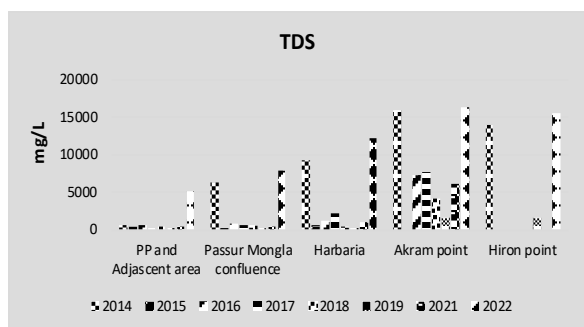
**Figure 2.13: Seasonal Variations in Temperature values in different monitoring sites**



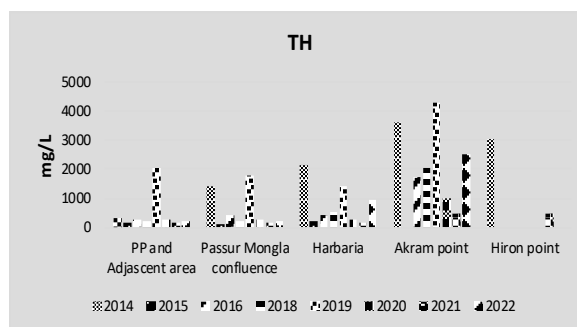
**Figure 2.14: Seasonal Variations in Salinity values in different monitoring sites**



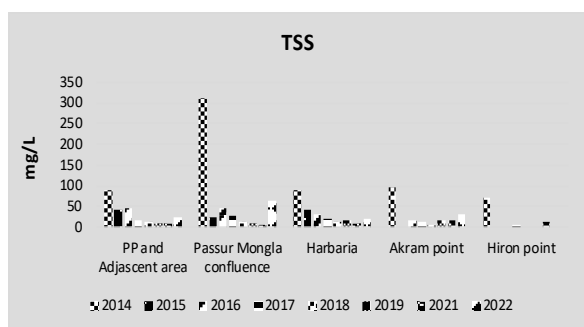
**Figure 2.15: Seasonal Variations in DO values in different monitoring sites**



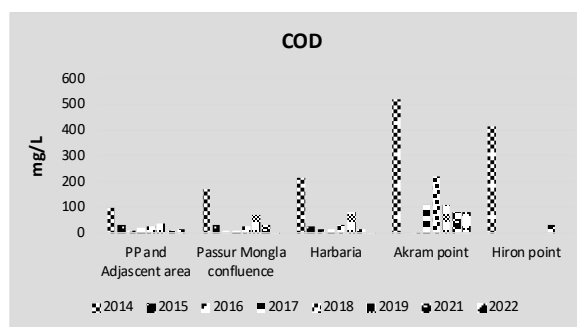
**Figure 2.16: Seasonal Variations in TDS values in different monitoring sites**



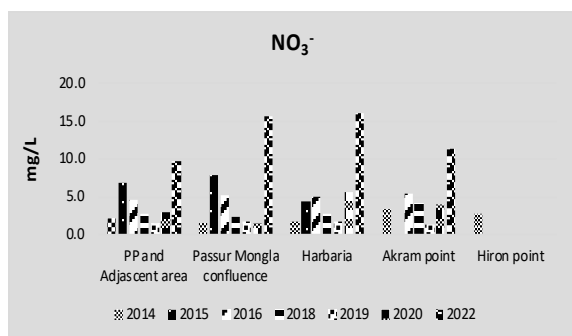
**Figure 2.17: Seasonal Variations in TH values in different monitoring sites**



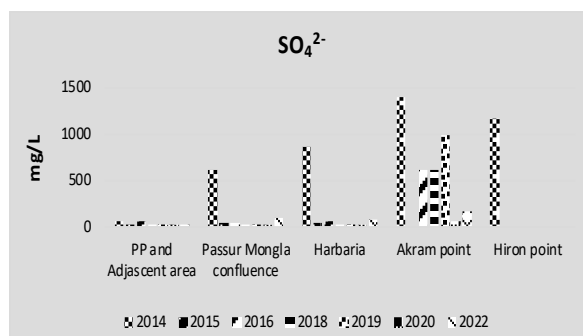
**Figure 2.18: Seasonal Variations in TSS values in different monitoring sites**



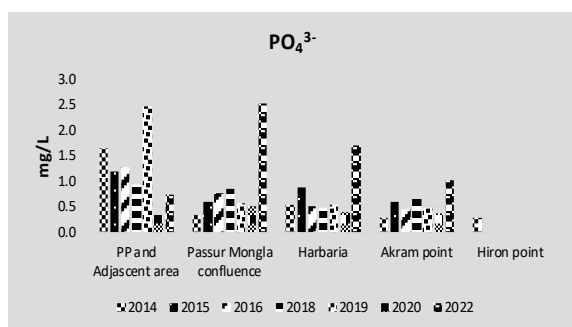
**Figure 2.19: Seasonal Variations in COD values in different monitoring sites**



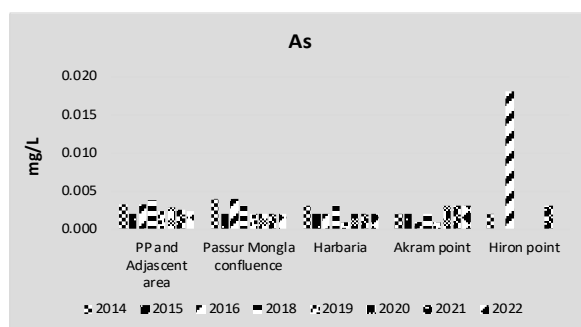
**Figure 2.20: Seasonal Variations in Nitrate values in different monitoring sites**



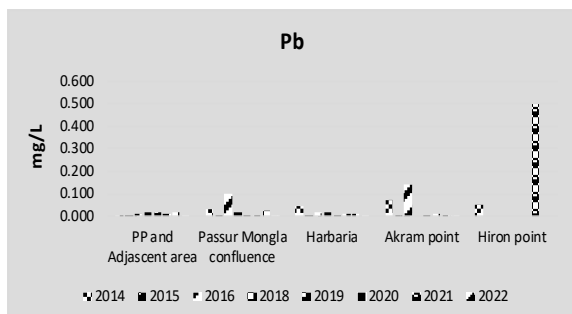
**Figure 2.21: Seasonal Variations in Sulphate values in different monitoring sites**



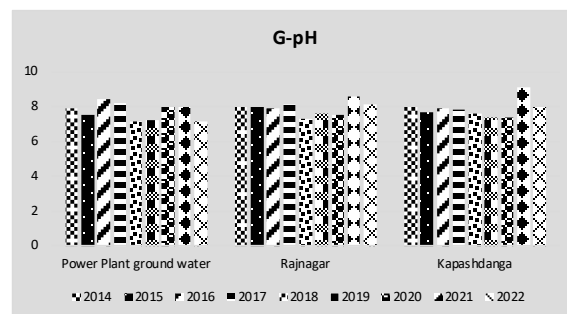
**Figure 2.22: Seasonal Variations in Phosphate values in different monitoring sites**



**Figure 2.23: Seasonal Variations in Arsenic values in different monitoring sites**

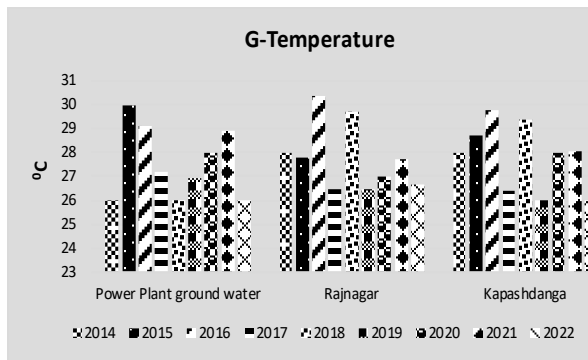


**Figure 2.24: Seasonal Variations in Lead values in different monitoring sites**

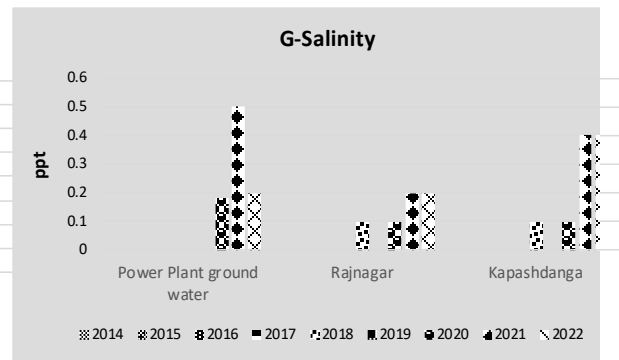


**Figure 2.25: Seasonal Variations in G-pH values in different monitoring sites**

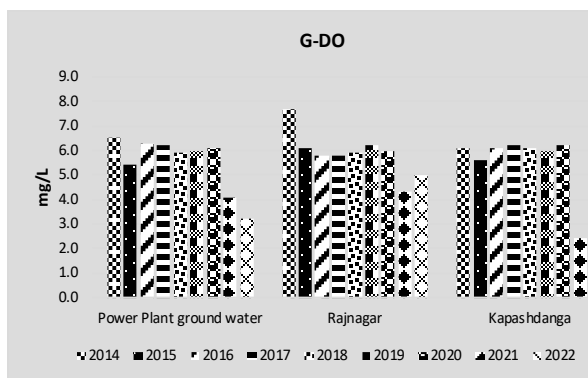




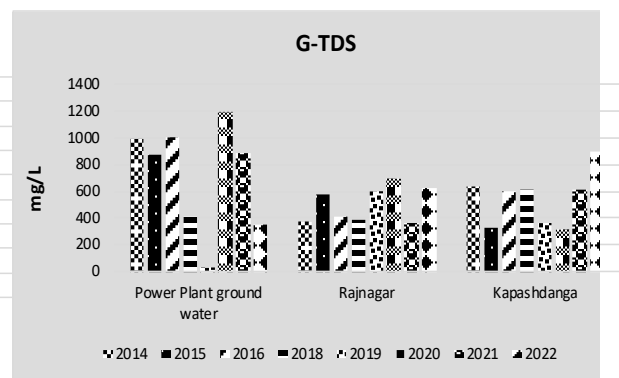
**Figure 2.26: Seasonal Variations in G-Temperature values in different monitoring sites**



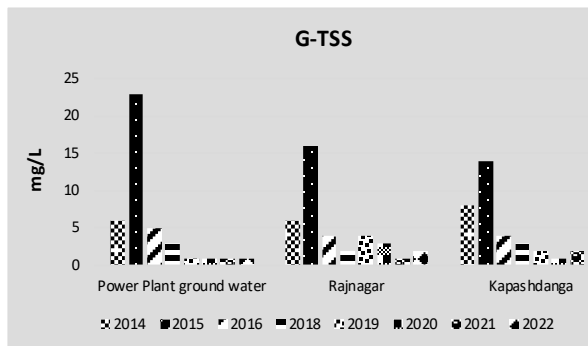
**Figure 2.27: Seasonal Variations in G-Salinity values in different monitoring sites**



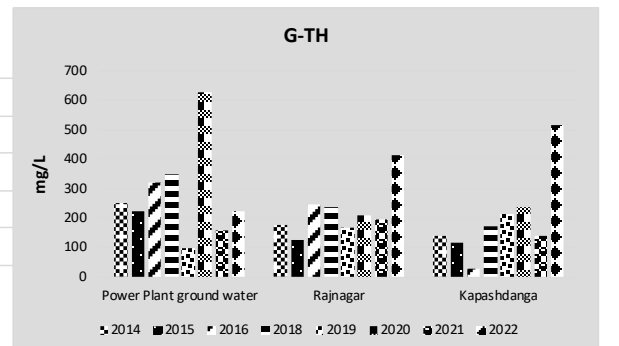
**Figure 2.28: Seasonal Variations in G-DO values in different monitoring sites**



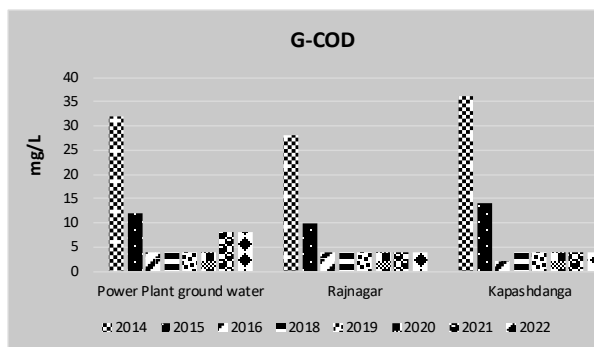
**Figure 2.29: Seasonal Variations in G-TDS values in different monitoring sites**



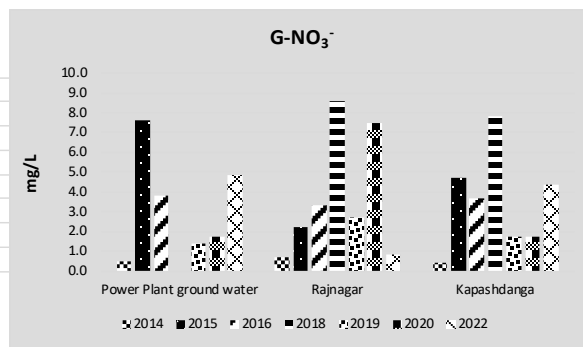
**Figure 2.30: Seasonal Variations in monsoon G-TSS values in different monitoring sites**



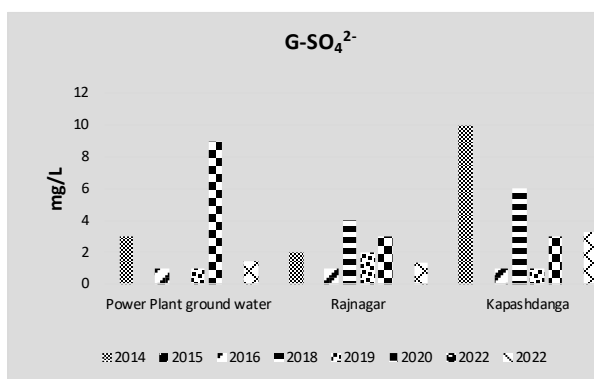
**Figure 2.31: Seasonal Variations in monsoon G-TH values in different monitoring sites**



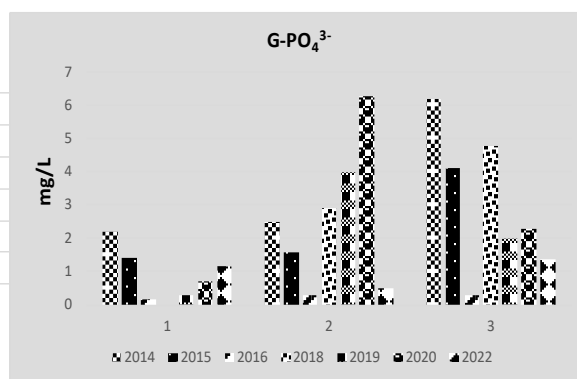
**Figure 2.32: Seasonal Variations in G-COD values in different monitoring sites**



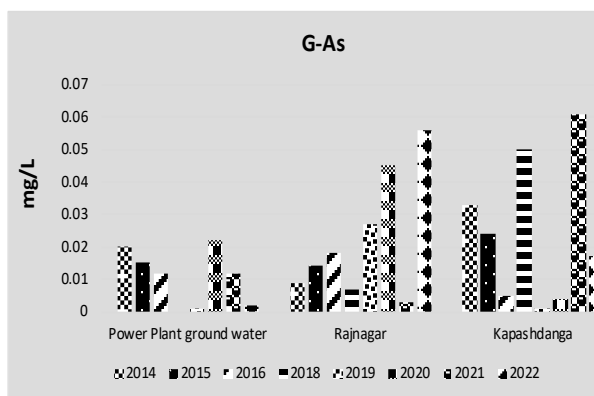
**Figure 2.33: Seasonal Variations in G-Nitrate values in different monitoring sites**



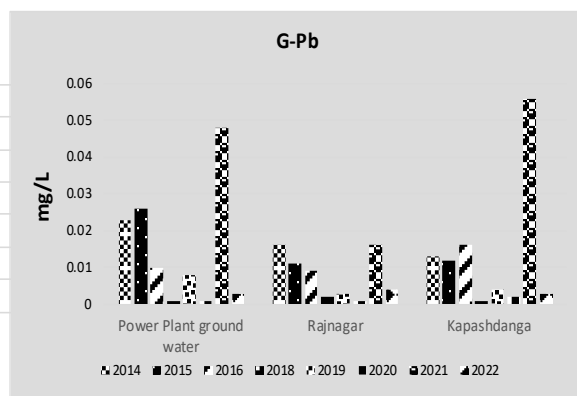
**Figure 2.34: Seasonal Variations in monsoon G-Sulphate values in different monitoring sites**



**Figure 2.35: Seasonal Variations in monsoon G-Phosphate values in different monitoring sites**



**Figure 2.36: Seasonal Variations in monsoon G-Arsenic values in different monitoring sites**



**Figure 2.37: Seasonal Variations in monsoon G-Lead values in different monitoring sites**

### Laboratory tested parameters

The laboratory tested results obtained up to 33<sup>rd</sup> monitoring period (July, 2022: Pre-Monsoon season) are described below:

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

TDS mainly indicates the presence of various kinds of minerals like ammonia, nitrate, phosphate, alkalis, some acids, sulphates and metallic ions etc., in water which comprise both colloidal and dissolved solids in water (Tareq. M. S. *et al.*, 2013). During the last visit, the TDS values were found to be ranged between 6200-115 mg/L (**Figure 2.15**). Among the monitoring sites highest TDS was observed at Hiron point (6200 mg/L) and lowest was found at Middle Passur River at Project Site-Jetty (115 mg/L). In general, the TDS values increase in Pre-monsoon and winter seasons than in monsoon and post-monsoon periods which could be the contribution of less rainfall and decreased upstream flow to its dilution in the rainy season (Izonfuo and Bariweni, 2001)<sup>2</sup>. TDS values in Passur River increased as it progressed towards the Sea. Therefore, Akram point of Sundarbans showed the highest TDS with respect to remaining sampling point. **Table B.7: Appendix IV**). Regarding spatial variation, towards downstream of the River System, usually high TDS concentrations due to tidal influence of the Bay of Bengal that contains lots of salts and other nutrients.

**Total Hardness (TH)** follows similar pattern as that of TDS e.g., high TH was found during pre-monsoon and winter season as of the TDS. The higher the nutrients the higher the occurrence of Total Hardness (TH). Insufficient freshwater supply due to low rainfall during winter and pre-monsoon period and seawater contains huge quantity of minerals including calcium and magnesium, which make the water hard. During the monitoring period the TH values were found to be ranged between 110 mg/L to 2500 mg/L. In the deep Sundarbans hardness always found to be comparatively higher than the standard value of surface water (**Figure 2.16**). Generally, water hardness is found to be higher in monsoon season but in Passur River, it is found to be higher in pre-monsoon and winter season due to the saline water intrusion toward upstream (Rahman *et al.*, 2013).

**Total Suspended Solids (TSS)** include solid materials of organic and inorganic in origins, which are normally suspended in water. In the Passur-Sibsa RS, the suspended matters generally contain sand, clay, silt and loam. TSS concentrations among the monitoring sites varied from 15 mg/L to 64 mg/L. TSS values recorded during the last monsoon period found to be within the permissible limit of 150 mg/L (ECR, 1997). In 2014, TSS reached more than 150 mg/L at Mongla-Passur Confluence due to the oil spillage incident occurred at 9<sup>th</sup> December, 2014 (**Figure 2.17**). After that, the issue was not found any more, and the water bodies reinstated its properties naturally. Above all, in the Passur-Sibsa RS, TSS showed consistency in the concentrations of suspended matters. Generally, in the Passur-Sibsa RS, TSS was found to be higher in 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.

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

<sup>2</sup> 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.

### Chemical Oxygen Demand (COD)

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

COD concentrations varied from 0.03 mg/L to 84 mg/L during the last monsoon season (**Figure 2.18**). The lowest value was found at Mongla (Passur Ghashiakhilai confluence) while the highest value was found in Akram point of Sundarbans. The higher values of COD indicate high level of organic matter in the river water (Sivasubramaniam, 1999). **Figure 2.18** indicates that, organic loads are higher in the deep forests of Sundarbans than the upstream areas. Deep forests supply many organic loads in the river while upstream loads as well increase the organic materials concentrations in huge at the downstream of the RS.

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

### Nitrate, Sulphate and Phosphate

During monsoon the highest nitrate value was found to be 15.96 mg/L at Harbaria of Sundarbans and lowest value was found to be 3.85 mg/L at Left Bank of Passur River at 100m u/s of North West corner from the Project boundary. The concentration of such Nitrate during the monsoon period could be the result of surface run-off, agricultural run-off, atmospheric deposition and domestic wastes dumping together with industrial pollution from upstream.

On the other hand, during the monitoring tier sulphate concentration was found to be higher in Akram point (172.39 mg/L) and lowest (14.26 mg/L) at Middle of Passur River at South West corner from the Project boundary. In general, sulphate ( $SO_4^{2-}$ ) concentration is higher in seawater as well as in coastal river due to the tidal influence. The monitored dataset substantiates this fact i.e.,  $SO_4^{2-}$  concentration of Passur-Sibsa RS increases in the direction of upstream to downstream.

on the contrary,  $PO_4^{3-}$  concentrations was found highest (2.53 mg/L) during the last monsoon period at Mongla area and lowest value (0.3 mg/L) was found at Middle of Passur River at South West corner from the Project boundary. However, the recorded low phosphates value during wet seasons might be attributed to the limited flow of upstream freshwater, high salinity and utilization of phosphate by phytoplankton, stated by Senthilkumar et al., 2002; Rajasegar, 2003.

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

### Heavy Metals

Arsenic (As) concentrations varied between .002 mg/L to 0.003 mg/L during the last monsoon period. Though As concentration remains very low yet the seasonal variations in arsenic might be due to seasonal differences in riverine input and the intrusion of water masses (Yuan, et al., 2021). On the other hand, the concentration of Pb ranged from 0.001 to 0.009 mg/L (**Figure 2.23**). Dissolved Pb is very harmful to aquatic organisms due to bioaccumulation, it increases in body tissue of organisms (Rompas, 2010). On the contrary, the values of Mercury (Hg) revealed consistency among all the

monitoring points in all the seasons in all monitoring quarters. The values never exceeded 0.001 mg/L. All the observed data are found to be within the permissible limit (0.05 mg/L) as per ECR, 1997.

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

#### Oil and Grease

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

#### Total Organic Carbon and Total Carbon (TC)

Total Carbon (TC) represents all the carbon in the sample, including both inorganic and organic carbon. Total Organic Carbon (TOC) is the amount of carbon found in an organic compound and is often used as a non-specific indicator of water quality or cleanliness of pharmaceutical manufacturing equipment. Total Inorganic Carbon (TIC) often referred to as inorganic carbon (IC), carbonate, bicarbonate, and dissolved carbon dioxide (CO<sub>2</sub>).

This study only considers TOC, which is very important in detecting contaminants in drinking water, cooling water, water used in semiconductor manufacturing, and water for pharmaceutical use. However, three sites of Project Jetty, Harbaria and Hiron Point were monitored for TOC concentrations. During the monitoring tier TOC and TC concentrations were found highest across the Majher point area i.e. 12.7 mg/L and 239 mg/L respectively. Observed surface water is safe from TOC and TC contaminant so far (**Table B.28: Appendix IV**).

#### PAHs (Polycyclic aromatic hydrocarbons)

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

### *Findings*

Passur River is highly influenced by tidal effects. Tidal penetration in the Passur River depends on seasonal change, upstream flow and catchment water discharge. However, the physico-chemical properties of Passur river changes with the tidal intrusion in different seasons. During 34<sup>th</sup> quarterly monitoring, pH was found slightly basic in nature. Salinity, Temperature and Dissolved oxygen level was found in fair and favourable for the aquatic life forms. During the 33<sup>rd</sup> quarter (post-monsoon, 2021), TDS and TH has been relatively same with respect to the same seasons of last consecutive years. Nitrate (NO<sub>3</sub><sup>-</sup>) level remained relatively lower. The phosphate (PO<sub>4</sub><sup>3-</sup>) was found within the safe limit

of aquatic organisms. In case of metal pollution, no variation was recorded for As, Pb and Hg concentration and even no issues as well. Oil & grease concentration was found less than 2.0 mg/L at all sites which is less than the recommended concentration (10 mg/L) for Inland Surface Water.

### 2.3.6 Status of the Groundwater quality

#### *In-situ tested parameters*

The in-situ tested results obtained up to 34<sup>th</sup> monitoring period (October, 2022: Post-monsoon season) are described below:

#### pH and Temperature

During the monitoring period highest pH and temperature (8.1 and 26.69°C respectively) was recorded at Rajnagar area and the values were found to be complied with the drinking water quality standards as specified in ECR, 1997. When it comes to increasing drinking water alkalinity, various chemicals and pollutants are known to cause high pH levels. If the soil or bedrock around groundwater sources includes carbonate, bicarbonate, or hydroxide compounds, those materials get dissolved and travel with the water. These mineral deposits also increase the alkalinity of the water. On the other hand, no significant differences were observed against the previously monitored periods of the same seasons results. Temperature were found more or less consistent with the previously respective season's data. However, the monitoring results of pH and temperatures (monsoon) of selected sites are presented in **Figure 2.24** and **2.25** the observed dataset of pH and Temperature are attached in **Table B.17** of **Appendix- IV**.

#### Salinity and Dissolved Oxygen (DO)

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

Again DO values ranged between 5.0 mg/L during this monitoring season. DO concentrations were found to be within the permissible limit of ECR, 1997 (6.0 mg/L or above) in power plant groundwater and other monitoring sites. A slight low DO concentration in drinking water might only reduce the taste of water. Higher DO level makes water tastier but causes corrosion to the supply pipe.

All monitoring results of salinity and DO of the selected monitoring sites are presented in **Figure 2.26** and **2.27** and all the observed dataset of DO and Salinity are attached in **Table B.18** of **Appendix- IV** respectively.

#### *Laboratory tested parameters*

The laboratory tested results obtained up to 33<sup>rd</sup> monitoring period (July, 2022: monsoon season) are described as follows:

#### TDS, TSS and TH

The highest TDS value of 900 mg/L was recorded in Kapashdanga well and lowest (350 mg/L) was observed in Power Plant area. The values were found to be complied with the ECR' 1997 (1,000 mg/L) (**Figure 2.28: TDS**). High ground water extraction, salinity intrusion or percolation may be the key reason for increasing the level of TDS. TSS also known as non-filterable residue, are the solids



(minerals and organic material) which remain trapped on a 1.2 $\mu$ m filter (U.S.EPA, 1998). During the 33<sup>rd</sup> monitoring period, maximum TSS concentrations (2 mg/L) was recorded at Rajnagar area and minimum (1mg/L) at Power plant sites, which complied within the Standard for Drinking Water, Bangladesh (TSS: 10mg/L, ECR, 1997) (**Figure 2.29: TSS**). However, TSS was found much higher than the drinking standard quality particularly at Rajnagar during the pre-monsoon of 2017 and 2018. On the other hand, TH concentrations of the three monitored spots varied from 225 mg/L to 515mg/L during the last monsoon period. The maximum value was found at kapashdanga site and lowest at power project area. Groundwater TDS, TSS and TH values of the consecutive periods are presented in **Figure: 2.28, 2.29 and 2.30** and all the observed dataset are attached in **Table B.19 and B.20 of Appendix- IV**.

#### Chemical Oxygen Demand

The Bangladesh standard for COD in drinking water is 4.0 mg/L. Monitoring results completely complied with the Bangladesh Standard for COD concentrations for every site during the last pre-monsoon period as like the year 2014 and 2015. Organic or inorganic compounds or ion in the ground water may be the major cause for increasing COD in the ground water during the winter which may also be triggered by the decreased groundwater recharge. The COD concentrations of all the pre-monsoon period monitoring sites are given in **Figure 2.31** and all the observed dataset are attached in **Table B.21 of Appendix- IV**.

#### Nitrate, Sulphate and Phosphate

Natural nitrate levels in groundwater are generally very low (typically less than 10 mg/l NO<sub>3</sub><sup>-</sup>), but nitrate concentrations increase due to human activities, such as agriculture, industry, domestic effluents. The sources of nitrates pollution in groundwater are cultivation in areas where the soil layer is relatively thin, or has poor nutrient buffering capacity, or where there are changes in land use; over fertilization of crop for intensification of agricultural activity; spread cultivation of crops which require high fertilizes doses and which leave the soil bare over long periods (maize, tobacco and vegetables); drainage systems which lead to drainage of fertilizers; intensive agricultural rotation cycles involving frequent ploughing and extensive areas of bare soils during winters; organic fertilizers from animal husbandry and increased urbanization. Among the monitoring tiers, the NO<sub>3</sub><sup>-</sup> values were found to be highest during the monsoon of 2018 though it was found to be within the standard limit set by ECR'97. However, during last monsoon period, the nitrate values were found to be highest (4.88 mg/L) at Power Plant area and lowest at Rajnagar (0.801 mg/L).

On the other hand, Sulphate (SO<sub>4</sub><sup>2-</sup>) results were found complying with the Bangladesh Standard for Drinking Water Quality (400 mg/L) from the beginning of the monitoring study. During the last monitoring period, highest (3.31 mg/L) values was found at kapashdanga area and lowest (1.36 mg/L) at Rajnagar area.

In addition, the concentrations of PO<sub>4</sub><sup>3-</sup> were ranged between 0.5 mg/L and 1.3mg/L, which was within the standard limit of 6.0mg/L (ECR'1997). PO<sub>4</sub><sup>3-</sup> concentrations actually have both spatial and temporal variations but which is minor in the interest of this monitoring objectives as well as drinking purpose by the community resides there. The observed monsoon seasons NO<sub>3</sub><sup>-</sup>, SO<sub>4</sub><sup>2-</sup> and PO<sub>4</sub><sup>3-</sup> concentrations of groundwater are presented in **Figure 2.32, 2.33 and 2.34** and all the observed dataset are attached in **Table B.22, B.23, and B.24 of Appendix- IV**.

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

According to Bangladesh Standard (ECR, 1997), the maximum acceptable concentration of Arsenic (As) in groundwater is 0.05 mg/L. The As concentrations among all the monitoring locations ranged

between 0.002 mg/L and 0.056 mg/L. During the monitoring tier As concentration breached the national water quality standard at Rajnagar area. The prominent sources of arsenic contamination in groundwater of Bangladesh is still a matter of debate as no single cause can interpret the contamination processes (Islam et al., 2010)<sup>3</sup>. The most widely discovered two theories for the backgrounds of arsenic contamination of groundwater in Bangladesh may be the pyrite oxidation and iron oxyhydroxide reduction (Saha and Rahman, 2020)<sup>4</sup>. Higher arsenic concentration in groundwater could be (i) the presence of suitable arsenic bearing source material (i.e., rocks, minerals, soils, sediments); (ii) efficient mobilization and/or transport processes (i.e., oxidation of arsenic bearing sulphides); and (iii) lack of rapid arsenic removal processes (Polya and Middleton, 2017)<sup>5</sup>. However the owner of the tube well will be informed to and monitoring will be continued in order to understand the facts.

On the other hand, during the last pre-monsoon period Pb concentration was found to be slightly exceeded the permissible limit as specified in the ECR'97 (0.05 mg/L for Pb). Maximum concentration was recorded at Kapashdanga and Rajnagar area 0.002 mg/L. The concentration of Pb showed only spatial variation to some extent in some seasons (**Figure 2.36: Lead**). However, the water of the tube-wells was found suitable for drinking purpose in terms of metal pollution status. In addition, the concentration of Hg has been remaining same at all seasons i.e. <0.001 which is compatible with the ECR'97 standards. The observed values of As and Pb in all the seasons are presented in **Figure: 2.35** and **2.36** and all the observed dataset of As, Pb and Hg are presented in **Table B.25, B.26 and B.27** of **Appendix-IV**.

#### *Remarks*

This concluding remark represent that the physical characteristics of groundwater quality is still in good condition with slight variation in pH and salinity. The reason being saline water intrusion and infiltration due to excessive withdrawn of groundwater by the surrounding communities during the dry season. During the monitoring tier As concentration breached the national water quality standard. However, the owner of the tube well will be informed to and monitoring will be continued in order to understand the facts. In addition, evaporation also responsible for this slight salinity in groundwater. Project activities are not related to this sort of changes in salinity. Chemical characteristics of the groundwater quality are also found relatively good.

## **2.4 Land and Agricultural Resources Monitoring**

### **2.4.1 Methodology of land resources monitoring**

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

#### *Sampling Frequency*

The frequency of monitoring for land resources data collection has been considered twice in a year. Accordingly, the soil samples are collected during this monitoring (34<sup>th</sup> monitoring) field visit and sent

<sup>3</sup> M.S. Islam, F. Islam, W.W. IWA., Arsenic contamination in groundwater in Bangladesh: an environmental and social disaster. IWA Water Wiki (2010).

<sup>4</sup> N. Saha, M.S. Rahman., Groundwater hydrogeochemistry and probabilistic health risk assessment through exposure to arsenic-contaminated groundwater of Meghna floodplain, central-east Bangladesh. Ecotoxicol. Environ. Saf., 206 (2020), Article 111349, 10.1016/j.ecoenv.2020.111349.

<sup>5</sup> D.A. Polya, D.R.S. Middleton., Arsenic in drinking water: sources & human exposure. Best Pract. Guid. Control Arsen. Drink. Water., 15 (2017)

immediately to SRDI laboratory for analysis. The analysis data will be incorporated with next monitoring report.

### *Monitoring Indicators*

The continuous monitoring has 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 milli equivalents per liter (meq/L) analysed from a saturated paste soil extract.

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

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

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

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:

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

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

### *Location*

The selected mauzas for monitoring are Baranpara (E-89°30'59.1", N-22°37'57.0") of Batiaghata Upazila, Chunkuri-2 (E-89°32'20.0", N-22°34'51.0") of Dacope Upazila, Kapalirmet (E-89°36'8.8", N-22°32'18.9") of Mongla Upazila, Chakgona (E-89°34'25.3", N-22°34'18.3") of Rampal Upazila and Basherhula (E-89°34'25.0", N-22°36'14.0") of Rampal Upazila under Khulna and Bagerhat Districts. However, a new sampling location (Bidyarbon- E-89°34'40.0", N-22°33'42.0") of Mongla Upazila was included with the previous ones for monitoring as per ToR. The sampling locations with their corresponding coordinates are stated in **Table 2.9**. Locations of collected soil samples are presented in **Figure 2.38**.

**Table 2.9: Land Resources Monitoring Plan**

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



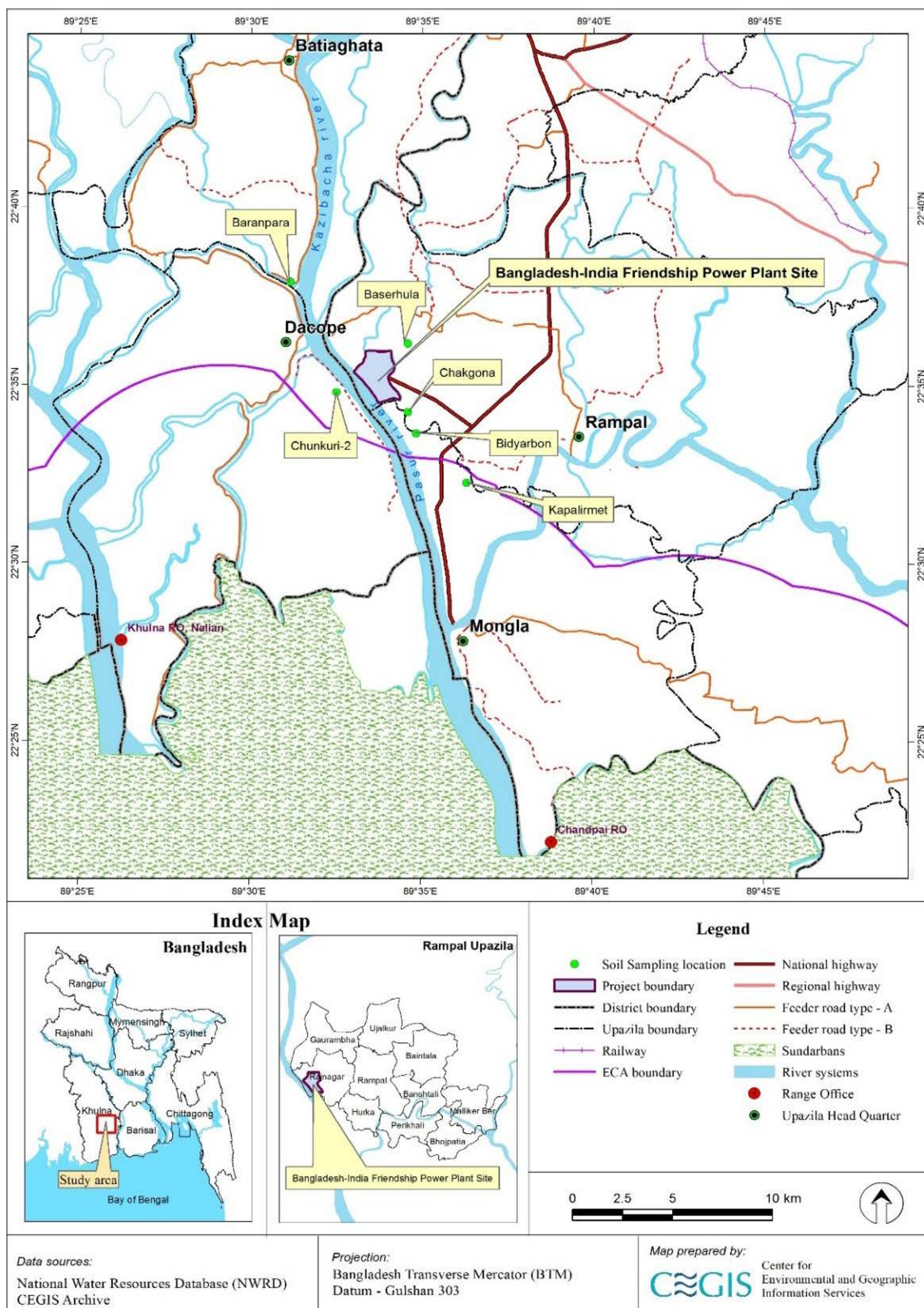


Figure 2.38: Land and Agricultural Resource Monitoring Locations





## 2.4.2 Process of Soil Samples Collection

### *Plot Selection*

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

### *Soil Sample Collection*

Standard procedure was maintained during the collection of soil samples. In every plot, minimum three pits were dug through augur to collect composite sample. Each plot had three composite samples, top soil (0-15 cm), sub soil (15-30 cm) and sub stratum (30-45 cm). Soil samples were preserved in an air-tight plastic bag for laboratory analysis.

### *Laboratory Analysis*

Collected soil samples have been handed over to the SRDI, Dhaka for laboratory analysis. The analysis data and report are incorporated with next monitoring (35<sup>th</sup> monitoring) report.

## 2.4.3 Methodology for Agricultural resources monitoring

### *Monitoring Indicators*

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

During 34<sup>th</sup> 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.

## 2.4.4 Present Cropping Patterns of Monitoring Plots

Detailed data on cropping pattern for this year were obtained through discussions with the plot owners. Based on the discussions, the plot-based cropping patterns was identified and the associated data was collected in October, 2022 and described in the following sections.

### *Agriculture Plot-1 (Baranpara)*

This plot is located at Baranpara mauza and the area is about 0.4 hectare. Previously local Aman (Chapshail) was cultivated in this area due to water logging and other problems. But this year, the farmers cultivate BR10 rice. Due to satisfactory growth, the farmer didn't use any chemical fertilizer and pesticides. The cropping practice and management practice remain same as the previous monitoring. The detailed cropping pattern is shown in **Table E.2 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. Local Aman (Benapole) was found to be cultivated in this plot in Kharif-II season. No chemical fertilizers were applied in this plot. The cropping practice and management practice remain same as the previous monitoring. Detailed cropping pattern has been shown in **Table E.2 of Appendix IV**.

*Agriculture Plot-3 (Kapalirmet)*

This monitoring plot is located at Kapalirmet and the size of the plot is 0.14 hectare. During the 1<sup>st</sup> monitoring period of pre-construction phase, it was found to be cultivated, but later on, this plot remained fallow from the 2<sup>nd</sup> and 3<sup>rd</sup> monitoring program due to increase in salinity. According to the opinion of the local people, Bangladesh Water Development Board (BWDB) decided to re-excavate the Ghona River and hence they had to remove all the obstacles to facilitate the re-excavation of the Golbunia khal mouth. Then the saline water was allowed to enter into the settlement areas including their cultivated plots during the year 2014-15 and remained inundated by saline water. As a result, farmers started practicing shrimp culture instead of cultivating traditional crops in these plots. However, a number of farmers tried to cultivate crops in their plot in this adverse condition, but all crops were actually damaged due to the above-mentioned fact.

Owners of Shrimp farms of this area used the saline water in these plots for shrimp culture as there was no scope to drain out saline water from this area. The situation is still not in farmers' favour. Farmer of this land decided that they would not cultivate crops in future due to increase in salinity. Rather they would only practice the shrimp culture in future. It was observed during the recent monitoring period that the plot still remained fallow and used for shrimp cultivation. Detailed for this plot is presented in **Table E.2 of Appendix IV**.

*Agriculture Plot-4 (Chakgona)*

This monitoring plot is located at Chakgona and the size of the plot is 0.14 hectare. Local Aman (Chapsail) was found in the field during field visit where no chemical fertilizer was used (**Table E.2 of Appendix IV**).

*Agriculture Plot-5 (Basherhula)*

This monitoring plot is located in Basherhula and the size of the plot is 0.47 hectare. Local Aman (Chapshail) was found to be cultivated in this plot in Kharif-II. The cropping practice and management practice remain same as the previous monitoring. However, detailed cropping pattern is shown in **Table E.2 of Appendix IV**.

*Agriculture Plot-6 (Bidyarban)*

The size of the plot is 0.1 ha. This year the farmer used for cultivate BR10 instead of local Aman (Chapshail). Farmer use urea for the growth of rice but no other fertilizer or pesticides are used here. Detailed cropping pattern is shown in **Table E.2 of Appendix IV**.

**2.4.5 Crop production in the monitoring plots**

The information on crop production will be collected after harvesting in April 2023. For this reason, crop production details will be incorporated in April, 2023 report (35<sup>th</sup> monitoring).

**2.4.6 Crop damage in the monitoring plots**

The information on crop damage will be collected after harvesting in April 2023. For this reason, crop damage details will be incorporated in April, 2023 report (35<sup>th</sup> monitoring).

## **2.4.7 Methodology for Livestock Resources Monitoring**

### *Monitoring Indicators*

The frequency of monitoring for livestock resources data collection was considered twice in a year. During the 30<sup>th</sup> quarterly visit, consultations and group discussions were organized with local people to know the status of feed/fodder and diseases of livestock in the adjacent of the project area (Baranpara, Chunkuri-2) and study area (Mongla bazar, Bhaga bazar, Rampal). The data on livestock status was collected in October 2022 and described in the following sections.

### *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 circumstances as for the past situations. The mortality rate of the livestock/poultry becomes negligible, due to immunization and insemination program run by Department of Livestock.

## **2.5 Water resources monitoring**

For monitoring the River bed materials analysis at the project site, Mongla, Harbaria and Akram point areas, Maidara River area were examined.

### **2.5.1 Methodology**

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 was done in 33<sup>rd</sup> monitoring (July, 2022; considered as wet season, 2022). Data analysis of that sampling is incorporated in this report.

### *Monitoring indicators*

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

## Locations

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 <sub>4</sub> )	Project Site	22°35'21.2"	89°32'53.4"	Bi-yearly (January and July)	Laboratory Testing at BCSIR
2		Moidara River	22°34'33.4"	89°33'38.8"		
3		Mongla Port	22°30'57.1"	89°35'0.3"		
4		Harbaria	22°17'44.2"	89°32'53.4"		
5		Akram Point	22°01'07.6"	89°30'34.4"		



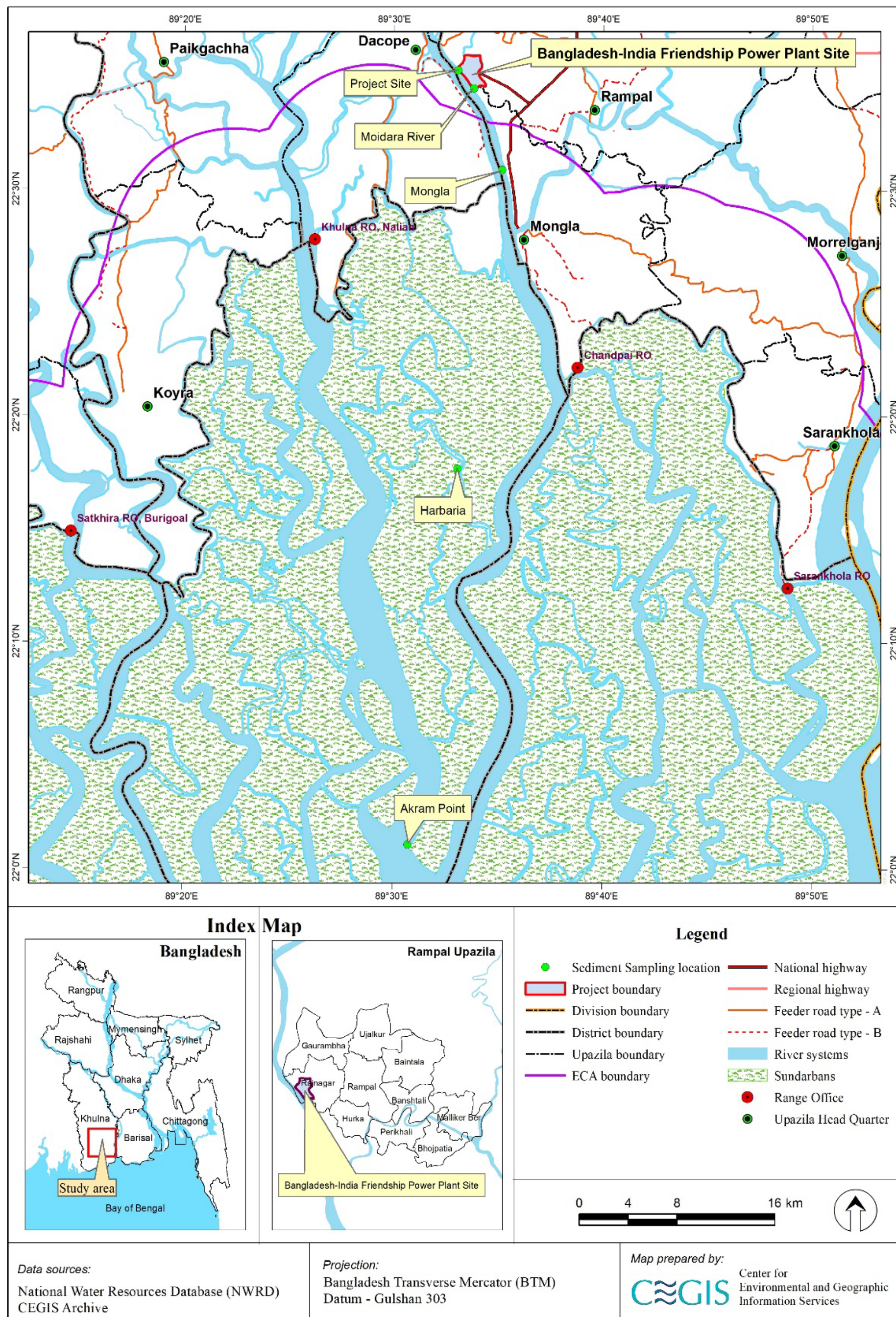


Figure 2.39: Locations of Sediment Sampling







### 2.5.2 Process of Sediment Samples Collection

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

#### *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*

Collected sediment samples have been handed over to BCSIR, Dhaka for laboratory analysis immediate after 33rd monitoring. After the analysis the data will be incorporated in 34th monitoring report.

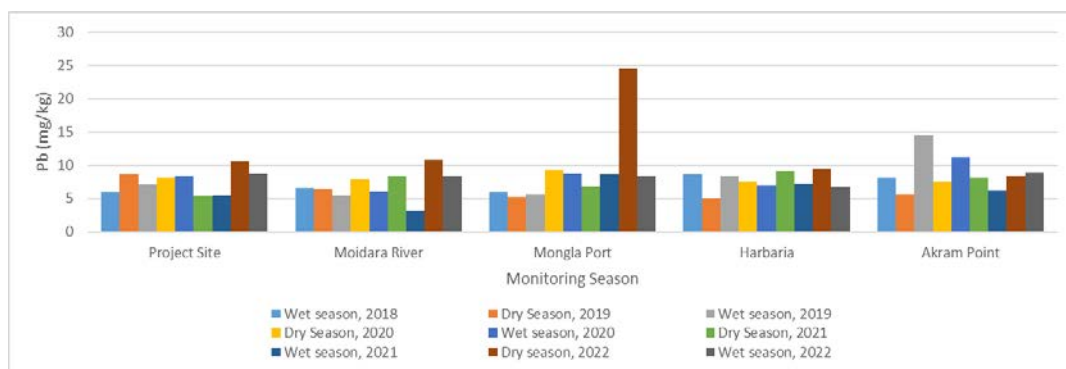
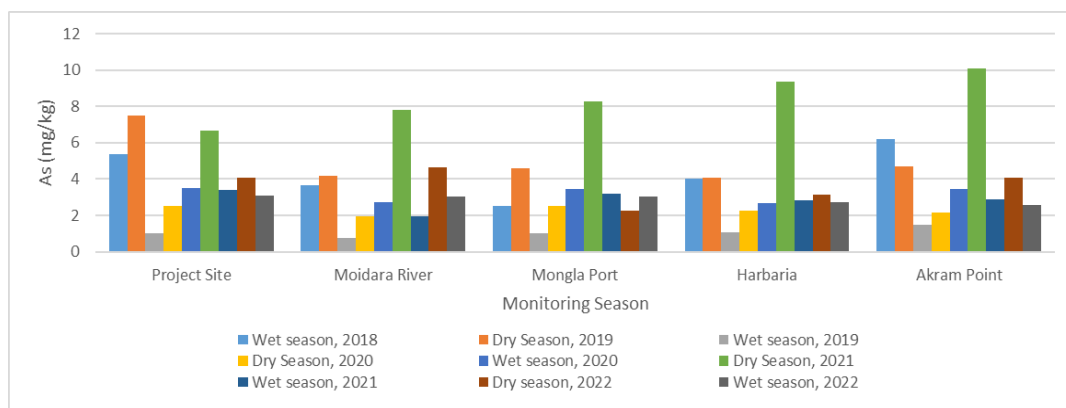
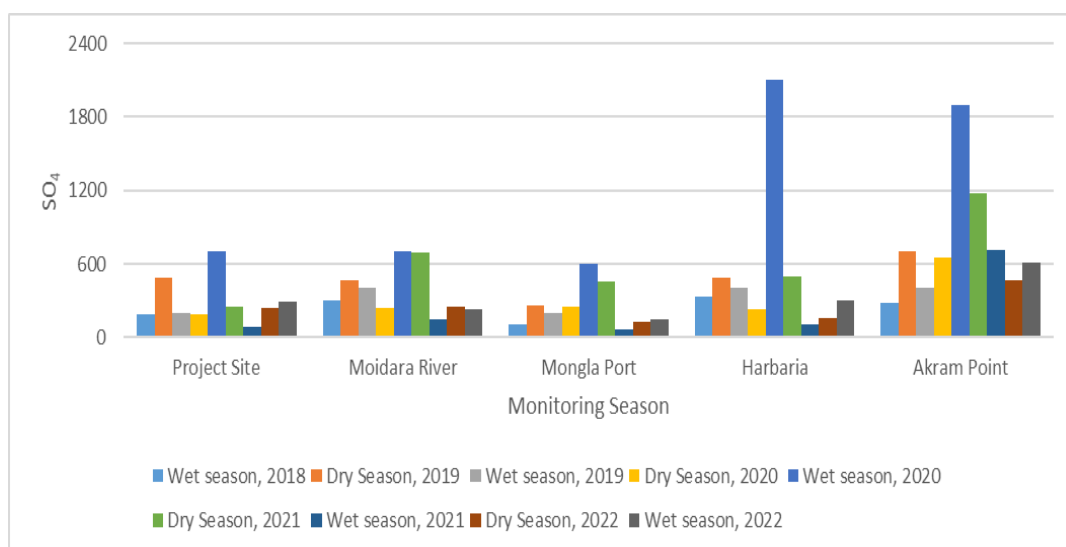
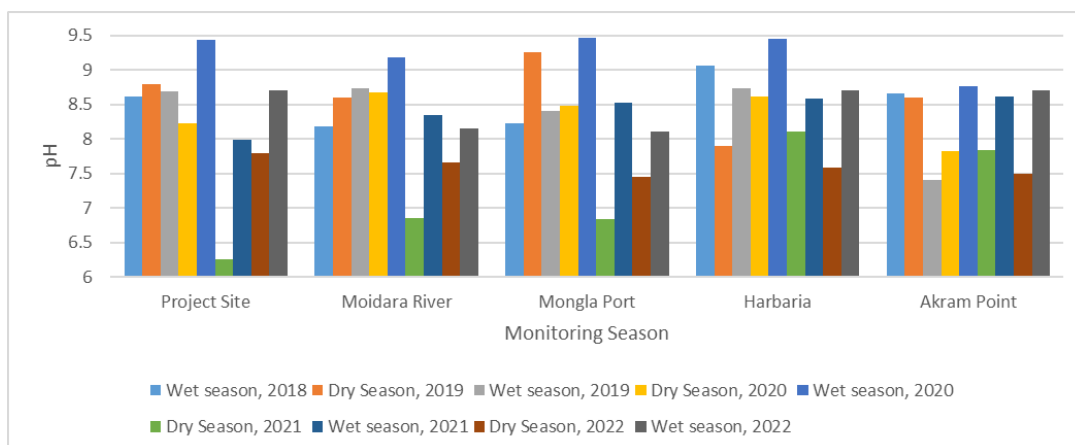
### 2.5.3 Status of sediment quality

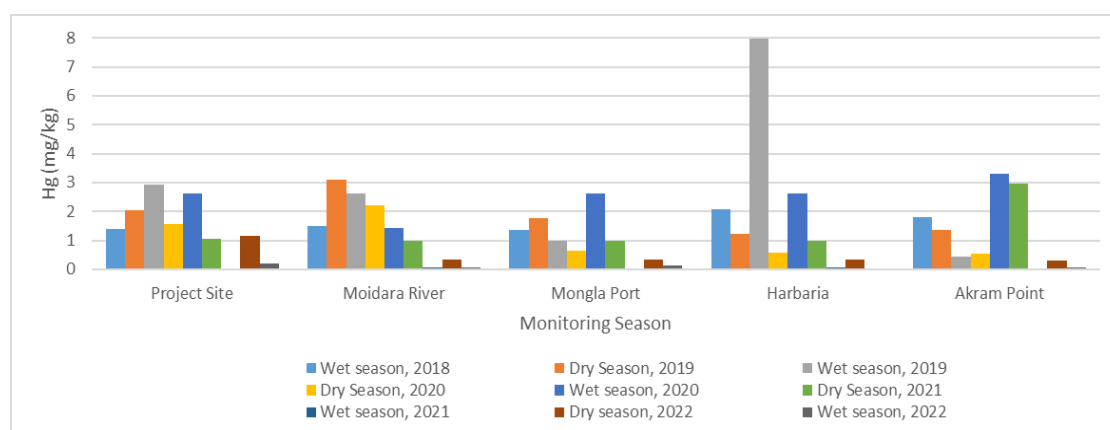
The data presented in this report represents wet season, 2022 which was collected in July, 2022 (33<sup>rd</sup> monitoring).

According to the analyzed data, Mercury (Hg) didn't cross average shale value (ASV) (**Marowsky and Wedepohl, 1971**) in any locations but crosses average upper crust value (AUCV) (**Rudnick and Gao, 2014**) in three locations (Jetty site, Moidara river and Mongla port) and touches in one (Akram point) **Table 2.11**. Both Arsenic (As) and Lead (Pb) concentration found to be lower than ASV and AUCV in all monitoring locations. As and Pb value found within the stated limits even in published reports (Ali *et al.*, 2018). Compared to previous wet season monitoring report (January, 2021), Pb and Hg concentration is increased in Jetty point while as concentration is decreased. The maximum concentration for As and Hg is found in Jetty site (project site) while Pb maximized in Akram point. Minimum concentration of Pb and Hg is observed at Harbaria while as concentration minimized at Akram point. The average concentration for As, Pb and Hg during this monitoring is 2.89 ppm, 8.26 ppm and 0.1 ppm respectively. All monitoring heavy metal (As, Pb and Hg) exceeds this monitoring average at jetty site. Previous monitoring data is incorporated in **Figure 2.40**.

**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 <i>et al.</i> , 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 2.40: Sediment quality monitoring data at different locations of the Passur River**

## 2.6 Transportation Monitoring

### 2.6.1 Location of Traffic Survey

The traffic survey for this monitoring during the construction phase was conducted in between October 25<sup>th</sup> and October 27<sup>th</sup> 2022 on three weekdays at three pre-selected locations around the project site. Weather was sunny on all the three days when the survey was conducted. The selected sites were Khudir Bottola and Gonai Bridge at Khulna Mongla Road and Taltola Bridge at Power Plant access road presented in the **Figure 2.41**.

### 2.6.2 Methodology

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

### 2.6.3 Traffic Volume Calculation

The survey results were used in computing the traffic volume of these roads in Passenger Car Unit (PCU). PCU is a matrix used in Transportation Engineering, to assess traffic-flow rate on roadways. A PCU is essentially the impact that a mode of transport has on traffic variables (such as headway, speed, density) compared to a single car. While calculating the traffic volume in PCU, vehicle conversion factors suggested by the Roads and Highway department of Bangladesh were used as mentioned in **Table 2.12**.

**Table 2.12: Vehicle Conversion Factors**

Vehicle type	Factor
Bus	2.5
Minibus/Truck	2
Car/Microbus/Zeep	1
CNG	0.5
Rickshaw/Auto Rickshaw	0.8
Tempo/Human hauler	0.6

Vehicle type	Factor
Motorcycle	0.3
Bicycle	0.2
Push Cart	4

#### 2.6.4 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	2578	1678	2383
Khulna Mongla Road at Gonai Bridge	830	567	695
Power Plant access road at Taltola Bridge	335	208	286

Source: Field Survey, October, 2022.

Similar to the earlier quarterly monitoring report, Khulna Mongla Road at Khudir Bottola received the highest traffic volume compared to the other two locations namely Khulna Mongla Road at Gonai Bridge and Power Plant access road at Taltola Bridge. On the other hand, Access road of the Power plant receives the lowest traffic load than the other monitoring locations. Moreover, during the noon time traffic loads were observed to be lower than the other time of the day. Vehicular movements at access road area were observed during the surveys were mostly for the regular construction activities of the Power Plant but decreasing than the previous time as one unit of 2x660 MW has already been completed. Furthermore, due to the completion of the Padma Bridge the Khulna mongla roads are receiving more traffic recently.



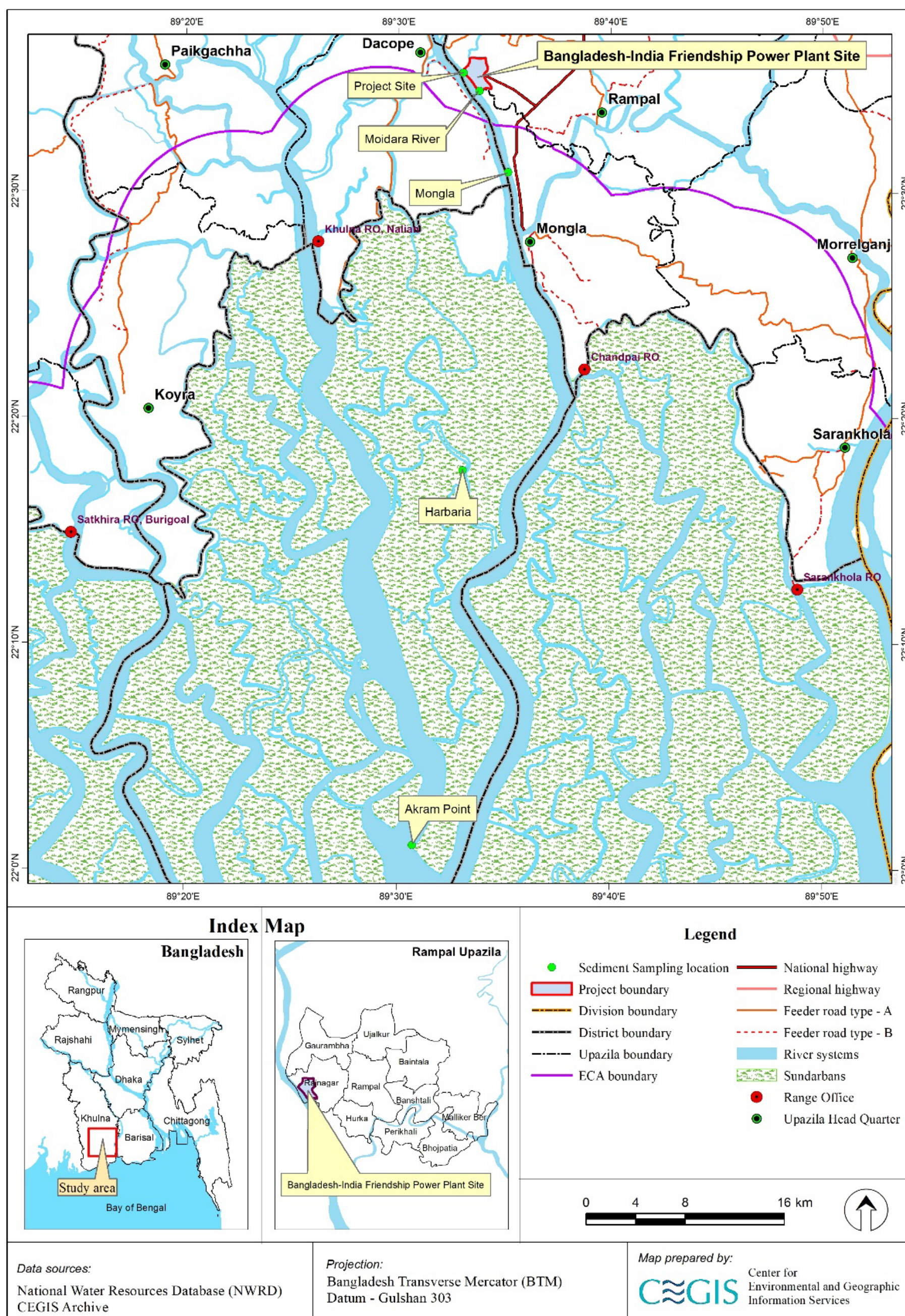


Figure 2.41: Locations of Traffic Survey







### 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 33 quarters for the session of 2014-15, 2015-16, 2016-17, 2017-18, 2018-2019, 2019-20, 2020-21 as well as of 2021-22 was completed and reported earlier. This chapter contains the findings of 34 quarter and a comparison with the earlier 33 quarters.

##### 3.1.1 Methodology

###### *Location of Monitoring Sites*

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

**Table 3.1: The Sampling Locations for Monitoring of Fisheries Resources**

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

###### *Selection of Parameters*

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

#### *Fish Habitat Status*

Fish habitat status was monitored through determination of Habitat Suitability Index (HSI) by applying numerical habitat model based on the habitat classification and sensitivity of fish diversity and survival success of different life stages of fish to abiotic and biotic factors. Fish habitat classification was analyzed by calculating Euclidean Distance among sampling sites. 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 and 2022-23 (up to 33<sup>rd</sup> quarter monitoring), 34<sup>th</sup> quarter monitoring of session 2022-23 was conducted during the period from 24 October - 02 November, 2022. No fishing activities were observed at Chandpai (F), Jongra (G), Mongla (H), Maidara (I) and Chalna (J) during the field visit in this quarter monitoring as this time was the government-imposed fishing ban period.

#### *Fish Habitat Status*

Fish habitat status has also varied in the view of habitat classification and habitat use pattern of different life stages of different fish species (**Table 3.2**).



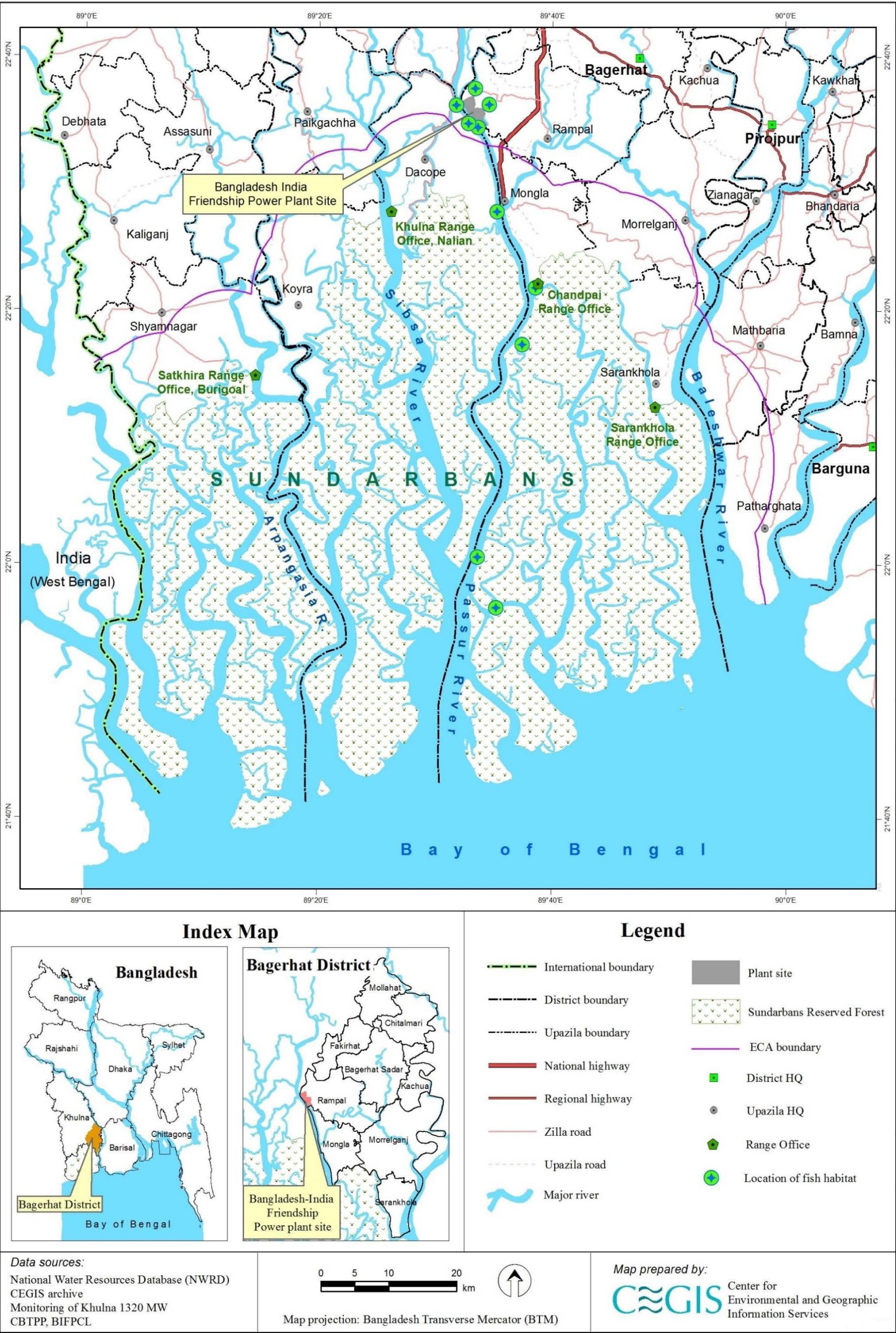


Figure 3.1: Fisheries Resources Monitoring Locations





**Table 3.2: Classification of habitat use of 10 sampling sites**

Monitoring Quarter	Type of Habitat Use
1 <sup>st</sup> (April, 2014)	<ul style="list-style-type: none"> <li>Grazing Ground</li> <li>Grazing and Breeding Ground</li> </ul>
2 <sup>nd</sup> (July, 2014)	<ul style="list-style-type: none"> <li>Grazing Ground</li> <li>Spawning and Nursery Ground</li> </ul>
3 <sup>rd</sup> (October, 2014)	<ul style="list-style-type: none"> <li>Grazing Ground</li> <li>Grazing and Breeding Ground</li> <li>Spawning, Nursery and Grazing Ground</li> </ul>
4 <sup>th</sup> (January, 2015)	<ul style="list-style-type: none"> <li>Grazing Ground</li> <li>Grazing and Breeding Ground</li> <li>Spawning, Nursery and Grazing Ground</li> </ul>
5 <sup>th</sup> (April, 2015)	<ul style="list-style-type: none"> <li>Grazing Ground</li> <li>Nursery Ground</li> <li>Spawning and Nursery</li> </ul>
6 <sup>th</sup> (August, 2015)	<ul style="list-style-type: none"> <li>Grazing, Breeding Ground</li> <li>Spawning, and Nursery Ground</li> </ul>
7 <sup>th</sup> (October, 2015)	<ul style="list-style-type: none"> <li>Grazing Ground,</li> <li>Nursery Ground and</li> <li>Growing and Feeding</li> </ul>
8 <sup>th</sup> (January, 2016)	<ul style="list-style-type: none"> <li>Nursery and Feeding Ground</li> <li>Growing and Feeding</li> </ul>
9 <sup>th</sup> (April, 2016)	<ul style="list-style-type: none"> <li>Spawning and Nursery Ground</li> <li>Feeding and Growing Ground</li> </ul>
10 <sup>th</sup> (July, 2016)	<ul style="list-style-type: none"> <li>Nursery Ground</li> <li>Feeding and Breeding Ground</li> </ul>
11 <sup>th</sup> (October, 2016)	<ul style="list-style-type: none"> <li>Breeding and Spawning Ground</li> <li>Feeding and Grazing Ground</li> </ul>
12 <sup>th</sup> (January, 2017)	<ul style="list-style-type: none"> <li>Grazing and Spawning Ground</li> <li>Nursing Ground</li> </ul>
13 <sup>th</sup> (April, 2017)	<ul style="list-style-type: none"> <li>Grazing and Feeding Ground</li> <li>Nursing Ground</li> </ul>
14 <sup>th</sup> (October, 2017)	<ul style="list-style-type: none"> <li>Grazing and Feeding Ground</li> <li>Nursing Ground</li> </ul>
15 <sup>th</sup> (January, 2018)	<ul style="list-style-type: none"> <li>Grazing and Feeding Ground</li> <li>Nursing Ground</li> </ul>
16 <sup>th</sup> (April, 2018)	<ul style="list-style-type: none"> <li>Feeding ground</li> <li>Growing ground</li> <li>Nursing ground</li> </ul>
17 <sup>th</sup> (July, 2018)	<ul style="list-style-type: none"> <li>Spawning and Nursery Ground</li> <li>Nursery Ground with Feeding and Growing Capacity</li> <li>Growing and Feeding Ground</li> <li>Omni-ground</li> </ul>
18 <sup>th</sup> (November, 2018)	<ul style="list-style-type: none"> <li>Ground for Maturation</li> <li>Omni-Ground: Nursery and Feeding Ground/Migratory Route; Ground for Maturation; Growing and Maturation Ground; Maturation Ground for Juveniles</li> </ul>
19 <sup>th</sup> (February, 2019)	<ul style="list-style-type: none"> <li>Ground for Feeding</li> </ul>

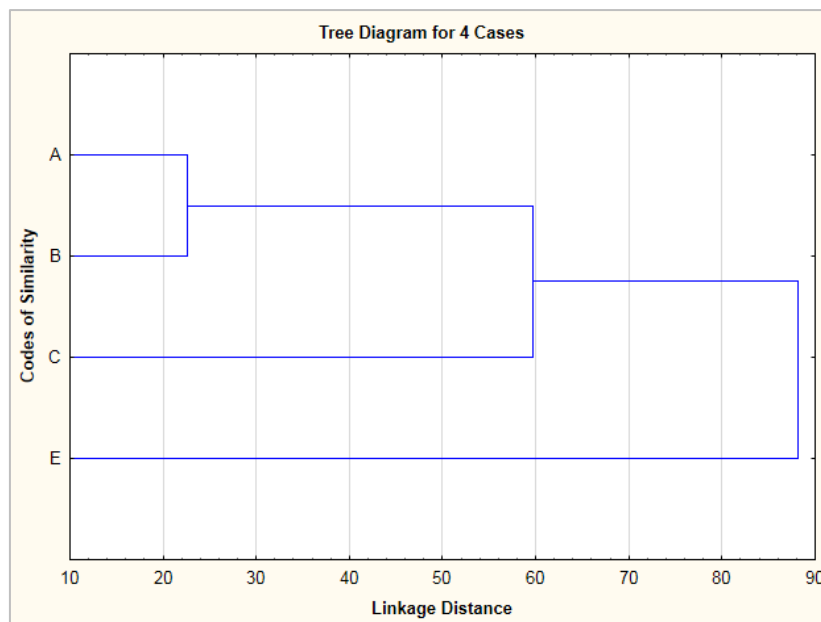
Monitoring Quarter	Type of Habitat Use
	<ul style="list-style-type: none"> <li>• Omni-Ground including Nursery Ground and Ground for Maturation</li> </ul>
20 <sup>th</sup> (April, 2019)	<ul style="list-style-type: none"> <li>• Ground for Feeding and Maturation</li> <li>• Omni-Ground including Nursery Ground and Ground for Maturation</li> </ul>
21 <sup>st</sup> (July, 2019)	<ul style="list-style-type: none"> <li>• Ground for Feeding and Maturation</li> <li>• Omni-Ground including Nursery Ground and Ground for Maturation</li> </ul>
22 <sup>nd</sup> (November, 2019)	<ul style="list-style-type: none"> <li>• Spawning and Nursery Ground</li> <li>• Omni-Ground including Feeding and Maturation Ground</li> </ul>
23 <sup>rd</sup> (February, 2020)	<ul style="list-style-type: none"> <li>• Nursery Ground</li> <li>• Spawning ground</li> <li>• Ground for maturation and feeding</li> </ul>
25 <sup>th</sup> (July, 2020)	<ul style="list-style-type: none"> <li>• Nursery Ground</li> <li>• Ground for maturation and feeding</li> </ul>
26 <sup>th</sup> (November, 2020)	<ul style="list-style-type: none"> <li>• Nursery Ground</li> <li>• Omni-Ground including Spawning and Nursery Ground, and Maturation Ground</li> </ul>
27 <sup>th</sup> (January, 2021)	<ul style="list-style-type: none"> <li>• Nursery Ground</li> <li>• Omni-Ground including Spawning and Nursery Ground, and Maturation Ground</li> </ul>
28 <sup>th</sup> (April, 2021)	<ul style="list-style-type: none"> <li>• Spawning and Nursery Ground</li> <li>• Ground for Maturation and Feeding</li> </ul>
29 <sup>th</sup> (September, 2021)	<ul style="list-style-type: none"> <li>• Nursery Ground</li> <li>• Ground for Maturation and feeding</li> </ul>
30 <sup>th</sup> (November, 2021)	<ul style="list-style-type: none"> <li>• Feeding Ground</li> <li>• Omni Ground including Nursery ground, and Maturation and Feeding Ground</li> </ul>
31 <sup>st</sup> (February, 2022)	<ul style="list-style-type: none"> <li>• Nursery Ground</li> <li>• Maturation and Feeding Ground</li> </ul>
32 <sup>nd</sup> (May, 2022)	<ul style="list-style-type: none"> <li>• Spawning and Nursery Ground</li> <li>• Maturation Ground</li> </ul>
33 <sup>rd</sup> (July, 2022)	<ul style="list-style-type: none"> <li>• Spawning and Nursery Ground</li> <li>• Feeding and Maturation Ground</li> </ul>

During the 34<sup>th</sup> quarterly monitoring conducted in October of 2022-23 Session, the sampling sites were divided into two major classes as shown in **Figure-3.2**.

**1. Feeding Ground:** The sampling sites, Akram point (A) and Haldikhali (B) were found to support mostly length groups of 3-5cm and 5-10cm of available fish species. Field findings revealed that the mentioned sampling sites were found to be used as feeding grounds of observed fish species.

**2. Maturation Ground:** The sampling sites, Akram Point (A), Haldikhali (B) and Charaputia (C) were found to support mostly 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.



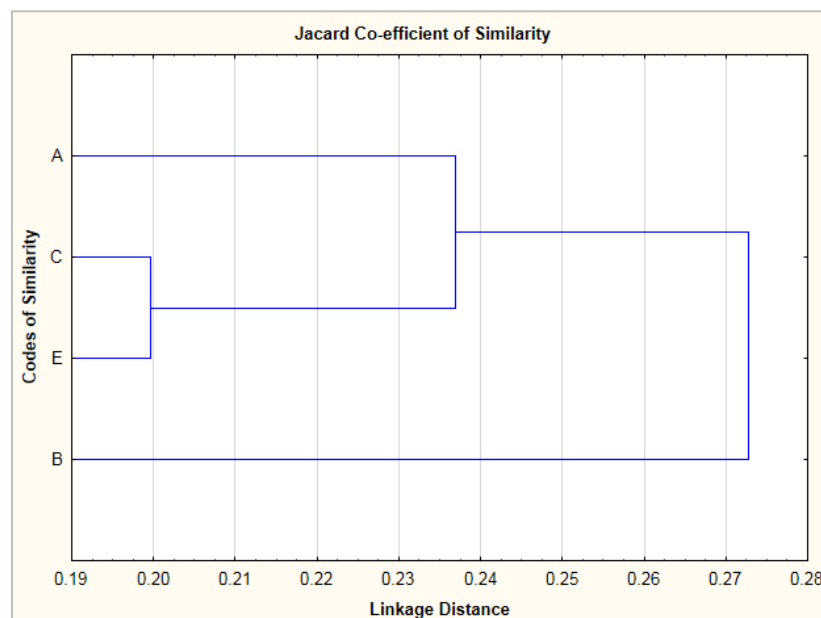


34<sup>th</sup> monitoring, October 2022

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

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

The dendrogram 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 2022-23, the JI value between the Charaputia (C) and Harbaria (E) sampling sites were the highest (**Figure 3.3**) which indicates the maximum similarity in species occurrence between the two sites out of 04 sampling sites of available fishing.



34<sup>th</sup> monitoring, October 2022

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

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*Fish Diversity**Shannon-Weiner Index*

In this monitoring year of 2022-23, species evenness also varies among the sampling sites. Highest Shannon-Weiner index was found at Charaputia (0.81) indicating most evenly distributed fish species. On the contrary, lowest evenness was found at Akram Point (0.39) (shown in **Table 3.3 and Table 3.4**). It has also been found that both the number of fish species found in in-situ catch and the evenness of their distribution within the sampling sites show high variation with the changing seasonal and yearly bio-physical conditions.

*Fish Species Richness (FSR)*

Fish species richness was identified through Simpson's Index<sup>6</sup>. Considerable difference is noticed in the fish species richness (FSR) in different habitat classes (**Table 3.5 and Table 3.6 and Figure-3.5**).

In this monitoring phase, species richness varies with the sampling sites. Maximum FSR was obtained at Charaputia Point (n=13), while very low FSR was recorded at Haldikhali (n=07). Different scenarios of richness were found in this quarter in comparison to the previous monitoring years. Among habitats in the down-stream of the Passur River system, Akram point was home to rich assemblage of *Chaka Chingri and Paissa*, Haldikhali was rich of *Kathali Chingri and Paissa*, Charaputia was rich assemblage of *Kathali Chingri, Gagra Tengra and Datina*, Harbaria was rich of *Chaka Chingri, Motka and Datina*.

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<sup>6</sup>Simpson's index is a method to calculate the community characteristics of fish in a particular habitat. It is mainly used to know about the species richness of a particular habitat to tell how many species are rich in their abundance. The value of this index ranges from 0 to 1. There is other kind of value which is described in the methodology section. The second value is mainly used to measure the species richness in the sampling sites.

Table 3.3: Site Wise Species Diversity using Shannon–Weiner Index (1st to 13th QM)

Site	Species Number													Shannon-Weiner Index*												
	1 <sup>st</sup> QM	2 <sup>nd</sup> QM	3 <sup>rd</sup> QM	4 <sup>th</sup> QM	5 <sup>th</sup> QM	6 <sup>th</sup> QM	7 <sup>th</sup> QM	8 <sup>th</sup> QM	9 <sup>th</sup> QM	10 <sup>th</sup> QM	11 <sup>th</sup> QM	12 <sup>th</sup> QM	13 <sup>th</sup> QM	1 <sup>st</sup> QM	2 <sup>nd</sup> QM	3 <sup>rd</sup> QM	4 <sup>th</sup> QM	5 <sup>th</sup> QM	6 <sup>th</sup> QM	7 <sup>th</sup> QM	8 <sup>th</sup> QM	9 <sup>th</sup> QM	10 <sup>th</sup> QM	11 <sup>th</sup> QM	12 <sup>th</sup> QM	13 <sup>th</sup> 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 3.4: Site Wise Species Diversity using Shannon–Weiner Index (14th to 34<sup>th</sup> QM)

Site	Species Number																	Shannon-Weiner Index																						
	14 <sup>th</sup> QM	15 <sup>th</sup> QM	16 <sup>th</sup> QM	17 <sup>th</sup> QM	18 <sup>th</sup> QM	19 <sup>th</sup> QM	20 <sup>th</sup> QM	21 <sup>st</sup> QM	22 <sup>nd</sup> QM	23 <sup>rd</sup> QM	25 <sup>th</sup> QM	26 <sup>th</sup> QM	27 <sup>th</sup> QM	28 <sup>th</sup> QM	29 <sup>th</sup> QM	30 <sup>th</sup> QM	31 <sup>st</sup> QM	32 <sup>nd</sup> QM	33 QM	34 QM	14 <sup>th</sup> QM	15 <sup>th</sup> QM	16 <sup>th</sup> QM	17 <sup>th</sup> QM	18 <sup>th</sup> QM	19 <sup>th</sup> QM	20 <sup>th</sup> QM	21 <sup>st</sup> QM	22 <sup>nd</sup> QM	23 <sup>rd</sup> QM	25 <sup>th</sup> QM	26 <sup>th</sup> QM	27 <sup>th</sup> QM	28 <sup>th</sup> QM	29 <sup>th</sup> QM	30 <sup>th</sup> QM	31 <sup>st</sup> QM	32 <sup>nd</sup> QM	33 QM	34 QM
A	0	0	3	0	8	0	2	0	0	0	0	7	18	0	6	20	25	0	0	11	0	0	0.92	0	0.16	0	0.65	0	0	0	0	0.64	0.59	0	0.49	0.61	0.50	0	0	0.39
B	0	0	0	0	2	0	-	0	0	0	0	0	0	0	0	7	25	0	0	7	0	0	0	0	0.92	0	-	0	0	0	0	0	0	0.73	0.52	0	0	0.65		
C	0	0	12	0	0	24	11	0	0	10	0	4	28	4	10	34	33	0	0	13	0	0	0.69	0	0	1.69	0.86	0	0	0.78	0	0.82	0.53	0.88	0.82	0.83	0.54	0	0	0.81
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	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	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
F	6	17	0	0	0	13	22	19	11	11	0	12	7	20	0	10	13	19	6	-	0.85	0.81	0	0	0	1.44	0.74	0.5	0.81	0.56	0	0.70	0.18	0.37	0	0.68	0.59	0.84	0.91	-
G	81	29	21	16	19	0	26	0	0	0	0	0	0	0	0	0	0	0	0	-	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	-
H	112	13	3	18	2	13	-	5	11	10	11	0	3	0	9	1	11	13	8	-	0.54	0.21	0.55	0.49	0	1.44	-	0.14	0.76	0.40	0.55	0	0.12	0	0.85	0	0.06	0.31	0.36	-
I	3	13	12	10	17	11	8	9	11	12	6	16	0	18	1	1	12	4	11	-	0.88	0.33	0.21	0.65	0.85	1.46	0.14	0.52	0.80	0.54	0.45	0.41	0	0.52	0	0	0.67	0.69	0.79	-
J	4	5	10	14	11	21	12	14	9	8	15	11	12	4	0	8	0	10	13	-	0.78	0.32	0.54	0.52	0.52	0.98	0.50	0.71	0.50	0.64	0.46	0.53	0.19	0.96	0	0.58	0	0.37	0.83	-

\*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 3.5: Site wise Rich Species Number (1st to 12<sup>th</sup> QM)**

Site	Location	No. of Rich Species											
		2014-2015				2015-2016				2016-2017			
		1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	7 <sup>th</sup>	8 <sup>th</sup>	9 <sup>th</sup>	10 <sup>th</sup>	11 <sup>th</sup>	12 <sup>th</sup>
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 3.6: Site wise Rich Species Number (13<sup>th</sup> to 34<sup>th</sup> QM)**

Location	No. of Rich Species																				
	2017-18			2018-19				2019-20				2020-21				2021-22				2022-23	
	13 <sup>th</sup>	14 <sup>th</sup>	15 <sup>th</sup>	16 <sup>th</sup>	17 <sup>th</sup>	18 <sup>th</sup>	19 <sup>th</sup>	20 <sup>th</sup>	21 <sup>th</sup>	22 <sup>th</sup>	23 <sup>th</sup>	25 <sup>th</sup>	26 <sup>th</sup>	27 <sup>th</sup>	28 <sup>th</sup>	29 <sup>th</sup>	30 <sup>th</sup>	31 <sup>th</sup>	32 <sup>nd</sup>	33 <sup>rd</sup>	34 <sup>th</sup>
Akram Point	2	0	0	4	0	1	0	2	0	0	0	2	4	0	1	3	5	0	0	0	11
Haldikhali	1	0	0	0	0	3	0	-	0	0	0	0	0	0	0	4	4	0	0	0	7
Charaputia	0	0	0	4	0	0	4	7	0	0	5	0	3	3	2	2	6	4	0	0	13
Bhodra	0	0	0	0	0	0	0	-	0	0	1	0	0	0	0	0	-	-	0	0	0
Harbaria	7	6	6	0	2	4	0	2	0	0	2	0	1	0	2	4	4	4	0	0	12
Chandpai	6	5	7	11	9	2	3	7	4	6	2	0	4	1	2	0	3	5	9	5	0
Jongra	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	-	-	0	0	0
MonglaPoint	2	2	1	2	3	0	3	-	1	5	2	3	0	1	0	3	-	3	1	2	0
Maidara	1	3	2	1	3	9	3	1	1	6	3	2	3	0	3	1	1	4	2	4	0
ChalnaPoint	4	2	1	2	3	2	2	2	3	2	3	2	3	1	2	0	2	-	2	5	0

Source: CEGIS Field Survey, October 2022

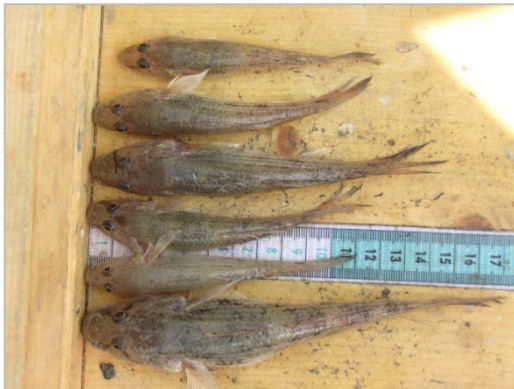
Bhetki (*Lates calcarifer*)Datina (*Pomadasys hasta*)



Paira (*Scatophagus argus*)



Bhut Baila (*Butis melanostigma*)



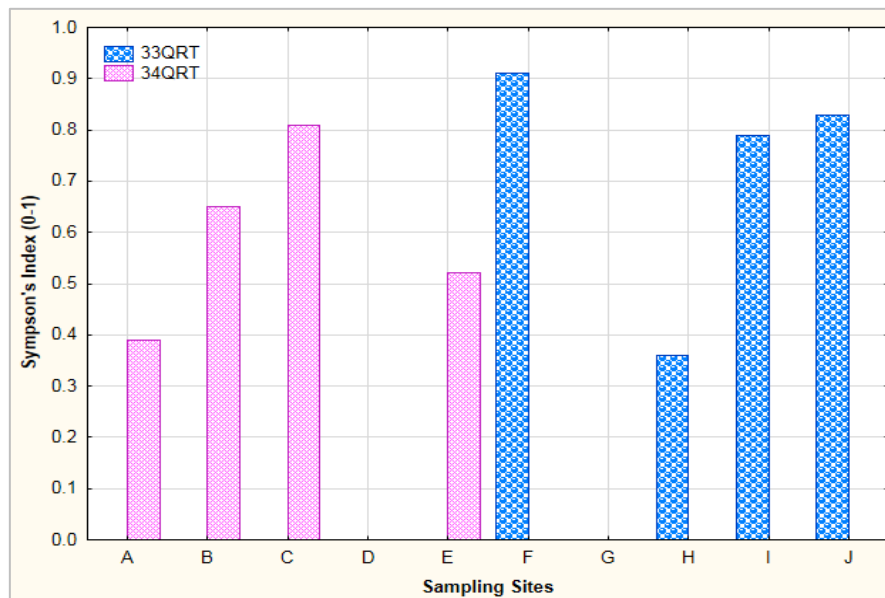
Chota Baita (*Platicephalus indicus*)



Paissa (*Liza persia*)

**Figure 3.4: Photos of some observed fish species in 34<sup>th</sup> quarter monitoring**

Source: CEGIS Field Survey, October 2022

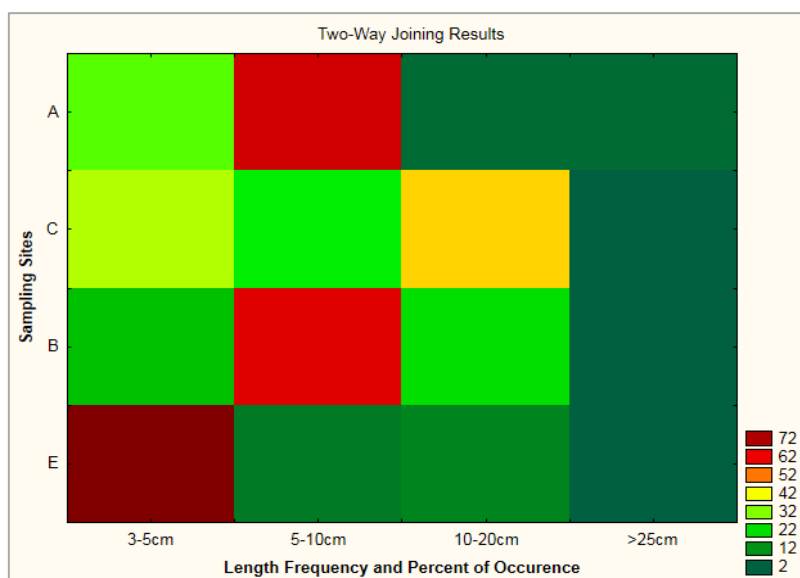


(FSR is identified though Simpson's Index)

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

### Fish Community Structure

Fish community structure was analyzed through counting the length-wise fish individuals (**Figure 3.6**). The following shows that Juvenile were dominant at Harbaria, Akram Point and Haldikhali but adult age group were at Akram Point.



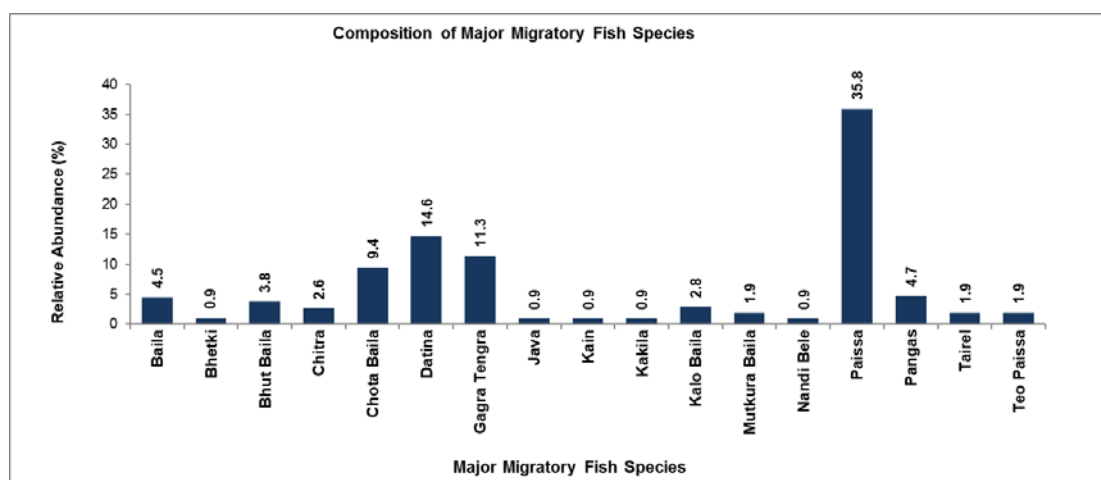
Note: N.B.: Colour ranges from deepest green to deepest red. 0-4.99% Occurrence signifies Deepest Green; 5-9.99%-Shaded Green; 11-14.99%-Normal Green; 15-19.99%-Light Green; 20-24.99%; 25-29.99%-Lightest Green; 30-34.99%; 35-39.99%; 40-44.99; 45-49.99; 50-54.99-Light Magenta; 55-59.99-Deep Magenta; 60-64.99%; 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

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

### 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 Paissa, Datina, Gagra Tengra and Chota Baila attain the maximum abundance among the migratory fish species observed in the 34<sup>th</sup> quarter of monitoring. The relative abundance of the migratory species is given below in the **Figure 3.7**.

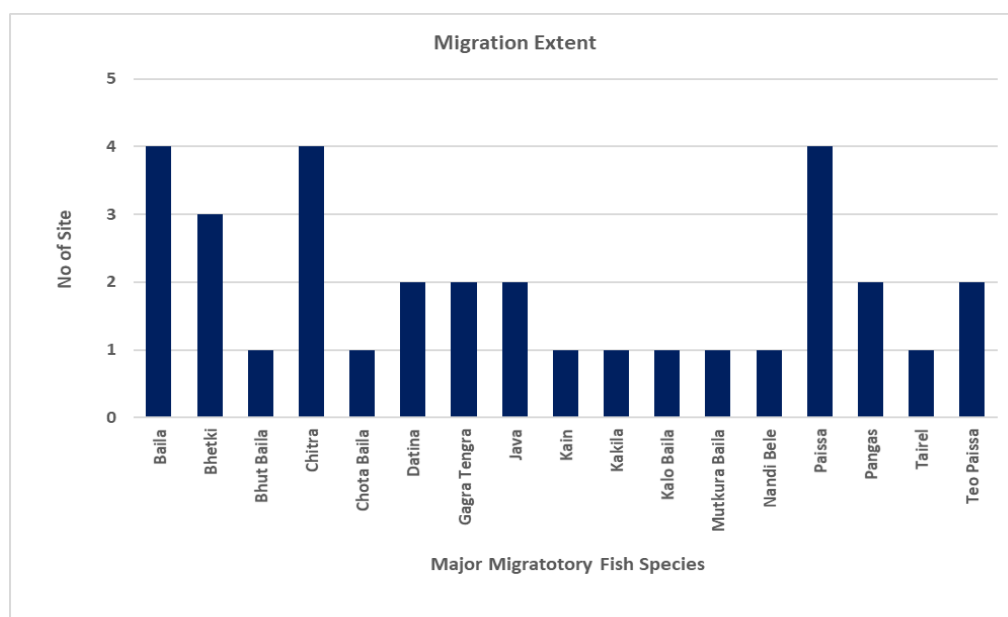


**Figure 3.7: Relative abundance of major migratory fish species in sampling sites**



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, Chitra and Baila were observed to migrate long distance (**Figure 3.8 and Table D.4 of Appendix-IV**).



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

*Shrimp/Fish Farm*

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

*Stocking Pattern*

It is reported by the farmers of the shrimp farms that maximum stocking in case of Bagda Chingri was found at Rajnagar Gher followed by Chunkuri-2 and Kapashdanga Gher. On the other hand, stocking density in respect of Paissa was highest at Chunkuri-2 followed by Kapashdanga gher (**Table 3. 7**).

**Table 3.7: Stocking Pattern of Fish/Shrimp Farm**

Name of shrimp farm	Name of species	Stocking Density (No/ha)	Stocking date
Rajnagar (42.09 ha)	Bagda	14,255	August, 2022
	Rui	114	August, 2022
	Sarpunti	76	August, 2022
	Carpu	128	August, 2022
Kapashdanga-Muralia (115.7ha)	Bagda	3,989	August, 2022
	Paissa	1296	August, 2022
	Rui	135	August, 2022

Name of shrimp farm	Name of species	Stocking Density (No/ha)	Stocking date
	Tilapia	175	August, 2022
	Carp	80	August, 2022
	Mrigal	55	August, 2022
	Patari	42	August, 2022
Chunkuri-2 (6.07ha)	Kharolla	1647	August, 2022
	Paissa	3295	August, 2022
	Bagda	6590	August, 2022
	Patari	329	August, 2022

Source: CEGIS Field Survey, October 2022

### Shrimp/Fish Growth Rate and Mortality

During the 34<sup>th</sup> quarter of monitoring, the highest growth rate was observed in Kapashdanga Gher. (Table 3.8 and Table 3.9).

**Table 3.8: Growth Rate and Mortality of Fish/Shrimp (1<sup>st</sup> to 13<sup>th</sup> QM)**

Gher No.		1 <sup>st</sup> QM		2 <sup>nd</sup> QM		3 <sup>rd</sup> QM		4 <sup>th</sup> QM		5 <sup>th</sup> QM		6 <sup>th</sup> QM		7 <sup>th</sup> QM		8 <sup>th</sup> QM		9 <sup>th</sup> QM		10 <sup>th</sup> QM		11 <sup>th</sup> QM		12 <sup>th</sup> QM		13 <sup>th</sup> QM		14 <sup>th</sup> QM		15 <sup>th</sup> QM		16 <sup>th</sup> QM		17 <sup>th</sup> QM	
		Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)		
1	0.3	15-20	0.2	40	0.25	50	-	-	-	-	30	0.18	25	0.20	60	-	-	-	-	0.2	20	0.20	60	-	-	-	30	0.03	50	-	-	0.28	0.28	0.38	80
2	0.3	30-35	0.3	94	0.25	10	-	-	-	-	0.14	20	0.15	100	-	-	0.21	15	0.3	40	0.25	50	-	-	-	10	0.38	35	-	-	0.42	0.42	0.30	70	
3	0.2	25-30	0.2	25	0.20	65	-	-	-	10	0.15	50	0.25	20	-	-	0.17	30	0.15	30	0.20	30	-	-	-	25	0.02	25	-	-	0.4	0.4	0.20	50	

**Table 3.9: Growth Rate and Mortality of Fish/Shrimp (15<sup>th</sup> to 34<sup>th</sup> QM)**

Gher No.		18 <sup>th</sup> QM		19 <sup>th</sup> QM		20 <sup>th</sup> QM		21 <sup>th</sup> QM		22 <sup>st</sup> QM		23 <sup>rd</sup> QM		25 <sup>rd</sup> QM		26 <sup>th</sup> QM		27 <sup>th</sup> QM		28 <sup>th</sup> QM		29 <sup>th</sup> QM		30 <sup>th</sup> QM		31 <sup>st</sup> QM		32 <sup>st</sup> QM		33 <sup>th</sup> QM		34 <sup>th</sup> QM		
		Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)	Growth Rate (cm/day)	Mortality (%)			
1	-	-	-	-	0.35	50	0.38	-	0.35	-	-	-	-	0.38	-	0.42	35	-	-	0.41	20	0.38	-	0.36	-	-	-	0.36	-	-	0.39	20	0.38	22
2	0.30	80	-	-	0.45	80	0.44	-	0.45	-	-	-	-	0.48	-	0.45	30	-	-	0.35	90	0.42	-	0.44	-	-	-	0.43	-	-	0.42	25	0.41	25
3	-	-	-	-	0.34	40	0.36	-	0.37	-	-	-	-	0.32	-	0.38	90	-	-	0.39	30	0.4	-	0.37	-	-	-	0.33	-	-	0.37	60	0.35	29

Source: CEGIS survey, 2014-2022

### Fish Production

#### Capture Fish Production

The present study revealed that the highest catch susceptibility was also found in case of Borshi (3.75 kg/haul) shown in Table 3.10. The highest production was observed at Akram Point followed by Harbaria (Table 3.11).

**Table 3.10: 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	0.07
		Borshi	3.0	10	3.05
		Khepla Jal	0.08	25	0.10
		Fash jal	6.0	6	1.33
		Borshi	3.0	10	3.75
B	Passur River	Khepla Jal	0.8	25	0.2
C	Passur River	Borshi	3.0	6	0.13
		Khepla Jal	0.08	20	0.02
E	Passur River	Moiya Jal	0.17	20	0.04
		Khuchuni Jal	0.08	30	0.05
		Khepla Jal	0.08	30	0.12

Source: Catch assessment survey, CEGIS, October 2022; \*\* Weight of Fry is not considered for catch assessment

**Table 3.11: Total Catch in the Sampling Sites**

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

Sampling Site	Total Catch (kg)																		
	14 QM	15 QM	16 QM	17 QM	18 QM	19 QM	20 QM	21 QM	22 QM	23 QM	25 QM	26 QM	27 QM	28 QM	29 QM	30 QM	31 QM	32 QM	33 QM
A	-	-	17	-	16	-	0.4	-	-	-	-	30.5	3.5	-	1.1	27	30	-	-
B	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	13	14.5	-	-
C	-	-	1.50	-	-	93	17.5	-	-	4.6	-	18.9	33	12.7	5.85	23	20	-	-
D	-	-	-	-	-	-	-	-	-	1.35	-	-	-	-	0	-	-	-	-
E	1.5	2.56	-	0.1	2	-	0.5	-	-	1.17	-	2.07	-	47.5	11.34	52	4	-	-
F	0	-	-	-	-	-	-	-	-	-	-	0.6	-	2.3	-	-	-	0.6	-
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
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
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

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



**Figure 3.9: Fishing gears observed during 34<sup>th</sup> quarter monitoring**

### Culture Fish Production

The present study on shrimp/fish farm in the 34th quarter monitoring phase showed that the highest production was observed in the Gher of Kapashdanga (**Table D-5, Appendix-1**).

## **3.2 Monitoring of Ecosystem and Bio-diversity**

### **3.2.1 Indicators Selection**

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

Canopy status of terrestrial vegetation indicates plant health and biomass properties of an area. Vegetation canopy structure may be change for change of plant growth rate due to soil properties change, plant physiological disorders due to change of climatic parameters or even for different human interventions. To monitor vegetation canopy status of the study area, canopy cover has been followed in different time intervals.

Among the terrestrial faunal community, Bird is an important class that is sensitive to their habitat condition. Changes of environmental parameters, land use and vegetation composition directly impact on bird's habitat of a locality. Broadly, two types of bird are found in an area; local and migratory. To observe local bird habitat suitability, number of bird nest and nesting bird species can be a good indicator. Numbers of wetlands where migratory birds come in each migration season have also been considered to observing migratory bird habitat suitability of the area.

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

### **3.2.2 Rationales for Selection of Locations**

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

### **3.2.3 Terrestrial Ecosystem**

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

#### *Description of the selected homestead*

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

#### *Species Composition of selected homestead vegetation*

##### Homestead at Rajnagar

Once, this homestead was dominated with Gewa (*Excoecaria agallocha*) among all the trees due to its height population which get favor from soil's salinity for luxurious succession. But at ending of the year 2020, the homestead owner re-developed the homestead platform by filling sand extracted from

nearer canal beds. Due to this activities, a staple portion of the Gewa coverage has been damaged along with other tree species. As a result, it is difficult to indicate the dominated tree species of this site. However, monocots fruits including Narikel (*Cocos nucifera*) and Khejur (*Phoenix sylvestris*) occupied the top canopy of the vegetation. Beside this, Safeda (*Manilkara zapota*) and Boroi (*Zizyphus sp*) are the two species of fruit yielding trees. In addition, a number of Bola (*Hibiscus tiliaceus*), Kewra (*Sonneratia apetala*) and one Sundari (*Heritiera fomes*) also found to exist. The homestead was cover very few grasses or undergrowth vegetation which also have been scarce after the land re-development.

#### Homestead at Kalekarber dighi

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

#### Homestead at Chalkghona

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

#### Homestead at Barni

A total of 38 tree species have been recorded through quadrature sample survey of this homestead. Of which, Rendi Koroi (*Albizia saman*), Mahagoni (*Swietenia mahagoni*), Taal (*Borassus flabellifer*), Narikel (*Cocos nucifera*), Khejur (*Phoenix sylvestris*) are referable. The home owner has planted many fruit yielding trees which is now in growing form. Among this, Kotbel (*Limonia acidissima*), Aam (*Mangifera indica*) and Safeda (*Manilkara zapota*) are common. Gewa (*Excoecaria agallocha*) was dominated at western part of this homestead now being less populated due to fell by the house owner. Tiger Fern (*Acrostichum aureum*) is a mangrove herb which presence at here also referable.

Random quadrature vegetation survey has been conducted at selected homesteads during recent monitoring tier. A total of 64 plant species (excluding undergrowth) has been recorded from 16 number of surveyed sample quadrates which Shanon-Winner Diversity Index were 3.59. Details of the survey result is presented in **Table 3.12 below**.



Table 3.12: 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	<i>Acalypha indica</i>	Muktajhuri	Euphorbiaceae									5								5	3.59
2	<i>Achyranthus aspera</i>	Apang	Amaranthaceae									10								10	
3	<i>Acrostichum aureum</i>	Tiger Fern	Pteridaceae					12	5	2	30	1								50	
4	<i>Albizia procera</i>	Shilkoroi	Fabaceae													1				1	
5	<i>Albizia richardiana</i>	Chambol	Fabaceae									1		3	1	1	2			8	
6	<i>Albizia saman</i>	Rendi Koroi	Fabaceae	1				5	1			1				2	1			11	
7	<i>Aphanamixis polystachya</i>	Rhyna	Meliaceae										4							4	
8	<i>Areca catechu</i>	Supari	Arecaceae					1	9	8	6		6							30	
9	<i>Averrhoa carambola</i>	Kamranga	Oxalidaceae									1								1	
10	<i>Azadirachta indica</i>	Neem	Meliaceae					8	2		1			1		1	3			16	
11	<i>Bombax ceiba</i>	Shimul	Bombacaceae															1		1	
12	<i>Borassus flabellifer</i>	Taal	Arecaceae								2									2	
13	<i>Borassus flabellifer</i>	Taal	Arecaceae									2						1		3	
14	<i>Carica papaya</i>	Pepey	Caricaceae									2						4		6	
15	<i>Cestrum nocturnum</i>	Hasnahena	Solanaceae															1	20	21	
16	<i>Citrus maxima</i>	Jambura	Rutaceae									2								2	
17	<i>Citrus medica</i>	Lebu	Rutaceae														1			1	
18	<i>Cocos nucifera</i>	Narikel	Arecaceae	3	3		4	3	2		1	1	2	5	4	1	2	2		33	
19	<i>Colocasia maxima</i>	Mankochu	Araceae					2		1	1	5								9	
20	<i>Dentella repens</i>	Danton	Rubiaceae									1								1	
21	<i>Diospyros blancoi</i>	Bilati Gaab	Ebenaceae									4								4	
22	<i>Diospyros pregrina</i>	Gaab	Ebenaceae													2	1			3	
23	<i>Erythrina ovalifolia</i>	Mandar	Fabaceae								2				1					3	
24	<i>Eucalyptus sp</i>	Eucalyptus	Myrtaceae					3												3	
25	<i>Euphorbia tirucalli</i>	Pencil Tree	Euphorbiaceae					4			6									10	
26	<i>Euphorbia tithymaloides</i>	Rangchita	Euphorbiaceae					200												200	
27	<i>Excoecaria agallocha</i>	Gewa	Euphorbiaceae	5	6		5		2		6			1						25	
28	<i>Ficus benamina</i>	Lokkho Pakur	Moraceae					3												3	
29	<i>Ficus hispida</i>	Dumur	Moraceae						1			3	8	4						16	
30	<i>Ficus religiosa</i>	Aswath	Moraceae						1				1		1					3	
31	<i>Heritiera fomes</i>	Sundari	Sterculiaceae	1																1	
32	<i>Hibiscus tiliaceus</i>	Bola	Malvaceae					3	3		2				2	1				11	
33	<i>Ipomoea fistulosa</i>	Kolmilata	Convolvulaceae					5												5	

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		
34	<i>Ixora coccinea</i>	Rangon	Rubiaceae													1				1	
35	<i>Justicia adhatoda</i>	Bashok	Acanthaceae										2		3					5	
36	<i>Lannea coromandelica</i>	Jigar	Anacardiaceae					5			2						25		1	33	
37	<i>Lawsonia inermis</i>	Mehedi	Lythraceae		1						1									2	
38	<i>Manilkara zapota</i>	Safeda	Sapotaceae									1								1	
39	<i>Mimusops elengi</i>	Bokul	Sapotaceae						1											1	
40	<i>Moringa oleifera</i>	Sazna	Moringaceae								2	2	1				2	13		20	
41	<i>Moringa oleifera</i>	Sazna	Moringaceae										1	1						2	
42	<i>Musa sp</i>	Kola	Musaceae					3				22	10				5		3	43	
43	<i>Ocimum sanctum</i>	Tulshi	Lamiaceae															50		50	
44	<i>Phoenix sylvestris</i>	Khejur	Arecaceae			3	1	1							4		5	3	1	18	
45	<i>Phyllanthus acidus</i>	Orboroi	Phyllanthaceae								1									1	
46	<i>Phyllanthus emblica</i>	Amloki	Phyllanthaceae									1								1	
47	<i>Phyllanthus reticulatus</i>	Sitki	Phyllanthaceae					6							100					106	
48	<i>Pithecellobium dulce</i>	Jilapi	Fabaceae														1			1	
49	<i>Pongamia pinnata</i>	Koroach	Fabaceae								1					1				2	
50	<i>Psidium guajava</i>	Peyara	Myrtaceae					3			1						1	1		6	
51	<i>Punica granatum</i>	Bedana	Lythraceae														3			3	
52	<i>Sonneratia apetala</i>	Kewra	Lythraceae		1	1														2	
53	<i>Sonneratia caseolaris</i>	Ora	Lythraceae															1		1	
54	<i>Spondias mombin</i>	Amra	Anacardiaceae													1				1	
55	<i>Spondios mombin</i>	Amra	Anacardiaceae						1											1	
56	<i>Swietenia mahagoni</i>	Mahagoni	Meliaceae					5	2	2		21	10	10	9	4	2			65	
57	<i>Syzygium cumini</i>	Jaam	Myrtaceae														3			3	
58	<i>Tagetes erecta</i>	Genda Phul	Asteraceae									7								7	
59	<i>Tamarindus indica</i>	Tentul	Fabaceae							2	2		1				1			6	
60	<i>Terminalia catapa</i>	Kathbadam	Combretaceae													3		1		4	
61	<i>Ziziphus mauritiana</i>	Kul boro	Rhamnaceae						1			1					2			4	
62	Unknown 1							2	4		5	1				2				14	
63	Unknown 2												1							1	
64	Unknown 3														1					1	

Species diversity of homestead plants followed more rich than the previous monitoring

### *Plant Health*

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

### *Plant Diseases and symptoms in homestead vegetation*

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

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

### *Number of diseases affected trees*

Plant health has been reduced at most the sites and found non-livelier than previous tier (May 2022). Comparing to same season monitoring in previous year (October, 2021), the present year shows deteriorating trend. The plant health has drastically fall at Rajnagar site due to post effects of sand filling of the settlement platform. Most of the trees have already death (**Figure 3.10**). Proportion of healthy and unhealthy trees are shown in **Table 3.13**.



**Figure 3.10: Overviews of the monitoring site of Rajnagar**

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

Ocation	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
Rajnagar	Cocos nucifera	17*	NS	10	5	5	15	4	5	NS	3	4	6	6	9	4	4	3	2	3	10	3	7	11	10	10	10	3	1	2	4
	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
	Manilkara zapota	1	NS	-	-	-	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
	Albizia saman	2	NS	-	-	-	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	2	2	-	2	-	2
	Excoecaria agallocha	55*	NS	-	1	1	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	10	-	-	-	-	12
	Mangifera indica	3	NS	1	-	-	2	-	-	NS	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	2	2	-	-	-	3
	Psidium guajava	2	NS	2	-	-	2	-	-	NS	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Borni	Cocos nucifera	10	7	3	-	-	3	1	2	NS	1	2	3	1	2		1	1	1	2	1	-	-	-	-	-	-	1	-	-	1
	Phoenix sylvestris	12	-	5	4	4	3	1	4	NS	4	3	4	2	1		-	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Borassus flabellifer	6	3	1	-	-	-	-	-	NS	-	-	-	-	-	1	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
	Mangifera indica	6	3	3	1	1	4	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-
	Excoecaria agallocha	18	-	-	-	-	-	-	-	NS	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	3	-		3	1	-
	Swietenia mehogani	11	-	-	-	-	1	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Areca catechu	10	-	6	2	2	8	2	2	NS	-	1	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Manilkara zapota	1	-	-	-	-	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Psidium guajava	2	2	1	-	-	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kalekarber Digghi	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
	Mangifera indica	5	1	1	-	-	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
	Manilkara zapota	2	-	-	-	-	1	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Borassus flabellifer	8	-	-	-	-	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Zizyphus sp	1	-	-	-	-	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
	Psidium guajava	8	-	-	-	-	-	-	-	NS	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Tamarindus indica	2	-	-	-	-	1	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chalkghona	Cocos nucifera	39	25	19	5	5	34	20	-	NS	2	2	4	5	3	-	3	4	2	4	3	5	-	-	-	-	-	-	-	-	2
	Phoenix sylvestris	24	-	10	1	1	6	5	1	NS	1	-	5	2	3	-	-	1	2	2	1	3	-	1	3	2	1	1	-	-	2
	Albizia saman	3	-	-	-	-	1	-	-	NS	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Excoecaria agallocha	36	-	-	1	1	-	-	-	NS	-	-	-	-	2	-	-	-	-	-	-	-	-	-	2	-	-	-	1	-	**
	Manilkara zapota	1	-	-	-	-	-	-	-	NS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Ocation	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
	<i>Psidium guajava</i>	17	1	7	-	-	-	-	NS	-	-	-	-	-	1	3	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
	<i>Mangifera indica</i>	7	2	1	-	-	-	-	NS	-	1	-	1	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	<i>Borassus flabellifer</i>	2	-	-	-	-	-	-	NS	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Note: NS = Not Surveyed \*1 Cocos and 45 Excoecaria have been cut\*\*19 Excoecaria have been cut



### Vegetation canopy status

#### Species representation in different canopy layers of homestead vegetation

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

#### Estimated Canopy cover in homestead vegetation of sampling sites

Canopy cover has been deteriorating at three sites out of four. Canopy cover has drastically reduced at Rajnagar site as most of the trees has been died in this settlement platform due to land filling by sand. In the case of other sites, the canopy cover found lower than previous monitoring because of the home owners pruned the large trees and monocots. **Table 3.14** represents the canopy status of different monitoring sites **Table 3.14**.

**Table 3.14: Vegetation Canopy Cover in different studied homesteads**

Location	% of canopy Coverage													
	Apr 2014	Jun 2014	Oct 2014	Jan 2015	Apr 2015	Aug 2015	Oct 2015	Jan 2016	Jul 2016	Oct 2016	Jan 2017	Jan 2018	Apr 2018	Jul 2018
Rajnagar	NS	19	19	17	20	20	20	20	21	23	19	15	18	14
Borni	NS	26	18	18	12	14	20	20	25	25	23	21	21	23
Kalekarber	NS	20	24	25	23	24	24	22	24	26	25	23	24	24
Chalkghona	NS	13	24	22	17	21	21	20	21	27	26	25	16	18

Note: NS = Not Surveyed

Location	% of canopy Coverage														
	Nov, 2018	Feb, 2019	Apr, 2019	Jul, 2019	Nov, 2019	Feb, 2020	Jul, 2020	Nov, 2020	Jan, 2021	Apr, 2021	Jul, 2021	Nov, 2021	Feb, 2022	May, 2022	July, 2022
Rajnagar	11	22	19	18	16	14	11	8	8	8	10	14	11	15	16
Borni	20	21	21	20	18	20	17	22	19	23	24	22	20	20	26
Kalekarber	25	24	25	25	24	24	22	22	24	19	21	24	24	24	25
Chalkghona	21	22	22	22	20	23	17	21	18	21	24	23	20	23	24

### Bird Habitat

#### Local birds and their nesting behaviour

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

Bird species and number of Bird nests in sampling sites

10 nests of Common myna have observed at Borni sites. Except that, none of the sites found any bird nest in this monitoring tier. However, **Table 3.15** represent the bird nest monitoring datasheet over the monitoring periods.

**Table 3.15: Bird Nest Monitoring Datasheet**

Monitoring Tier	Location	Name of nesting Bird						
		Little Cormorant	Little Egret	Asian Pied Starling	Tailor Bird	Great Egret	Spotted Dove	Black R. Flameback
Apr 2014	R	NS	NS	NS	NS	NS	-	-
	B	-	-	1	-		-	-
	K	NS	NS	NS	NS	NS	-	-
	C	-	1	-	1	-	-	-
Jun 2014	R	12	4	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C			11		-	-	-
Sep 2014	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Dec 2014	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Apr 2014	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Aug 2015	R	1	5	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Jan 2016	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Jun 2016	R	10	5	-	-	3	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	1	1	-	-	-	-	-
Oct 2016	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Jan 2017	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Jan 2018	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-

Monitoring Tier	Location	Name of nesting Bird						
		Little Cormorant	Little Egret	Asian Pied Starling	Tailor Bird	Great Egret	Spotted Dove	Black R. Flameback
	K	-	-	-	-	-	-	-
	C	-	1	-	-	-	-	-
Nov 2018	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Feb 2019	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	1	-	-	-
Apr 2019	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Jul 2019	R	-	-	-	1	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Nov 2019	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Feb 2020	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Jul 2020	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Nov 2020	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Jan 2021	R	-	-	1	1	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Apr 2021	R	-	-	1	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	1	-
Jul 2021	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
Nov 2021	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
	C	-	-	-	-	-	-	-
Feb 2022	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
May, 2022	R	-	-	-	-	-	-	1
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	1
	C	-	-	-	-	-	-	-
July, 2022	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	K	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-

Note: Location R=Rajnagar, B=Borni, K=Kalekarber, C=Chalkghona

### 3.2.4 Aquatic Ecosystem Monitoring

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

#### Monitoring locations

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

#### Dolphin Occurrence

##### Dolphin migration route in study area

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

##### Dolphin occurrence in Passur and Midara River

A total of 14.5 km river reach was surveyed have been surveyed within the Passur and Maidara River surround the project area (From Digraz Kheyaghat to Maidara to Chalna Ghat) through boat transact

during full tide. A total of 6 dolphins have been recorded. Of which 4 were recorded within the Maidara River in this survey. The encounter rate is 0.26 individual/km/hr which is higher than previous monitoring tier. **Figure 3.11** represents the survey transact and location of dolphin occurrence within the river channel.

#### *Dolphin occurrence in Shella Gang and Bhadra Khal*

Dolphin occurrence has monitored within 6.91 km length of Dhanmari Khal and recorded 8 dolphins. The transect length was 13.7 km which duration was 120 mins. The encounter rate was 0.56 individual/km/hour which is significantly lower than previous monitoring. The distribution of dolphin occurrence at Dhangmari Khal is presented in **Figure 3.12**.

Three Dolphins were also sighted in Shella Gang while 7.8 km transact survey conducted from Chandpai to Joymonirgol Thota to Food Silo to Joymonirgol Thota (**Figure 3.13**). The occurrence rate was 0.32 individual/km/hour.

Three dolphins have been recorded at Bhadra Khal during 45 min survey time and the 3.15 km inner reach from Bhadra Patrol Post. The encounter rate was 4.26 individuals/km/hr. The encounter rate was higher than the previous monitoring. The distribution of dolphin occurrence at Bhadra Khal is presented in **Figure 3.14**.

Another short survey was conducted Karomjal, Harbaria and Akram Point while passing the river. Dolphin has been notified at Karamjal and Harbaria while travelling on boat. However, the survey result is included in **Table 3.16**.

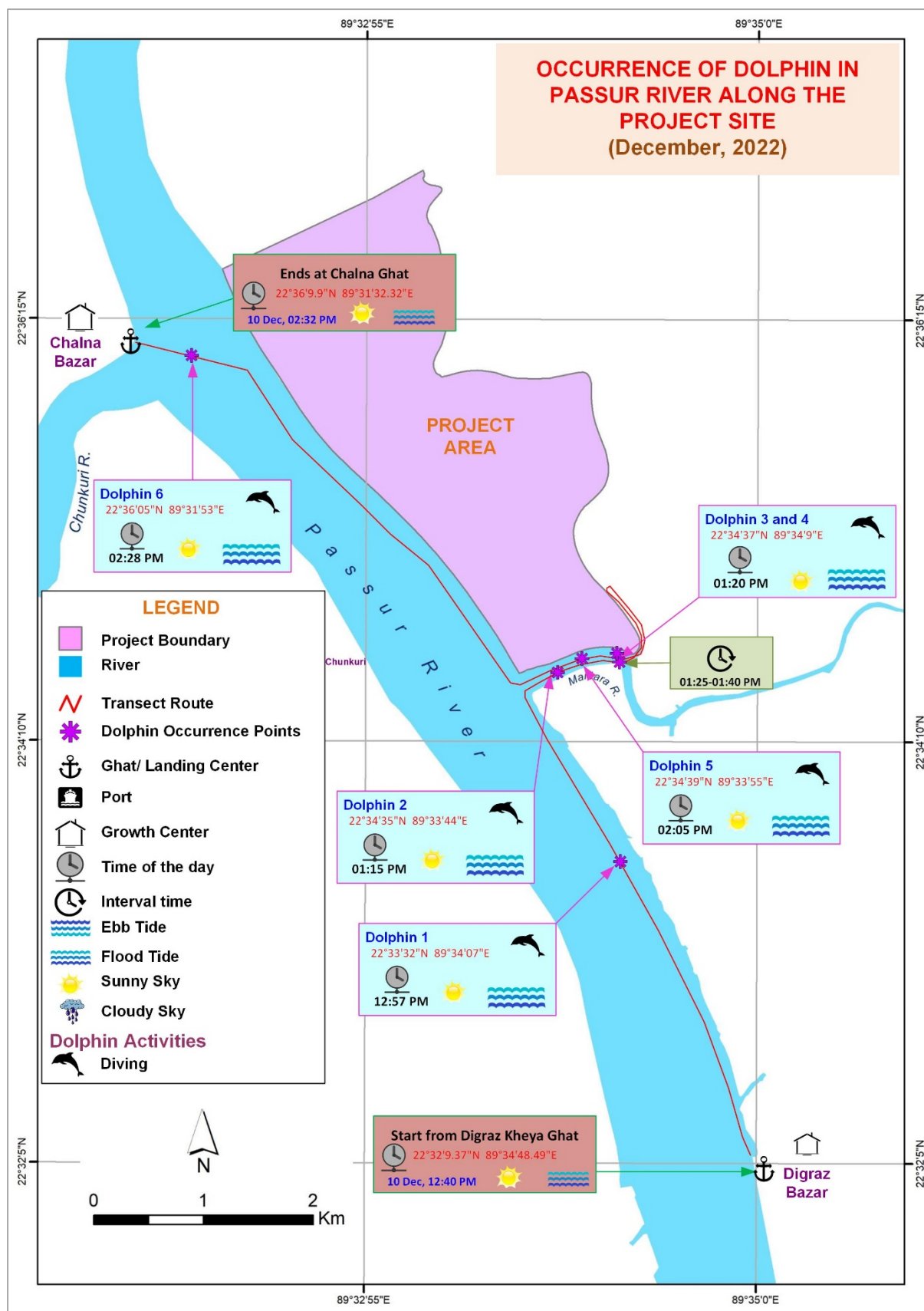


Figure 3.11: Occurrence of dolphins in Passur and Maidara River along the project site



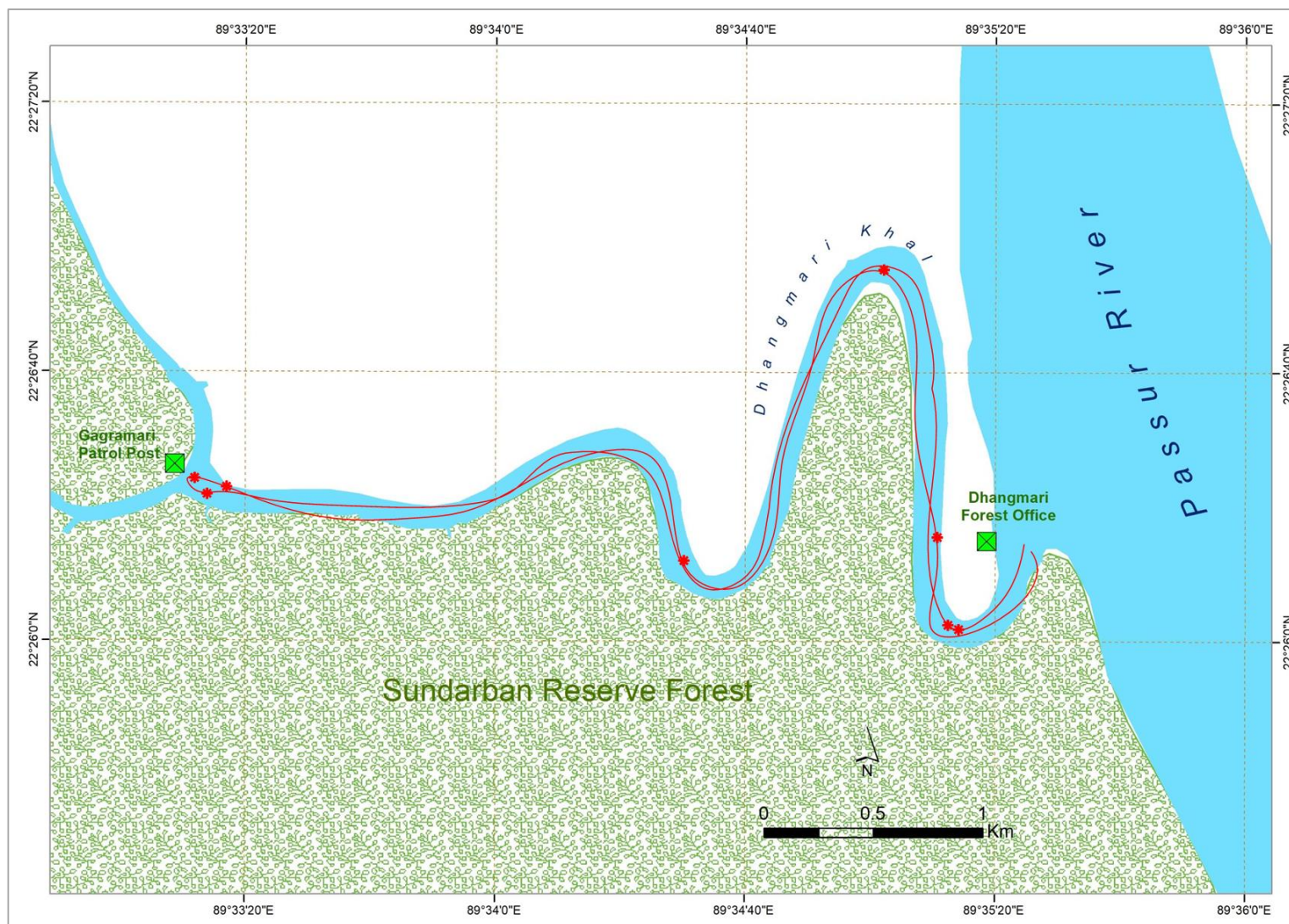


Figure 3.12: Location of dolphin occurrences in Dhangmari Khal



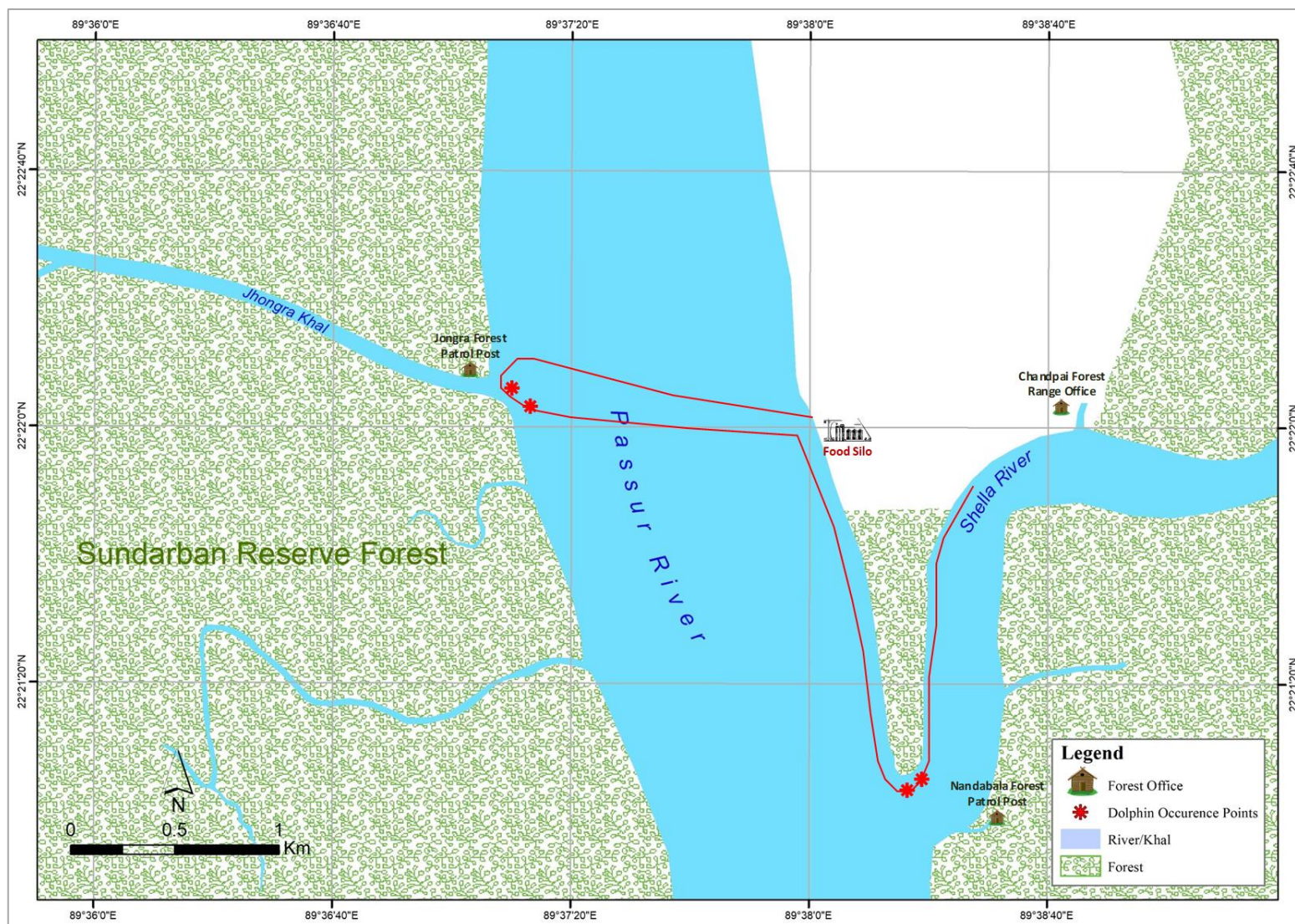


Figure 3.13: Location of dolphin occurrences in Chandpai



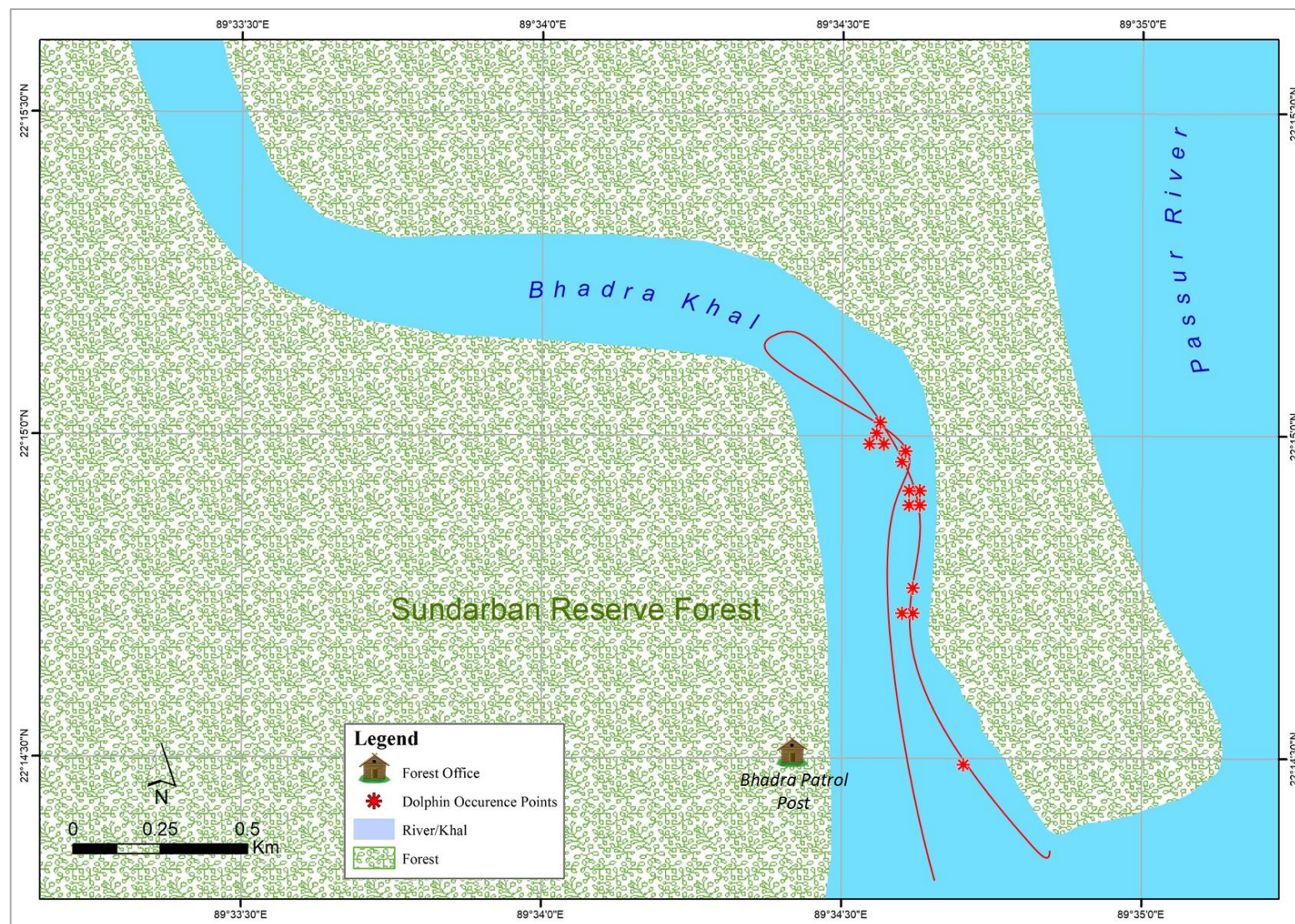


Figure 3.14: Location of dolphin occurrence in Bhadra Khal

**Table 3.16: 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
Oct-22	FT	N	NS	N	N	Y	Y
	NT	NS	Y	N	N	NS	NS

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

### 3.3 Sundarbans Forest Health monitoring

#### 3.3.1 Background

Forest health monitoring (FHM) is concerned with the ecosystem's health. Monitoring forest cover and functions provide data that can be used to influence policies and decisions on how to conserve, protect, and manage forests sustainably. Forests are an important aspect of our country's landscape. The Forest Health Monitoring program is designed to determine the status, changes, and trends in indicators of forest condition on a certain time interval basis. The Forest Health Monitoring program analyzes data from a variety of sources, including ground plots (i.e. long-term monitoring plots), aerial surveys, and other biotic and abiotic data sources, to address forest health issues that threaten forest ecosystem sustainability. One of the widely used forest healthy monitoring Bio-indicators is the growth trend over time and its relation to leaf area index (Beets and Whitehead 1996). Stands with a high leaf area index will accumulate more biomass and total volume per ha than stands with a low leaf area, other things being equal (Beets et al. 2008). Lichen abundance is another good indicator of forest health. Lichens often grow on trees and shrubs, absorbing nutrients from the atmosphere. Because lichens are very sensitive to air pollution—particularly to sulfur dioxide, fluoride, and ammonia—their presence or absence is an indicator of forest health. Mangrove trees can adapt to anaerobic and water-logged conditions by increasing their number of pneumatophores, hence providing greater surface area for gas exchange. Crab has a significant contribution to forming the ecological stability of

the mangrove forest ecosystem. Crab burrows can effectively remove nitrogen from the aquatic ecosystem in the form of gaseous nitrogen (N<sub>2</sub>) and nitrous oxide (N<sub>2</sub>O) (Lee, 1989), and can improve oxygen content in the soil layer (Amarasinghe, 2009). The quality of the soil in a forest is another important indicator of forest health (USDA Forest Service. 2007). An evaluation of soil quality usually involves measuring the soil's physical, chemical, and biological makeup at different depths. Plant species diversity is another Bio-indicator of a healthy forest. One way to assess this diversity is to determine whether there is a mix of plant species of different sizes and ages, thus creating forest "layers" that provide habitat for many species (Greenleaf Forestry and Wood Products Inc. 2010). A healthy forest has a good regeneration capacity, which is also a bio-indicator of forest health monitoring. These bio-indicators will be investigated in Sundarbans Reserve Forest (SRF) in light of the Rampal Power Plant Installation.

### 3.3.2 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 3.15**). 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 3.17**). The sites have been selected considering the distance from the proposed Project site, wind directions, coal transportation route, river systems and vegetation types. Forest health at Hiron Point site have not monitored in this visit for not reach there due to unfavourable weather.

#### *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
- Species composition & diversity
- Above ground and below ground carbon estimation
- Leaf phenology and phonological behaviour

#### *Sampling Design of Permanent Sample Plots (PSPs)*

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





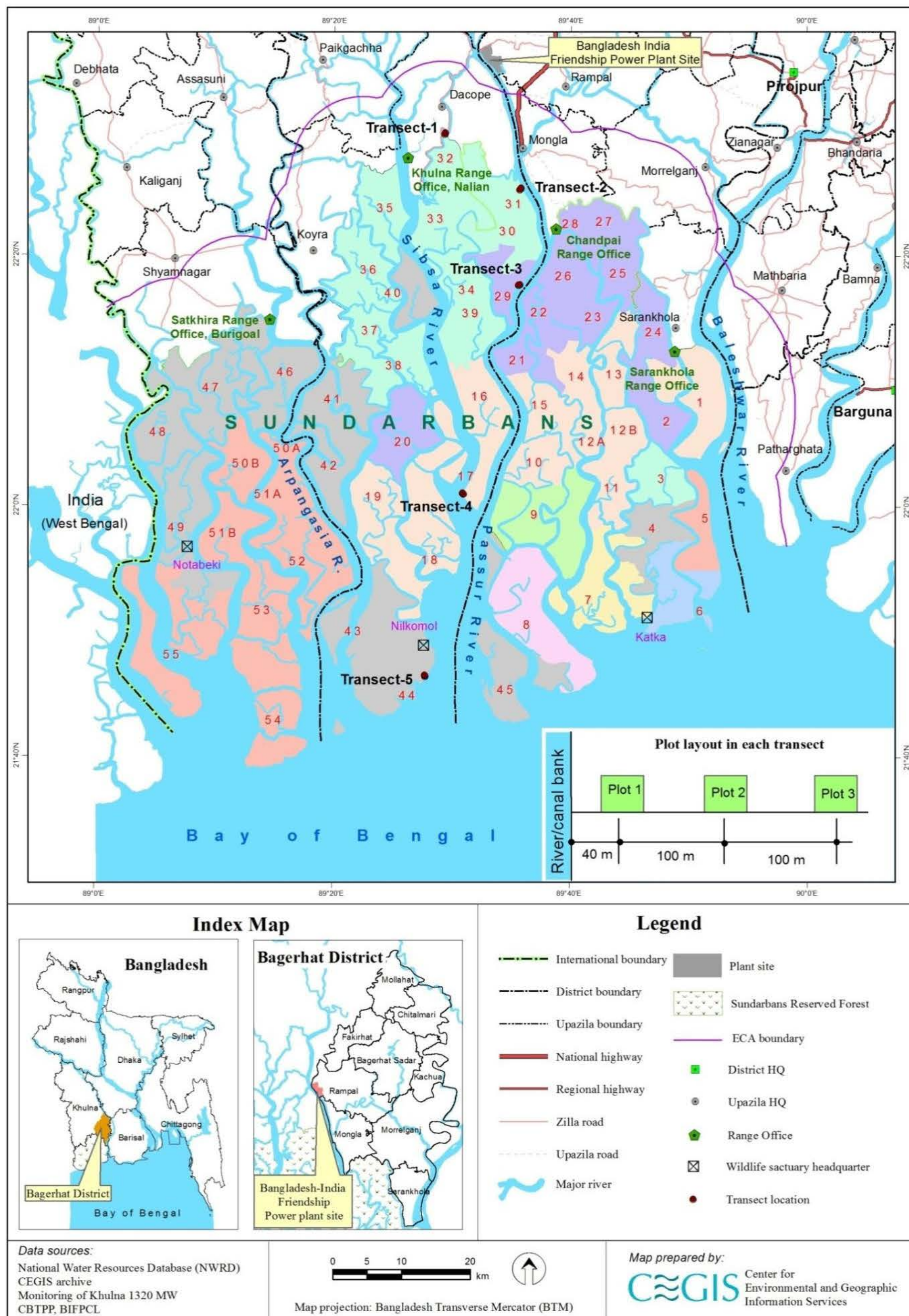
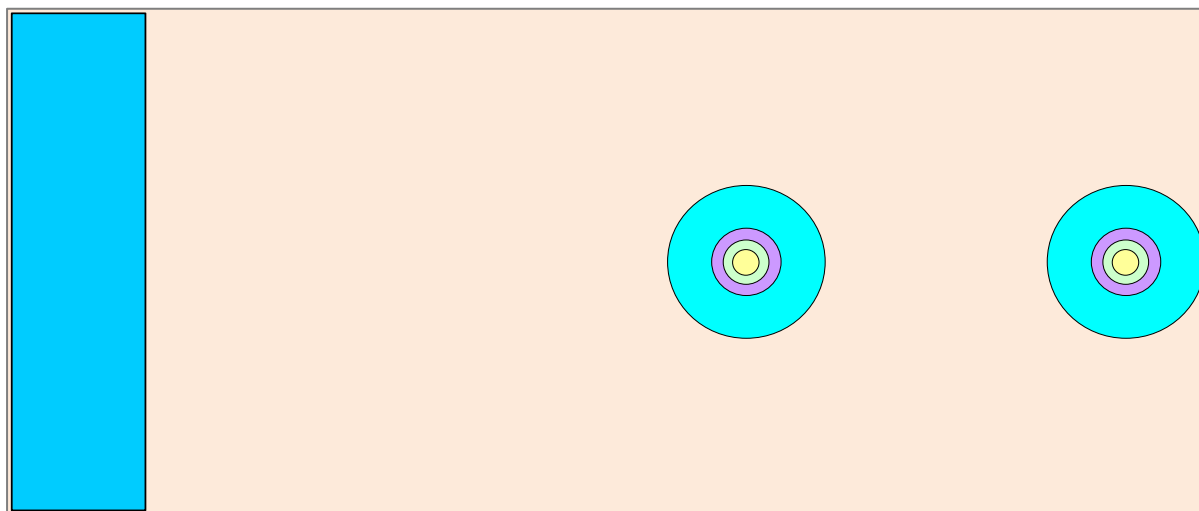


Figure 3.15: Location Map of Sundarbans Forest Health Monitoring Plots (PSP)

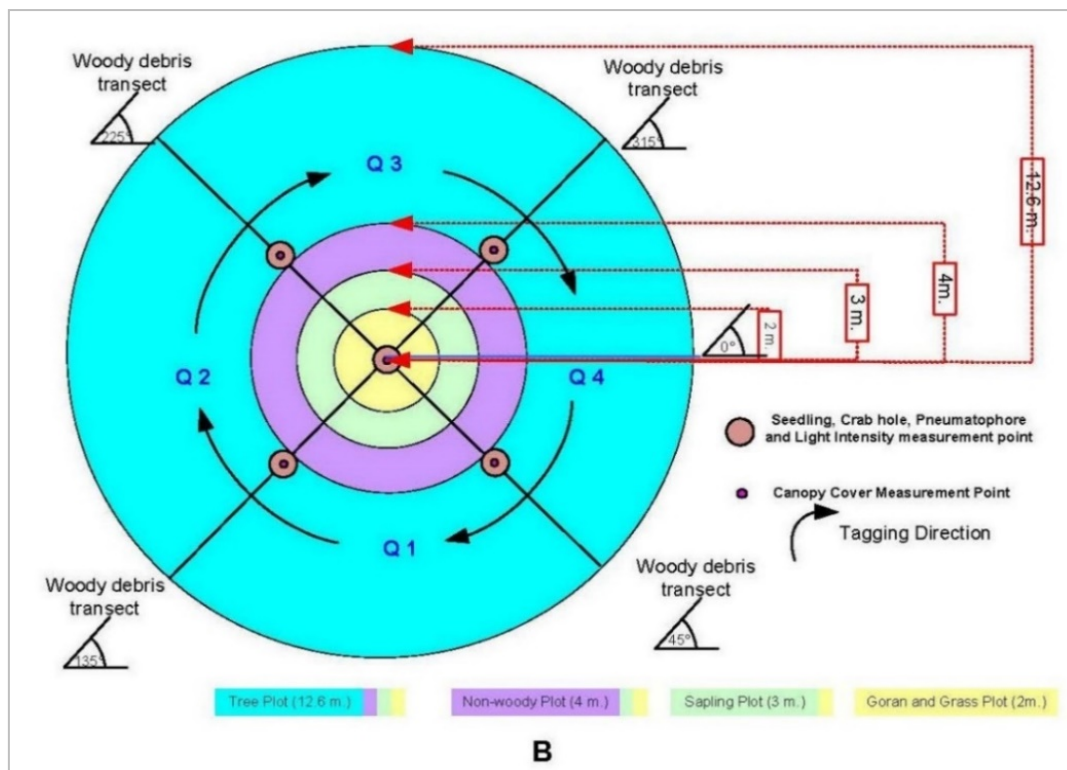


**Table 3.17: General Description of Permanent Sampling Plots (PSPs)**

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

**Figure 3.16: Layout of the Subplots and Transect Line Perpendicular from Ecotone (river or canal bank)**





**Figure 3.17: Layout of the Survey Activities in each Subplot**

### Tree Growth

The tag number of trees (DBH  $\geq 5$  cm and lean angle greater than  $45^\circ$ ) 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 3.18**).



**Figure 3.18: Team members measuring DBH and Height of trees**

### Biomass and carbon stock estimation

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

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



Where, ABG = above ground biomass; BGD = belowground biomass; DBH = diameter at breast height.

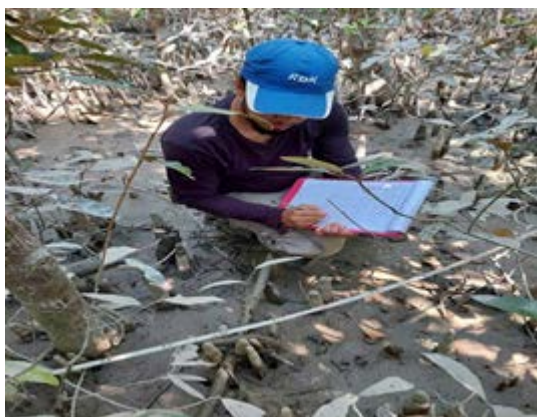
After calculating biomass, carbon content was calculated based on the assumption that carbon content is 50 percent of the dry woody biomass (Brown 1997).

### Pneumatophores

The total number of living pneumatophores has been recorded within a circular area of 2 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° (**Figure 3.19**).

### 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 2 m radius circle in each subplot's centre and in the midpoint of four woody debris transect (**Figure 3.20**).



**Figure 3.19: Team members Counting Pneumatophores**



**Figure 3.20: Team members counting crab hole**

### 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 (**Photo 3.20**). 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.



**Figure 3.21: Team member taking canopy cover and light intensity using Densitometer and Lux meter**

### Species Diversity and evenness

Tree species data with detailed information were collected from all the PSPs to identify diversity. Individual tree DBH  $\geq 5$ cm was considered.

The following indices of the Shannon's index  $H'$  was used to measure woody species diversity.

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

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

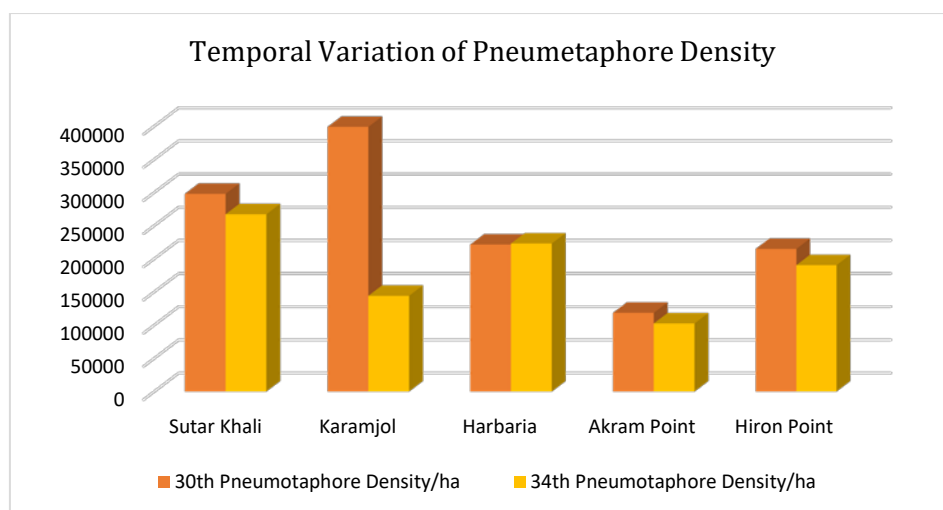
### Statistical analysis

Different statistical analyzes were performed for different indicators. A one-way ANOVA analysis was tested for canopy cover, pneumatophores and seedling density in order to find out whether any difference was made. For crab hole change, we performed paired sample t test in order to find out the difference.

### **3.3.3 Monitoring Result and discussion of SRF Health**

#### *Pneumatophore*

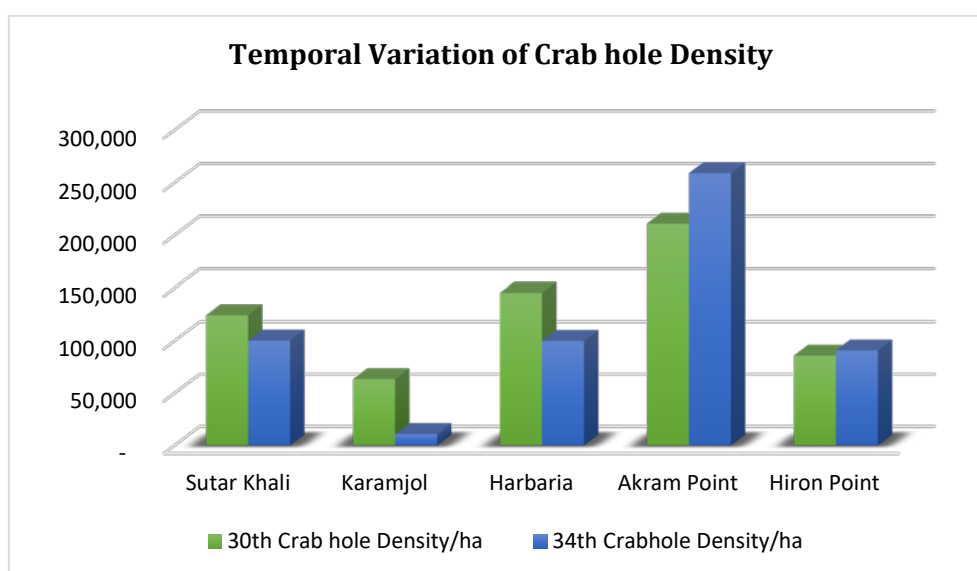
The mean number of pneumatophores increased Harbaria but decreased in others four points in compared with the assessment was done at the same time last year (**Figure 3.21**). In karamjol pneumatophores density significantly reduced than others plot as the 2<sup>nd</sup> and 3<sup>rd</sup> plot of karamjol is fully inundated up to 5 cm. Moreover, large gap phase dynamics observed in 3<sup>rd</sup> sub plot with high abundance of sundry tree regeneration. The number of pneumatophores may also vary due to the elevation of the forest floor from the mean sea level (MSL). The major function of pneumatophores is to exchange gas into the atmosphere during tidal inundation. Hence, the highly elevated plot with less effect of inundation may have lesser number of pneumatophores.



**Figure 3.22: Pneumetaphore density among the four plots between two different time periods**

#### *Crab hole Density*

The mean number of crab hole observed within plots during this monitoring survey showed a substantial decrease in 3 plots except Akram point and hiron point compared with assessment done at the same time last year. Crab hole density increased in Akram point and Hiron point by 23% and 6% respectively (**Figure: 3.22**). This may be due to sandy forest floor at Akram point because crab love to drag hole on that particular habitat. In Karamjal, as the 2<sup>nd</sup> and 3<sup>rd</sup> plot was fully inundated so the carb hole was found significantly lower than previous year. It is difficult to predict the relationship of crab hole with seasonal variability. Although mangroves are marshy land, there are differences in terms of area in dry period (winter) and wet period (monsoon) which shows some influences on crab hole abundance.

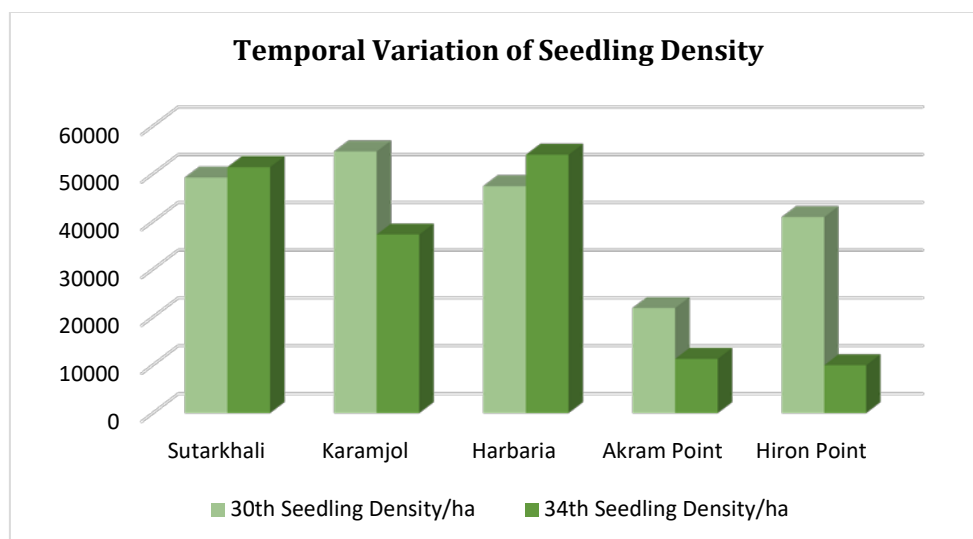


**Figure 3.23: Crab hole density among the four plots between two different time periods**

#### *Seedling Density*

The mean number of seedlings observed within the plots during this monitoring survey showed a substantial increase at Sutarkhali and Harbaria point but significant decrease at Karamjol, Akram point and Hiron point compared with the previous year same time assessment. A substantial decrease

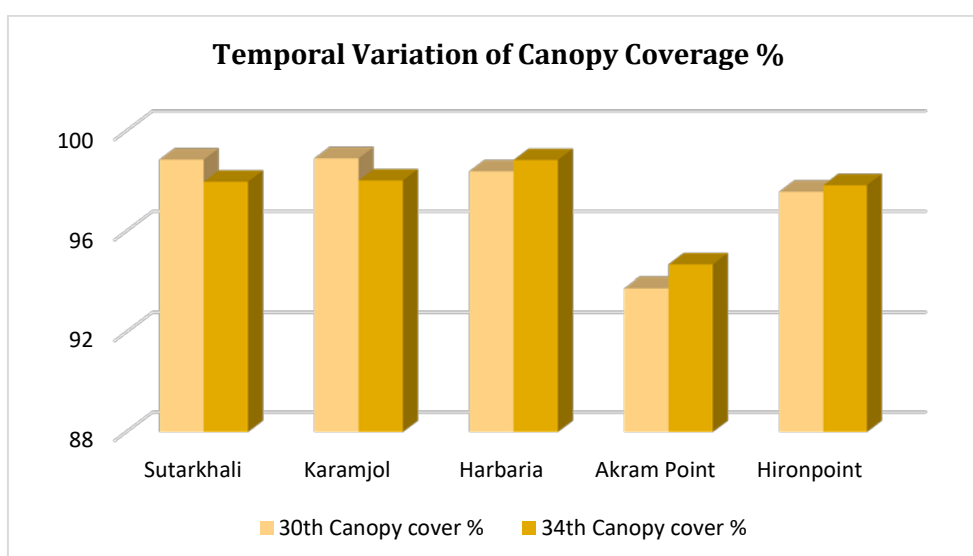
by 32%, 48% and 76% was seen for karamjol, Akram point and Hiron point respectively (**Figure 3.23**). The recruitment of new seedlings depends on regeneration and survival rate. These indicators also depend on canopy cover, soil chemistry (pH, salinity, organic matter etc.). Seedlings usually die at an early stage in natural forest due to competition for nutrients as well as light intensity. Other than the silvicultural competition, the seedlings at Karamjol face anthropogenic stresses due to their location being very much closer to the locality and considered tourist hotspots. However, the monitoring result of this period has shown significantly decrease of seedlings at Akram point and Hiron point than than previous year. Sand carpeting may be created stress condition for seedling survival.



**Figure 3.24: Seedling density among the four plots between two different time periods**

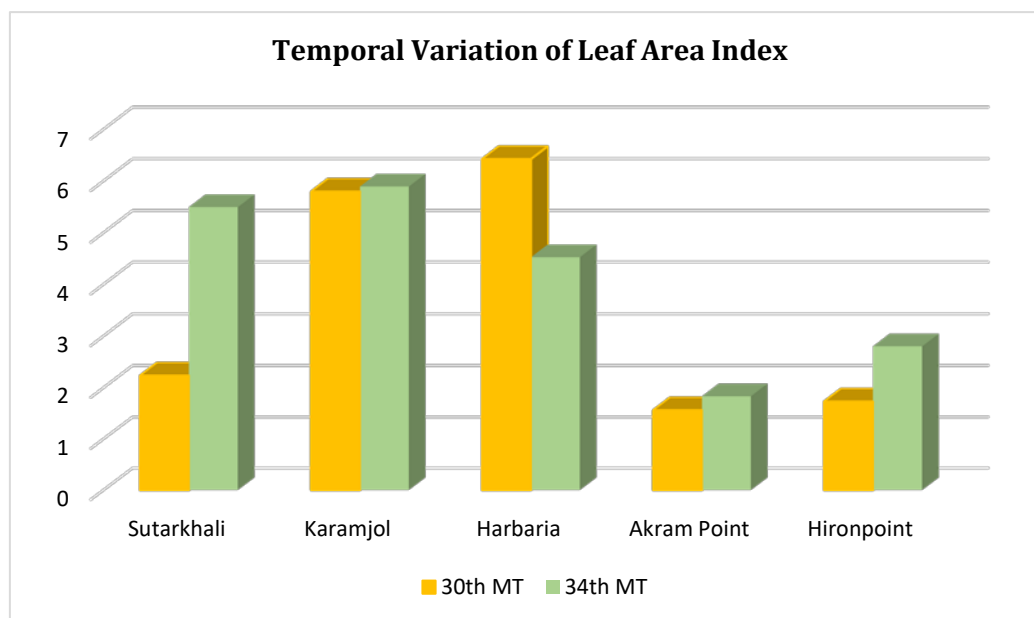
#### *Canopy Coverage*

Canopy coverage is almost same compared with the last post monsoon season. The highest percentage (99%) of canopy coverage found this time was in Harbaria point (**Figure 3.24**). This may be due to the good foliage condition and less insect damage. Since greater than 60% of the canopy coverage in a site is treated as healthy, all the locations of the monitoring sites are in good shape.



**Figure 3.25: Canopy coverage among the four plots between two different time periods**

The LAI influences daily rate of net canopy photosynthesis which results in exchange of atmospheric CO<sub>2</sub>. The minimum the ratio of under canopy to open canopy light intensity value indicates the maximum the LAI. Hence, the maximum the net canopy photosynthesis. It is found that the LAI has increased in Karamjol, Akram point and Hiron point from previous results. This is a sign of good health of forest. However, at Sutarkhali and Akram point the LAI is much lower due to high under canopy light intensity. This is may be due to the intensity of day light, weather condition and variation of canopy coverage (**Figure 3.25**).

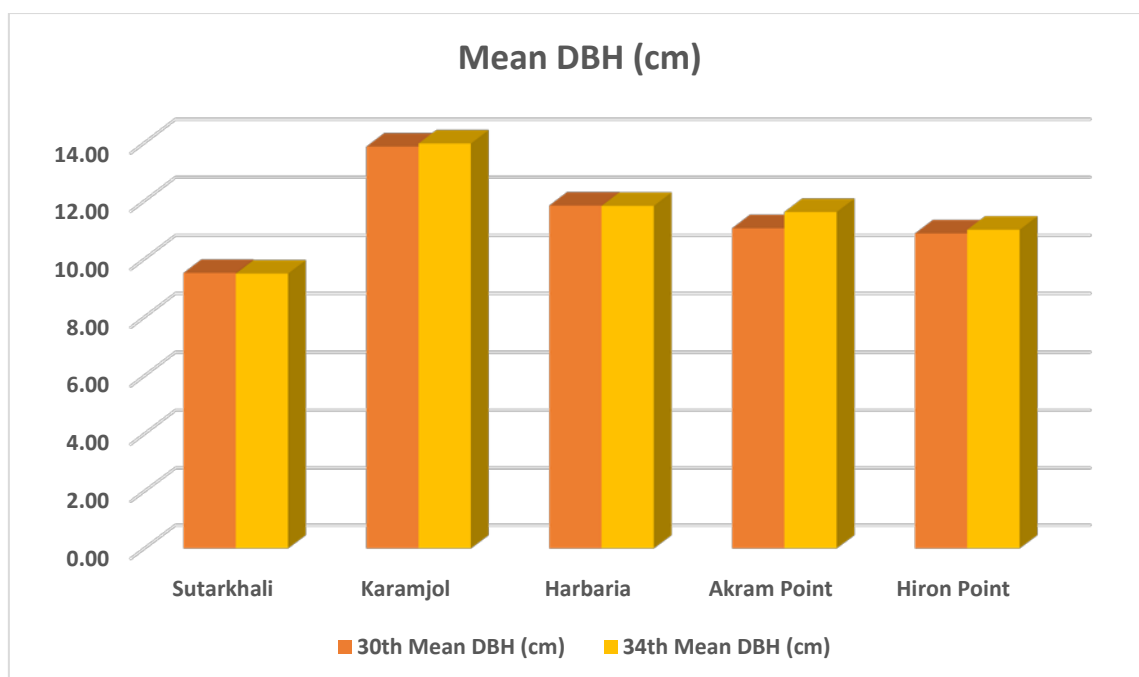


**Figure 3.26: Leaf Area Index between two different time periods**

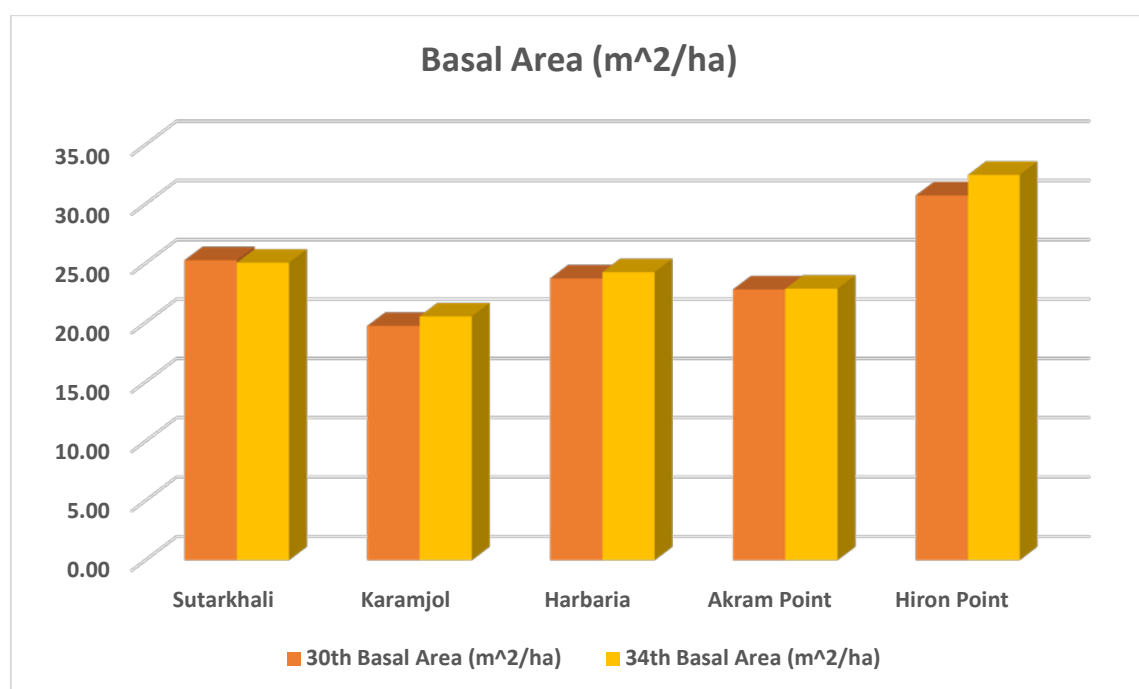
*Mean DBH, Basal Area and stem density*

Mean DBH (Diameter at breast height; 1.37 m), Basal area (Sum of cross sectional area measured at breast height of all tree species in a plot) and stem density are three important stand structural properties in mangrove forests that are related to timber stand volume and growth. These three structural properties are inter-linked. For example, if a stand has higher stem density but lowers basal area indicating that the mean DBH of the tree of that stand is also lower and vice-versa. However, it is also varied by other adaptic and climatic factors. The average DBH increased in all plots except Harbaria and Sutarkhali points as some of the trees were seen to be shrank because of top dying of Sundri. However, DBH sometimes varies due to the position of the gall at DBH points. For the same reason basal Area (m<sup>2</sup>/ha) was also reduced in Sutarkhali from the previous year assessment period but increased in others four plots. Greater basal area equals greater tree canopy cover; thus, less sunlight reaches the ground as both increase. Change in basal area over time is an important indicator of forest recovery during succession. In Akram point stem density of trees per hectare also reduced due to increasing mortality rate of sundri because of top dying. The mean DBH, basal area and stem density are shown in **Figure 3.26**, **Figure 3.27** and **Figure 3.28**.

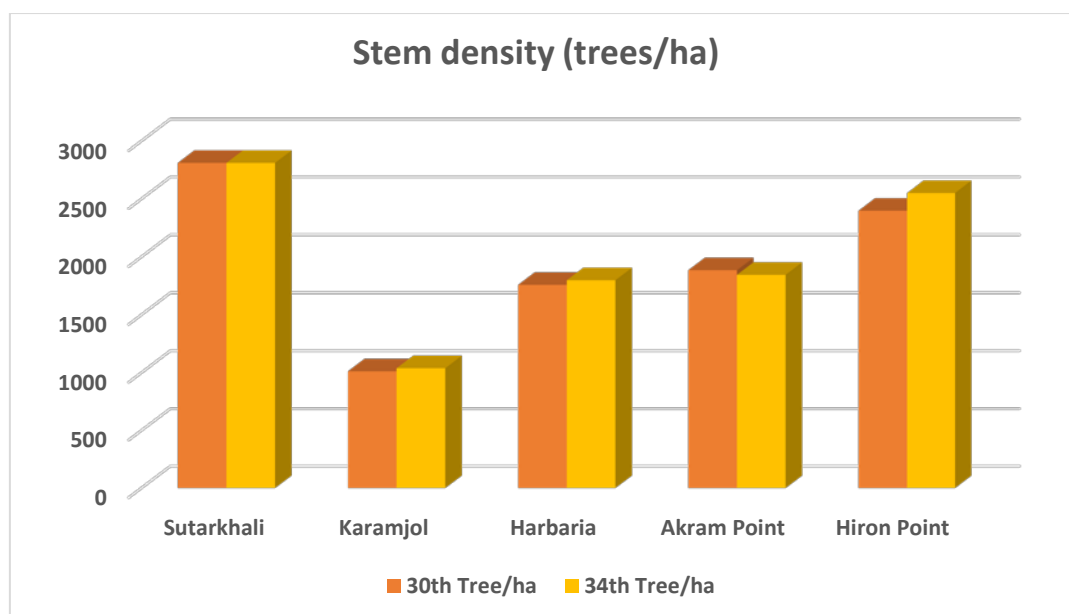




**Figure 3.27: Temporal Variation of Mean DBH in five study plots in SRF**



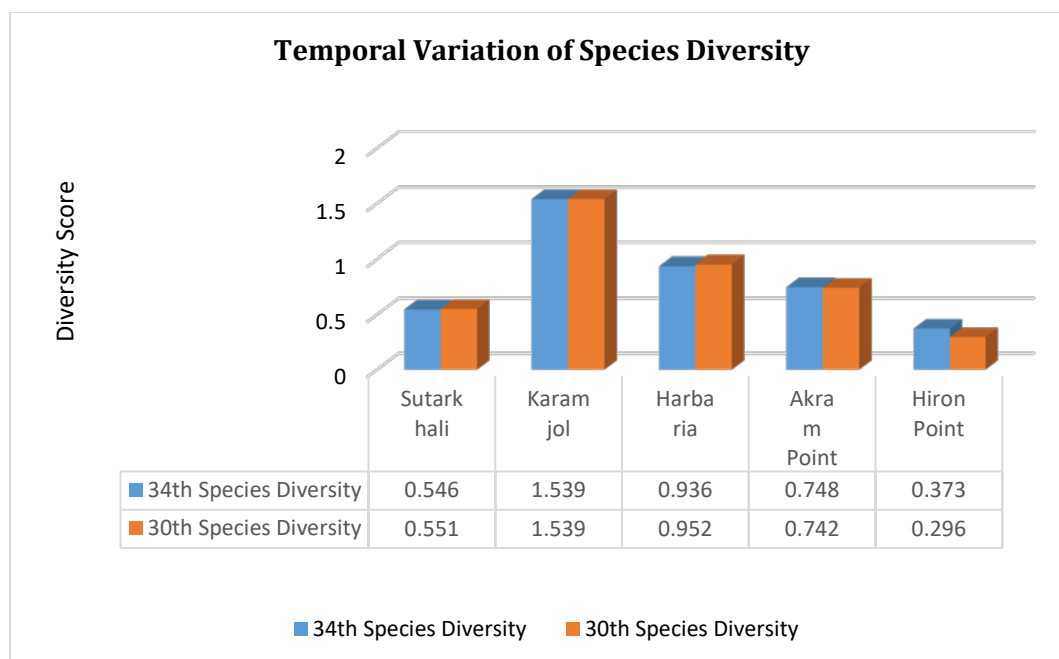
**Figure 3.28: Temporal Variation of basal area (m<sup>2</sup>ha<sup>-1</sup>) in five study plots in SRF**



**Figure 3.29: Temporal Variation of Mean Stem density (trees (DBH≥ 5)/ha-1)**

*Floristic composition and important value index*

Floral diversity and is the major driver of ecosystem productivity, stability, nutrient dynamics and invisibility. Species diversity indicates the degree of heterogeneity in a community. The floral diversity are higher in Karamjol followed by Harbaria, Akram Point, Sutarkhali and Hiron point (**Figure 2.29**). From the diversity index, it has been seen that species diversity did not significantly vary with the previous year's same time assessment. However, some trees were newly recruited in all plot as their DBH reached > 5cm. The lower species diversity in Hiron point indicate that it is ecologically less stable than other sites. This is because Hiron point face natural stresses due to their location being very much closer to the sea.



**Figure 3.30: Species diversity index, evenness index and richness index of the monitoring site in SRF**

### Carbon density

Sundarbans Reserved Forest (SRF) is now dedicated to environmental purpose; all sort of timber harvest is completely banned. Only some Non Timber Forest products are allowed for extraction. In the environmental context, global warming and its possible mitigation option is a major concern among policy makers. Forests play an important role in mitigating global warming by sequestering atmospheric carbon. Concerning this issue, biomass carbon and soil carbon were given the highest priority in SRF health monitoring. The mean carbon (excluding soil) density in the five monitoring sites is shown in **Table 3.18 and Table 3.19**. Sutarkhali points have the highest carbon density per ha in both monitoring periods though its diversity was low and the mean DBH was lowest than other plots. But stem density was highest (2811 tree/ha) than. Carbon density is mostly determined by factors such as function character of dominant species (tree size e.g. diameter, Height, density of mature species etc.). Among the other monitoring sites, the mean carbon density increased in all plots than that of the previous year's assessment.

**Table 3.18: Temporal variation of mean carbon density (30th carbon density)**

Plot area	Sutar Khali	Karamjol	Harbaria	Akram Pont	Hiron Point
ABC Mg/ha per plot	88.85	67.26	82.39	64.24	83.06
BGC Mg/ha per plot	51.23	36.07	45.32	36.91	45.52
<b>Total carbon</b>	<b>140.08</b>	<b>103.33</b>	<b>127.71</b>	<b>101.15</b>	<b>128.58</b>

**Table 3.19: Temporal variation of mean carbon density (34th carbon density)**

Plot area	Sutar Khali	Karamjol	Harbaria	Akram Pont	Hiron Point
ABC Mg/ha per plot	87.82	70.7	82.84	65.06	88.04
BGC Mg/ha per plot	50.78	37.38	45.65	37.77	48.27
<b>Total carbon</b>	<b>138.61</b>	<b>107.44</b>	<b>128.49</b>	<b>102.43</b>	<b>136.31</b>

### Forest soil sampling

The soil sampling was carried out in seventh year first quarter (post winter) and the soil properties data after being analyzed has been incorporated in this tier.

An open-face split auger (1m long) has been used to pull out a one-meter-long soil core. Soil core has been taken around the center of each plot. From the 100 cm soil core, a 5 cm long subsample has been taken from the middle point of 0-15, 15-30, 30-50 and, 50-100 cm intervals for bulk density, soil pH, salinity, soil nutrients (Ca, Mg, Al, K, N and P) and organic carbon assessment (Kuaffman, and Donato, 2012)

### Bulk Density

Bulk density has been measured according to Maynard and Curran, 2007. Collected samples have been oven-dried at 105°C until constant weight by using an air flow oven (Wisd, WOF-W305, Korea). The oven-dried samples have been weighted and the corresponding volume of core has been measured and bulk density (BD) of the soil sample has been calculated with the following equation:

$$\text{Bulk Density (BD)} = \text{Wt}_{105^{\circ}\text{C}} / \text{Vcore}$$

$$\text{Vcore} = \pi \text{Dcore}^2 \text{Lcore} / 4$$

Where, Wt<sub>105°C</sub> is the weight of oven dried soil, Vcore is the volume of the core, Dcore is the inner

diameter of the core and  $L_{core}$  is the length of the core.

#### *Soil Salinity (EC)*

Soil Salinity (EC) has been measured according to Mostara and Roy, 2008. 1:2 ratio of soil and water (w/v) extraction has been followed to determine soil EC. 10 g of soil has been added with 20 ml of distilled water in a 250 ml Erlenmeyer flask. This mixture has been shaken on a reciprocating shaker for 1 hour and was filtered through Whatman No-1 filter paper. EC of the filtrated extraction has been measured by using an EC meter (Neomet EC-470L, istekInc, Korea)

#### *Soil pH*

Soil pH has been measured according to Miller and Kissel, 2010. 1:2 ratio of soil and water (w/v) extraction has been followed to determine soil pH. 10 g of soil has been added with 20 ml of distilled water in a 250 ml Erlenmeyer flask. The mixture has been shaken on a reciprocating shaker for 30 min and allowed the slurry to settle for 30 min. pH of the slurry has been measured by a pH meter (Hach, sension3, USA).

#### *Total Organic Carbon*

Loss of ignition (LOI) method has been followed to measure organic carbon in soil sample (Allen et al., 1974). One gram of soil has been taken in a pre-weighted porcelain cup and oven-dried at 105 °C for 24 hours. The oven-dried sample has then been placed in digital Muffle furnace (WiseTherm F, Wisd, Korea) at 450 °C for four hours. After ignition the sample has then been placed in desiccators to allow it to room temperature and weight it again to calculate the loss of ignition (LOI %) using the following formula-

$$LOI\% = (Wt_{105\text{ }^{\circ}C} - Wt_{450\text{ }^{\circ}C}) / Wt_{105\text{ }^{\circ}C}$$

Where,  $Wt_{105\text{ }^{\circ}C}$  is the weight of soil at 105 °C and  $Wt_{450\text{ }^{\circ}C}$  is the weight of soil at 450 °C.

The LOI% is usually accounted as organic matter percentage. A total of 50% of LOI% or ash free mass has been considered as the C content in the sample (Allen, 1989). However, the LOI or organic matter can be converted to organic carbon according to Nelson and Sommers, 1996 by using a universal conversion factor 1.724 (Van Bemmelenfactor) based on the assumption that organic matter contains 58% organic C (i.e., Organic C% = Organic matter (%) / 1.724).

#### *Soil Total Kjeldahl Nitrogen*

Soil Total Kjeldahl Nitrogen has been measured according to Baethgen and Alley (1989). The digestion of soil sample has been carried out with concentrated  $H_2SO_4$  catalyst mixture (100:10:1 of  $K_2SO_4$ :  $CuSO_4$ : Se) (Bremner and Mulvaney, 1982) in a block digester (VELP DK-6, VELP Scientifica) and diluted the digest with distilled water to a final volume of 100 ml. The Nitrogen concentration of the digest has been then analyzed colorimetrically using UV-VIS Spectrophotometer (Hitachi U-2910, Japan). 5.5 ml working buffer solution (0.1M  $Na_2HPO_4$ , 5% Na-K tartrate, 5.4% NaOH), 4 ml Na Salicylate-Na nitroprusside solution (15% - 0.03%), 2 ml Na hypochlorite solution have been added to 1 ml of aliquots. The absorbance of the sample has been then measured at 650 nm wavelength after 45 minutes.

#### *Soil Total Phosphorus*

Total Phosphorus in soil has been measured according to Olsen and Sommers (1982). The digestion of soil sample has been carried out with concentrated  $HNO_3$  and 60% Perchloric acid ( $HClO_4$ ). The digest has been then diluted to a final volume of 100 ml with distilled water. 10 ml of Ammonium

Paramolybdate-Vanadate reagent was added in 2 ml of sample aliquots and diluted the solution to 25 ml with distilled water. The Phosphorus concentration has been then analyzed colorimetrically with UV-VIS Spectrophotometer (Hitachi U-2910, Japan) at 470 nm wavelength after 20 minutes of sample preparation.

*Relevance of Key soil variable*

**Table 3.20: Relevance of Key Soil Variables**

Type of variable	Key soil variable	Layer	Relevance
Carbon and nitrogen	Total organic C, total N, and carbonates	Organic	Forest nutrition, atmospheric N deposition, and climate change
		Mineral	Forest nutrition (0–20 cm), C, and N sinks
Nutrients	Total P, Ca, Mg, K, Mn, and S	Organic	Atmospheric deposition of basic cations and stock of macronutrients
		Mineral	Weathering rates, critical loads of acidity, and stock of macronutrients
Acidity, cation exchange characteristics	pH, carbonates, cation exchange capacity, base saturation, and exchangeable cations	Organic and mineral	Buffering acid input and acidification status
	Acid ammonium oxalate extractable Al and Fe	Mineral	
Heavy metals	Pb, Cu, Zn, Cd, Cr, Ni, and Hg	Organic	Atmospheric metal deposition
		Mineral	Atmospheric metal deposition, calculation critical loads (0–20 cm), and deficiency of oligo elements
Physical soil variables	Particle-size distribution and soil texture	Mineral	Soil classification, estimation of plant available water, and nutrient exchange capacity
	Organic layer mass	Organic	Calculation of stocks
	Bulk density of the fine earth, coarse fragment content, and soil depth	Mineral	Calculation of stocks, nutrient supply to plants, index for compaction, and rootable soil volume
	Soil water retention characteristic	Organic	Water balance models, nutrient fluxes, and estimation of soil porosity
		Mineral	

Source: Cools and De Vos (2010).

*Soil properties*

The concentrations and vertical distribution pattern of soil C, N and P in wetland ecosystems were affected by the types of plant community. The type of plant community, plant diversity and the presence of dominant species had differences in root distribution, the amount of litter returned to soil and plant cycling. The mean bulk density, Soil pH, soil salinity (EC), OC%, N and P contain across the five monitoring sites were given in **Table 3.20**.



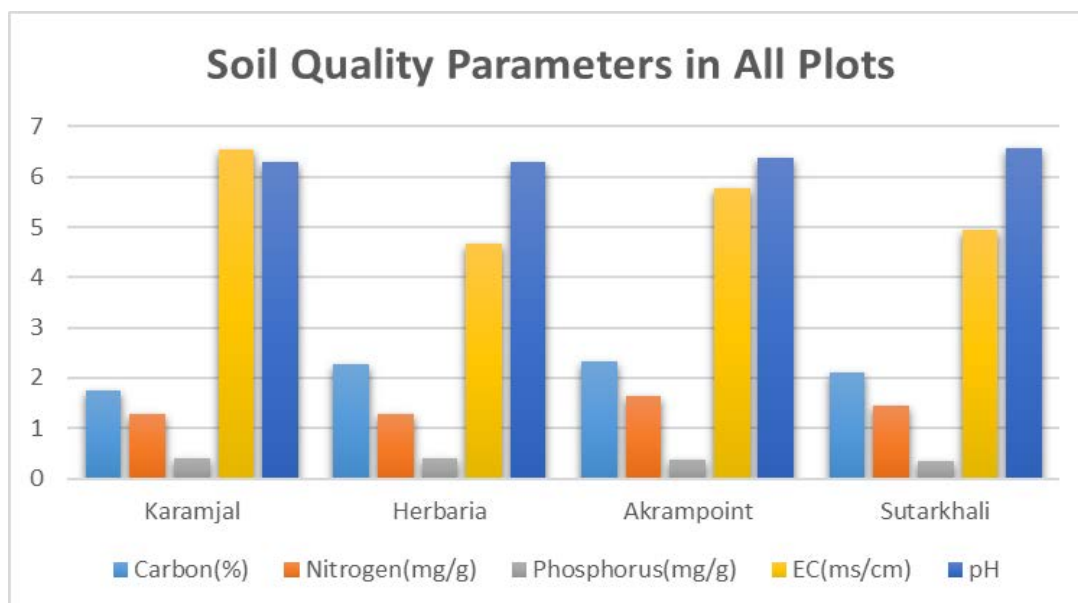
**Table 3.21: Mean soil properties among the Five monitoring sites in SRF**

Sample Code	Site	Sub-plot	Layer	Sample weight for Bulk density (g)	Organic carbon (%)	EC (ms/cm)	pH	Nitrogen final concentration (mg/g)	Phosphorus final concentration (mg/g)
1	Karamjal	1	0-15	107.40	2.52	4.96	6.19	1.98	0.43
2			15-30	115.98	1.76	6.03	6.45	1.08	0.37
3			30-50	100.13	1.20	9.36	6.24	1.29	0.42
4			50-100	112.47	1.25	8.48	6.34	1.53	0.41
5		2	0-15	102.42	1.31	5.53	6.45	1.21	0.40
6			15-30	122.03	1.44	3.33	6.41	1.26	0.32
7			30-50	125.14	1.46	5.61	6.27	1.69	0.40
8			50-100	126.43	1.67	7.64	6.27	0.57	0.38
9		3	0-15	114.80	2.40	6.56	6.16	0.57	0.41
10			15-30	122.32	1.97	8.92	6.27	1.59	0.49
11			30-50	124.13	1.73	8.67	6.28	1.65	0.54
12			50-100	107.14	2.26	3.39	6.16	0.81	0.38
13	Herbaria	1	0-15	96.43	2.81	2.84	6.36	0.89	0.36
14			15-30	104.85	2.40	5.40	6.20	0.87	0.36
15			30-50	110.40	2.26	3.51	6.36	1.89	0.38
16			50-100	101.18	2.38	3.19	6.19	1.08	0.59
17		2	0-15	110.19	2.06	3.86	6.35	0.91	0.39
18			15-30	131.08	1.96	7.31	6.12	1.11	0.40
19			30-50	124.73	1.83	6.98	6.29	0.88	0.34
20			50-100	126.82	1.89	6.97	6.42	0.97	0.42
21		3	0-15	94.73	2.87	3.46	6.47	1.30	0.43
22			15-30	100.88	2.08	3.88	6.23	1.94	0.37
23			30-50	111.49	2.12	6.03	6.29	1.88	0.35
24			50-100	108.42	2.58	2.73	6.35	1.63	0.37
25	Akrampoint	1	0-15	102.41	1.82	9.52	6.18	1.27	0.38
26			15-30	116.02	1.67	8.17	6.29	1.41	0.36
27			30-50	110.23	2.00	7.44	6.15	1.67	0.36
28			50-100	91.31	2.26	4.39	6.08	1.61	0.26
29		2	0-15	115.35	2.29	5.31	6.57	1.80	0.42
30			15-30	108.10	2.52	6.44	6.43	1.91	0.40
31			30-50	107.47	2.72	6.23	6.38	1.90	0.39
32			50-100	106.55	2.53	6.64	6.41	1.65	0.39
33		3	0-15	97.72	2.67	4.01	6.61	1.88	0.39
34			15-30	97.27	2.83	3.02	6.50	1.24	0.28
35			30-50	119.07	2.30	3.37	6.56	1.76	0.42
36			50-100	124.88	2.28	4.72	6.50	1.64	0.44
37	Sutarkhali	1	0-15	118.34	1.77	2.47	6.72	1.22	0.28

Sample Code	Site	Sub-plot	Layer	Sample weight for Bulk density (g)	Organic carbon (%)	EC (ms/cm)	pH	Nitrogen final concentration (mg/g)	Phosphorus final concentration (mg/g)
38			15-30	135.57	1.98	4.28	6.41	1.52	0.34
39			30-50	126.24	2.26	6.06	6.51	1.57	0.29
40			50-100	115.14	2.22	2.63	6.82	1.17	0.20
41		2	0-15	126.42	2.14	4.50	6.61	1.78	0.27
42			15-30	117.74	2.49	6.62	6.53	1.74	0.39
43			30-50	116.04	2.68	7.73	6.54	1.54	0.38
44			50-100	118.53	1.59	3.53	6.57	1.17	0.43
45		3	0-15	122.11	1.48	3.17	6.64	1.47	0.37
46			15-30	117.92	2.15	6.54	6.43	1.51	0.35
47			30-50	113.46	2.54	7.91	6.54	1.47	0.40
48			50-100	96.36	2.09	3.97	6.59	1.31	0.34

Higher bulk density indicates that the site has less organic matter. The findings show that Sutarkhali points have an increased bulk density. This fact indicated that the soil at the Sutarkhali location was less organically rich, more compact, and less porous. The organic carbon content in the soils varied from 1.2 % to 2.87% in the study area (**Figure 3.30**). The highest organic carbon (2.87 %) was found in the soils of Harbaria and the lowest organic carbon (1.2%) was found in the soils of Koromjol area. The result also revealed that the average content (2.18%) of organic matter in all plots was observed higher in the 0-15 cm layer than in the other layers (15-30=2.10, 30-50=2.09, 50-100=2.08) of Sundarbans mangrove forest (**Table 3.20**). Due to more decomposition of plant and animal residues in mangrove areas the percentage of organic matter is higher than in other soil tracts. For this reason, the biological activity in mangrove forest areas is highly active. Anderson (1977), Escourt (1967), and Mayer et al. (1985) reported that organic carbon is related to mud percentage in the soil. More mud percentage than sand in the study areas indicated more organic matter and that is why the organic matter was varied within the plots.

Total nitrogen content in the soils varied from 0.57mg/g to 1.98mg/g in the study area (**Figure 3.30**). The highest nitrogen (1.98mg/g) was found in first sub plot soils of Karamjoland lowest nitrogen (0.57mg/g) was also found in third subplot soils of the Karamjol area. It was also observed from the results that the average values of N concentration (1.6mg/g) were higher in below-layer (30-50) soils compared to other layers of Sundarbans mangrove forest (**Table 3.20**).



**Figure 3.31: Soil Quality Parameters in the observed plots**

Available phosphorus content in the soils slightly varied from 0.2mg/g to 0.59mg/g in the study area (**Figure 3.30**). The highest phosphorus (0.59mg/g) was found in soils of Harbaria and the lowest phosphorus (0.2 mg/g) was found in soils of the Sutarkhali point area. The average values of P concentration (0.39mg/g) were higher in 30-50 layer soils compared to other layers of Sundarbans mangrove forest (**Table 3.20**). As a result the density of seedling and over all forest condition in herbaria is good.

The pH values in the soils varied from 6.08 to 6.82 in the study area (**Figure 3.30**). The highest pH (6.82) was found in the soils of Sutarkhali and the lowest pH (6.08) was found in the soils of Akram points. It is found that all the study area soils are mildly alkaline. The average pH values (6.44) were higher in 0-15 layer soils compared to other layers of Sundarbans mangrove forest (**Table 3.20**). The range of soil PH in all plot considered as a good in this monitoring period.

The electrical conductivity values in the soils varied from 2.63 to 9.52ms/cm in the study area (**Figure 3.30**). The highest EC (9.52ms/cm) was found in soils of Akram point and the lowest EC (2.63ms/cm) was found in soils of the Sutarkhali area. The average EC values (6.58ms/cm) were found higher in the sub-surface (30-50) layer compared to other layers of Sundarbans mangrove forest (**Table 3.20**). **Soil electrical conductivity is an indirect indicator of soil health and its effect on plant growth. Extremely low electrical conductivity means the soil does not have enough nutrients. Extremely high electrical conductivity means that there are excess nutrients in the soil, causing nutrient burn and other issues. So that it indicate that Akram point soil does not have enough nutrients.**



## 4. Social Environment

### 4.1 Introduction

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

The objective of the social safeguard monitoring is to ensure compliance during the project's construction phase. The monitoring 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 issues based on the findings of the safeguard monitoring.

#### 4.1.1 Methodology

This monitoring was conducted using social data collection tools. There is consultation, informal interviews, and physical observation applied to collect data from the study area and the project area. The consultations were held at the MSTPP office and Niramoy Medical Center, whereas relevant project officials provided their feedback based on the checklist. In addition, physical observation and informal interviews were held with the workers and local people. The informal interview was carried out at Zero Point, Kapasdanga, Barni, Gaurambha, Rajnagar, and Borodurgapur; and labor sheds in the project area for getting people's/laborers opinions about the safeguard issues. The monitoring locations are shown in **Figure 4.3**.

#### *Findings of Social Safeguard Monitoring*

##### Impact on Livelihoods

According to the local inhabitants and the Project Management Unit (PMU), engagement of laborers is almost similar as it was in previous monitoring tenure. It is estimated that about 10% labors are local labor force is working (during this monitoring phase) at the project site only for non-technical activities i.e. cleaning, gardening, cooking assistance etc. According to the statement of local people, more than 100 laborers are regularly move to work at the project site from Gaurambha union. As the plant is on trial for power generation where technical workforce will be required for its operation which is rarely found the study area.

However, the expansion of further industrial development after the operation of this power plant, will enhance the local employment opportunity. In the meantime, MSTPP is committed for the skill development of the PAPs which will generate semi-skilled and skilled labors in the study area.

In addition, scope of developing small business opportunities has been created for the local people because of the influence of MSTPP. Already some local people of near villages are engaged in selling food, beverages, vegetable, and providing mobile banking services and others. About 270 non-motorized vehicle drivers are so far registered to get access in the approach road of the power plant.

##### Working Environment

The PMU regularly monitors the safety issues for ensuring safe and secured working environment for all the workers. The tri-party coordination meeting was held with a regular interval with the safety officers of BIFPCL, BHEL, and other construction companies to ensure compliance with the working



environment. Regular toolbox training is held every day before starting the construction activities. However, the “no training” and “no work” campaigns continue. The PMU monitors the issue, and without getting a pass from the safety exam, no new laborers can join as a working force at the project site. Despite all these monitoring activities, asbestos used in the construction phase is not found properly managed in the construction yards which is health hazardous for the construction workers.

BIFPCL authority checked up all the important medical issues of newly recruited workers and include them under a health insurance program. The Niramoy Medical Center of the MSTPP conducted and facilitated all these activities. This medical center provides all kinds of available medical supports including medicine, diagnosis, general operation, ICU bed with oxygen support, private ambulance service, physiotherapy etc. for the workers.

Physical condition of the labors sheds were in moderate condition with toilet facilities and drinking water, but still have some scope of improvement of floors and drainage system in the labor sheds. The labors of the sheds complaint against food menu and cooking quality of their meal in the sheds.



**Figure 4.1: Unsafe asbestos management**



**Figure 4.2: ICU arrangement in Niramoy Medical**

### Community Health and Safety

During this quarter of monitoring, local community did not raise any grievance regarding degradation of their health and safety due to the project. However, they experience of intolerable noise in mid-July, when the plant started with testing its generation. It takes about 1 week to take control over this intolerable noise. Also, they stated that the waste water discharge of the plants deteriorated the water quality of the surrounding ghats/ponds which causes unexpected production loss of the fish farms and the situation is not yet improved.

However, for ensuring better environment in the project area and its surrounding villages, project authority planted number of trees in the project site and the plantation program is ongoing where local forest office have been appointed for implementing the plantation program for about 3 lac saplings with nurture up to 3 years. Already a MoU has been signed between MSTPP and BFD, Bagerhat, in this regard.



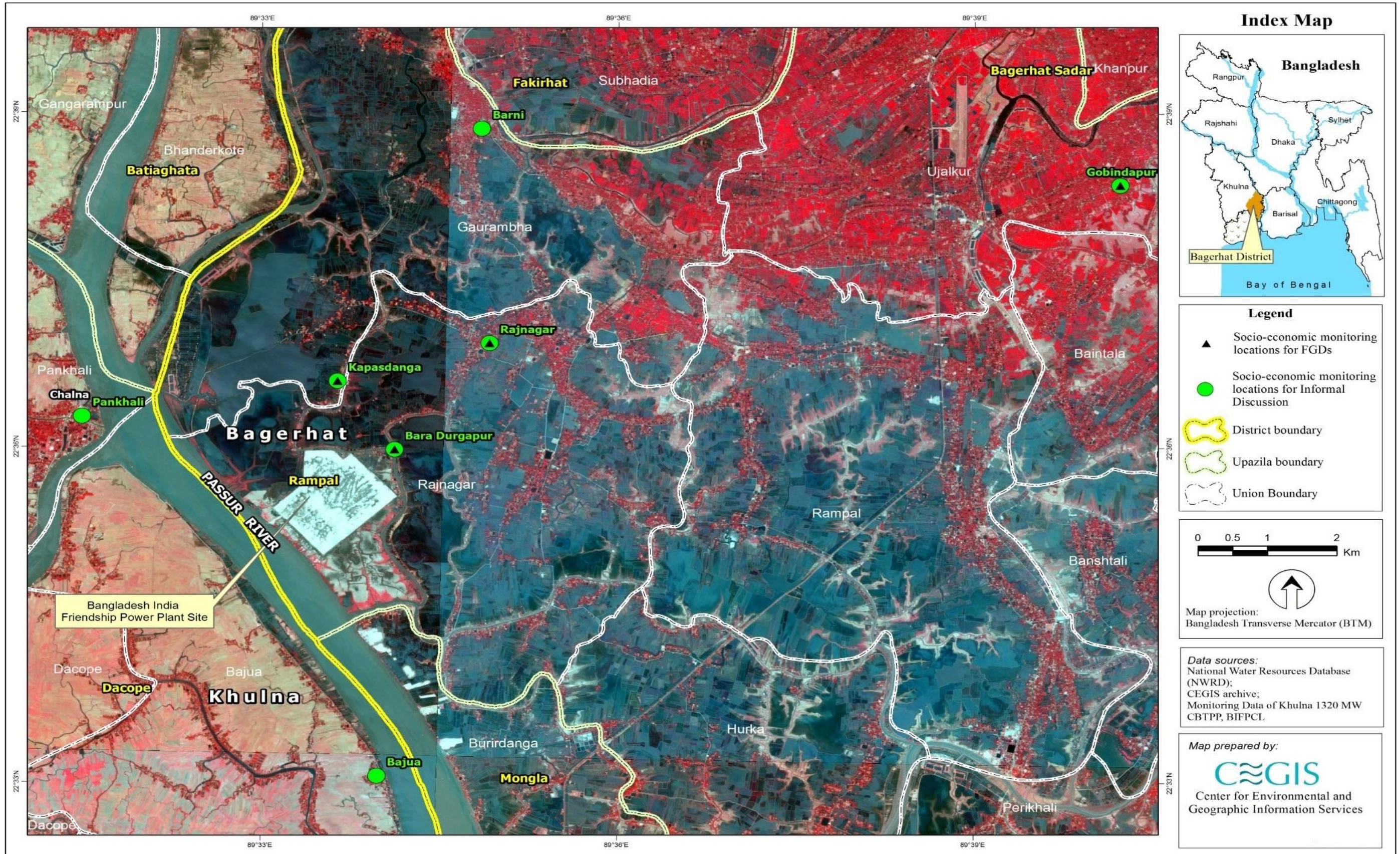


Figure 4.3: Socio-Economic Environment Monitoring Location





### Corporate Social Responsibility (CSR)

The BIFPCL is committed to continue supporting/development activities under the CSR through in last three months no such activities was initiated except to the safe drinking water tank installation because of focusing on the power generation activity. So far the feedback of the CSR activity is quite good among the local people.

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

#### *RO System Installation*

Four (4) RO system was previously installed in the Rajnagar and Gaurambha Unions as 2 in each union which are already under operation. Also, 6 new RO system are under construction in Hurka and Burirdanga unions of Rampal and Mongla upazila respectively. The MSTPP authority installed these ROs while local people with the involvement of local chairman will operate the ROs. The maintenance activity will be initiated by the project authority up to 1 year of it installation.

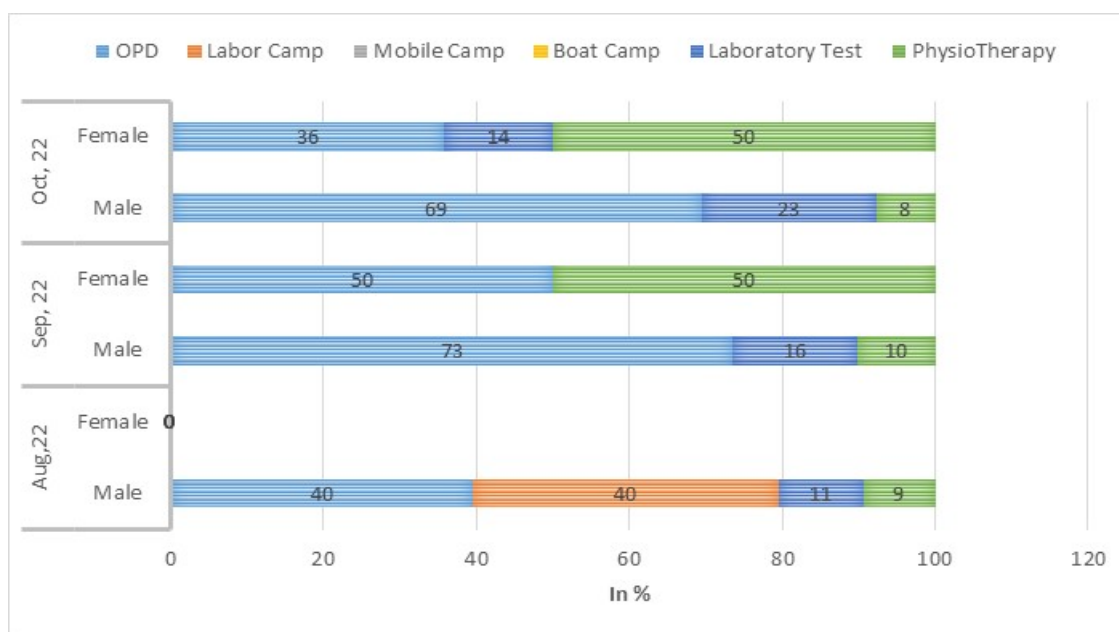


Source: Field Survey, October 2022.

**Figure 4.4: RO treatment and filtering system installation in the study area**

#### *Medical Facilities*

Medical campaign is one of the major program under the CSR of MSTPP. From August 2022 to October 2022, a total of 1,659 patients were freely treated under six types of medical facilities (OPD, mobile, boat, labor camp, laboratory tests and physiotherapy services) from the Niramoy medical center. From the Covid 19 pandemic, regular medical camp for the communities has been halted because of the safety issue which is not yet restarted. However, the authority initiated mobile medical camps and boat camps for providing medical support of the local community. Detail of the medical facilities provided over last three months are given in the following **Figure XXX**.



Source: Niramoy medical center, October 2022

**Figure 4.5: Medical Campaign from August 2022 to October 2022**

#### Autonomous Development due to MSTPP

The proposed project insists for autonomous development in the project area and the surrounding area. Babur Bari bazaar and DBBL agent banking facilities are already developed in the approach road and close adjacent. Some village road connectivity was observed with the approach road of MSTPP. These facilities are helpful to the local people and they are getting sufficient benefits of these services.

Also, some plots adjacent to the MSTPP approach road have already purchased for using industrial and commercial activities that might be change the urban development trend and employment status in the study area.

#### Recommendations

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

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

- A gender action plan regarding the women employment is required for the local communities;
- Previously sewing and computer training were introduced for the skill development of local people. Outcomes of those trainings should be monitored as a lesson learnt, before initiating further such types of training;
- Asbestos in the construction yard is not properly managed which is a serious health hazardous issue for the construction workers and it should be properly and carefully handled.
- Regular plantation is to be continued for making the desired and committed greenery effectively as per conditions of DoE;

- e. Continuing regular health checkup and disease monitoring for the daily laborer at work place as well as for the laborer staying at labor colony;
- f. Close monitoring should be continued for handling COVID 19 and dengue cases; Ensure masks and other PPEs for everyone who are working at the Project site;
- g. CSR activities should be performed primarily among the PAPs on equitable manner. This should be audited by a third party monitoring team;
- h. Special attention should be taken care for assessing the needs to local schools and colleges for implementing different programs under the CSR;
- i. Local people are becoming aware about the new entrepreneurship development in this area; in this regard, training on entrepreneurship development should be arranged under the CSR activities;
- j. Rehabilitates should be given preference in implementing CSR program as they are under serious threat of another shifting;
- k. River water should be used for dust suppression activities and ground water use should be avoided completely;
- l. The PMU should be active and efficient in maintaining vehicle speed limits in the Project site;
- m. Mindset of local people have been changed and people are more positive about the project. To increase more awareness, it is required to arrange some consciousness program in which they can be more aware how this power plant will be operated and how this project will be beneficial for the local people;
- n. Digital Billboard about the MSTPP work progress status, and operation system would be placed on the approach road at main road connecting side to create more awareness about the construction and operation of the MSTPP.
- o. It is required to arrange program at local schools, colleges and UP offices about the operation and impact of the power plant to disseminate the progress of the project and create more awareness about the MSTPP.





## 5. Environmental Compliance

### 5.1 Introduction

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

- Synchronized with National Grid on 15.08.22
- Trial operation done up to 416 MW.
- Ready for full load operation followed by COD, planed in Nov'22

However, an E&S team from CEGIS recently visited to the plant on 25<sup>th</sup> October, 2022 for a routine inspection and to acquire information intrinsically considering the bio-physical and other related parameters through a rigorous walk-in visit, meeting with plant officials, general laborers and overall, the close observation of the ongoing work at the 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; Labour and Working Condition; Community Health, Safety and Security; Biodiversity and Sustainable Management of Living Natural Resources, waste management and other relevant issues. Unlike the 33<sup>rd</sup> environmental compliance monitoring report this quarterly report will focus again on waste generation and its management in and around of the main plant and labour shed. It is noted that during 33<sup>rd</sup> 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 34<sup>th</sup> visit we had a quick look on those issues again and found that all waste related issues are still unsolved. CEGIS raised this issue in the meeting to consider this issue as urgent and project management has assured us to take immediate step to resolve the issue. Along with the previous issues we would like to bring the following issues to the respective authorities for an earlier solution:

1. The sensitive and critical issue has come in front is the Asbestos management issue. Plenty of Asbestos fibre were observed in the plant premises specially at the boiler and ESP plant site. Lack of proper management, Asbestos can be a serious health hazard causing the lung function decrease, lung cancer and even death if someone inhale plenty of Asbestos fibres. We strongly suggested to take necessary actions to manage the Asbestos as soon as possible.
2. Waste management issues need to be solved as soon as possible. The lavatory waste sewerage facility is inadequate at labour shed that is causing substantial environmental hazard in and around the camp area. Also dumping the construction waste by the side of Maidara River and Coal-water slurry at the jetty area has become a significant threat for the aquatic ecosystem at Maidara and Pashur River respectively mixing by rain water and other ways.

3. Coal Conveyor belt from jetty area to 1<sup>st</sup> Transportation Point (About 20 to 25 m) found uncovered and no integrated dust control system that is allowing 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.
4. Heap of Sand and other loose material were found uncovered at the labour shed and inside the plant premises.

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.	<ul style="list-style-type: none"> <li>Switch off / throttle down all site machinery, vehicles, water vessels, and generator when not in use</li> <li>No construction activities at night</li> </ul> <p>Use noise damper within the project boundary, Limit vehicle speed and monitor it at every suitable point.</p>	<ul style="list-style-type: none"> <li>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-1997 Standard which are being documented by EPC contractor.</li> <li>No noticeable noise detected except some gentle sound during the walk-in visit inside the project boundaries.</li> <li>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.</li> <li>Idle machines / equipment / generators are switched off / throttled down.</li> <li>Generators with acoustic enclosures are only being used as and when required.</li> </ul> <p>Signboards regarding noise permits were not observed at site.</p>	Complied	<ul style="list-style-type: none"> <li>Schedule the Heavy noise related work if required and that should be disseminated to the workers and nearby communities before</li> <li>CEGIS team has suggested to attach precautionary signboard regarding noise management.</li> <li>Noise silencer should be imposed if any plan to run the work at night</li> </ul>
2	Dust generation from construction works	<ul style="list-style-type: none"> <li>Limiting activities for producing fugitive dust particle within project area</li> <li>Vegetation clearance and base stripping should be minimized.</li> <li>Vehicle speed restriction must be enforced to control dust generation.</li> <li>Earthen roads and undeveloped roads should be avoided to minimize dust generation</li> </ul>	<ul style="list-style-type: none"> <li>Monthly and quarterly air quality monitoring in and around the project sites is being conducted and checked with ECR, 2005 standard.</li> <li>Mixing of cement and concrete may generate some unavoidable dust but the crushed material was well covered and also noticed the water spraying at those areas.</li> </ul>	Mostly Complied	<ul style="list-style-type: none"> <li>It is strongly recommended to cover all the Stockpiles of sand or any type of loose materials inside the plant premises and at the labour shed/camp.</li> <li>As winter season will be drier, dust</li> </ul>

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/ Measures already Implemented	Compliance Status	Recommended Action
		<ul style="list-style-type: none"> <li>Construction materials must be covered to protect from wind action</li> <li>Spray water regularly for suppressing fugitive dust</li> <li>Dust particle generated from access road must be controlled by spraying water during dry season.</li> <li>Stock piles of construction materials must be covered in order to protect from wind action.</li> </ul> <p>An appropriate freeboard must be maintained in trucks hauling construction materials.</p>	<ul style="list-style-type: none"> <li>Continuous water spraying on the dusty road was noticed. BHEL has contracted a company for 3 years for this job.</li> <li>Like the 33<sup>rd</sup> monitoring visit still some stockpiles of sand and other loose material were noticed uncovered.</li> <li>Now-a days, earthen stock piles are covered by natural green of tiny grasses. These are acting as shield cover for fugitive dust</li> <li>No black smoke observed because of plant and equipment are well maintained.</li> </ul> <p>Visual monitoring of dust is also being conducted.</p>		<p>suppression activities should be monitored on a regular basis for maintaining the air quality within standard limit.</p> <ul style="list-style-type: none"> <li>Face mask should be use wear throughout the workplace.</li> </ul>
3	Water Quality	<ul style="list-style-type: none"> <li>Surface water must be saved from any harmful effluent emission and waste dumping from project site</li> <li>Provide closed system facilities and wastewater treatment plant to minimize discharge of effluents from worker's colony.</li> <li>Good housekeeping at workshop and construction site</li> <li>Appropriate equipment with safety measures should be used for storage and handling of lubricant</li> <li>Provide training and awareness building program to the workers during construction. The training and awareness programs are:               <ol style="list-style-type: none"> <li>Arrange weekly consultation session among the workers through plant site managers.</li> </ol> </li> </ul>	<ul style="list-style-type: none"> <li>Surface water is regularly monitored. The discharge water quality has been recorded within the standard limit (ECR, 1997)</li> <li>Ground water is not used for construction purpose.</li> <li>Construction waste water discharge is minimum and need based only. They are also meeting effluent norms.</li> <li>Most of the permanent drainage channel found in blocked condition by depositing mud and other construction waste.</li> <li>There are two nos. of runoff settling ponds to settle the silt before discharge in to river.</li> <li>Waste water is being discharging in to the Maidara River without any further treatment.</li> <li>Temporary chemical lab has been established where turbidity, PH, alkalinity,</li> </ul>	Mostly Complied at present	<ul style="list-style-type: none"> <li>Good housekeeping at workshop and construction site is strongly recommended</li> <li>All the drainage channel must be cleaned immediately for proper and quick drainage of the stagnant water.</li> <li>Waste water must have to be treated properly before final discharge into the river.</li> </ul>



Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/ Measures already Implemented	Compliance Status	Recommended Action
		<p>The duration of consultation is one hour according to ISO-14001 standard,</p> <p>Arrange monthly environmental meeting among the mid-level officers through top management when those issues will be discussed under guidance of ECR 1997.</p>	<p>conductivity, chlorine, iron (Fe) parameters are being tested and monitored.</p> <ul style="list-style-type: none"> <li>Drinking water is being supplied from M/S ABM/Canopass (1m<sup>3</sup>) RO water processing plant. It is also complying ECR 1997 (Bangladesh).</li> <li>A dedicated RO plant (5 m<sup>3</sup>) has been placed at Padma Abasan (Temporary Township) for RO water.</li> <li>ETP plant is still under construction where the effluent will be further treated before final discharge.</li> <li>BIFPCL authority has established a silt trap at the North-East corner of the project site to control sediment running out from the projects with rainfall runoff.</li> </ul> <p>Training and awareness programs are being conducted regularly through PEP talks, lectures, one to one talk etc.</p>		
4	Waste Generation	<ul style="list-style-type: none"> <li>Limiting site clearance and base stripping activities within the project boundary.</li> <li>Gathering and stocking of construction materials and machinery must be within a limited area in the project boundary.</li> <li>The project area has to be fenced prior to initiation of construction activities.</li> <li>Stock piles of construction materials requiring cover up in order to protect them from wind and weathering action.</li> </ul>	<ul style="list-style-type: none"> <li>During the visit CEGIS team found most of the construction waste are compiled at the demarcated place but more attention needs to manage this properly as some wastes were scattered here and there.</li> <li>Most of the Labour shed/camp area were found very dirty. Organic and inorganic waste were found on the roads/lanes inside the camp which are spreading the stench around the camp community.</li> <li>Stockpile of construction and household waste were noticed along with the bank of the nearby river which may pollute the</li> </ul>	Partially Complied with many lacking	<ul style="list-style-type: none"> <li>Strongly advised to keep the footpath of the labour shed clean and waste free.</li> <li>Riverbank must be waste free and keep clean to save the river water deterioration.</li> <li>Proper and immediate step need to be taken for the lavatory sewerage waste management at labour shed</li> </ul>

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/ Measures already Implemented	Compliance Status	Recommended Action
		<ul style="list-style-type: none"> <li>The existing right of way have to be used for material transportation without creating any block</li> <li>Location of spoil stock pile ought to be located in safe area and protected from wind and rain action.</li> <li>No spoil store on River bank/slope</li> <li>Construction wastes must be reused or recycled as and where possible</li> <li>Burning of waste material should be restricted</li> <li>Quality housekeeping practice must be maintained by regular inspection and checking.</li> <li>Keep onsite waste collection and disposal facilities</li> <li>Keep provision of different colored waste bin for dumping biodegradable, reusable and recyclable wastes.</li> </ul> <p>Keep provision of awareness building meeting and training for employees</p>	<p>river water during rainy season. (Pic attached)</p> <ul style="list-style-type: none"> <li>Lack of proper drainage facilities of the lavatory (Toilet) waste that is deteriorating the ambient environment.</li> <li>Waste quantity practice is not being yet to be measured.</li> <li>No chemical or gaseous waste noticed during the visit as Chemical wastes are properly stored and labelled</li> <li>Limited but Onsite waste collection and disposal facility has been observed.</li> <li>Source segregation method were absent and not kept in separate labelled container.</li> <li>Though there are 707 different colored waste containers (EMP_ October) but not labeled by Bengali or English written sticker that is very important for source segregation of the waste.</li> <li>Burning of waste materials is strictly banned inside the plant premises.</li> <li>BHEL has engaged a company name Rahman Brothers in collaboration with the KCC for collection of waste from the disposal.</li> </ul> <p>Waste management training has been included in induction training of the labor.</p>		<ul style="list-style-type: none"> <li>Special care and training need to be conducted regarding source segregation of the waste</li> <li>Awareness raising programs regarding waste recycle and reuse should be introduced.</li> <li>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.</li> </ul>
5	Compensation and Resettlement	<ul style="list-style-type: none"> <li>Proper resettlement action plan and compensation plan if the Project needs any land acquisition addressing compensation, restoration, livelihood,</li> </ul>	<ul style="list-style-type: none"> <li>Compensation has been given to the rightful owners of the land as per the laws of Bangladesh e.g., 'Acquisition and Requisition</li> </ul>	In the process of Compliance	<ul style="list-style-type: none"> <li>The CSR activities should be oriented towards the affected people or household;</li> </ul>

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/ Measures already Implemented	Compliance Status	Recommended Action
		<p>living standards etc. based on proper socio-economic studies.</p> <ul style="list-style-type: none"> <li>• Resettlement of the PAPs</li> <li>• Cash for compensation of land (CCL) before resettlement formal agreement with the affected people prior to migration/resettlement</li> <li>• Sufficient standing crop compensation</li> <li>• Compensation for movable structures</li> <li>• Retention of salvageable materials</li> <li>• Compensation for loss of trading income one-time moving assistance grant to cover loss of regular wage income</li> <li>• Has a resettlement plan been developed which includes compensation, restoration, livelihood, living standards etc. based on proper socio-economic studies?</li> <li>• Human provide/ take extra care/caution for the disadvantaged/ vulnerable group/s (women, children, ethnic minorities, indigenous people etc.)</li> </ul> <p>Provision of monitoring the compensation and resettlement process</p>	<p>of Immovable Property Ordinance, 1982 started in 2011</p> <ul style="list-style-type: none"> <li>• Compensation was paid by the local DC office as per law of the land.</li> <li>• Local DC office facilitates to obtain house of the PAPs (settlers of the project area) in cluster villages provided by the GoB.</li> <li>• Almost 32 affected families are now having their houses at Foyla cluster villages.</li> <li>• BIFPCL is giving priority to affected people in project employment or trained them as much possible.</li> <li>• 136 indirectly affected people were given compensation by the DC Office, Bagerhat.</li> <li>• The project authority has given training on computer and swing to the nearby villagers including PAPs which is stopped at present due to COVID-19.</li> <li>• BIFPCL have also plan to initiate skill development trainings on electronics, driving, health and hazard safety, fittings, welding etc.</li> <li>• 17 families got their residence who have shifted their houses from project area to Kapashdanga.</li> </ul>		<p>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.</p>
6	Livelihood and living condition	<ul style="list-style-type: none"> <li>• 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.</li> </ul>	<ul style="list-style-type: none"> <li>• BIFPCL are recruiting the local people especially PAPs with the help of local government (UP Chairman and members).</li> </ul>	Partially complied	<ul style="list-style-type: none"> <li>• Drainage and sewerage facility must be improved for proper</li> </ul>

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/ Measures already Implemented	Compliance Status	Recommended Action
		<ul style="list-style-type: none"> <li>Govt./NGOs need to provide support the skill development program and income generation activities to local people;</li> <li>For the increased movement of people and heavy vehicles, the road networks must be developed.</li> </ul> <p>Keep provision of sanitary toilet, one toilet for 10 persons.</p>	<ul style="list-style-type: none"> <li>In October, 2022 Total manpower at site was 5000. Out of this, Bangladeshi manpower was 3600.</li> <li>An NGO "SAMAHAR" was engaged by BPDB to give livelihood training for the affected people.</li> <li>Accidental log sheet or injury log book are being maintained.</li> <li>Provisions has been kept for health facilities to the labors as well as for the communities.</li> <li>Proponent has taken numbers of potential measures for COVID protection which is continued</li> <li>The wage of the labor was found compatible with the national standard.</li> <li>Labour accommodation is clean but plenty of waste were found on the camp road that is polluting the camp environment.</li> <li>Some water reservoirs inside the labour camp were found very dirty where plenty of polybags and other garbage waste were floating.</li> <li>Inadequate drainage facility of lavatory waste made the whole workers camp very unhygienic.</li> </ul> <p>Available drinking water, sanitation facilities, prayer room are being provided at site.</p>		<p>lavatory waste management.</p> <ul style="list-style-type: none"> <li>Dirty water reservoirs must be cleaned immediately.</li> <li>1 toilet for 10 people should be ensured</li> </ul> <p>Health and financial support should be available for the labour in case of COVID and other health effects.</p>
7	Green House Gas Controlling Measures	<ul style="list-style-type: none"> <li>Restriction of any kind of solid waste disposal</li> </ul>	<ul style="list-style-type: none"> <li>The EPC Contractor is using relatively new equipment and vehicles to reduce the GHGs emission.</li> </ul>	Partially Complied	<ul style="list-style-type: none"> <li>GHGs inventory checklist should be</li> </ul>

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/ Measures already Implemented	Compliance Status	Recommended Action
		<ul style="list-style-type: none"> <li>Approved pollution control devices to be fitted in equipment and machinery.</li> <li>Transport vehicles must not be overloaded.</li> <li>Avoid queuing of vehicles in areas adjacent to site, particularly near sensitive receptors including housing.</li> <li>Switch off / throttle down all site vehicles, water vessels, generator and machinery when not in use.</li> </ul> <p>Regular maintenance of water vessels, vehicles, generator and machinery in accordance with manufacturer's</p>	<ul style="list-style-type: none"> <li>Equipment, generators and vehicles were observed switched off during non-operation period.</li> <li>Green waste is not being segregated from others that can be a major concern for GHG emission.</li> <li>No GHG inventories were prepared yet.</li> </ul> <p>From the discussion meeting CEGIS came to know that Authority will appoint third party to develop the GHG inventory including its management plan.</p>		<p>prepared as soon as possible</p> <p>Segregation of the green and food waste must be the top priority for the waste management team.</p>



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	<ul style="list-style-type: none"> <li>• Preparation of Human Resources Policies and Procedures for Direct workers;</li> <li>• Defined Working condition and Terms of Employment for direct worker;</li> <li>• Sustainably equivalent terms and condition for migrant workers;</li> <li>• Compliance to national law of forming workers' organization;</li> <li>• No discrimination and equal opportunity for all;</li> </ul> <p>Grievance Redress Mechanism.</p>	<ul style="list-style-type: none"> <li>• BIFPCL is running through the HR policies and switching their professionals as per demand of the project.</li> <li>• Based on the conversation with HR manager CEGIS team found all the agreement for the direct workers are well maintained.</li> <li>• Accidents, incidents, near miss, corrective actions, preventive measures, are reviewed and recorded.</li> <li>• O2 level measurement and other precautionary measures followed properly if there is any work need to be done in a confined space or any other closed premises.</li> <li>• The EHS department is also monitoring the occupational health safety issues carefully under this COVID situation.</li> <li>• No discrimination was recorded among at labor level between local or migrating labor in Bangladesh</li> <li>• BIFPCL has ensured minimum wage and working hours for the labor as per GoB rules and regulation.</li> <li>• Routine medical checkup and emergency medical care has been ensured Continued in association with COVID management guideline.</li> </ul>	Mostly Complied	<ul style="list-style-type: none"> <li>• OHAS must be monitored for construction workers</li> <li>• Requested to develop labour association protecting labour interest but still not done.</li> <li>• Create fund to support the labour and his families in case of any fatalities</li> <li>• CEGIS team strongly and repeatedly recommended to the authority for Community GRM but still not done. The grievance box may be fixed just at the outside of the main entrance.</li> </ul>

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual measures already Implemented	Compliance Status	Recommended Action
			<ul style="list-style-type: none"> <li>GRM procedure is available for the project workers and officials but Community GRM is absent.</li> </ul>		
2	Protecting Work Force	<ul style="list-style-type: none"> <li>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.</li> </ul> <p>No Forced Labor</p>	<ul style="list-style-type: none"> <li>CEGIS tem visited all part of the construction area and pleased to see there is no child involved in the construction and any other works.</li> <li>No forced labor has been recorded during the project tenure.</li> <li>Proper documentation of contract with the worker is being maintained which includes working hour, wage and benefit.</li> <li>Awareness about Covid-19 is being monitored. Team observed the workers are maintaining a physical distancing as well as using the proper precaution against COVID-19.</li> <li>Workers must get the safety clearance before initiating any work like – routine checkup of the work places and administrative clearance is being Implemented</li> <li>Sanitization is being done at regular intervals at Offices and labor sheds</li> <li>First Aid support is readily available for the labors as required.</li> </ul>	Complied	<ul style="list-style-type: none"> <li>Complied but this should be continued strictly till the end of the pandemic.</li> </ul> <p>Awareness work should be continued regarding the local cultural values, STD, redressing of workers grievances, insurance policy related facilities and also contract clauses of the job to get maximum benefit.</p>
3	Safety at site	<ul style="list-style-type: none"> <li>Installation/Construction of Safety Fence around the Project area</li> <li>Use of Personnel Protective Equipment's (i.e., safety vest,</li> </ul>	<ul style="list-style-type: none"> <li>BIFPCL has demarcated the specific construction site with appropriate warning sign.</li> <li>It was impressive to see that all Labors and Project personnel are using</li> </ul>	Complied	Satisfied but this process must be continued through the entire construction and operational phase.

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual measures already Implemented	Compliance Status	Recommended Action
		<p>safety goggles, ear plug, safety shoes, gloves, dust mask, etc.);</p> <ul style="list-style-type: none"> <li>• Safety trainings for workers (i.e., fire control, working at height, working in heat, first aid etc.);</li> <li>• Practice of Tool box meeting, safety talks</li> <li>• Safe Storage of Hazardous Chemicals (e.g., fuel, flammable chemical, toxic chemicals, etc.);</li> <li>• Maintaining Material Safety Data Sheet (MSDS);</li> <li>• Provision of Health care facilities such as doctor, hospital etc. available at/nearby the Plant construction site;</li> <li>• Availability of First Aid at work place;</li> <li>• Preparation and Follow of Emergency Response Plan (ERP);</li> <li>• Adequate fire precautions in place (e. g., fire extinguishers, escape routes etc.);</li> <li>• Documentation and reporting of occupational accidents, diseases, and incidents;</li> </ul> <p>Policies and procedures for managing and monitoring the performance of third-party employers in relation to OHS</p>	<p>appropriate PPEs like reflecting vest, helmet, and safety shoes and face masks.</p> <ul style="list-style-type: none"> <li>• Fire-fighting system were observed. Fire extinguisher - Foam type-26 no's, Soda type -Nil, DCP type-288 nos and CO<sub>2</sub> type-235 no's have been kept at different places of sites (October, 2022). In addition to this, two nos of fire fighting vehicle, two nos ambulance with doctors are also available at sites.</li> <li>• Induction trainings and awareness program were given to 809 nos of participants work force during month of October, 2022. Regular Safety talk, safety meetings are being organized at site and also in class rooms. Photo are being attached.</li> <li>• The OHAS Company named Cholamandalam has been looking into the occupational safety system of this project.</li> <li>• Safety walk-down at a regular interval by the OHS officer has been strengthening the HIRA process.</li> <li>• 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)</li> <li>• The existing temporary hospital are fully running with doctors and 24hr availability of ICU supporting ambulance at the Project site;</li> </ul>		

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual measures already Implemented	Compliance Status	Recommended Action
			EPC has made a contract with the Gazi Medical of Khulna city for emergency medical support.		
4	Occupational Health and Safety procedure	<ul style="list-style-type: none"> <li>Provision of complete EHS division in the Human Resources Planning/ Organogram</li> <li>Preparation of Safety Policy to be adopted during Plant operation</li> </ul>	<ul style="list-style-type: none"> <li>Adequate number of safety officers have been employed by the EPC contractor and Sub-contractors.</li> <li>The OHAS Company named Cholanmandalam has been looking into the occupational safety system of this project.</li> <li>One safety park has been established for continual training as well as training during induction level.</li> <li>Zero major accident/ incident happened from 21st April 2021 till now except some minor injuries.</li> <li>Total Recordable Injury Frequency Rate (TRIFR) and Lost Time Injury Frequency Rate (LTIFR) are being followed.</li> <li>Medical aid, fire extinguishers, PPEs are being provided adequately.</li> <li>Regular Safety talk, safety meetings are being organized at site and also in class rooms. Photo are being attached.</li> <li>Adequate safety bill-boards etc. have been displaced all over the construction area.</li> </ul>	Being Complied	<ul style="list-style-type: none"> <li>OHS should be a Continuous process regarding awareness build-up and strict to the safety issues,</li> <li>Continued the safety training, buildup the awareness and make the labour habituated with the safety procedure</li> </ul>
5	Workers Well Being	<ul style="list-style-type: none"> <li>Provision of Welfare facilities for Worker/Labor such as, timely bonuses, wage, overtime, sick leaves, vacations etc.;</li> </ul>	<ul style="list-style-type: none"> <li>Workers are satisfied with the residence facilities provided by BIFPCL. No dissatisfaction among the workers observed.</li> </ul>	Mostly Complied	<ul style="list-style-type: none"> <li>Establish and Freedom of Association, Rights &amp; scope of bargaining should be open for the workers.</li> </ul>

Sl. No.	Potential Impacts	EMP measures as proposed in the EIA	Actual measures already Implemented	Compliance Status	Recommended Action
		<ul style="list-style-type: none"> <li>• Routine medical check-up and emergency medical care for the sick and injured;</li> <li>• Appointment of a leader amongst the labor group, who will look into workers' well-being.</li> </ul>	<ul style="list-style-type: none"> <li>• BIFPCL has developed apps <a href="https://bifpcl.com/safety.aspx">https://bifpcl.com/safety.aspx</a> for stepping up the safety issues well.</li> <li>• BIFPCL has ensured the benevolent grant developed by the contractor for the victim's family as per Government' rule.</li> <li>• Basic amenities like food, medicines, hygiene etc. are being ensured in labor colony</li> <li>• Workers get lemon or water during work period</li> <li>• Basic Medical care with free medicine and counseling is being provided to workers on regular basis.</li> <li>• Vitamin-C rich fruits, ORS distribution being done to contract workers occasionally.</li> <li>• Grievance mechanism available for the workers that usually address the safety issues.</li> <li>• No labour association identified yet to look after workers 'well-being issues</li> </ul>		<ul style="list-style-type: none"> <li>• Take care about the ultimate payment of the labors from the sub-contractor or local contractor. It should not be lower than the national standard fixed by the PWD for the labors.</li> </ul>

Table 5.3: Monitoring of Community Health, Safety and Security

Sl. No	Potential Impacts	Proposed EMP	Actual measures already Implemented	Compliance Status	Recommended Action
1	Disturbance to nearby community due to dust from developed land and Noise from construction activities	<ul style="list-style-type: none"> <li>Construction of boundary wall around the Project area;</li> <li>Installed water spraying system to control dusts;</li> <li>Conducting dust monitoring and visual inspection around the site boundary;</li> </ul> <p>Adopted noise management plan.</p>	<ul style="list-style-type: none"> <li>Boundary wall construction is almost completed except some part from Bridge area to Jetty area.</li> <li>Some sand pile and other loose material were found uncovered that could be a concern for the local communities.</li> <li>Water is also being sprayed regularly on the stockpiles and registered.</li> <li>Environmental Monitoring team from CEGIS is routinely communicating with the nearby communities for assessing impacts and related complaints on dust generation issue.</li> <li>Regular communication and consultation are taken place with the local government and local administration officials except this COVID situation</li> <li>CEGIS team regularly monitors the noise level in the ambient area of the project site like Bajua, Mongla, koigordashkathi and it meets the standard noise level.</li> <li>Community GRM system was absent that is considered as an important tool to identify communities complain</li> </ul>	Mostly complied	<ul style="list-style-type: none"> <li>Uncovered sand and other flyable material should be covered and watered regularly.</li> <li>Any complaint regarding noise and dust from local people must be addressed immediately and recorded accordingly in the register.</li> <li>The grievance register box should be placed at the gate of MSTPP so that the communities could easily put their written complain there.</li> </ul>
2	Grievance of local people	<ul style="list-style-type: none"> <li>Availability and operation of Grievance Redress Mechanism;</li> </ul> <p>Maintaining open communication channel with the local community.</p>	<ul style="list-style-type: none"> <li>Social liaison officer is working for maintaining relation with local communities especially the CSR activities.</li> <li>BIFPCL regularly display the progress of the development through their website</li> </ul>	Mostly complied	Recommend and advise in each quarterly meeting to initiate the community GRM procedure so that the local community



Sl. No	Potential Impacts	Proposed EMP	Actual measures already Implemented	Compliance Status	Recommended Action
			<p>(<a href="https://www.bifpcl.com/">https://www.bifpcl.com/</a>) and disclosure meeting at the local government</p> <ul style="list-style-type: none"> <li>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.</li> </ul>		could easily state any grievance properly. But this issue has yet to be done.
3	Risk of breaching Community Safety	<ul style="list-style-type: none"> <li>Construction of boundary wall/safety fence around the Project area;</li> <li>Practicing Risk Assessment and Evaluation Process;</li> <li>Practicing safe management for hazardous materials which may pose threat to the community;</li> <li>Availability and operation of Emergency Response Plan;</li> <li>Maintaining open communication channel with the local community;</li> <li>Training and instruction to the security personnel about their behavior and communication with the local people;</li> </ul> <p>Aware the security personnel about the right of the community people.</p>	<ul style="list-style-type: none"> <li>Boundary wall construction is almost completed except some part from Bridge area to Jetty area.</li> <li>Initiated numbers of pollution mitigating system for protecting the dust and other pollution outside to the project area.</li> <li>Strictly prohibited to enter outsider to the project site or labor camp were observed. And if required entry pass is being checked by the security guard to enter the project site area.</li> <li>No conflict has been noticed between local communities and project authorities or workers.</li> <li>Project Security personnel is well trained and instructed by the authority to demonstrate a decent behavior and attitude to the local communities.</li> </ul> <p>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.</p>	Complied	<ul style="list-style-type: none"> <li>Advise to Maintain and limit the frequent access of the project workers to the local community during this COVID pandemic</li> <li>Keep on tack about the communicable disease transmission between the labors and nearby communities</li> </ul> <p>Again a grievance Box is strongly recommended for the community to raise their complaints.</p>

Sl. No	Potential Impacts	Proposed EMP	Actual measures already Implemented	Compliance Status	Recommended Action
4	Community Health and Risk	<ul style="list-style-type: none"> <li>Provision of providing health service facilities to community if the Project poses any health risk like sexually transmitted disease, contract disease, vector-borne diseases;</li> </ul> <p>Implement all pollution mitigation measures to ensure safeguarding to community.</p>	<ul style="list-style-type: none"> <li>Continued the medical facilities (consisting medical officer, medical assistant, office assistant) at Plant site for checkup the communicable diseases of the workers and staffs;</li> <li>Office medical centers of BIFPC provided general treatment about 307 patients, 101 Pathology test and 33 Physiotherapy in October, 2022 and about 381 patients, 83 Pathology test and 33 Physiotherapy in September, 2022.</li> <li>Monthly Medical Camp at labor colony conducted on 27.08.2022 around 272 patients have been taken treatment.</li> <li>BIFPCL arrange regular weekly health service program (medical consultation and free medicine) for the local community considering the COVID situation.</li> </ul> <p>EPC contractor is training up the labors about protective action taken to avoid vector borne diseases and HIV positives and COVID pandemic to prevent transmission to the local community.</p>	Complied	BIFPCL may introduce awareness program for STD and other transmitted diseases from workers to the 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.	<ul style="list-style-type: none"> <li>Regular communication is being maintained with the local government and community representatives for labor recruitment</li> <li>An NGO "SAMAHAR" was engaged by BPDB to give livelihood training for the affected people</li> <li>The proponent took a number of initiatives to encourage local students through awarding them scholarships before the COVID situation.</li> </ul>	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.

Sl. No	Potential Impacts	Proposed EMP	Actual measures already Implemented	Compliance Status	Recommended Action
			They will work again on this field after reducing the COVID cases significantly. BIFPCL took initiatives and started to give computer training for generating ICT skill among local people. Besides, BIFPCL have also plan to initiate skill development trainings on electronics, driving, health and hazard safety, fittings, welding etc.		should be introduced immediately.
6	Public Communication, Consultation and Awareness	<ul style="list-style-type: none"> <li>• Arranging public communication/consultation meeting;</li> <li>• Sharing of Project information with local people;</li> </ul> Organizing environmental and social awareness programs/meetings.	<ul style="list-style-type: none"> <li>• One social liaison officer is working (24x7) continuously for developing relation with local communities.</li> <li>• A social expert from CEGIS also visits the nearby community at quarterly basis to get their opinions.</li> <li>• Regular consultation meetings are being carried out with the local government and administration</li> <li>• Environmental and social awareness programs are organized and conducted by proponent on a regular basis except during the COVID situation.</li> <li>• BIFPCL regularly display the progress (thru Video) of the development through their website (<a href="https://www.bifpcl.com/">https://www.bifpcl.com/</a>) 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.</li> </ul>	Mostly Complied	<ul style="list-style-type: none"> <li>• BIFPCL may use print media, social media, digital media might be used for spreading the project right information</li> </ul> The proponent should aware and clarify about the project the local people to stopover any rumor.

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

Sl No	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/Measures already Implemented	Compliance Status	Recommended Action
1	Rainfall runoff from the construction site would cause deterioration of aquatic ecosystem.	<ul style="list-style-type: none"> <li>• Installation of proper runoff drains; Use of sediment fences, traps and basins for trapping the sediment, if required.</li> </ul>	<ul style="list-style-type: none"> <li>• Permanent drainage system (Under BHEL) to discharge waste water from the project has blocked by mud and other construction wastage.</li> <li>• EPC Contractor is monitoring the water quality on monthly basis at every outlet of the project site and comply with the ECR 1997 standard</li> <li>• Though there are two settling pond to settle the silt from Rainfall, runoff and other construction water but the waste water is being discharged to the Maidara river body without any proper treatment. This is very concerning in terms of aquatic biodiversity and water quality.</li> </ul> <p>Runoff/ wash away of the sediment is comparatively low to zero during this dry season.</p>	partially complied	<ul style="list-style-type: none"> <li>• Drainage channel should be cleaned immediately to run the stagnant water from the plant premises.</li> <li>• Operation of ETP should be quick to treat the waste water and other effluent before discharging in the nearby river.</li> </ul>
2	Disturbance to nearby ecosystem due to different construction activities	<ul style="list-style-type: none"> <li>• No cutting/ felling of trees along the river bank;</li> <li>• Implementation of onsite waste and air quality management plan;</li> <li>• Limiting soil extraction activities within the defined area;</li> <li>• Limiting the vegetation clearance and base stripping process within the Project boundary;</li> <li>• Safety fence around the construction site;</li> <li>• Limiting the use of night light;</li> </ul>	<ul style="list-style-type: none"> <li>• Most of the civil works has already completed. Now only the mechanical (instrumental and machine fitting) and electrical works are under-way. Thus, the risk of deforestation and disturbance to the nearby ecosystem are minimal in this quarter.</li> <li>• Limiting the vegetation clearance within the Project boundary especially around the ash impoundment.</li> <li>• An MoU signed with Forest Dept., Bangladesh on 24.02.2015 for implementation of</li> </ul>	Being Complied	<ul style="list-style-type: none"> <li>• Advised to finish the unfinished plantation ASAP.</li> <li>• Regular monitoring of the planted trees.</li> <li>• Reduce the rate of mortality at the sapling stages.</li> <li>• Top soil management should be strictly followed.</li> </ul>

Sl No	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/Measures already Implemented	Compliance Status	Recommended Action
		<ul style="list-style-type: none"> <li>Using shade (directed downwards) around the outdoor lights;</li> <li>Provision of cut-off time to switch off unnecessary lights at night;</li> <li>Initiate Green plantation;</li> <li>No plantation of non-native species;</li> <li>Retaining top soil for future habitat restoration;</li> </ul> <p>No degradation of sensitive habitat.</p>	<p>Afforestation Program. Initial target was to plant 2 lac saplings in 3 years. During the visit we came to know that about 80,000 plantations have already done.</p> <ul style="list-style-type: none"> <li>Another 30000 to 50000 trees were supposed to be planted by December, 2022 by Bagerhat Social Forest Division alongside the Ansar camp and residential area.</li> <li>They are maintaining the EMP measures in a desired way for protecting the adjacent ecosystem.</li> <li>No alien species has been recorded</li> <li>Wild species like avifauna and mammals are now recorded in the greenery areas of the project site</li> </ul> <p>Employees are aware about the rescues of species and no harm to wild species</p>		
3	Disturbance to river, inter-tidal areas and wet lands	<ul style="list-style-type: none"> <li>No encroachment of inter-tidal flood plain area;</li> <li>No disturbance to Dolphin community;</li> <li>Monitoring of Ecosystem Health and Monitoring of Sundarbans Forest Health;</li> <li>If required, embankment should be constructed considering a setback distance from river/canal bank;</li> <li>Slope protection work along the Maidara River should be completed on an urgent basis before rainy season come, and;</li> </ul>	<ul style="list-style-type: none"> <li>Monitoring of ecosystem health of Sundarbans, and around the Project site is being continued.</li> <li>The project is not obstructing the surface water flow.</li> <li>BIFPCL has started maintenance of the slope protection works</li> <li>Bank protection works of western bank of Maidhara river has finished</li> <li>EPC Contractor is monitoring the discharged water quality at each of the outlet from this project on a monthly basis.</li> <li>The project authority has constructed the permanent jetty as per approved layout.</li> </ul>	Complied	<ul style="list-style-type: none"> <li>Initiatives should be taken for excavation of silted reach of Maidara River to protect the rainfall runoff washout.</li> <li>Proper protective measures must be taken to take care of Dolphin community</li> </ul>

Sl No	Potential Impacts	EMP measures as proposed in the EIA	Actual condition/Measures already Implemented	Compliance Status	Recommended Action
		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	<ul style="list-style-type: none"> <li>The Maidara River is showing its natural phenomena without any negative impact due to the construction interventions.</li> </ul> Selected coal suppliers ensured the appropriate vessels with minimum sound for the coal transportation to avoid the disturbance to 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. Now the mechanical and electrical works are in progress.	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	BIFPCL engaged CEGIS as an independent entity for monitoring the construction activities for examining environmental impacts on	Being Complied.



Sl. No	Condition of DoE	Compliance Status	Remarks
	and operation shall not release any pollutant that affect human health or will have damaging impact on the environment or natural resources.	<p>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:</p> <ul style="list-style-type: none"> <li>• <b>Effluent Treatment Plant (ETP):</b> Civil works of ETP has completed and now the mechanical and instrumental works are under way.</li> <li>• <b>Electro Static Precipitator (ESP):</b> Completed and ready for operation</li> <li>• <b>Flue Gas Desulfurization (FGD):</b> FGD for Unit-1 is ready for operation.</li> <li>• <b>Desalinization plant:</b> Completed</li> <li>• <b>Low NOx burner:</b> Completed</li> <li>• <b>Online air and water quality monitoring system:</b> Steam and water quality analysis system has already been developed. Air monitoring system in under developing stage.</li> </ul> <p>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.</p>	
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.	<ul style="list-style-type: none"> <li>• BIFPCL has taken appropriate mitigation measures conforming EMP and technical specification of main Plant at each of the stages of Project Development.</li> </ul> <p>Proper safeguard measures for the safety of the workers were very satisfactory. Proper PPE and scaffolding structures were observed during the site visit.</p>	Being Complied.

Sl. No	Condition of DoE	Compliance Status	Remarks
7	Any heritage sight, ecologically critical area, and other environmentally, religious and archaeologically sensitive places shall be kept protected during Project construction phase.	There is no Religious and Archaeological place in and around the Project site. As a third party, CEGIS is continuously monitoring the potential locations and indicators which are sensitive to coal transportation in the Sundarbans ECA, Sundarbans Reserve Forest and Sundarbans World Heritage Site as per the guidance of DOE and Bangladesh Forest Department (BFD).	Being Complied and suggested to continue this compliance till and during the operation stage.
8	Environment friendly construction and development practices shall be followed that minimize loss of habitats and fish breeding, feeding & nursery sites.	All the construction activities along with the coal transportation system are being followed and 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 labour camp seems unhygienic in terms of waste management. It is observed that sanitation facilities for health safety from COVID are supplied by the Contractor at the labor camps as well as in the working areas.	Being Complied Waste management around the labour 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	All vehicle & equipment used at site are under regular maintenance and registration process. Working during sensitive hours like night	Being Complied

Sl. No	Condition of DoE	Compliance Status	Remarks
	machinery close to sensitive receptor shall be avoided.	time and operating machinery close to sensitive receptor like near the labor camps and residential areas are being avoided.	
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.	<ul style="list-style-type: none"> <li>Burning of waste materials is strictly prohibited inside the project boundary.</li> <li>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.</li> <li>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.</li> </ul> <p>In addition, waste management training has been conducted in a regular basis among the labor.</p>	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.	<p>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.</p> <ul style="list-style-type: none"> <li>An ICU rich hospital with an experienced medical team and ambulance has kept ready to provide the instant services</li> <li>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.</li> <li>Emergency fire exit, the fire extinguisher, fire alarm has observed available and well-functioning.</li> <li>As a part of emergency response plan emergency contact numbers contained laminated poster has noticed beside the construction site.</li> </ul> <p>Proper PPE and scaffolding have observed during the field visit.</p>	Being Complied

Sl. No	Condition of DoE	Compliance Status	Remarks
15	To control dust, spraying of water over the earthen materials should be carried out from time to time.	Periodic air quality monitoring in and around the project sites is being conducted and checked it with ECR, 2005 standard. Monthly air quality monitoring at three locations inside the project boundary are being carried out. Based on the air quality monitoring findings and seasonal aspects, site specific water spraying is scheduled. BHEL has contracted with an external company for three years (renewable) who are spraying water as per schedule by three (03) water tankers to suppress fugitive dust.	Being Complied
16	Storage area for soils and other construction materials shall be carefully selected to avoid disturbance of the natural drainage.	<ul style="list-style-type: none"> <li>Many parts of the permanent drainage channel were observed as blocked situation by the mud and other construction residuals. This has created the water logging in the drain and thus created an unhealthy situation for the workers and environment.</li> <li>During 34<sup>th</sup> field visit piles of sand and other construction material were noticed uncovered.</li> </ul> Plenty of construction residuals has been kept by the side of the Maidara river bank.	Partially complied. <ul style="list-style-type: none"> <li>Proper housekeeping is strongly recommended.</li> <li>Strongly advised to cover up the sand pile and other loose material</li> <li>Construction wastage should be placed at the demarcated place.</li> </ul> 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 depositing the sediments coming with the storm water and finally discharge relatively sediment free storm water through the drainage line.	Being Complied.
19	The entire coal handling system should be designed as an enclosed (and not only covered) conveyor system. There should be integrated dust control system with dust extraction and	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	Mostly Complied

Sl. No	Condition of DoE	Compliance Status	Remarks
	bag filters at unloading areas and at each transfer points on the conveyor system.	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 33 <sup>rd</sup> field visit by CEGIS team it is observed that about 100% installation of the closed system coal conveyor belt from jetty to the coal shed has completed.	
20	Coal Plant should have high-efficiency bag filter for arresting dust emissions.	Integrated dust control system with dust extraction system/bag filter and dust suppression system at crusher house, unloading points, transfer points has been specified in the technical specification of EPC contract. Refer Section (V), B4 of Technical Specification (Clause no B4.3.1.4). High-efficient ESP is now completed that will control the dust emission.	Compliance action initiated.
21	Coal should be stored in a covered storage yard.	All these stipulations have been included in the technical specification of Main Plant EPC contract package, Section (V), B4 of Technical Specification (Clause No B4.3.1.6).  The coal shed construction has already finished and the sheeting work is at finishing stage.	Being complied
22	The entire coal stockyard should be covered with water sprinkler provided with automated moisture sensor to control self-combustion.	All these stipulations have been included in the technical specification of Main Plant EPC contract package, Section V, B4 of Technical Specification.  Out of 4 coal stockyards, construction of 1 stockyard is fully completed and 50% of another stockyard has completed.  Automated moisture sensor has observed to protect self-combustion.	Being complied
23	100% utilization of fly ash and bottom ash should be planned and implemented throughout the operation of the Plant. There should only be a provision of small ash dyke that will not exceed 25 (twenty-five) acres of land to store residual ash.	100% utilization of fly ash has been planned and shall be implemented throughout the operation of this Plant. EOI has been received in this regard from nearby Cement Industries. 25 acres' area has been allocated to store residual ash in case of emergencies. The ash dyke is now under construction stage.	Compliance action initiated.

Sl. No	Condition of DoE	Compliance Status	Remarks
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 under construction. <b>Status:</b> <ul style="list-style-type: none"><li>Fly ash equipment erection below ESP completed.</li></ul> Fly Ash Intermediate Silo structural erection completed.	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). <b>Status:</b> <ul style="list-style-type: none"><li>Bottom Ash Intermediate Silo structural erection completed.</li></ul> FA Pipe rack and piping work under progress.	Compliance action initiated
27	Resettlement and rehabilitation of the displaced population (including those who do not own land) should be done properly.	Land has been acquired as per the legal procedure of GoB. However, BPDB wrote to Ministry for suitable resettlement and rehabilitation as per DoE requirement. BPDB prepared an assessment (Livelihood Restoration Plan) regarding the rehabilitees (including those who do not own land) for this Power Plant. As per the recommendation of the LRP, a NGO "SAMAHAR" completed Their tasks. This monitoring has recorded that DC office has rehabilitated around 32 families at Foyla and 17 families at Koigardaskati.	Compliance action continued
28	Resettlement plan should be properly implemented and people should be adequately compensated.	Resettlement and rehabilitation action had been taken as per the law of the land, Bangladesh. However, BPDB conducted an assessment (Livelihood Restoration Plan) regarding the rehabilitees (including	Compliance action continued



Sl. No	Condition of DoE	Compliance Status	Remarks
		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.	
29	Construction material should be properly disposed-off after construction work is over.	<p>Most of the civil works has already finished and now the mechanical and electrical works are going at full phase. During the field visit we found most of the mechanical and construction residual are being kept at demarcated places. But during the 34<sup>th</sup> field visit it is observed some unused construction materials are scattered in different places without any proper management.</p> <p>For the solid waste management, BHEL has engaged a company named Rahman &amp; brothers in association with Khulna City Corporation (KCC) for collecting and safe disposal of waste materials from site.</p> <p>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.</p>	Compliance action initiated Establishment of WMC is behind
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.	<p>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.</p> <p>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.</p>	Being Complied

Sl. No	Condition of DoE	Compliance Status	Remarks
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 system with a view to assess the natural quality of the Sundarbans and other fragile ecosystem and report of monitoring results should be submitted to Bagerhat District Office, Khulna Divisional Office and Headquarters of the Department of Environment simultaneously.	The network monitoring system will be installed as a part of the project construction and it will be run as online monitoring system during the operation of the Power Plant.  All these stipulations have been included in the technical specification of Main Plant EPC contract package. (Section-V, Clause No B0 6.19.13.2 and Clause No. B0 6.19.13.5). However, air, water, soil and biological components are regularly monitored as per recommendation of EMP. Each of the monitored environmental data has been incorporated in the Monitoring report and displayed on the BIFPCL website at present.	Compliance action initiated.
35	There should be regularly disclosure of the report through workshops and websites and responses should be taken care accordingly.	CEGIS has been regularly carrying out public consultation at different levels. All the monitoring reports are being kept available on website of BIFPCL ( <a href="http://www.bifpcl.com">www.bifpcl.com</a> )	Being Complied.
36	Online air and water quality monitoring system should be made functional throughout the life of the Plant.	The online monitoring system usually install when the Plant will be in operation phase. This will be continued throughout the life time of the Power 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	Compliance action initiated

Sl. No	Condition of DoE	Compliance Status	Remarks
		<p>Padma Abashan area which is now functional and four other devices will be installed at four corners of the project premises which is under approval process.</p> <p>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).</p>	
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 items/events maintain the health and safety protocol of the construction site.	Being complied
39	No ground water should be allowed to use for plant purposes.	<p>The Power Plant has been designed considering use of surface water only during all stages of project development and operation.</p> <p>The authority has already installed Reverse Osmosis (RO) Water Treatment Plant (ABM Water) for use ground water for potable and domestic purposes. A second unit of RO plant is now in operation fulfilling fresh water from both domestic and construction requirements.</p> <p>However, a 1200ft deep tube well has been recorded near the ABM water plant for backup during emergencies. Proponent informed that some time it is used to supply the drinking water.</p>	Ground water is being withdrawn only for supplying the drinking water.

Sl. No	Condition of DoE	Compliance Status	Remarks
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 to the Bagerhat District Office, Khulna Divisional Office and Headquarters of the Department of Environment simultaneously.	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 prescribed offices of DOE. This practice will be continued till the end of the project.	Being complied
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: <ul style="list-style-type: none"> <li>The date(s) on which the sample was taken;</li> </ul>	The Monitoring report keeps all the records as suggested.	Being Complied

Sl. No	Condition of DoE	Compliance Status	Remarks
	<ul style="list-style-type: none"> <li>The time(s) at which the sample was collected;</li> <li>The point at which the sample was taken; and</li> </ul> The name of the person who collected the sample.		
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.)	<p>No single emergency incident has occurred since April, 2021. The COVID restriction has been withdrawal by Gov. with the decreasing infection which also implemented for the MSTPP construction site.</p> <p>During 34<sup>th</sup> field visit we observed most of the workers were reluctant to use the face mask.</p> <p>BIFPCL has given top priority on safety issues as like environment for this project after the bitter experience of two incidents. They have instructed the EPC contractor to establish best practices on OHAS and keep all records for avoiding any incident as like earlier. However, taking numbers of initiatives by the EPC and proponent significantly improve the safety system of the project.</p>	<p>Complied at present</p> <p>COVID-19 PPE (Specially Face-mask) usage should be ensured</p>
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.	<p>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.</p> <p>EPC have already revised the health and safety management manual to continue the work amid the COVID pandemic. Moreover, CEGIS is monitoring the EMP implementation as a whole.</p>	Complied at present.
49	All pollution incidents shall be reported immediately and simultaneously to the Bagerhat District Office, Khulna Divisional Office	BIFPCL has established a proper mechanism for recording such incident as suggested in the ERP	Being complied

Sl. No	Condition of DoE	Compliance Status	Remarks
	and Headquarters of the Department of Environment (DoE) in Dhaka.		
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.	<ul style="list-style-type: none"> <li>Limiting the vegetation clearance within the Project boundary especially around the ash impoundment.</li> <li>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.</li> <li>Under these plantation program initiated by Bangladesh Forest Department (BFD) about 80,000 trees of fruits and medicinal species has already planted.</li> </ul> <p>Another 30000 to 50000 trees were supposed to be planted by April to May 2022. But during 34<sup>th</sup> site visit CEGIS came to know that this plantation program will be done by December, 2022 alongside of ansar camp and residential area under the supervision of Bagerhat Social Forest Division.</p>	<p>Being Complied</p> <p>CEGIS Team has strongly suggested to finish the unfinished plantation as soon as possible</p>
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.



Sl. No	Condition of DoE	Compliance Status	Remarks
54	A full-fledged institutional setup for EHS and CSR must be put in place before operation of the Power Plant.	<p>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. Safety walk-down by the EHS team inside the plant premises help to identify and register all kind of accident and incidental hazards if occurred and take immediate remedy measures.</p> <p>Meanwhile, a number of CSR activities like free medical camp, Boat Medical camp and medicines, free potable water supply to the local people, medical campaign, blanket distribution to the local people, EHS training, infrastructure development etc. are being conducted by the BIFPCL authority as a continuous process at the plant site.</p> <p>As a part of CSR Total 307 patients have taken treatment, 101 pathology tests have done and 33 patients Physiotherapy has given in October, 2022</p>	In the process of compliance
55	The Project authority shall extend active cooperation to DoE officials to facilitate their visit to the site as and when necessary.	BIFPCL is extending its all-out cooperation to DoE.	Being Complied
56	Violation of any of the above conditions shall render this approval void.	Noted by BIFPCL	
57	Any injunction on this Project from the Honorable Supreme Court/High Court Division shall render this approval void.	Noted by BIFPCL	
58	Without installation of 275 Meter Height Chimney, Effluent Treatment Plant (ETP), Waste Water Treatment Plant (WWTP), Settling Pond, Desalinization Plant, API Oil Water Separator, High Efficiency Electro Static Precipitator (ESP), 'closed-loop' Flue Gas Desulfurization (FGD), Low NOx Burner, online air and water quality monitoring system and other pollution control equipment and obtaining Environmental	<p>At present, the Plant is in construction phase. Some of the required parameter from DoE are ready, some are under ready and some will be ready before operation phage.</p> <p><b>Current status:</b></p> <ul style="list-style-type: none"> <li>• <b>Chimney:</b> Shell construction completed in Apr'21 (270 Meter). Flue liner erection completed and ready for Boiler light up (pic attached).</li> <li>• <b>DM water plant:</b> DM water plant has completed.</li> <li>• <b>Effluent Treatment Plant (ETP):</b> Civil works of ETP has completed and now the mechanical and instrumental works are under way.</li> </ul>	Compliance action initiated

Sl. No	Condition of DoE	Compliance Status	Remarks
	Clearance Certificate, the proponent shall not start operation of the Project.	<ul style="list-style-type: none"> <li>• <b>Electro Static Precipitator (ESP):</b> Completed and ready for operation. Air Tightness test completed for all 04 pass.</li> <li>• <b>Flue Gas Desulfurization (FGD):</b> FGD for Unit-1 is ready for operation. Absorber tower structure under progress for unit 2</li> <li>• <b>Desalinization plant:</b> Completed</li> <li>• <b>Low NOx burner:</b> Completed</li> <li>• <b>Online air and water quality monitoring system:</b> Steam and water quality analysis system has already been developed. Air monitoring system in under developing stage.</li> <li>• <b>Settling pond:</b> 02 no rain off settling ponds are being constructed to settle the silt before discharge in to river.</li> </ul> <p>Moreover, BIFPCL has got the Environmental Renewal Certificate each of the year through maintaining the conditions of DOE.</p>	
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)

Compliance to the conditions of DoE (EIA study of Coal Transportation)

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

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

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

Sl. No.	Conditions	Compliance status	Remarks
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 archeologically sensitive places shall be kept protected during project operation.	There is no Religious and Archaeological place in and around the Project site. As a third party, CEGIS is now monitoring the potentially vulnerable locations and indicators which are sensitive to coal transportation in the Sundarbans ECA, Sundarbans Reserve Forest and Sundarbans World Heritage Site. Those information and data assist to protect the ecological critical areas in future during the operation of coal transportation.	Suggested to comply at operation phase.
7	Environment friendly construction and development practices shall be followed that minimize loss of habitats and fish breeding, feeding and nursery sites.	Development of coal transportation system will be followed through best practices, EMPs of EIA of Coal Transportation Report, national and international rules and guideline. Since, the environmental monitoring indicators are not observed any anomalies, it can be concluded that the construction work is progressing in environment friendly procedure till now.	Being Complied
8	Proper and adequate sanitation facilities shall be ensured in labor camps throughout the proposed project period.	<ul style="list-style-type: none"> <li>BIFPCL, EPC contractor and sub-contractors should ensure the sanitation facilities for the labour camps. During 34th field visit the following anomalies were identified:</li> <li>During the visit inside the labour shed plenty of household waste were found on the road in an unmanaged situation.</li> <li>Lack of waste bin and lack of proper initiative of source segregation of the organic waste has made the labour shed unhygienic</li> <li>Unused bath-tub with dirty water has noticed where waste</li> </ul>	Partially Complied Waste management issue needs to take as top priority.

Sl. No.	Conditions	Compliance status	Remarks
		<p>garbage and polybags were floating.</p> <ul style="list-style-type: none"> <li>Lack of lavatory/toilet waste drainage and sewerage facilities that has been causing waste accumulation and malodorous stench.</li> <li>CEGIS advised to take immediate step to clean the labour camp and other waste related issues to make the environment healthy. But during 33rd field visit the team observed the same situation as before.</li> <li>But Authority has been providing sufficient training, instruction and facilities for managing COVID-19 to improve hygienic condition at labor camps and workplaces. Adequate no. of toilets has been made at every location at sites &amp; labour colony</li> </ul>	
9	Proper and adequate on-site precautionary Measures and safety measures shall be ensured so that no habitat of any flora and fauna would be endangered or destructed.	All the finished construction works so far including the Jetty has been followed in accordance with the EMP guidelines sated in the EIA report. Moreover, regular monitoring activities will be carried out to assess the significant changes (if any) for the rest of the unfinished works. The quarterly monitoring reports do not reflect any significant changes of the habitat of flora and fauna of the project influenced Passur river and Sundarbans ecosystem.	Being Complied
10	All the required mitigation measures Suggested in the EIA report along with the emergency response plan are to be Strictly implemented and kept operative/functioning on a continuous basis.	<p>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.</p> <ul style="list-style-type: none"> <li>An ICU rich hospital with an experienced medical team and ambulance has kept ready to provide the instant services</li> <li>In case of emergency situation for both BIFPCL and EPC contractor, a contract has been signed with a private hospital</li> </ul>	Being complied

Sl. No.	Conditions	Compliance status	Remarks
		<p>(GAZI medical, Khulna) for medical services.</p> <ul style="list-style-type: none"> <li>Emergency fire exit, the fire extinguisher, fire alarm has observed available and well-functioning.</li> <li>As a part of emergency response plan emergency contact numbers contained laminated poster has noticed beside the construction site.</li> </ul> <p>EHS team of BIFPCL, BHEL and Choramandalam are compelling to ensure the safety mitigation measures as per EIA and EHS guideline. Moreover, Periodic training has been made as mandatory for the workers.</p> <p>BIFPCL has been working hard to build awareness about Covid-19 among workers and office support staff. Thermal scanning of workers is being done at regular frequency for checking COVID symptom.</p>	
11	To control dust, spraying of water over the earthen materials should be carried out from time to time	<p>Periodic air quality monitoring in and around the project sites is being conducted and checked it with ECR, 2005 standard. BHEL has contracted with an external company for three years (renewable) who are continuously spraying water as per schedule by three (03) water tankers to suppress fugitive dust from the plant premises.</p> <p>At jetty site the following issues were identified:</p> <ul style="list-style-type: none"> <li>Coal stackyard was found hygienic where coal was being sprayed by water to prevent self-combustion.</li> <li>Raw coal was not being sprinkled by water and results dust hazards</li> <li>From jetty to 1st transfer point (TP) about 20 to 25 m coal conveyor was observed uncovered that is dispersing coal ash around the Pashur river side.</li> </ul>	<p>Being Complied</p> <p>The anomalies identified in the compliance status should be mitigate ASAP</p>



Sl. No.	Conditions	Compliance status	Remarks
		<ul style="list-style-type: none"> <li>Underneath the TP the floor was identified very dirty by mixing residual coal with water.</li> </ul>	
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 Pashur river side. 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 labour 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). Out of 04 coal Stackyard 01 has completed where Coal Staggered and Reclaimer commissioned.	Compliance Action initiated.
14	The entire coal stockyard should be Covered with water sprinkler provided with automated moisture sensor to control self-combustion.	EIA study of the Power Plant suggested to install water sprinkler in coal stockyard which has been repeated in EIA study of Coal transportation. However, all these stipulations have been included in the technical specification of Main Plant EPC contract package. Coal stockyard was found in good condition where coal was being sprinkled by water to prevent self-combustion	Compliance Action initiated.
15	Construction material should be properly disposed of after the construction work is over.	Lots of construction materials and waste were observed by the side of the Pashur River in the jetty area. Coal-water slurry is deposited in around the jetty area and TP that was found very unhealthy and dangerous.	Partially complied Good housekeeping practice has strongly recommended. The slurry should remove immediately to protect the runoff to the nearest water body.

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

Sl. No.	Conditions	Compliance status	Remarks
		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 ( <a href="http://www.bifpcl.com">www.bifpcl.com</a> ). 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.	54600 tons of coal has been transported by 43 barges for the commissioning. Proponent confirmed that the vessel was covered and most of the work conducted during day time. 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 will hamper other route vessels movement.	Not 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.
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.	Being complied and suggested to follow this throughout the project cycle. The grabber should be enclosed while coal was unloading from the ship to conveyor belt.

Sl. No.	Conditions	Compliance status	Remarks
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>i.e.</i> 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 produced 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: a) the date(s) on which the sample was taken; b) the time(s) at which the sample was collected; c) the point at which the sample was taken; and The name of the person who collected the sample.	The Monitoring report of CEGIS are maintaining all the records as suggested.	Being Complied
31	The results of any monitoring required to be conducted under this EIA report must be recorded.	CEGIS is maintaining database for all monitoring data analysis result and submitting to BIFPCL through proper documentation. The report is	Being Complied

Sl. No.	Conditions	Compliance status	Remarks
		being shared with DoE on regular basis through monitoring reports.	
32	<p>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:</p> <ol style="list-style-type: none"> <li>Nature of incident (oil spill, fire, accident, collision, land slide etc.)</li> <li>Personnel affected (injured, missing, fatalities, etc.)</li> <li>Emergency support available and its location (standby transport, medical facilities, etc.)</li> <li>Weather conditions</li> </ol> <p>Current operations (abandoning the site, firefighting, etc.)</p>	<p>Emergency Reporting/ Emergency response Plan has been prepared and maintained for the Jetty construction (already finished) and will be followed for the coal transportation issues in future. As Coal transportation and its management is very sensitive to Environment and human body, Health and safety management manual have been revised for better and pre-cautious implementation of OHAS.</p> <p>Though BIFPCL has already put a top priority on OHAS issue, extra care will be ensured for this coal related issues.</p> <p>BIFPCL will adopt the ERP suggested on the EIA study of coal transportation in association with the NOS COP and NPDM for any future incidents as suggested.</p>	Compliance Action initiated.
33	National Oil Spill Contingency Plan (NOS COP) 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 (NOS COP).	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.	<p>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.</p> <p>The institutional arrangement for managing the incident during coal transportation will be set up before operation stage based on the EIA and DoE recommendations. Moreover, monitoring activities is continued for checking any significant changes in natural ecosystem.</p>	Complied at Present.
35	All pollution incidents shall be reported immediately and simultaneously to the Bagerhat District Office, Khulna Divisional	BIFPCL has established a proper mechanism for recording such incidents as suggested in the EMP. CEGIS has been engaged to monitor	Complied at Present.

Sl. No.	Conditions	Compliance status	Remarks
	Office and Headquarters of the Department of Environment (DOE) in Dhaka.	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.	Not applicable in this stage	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	<ul style="list-style-type: none"> <li>• Conduct noise survey around and inside the site boundary</li> <li>• Reducing Noise and Vibrations to country's ambient standards, and occupational health and safety standards</li> <li>• Introducing vehicle speed limit and speed limit monitoring system</li> <li>• Green Plantation around the Project boundary</li> <li>• Switching off/ throttling down of machines/equipment's/generators which are not in use</li> </ul>			
2	Dust Generation from Land development activities and other construction works	<ul style="list-style-type: none"> <li>• Conducting dust monitoring and visual inspection around the site boundary</li> <li>• No use of earthen and undeveloped roads by vehicles related to the Project use</li> <li>• Installation of water spraying system to control fugitive dusts</li> <li>• Introducing vehicle speed limit and speed limit monitoring system</li> <li>• If yes, do they monitor vehicle speed regularly?</li> </ul>			
3	Water Quality	<ul style="list-style-type: none"> <li>• Fencing the construction site by drum sheet or Tarjja of any other fencing</li> <li>• Arrangement of runoff drainage for reducing any water logging</li> <li>• Location of backfilling stockpile in safe area and protected from wind and rain action</li> <li>• No storing of backfilling materials/spoil stored on river bank/slope</li> <li>• No disposal of waste and wastewater to river or canal.</li> </ul>			
4	Waste Management System	<ul style="list-style-type: none"> <li>• Provision of onsite waste management system</li> </ul>			
5	Compensation and Resettlement	<ul style="list-style-type: none"> <li>• Prepare Proper resettlement action plan and compensation plan if the Project needs any land acquisition addressing compensation, restoration, livelihood, living standards etc. based on proper socio-economic studies</li> <li>• Resettlement of the PAPs</li> <li>• cash for compensation of land (CCL) before resettlement</li> </ul>			

SI No	Potential Impacts	Proposed EMP	Actual Implementation	Recommended Action	Compliance Status
		<ul style="list-style-type: none"> <li>• formal agreement with the affected people prior to migration/resettlement</li> <li>• Sufficient standing crop compensation</li> <li>• Compensation for shift able structures?</li> <li>• Retention of salvageable materials?</li> <li>• Compensation for loss of trading income?</li> <li>• one-time moving assistance</li> <li>• grant to cover loss of regular wage income</li> <li>• Has a resettlement plan been developed which includes compensation, restoration, livelihood, living standards etc. based on proper socio-economic studies?</li> <li>• Provide/take extra care/caution for the disadvantaged/vulnerable group(s) (i.e., women, children, ethnic minorities, indigenous people etc.)</li> <li>• Provision of monitoring the compensation and resettlement process</li> </ul>			
6	Livelihood and living	<ul style="list-style-type: none"> <li>• Does the Project pose any threat to the livelihood/living standards of the local people?</li> <li>• If yes, are adequate steps taken to reduce the impacts?</li> <li>• Has the company developed any policy which prioritizes the local laborers in employment opportunities?</li> <li>• Is there any possibility that large vehicle related to the Project will cause traffic induced disturbance/s to the local dwellers?</li> <li>• If yes, are there any mitigative steps taken to decrease the disturbance/s?</li> <li>• Has the road network been developed after the Project being proposed and during the construction phase?</li> <li>• Are there separate water and sanitation facilities for the construction workers in the Project area?</li> </ul>			
7	Green House Gas Controlling Measures	<ul style="list-style-type: none"> <li>• Use of efficient generator in the construction activities</li> <li>• Regular maintenance of vehicles, generator and machinery in accordance with manufacturer's specifications</li> <li>• Use of approved pollution control devices fitted in the equipment's and machineries</li> <li>• Switching off and throttling down the machines/equipment's/generators which are not in use</li> </ul>			

**Table B: Checklist of Monitoring ESMP Implementation (During Construction Phase)**  
**(Labor and Working Condition)**

**Basic Data**

SI 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**

SI No	Potential Impacts	Proposed EMP	Actual Implementation	Recommended Action	Compliance Status
1	Working Conditions and Management of Worker Relationship	<ul style="list-style-type: none"> <li>• Preparation of Human Resources Policies and Procedures for Direct workers</li> <li>• Defined Working condition and Terms of Employment for direct worker</li> <li>• Sustainably equivalent terms and condition for migrant workers</li> <li>• Compliance to national law of forming workers' organization</li> <li>• No discrimination and equal opportunity for all</li> <li>• Measures for diminishing past discrimination</li> <li>• Grievance Mechanism</li> </ul>			
	Protecting Workforce	<ul style="list-style-type: none"> <li>• 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.</li> <li>• No Force Labor</li> </ul>			
2	Safety at site	<ul style="list-style-type: none"> <li>• Installation/Construction of Safety Fence around the Project area</li> </ul>			

SI No	Potential Impacts	Proposed EMP	Actual Implementation	Recommended Action	Compliance Status
		<ul style="list-style-type: none"> <li>• Use of Personnel Protective Equipment (i.e. safety suit, safety goggles, ear plug, safety shoes, gloves, dust mask, etc.)</li> <li>• Safety trainings for workers (i.e. fire control, working at height, working in heat, first aid etc.)</li> <li>• Practice of Tool box meeting, safety talks,</li> <li>• Safe Storage of Hazardous Chemicals (e.g. fuel, flammable chemical, toxic chemicals, etc.)</li> <li>• Maintaining Material Safety Data Sheet (MSDS)</li> <li>• Provision of Health care facilities such as doctor, hospital etc. available at/nearby the plant construction site</li> <li>• Availability of First Aid at work place</li> <li>• Preparation and Follow of Emergency Response Plan</li> <li>• Adequate fire precautions in place (for example, fire extinguishers, escape routes etc.)</li> <li>• Documentation and reporting of occupational accidents, diseases, and incidents</li> <li>• Policies and procedures for managing and monitoring the performance of third-party employers in relation to OHS</li> </ul>			
3	Occupational Health and Safety Procedure	<ul style="list-style-type: none"> <li>• Provision of complete EHS division in the Human Resources Planning/Organogram</li> <li>• Preparation of Safety Policy to be adopted during plant operation</li> </ul>			
4	Worker's Well Being	<ul style="list-style-type: none"> <li>• Establishment Grievance Mechanisms</li> <li>• Ensuring fair treatment, non-discrimination and equal opportunity</li> <li>• Compliance of Project's labor policy with the national labor law</li> <li>• No Child Labor</li> <li>• No incident of forced labor</li> <li>• Provision of Welfare facilities for Worker/Labor</li> </ul>			

**Table C: Checklist of Monitoring ESMP Implementation (During Construction phase)**  
**(Community Health, Safety and Security)**

SI 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	<ul style="list-style-type: none"> <li>• Construction of boundary wall around the Project area</li> <li>• Installation of water spraying system to control dusts</li> <li>• Conducting dust monitoring and visual inspection around the site boundary</li> <li>• Adoption of Noise management plan</li> </ul>			
2	Grievance of local people	<ul style="list-style-type: none"> <li>• Availability and operation of Grievance Redress Mechanism</li> <li>• Maintaining open communication channel with the local community</li> </ul>			
3	Risk of breaching Community Safety	<ul style="list-style-type: none"> <li>• Construction of boundary wall/safety fence around the Project area</li> <li>• Practicing Risk Assessment and Evaluation Process</li> <li>• Practicing safe management for hazardous materials which may pose threat to the community</li> <li>• Availability and operation of Emergency Response Plan</li> <li>• Maintaining open communication channel with the local community</li> <li>• Training and instruction to the security personnel about their behaviour and communication with the local people</li> <li>• Aware the security personnel about the right of the community people</li> </ul>			
4	Community Health Risk	<ul style="list-style-type: none"> <li>• Provision of providing health service facilities to community if the Project possess any health risk like sexually transmitted disease, communicable disease, vector-borne diseases</li> <li>• Implement all pollution mitigation measures to ensure safeguarding to community</li> </ul>			<i>(Continued)</i>
5	Youth Employment	<ul style="list-style-type: none"> <li>• Providing training/awareness program for the local youth to let them aware about the required qualification to get involved in the Project related activities</li> </ul>			
6	Public Communication, Consultation and Awareness	<ul style="list-style-type: none"> <li>• Arranging public communication/consultation meeting</li> <li>• Sharing of Project information with local people</li> <li>• Organizing environmental and social awareness programs/meetings</li> </ul>			



**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.	<ul style="list-style-type: none"> <li>• Installation of proper run on/runoff drains</li> <li>• Use of sediment fences, traps and basins for trapping the sediment, if required</li> </ul>			
2	Disturbance to nearby ecosystem due to different construction activities	<ul style="list-style-type: none"> <li>• No cutting/ felling of trees along the river bank</li> <li>• Implementation of on-site waste and air quality management plan</li> <li>• Limiting soil extraction activities limited within the defined area</li> <li>• Limiting the vegetation clearance and base stripping process within the Project boundary</li> <li>• Safety fence around the construction site</li> <li>• Limiting the use of night light</li> <li>• Using shade (directed downwards) around the outdoor lights</li> <li>• Provision of cut-off time to switch off unnecessary lights at night</li> <li>• Initiate Green plantation</li> <li>• No plantation of non-native species</li> <li>• Retaining top soil for future habitat restoration</li> <li>• No degradation of critical habitat?</li> </ul>			
3	Occupation of river, inter-tidal areas and wetlands	<ul style="list-style-type: none"> <li>• No encroachment of inter-tidal flood plain area</li> <li>• No disturbance to Dolphin community</li> <li>• Monitoring of Ecosystem Health and Monitoring of Sundarbans Forest Health</li> <li>• If required, embankment should be constructed considering a setback distance from river/canal bank</li> <li>• Slope protection work along the Maidara River should be completed on an urgent basis before rainy season come and</li> <li>• 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</li> </ul>			

## Appendix II: Photo Album

### Environmental and Socio-economic Monitoring of Khulna 2×660 MW Power Plant for 34<sup>th</sup> monitoring program (October, 2022)



Monitoring Team



Measuring tree height



Collecting survey data





Marking the tree



Counting Pneumatophores



Collecting survey data



Water sampling bottle tagging

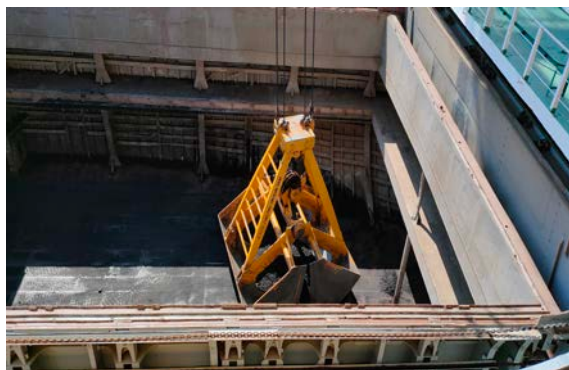


Collecting water samples



Erosion at Hiron Point of Sundarbans





Uncovered Coal unloading from vessel



Uncleaned floor under the conveyor belt



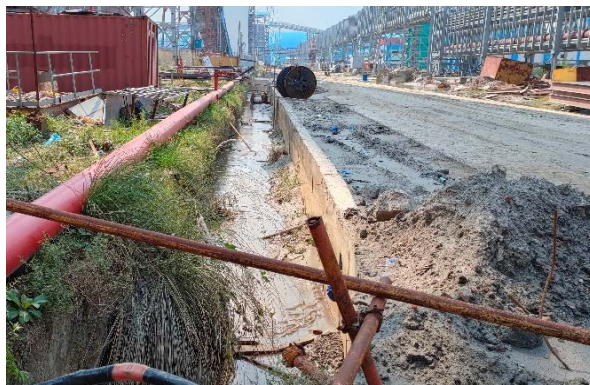
Uncleaned floor under the conveyor belt



Coal spillage from TP



Unsafe management of waste at jetty area



Drainage sysytem blocked due to debris



Scattered construction materials



Unsafe management of Asbestos



Coal yard



Collecting water samples from Sundarbans area



## Appendix III: Terms of References (ToR)

### Background

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

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

**Project Location:** Upazila: Rampal, District: Bagerhat  
Site is located at 23 kms Southward of Khulna City and 14 kms. North-Eastward from Mongla Port.



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

**Mode of Operation:** Base Load

**Fuel:** Imported Coal

<b>Fuel Transportation:</b>	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.
<b>Land&amp; Land Development:</b>	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).
<b>Evacuation of power:</b>	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.
<b>Expected Timeline for project implementation</b>	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.



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**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 <sub>3</sub> and PO <sub>4</sub>
	River Morphology,
	Tidal inundation
	Drainage Network
	Erosion and Accretion
	Ground water quality
Air quality	SO <sub>x</sub>
	NO <sub>x</sub>
	SPM (PM <sub>10</sub> and PM <sub>2.5</sub> )
	CO

### Air quality monitoring progress

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

- SO<sub>x</sub>: measured by Fluorescent signal generated by exiting SO<sub>2</sub> with UV light
- NO<sub>x</sub>: measured by Chemilumiscent reaction between NO<sub>x</sub> & O<sub>3</sub>
- O<sub>3</sub>: 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<sub>10</sub>, PM<sub>2.5</sub>): 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<sub>10</sub> or PM<sub>2.5</sub> 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		1 <sup>st</sup> QM, Apr 2014	2 <sup>nd</sup> QM, Jul 2014	3 <sup>rd</sup> QM, Oct 2014	4 <sup>th</sup> QM, Jan 2015	5 <sup>th</sup> QM, Apr 2015	6 <sup>th</sup> QM, Jul2015	7 <sup>th</sup> QM, Oct 2015	8 <sup>th</sup> QM, Jan 2016	9 <sup>th</sup> QM, Apr 2016	10 <sup>th</sup> QM, Jul 2016	11 <sup>th</sup> QM, Oct 2016	12 <sup>th</sup> QM, Jan 2017	13 <sup>th</sup> QM, April, 2017	14 <sup>th</sup> QM, Oct, 2017	15 <sup>th</sup> QM Jan, 2018	16 <sup>th</sup> QM April, 2018	17 <sup>th</sup> QM, Jul 2018	18 <sup>th</sup> QM, Nov, 2018	19 <sup>th</sup> QM, Feb, 2019	20 <sup>th</sup> QM, Apr, 2019	21 <sup>st</sup> QM, Jul, 2019	22 <sup>nd</sup> QM, Jul, 2019	23 <sup>rd</sup> QM, Feb, 2020	25 <sup>th</sup> QM, July, 2020	26 <sup>th</sup> QM, Oct, 2020	27 <sup>th</sup> QM, Jan, 2021	28 <sup>th</sup> QM, April, 2021	29 <sup>th</sup> QM, Aug, 2021	30 <sup>th</sup> QM, Nov, 2021	31 <sup>st</sup> QM, Jan, 2022	32 <sup>nd</sup> QM, May, 2022	33 <sup>rd</sup> QM, July, 2022	33rd QM, JOct, 2022	Bangladesh (DoE) Standard (Air Pollution Control rules, 2022; ECR, 1997 and subsequent amendments)
Weather	Pollutants	Sunny	Rainy/Cloudy	Sunny	Sunny	Sunny	Rainy/Cloudy	Sunny/Rainy	Sunny	Sunny	Rainy/Cloudy	Rainy/Cloudy	Sunny	Sunny/Cloudy	Sunny	Sunny	Sunny/Cloudy	Rainy/Cloudy	Sunny/Cloudy	Sunny	Sunny	Sunny/Cloudy	Sunny/Cloudy	Sunny	Rainy/Cloudy	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny	Rainy/Cloudy	Rainy/Cloudy	Sunny	
	Concentrations are in µg/m <sup>3</sup>																																		
SW Corner of the PP area	PM <sub>2.5</sub>	33	37	25	33	47	25	22	34	19	5	9	24.8	8.12	28.2	32.9	28.4	15.2	31.1	27.3	21.7	37.76	51.32	27.12	18.71	44.18	55.35	49.13	38.25	56.83	46.83	41.78	34.84	39.63	65 <sup>24hr</sup>
	PM <sub>10</sub>	78	77	53	79	83	35	52	135	117	32	22	79	43.8	73.6	133	70	15.8	106	105.4	98.2	67.15	127.6	68.1	80.28	107.16	106.13	103.88	59.17	83.46	91.25	74.32	56.18	57.26	150 <sup>24hr</sup>
	SPM	207	239	190	200	177	42	91	175	332	51	53	115.7	122.4	169.4	145.6	121.5	12.9	137.4	151.6	128.6	109.25	183.56	108.4	98.26	149.73	163.48	155.14	99.44	144.48	159.45	139.42	106.28	109.27	200 <sup>8hr</sup> (ECR, 1997)
	SO <sub>2</sub>	21	24	19	23	15	52	35	14	18	9	8	9.5	9.0	7.2	14.3	11.4	11.9	12.7	11.6	13.9	56.5	31.53	18.35	19.91	26.63	14.74	16.26	14.49	16.28	21.54	15.22	11.04	10.18	80 <sup>24hr</sup>
	NO <sub>x</sub>	26	29	27	31	29	35	29	18	18	12	10	11.3	10.7	7.5	17.7	12.8	10.2	14.8	12.4	16	55.08	24.97	12.12	8.82	16.62	37.16	22.31	19.87	21.64	39.5	22.49	23.18	17.64	80 <sup>24hr</sup>
	CO	120	188	140	190	144	146	88	74	57	35	119	59	91	73	61	32	11.1	28	15	18	4	16	28	0	2	0	0	1	0	1	1	0.3	0.6	(5000) <sup>8hr</sup>
	O <sub>3</sub>	27	26	19	22	26	12	5	4	1	1	1	5	03	10	03	9	13.2	7	9	6	25	10	8	8	8	9	16	42	11	12	18	12	19	100 <sup>8hr</sup>
Shapmari area	PM <sub>2.5</sub>	39	48	48	39	34	18	17	35	25	3	8	25	14.6	8.5	31.5	26.7	15.8	35.7	30.6	18.9	50.24	19.34	19.14	20.35	29.17	52.74	48.64	41.2	44.65	39.86	36.71	41.2	49.63	65 <sup>24hr</sup>
	PM <sub>10</sub>	814.6	90	74	102	97	31	48	116	44	11	11	99.5	56.9	40.4	147.8	52	64.4	109.9	126.3	106.1	63.94	82.27	83.22	71.06	84.3	112.04	83.1	64.28	71.35	58.29	68.79	64.29	58.48	150 <sup>24hr</sup>
	SPM	2156.3	263	217	274	266	47	79	192	187	27	23	154.2	136.7	45.3	181.4	138.7	113.4	143.9	168	150.8	123.56	120.45	106.3	95.24	119.22	170.33	139.26	116.48	118.49	128.34	158.14	118.62	123.62	200 <sup>8hr</sup> (ECR, 1997)
	SO <sub>2</sub>	19	28	22	21	22	58	27	13	11	4	6	12.9	10	4.3	15	9.6	10.8	12.2	12.3	12.1	31.53	60.26	27.41	17.44	14.15	18.32	14.06	11.77	14.55	14.48	13.96	12.58	16.71	80 <sup>24hr</sup>
	NO <sub>x</sub>	29	39	27	26	24	46	25	16	22	6	8	15.7	11.8	6	18.6	10.2	13.1	13.6	13.8	13.9	24.97	58.39	18.77	10.17	14.18	29.9	21.65	21.394	20.85	20.44	20.47	18.4	25.45	80 <sup>24hr</sup>
	CO	165	210	230	164	136	127	102	77	22	31	108	66	78	79	69	27	25	30	21	20	4	11	44	4	0.013	0	0	1	1.1	1	1	1	0.4	(5000) <sup>8hr</sup>
	O <sub>3</sub>	33	26	26	23	21	16	1	1	1	0	0	1	08	25	04	4	8	6	4	1	34	22	9	6	2	6	9	28	41	49	8	16	14	100 <sup>8hr</sup>
NW Corner of the PP area	PM <sub>2.5</sub>	37	44	19	42	59	28	19	24	11	3	10	29	10.3	15.2	40.7	27.7	12.9	32.3	20.3	14.2	37.27	33.2	21.61	21.93	46.73	68.26	58.81	22.66	41.98	42.81	54.16	39.36	46.32	65 <sup>24hr</sup>
	PM <sub>10</sub>	67	78	56	98	91	96	29	125	29	24	14	108.7	31.3	49.9	136.3	100.1	44.3	117.4	93.6	58.7	42.99	1119.34	77.69	76.76	110.43	131.84	97.61	48.19	61.48	73.42	63.26	58.03	64.18	150 <sup>24hr</sup>
	SPM	234	217	157	310	244	321	66	187	115	31	35	168	91.7	63.9	161.7	116.2	76.3	156.2	125.5	119.2	60.45	175.13	100.04	101.33	160.3	180.43	161.8	77.149	104.73	123.76	132.77	108.2	139.24	200 <sup>8hr</sup> (ECR, 1997)
	SO <sub>2</sub>	19	22	18	27	21	56	32	13	17	4	8	12.2	5.8	7.5	9.6	13.2	5.8	13.4	10.7	11.6	60.26	54.02	19.68	16.21	25.82	16.19	16.58	13.58	12.19	11.79	10.47	13.29	14.66	80 <sup>24hr</sup>
	NO <sub>x</sub>	23	28	22	32	39	43	21	18	16	5	11	14.7	7.1	9.2	11.7	14.3	5.9	15	11.3	13.5	58.39	43.45	17.53	10.55	18.91	34.1	27.42	20.49	18.39	20.25	23.96	20.63	21.43	80 <sup>24hr</sup>
	CO	110	178	110	210	140	133	87	77	38	47	127	31	74	80	45	43	21	32	20	16	7	0	30	2	0.012	0	0.2	1	1.4	1	0.6	0.4	0.2	(5000) <sup>8hr</sup>
	O <sub>3</sub>	25	19	17	36	44	11	8	2	0	1	1	3	05	10	05	7	6	8	1	5	18	2	9	8	8	12	14	17	34	12	8	11	13	100 <sup>8hr</sup>
Barni, Gaurambha	PM <sub>2.5</sub>	39	47	57	39	41	34	11	29	23	9	10	21.7	7.9	13.8	52.3	18	11.9	15.4	19.3	19.7	57.51	31.28	26.66	18.04	38.69	61.29	62.29	21.8	58.34	29.22	31.43	27.55	41.59	65 <sup>24hr</sup>

Locations of Monitoring		1 <sup>st</sup> QM, Apr 2014	2 <sup>nd</sup> QM, Jul 2014	3 <sup>rd</sup> QM, Oct 2014	4 <sup>th</sup> QM, Jan 2015	5 <sup>th</sup> QM, Apr 2015	6 <sup>th</sup> QM, Jul2015	7 <sup>th</sup> QM, Oct 2015	8 <sup>th</sup> QM, Jan 2016	9 <sup>th</sup> QM, Apr 2016	10 <sup>th</sup> QM, Jul 2016	11 <sup>th</sup> QM, Oct 2016	12 <sup>th</sup> QM, Jan 2017	13 <sup>th</sup> QM, April, 2017	14 <sup>th</sup> QM, Oct, 2017	15 <sup>th</sup> QM Jan, 2018	16 <sup>th</sup> QM April, 2018	17 <sup>th</sup> QM, Jul 2018	18 <sup>th</sup> QM, Nov, 2018	19 <sup>th</sup> QM, Feb, 2019	20 <sup>th</sup> QM, Apr, 2019	21 <sup>st</sup> QM, Jul, 2019	22 <sup>nd</sup> QM, Jul, 2019	23 <sup>rd</sup> QM, Feb, 2020	25 <sup>th</sup> QM, July, 2020	26 <sup>th</sup> QM, Oct, 2020	27 <sup>th</sup> QM, Jan, 2021	28 <sup>th</sup> QM, April, 2021	29 <sup>th</sup> QM, Aug, 2021	30 <sup>th</sup> QM, Nov, 2021	31 <sup>st</sup> QM, Jan, 2022	32 <sup>nd</sup> QM, May, 2022	33 <sup>rd</sup> QM, July, 2022	33 <sup>rd</sup> QM, JOct, 2022	Bangladesh (DoE) Standard (Air Pollution Control rules, 2022; ECR, 1997 and subsequent amendments)
Weather	Pollutants	Sunny	Rainy/Cloudy	Sunny	Sunny	Sunny	Rainy/Cloudy	Sunny/Rainy	Sunny	Sunny	Rainy/Cloudy	Rainy/Cloudy	Sunny	Sunny/Cloudy	Sunny	Sunny	Sunny/Cloudy	Rainy/Cloudy	Sunny/Cloudy	Sunny	Sunny	Sunny/Cloudy	Sunny/Cloudy	Sunny	Rainy/Cloudy	Sunny	Sunny	Sunny	Sunny	Sunny	Rainy/Cloudy	Rainy/Cloudy	Sunny		
	Concentrations are in µg/m <sup>3</sup>																																		
	PM <sub>10</sub>	103	122	67	97	82	65	26	97	82	45	13	105.4	30.5	30.2	140	30.5	20.5	50.1	102	69.9	33.25	69.32	61.11	59.02	91.79	93.36	103.42	50.26	73.17	43.88	46.29	51.98	64.71	150 <sup>24hr</sup>
	SPM	233	244	183	277	236	79	112	176	268	69	30	167.8	95.6	57.2	171.9	90.6	5.2	113.5	127.5	92.2	75.13	102.17	98.74	82.02	128.48	159.8	154.35	83.2	134.6	92.38	98.15	93.44	111.39	200 <sup>8hr</sup> (ECR, 1997)
	SO <sub>2</sub>	21	23	17	22	25	41	31	16	20	10	7	12.2	5.5	4.1	13.8	6.1	6.1	9.5	11.5	12.6	54.02	59.33	18.88	24.29	20.17	16.47	13.52	14.44	21.39	14.36	18.42	10.57	13.88	80 <sup>24hr</sup>
	NO <sub>x</sub>	25	28	22	26	27	44	32	21	16	12	9	19.3	9.8	5.0	16.7	7.3	7.4	10.7	13.8	13.8	43.45	57.02	11.58	10.62	14.47	21.18	19.371	19.48	38.46	21.92	40.28	16.4	20.31	80 <sup>24hr</sup>
	CO	175	210	190	150	196	96	96	81	73	41	98	63	85	77	59	24	20	20	17	18	6	0	32	0	0	0	0	0	0	0.1	1	0.8	0.1	(5000) <sup>8hr</sup>
	O <sub>3</sub>	26	29	22	19	15	9	6	4	0	0	3	5	08	6	04	6	6	2	3	4	7	52	12	8	0	6	2	19	28	6	10	14	33	100 <sup>8hr</sup>
Chunkuri-2, Bajua Dacope	PM <sub>2.5</sub>	35	39	46	37	33	35	28	31	25	7	5	25.2	8.7	17.3	33.4	11.4	10.2	26.8	22.8	15	19.46	33.74	39.44	18.22	43.91	59.18	53.36	33.27	29.61	45.3	48.94	38.48	30.22	65 <sup>24hr</sup>
	PM <sub>10</sub>	77	86	69	68	61	109	49	98	60	23	20	74.4	44.4	100.2	157.1	40.6	30.6	105.9	126.7	72.7	46.37	78.27	100.08	59.91	88.93	117.42	86.44	61.9	44.28	66.54	86.48	53.19	39.66	150 <sup>24hr</sup>
	SPM	117	113	162	183	188	175	94	167	167	31	48	162	110.6	127.8	200	108	78.6	128.5	146.6	117.6	80.31	100.95	146.72	146.72	139.04	188.27	128.36	104.29	77.88	134.71	165.58	103.72	77.36	200 <sup>8hr</sup> (ECR, 1997)
	SO <sub>2</sub>	19	24	21	18	11	55	33	21	13	7	9	18.9	8.2	7.9	19	10.4	7.5	12.1	12.4	11.2	45.81	35.42	36.14	18.74	29.94	16.45	19.66	15.98	10.59	12.84	14.82	11.08	10.52	80 <sup>24hr</sup>
	NO <sub>x</sub>	23	26	27	24	18	49	23	16	25	10	8	18	11.2	8.4	20.7	11.6	8.4	14	13.8	13.7	44.92	40.09	20.04	10.19	18.32	26.14	24.21	18.66	17.21	16.73	26.42	21.94	18.03	80 <sup>24hr</sup>
	CO	190	205	170	170	33	133	75	70	33	38	79	36	94	69	58	42	23	27	25	20	10	0	18	10	0	0.1	0.1	0.8	1	1	1	0.2	0.1	(5000) <sup>8hr</sup>
O <sub>3</sub>	27	24	18	22	41	21	2	1	1	0	2	2	03	5	05	2	4	5	9	8	2	38	22	8	0	23	28	11	9	8	13	29	14	100 <sup>8hr</sup>	
Pankhali, Dacope	PM <sub>2.5</sub>	47	49	57	41	39	34	25	47	15	8	10	38.7	15.8	17	72.3	15.9	11.1	24.8	28.6	15.8	24.03	24.03	33.26	16.63	33.32	66.31	42.62	32.45	42.59	47.51	42.57	42.85	48.3	65 <sup>24hr</sup>
	PM <sub>10</sub>	119	127	139	101	105	144	62	128	46	42	18	141.6	105	63.4	208.9	74.3	58.4	92	125.8	92.7	56.56	119.28	127.52	55.78	74.83	102.73	73.29	74.89	64.71	81.84	71.22	69.02	74.05	150 <sup>24hr</sup>
	SPM	297	266	254	208	299	339	183	198	114	78	34	194.6	179	87.5	223.9	154.1	98.4	139	178.2	141.1	93.5	100.95	160.02	70.23	111.95	156.56	116.73	118.4	107.31	148.93	128.98	127.39	138.51	200 <sup>8hr</sup> (ECR, 1997)
	SO <sub>2</sub>	28	31	31	24	30	58	36	18	9	8	8	16.1	12.9	8	16.3	12.2	9.4	10.4	13.3	10.4	59.41	44.29	30.89	16.73	21.39	16.16	13.1	14.61	12.8	21.4	19.71	12.71	15.42	80 <sup>24hr</sup>
	NO <sub>x</sub>	41	39	36	26	27	47	23	15	19	9	9	19	18.7	10.2	17.7	13.7	12.1	13.4	14.9	11.7	51.09	17.72	19.02	10.52	12.12	28.54	17.18	20.27	19.33	38.27	29.44	23.16	22.14	80 <sup>24hr</sup>
	CO	230	217	250	188	177	125	105	101	55	29	112	48	83	87	49	34	29	30	14	14	9	0	11	0	0	1	0	1	1.1	2.8	2	0.4	0.6	(5000) <sup>8hr</sup>
O <sub>3</sub>	49	38	36	27	11	13	5	2	2	0	0	3	06	0	06	6	8	8	8	3	22	26	2	2	4	20	2	10	19	48	39	37	24	100 <sup>8hr</sup>	
Mongla Port area	PM <sub>2.5</sub>	47	55	39	41	26	33	19	34	21	9	11	25.7	22.6	33.2	70.1	23.2	13.2	30.3	26.6	35	56.67	39.69	38.92	41.33	40.75	74.19	65.37	22.54	51.83	26.39	28.19	43.8	58.46	65 <sup>24hr</sup>
	PM <sub>10</sub>	139	174	77	82	35	52	33	132	45	29	15	119.3	93.6	97	209.1	89.9	47.5	103.7	109.3	131	119	64.12	119.61	126.13	114.61	118.67	129.71	64.44	72.4	61.63	51.66	62.53	93.43	150 <sup>24hr</sup>
	SPM	288	303	197	217	214	118	65	189	144	50	6	172.3	196	187.2	242	144.7	73.7	161.9	157.1	183.1	192.17	83.9	173.36	166.16	152.76	201.16	180.22	85.2	128.3	100.53	92	120.3	170.28	200 <sup>8hr</sup> (ECR, 1997)
	SO <sub>2</sub>	27	28	26	24	14	45	36	16	10	8	7	16.8	10.5	8.2	15.5	11.8	6.5	12	10.8	16.8	59.33	57.24	31.33	22.04	20.06	12.26	18.91	10.28	17.44	12.54	20.33	14.55	21.41	80 <sup>24hr</sup>
	NO <sub>x</sub>	44	39	33	27	17	40	20	13	14	10	8	15.3	15.1	10.7	18.4	13.2	7.2	16.8	12.6	17.8	57.02	46.58	13.34	11.29	9.69	19.25	30.2	19.73	29.16	18.43	31.63	22.3	34	80 <sup>24hr</sup>
	CO	230	320	220	211	24	110	84	71	29	31	97	44	72	79	52	29	20	33	28	17	15	48	29	24	0	2	0.9	2	2.4	2	0.2	0.1	1.9	(5000) <sup>8hr</sup>
O <sub>3</sub>	57	52	37	26	09	15	8	3	1	2	1	4	04	9	02	3	1	9	7	3	5	40	4	2	1	66	91	23	43	20	13	29	59	100 <sup>8hr</sup>	
Harbaria,	PM <sub>2.5</sub>	19	22	33	27	24	27	24	26	13	6	10	19.2	10.5	28.3	43.5	11.6	11.4	20.6	15.4	14.2	28.03	39.69	17.81	20.11	34.42	53.28	46.13	34.94	31.2	41.58	43.27	49.15	53.98	65 <sup>24hr</sup>



Locations of Monitoring		1 <sup>st</sup> QM, Apr 2014																																	2 <sup>nd</sup> QM, Jul 2014																																	3 <sup>rd</sup> QM, Oct 2014																																	4 <sup>th</sup> QM, Jan 2015																																	5 <sup>th</sup> QM, Apr 2015																																	6 <sup>th</sup> QM, Jul2015																																	7 <sup>th</sup> QM, Oct 2015																																	8 <sup>th</sup> QM, Jan 2016																																	9 <sup>th</sup> QM, Apr 2016																																	10 <sup>th</sup> QM, Jul 2016																																	11 <sup>th</sup> QM, Oct 2016																																	12 <sup>th</sup> QM, Jan 2017																																	13 <sup>th</sup> QM, April, 2017																																	14 <sup>th</sup> QM, Oct, 2017																																	15 <sup>th</sup> QM Jan, 2018																																	16 <sup>th</sup> QM April, 2018																																	17 <sup>th</sup> QM, Jul 2018																																	18 <sup>th</sup> QM, Nov, 2018																																	19 <sup>th</sup> QM, Feb, 2019																																	20 <sup>th</sup> QM, Apr, 2019																																	21 <sup>st</sup> QM, Jul, 2019																																	22 <sup>nd</sup> QM, Jul, 2019																																	23 <sup>rd</sup> QM, Feb, 2020																																	25 <sup>th</sup> QM, July, 2020																																	26 <sup>th</sup> QM, Oct, 2020																																	27 <sup>th</sup> QM, Jan, 2021																																	28 <sup>th</sup> QM, April, 2021																																	29 <sup>th</sup> QM, Aug, 2021																																	30 <sup>th</sup> QM, Nov, 2021																																	31 <sup>st</sup> QM, Jan, 2022																																	32 <sup>nd</sup> QM, May, 2022																																	33 <sup>rd</sup> QM, July, 2022																																	33 <sup>rd</sup> QM, JOct, 2022																																	Bangladesh (DoE) Standard (Air Pollution Control rules, 2022; ECR, 1997 and subsequent amendments)																																
Weather	Pollutants	Sunny	Rainy/Cloudy	Sunny	Sunny	Sunny	Rainy/Cloudy	Sunny/Rainy	Sunny	Sunny	Rainy/Cloudy	Rainy/Cloudy	Sunny	Sunny/Cloudy	Sunny	Sunny	Sunny/Cloudy	Sunny/Cloudy	Sunny	Sunny	Sunny/Cloudy	Sunny/Cloudy	Sunny	Rainy/Cloudy	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny	Rainy/Cloudy	Rainy/Cloudy	Sunny																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
		Concentrations are in µg/m <sup>3</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
Sundarbans	PM <sub>10</sub>	41	39	59	56	49	42	50	82	42	20	14	85.2	36.7	89.9	152.4	29.1	24.3	80.5	92.6	63.9	21.85	64.12	63.27	62.24	79.38	100.11	82.83	61.53	49.07	58.92	51.04	74.7	76.18	150 <sup>24hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	SPM	111	117	129	139	109	70	73	159	91	43	44	93.5	103.7	107	189.9	72.4	47.6	90.3	118.3	90.9	48.09	83.9	87.51	87.71	122.94	146.2	133.1	108.74	83.16	118.83	110.28	141.48	142.09	200 <sup>8hr</sup> (ECR, 1997)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	SO <sub>2</sub>	9	10	14	12	16	51	34	15	11	6	7	11.9	5.7	7.6	13.2	7.9	4.9	11.6	9.5	11.6	49.72	57.24	16.47	13.31	19.74	14.66	16.58	14.75	12.68	22	13.76	14.9	12.37	80 <sup>24hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	NO <sub>x</sub>	19	22	27	18	22	34	22	14	16	8	10	13	7.7	9.3	15.2	8.3	5.4	13	10.1	13	41.91	46.58	9.9	8.13	10.16	21.44	0	23.28	22.27	27.2	39.23	20.82	20.41	80 <sup>24hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	CO	65	58	70	64	56	112	81	62	47	32	110	67	73	84	57	31	20	20	25	16	16	48	30	8	0	0	3	1	1	1	1	0.4	0.3	(5000) <sup>8hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	O <sub>3</sub>	13	12	13	11	14	12	4	2	2	0	1	4	08	0	02	2	6	4	3	5	8	40	12	22	3	6	46.13	9	11	41	24	31	41	100 <sup>8hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
Akram Point, Sundarbans	PM <sub>2.5</sub>	17	19	23	18	49	NO	25	18	9	4	4	14.3	13.2	7.5	35.4	13.7	14	29.1	16.2	13	19.68	36.67	23.04	13.16	22.74	48.2	41.33	39.16	23.6	29.65	58.43	30.22	35.35	65 <sup>24hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	PM <sub>10</sub>	39	44	32	39	77	NO	32	77	31	15	14	85.5	96.0	37.8	150.6	36.4	41.6	100.2	93.2	51.9	43	87.15	82.91	58.82	56.74	90.12	84.16	76.18	51.88	53.69	77.69	60.21	50.14	150 <sup>24hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	SPM	114	133	97	88	102	NO	51	128	46	23	27	90.9	137.0	41.8	175.1	90.3	58	121.4	117.8	71.1	83.9	122.62	121.68	78.8	80.31	144.95	131.46	123.59	79.47	98.47	141.37	103.5	99.42	200 <sup>8hr</sup> (ECR, 1997)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	SO <sub>2</sub>	7	9	12	13	21	NO	27	14	9	4	6	8.4	6	5.8	14	8.3	6.3	10.8	10.1	8.9	57.24	35.23	24.21	15.06	12.74	15.05	17.44	16.55	15.89	15.53	21.81	12.59	11.06	80 <sup>24hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	NO <sub>x</sub>	17	19	22	17	27	NO	19	15	10	5	6	12.7	10.1	5.9	15.1	9.9	9.3	11.7	11.3	9.4	46.58	31.26	16.74	10.47	6.64	20.6	23.5	21.28	21.39	19.38	38.3	19.69	18.2	80 <sup>24hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	CO	49	60	50	46	163	NO	92	64	21	37	101	58	79	69	52	21	25	28	17	14	38	24	20	14	0	0.2	0	2	1	1.4	0.3	0.9	1	(5000) <sup>8hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	O <sub>3</sub>	11	14	9	10	27	NO	8	1	0	0	2	3	0	0	03	3	4	5	3	1	9	90	2	4	6	8	8	11	8	16	41	24	19	100 <sup>8hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
Hiron Point, Sundarbans	PM <sub>2.5</sub>	15	23	19	17	28	NO	27	NO	17	NO	9	21.7	No	17.0	40.5	NO	NO	23.4	18.2	NO	NO	27.76	17.39	NO	28.15	55.71	NO	25.3	38.51	36.88	39.62	NO	57.2	65 <sup>24hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	PM <sub>10</sub>	44	38	34	41	60	NO	45	NO	40	NO	14	104.5	NO	92.1	149.8	NO	NO	86.7	96.1	NO	NO	67.89	72.45	NO	59.31	99.64	NO	59.7	49.27	58.45	48.81	NO	89.22	150 <sup>24hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	SPM	101	119	107	97	110	NO	88	NO	132	NO	26	111.4	NO	102	173.7	NO	NO	107.9	127.8	NO	NO	90.31	94.28	NO	91.06	155.39	NO	94.7	89.36	106.93	96.23	NO	164.2	200 <sup>8hr</sup> (ECR, 1997)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	SO <sub>2</sub>	8	7	13	14	15	NO	28	NO	15	NO	9	13.5	NO	6	15.8	NO	NO	10.6	10.7	NO	NO	45.81	13.33	NO	11.36	16.2	NO	13.92	14.33	12.76	15.38	NO	16.82	80 <sup>24hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	NO <sub>x</sub>	18	18	19	22	20	NO	23	NO	19	NO	9	15.9	NO	7.8	18.1	NO	NO	12.5	10.9	NO	NO	44.92	8.65	NO	9.74	23.53	NO	20.06	16.27	19.66	39.72	NO	27.87	80 <sup>24hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	CO	52	62	65	60	60	NO	93	NO	40	NO	121	43	NO	72	71	NO	NO	22	21	NO	NO	2	36	NO	0	0	NO	0	0	0.3	0.7	NO	0.5	(5000) <sup>8hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	O <sub>3</sub>	14	13	11	9	23	NO	2	NO	0	NO	0	4	NO	0	04	NO	NO	6	6	NO	NO	16	7	NO	1	11	NO	14	22	22	38	NO	28	100 <sup>8hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	PM <sub>2.5</sub>	54	39	52	42	55	46	19	35	11	16	9	34.6	23.1	19.5	78.7	12.4	12.5	21.3	20.8	33	38.59	18.65	40.22	46.73	48.32	88.71	71.2	29.47	65.66	61.57	67.33	69.28	63.57	65 <sup>24hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																

Locations of Monitoring		1 <sup>st</sup> QM, Apr 2014																																	2 <sup>nd</sup> QM, Jul 2014																																	3 <sup>rd</sup> QM, Oct 2014																																	4 <sup>th</sup> QM, Jan 2015																																	5 <sup>th</sup> QM, Apr 2015																																	6 <sup>th</sup> QM, Jul2015																																	7 <sup>th</sup> QM, Oct 2015																																	8 <sup>th</sup> QM, Jan 2016																																	9 <sup>th</sup> QM, Apr 2016																																	10 <sup>th</sup> QM, Jul 2016																																	11 <sup>th</sup> QM, Oct 2016																																	12 <sup>th</sup> QM, Jan 2017																																	13 <sup>th</sup> QM, April, 2017																																	14 <sup>th</sup> QM, Oct, 2017																																	15 <sup>th</sup> QM Jan, 2018																																	16 <sup>th</sup> QM April, 2018																																	17 <sup>th</sup> QM, Jul 2018																																	18 <sup>th</sup> QM, Nov, 2018																																	19 <sup>th</sup> QM, Feb, 2019																																	20 <sup>th</sup> QM, Apr, 2019																																	21 <sup>st</sup> QM, Jul, 2019																																	22 <sup>nd</sup> QM, Jul, 2019																																	23 <sup>rd</sup> QM, Feb, 2020																																	25 <sup>th</sup> QM, July, 2020																																	26 <sup>th</sup> QM, Oct, 2020																																	27 <sup>th</sup> QM, Jan, 2021																																	28 <sup>th</sup> QM, April, 2021																																	29 <sup>th</sup> QM, Aug, 2021																																	30 <sup>th</sup> QM, Nov, 2021																																	31 <sup>st</sup> QM, Jan, 2022																																	32 <sup>nd</sup> QM, May, 2022																																	33 <sup>rd</sup> QM, July, 2022																																	33 <sup>rd</sup> QM, JOct, 2022																																	Bangladesh (DoE) Standard (Air Pollution Control rules, 2022; ECR, 1997 and subsequent amendments)
Weather	Pollutants	Sunny	Rainy/Cloudy	Sunny	Sunny	Sunny	Rainy/Cloudy	Sunny/Rainy	Sunny	Sunny	Rainy/Cloudy	Rainy/Cloudy	Sunny	Sunny/Cloudy	Sunny	Sunny	Sunny/Cloudy	Rainy/Cloudy	Sunny/Cloudy	Sunny	Sunny	Sunny/Cloudy	Sunny/Cloudy	Sunny	Rainy/Cloudy	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny	Rainy/Cloudy	Rainy/Cloudy	Sunny																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
	Concentrations are in µg/m <sup>3</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
Khulna City, near Khan Jahan Ali Bridge	PM <sub>10</sub>	139	117	91	84	75	89	49	112	69	68	24	145.9	99.5	39.6	213.9	38.8	45.4	57.9	91.3	125.9	47.05	59.19	116.16	119.11	109.63	159.22	120.38	64.44	124.55	100.3	92.36	100.28	92.2	150 <sup>24hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	SPM	301	287	239	219	222	181	101	181	112	107	64	189.7	187.2	127.9	243.4	78.9	69.9	102.9	158	173.4	100.95	78.09	157.28	167.18	157.35	240.18	193.61	101.85	195.17	198.24	178.26	189.38	169.49	200 <sup>8hr</sup> (ECR, 1997)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	SO <sub>2</sub>	33	29	33	28	31	59	28	16	11	10	10	17.1	7.2	7.1	21	7.5	7.5	8.7	10.4	15.3	35.42	49.72	28.31	30.73	29.58	18.8	20.64	12.73	26.18	28.52	19.29	23.66	21.71	80 <sup>24hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	NO <sub>x</sub>	49	41	39	36	33	38	26	16	15	15	14	18.6	11.7	8.8	25	8.4	11.1	9.7	11.1	17.1	40.09	41.91	24.14	24.24	20.44	34.2	28.35	20.45	38.58	41.59	37.91	39.12	36.56	80 <sup>24hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	CO	330	370	330	296	101	89	94	98	68	36	104	66	79	81	69	36	28	121	19	23	11	24	32	18	0.7	2	3	4	4.9	1.4	0.2	2.1	1.6	(5000) <sup>8hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	O <sub>3</sub>	59	67	57	39	21	7	4	2	1	0	2	3	07	07	09	9	7	4	5	6	6	18	10	4	0	80	63	21	59	53	36	66	64	100 <sup>8hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
Township area	PM <sub>2.5</sub>	x	x	x	x	x	x	x	x	x	x	x	x	x	x	29.1	13.7	28.6	21.2	17.2	21.24	29.64	44.26	22.08	41.29	166.72	67.82	59.2	79.64	56.26	69.23	51.29	61.47	65 <sup>24hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	PM <sub>10</sub>	x	x	x	x	x	x	x	x	x	x	x	x	x	x	70.3	60.8	111.7	88.7	61.6	96.71	98.15	122.73	86.26	97.16	234.41	108.16	94.6	102.33	104.73	94.28	69.28	84.89	150 <sup>24hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	SPM	x	x	x	x	x	x	x	x	x	x	x	x	x	x	120.6	98.1	144.6	129.4	102.5	127.79	127.79	171.29	111.73	142.36	347.39	170.37	158	193.43	178.63	181.85	134.27	158.26	200 <sup>8hr</sup> (ECR, 1997)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	SO <sub>2</sub>	x	x	x	x	x	x	x	x	x	x	x	x	x	x	13.1	8.4	10.2	11.3	7.9	9.32	19.32	34.12	20.61	21.73	18.61	23.72	19.7	16.92	38.36	27.45	14.56	23.49	80 <sup>24hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	NO <sub>x</sub>	x	x	x	x	x	x	x	x	x	x	x	x	x	x	14	9	11.6	12.1	11.9	15.63	15.63	21.72	11.17	13.36	33.48	34.49	27.3	48.41	44.77	39.56	20.23	39.35	80 <sup>24hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	CO	x	x	x	x	x	x	x	x	x	x	x	x	x	x	46	32	30	18	21	9	0	18	2	0	3	1	1	1	3.3	4	1.3	1	(5000) <sup>8hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	O <sub>3</sub>	x	x	x	x	x	x	x	x	x	x	x	x	x	x	9	4	9	1	5	19	11	4	2	0	212	108	92	68	93	59	38	49	100 <sup>8hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
Access road bridge	PM <sub>2.5</sub>	x	x	x	x	x	x	x	x	x	x	x	x	x	x	33.1	20.9	40.9	26.9	36.1	39.65	14.65	26.26	20.16	38.72	94.23	64.73	52.2	55.31	57.29	31.28	28.43	42.84	65 <sup>24hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	PM <sub>10</sub>	x	x	x	x	x	x	x	x	x	x	x	x	x	x	118.1	83.7	128.3	112.9	137	142.84	79.92	91.39	78.69	93.48	188.64	119.73	96.1	69.4	69.89	59.15	53.42	71.49	150 <sup>24hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	SPM	x	x	x	x	x	x	x	x	x	x	x	x	x	x	142.5	106.2	177.8	168.2	163.2	171.2	109.25	126.13	102.03	136.66	269.3	173.92	151	129.45	137.46	98.74	89.45	127.77	200 <sup>8hr</sup> (ECR, 1997)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	SO <sub>2</sub>	x	x	x	x	x	x	x	x	x	x	x	x	x	x	12.2	10.9	13.4	12.5	15.7	17.37	56.5	16.16	18.82	18.11	20.23	19.16	13.3	20.76	16.93	19.3	11.39	13.27	80 <sup>24hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	NO <sub>x</sub>	x	x	x	x	x	x	x	x	x	x	x	x	x	x	14.8	13.4	15	13	17.6	21.32	55.08	9.04	9.22	9.92	26.3	23.74	20.1	31.69	21.62	33.62	20.47	20.63	80 <sup>24hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	CO	x	x	x	x	x	x	x	x	x	x	x	x	x	x	38	34	32	23	21	8	0	22	0	0	0.8	0.2	2	1	1	1	2	1.1	(5000) <sup>8hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	O <sub>3</sub>	x	x	x	x	x	x	x	x	x	x	x	x	x	x	5	7	9	6	7	6	6	6	8	2	68	46	16	29	72	31	23	14	100 <sup>8hr</sup>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	

Note(s): Concentrations are in µg/m<sup>3</sup>

- DoE- Department of Environment, NF- Not found; NO-Not observed; x-not measured at pre-construction stage.
- Fine Particulate Matter (PM<sub>2.5</sub>), Respirable Dust Content (PM<sub>10</sub>), Suspended Particulate Matter (SPM), Oxides of Nitrogen (NO<sub>x</sub>). Sulfur dioxide (SO<sub>2</sub>), Carbone Monoxide (CO) & Ozone (O<sub>3</sub>);
- Standards for 1hr, 24hr or Annual are indicated using superscript;

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

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

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

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

Legend X-Absence of source or no emission

√-Presence of source, emission of pollutant

(B) Water Quality Data  
Surface Water Quality Monitoring Data

Table B.1: pH Values of Passur River Water

Sl	Sampling Locations	Monitoring periods																																	Std*
		Apr	July	Oct	Jan	Apr	July	Oct	Jan	Apr	July	Oct	Jan	Apr	Oct	Jan	Apr	July	Nov	Feb	Apr	July	Nov	Feb	July	Oct	Jan	Apr	Aug	Oct	Jan	May	July	Oct	
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM	32QM	33QM	34th	
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	7.2	7.0	8.1	7.9	7.6	7.8	7.6	7.1	7.5	7.27	6.9	7.6	7.2	7.1	8.28	8.1	8.4	7.9	8.18	9.0	6.8	7.9	8.4	6.9	6.9	8.5	8.3	5.5	7.8	8.0	7.77	8.02	7.67	6.5– 8.5
2	Middle Passur River at 100m u/s of North West corner from the Project boundary	7.2	7.0	8.2	8.0	7.7	7.9	7.58	7.3	7.8	7.3	7	7.5	7.3	6.9	8.25	8.1	8.4	6.04	8.03	9.9	6.8	7.8	8.3	7.0	6.66	7.8	8.1	6.5	7.5	7.6	7.8	8.0	7.59	
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	7.2	6.9	8.0	8.1	7.8	7.8	7.64	7.3	7.2	7.93	7.2	7.8	7.3	6.9	8.17	8.1	8.4	8.09	8.06	8.7	7.1	7.8	8.8	7.1	6.59	8.0	8.0	8.5	6.5	7.7	7.7	7.94	7.6	
4	Left Bank of Passur River at Project Site-Jetty	7.9	7.1	8.1	7.9	7.5	7.9	7.6	7.1	7.4	7.56	7.3	8.2	7.2	6.9	8.2	8.1	8.3	7.65	7.78	8.9	7.5	7.5	8.3	7.0	6.6	7.7	8.6	7.4	6.8	8.1	7.63	7.58	7.55	
5	Middle Passur River at Project Site-Jetty	7.1	6.9	8.1	7.9	7.6	8	7.58	7.5	7.8	7.6	7	8.5	7.8	7.2	8.21	8.1	8.3	8.20	7.97	8.4	7.2	7.4	8.3	7.2	6.77	7.7	8.0	8.4	7.6	7.7	7.72	7.95	7.44	
6	Right Bank of Passur River at Project Site-Jetty	7.1	6.9	8.2	7.9	7.7	8	7.62	7.6	7.4	7.9	6.9	8.7	7.4	7.2	8.2	8.1	8.2	7.87	8.04	8.5	6.7	7.4	8.0	7.2	6.88	7.8	8.9	5.8	7.6	7.8	7.81	7.98	7.42	
7	Left Bank of Passur River at South West corner from the Project boundary	7.4	7.0	8.1	7.6	7.5	8.1	7.78	8.1	7.6	7.94	7.2	8.1	6.9	7.2	8.39	8.0	8.4	8.11	7.89	9.3	7.4	7.3	8.6	7.4	7.13	7.8	8.2	6.7	8.2	7.9	7.63	7.99	7.58	
8	Middle of Passur River at South West corner from the Project boundary	7.4	6.9	8.0	7.5	7.2	8	7.6	8	7.1	8.04	7.5	8.6	6.8	7.1	8.15	8.1	8.5	7.44	7.85	8.7	6.5	7.2	8.2	7.6	6.82	8.0	8.4	8.6	8.2	7.8	7.64	7.99	7.5	
9	Right Bank of Passur River at South West corner from the Project boundary	7.3	6.8	8.0	7.8	7.3	8.1	7.64	7.9	7.2	8.2	7.3	8.9	7.1	7	8.16	8.1	8.5	7.07	8.06	8.4	7.3	7.2	8.3	7.8	6.8	7.8	8.3	8.5	7.9	7.7	7.8	8.03	7.4	
10	Maidara river of the South East corner of the Project at Ichamoti-Maidara confluence	7.4	6.9	8.1	7.7	7.5	8.1	7.3	7.3	7.1	8.1	6.8	8.1	7.2	7.1	8.4	8.1	8.6	7.94	8.05	9.3	7.2	7.4	8.0	7.1	6.85	7.4	8.0	5.9	7.8	8.0	7.61	8.5	7.79	
11	Maidara river near proposed township area	7.4	6.8	8.1	7.3	7.6	6.9	7.56	7.1	7.4	7.8	7.1	7.6	7.4	7	7.92	7.6	7.3	7.631	7.8	8.2	7.0	7.3	7.9	6.9	6.83	7.5	8.3	6.9	8.5	7.7	7.5	7.74	7.66	
12	Passur river at Passur-Ghasiakhali confluence	7.3	6.8	7.4	8.2	7.5	7.9	7.1	7.4	7.3	7.3	6.9	7.2	6.9	6.8	7.48	7.3	8.3	7.02	8.65	8.1	7.0	8.0	8.3	7.1	7.06	7.8	8.6	7.3	8.1	7.9	7.9	8.1	8.4	
13	Passur river at Harbaria of Sundarbans	7.9	6.9	8.0	8.1	7.7	7.9	7.8	8.2	7.3	7.63	7.4	7.8	6.9	7.1	8.19	8.1	8.4	7.19	7.71	8.2	7.2	8.0	8.4	7.4	6.1	8.2	7.8	6.6	7.3	7.7	7.7	8.07	8.2	
14	Passur river at Akram point of Sundarbans	7.2	6.9	7.9	8.1	7.7	NS	7.63	8	7.9	7.67	7.1	8.2	7.2	7.1	8.22	8.2	8'''.2	8	7.77	7.9	7.1	7.8	8.2	7.7	6.6	7.7	8.2	6.0	6.9	7.6	7.69	7.83	7.71	
15	Passur river at Hiron po.000int of Sundarbans	7.2	7.0	7.0	8.1	7.7	NS	7.39	NS	7.8	NS	7.6	8.5	NS	6.8	8.2	NS	NS	7.18	7.79	NS	NS	7.8	8.2	NS	6.7	7.6	NS	8.0	6.7	7.5	NS	NS	7.28	

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

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

Sl. No.	Sampling Locations	Monitoring periods																																	
		Apr	Jul	Oct	Apr	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	July	Oct	Jan	Apr	Aug	Oct	Jan	May	Jul	Oct	
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM	32QM	33QM	34th	
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	31	33	31	19	30	31.8	31.2	22.0	31.2	29.6	30.1	22.8	30	29.8	19.7	30	30	28	22.02	31	30	27	25	30	27.67	20	31	30.26	26	22	29.99	31.17	27.8	20°C – 30°C
2	Middle Passur River at 100m u/s of North West corner from the Project boundary	31	33	31	20	30	30.5	31.8	21.0	31.1	29.1	30.8	22.5	30	30.1	19.8	30	30	26.85	21.96	31	30	27	25	30	27.68	20	30	30.46	26	22	30.18	30.9	27.99	
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	31	33	30	20	30	30.5	30.9	21.0	30.8	29.4	30.4	22.1	29.8	30.2	20.2	31	30	27.49	21.82	31	30	27	24	31	27.7	20	30	30.46	26	22	30.15	30.81	27.91	
4	Left Bank of Passur River at Project Site-Jetty	31	33	31	19	31	30.8	31.3	22.0	31.4	30.1	30.1	22.8	31.3	30.1	20.3	28	30	28.38	22.62	31	30	28	24	30	27.82	20	30	30.55	28	21	30.14	30.93	28.2	
5	Middle Passur River at Project Site-Jetty	30	32	31	19	30	30.6	31.6	22.0	30.9	30.5	31.0	21.8	30.0	29.8	20.3	29	30	27.97	22.55	31	31	28	24	30	27.76	20	30	30.44	27	22	30.28	31.04	28.1	
6	Right Left Bank of Passur River at Project Site-Jetty	30	32	31	19	30	30.4	31.1	21.0	31.0	30.5	31.1	21.9	30.0	29.9	20.3	28	31	28.05	22.35	31	30	28	24	30	27.67	20	30	30.54	30	22	30.24	31.14	28.08	
7	Left Bank of Passur River at South West corner from the Project boundary	31	32	30	20	31	30.5	30.3	23.0	30.7	30.7	30.4	22.1	29.9	30.0	20.6	28	31	27.85	22.17	33	30	27	25	30	28.42	21	30	30.44	27	23	30.14	31.19	28.36	
8	Middle of Passur River at South West corner from the Project boundary	31	31	29	19	30	30.8	30.5	22.0	30.4	29.8	30.2	22.0	29.8	30.1	20.2	28	31	28	22.27	31	30	27	25	30	27.9	20	30	30.5	27	22	30.24	30.98	28.09	
9	Right Bank of Passur River at South West corner from the Project boundary	31	31	29	19	31	30.6	30.8	21.0	30.1	29.8	31.1	22.1	30.1	30.1	20.3	28	31	28	22.54	32	30	27	25	30	27.83	21	30	30.46	27	22	30.21	31.08	28.25	
10	Maidara river of the South East corner of the Project at Ichamoti-Maidara confluence	30	31	28	19	30	30.8	31.8	22.0	31.2	30.4	31.1	21.9	30.3	29.9	19.1	28	31	27.62	22.06	33	30	27	25	30	28.67	22	31	30.39	27	23	30.45	31.77	29.27	
11	Maidara river near proposed township area	30	32	27	20	30	31.6	31.2	23.0	30.6	30.7	31.2	21.8	30.1	30.0	21.1	31	31	30.2	21	32	30	27	23	30	28	21	31	30.54	29	22	29.21	32.51	29.19	
12	Passur river at Passur-Ghasiakhali confluence	29	30	32	19	30	29.8	30.7	21	31.3	30.7	30.38	22.1	30.2	30	20.8	30	29	26.82	21.89	31	30	28	22	30	28.07	21	29	30.15	27	22	31.63	31.05	26.3	
13	Passur river at Harbaria of Sundarbans	30	30	27	22	30	29.0	30.8	22.0	31.5	30.9	29.9	23.1	30.2	29.8	21	30	29	27.62	21.81	31	31	30	24	31	28.35	21	30	29.6	27	24	30.13	31.76	27.59	
14	Passur river at Akram point of Sundarbans	29	29	30	21	30	NS	30.2	21.0	30.8	30.4	30.4	22.5	30.8	29.9	21.2	32	30	27.21	22.42	31	31	29	24	31	29.48	22	30	29.75	28	21	31.36	32.34	28.25	
15	Passur river at Hiron point of Sundarbans	29	30	29	21	30	NS	30.4	NS	31.4	NS	31.3	21.4	NS	29.4	21.2	NS	NS	28.66	23.78	NS	NS	31	23	NS	29.02	22	NS	30.66	28	22	NS	NS	28.59	

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

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

Sl. No	Sampling Locations	Monitoring periods																																		
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	July	Oct	Jan	Apr	Aug	Oct	Jan	May	Jul	Oct		
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30th	31QM	32QM	33QM	34th		
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	11.5	2.5	0.0	4.5	13	0	0	4.1	8	0	0	3.7	6.3	0	2	11.5	0.2	0.9	11.1	16.6	0.5	0.4	3.8	0.2	0.1	2.4	7.1	0.1	0.1	0.8	2.6	0.1	0.1	No Specific standard for salinity has Been mention-ed in the ECR'1997	
2	Middle Passur River at 100m u/s of North West corner from the Project boundary	11.5	0.3	0.0	4.1	15	0	0	4.3	7.4	0	0	3.8	5.9	0	2	11.5	0.2	0.1	11.1	16.2	0.2	0.3	3.9	0.3	0.1	2.7	7.5	0.1	0.1	0.7	2.5	0.1	0.1		
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	11.5	0.2	0.0	4.5	16	0	0	4.3	7	0	0	3.6	6.2	0	2	11.5	0.4	0.8	10.6	16.5	0.3	0.3	4.0	0.2	0.1	2.7	7.2	0.1	0.1	0.7	2.3	0.1	0.1		
4	Left Bank of Passur River at Project Site-Jetty	12.0	2.2	0.0	4.7	9	0	0	4.4	6	0	0	4	6.8	0	2.6	12.0	0.3	0.9	10.8	16.6	0.2	0.5	3.8	0.1	0.1	2.5	7.2	0.1	0.1	0.7	2.6	0.1	0.1		
5	Middle Passur River at Project Site-Jetty	12.0	0.3	0.0	5.1	13	0	0	5.1	6.2	0	0	3.9	6.9	0	2.6	12.0	0.2	0.8	10.8	16.9	0.2	0.3	3.9	0.2	0.1	2.7	7.3	0.1	0.1	0.8	2.3	0.1	0.1		
6	Right Left Bank of Passur River at Project Site-Jetty	12.0	0.5	0.0	5.0	14	0	0	5	9	0	0	4.2	6.1	0	2.7	12.0	0.2	0.8	11	16.9	1.2	0.3	3.9	0.1	0.1	2.4	7.3	0.1	0.1	0.8	2.1	0.1	0.1		
7	Left Bank of Passur River at South West corner from the Project boundary	9.5	4.0	0.0	5.2	14	0	0	5.2	8	0	0	4.2	6.5	0	2.8	9.5	0.2	1	9.9	12.0	0.3	2.1	3.7	0.2	0.2	2.6	7.0	0.1	0.1	1.0	2.6	0.1	0.1		
8	Middle of Passur River at South West corner from the Project boundary	9.0	0.0	0.0	5.2	13	0	0	4.9	7	0	0	4.1	7.1	0	2.8	9.0	0.3	0.2	11.5	16.7	0.2	0.1	0.1	0.2	0.1	2.5	7.3	0.1	0.1	0.9	2.7	0.1	0.1		
9	Right Bank of Passur River at South West corner from the Project boundary	10.0	2.5	0.0	5.1	12	0	0	5.5	6.8	0	0	4.1	7	0	2.8	10.0	0.3	0.3	11.1	16.9	0.3	0.4	3.5	0.3	0.1	2.7	7.4	0.1	0.1	0.9	2.4	0.1	0.1		
10	Maidara river of the South East corner of the Project at Ichamoti-Maidara confluence	10.0	0.5	0.0	5.2	10	0	0	3.8	7.1	0	0	3.9	7	0	2.6	10.0	0.3	0.9	11.3	16.5	0.3	0.3	4.0	0.3	0.2	2.5	7.0	0.1	0.1	0.9	2.7	0.1	0.1		
11	Maidara river near proposed township area	9.0	4.5	0.0	4.5	9	0	0	2.5	6.3	0	0	3.8	6.9	0	2.52	9.0	0.2	0.02	9.9	8.0	1.0	0.3	4.0	0.5	2.	2.5	6.5	0.8	0.5	0.2	2.5	1.6	0.1		
12	Passur river at Passur-Ghasiakhali confluence	10.0	9.5	0.0	5.0	14	0	0	4.8	6	0	0	6.7	10.4	1.2	10.8	10.0	0.6	1	7.9	14.9	0.4	0.5	3.6	0.4	0.2	1.8	6.9	0.1	0.1	0.9	4.0	0.3	0.1		
13	Passur river at Harbaria of Sundarbans	12.0	10.0	0.0	6.0	15	0	0	5.3	8.9	0	0	8.9	10.4	2.3	2.8	12.0	2.2	1.8	11.9	15.6	0.3	0.7	3.7	1.5	0.2	2.6	7.0	0.1	0.2	2.1	6.3	0.6	0.2		
14	Passur river at Akram point of Sundarbans	19.0	15.0	1.0	16.0	20	NS	5	11.3	9.4	4	3	16.3	16	3.6	13.1	19.0	2.8	9.1	16.7	22.9	0.9	6.6	8.9	4.0	1.6	7.1	10.9	1.0	2.2	6.4	8.3	3.2	1.7		
15	Passur river at Hiron point of Sundarbans	23.0	19.5	2.0	23.0	25	NS	6.2	NS	14	NS	5.8	21.4	NS	5.1	16.45	23.0	NS	13.9	22.7	NS	NS	9.2	11.0	NS	2.6	8.2	NS	0.9	2.6	8.0	NS	NS	2.9		

Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring,

NS – Not Surveyed

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

SL	Sampling Locations	Monitoring periods																																		
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	July	Oct	Jan	Apr	Aug	Oct	Jan	May	Jul	Oct		
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM	32QM	33QM	34th		
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	5.9	6.1	5.6	5.5	6.2	5.3	6.8	5.1	7.1	6.2	6	6.1	7.1	6.3	5.19	6.575	6.0	6.4	8.7	5.9	6.0	7.7	8.4	6.1	6.4	9.2	6.5	5.8	7.8	6.5	7.3	8.1	6.2	5 or more (standard for sustaining fisheries)	
2	Middle of Passur River at 100m u/s of North West corner from the Project boundary	4.9	6.8	7.7	6.6	6.4	5	6.4	5.1	6.4	5.7	6.1	5.9	7.2	6.4	5.03	6.225	6.2	6.2	7.9	6.5	6.0	7.8	8.6	6.1	7.64	9.6	6.0	6.0	7.5	6.7	7.8	8.5	8.4		
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	5.2	6.7	7.7	6.7	6.2	5	7.1	6.2	6.9	5.6	6	6.1	6.8	6.5	5.06	6.275	6.1	6.3	7.3	6.3	6.1	7.8	7.6	6.0	6.3	7.8	6.8	6.3	6.5	6.5	7.5	7.8	8.5		
4	Left Bank of Passur River at Project Site-Jetty	5.7	6.8	7.6	5.8	6.2	6.7	6.8	5.9	5.8	6.1	6.3	6.2	6.9	6.3	5.1	6.15	5.5	6	8.7	6.1	6.5	8.6	8.1	6.0	8.2	9.0	8.4	6.6	6.7	7.1	7.5	7.5	7.7		
5	Middle of Passur River at Project Site-Jetty	5.9	6.9	7.2	5.9	6.6	6.6	7.2	5.3	6.1	6.3	5.9	5.9	7.4	6.3	5.03	6.5	6.0	6.2	7.3	6.5	6.3	8.0	8.2	6.4	8.89	8.9	8.0	6.2	5.6	5.5	6.0	8.8	5.7		
6	Right Bank of Passur River at Project Site-Jetty	5.8	6.6	8.0	6.8	6.4	6	7.6	5.4	6.6	5.8	6.1	5.9	7.5	6.5	4.9	6.575	6.5	6	7.4	6.0	6.4	8.2	7.0	6.2	7.8	9.3	8.5	6.8	6.5	6.7	5.0	8.1	5.8		
7	Left Bank of Passur River at South West corner from the Project boundary	6.6	7.3	5.6	6.1	6.3	7.5	6.4	6	6.9	6.3	5.9	6.3	6.4	6.5	5	6.55	6.8	6.1	7.8	6.1	6.2	9.9	6.9	6.6	9.7	9.6	5.4	7.2	6.7	6.4	6.2	7.5	7.5		
8	Middle of Passur River at South West corner from the Project boundary	6.5	7.1	5.6	6.9	6.5	7.4	6.1	6.1	7.1	6.4	6	6.4	7.2	7.1	4.98	6.825	6.2	6.3	7.1	6.5	6.2	10.0	7.2	6.5	9.76	7.0	6.3	6.2	6.5	6.6	7.2	8.0	8.2		
9	Right Bank of Passur River at South West corner from the Project boundary	6.5	7.2	5.8	6.6	6.4	7.3	6.3	5.8	6.8	5.6	6	6.4	6.8	6.5	5.11	6.625	6.0	6.2	6.9	6.1	6.3	10.5	7.8	6.3	9.76	6.4	5.9	6.7	6.1	6.5	6.7	8.1	5.9		
10	Maidara river of the South East corner of the Project at Ichamoti-Maidara confluence	6.0	6.5	8.0	6.0	6.2	6	7.1	4.1	6.4	5.2	6.1	6.7	6.8	6.3	5.17	6.35	6.7	5.8	7.5	6.3	6.4	7.1	9.7	6.4	9.7	8.1	7.5	6.8	6.7	6.5	6.1	8.5	5.7		
11	Maidara river near proposed township area	6.7	6.8	8.0	6.2	6.5	6.4	7.1	5.2	5.9	5.4	6.4	6.7	7.1	6.2	5.11	6.7	6.3	6	6.0	6.2	6.0	7.7	7.5	6.1		8.0	7.0	5.5	6.2	6.5	7	7.6	7.5		
12	Passur river at Passur-Ghasiakhali confluence	5.3	6.2	7.0	6.5	6.3	7	6.6	5.4	5.8	5.4	5.6	5.9	6.4	6.4	5.23	5.95	5.8	6	6.9	6.5	6.2	7.9	8.6	6.0	8.14	9.2	5.9	6.2	5.8	6.9	6.8	7.1	8.1		
13	Passur river at Harbaria of Sundarbans	5.4	5.9	7.0	6.6	5.8	7.5	7.1	5.2	6.4	5.4	5.8	6.1	6.4	6.2	5.03	5.8	6.9	8.21	7.5	6.9	6.0	8.4	6.9	6.1	7.65	7.6	5.5	6.6	6.8	5.9	7.8	7.6	8.4		
14	Passur river at Akram point of Sundarbans	7.9	6.4	7.7	6.7	6	NS	7.3	6.2	6.1	6.2	6.7	6.5	7.2	6.8	5.4	6	6.8	6.9	7.7	7.0	6.6	7.7	9.7	6.5	6.61	7.2	6.8	6.1	6.5	6.2	7.1	7.6	8.2		
15	Passur river at Hiron point of Sundarbans	7.5	6.5	7.8	6.5	5.8	NS	7	NS	7.1	6.8	6.9	6.8	NS	7.3	5.4	NS	NS	7.2	8.0	NS	NS	8.6	6.7	NS	8.2	9.0	NS	6.2	6.9	6.2	NS	NS	7.5		

Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring,

NS – Not Surveyed

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

Sl	Sampling Locations	Monitoring periods																																
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	July	Oct	Jan	April	Aug	Oct	Jan	May	Jul	
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM	32QM	33QM	
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	288	24	6	128	87	42	32	124	220	8	12	56	52	24	48	276	20	56	72	188	36	56	24	32	16	56	508	4	44	24	24	4.00	
2	Middle Passur River at 100m u/s of North West corner from the Project boundary	284	20	30	68	58	43	36	100	240	8	8	40	48	8	28	240	24	44	60	180	24	40	28	36	12	32	404	4	52	12	28	12.00	
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	328	56	14	92	132	18	28	96	280	8	8	44	56	40	40	230	12	48	48	176	32	26	32	28	8	20	400	4	40	8	48	4.00	
4	Left Bank of Passur River at Project Site-Jetty	376	28	18	84	102	26	36	100	280	8	12	48	40	32	36	232	30	60	44	192	20	40	24	24	28	48	304	4	20	40	36	8.00	
5	Middle Passur River at Project Site-Jetty	400	60	14	116	110	21	36	108	240	12	16	52	36	40	32	254	16	36	56	180	28	28	40	36	16	20	412	4	40	32	24	36.00	
6	Right Bank of Passur River at Project Site-Jetty	364	496	18	108	88	24	40	80	260	8	12	42	48	16	28	252	12	42	64	172	24	24	24	40	20	56	390	12	4	12	20	20.00	
7	Left Bank of Passur River at South West corner from the Project boundary	364	108	10	104	96	32	42	100	240	12	8	56	42	48	40	212	10	48	88	200	28	20	26	48	8	48	408	8	4	16	24	4.00	
8	Middle of Passur River at South West corner from the Project boundary	400	40	22	16	18	25	28	100	180	8	8	52	36	8	44	218	24	32	36	160	20	32	20	36	12	56	424	8	24	36	48	36.00	
9	Right Bank of Passur River at South West corner from the Project boundary	408	120	10	100	106	25	48	124	200	12	12	44	52	4	36	230	16	28	68	180	32	20	28	42	20	8	448	12	4	12	52	48.00	
10	Maidara river of the South East corner of the project at Ichamoti-Maidara confluence	276	32	10	116	88	51	40	100	160	8	8	36	44	16	40	180	40	36	72	160	24	24	44	32	12	12	400	16	48	12	56	4.00	
11	Maidara river near proposed township area	284	96	26	84	94	36	42	108	210	30	8	48	40	32	32	252	20	42	68	172	20	36	36	48	28	24	380	48	4	32	96	12.00	
12	Passur river at Passur - Ghasiakhali confluence	408	172	14	96	92	30	46	88	220	12	16	40	64	40	48	260	10	20	32	178	24	40	36	72	56	32	472	32	12	16	96	0.03	
13	Passur river at Harbaria of Sundarbans	372	216	14	96	102	26	36	100	140	16	12	40	216	32	40	280	16	58	56	184	32	32	40	80	76	12	424	16	4	60	240	4.00	
14	Passur river at Akram point of Sundarbans	536	520	54	316	302	NS	84	96	156	4	68	56	240	16	72	296	110	44	180	160	220	92	56	108	60	28	392	80	192	36	36	84.00	
15	Passur river at Hiron point of Sundarbans	540	416	122	472	470	NS	96	NS	160	NS	56	196	NS	4	88	NS	NS	76	140	NS	NS	72	64	NS	40	NS	NS	32	180	40	NS	NS	

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

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

Sl	Sampling Locations	Monitoring periods																																
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	April	Aug	Oct	Jan	May	Jul	
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22 QM	23QM	25QM	26QM	27QM	28QM	29 QM	30QM	31QM	32QM	33rd	
1	Left Bank of Passur River at South West corner from the Project boundary	<5	<5	<5	>15	16.9	9	<5	39	61	5	<5	9.2	5.73	<5	16.6	<5	<1	<2.0	<2.0	<2.0	<2.0	<2.0	2.3	<2.0	<2.0	2.93	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
2	Passur-Ghasiakhali Confluence	<5	<5	<5	>15	13	7.63	9.87	21	30.3	13.5	<5	15.6	<5	<5	<5	<5	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
3	Passur river at Harbaria of Sundarbans	<5	6.3	<5	>20	39.1	10.1	<5	14	26	5.73	<5	<5	<5	<5	<5	<1	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
4	Akram Point of Sundarbans	<5	<5	<5	>20	<5	NS	10.8	ND	31	NS	10.1	13.8	7.71	<5	<5	<5	NS	<2.0	<2.0	<2.0	<2.0	<2.0	4.4	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
5	Passur river at Hiron point of Sundarbans	<5	<5	<5	>20	<5	NS	9.73	36	82	5.87	<5	14.2	ND	<5	<5	<5	<1	<2.0	<2.0	<2.0	<2.0	<2.0	2.3	<2.0	<2.0	NS	3.2	<2.0	<2.0	<2.0	<2.0	NS	

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

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

SL	Sampling Locations	Monitoring periods																															
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan	May	Jul
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM	32QM	33rd
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	13060	251	176	4360	14400	937	158	5570	13400	179	138	3100	13400	496	1913	14500	315	855	9940	15800	290	480	6800	134	122	3770	12500	58	160	1380	4870	190
2	Middle of Passur River at 100m u/s of North West corner from the Project boundary	12630	246	162	3950	14700	941	169	5910	13280	112	106	3140	13480	122	1919	14420	224	733	9950	15600	150	175	6950	114	96	4410	12700	105	150	1300	4800	125
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	12900	383	153	4330	14900	127	152	5490	13560	125	108	3330	13400	123	1915	14650	232	722	9730	15500	152	170	7300	116	94	4390	12300	106	147	1210	4350	122
4	Left Bank of Passur River at Project Site-Jetty	13190	445	169	4750	14600	175	172	5720	12830	162	147	3630	13560	172	2500	14300	328	824	9860	15700	205	190	6760	221	102	4150	12800	74	158	1230	5250	140
5	Middle Passur River at Project Site-Jetty	13330	353	156	4920	14500	132	162	5850	13100	185	110	3600	13490	125	2520	14450	235	716	9980	16000	142	175	6760	125	179	4170	13100	97	150	1510	4920	115
6	Right Bank of Passur River at Project Site-Jetty	13380	402	152	4870	14200	156	160	5480	13460	143	112	3520	13330	125	2500	14540	208	732	9800	16100	150	174	6900	132	105	4060	13200	110	153	1380	4060	135
7	Left Bank of Passur River at South West corner from the Project boundary	13180	655	162	5040	14500	336	192	5650	12820	205	113	3470	13640	160	2840	14400	205	945	10190	15640	208	325	6740	195	181	4100	13100	158	155	1850	5150	150
8	Middle of Passur River at South West corner from the Project boundary	13390	587	153	5050	14600	158	164	5740	12960	195	108	3790	13680	126	2710	14500	286	784	10280	16000	145	180	6450	128	98	4210	13300	110	153	1680	5070	127
9	Right Bank of Passur River at South West corner from the Project boundary	13240	916	154	5130	14250	160	164	5650	13590	140	146	3770	13360	127	2720	14610	296	786	10080	15800	154	172	6700	114	92	4450	13200	100	156	1650	4750	125
10	Maidara river of the South East corner of the project at Ichamoti-Maidara confluence	12400	455	214	5050	14000	2320	183	5450	13340	165	196	2920	13490	1616	2500	14160	265	992	10040	15700	940	1405	7250	229	206	4170	12500	216	160	1540	5100	134
11	Maidara river near proposed Township area	10970	2510	257	4390	13900	355	176	4420	11700	5170	238	3960	13110	1200	2970	14450	340	827	8860	15100	365	875	5800	2893	164	2320	11800	1270	780	1350	8900	2850
12	Passur river at Passur - Mongla confluence	12800	6410	209	5130	14050	298	227	4540	11330	893	162	3370	12340	204	2570	14500	580	940	8350	15722	172	350	6240	740	148	3010	12100	180	203	1580	7820	460
13	Passur river at Harbaria of Sundarbans	12280	9360	285	4780	13900	683	205	4940	13580	1321	301	3370	13600	245	2690	15350	2190	1715	10950	15400	560	474	6430	489	2260	4060	12400	240	275	3850	12200	1020
14	Passur river at Akram point of Sundarbans	21500	15960	3400	12350	13600	NS	4220	13330	20720	7330	2550	3580	19370	3270	11390	20600	7680	8100	17200	14800	12500	3950	16300	4188	1472	11400	18500	1700	3850	11600	16400	6200
15	Passur river at Hiron point of Sundarbans	21500	14050	5720	17900	25300	NS	5830	NS	25500	NS	4120	12210	NS	4450	14190	NS	NS	12500	21110	NS	NS	5750	20400	NS	490	14600	NS	1610	6300	15500	NS	



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

SL	Sampling Locations	Monitoring periods																																
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan	May	Jul	
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM	32QM	33rd	
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	2900	250	216	930	3000	245	250	1270	3130	240	255	1090	3640	200	430	3100	210	335	2050	3000	2100	215	1540	205	272	2800	4500	140	145	370	2500	140	
2	Middle of Passur River at 100m u/s of North West corner from the Project boundary	2500	180	218	870	3050	110	330	1380	3090	205	250	980	3420	150	510	1040	205	310	3900	5000	1950	125	1485	200	195	2700	4200	200	125	385	2400	110	
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	2650	170	335	870	3250	105	360	1240	3140	205	190	1030	3300	155	498	1030	185	313	4100	5000	1900	190	1530	187	225	2750	4300	180	130	310	2250	115	
4	Left Bank of Passur River at Project site-Jetty	2550	175	390	940	3450	118	365	1220	3010	220	265	1020	3400	160	570	1060	200	285	4600	5200	1850	175	1580	217	210	3000	4100	200	175	375	2500	120	
5	Middle Passur River at Project Site-Jetty	2600	275	340	990	3250	103	355	1300	3070	232	237	915	3440	145	590	1040	210	255	4200	5000	2500	178	1560	215	235	3100	4500	175	140	325	2350	110	
6	Right Bank of Passur River at Project site-Jetty	2625	350	355	970	3200	105	350	1260	3100	218	242	1070	3380	140	480	1085	215	275	4400	4800	2550	155	1490	202	200	2500	4000	175	145	340	2100	120	
7	Left Bank of Passur River at South West corner from the Project boundary	2550	325	330	1045	3600	153	345	1370	3060	235	205	935	3540	150	505	1080	205	295	4400	4400	1700	175	1530	195	240	2550	4400	140	160	375	2550	125	
8	Middle of Passur River at South West corner from the Project boundary	2800	350	345	1125	3670	105	390	1340	3130	242	217	1100	3480	155	530	1110	212	265	4300	5100	1850	150	1560	210	235	3200	4100	130	170	420	2400	120	
9	Right Bank of Passur River at South West corner from the Project boundary	2500	475	325	975	3540	165	445	1270	3110	224	238	1110	3600	175	512	1100	205	325	4600	4900	2000	115	1485	207	243	2800	4400	100	155	430	2460	130	
10	Maidara river of the South East corner of the project at Ichamoti-Maidara confluence	2500	450	350	980	3260	470	183	950	3180	220	250	1040	1960	165	505	1300	210	295	4000	5200	2000	350	1460	310	198	1400	4200	145	165	380	2450	140	
11	Maidara river near proposed township area	2400	725	330	970	3190	130	340	1075	3080	875	240	1170	2300	320	478	1120	220	315	4100	5000	2200	285	1440	742	217	1200	4100	400	265	435	3100	1000	
12	Passur river at Passur - Mongla confluence	3150	1400	377	1000	3210	135	410	1090	3060	405	245	1070	2450	220	1070	1410	245	325	4000	4782	1800	200	1510	250	265	2850	4200	150	190	500	2300	215	
13	Passur river at Harbaria of Sundarbans	2625	2150	345	970	3080	200	430	1100	3050	415	282	1070	3560	200	610	1330	530	2550	4500	4500	1400	185	1390	280	225	2870	4400	160	170	680	4000	930	
14	Passur river at Akram point of Sundarbans	4500	3625	980	2380	3420	NS	1090	2850	4520	1750	670	1130	4300	640	1475	1440	2030	2750	5900	4500	4300	830	3470	1000	210	5050	4300	480	1000	6500	5000	2500	
15	Passur river at Hiron point of Sundarbans	4850	3050	1440	2690	3640	NS	1460	NS	5050	NS	810	2870	NS	905	1740	NS	NS	4200	6900	NS	NS	1225	3850	NS	230	5600	NS	470	1450	5300	NS	NS	

Source: CEGIS Field Survey; Note: 1QM= First Quarterly Monitoring, 2QM = Second Quarterly Monitoring, 3QM = Third Quarterly Monitoring, 4QM = Fourth Quarterly Monitoring:

NS – Not Surveyed.

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

SL	Sampling Locations	Monitoring periods																															
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan	May	Jul
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM	32QM	33rd
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	598	126	234	180	160	26	76	14	8	61	20	46	51	18	14	18	17	14	15	12	14	8	11	14	7	11	15	12	13	15	7	27
2	Middle of Passur River at 100m u/s of North West corner from the Project boundary	45	92	193	210	167	25	80	12	7	48	18	52	42	15	15	17	16	11	12	14	11	7	8	6	11	6	23	14	12	14	10	23
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	53	112	174	230	170	127	65	14	10	56	16	48	48	22	14	22	15	15	14	13	13	6	7	11	8	7	20	9	10	17	11	24
4	Left Bank of Passur River at Project Site-Jetty	54	99	227	450	160	30	92	17	10	62	20	42	52	16	13	20	18	11	12	11	12	8	8	12	7	7	13	12	14	12	12	31
5	Middle Passur River at Project Site-Jetty	60	100	232	250	165	27	85	18	8	45	24	54	43	20	13	19	16	13	13	12	13	7	9	9	6	6	12	11	9	13	9	27
6	Right Bank of Passur River at Project Site-Jetty	55	105	186	200	155	40	97	22	7	49	19	46	38	17	14	21	15	12	15	15	14	6	6	12	9	8	16	8	13	11	11	26
7	Left Bank of Passur River at South West corner from the Project boundary	24	116	185	300	150	32	104	20	12	51	20	61	32	15	15	17	16	14	16	12	13	7	7	14	15	7	14	12	17	14	18	29
8	Middle of Passur River at South West corner from the Project boundary	27	112	536	530	147	40	90	7	10	43	18	58	44	16	17	19	14	13	13	11	12	6	8	13	8	6	15	9	4	12	13	26
9	Right Bank of Passur River at South West corner from the Project boundary	67	37	459	450	155	44	82	18	11	39	16	63	40	14	12	18	20	15	14	13	13	5	6	8	6	6	13	15	15	15	12	24
10	Maidara river of the South East corner of the project at Ichamoti-Maidara confluence	7	65	798	280	148	36	96	11	7	42	24	55	37	26	14	23	13	11	14	14	15	9	13	11	8	7	17	13	11	13	19	30
11	Maidara river near proposed township area	9	24	389	206	160	28	92	10	6	11	30	66	49	30	15	32	12	42	8	12	12	7	12	5	7	8	12	3	8	13	16	15
12	Passur river at Passur - Mongla confluence	50	310	203	280	165	24	60	15	13	47	27	61	38	25	13	14	17	27	15	13	13	15	14	9	8	6	3	7	13	14	15	64
13	Passur river at Harbaria of Sundarbans	65	90	869	400	160	42	74	22	18	31	18	61	33	27	17	15	13	22	12	11	12	11	11	17	5	8	14	9	15	15	13	21
14	Passur river at Akram point of Sundarbans	115	99	28	103	150	NS	110	16	23	16	41	34	28	22	14	18	14	15	11	10	7	7	10	18	8	11	11	16	12	16	17	32
15	Passur river at Hiron point of Sundarbans	91	72	267	200	180	NS	144	NS	15	NS	33	49	NS	16	13	NS	NS	6	9	NS	NS	5	10	NS	6	6	NS	13	13	13	NS	NS

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

**Table B.10: Nitrate (NO<sub>3</sub><sup>2-</sup>) (mg/L) concentration of Passur River System**

Sl	Sampling Locations	Monitoring periods																																
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan	May	Jul	
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM	32QM	33rd	
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	0.9	2.89	0.32	3	33	9.1	4	6.3	3	3.9	0.25	3.62	4.35	5.8	3	6.8	0.8	2.8	3.5	0.3	0.1	3.5	1.3	3	3.2	4.3	3.3	2.1	3.5	2.06	8.41	3.85	
2	Middle of Passur River at 100m u/s of North West corner from the Project boundary	0.7	2.4	1.57	1.5	13	7.5	7.1	4.3	2.9	6.2	0.39	2.89	5.05	6.8	4.2	4.9	1.7	0.1	2.6	0.3	1.1	2.7	1.7	3.3	1.3	2.2	2.1	2.2	3.8	1.43	13.52	6.47	
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	0.1	3.2	1.84	4.3	39	6.2	5	3.9	2.5	4.3	0.42	1.87	4.55	4.5	3.6	5.1	2.1	0.11	1.9	3.7	1.2	3.4	3.2	9.5	4.7	1.2	1.3	1.3	6.7	2.0	12.75	10.43	
4	Left Bank of Passur River at Project Site-Jetty	1.3	0.76	1.64	3.1	48	6.6	5.7	3.1	2	5.1	0.76	2.25	6.11	7.1	3	2.8	2.8	1.7	2.1	3.0	1.5	3.0	4.5	2.9	2.5	0.7	2.1	1.4	12.6	15.9	10.8	8.83	
5	Middle Passur River at Project Site-Jetty	1.4	2.69	1.42	2.2	69	6.1	3.3	5.2	3.1	2.7	0.52	2.46	3.4	3.1	4.7	5.2	1.8	0.9	2.2	1.2	1.5	1.7	2.7	1.9	2.6	3.1	3.0	1.6	0.3	1.5	8.71	13.06	
6	Right Bank of Passur River at Project Site-Jetty	1.1	2.98	1.33	8.5	8	6.6	4.7	4.1	3.6	3.9	0.31	3.01	3.16	5	7.6	5.5	3.2	0.1	3.5	4.8	2.1	2.1	5.1	1.8	1.0	2.7	1.5	1.4	7.4	6.8	9.39	12.26	
7	Left Bank of Passur River at South West corner from the Project boundary	0.75	2.13	1.85	2.7	87	14.9	4.4	4.9	2.6	3.6	0.2	3.64	3.14	4.1	8.8	2.6	4	0.1	4.2	0.5	1.5	2.0	7.4	1	0.5	1.8	1.7	1.9	0.7	1.1	11.15	8.2	
8	Middle of Passur River at South West corner from the Project boundary	1.1	2.43	2.09	1.8	48	4	6.2	3.7	2.9	5.1	0.41	1.93	3.34	3.4	8.5	4.5	3.7	3.4	3.0	3.4	1.7	1.3	3.9	1.5	2.1	3.0	2.0	2.1	9.2	ND	8.5	8.18	
9	Right Bank of Passur River at South West corner from the Project boundary	1.2	2.05	2.21	1.9	128	4.9	4.4	4.4	2.6	4.9	0.63	2.17	2.00	3.1	2.8	5.3	3.8	0.7	3.1	4.1	0.5	2.2	4.1	1.3	3.0	1.9	2.3	2.5	1.7	1.5	11	11.82	
10	Maidara river of the South East corner of the project at Ichamoti-Maidara confluence	0.3	2.18	2.26	6	62	7	4.9	5.6	2.7	5.2	0.4	2.46	3.61	2.3	1.6	5.9	4.4	2.3	2.1	5.0	3.1	2.9	4.7	3.9	1.5	3.0	4.2	3.1	0.5	16.2	14.42	11.52	
11	Maidara river near proposed township area	0.5	0.88	1.98	4	48	3.1	2.9	3.9	3.1	5.3	0.32	3.1	1.60	3.2	3.4	3.9	3.1	0.12	1.3	2.9	2.5	1.6	4.9	2.1	1.3	4.9	1.0	2.1	0.1	5.7	6.41	13.14	
12	Passur river at Passur - Mongla confluence	0.6	1.52	1.64	4.5	29	7.8	3.1	3.7	3	5.2	0.27	2.78	2.49	3.5	4.5	4.7	2.4	1.6	3.7	2.7	1.8	2.0	3.3	1.5	2.6	0.5	1.7	3.8	0.4	9.4	8.05	15.7	
13	Passur river at Harbaria of Sundarbans	1.4	1.75	1.67	2.7	18	4.4	4.4	5.1	3.4	5.1	0.39	2.78	2.46	4.2	4.6	5.2	2.7	0.1	4.7	4.4	1.7	2.1	3.2	5.7	2.6	0.5	2.6	3.9	1.0	4.06	15.35	15.96	
14	Passur river at Akram point of Sundarbans	2.7	3.32	0.59	1.5	25	NS	3.2	4.9	2.9	5.4	0.25	3.08	3.69	2.2	1.8	5.5	4.2	0.1	1.8	2.7	1.3	1.6	2.6	4	2.6	2.9	2.8	4.1	0.0	24.7	10.85	11.29	
15	Passur river at Hiron point of Sundarbans	0.8	2.84	0.4	2	28	NS	11.5	NS	3.5	NS	0.38	2.28	NS	2.6	6.1	NS	NS	0.9	2.6	NS	NS	2.5	4.1	NS	2.6	3.9	NS	3.2	0.5	1.8	NS	NS	

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

**Table B.11: Sulphate (SO<sub>4</sub><sup>2-</sup>) (mg/L) concentration of Passur River System**

Sl	Sampling Locations	Monitoring periods																															
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan	May	Jul
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM	32QM	33rd
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	1840	20	26	580	1360	67	7	570	1080	18	5	230	422	29	630	1400	24	51	760	1460	23	37.0	490	4	3	270	1	21	99.4	185.5	36.32	28.35
2	Middle of Passur River at 100m u/s of North West corner from the Project boundary	1320	23	28	450	1260	11	8	590	1040	10	3	210	460	3	370	1320	18	49	756	1380	19	6.0	510	3	6	420	5	20	90.3	188.57	33.65	19.51
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	1280	36	34	480	1240	9	11	560	1020	13	4	200	1340	5	410	1440	20	46	764	1420	21	6.0	560	5	11	460	2	24	92.6	197.77	46.92	21.31
4	Left Bank of Passur River at Project Site-Jetty	1360	45	33	550	1240	26	10	550	1060	15	4	230	1380	2	310	1260	22	52	748	1410	16	5.0	530	8	5	410	1	18	89.3	198.12	41.55	23.56
5	Middle Passur River at Project Site-Jetty	1040	32	30	520	1120	6	8	580	980	17	6	280	1280	1	310	1200	21	38	760	1440	17	4.0	640	10	3	420	3	15	108.4	186.22	22.28	21.32
6	Right Bank of Passur River at Project Site-Jetty	1320	20	27	540	820	8	9	565	1100	14	5	230	1400	2	490	1400	16	42	762	1400	19	8.0	490	13	8	430	2	18	98.0	180.76	29.53	22.27
7	Left Bank of Passur River at South West corner from the Project boundary	1640	60	40	630	880	9	12	640	1060	15	6	230	880	2	700	1300	10	56	768	1500	15	25.0	520	16	6	450	3	19	118.7	191.27	37.16	30.07
8	Middle of Passur River at South West corner from the Project boundary	1520	40	35	560	1180	19	8	560	1020	18	5	231	1440	1	340	1380	24	52	760	1450	16	9.0	470	8	4	440	1	13	118.0	189.35	45.68	14.26
9	Right Bank of Passur River at South West corner from the Project boundary	1280	80	64	620	900	12	6	550	1080	12	8	250	1340	3	340	1240	22	39	770	1460	14	6.0	510	16	12	450	2	14	118.7	185.03	52.04	21.18
10	Maidara river of the South East corner of the project at Ichamoti-Maidara confluence	1120	20	63	570	1220	72	11	96	1040	11	14	160	1220	120	270	1200	21	65	758	1500	18	71.0	490	16	31	420	3	17	115.0	199.7	36.65	35.24
11	Maidara river near proposed township area	1320	210	63	460	840	27	9	480	1020	480	14	200	1340	76	350	1250	18	46	760	1490	12	55.0	565	21	26	190	15	39	91.1	217.98	158.91	33.71
12	Passur river at Passur - Mongla confluence	1360	620	44	630	980	39	13	482	1100	42	14	220	1220	5	280	1260	28	30	765	1446	14	33.0	580	12	21	260	13	39	106.8	212.37	111.28	92.53
13	Passur river at Harbaria of Sundarbans	1560	860	69	590	900	51	7	500	1080	60	19	220	1300	13	220	1300	35	20	756	1500	16	38.0	470	34	540	410	5	41	243.8	227.53	200.6	79.75
14	Passur river at Akram point of Sundarbans	2600	1400	1390	850	1540	NS	84	760	1650	620	190	230	1420	30	760	1460	620	250	764	1500	980	370.0	410	60	430	580	5	410	183.3	245.62	517.86	172.39
15	Passur river at Hiron point of Sundarbans	2080	1160	2360	1500	1920	NS	97	NS	2100	NS	320	1090	NS	2	510	NS	NS	780	769	NS	NS	540.0	445	NS	30	1240	NS	598	230.8	985	NS	NS

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

Table B.12: Phosphate (PO<sub>4</sub><sup>3-</sup>) (mg/L) concentration of Passur River System

Sl	Sampling Locations	Monitoring periods																																
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan	May	Jul	
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM	32QM	33rd	
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	0.52	2.23	0.67	0.32	0.86	10	1.27	0.269	0.22	1.14	3.39	0.67	1.31	0.49	0.21	0.38	1.03	0.25	0.25	0.25	10.1	0.3	0.2	0.25	0.5	5.3	4.9	4.2	1.5	0.19	0.0481	1.02	
2	Middle Passur River at 100m u/s of North West corner from the Project boundary	0.5	1.99	1.12	0.61	0.53	0.23	1.97	0.269	0.36	1.76	4.11	0.31	1.72	2.5	0.16	0.25	0.83	0.3	0.30	0.32	0.6	0.3	0.2	0.27	0.5	3.5	2	0.6	0.9	0.33	0.025	0.67	
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	1.1	2.55	0.95	0.7	0.72	0.67	1.94	0.179	0.27	1.77	4.58	0.09	2.73	2.8	0.3	0.29	0.76	0.22	0.17	0.40	0.5	0.4	0.3	0.3	0.5	3.2	1.9	0.54	1.3	0.13	0.069	1.2	
4	Left Bank of Passur River at Project Site-Jetty	2.1	0.45	0.92	0.43	0.49	0.27	2.53	0.357	0.31	2.31	2.76	0.07	2.77	3.3	0.19	0.38	0.88	0.24	0.20	0.30	0.6	0.2	0.3	0.35	0.7	2.9	2.3	4.5	0.0	0.46	0.051	1.74	
5	Middle Passur River at Project Site-Jetty	2.2	2.13	1.11	0.41	0.68	0.59	1.3	0.536	0.3	0.98	3.2	0.12	0.66	3.9	0.17	0.34	1.07	0.4	0.35	0.27	0.6	0.3	0.2	0.29	0.5	3.0	5.7	2.1	0.0	0.10	0.02	0.49	
6	Right Bank of Passur River at Project Site-Jetty	2	2.42	0.99	0.55	0.61	0.13	1.32	0.269	0.43	1.01	2.48	0.16	0.62	3.9	0.47	0.27	0.67	0.53	0.27	0.25	0.9	0.4	0.3	0.36	0.8	5.4	4	3.4	0.0	0.40	0.021	0.4	
7	Left Bank of Passur River at South West corner from the Project boundary	0.57	1.25	1.18	0.76	0.65	0.1	0.99	0.536	0.63	0.87	4.16	0.09	0.65	4.6	1.31	0.29	1.16	0.32	0.20	0.41	11.1	0.5	0.4	0.4	0.7	3.0	1.2	5.4	0.3	0.04	0.02	0.44	
8	Middle of Passur River at South West corner from the Project boundary	1.2	1.51	1.25	0.85	0.53	0.18	1.02	0.625	0.21	0.96	2.76	0.04	0.37	0.41	0.39	0.29	0.86	0.43	0.20	0.35	0.8	0.7	0.4	0.43	0.4	2.5	2.4	3.7	0.4	0.03	0.061	0.3	
9	Right Bank of Passur River at South West corner from the Project boundary	1.5	1.1	1	0.53	0.6	0.1	1.39	0.536	0.33	1.123	2.71	0.07	0.45	0.63	0.62	0.42	1.03	0.57	0.37	0.27	0.8	0.5	0.4	0.52	1.3	3.2	6.3	2.7	0.1	0.14	0.008	0.5	
10	Maidara river of the South East corner of the project at Ichamoti-Maidara confluence	0.55	2.1	1.27	0.59	0.7	0.5	1.27	0.351	0.19	1.06	2.836	0.07	0.61	0.51	0.38	0.24	0.83	0.27	0.40	0.28	0.5	0.6	0.5	0.25	1.2	13.1	8	3.4	0.2	0.59	0.006	0.71	
11	Maidara river near proposed township area	1.1	0.53	1.04	0.64	0.55	0.29	1.28	0.269	0.13	1	5.23	0.2	0.47	15.3	0.71	0.28	1.2	0.22	0.28	0.30	0.8	0.4	0.3	0.56	0.7	4.1	0.76	0.2	0.4	0.35	0.003	0.68	
12	Passur river at Passur - Mongla confluence	1.3	0.35	0.86	0.42	0.71	0.59	0.95	0.179	0.31	0.78	4.01	0.09	0.18	1.3	0.63	0.37	0.86	0.33	0.29	0.31	0.6	0.6	0.4	0.53	0.8	9.6	0.79	0.27	0.2	0.3	0.0572	2.53	
13	Passur river at Harbaria of Sundarbans	1.1	0.56	1.22	0.61	0.59	0.89	0.35	0.269	0.42	0.53	1.16	0.09	0.21	3.15	0.81	0.26	0.5	0.25	0.30	0.52	0.6	0.7	0.2	0.4	0.3	2.6	0.6	1.9	0.7	0.48	0.228	1.7	
14	Passur river at Akram point of Sundarbans	1.3	0.29	0.8	0.42	0.61	NS	0.43	0.357	0.26	0.47	9.08	0.1	0.19	0.36	0.97	0.20	0.67	0.5	0.19	0.63	0.5	0.3	0.1	0.37	0.4	7.1	3	0.87	0.4	0.45	0.125	1.04	
15	Passur river at Hiron point of Sundarbans	7.51	0.29	1.09	0.44	0.47	NS	0.45	NS	0.36	NS	5.9	0.23	NS	0.55	1.45	NS	NS	0.61	0.18	NS	NS	0.3	0.2	NS	0.4	1.1	NS	0.5	0.2	1.03	NS	NS	

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

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

Sl	Sampling Locations	Monitoring periods																																
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan	May	Jul	
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM	32QM	33rd	
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	0.002	0.003	0.004	0.003	0.002	0.002	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.001	0.004	0.003	0.002	0.003	0.002	0.002	0.002	0.003	0.003	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.002	
2	Middle Passur River at 100m u/s of North West corner from the Project boundary	0.002	0.003	0.004	0.003	0.002	0.002	0.001	0.001	0.003	0.003	0.003	0.001	0.002	0.001	0.002	0.001	0.005	0.002	0.001	0.002	0.002	0.003	0.003	0.003	0.003	0.002	0.004	0.002	0.002	0.003	0.003	0.002	
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	0.001	0.003	0.004	0.003	0.003	0.002	0.001	0.001	0.003	0.005	0.002	0.001	0.001	0.002	0.003	0.001	0.004	0.002	0.003	0.003	0.002	0.002	0.002	0.003	0.003	0.002	0.003	0.003	0.002	0.003	0.003	0.002	
4	Left Bank of Passur River at Project Site-Jetty	0.002	0.004	0.004	0.004	0.002	0.002	0.001	0.002	0.002	0.004	0.002	0.002	0.001	0.002	0.002	0.002	0.005	0.002	0.001	0.003	0.002	0.003	0.003	0.002	0.003	0.002	0.002	0.003	0.002	0.002	0.003	0.002	
5	Middle Passur River at Project Site-Jetty	0.002	0.004	0.004	0.003	0.002	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.003	0.002	0.001	0.003	0.002	0.003	0.002	0.003	0.002	0.004	0.003	0.002	0.002	0.002	0.002	0.003	0.002	
6	Right Bank of Passur River at Project Site-Jetty	0.002	0.003	0.003	0.003	0.002	0.002	0.001	0.001	0.002	0.002	0.002	0.001	0.002	0.003	0.002	0.002	0.002	0.001	0.002	0.003	0.002	0.002	0.002	0.002	0.003	0.003	0.004	0.003	0.002	0.002	0.003	0.002	
7	Left Bank of Passur River at South West corner from the Project boundary	<0.001	0.003	0.006	0.003	0.002	0.002	0.001	0.002	0.001	0.003	0.002	0.002	0.002	0.003	0.001	0.002	0.005	0.002	0.003	0.003	0.003	0.003	0.003	0.002	0.005	0.004	0.002	0.003	0.003	0.002	0.003	0.004	0.003
8	Middle of Passur River at South West corner from the Project boundary	<0.002	0.004	0.004	0.003	0.002	0.002	0.001	0.001	0.002	0.003	0.003	0.001	0.002	0.002	0.001	0.001	0.003	0.002	0.001	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.003	0.002	0.002	0.002	0.003	0.002	
9	Right Bank of Passur River at South West corner from the Project boundary	0.002	0.003	0.006	0.003	0.002	0.003	0.001	0.001	0.002	0.004	0.002	0.002	0.003	0.002	0.001	0.001	0.004	0.002	0.001	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.003	0.002	0.002	0.002	0.003	0.003	
10	Maidara river of the South East corner of the project at Ichamoti-Maidara confluence	<0.001	0.003	0.006	0.004	0.003	0.002	0.001	0.002	0.002	0.005	0.002	0.001	0.003	0.003	0.002	0.002	0.004	0.001	0.002	0.003	0.003	0.003	0.003	0.004	0.004	0.003	0.003	0.002	0.002	0.003	0.004	0.002	
11	Maidara river near proposed township area	0.002	0.002	0.003	0.003	0.003	0.002	0.001	0.001	0.002	0.002	0.002	0.001	0.003	0.001	0.001	0.001	0.003	0.001	0.005	0.003	0.004	0.004	0.003	0.002	0.004	0.002	0.004	0.002	0.003	0.003	0.003	0.003	
12	Passur river at Passur - Mongla confluence	0.002	0.004	0.003	0.003	0.004	0.002	0.001	0.002	0.003	0.004	0.003	0.002	0.002	0.002	0.001	0.002	0.003	0.001	0.007	0.003	0.002	0.004	0.003	0.002	0.002	0.003	0.002	0.002	0.002	0.003	0.003	0.002	
13	Passur river at Harbaria of Sundarbans	0.004	0.003	0.004	0.004	0.004	0.002	0.001	0.002	0.005	0.002	0.003	0.002	0.001	0.003	0.002	0.001	0.003	0.002	0.001	0.002	0.001	0.002	0.003	0.002	0.002	0.002	0.002	0.002	0.003	0.002	0.003	0.002	
14	Passur river at Akram point of Sundarbans	0.004	0.002	0.002	0.003	0.002	NS	0.001	0.002	0.006	0.001	0.003	0.001	0.002	0.002	0.001	0.002	0.002	0.001	0.002	0.002	0.001	0.002	0.002	0.003	0.002	0.002	0.002	0.003	0.003	0.002	0.003	0.003	
15	Passur river at Hiron point of Sundarbans	0.003	0.002	0.003	0.002	0.002	NS	0.001	NS	0.004	NS	0.002	0.002	NS	0.002	0.001	NS	NS	0.001	0.001	NS	NS	0.002	0.002	NS	0.009	0.002	NS	0.003	0.002	0.002	NS	NS	

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

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

Sl	Sampling Locations	Monitoring periods																															
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan	May	Jul
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM	32QM	33rd
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	0.053	0.004	0.002	0.104	0.098	0.0059	0.007	0.168	0.203	0.01	0.009	0.024	0.002	0.003	0.001	0.002	0.002	0.003	0.004	0.003	0.001	0.001	0.008	0.006	0.002	0.016	0.029	0.017	0.009	0.013	0.009	0.006
2	Middle Passur River at 100m u/s of North West corner from the Project boundary	0.055	0.002	0.003	0.104	0.102	0.0038	0.006	0.092	0.302	0.009	0.007	0.034	0.001	0.003	0.001	0.001	0.001	0.007	0.005	0.002	0.003	0.002	0.007	0.004	0.005	0.017	0.029	0.019	0.019	0.01	0.009	0.005
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	0.055	0.005	0.002	0.111	0.138	0.0058	0.008	0.176	0.347	0.017	0.01	0.03	0.003	0.003	0.002	0.004	0.02	0.017	0.007	0.004	0.002	0.001	0.009	0.007	0.006	0.018	0.036	0.019	0.002	0.011	0.01	0.006
4	Left Bank of Passur River at Project Site-Jetty	0.057	0.002	0.003	0.154	0.142	0.011	0.01	0.115	0.336	0.014	0.007	0.036	0.001	0.002	0.002	0.001	0.018	0.013	0.005	0.003	0.009	0.001	0.008	0.005	0.008	0.015	0.016	0.012	0.003	0.009	0.008	0.007
5	Middle Passur River at Project Site-Jetty	0.06	0.002	0.002	0.139	0.135	0.002	0.009	0.148	0.317	0.006	0.006	0.046	0.003	0.002	0.001	0.003	0.008	0.01	0.003	0.003	0.003	0.001	0.006	0.007	0.006	0.017	0.014	0.012	0.002	0.007	0.003	0.009
6	Right Bank of Passur River at Project Site-Jetty	0.058	0.002	0.002	0.138	0.156	0.0021	0.007	0.112	0.298	0.01	0.005	0.041	0.002	0.001	0.001	0.001	0.041	0.012	0.007	0.002	0.009	0.003	0.004	0.008	0.005	0.019	0.012	0.016	0.002	0.011	0.008	0.007
7	Left Bank of Passur River at South West corner from the Project boundary	0.053	0.002	0.003	0.16	0.142	0.0076	0.01	0.134	0.396	0.007	0.006	0.048	0.003	0.001	0.001	0.007	0.012	0.011	0.003	0.002	0.120	0.001	0.006	0.019	0.018	0.019	0.0140	0.022	0.003	0.014	0.004	0.007

Sl	Sampling Locations	Monitoring periods																																
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan	May	Jul	
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM	32QM	33rd	
8	Middle of Passur River at South West corner from the Project boundary	0.054	0.003	0.004	0.153	0.148	0.002	0.011	0.099	0.323	0.006	0.007	0.044	0.009	0.002	0.001	0.003	0.015	0.014	0.004	0.003	0.006	0.002	0.008	0.009	0.008	0.017	0.003	0.015	0.004	0.006	0.007	0.006	
9	Right Bank of Passur River at South West corner from the Project boundary	0.056	0.005	0.004	0.139	0.163	0.002	0.009	0.093	0.331	0.012	0.007	0.056	0.003	0.002	0.002	0.005	0.03	0.019	0.006	0.002	0.004	0.001	0.007	0.01	0.004	0.022	0.014	0.016	0.005	0.007	0.009	0.008	
10	Maidara river of the South East corner of the project at Ichamoti-Maidara confluence	0.053	0.004	0.004	0.143	0.135	0.002	0.07	0.023	0.35	0.008	0.008	0.038	<LOQ	0.003	0.002	0.002	0.01	0.008	0.004	0.002	0.003	0.002	0.008	0.013	0.003	0.019	0.013	0.022	0.004	0.008	0.01	0.003	
11	Maidara river near proposed township area	0.048	0.004	<0.002	0.133	0.14	0.002	0.008	0.067	0.275	0.015	0.007	0.056	0.001	0.011	0.001	0.003	0.016	0.017	0.005	0.003	0.004	0.003	0.006	0.005	0.006	0.007	0.015	0.002	0.005	0.01	0.012	0.002	
12	Passur river at Passur - Mongla confluence	0.05	0.032	<0.002	0.141	0.14	0.002	0.009	0.078	0.258	0.098	0.011	0.05	0.0001	0.011	0.001	0.002	0.015	0.009	0.007	0.003	0.002	0.002	0.005	0.003	0.007	0.015	0.014	0.023	0.008	0.013	0.017	0.006	
13	Passur river at Harbaria of Sundarbans	0.043	0.044	0.004	0.137	0.13	0.002	0.012	0.135	0.228	0.02	0.01	0.05	0.001	0.005	0.003	0.003	0.017	0.009	0.015	0.002	0.006	0.014	0.007	0.009	0.004	0.002	0.014	0.011	0.019	0.01	0.01	0.001	
14	Passur river at Akram point of Sundarbans	0.194	0.071	0.032	0.309	0.297	NS	0.084	0.302	0.359	0.142	0.126	0.033	0.009	0.004	0.169	0.001	0.062	0.018	0.013	0.002	0.001	0.019	0.043	0.011	0.020	0.001	0.018	0.005	0.004	0.011	0.009	0.001	
15	Passur river at Hiron point of Sundarbans	0.224	0.05	0.07	0.309	0.291	NS	0.073	NS	0.607	NS	0.151	0.129	NS	0.019	0.175	NS	NS	0.014	0.017	NS	NS	0.008	0.056	NS	0.013	0.001	NS	0.5	0.005	0.009	NS	NS	

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

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

Sl	Sampling Locations	Monitoring periods																															
		Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Oct	Jan	Apr	Jul	Nov	Feb	Apr	July	Nov	Feb	Jul	Oct	Jan	Apr	Aug	Oct	Jan	May	Jul
		1QM	2QM	3QM	4QM	5QM	6QM	7QM	8QM	9QM	10QM	11QM	12QM	13QM	14QM	15QM	16QM	17QM	18QM	19QM	20QM	21QM	22QM	23QM	25QM	26QM	27QM	28QM	29QM	30QM	31QM	32QM	33rd
1	Left Bank of Passur River at 100m u/s of North West corner from the Project boundary	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.004	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
2	Middle Passur River at 100m u/s of North West corner from the Project boundary	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
3	Right Bank of Passur River at 100m u/s of North West corner from the Project boundary	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
4	Left Bank of Passur River at Project Site-Jetty	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
5	Middle Passur River at Project Site-Jetty	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
6	Right Bank of Passur River at Project Site-Jetty	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
7	Left Bank of Passur River at South West corner from the Project boundary	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
8	Middle of Passur River at South West corner from the Project boundary	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
9	Right Bank of Passur River at South West corner from the Project boundary	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
10	Maidara river of the South East corner of the project at Ichamoti-Maidara confluence	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
11	Maidara river near proposed township area	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
12	Passur river at Passur - Mongla confluence	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
13	Passur river at Harbaria of Sundarbans	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
14	Passur river at Akram point of Sundarbans	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
15	Passur river at Hiron point of Sundarbans	< 0.00015	NS	< 0.00015	< 0.00015	< 0.00015	< 0.00015	NS	NS	< 0.00015	NS	< 0.00015	< 0.00015	< 0.001	< 0.001	< 0.001	NS	NS	< 0.001	< 0.001	NS	< 0.001	< 0.001	NS	< 0.001	< 0.001	NS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

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

[illegible]

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

[illegible][illegible][illegible]

Source: U.S. EPA, National Sanitation Survey, 1991. First quarter monitoring, 1991. Second quarter monitoring, 1991. Third quarter monitoring, 1991. Fourth quarter monitoring, 1991. Non-functional swimming water quality standard, The Environmental Conservation Act, 1971.

[illegible]

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

[illegible]

Second Quarter Monitoring, 2014: Second Quarter Monitoring, 2014: Third Quarter Monitoring, 2014: Fourth Quarter Monitoring, 2014: Non functional,

[illegible][illegible][illegible][illegible][illegible]

[illegible]

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

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

[illegible]

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

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

[illegible]

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

[illegible]

Source: CEGIS Field Survey; July 2022



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

Monitoring sites	July, 2018		January, 2019		July, 2019		February, 2020		July, 2020		January, 2021		August, 2021		January, 2022		July, 2022	
	Total Carbon	Total Organic Carbon	Total Carbon	Total Organic Carbon	Total Carbon	Total Organic Carbon	Total Carbon	Total Organic Carbon	Total Carbon	Total Organic Carbon	Total Carbon	Total Organic Carbon	Total Carbon	Total Organic Carbon	Total Carbon	Total Organic Carbon	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
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
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

Source: CEGIS Field Survey, July 2022



## (C) Noise Level monitoring data

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

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

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

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

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

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

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

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

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

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

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

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

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

Sl No	Location	QM 17 (Noise Level in dB (A)) July-18				QM 18 (Noise Level in dB (A)) Nov-18				QM 19 (Noise Level in dB (A)) Feb-19				QM 20 (Noise Level in dB (A)) Apr-19				Std*
		Morning (9:00)	A. noon (13:00)	Evening (18:00)	Day time AVG	Morning (9:00)	A. noon (13:00)	Evening (18:00)	Day time AVG	Morning (9:00)	A. noon (13:00)	Evening (18:00)	Day time AVG	Morning (9:00)	A. noon (13:00)	Evening (18:00)	Day time AVG	
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 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; Note: NM-Not measured; \*Std- Standard as defined in National Noise Control Rules 2006.

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

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

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

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

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

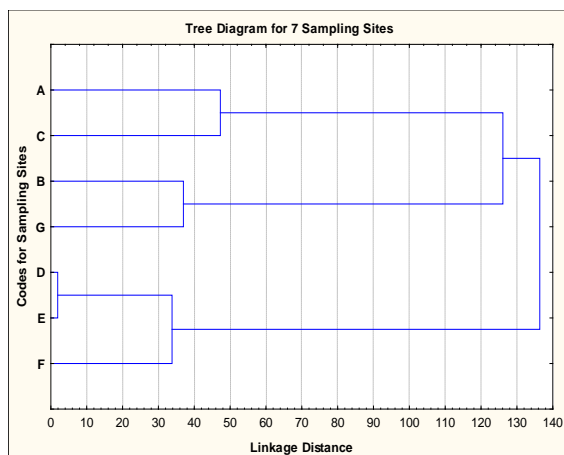
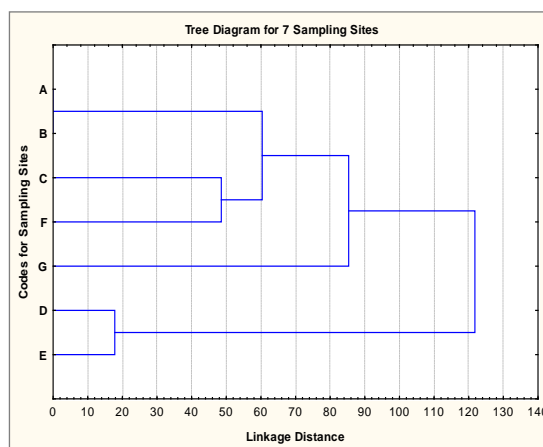
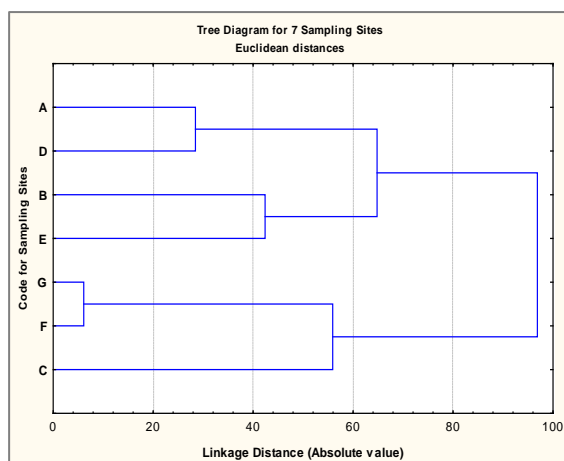
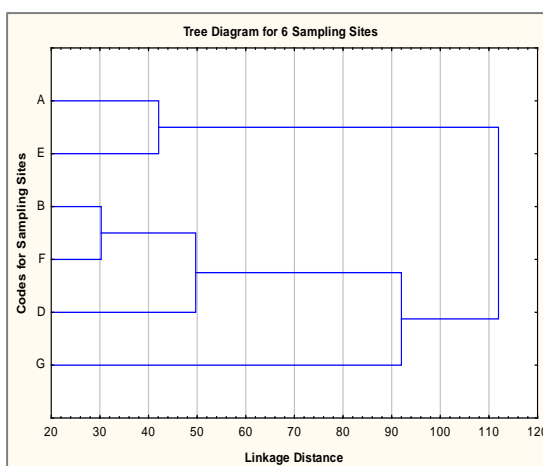
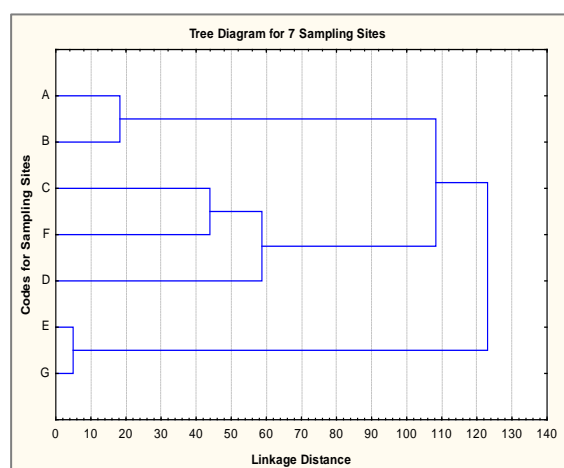
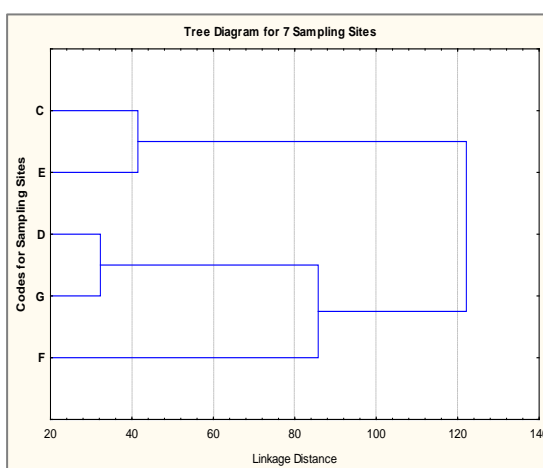
Source: CEGIS field Survey; Note: NM-Not measured; \*Std- Standard as defined in National Noise Control Rules 2006.

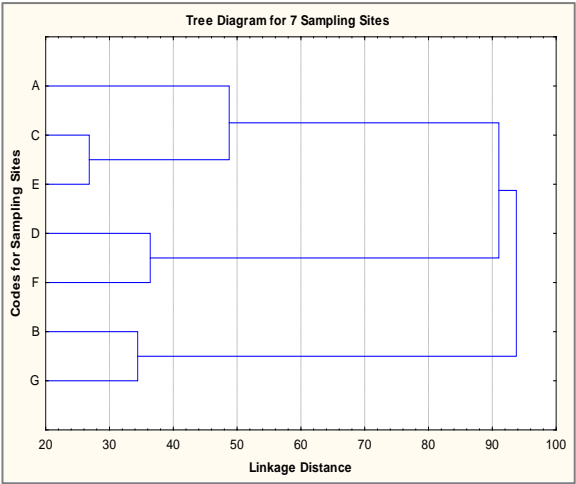
Table C.9: Ambient noise monitoring status at the monitored locations

SI No	Location	QM 32(Noise Level in dB (A)) May, 2022				Std*	QM 33(Noise Level in dB (A)) Jul, 2022				Std*	QM 34 (Noise Level in dB (A)) Oct, 2022				Std*
		Morning (9:00)	A. noon (13:00)	Evening (18:00)	Day time AVG	Day time	Morning (9:00)	A. noon (13:00)	Evening (18:00)	Day time AVG	Day time	Morning (9:00)	A. noon (13:00)	Evening (18:00)	Day time AVG	Day time
1	Chalna, Dacope	56	61.25	59.97	59.08	70	52.71	52.62	53.30	52.88	70	78.10	72.20	76.20	75.50	78.10
2	NW Corner of the Project area	48.63	48.64	48.64	48.60	55	46.55	44.82	45.44	45.60	55	57.00	57.7	52.3	55.67	57.00
3	Chunkuri-2, Bajua	48.32	48.72	49.70	48.91	55	48.00	45.61	47.75	47.12	55	63.50	55.40	54.6	57.83	63.50
4	SW corner of the Project area	50.31	50.05	51.24	50.53	55	54.00	48.07	46.06	49.38	55	56.20	53.70	52.70	54.20	56.20

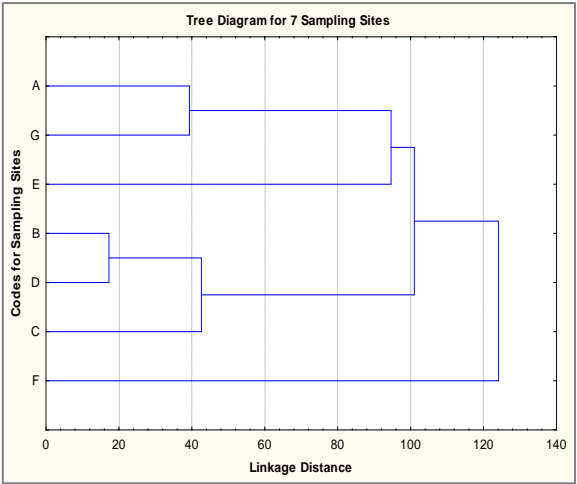
Sl No	Location	QM 32(Noise Level in dB (A)) May, 2022				Std*	QM 33(Noise Level in dB (A)) Jul, 2022				Std*	QM 34 (Noise Level in dB (A)) Oct, 2022				Std*
		Morning (9:00)	A. noon (13:00)	Evening (18:00)	Day time AVG		Morning (9:00)	A. noon (13:00)	Evening (18:00)	Day time AVG		Morning (9:00)	A. noon (13:00)	Evening (18:00)	Day time AVG	
5	Project site near Shapmari area	49.70	49.34	50.24	49.76	55	44.50	45.75	43.49	44.58	55	57.40	50.90	NM	54.15	57.40
6	Barni, Gaurambha	47.60	45.05	49.04	47.23	60	50.06	45.93	46.40	47.46	60	62.50	60.50	62.60	61.87	62.50
7	Khan Jahan Ali Bridge, Khulna	56.46	56.93	62.42	58.60	70	55.75	NM	NM	55.75	70	65.10	63.20	NM	64.15	65.10
8	Mongla Port area	55.95	56.99	59.19	57.38	75	55.41	55.09	54.75	55.08	75	61.50	67.9	65.60	65.00	61.50
9	Harbaria, Sundarbans	52.31	46.44	NM	49.37	50	42.95	38.59	NM	40.77	50	49.60	50.40	NM	50.00	49.60
10	Akram Point, Sundarbans	46.22	39.94	NM	43.08	50	41.97	NM	41.01	41.49	50	42.50	41.70	NM	42.10	42.50
11	Hiron Point, Sundarbans	NM	NM	NM	NM	50	NM	NM	NM	NM	50	47.80	NM	NM	47.80	47.80

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

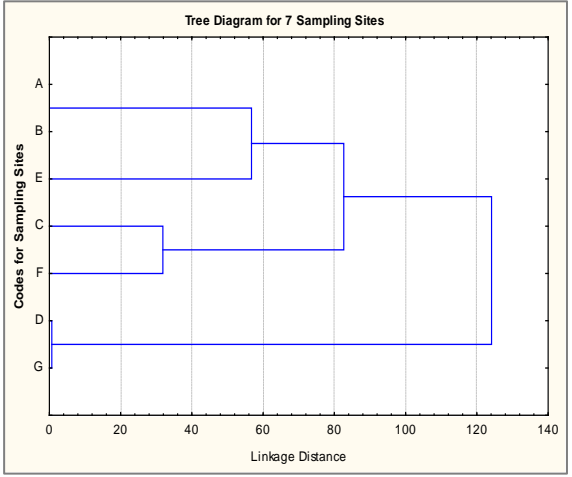
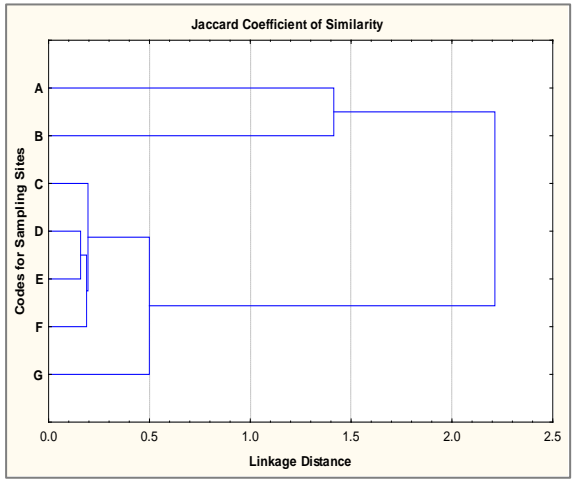
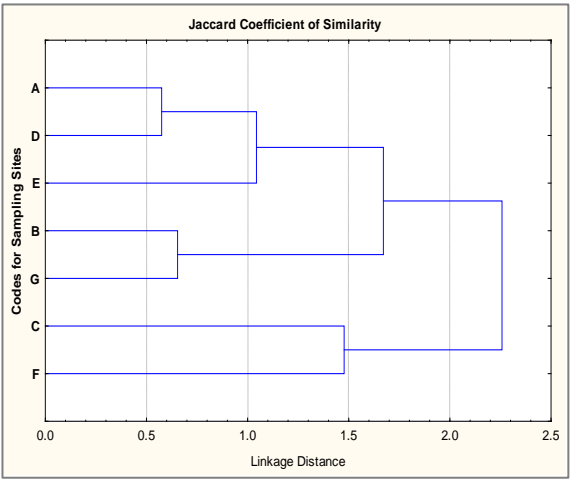
**(D) Fisheries resources monitoring data****D1: Classification of functional habitat**1<sup>st</sup> Monitoring, April, 20142<sup>nd</sup> Monitoring, July 20143<sup>rd</sup> Monitoring, October, 20144<sup>th</sup> Monitoring, January 20155<sup>th</sup> Monitoring, April, 20156<sup>th</sup> Monitoring, August, 2015



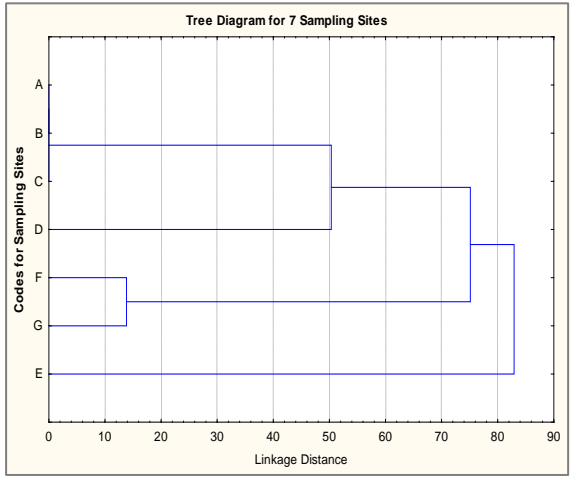
7<sup>th</sup> Monitoring, October, 2015



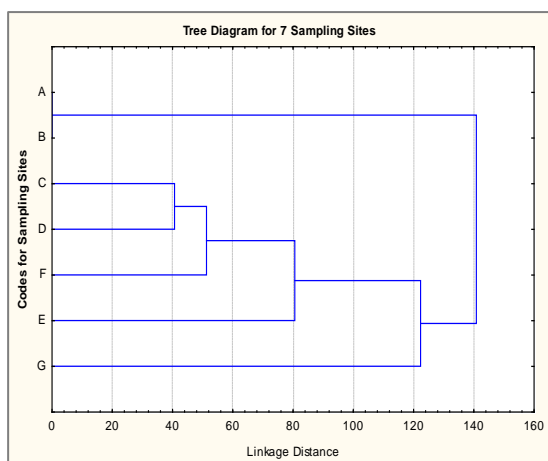
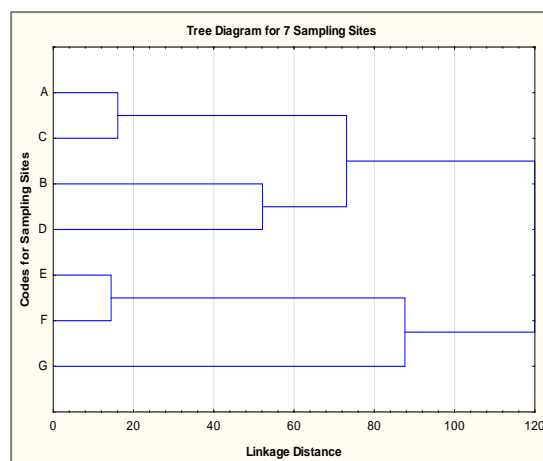
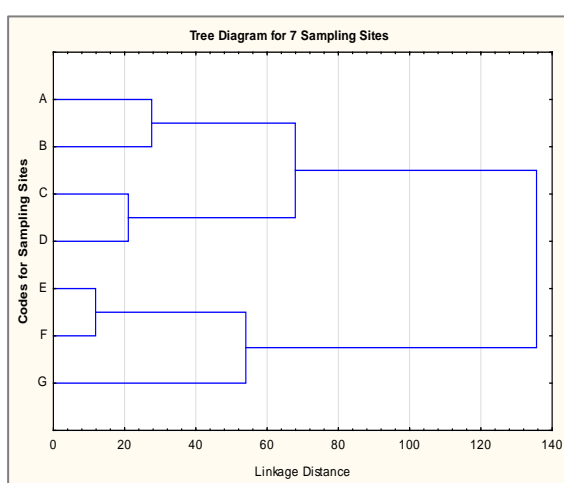
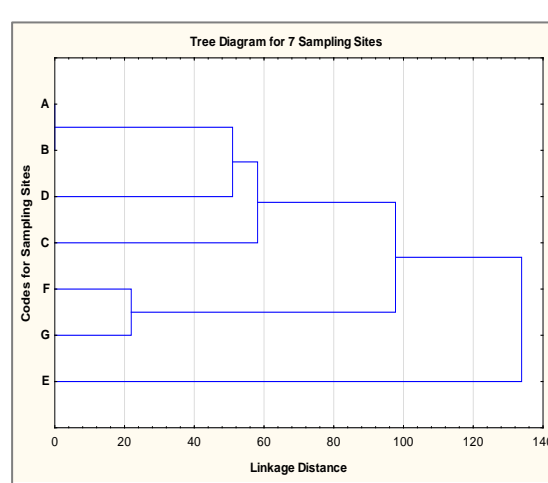
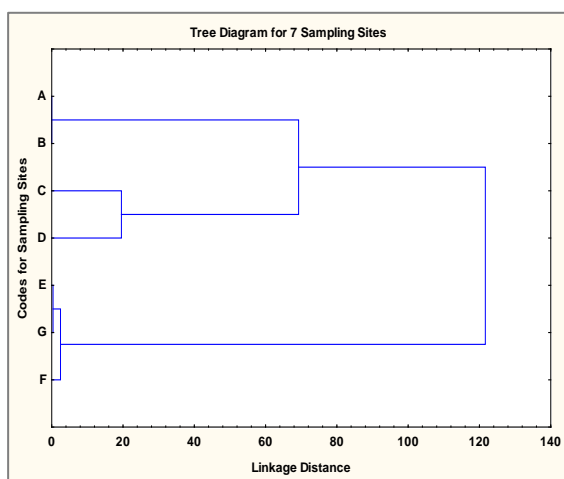
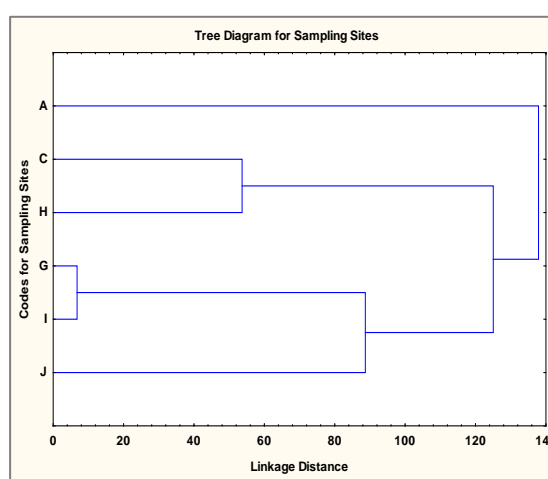
8<sup>th</sup> Monitoring, January, 2016



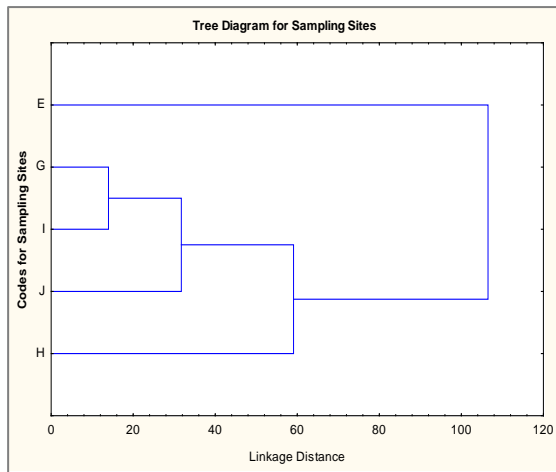
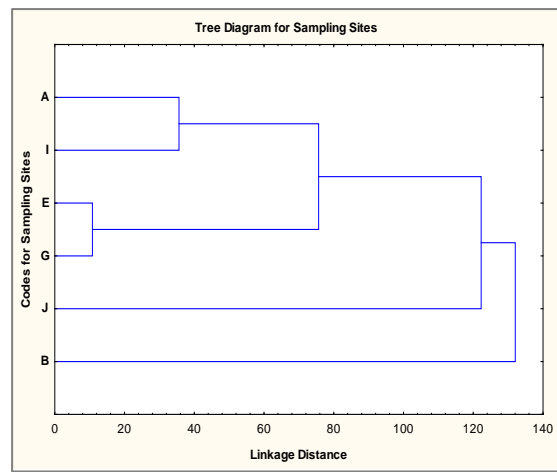
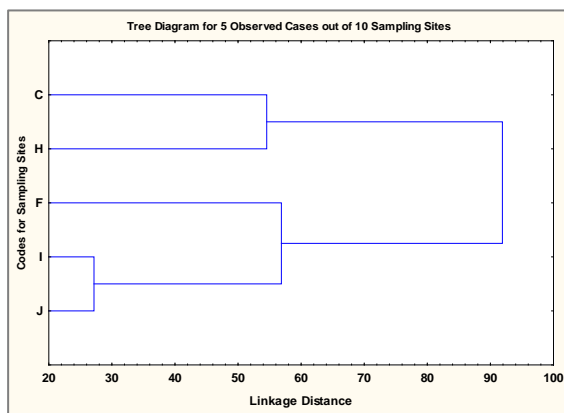
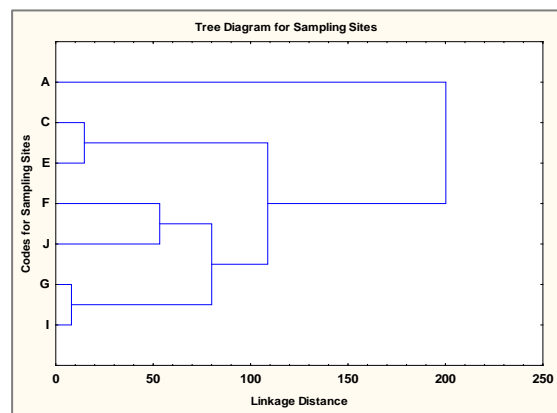
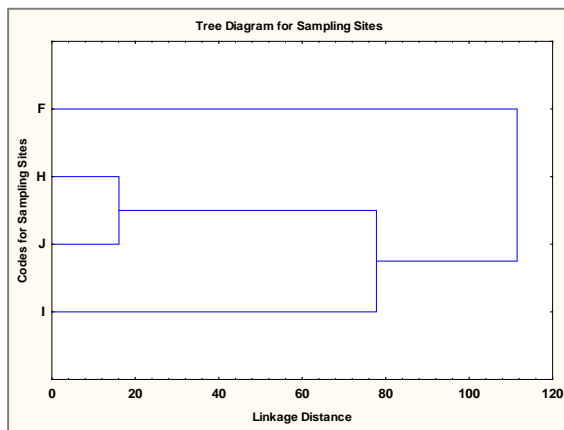
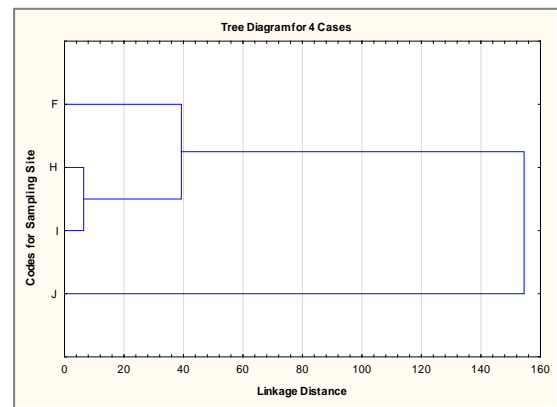
9<sup>th</sup> Monitoring, April, 2016

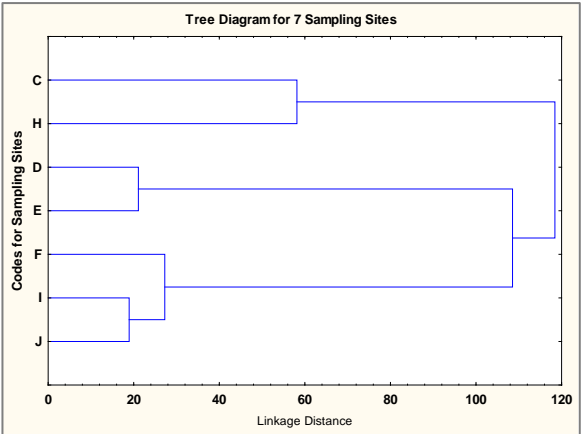


10<sup>th</sup> Monitoring, July, 2016

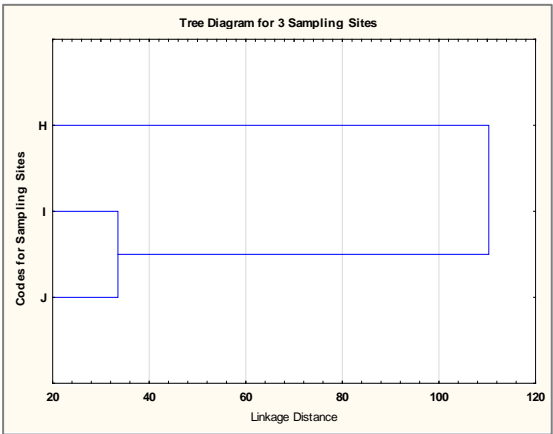
11<sup>th</sup> Monitoring, October, 201612<sup>th</sup> Monitoring, January, 201713<sup>th</sup> Monitoring, April, 201714<sup>th</sup> Monitoring, October, 201715<sup>th</sup> Monitoring, January, 201816<sup>th</sup> Monitoring, April, 2018



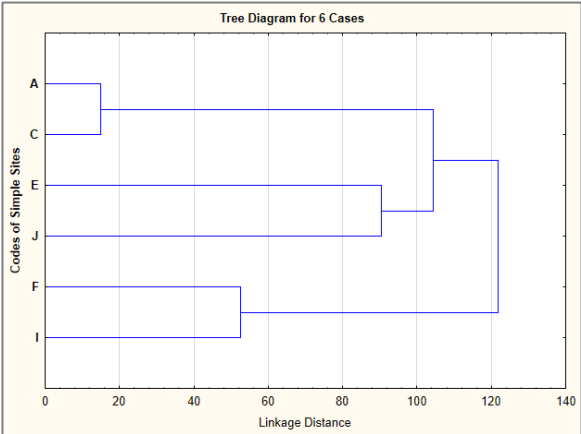
17<sup>th</sup> Monitoring, July, 201818<sup>th</sup> Monitoring, November, 201819<sup>th</sup> Monitoring, February, 201920<sup>th</sup> Monitoring, April, 201921<sup>st</sup> Monitoring, July 201922<sup>nd</sup> Monitoring, November, 2019



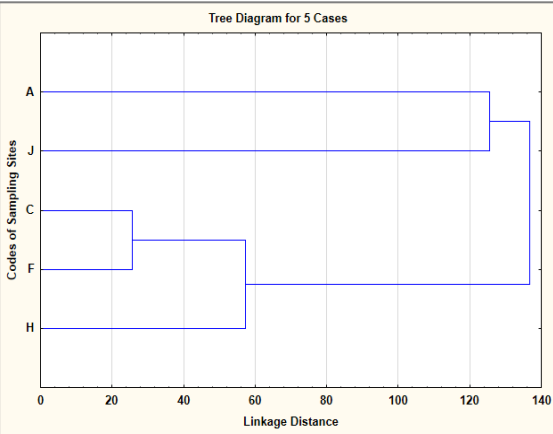
23<sup>rd</sup> Monitoring, February 2020



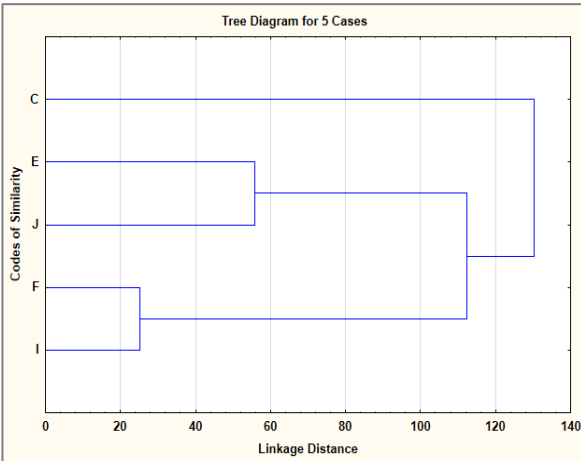
25<sup>th</sup> Monitoring, July 2020



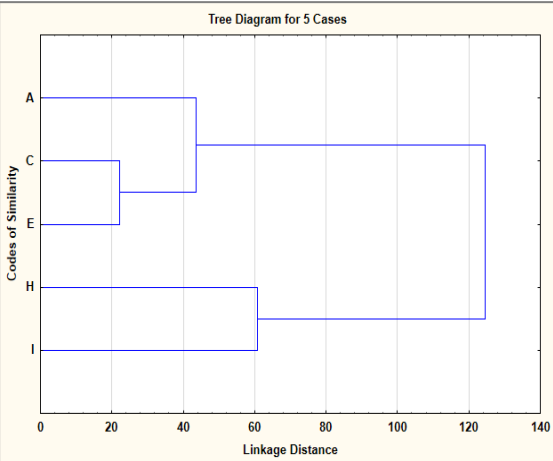
26<sup>th</sup> Monitoring, November 2020



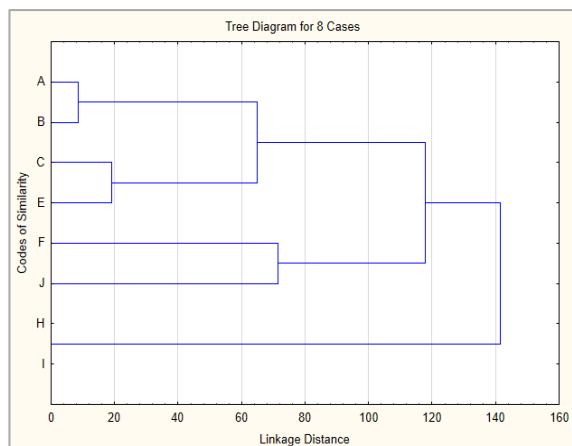
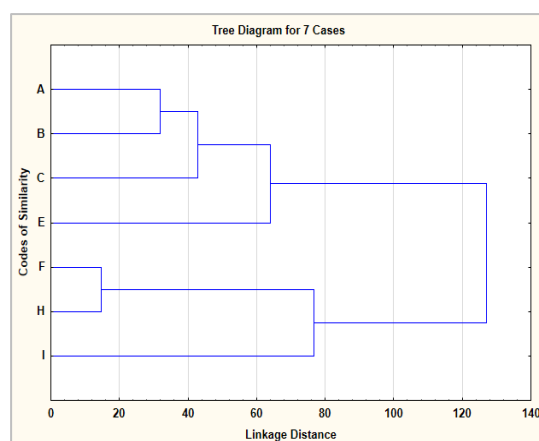
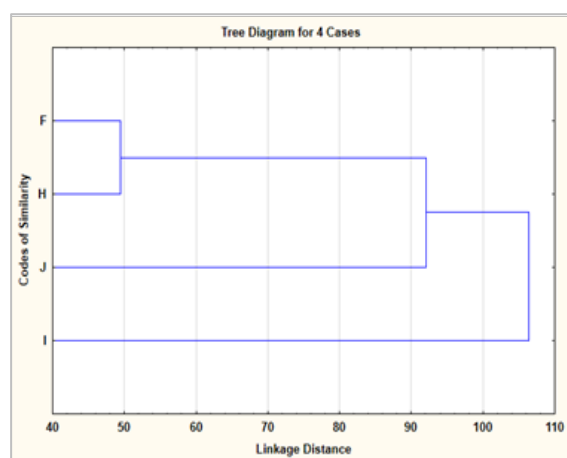
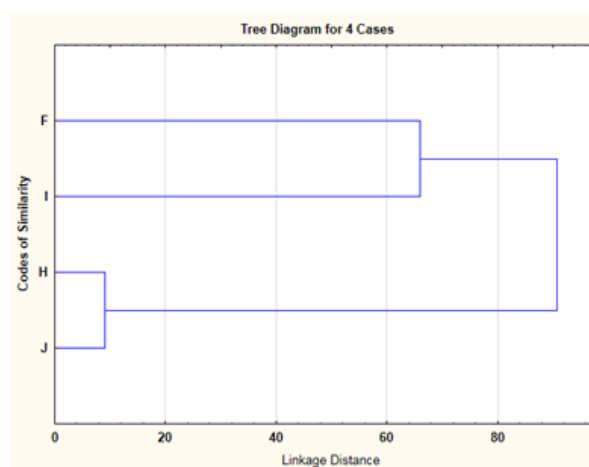
27<sup>th</sup> Monitoring, January 2021



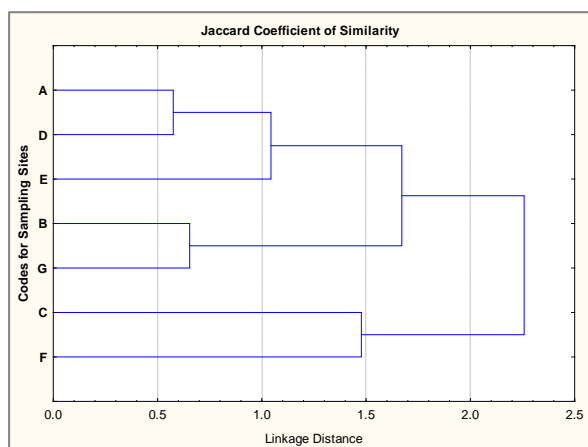
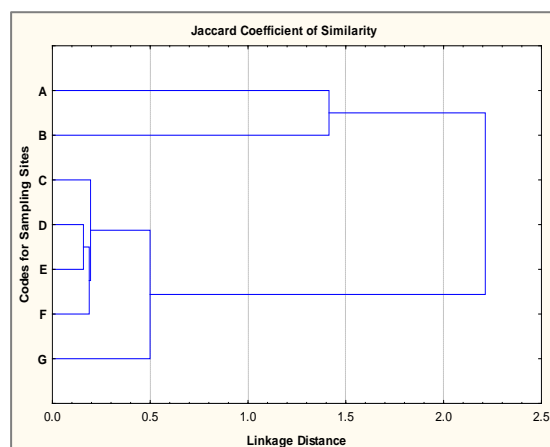
28<sup>th</sup> monitoring, April 2021

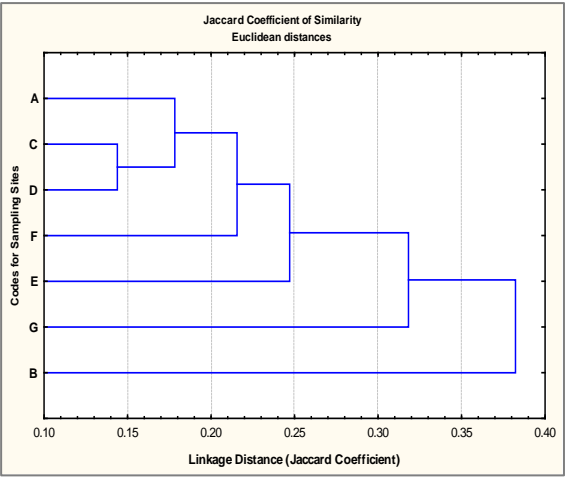


29<sup>th</sup> Monitoring, August 2021

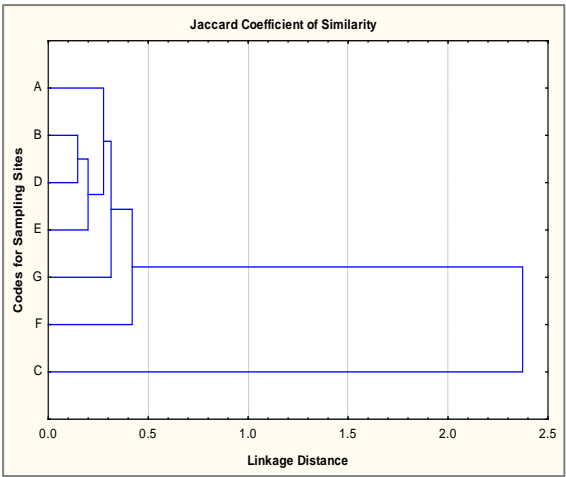
30<sup>th</sup> Monitoring, November 202131<sup>st</sup> Monitoring, February, 202232<sup>nd</sup> Monitoring, May 202233<sup>rd</sup> Monitoring, July 2022

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

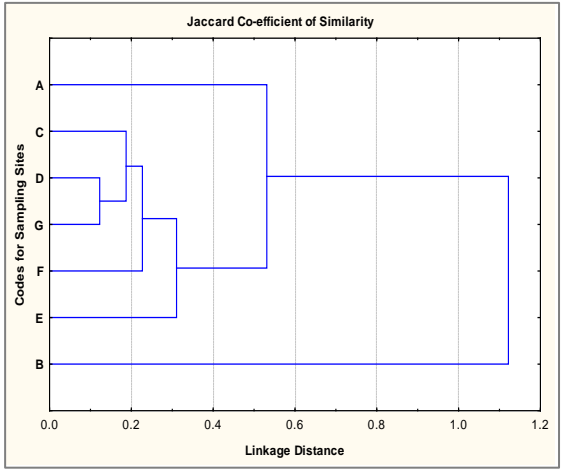
1<sup>st</sup> Monitoring, April, 20142<sup>nd</sup> Monitoring, July 2014



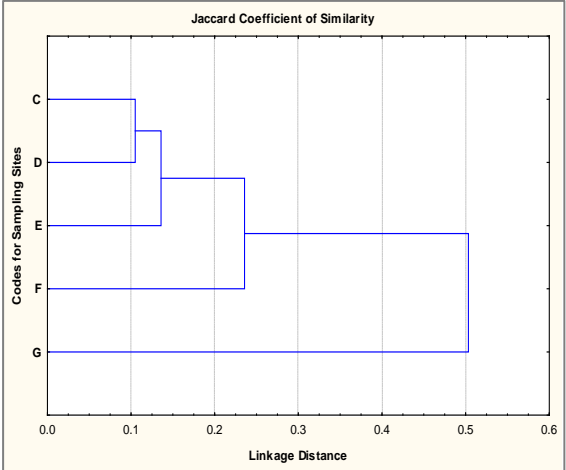
3<sup>rd</sup> Monitoring, October, 2014



4<sup>th</sup> Monitoring, January, 2015



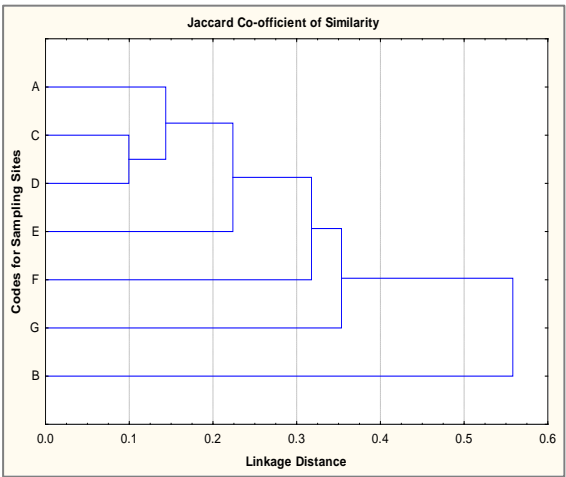
5<sup>th</sup> Monitoring, April, 2015



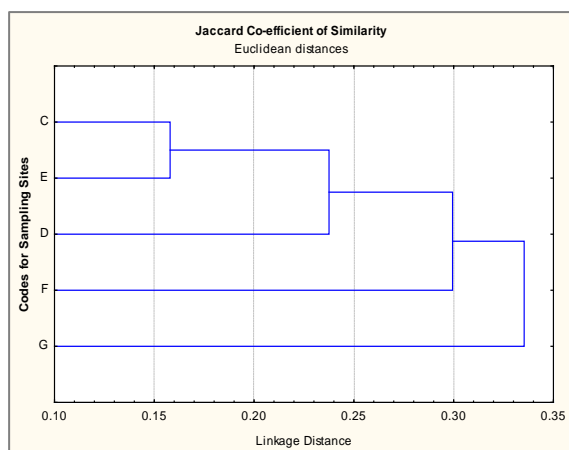
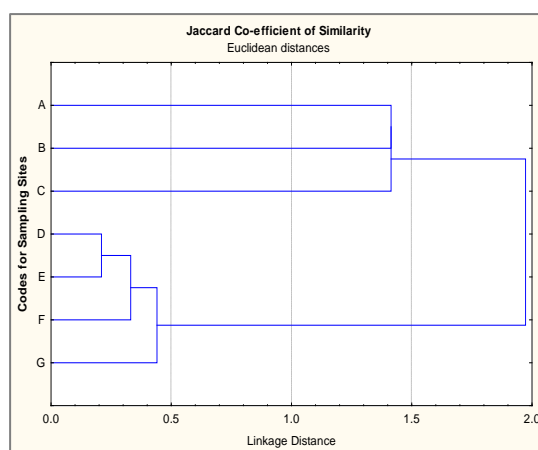
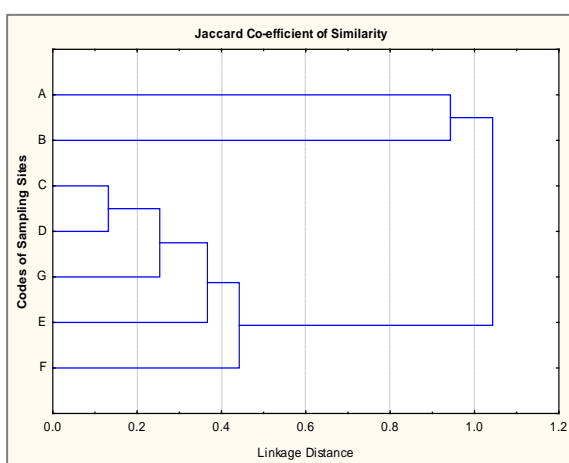
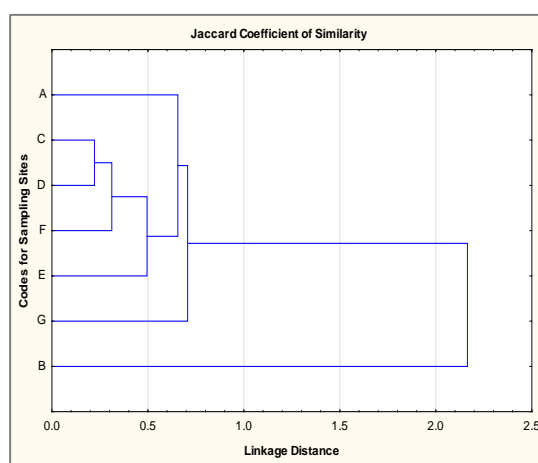
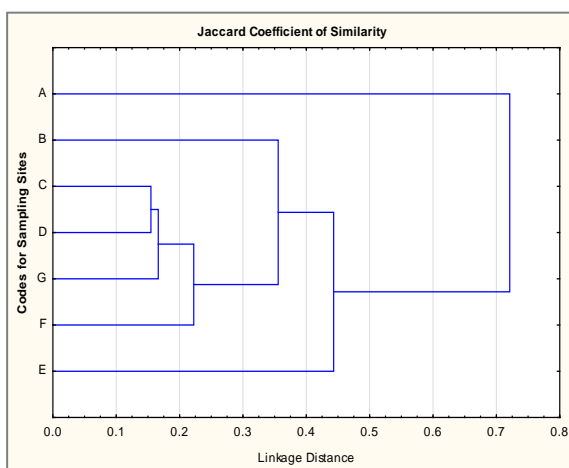
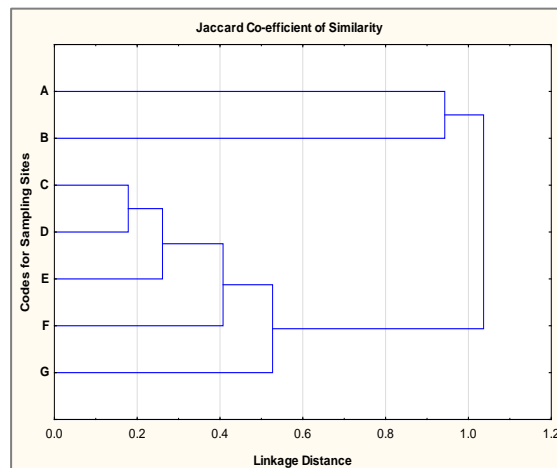
6<sup>th</sup> Monitoring, August, 2015

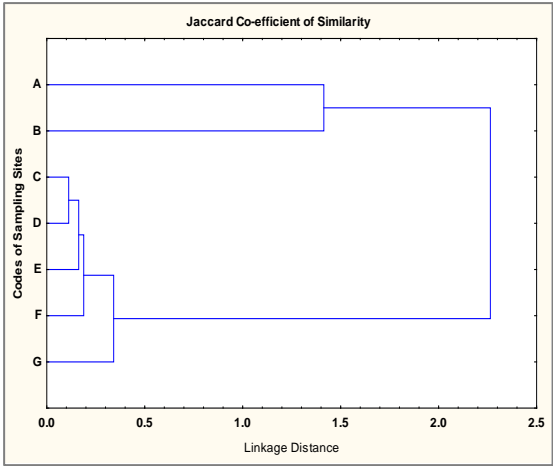


7<sup>th</sup> Monitoring, October, 2015

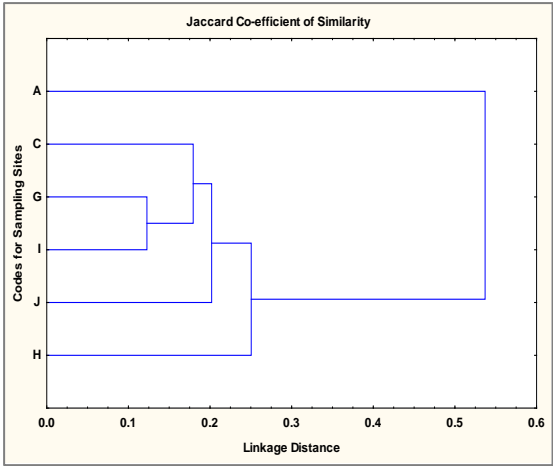


8<sup>th</sup> Monitoring, January, 2016

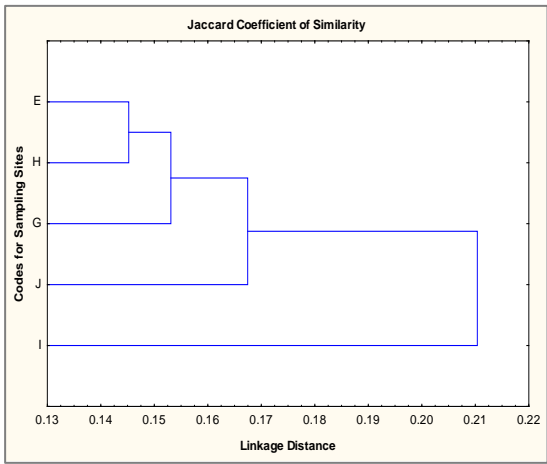
9<sup>th</sup> Monitoring, April, 201610<sup>th</sup> Monitoring, July, 201611<sup>th</sup> Monitoring, October, 201612<sup>th</sup> Monitoring, January, 201713<sup>th</sup> Monitoring, April, 201714<sup>th</sup> Monitoring, October, 2017



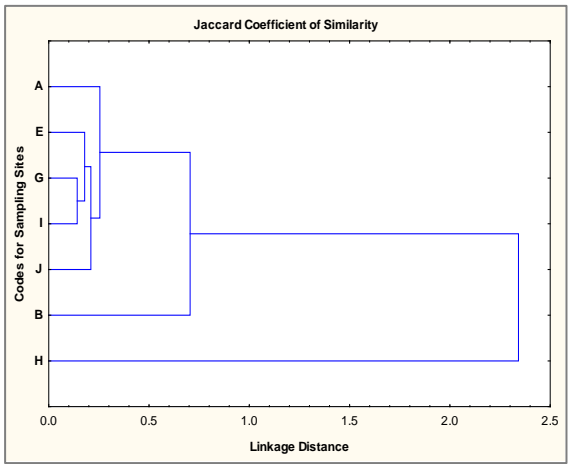
15<sup>th</sup> Monitoring, January, 2018



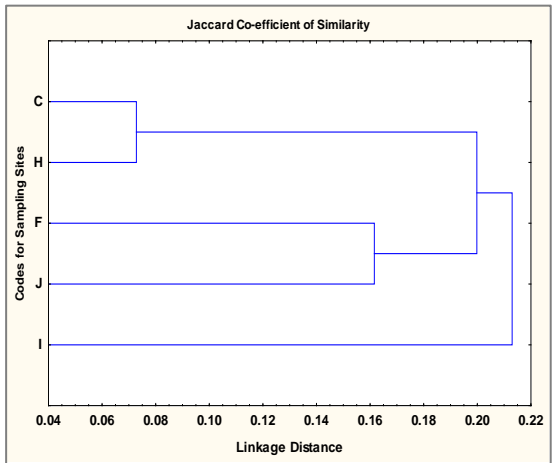
16<sup>th</sup> Monitoring, April, 2018



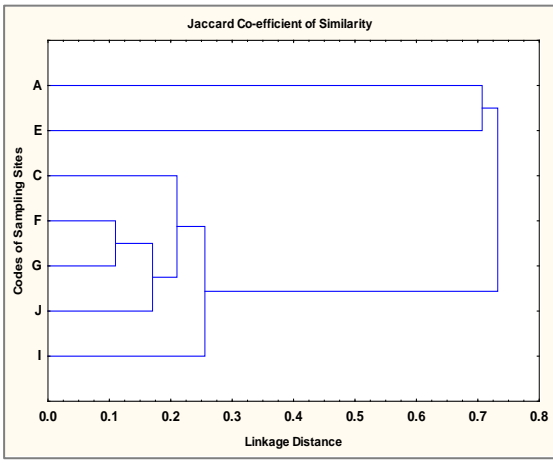
17<sup>th</sup> Monitoring, July, 2018



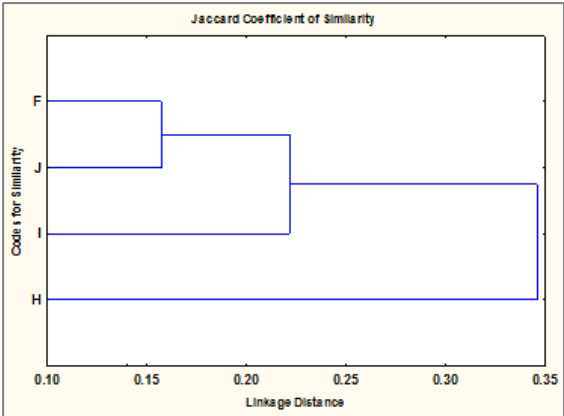
18<sup>th</sup> Monitoring, November, 2018



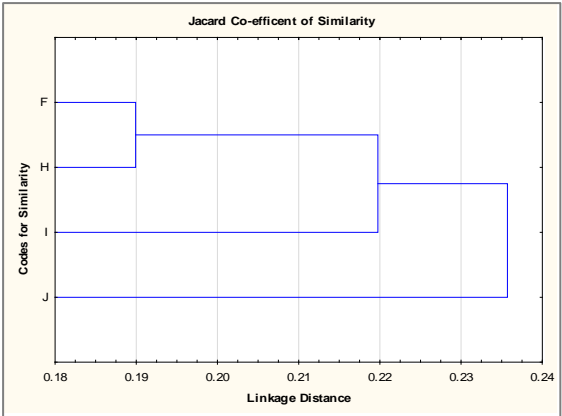
19<sup>th</sup> Monitoring, February, 2019



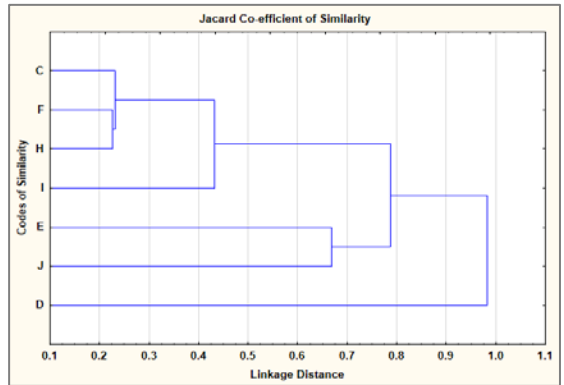
20<sup>th</sup> Monitoring, April, 2019



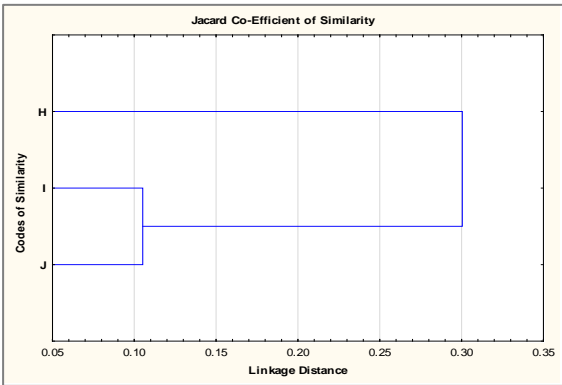
21<sup>st</sup> Monitoring, July 2019



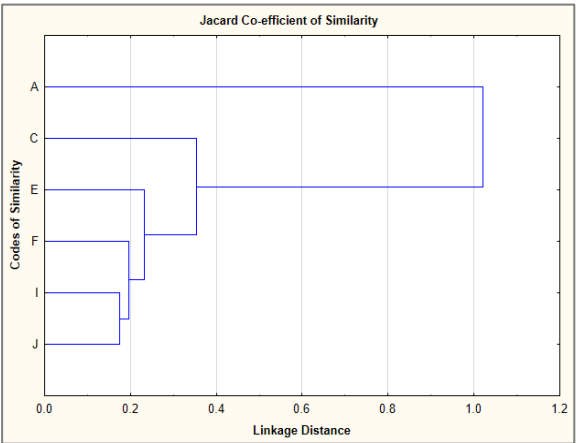
22<sup>nd</sup> Monitoring, November 2019



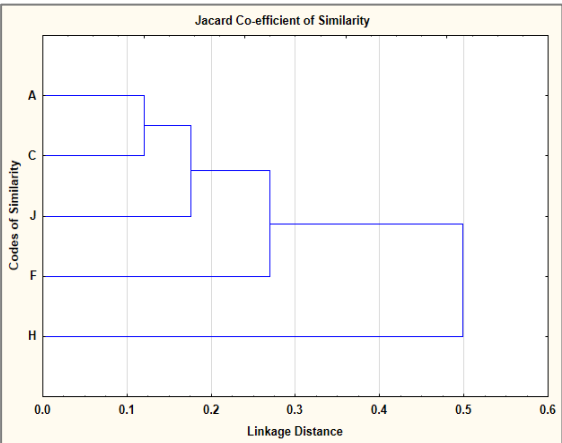
23<sup>rd</sup> Monitoring, February 2020



25<sup>th</sup> Monitoring, July 2020

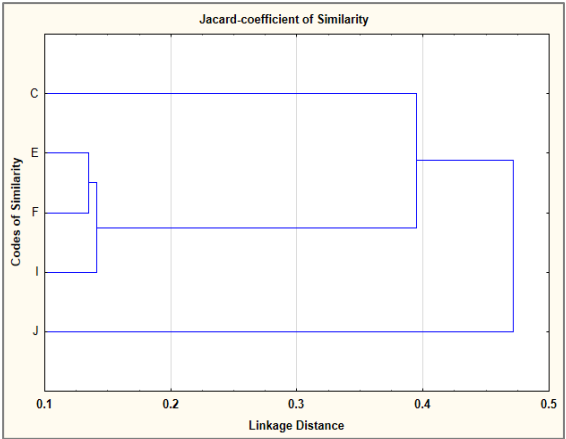


26<sup>th</sup> Monitoring, November, 2020

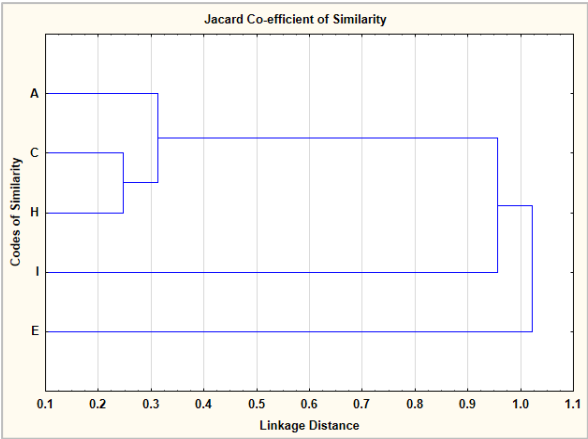


27<sup>th</sup> Monitoring, January, 2021

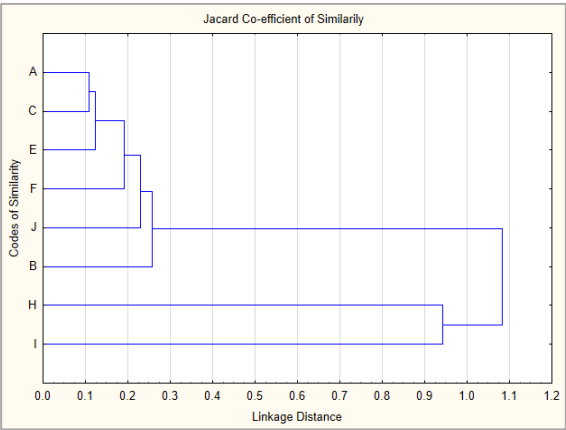




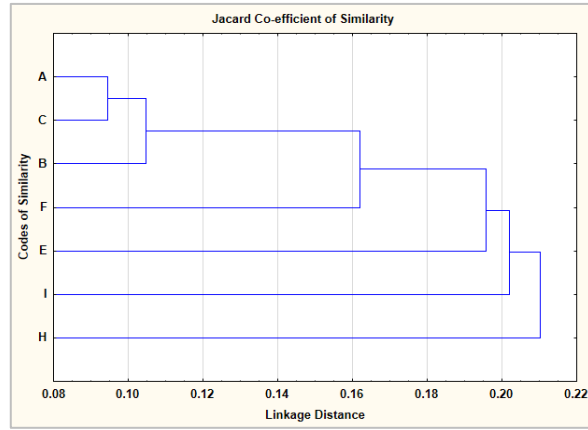
28<sup>th</sup> monitoring, April, 2021



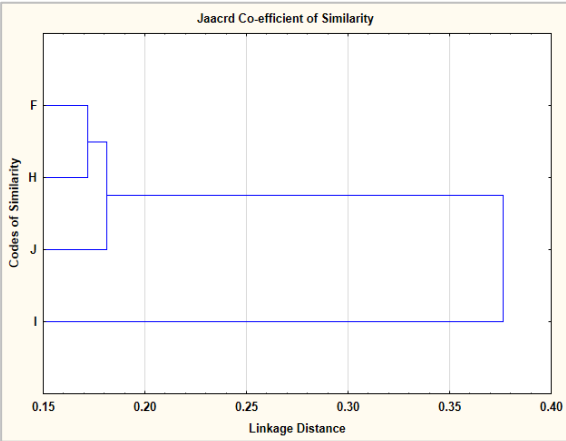
29<sup>th</sup> monitoring, August, 2021



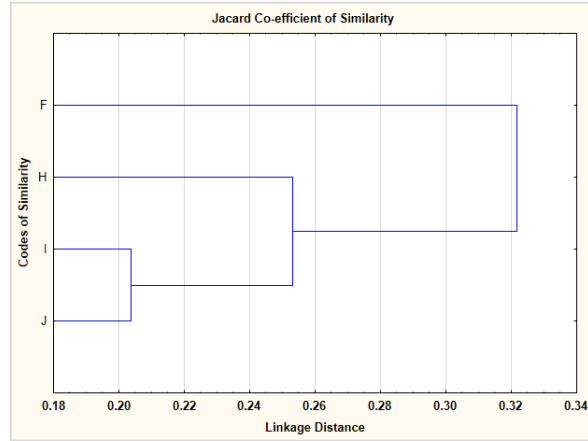
30<sup>th</sup> Monitoring, November 2021



31<sup>st</sup> Monitoring, February, 2022

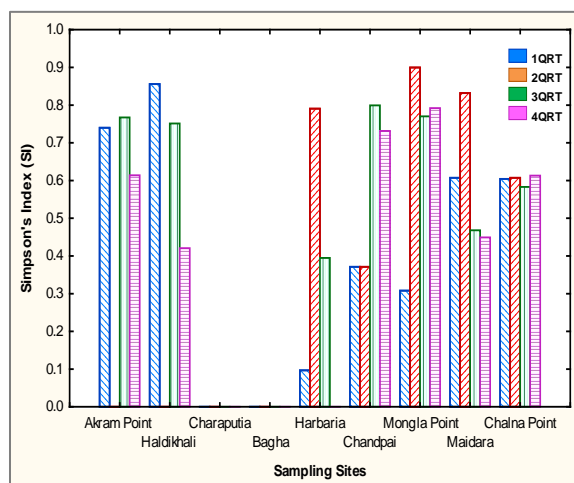


32<sup>nd</sup> Monitoring, May 2022

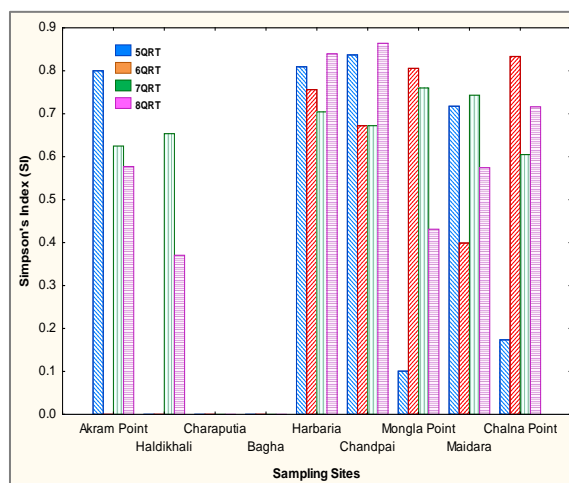


33<sup>rd</sup> Monitoring, July 2022

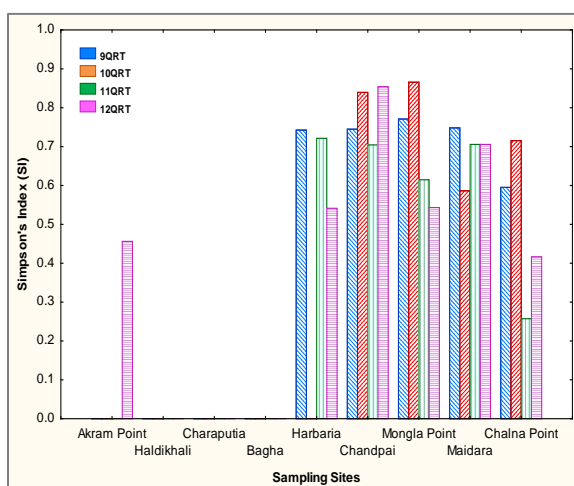
### D.3: Site-wise fish species richness (FSR) in the Passur River System



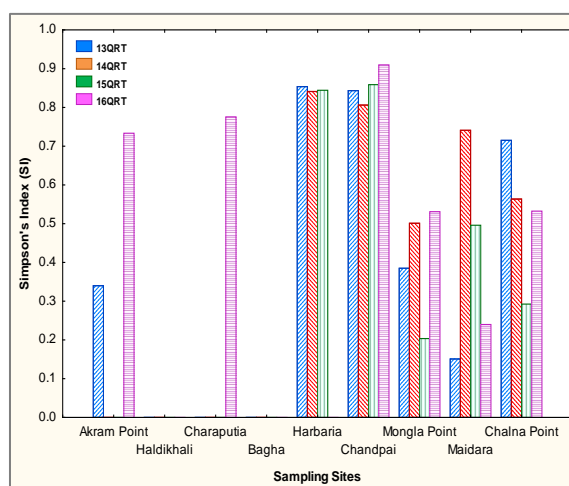
2014-2015



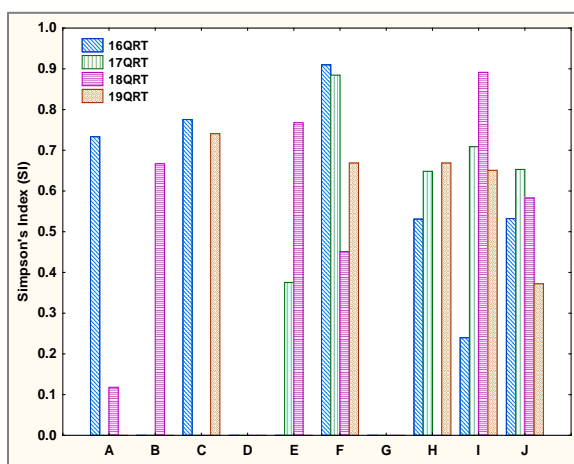
2015-2016



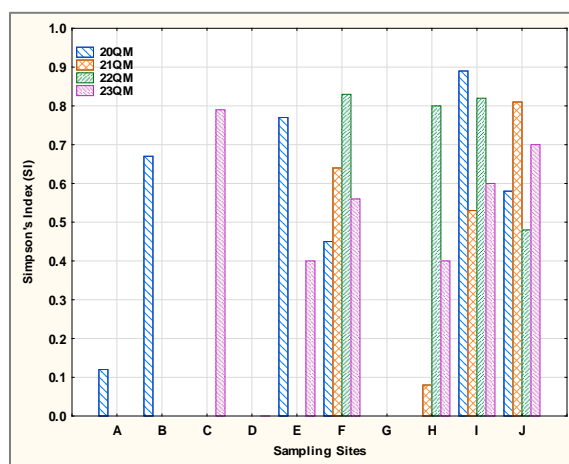
2016-2017



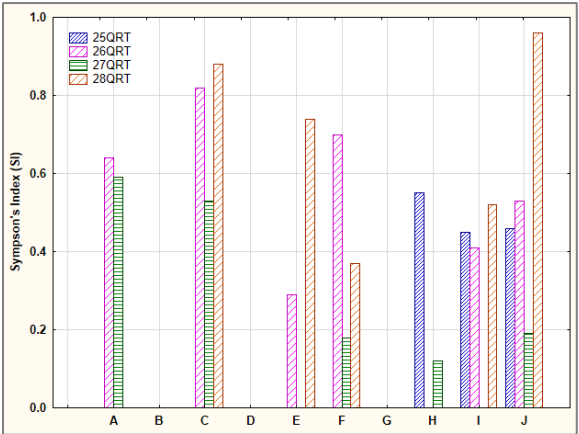
2017-18



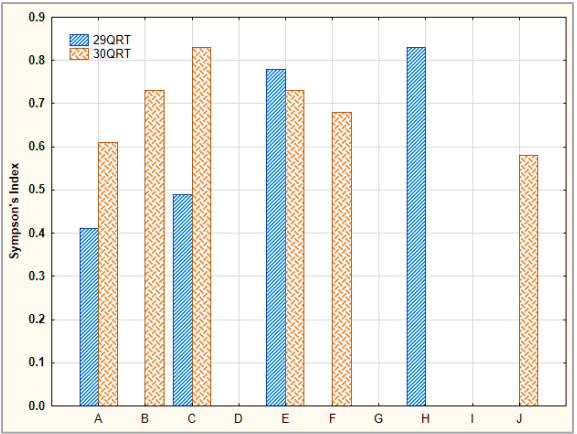
2018-19



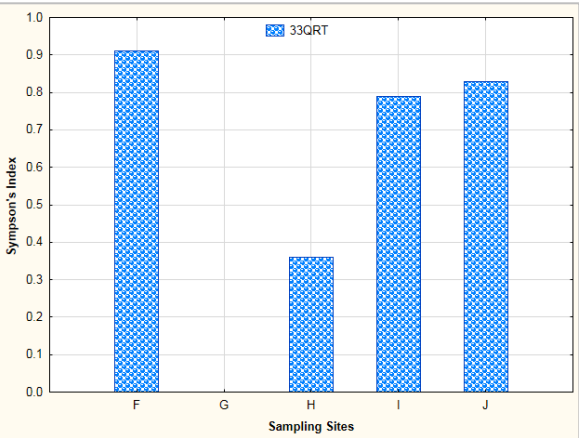
2019-20



2020-21

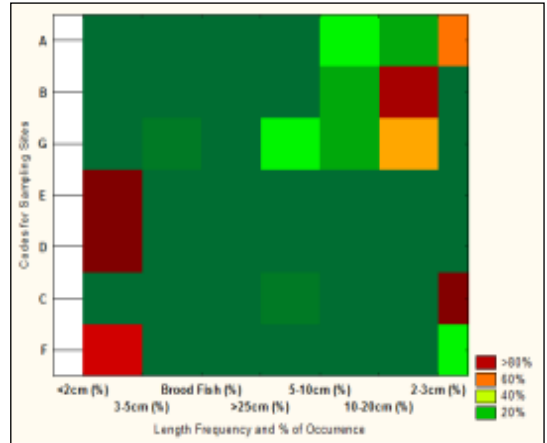


2021-22

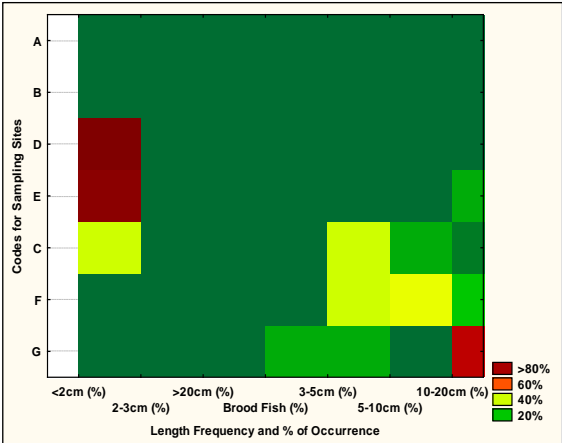


2022-23

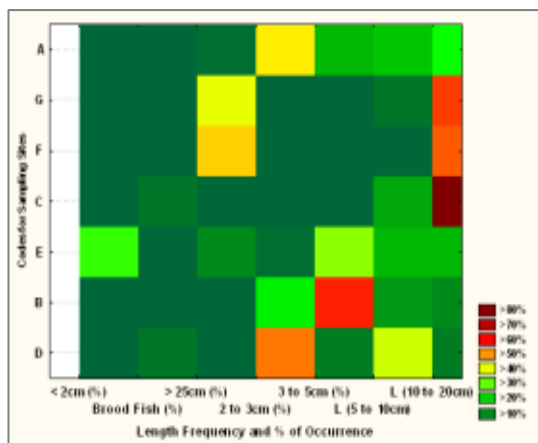
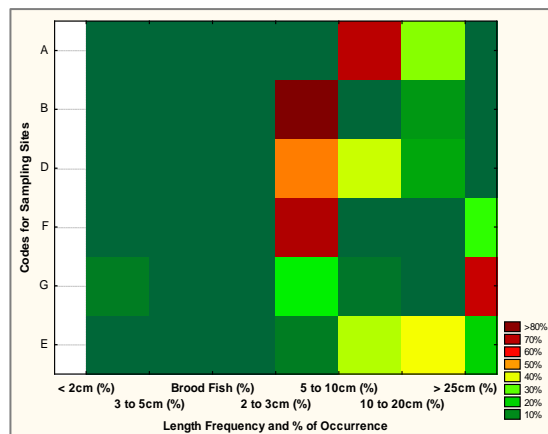
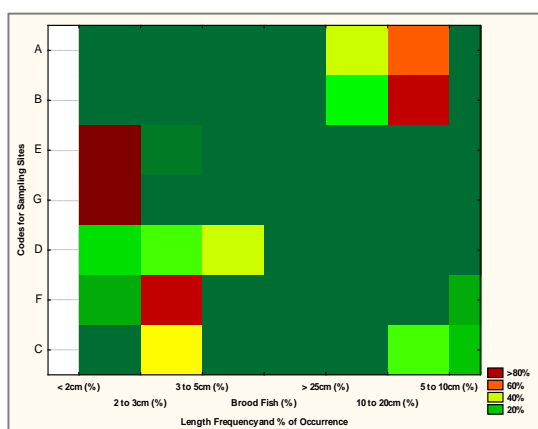
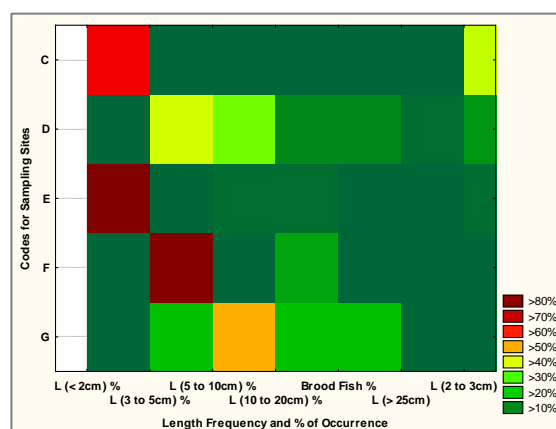
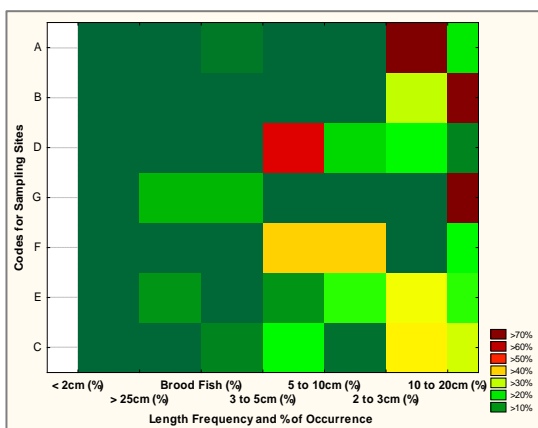
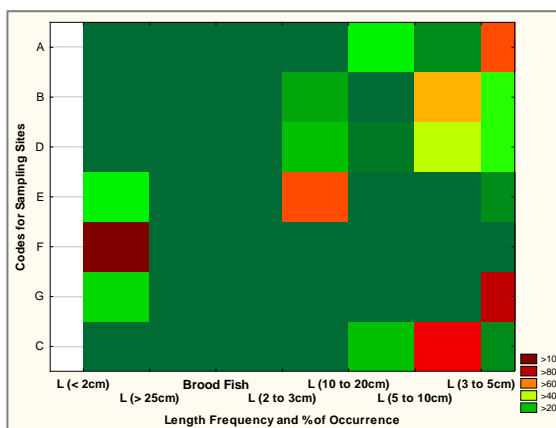
D4: Fish Community Structure

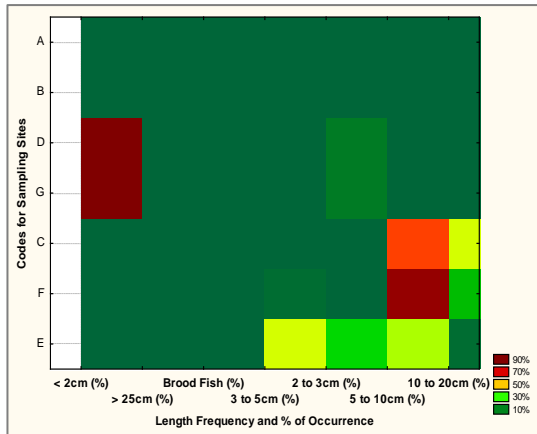
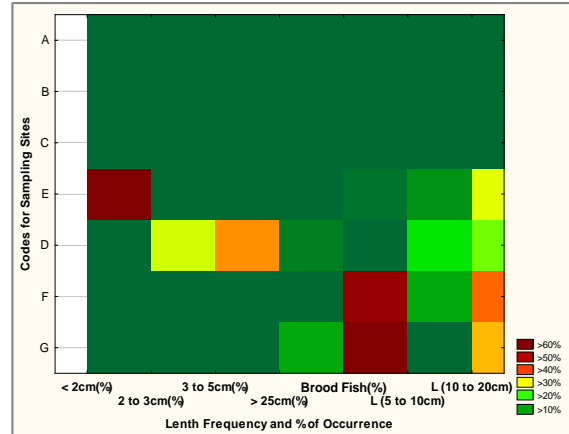
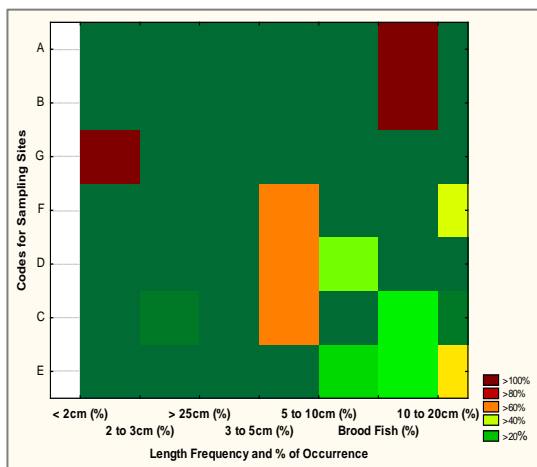
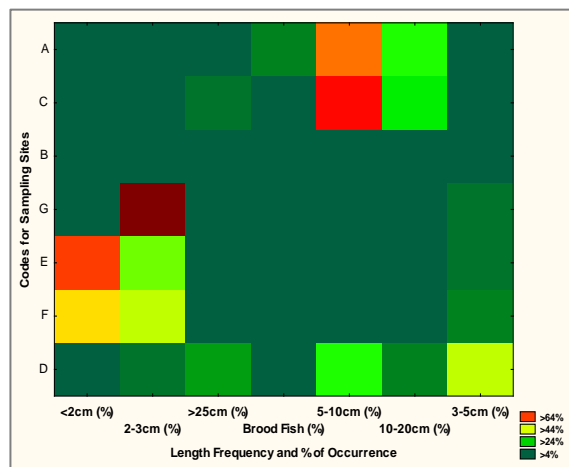
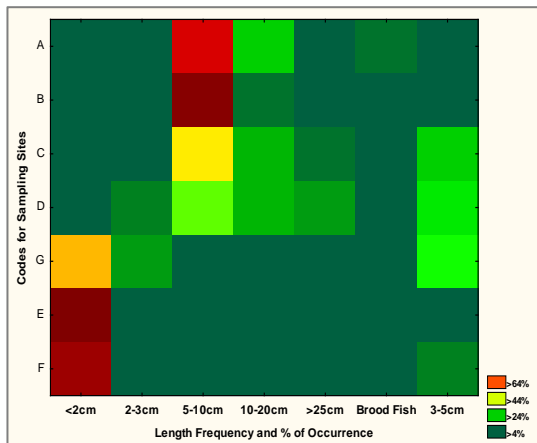
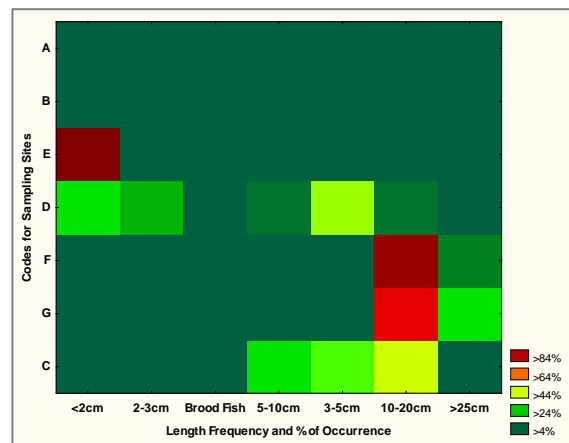


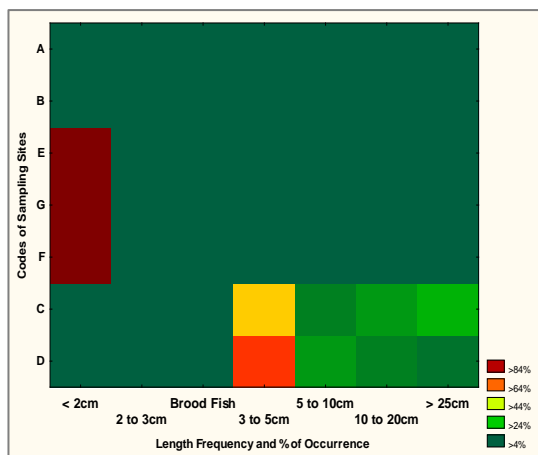
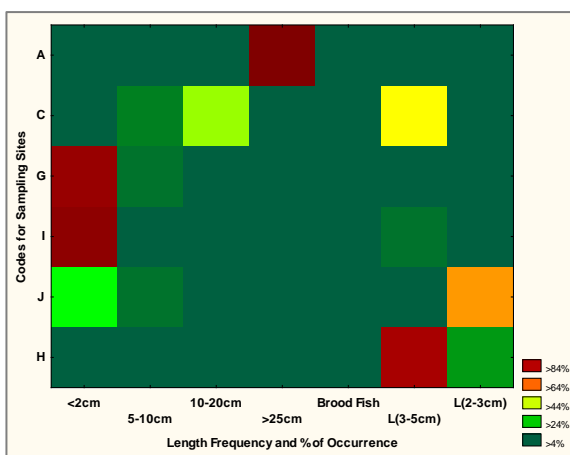
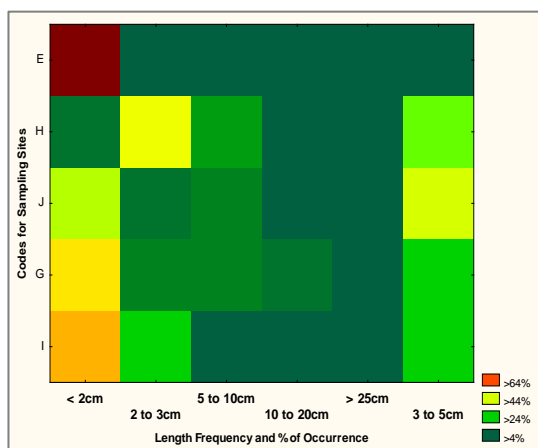
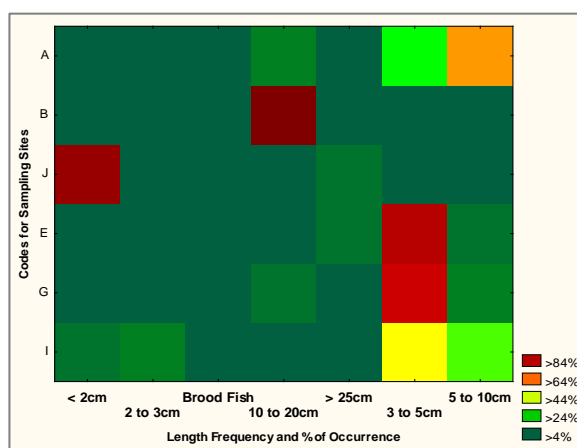
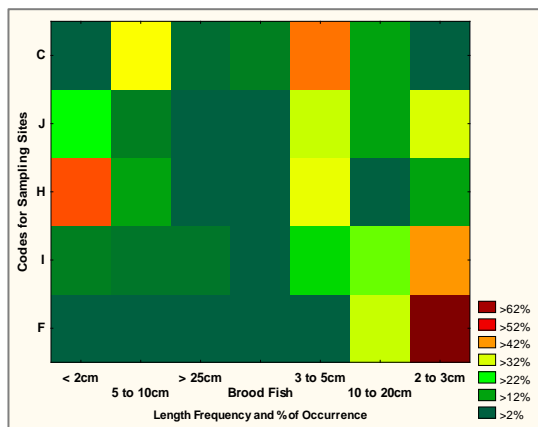
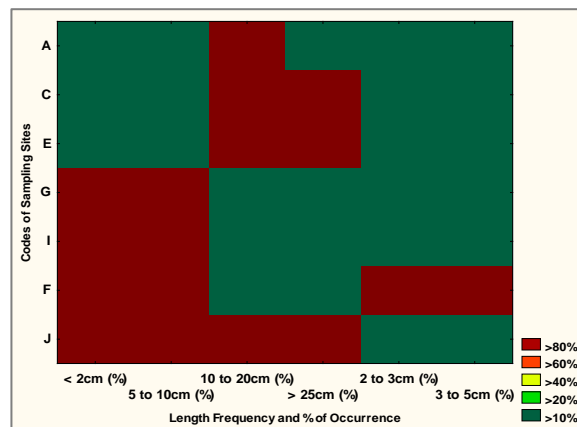
1st Monitoring, April, 2014

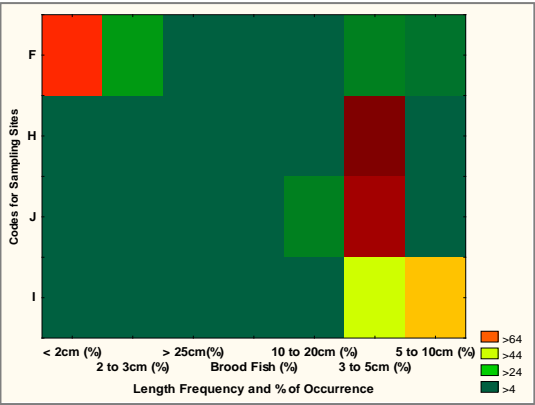


2nd Monitoring, July 2014

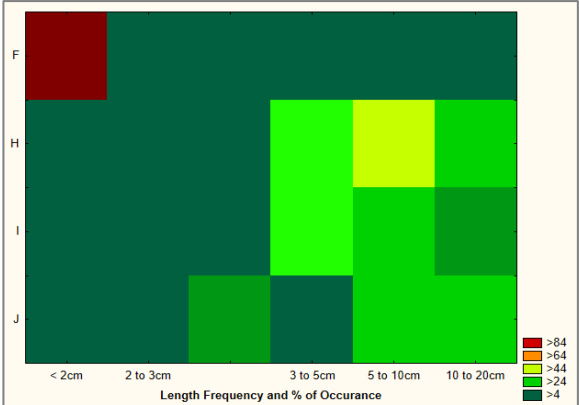
3<sup>rd</sup> Monitoring, October, 20144<sup>th</sup> Monitoring, January, 20155<sup>th</sup> Monitoring, April, 20156<sup>th</sup> Monitoring, August, 20157<sup>th</sup> Monitoring, October, 20158<sup>th</sup> Monitoring, January, 2016

9<sup>th</sup> Monitoring, April, 201610<sup>th</sup> Monitoring, July, 201611<sup>th</sup> Monitoring, October, 201612<sup>th</sup> Monitoring, January, 201713<sup>th</sup> Monitoring, April, 201714<sup>th</sup> Monitoring, October, 2017

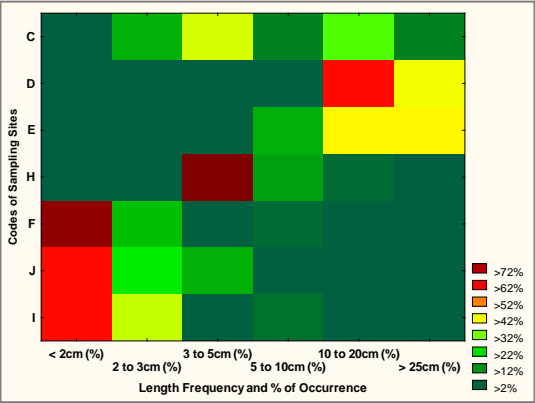
15<sup>th</sup> Monitoring, January, 201816<sup>th</sup> Monitoring, April, 201817<sup>th</sup> Monitoring, July, 201818<sup>th</sup> Monitoring, November, 201819<sup>th</sup> Monitoring, February, 201920<sup>th</sup> Monitoring, April, 2019



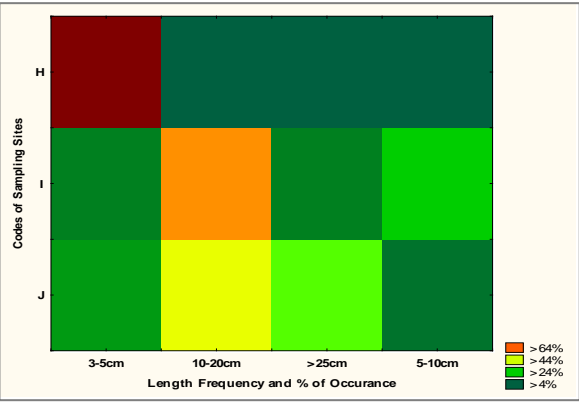
21<sup>st</sup> Monitoring, July 2019



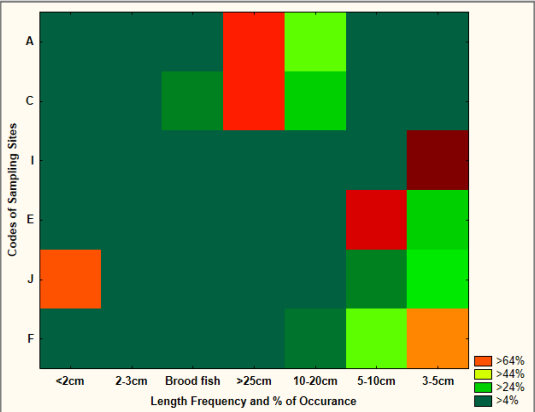
22<sup>nd</sup> Monitoring, November 2019



23<sup>rd</sup> Monitoring, February 2020



25<sup>th</sup> Monitoring, July 2020

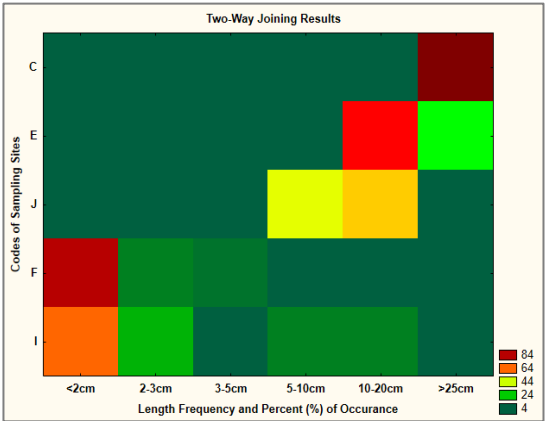


26<sup>th</sup> Monitoring, November 2021

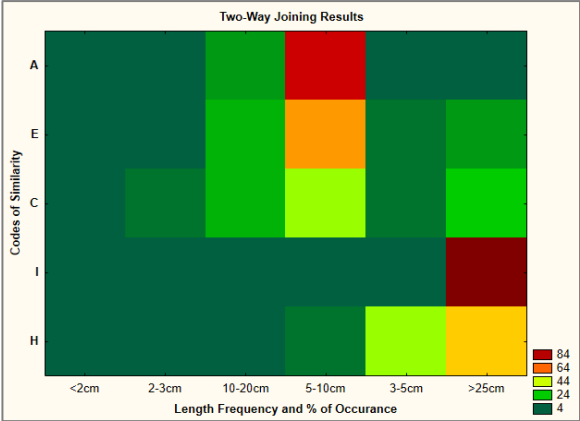


27<sup>th</sup> Monitoring, January 2021

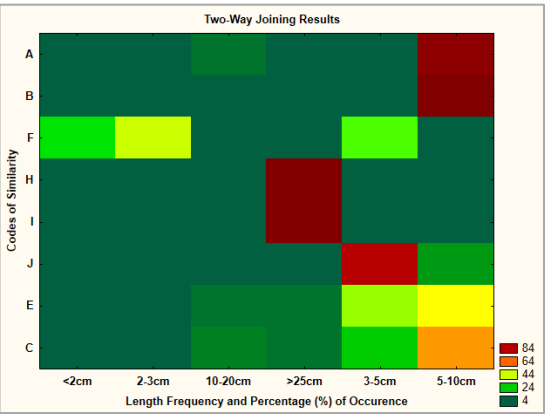




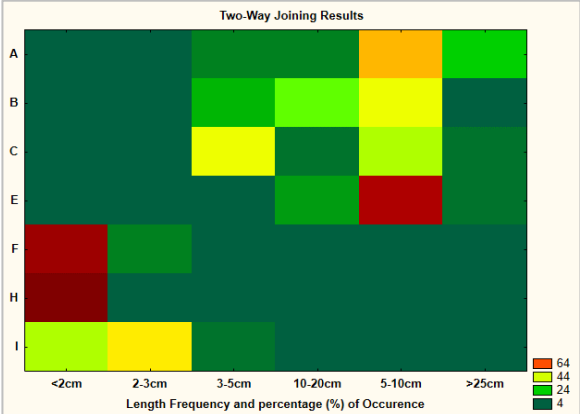
28<sup>th</sup> monitoring, April, 2021



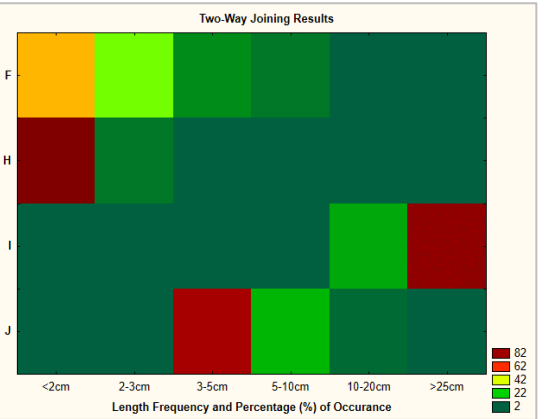
29<sup>th</sup> monitoring, August, 2021



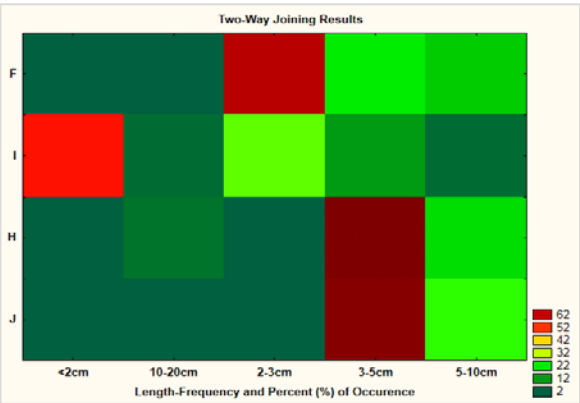
30<sup>th</sup> Monitoring, November, 2021



31<sup>st</sup> Monitoring, February, 2022



32<sup>nd</sup> Monitoring, May 2022



33<sup>rd</sup> Monitoring, July 2022

#### D.4: Occurrence of Species

[illegible]

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

Local Name	Scientific Name	Local Status*	13 <sup>th</sup> QM	14 <sup>th</sup> QM	15 <sup>th</sup> QM	16 <sup>th</sup> QM	17 <sup>th</sup> QM	18 <sup>th</sup> QM	19 <sup>th</sup> QM	20 <sup>th</sup> QM	21 <sup>st</sup> QM	22 <sup>nd</sup> QM	23 <sup>rd</sup> QM	25 <sup>th</sup> QM	26 <sup>th</sup> QM	27 <sup>th</sup> QM	28 <sup>th</sup> QM	29 <sup>th</sup> QM	30 <sup>th</sup> QM	31 <sup>st</sup> QM	32 <sup>nd</sup> QM	33 <sup>rd</sup> QM	34 <sup>th</sup> QM
		‘-’ = No; ‘+’ = Occurrence																					
Hilsa	<i>Tenualosa ilisha</i>	NO	-	-	-	-	-	+	-	-	-	+	-	-	-	-	-	+	-	+	-	+	-
Sagor Baim	<i>Anguilla bengalensis</i>	NT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bacha	<i>Eutropiichthys vacha</i>	CR	+	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
Bagda Chingri	<i>Penaeus monodon</i>	DD	+	-	+	+	+	+	+	+	+	+	+	-	-	+	+	+	-	+	+	-	-
Banspata	<i>Brachypleura novae-zeelandiae</i>	NO	+	+	+	+	+	+	+	+	+	-	-	+	+	+	-	+	-	+	+	-	-
Kukurjib	<i>Cynoglossus lingua</i>	NO	-	-	+	-	-	-	+	-	+	+	-	+	-	+	-	+	-	+	-	+	-
Bele	<i>Glossogobius giuris</i>	NO	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+
Aswine Bele	<i>Butis butis</i>	NO	+	+	+	+	+	-	+	+	-	-	-	-	-	-	-	-	-	-	+	-	-
Bairagi	<i>Coilia dussumieri</i>	NO	+	+	+	+	+	+	+	+	+	-	+	+	-	+	+	+	-	+	+	+	-
Boishakhi Chingri	<i>Macrobrachium</i> sp.	NO	-	-	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-
Chammu Chingri	<i>Metapenaeus brevicornis</i>	DD	-	+	+	+	+	+	+	+	+	+	+	-	+	+	+	-	-	+	+	-	+
Chaka Chingri	<i>Penaeus indicus</i>	DD	+	-	+	+	+	+	+	+	+	+	+	-	+	+	+	-	-	+	+	+	+
Ghora Chela	<i>Securicula gora</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chanda Chela	<i>Securicula</i> sp.	-	-	-	+	+	+	+	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-
Sada Chewa	<i>Trepauchen vagina</i>	NO	-	-	-	+	-	-	-	+	-	+	-	-	-	-	-	+	-	+	+	-	-
Lal Chewa	<i>Taenioides cirratus</i>	NO	+	+	-	+	+	-	+	+	-	-	+	-	-	-	+	+	-	-	-	-	-
Chhuri	<i>Trichiurus muticus</i>	NO	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
Sagor Chela	<i>Megalops cyprinoids</i>	NO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Purabi Chela	<i>Thryssa purava</i>	NO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kabashi Tengra	<i>Mystus cavasius</i>	DD	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-
Gagra Tengra	<i>Nemapteryx nenga</i>	DD	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	-	+	+	-	+
Gulsha Tengra	<i>Mystus bleekery</i>	DD	+	+	+	+	+	-	+	+	+	-	+	-	-	+	-	-	-	+	-	+	+
Harina Chingri	<i>Metapenaeus ensis</i>	DD	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	-	+	+
Ekthuto	<i>Hyporhamphus limbatus</i>	NO	+	+	-	-	+	+	+	+	+	+	-	-	-	+	-	-	+	-	-	-	-
Kakila	<i>Xenentodon cancila</i>	NO	-	+	-	-	+	-	-	-	-	+	-	-	+	-	-	-	+	+	-	-	+

Local Name	Scientific Name	Local Status*	13 <sup>th</sup> QM	14 <sup>th</sup> QM	15 <sup>th</sup> QM	16 <sup>th</sup> QM	17 <sup>th</sup> QM	18 <sup>th</sup> QM	19 <sup>th</sup> QM	20 <sup>th</sup> QM	21 <sup>st</sup> QM	22 <sup>nd</sup> QM	23 <sup>rd</sup> QM	25 <sup>th</sup> QM	26 <sup>th</sup> QM	27 <sup>th</sup> QM	28 <sup>th</sup> QM	29 <sup>th</sup> QM	30 <sup>th</sup> QM	31 <sup>st</sup> QM	32 <sup>nd</sup> QM	33 <sup>rd</sup> QM	34 <sup>th</sup> QM
		'-' = No; '+' = Occurrence																					
Chapila	<i>Gudusia chapra</i>	NO	-	-	-	-	+	+	+	-	+	+	-	+	+	+	+	-	+	+	+	+	-
Kuchia	<i>Monopterusuchia</i>	DD	+	+	+	+	+	+	-	+	+	-	+	+	-	+	+	+	-	+	-	+	-
Loitta	<i>Harpodon nehereus</i>	NO	+	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-	+	-	+	-	-
Motka Chingri	<i>Macrobrachium villosimanusless</i>	DD	+	+	+	+	+	+	+	+	+	+	+	-	-	+	+	-	-	+	+	+	+
Mud Crab	<i>Scylla serrata</i>	NO	+	+	+	+	-	+	+	+	-	+	+	-	-	-	-	-	+	+	+	+	+
Tular Dandi	<i>Sillaginopsis panijus</i>	NO	-	+	-	-	-	+	+	+	+	-	-	-	+	-	+	-	+	-	+	-	-
Pairst Chanda	<i>Scatophagus argus</i>	DD	-	-	-	-	-	-	+	-	-	-	-	-	-	+	-	-	-	+	-	-	+
Paissa	<i>Liza parsia</i>	NO	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+
Pangas	<i>Pangasius pangasius</i>	CR	-	-	-	-	-	+	+	+	+	+	-	-	-	-	-	+	+	+	-	-	+
Tak Chanda	<i>Leiognathus equulus</i>	NO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pheksa	<i>Setipinna phasa</i>	NO	+	+	-	+	-	-	+	+	+	+	+	-	+	-	+	+	-	+	-	-	-
Teli Pheksa	<i>Setipinna phasa</i>	DD	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-
Poma	<i>Poma poma</i>	NO	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+
Potka	<i>Chelonodon patoca</i>	NO	+	+	+	+	+	+	+	+	-	-	-	-	-	+	+	+	-	+	+	-	-
Shilong	<i>Silonia silondia</i>	EN	+	+	-	-	-	-	-	-	-	+	-	+	-	-	-	+	+	-	-	-	-
Tailla	<i>Eleutheronema tetradactylum</i>	DD	-	-	-	-	-	+	-	+	+	-	-	-	+	+	-	+	+	-	-	-	+
Tapse	<i>Polynemus paradiseus</i>	DD	-	+	+	+	+	+	+	+	+	-	+	+	+	-	-	+	+	-	+	-	-
Daitna	<i>Acanthopagrus latus</i>	DD	-	+	+	+	-	+	+	+	-	-	+	-	+	+	-	-	-	+	-	-	+
Shole	<i>Channa striatus</i>	DD	-	+	+	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-
Magur	<i>Clarias batrachus</i>	DD	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-
Koi	<i>Anabas testudineus</i>	DD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-
Vetki	<i>Lates calcarifer</i>	DD	+	+	+	+	-	+	+	-	+	-	-	-	+	-	-	+	-	-	-	-	+

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

Fish Species	Sampling	L (< 2cm)	L (2 to 3cm)	L (3 to 5cm)	L (5 to 10cm)	L (10 to 20cm)	L (> 25cm)	Brood Fish
Baila	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	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
Bhetki	A	0.00	0.00	0.00	0.00	0.00	100.00	0.00
	E	0.00	0.00	0.00	0.00	100.00	0.00	0.00
Bhut Baila	C	0.00	0.00	0.00	50.00	50.00	0.00	0.00
Chaka Chingri	A	0.00	0.00	50.00	50.00	0.00	0.00	0.00
	B	0.00	0.00	0.00	100.00	0.00	0.00	0.00
	E	0.00	0.00	100.00	0.00	0.00	0.00	0.00
Chamua	B	0.00	0.00	100.00	0.00	0.00	0.00	0.00
	C	0.00	0.00	100.00	0.00	0.00	0.00	0.00
Chitra	A	0.00	0.00	0.00	20.00	20.00	60.00	0.00
Chota Baila	C	0.00	0.00	0.00	0.00	100.00	0.00	0.00
Datina	E	0.00	0.00	0.00	0.00	100.00	0.00	0.00
Gagra Tengra	A	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
Goda Icha	A	0.00	0.00	50.00	50.00	0.00	0.00	0.00
	C	0.00	0.00	0.00	100.00	0.00	0.00	0.00
Golda	A	0.00	0.00	0.00	0.00	0.00	100.00	0.00
	E	0.00	0.00	0.00	50.00	50.00	0.00	0.00
Java	A	0.00	0.00	0.00	0.00	0.00	100.00	0.00
Juboti Icha	E	0.00	0.00	0.00	100.00	0.00	0.00	0.00
Kain	A	0.00	0.00	0.00	0.00	0.00	100.00	0.00
Kakila	C	0.00	0.00	100.00	0.00	0.00	0.00	0.00
Kalo Baila	E	0.00	0.00	0.00	100.00	0.00	0.00	0.00
Kathali	B	0.00	0.00	50.00	50.00	0.00	0.00	0.00
	C	0.00	0.00	50.00	50.00	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
Kumirer Khil	C	0.00	0.00	0.00	100.00	0.00	0.00	0.00
Menua	E	0.00	0.00	0.00	100.00	0.00	0.00	0.00
Mola	C	0.00	0.00	100.00	0.00	0.00	0.00	0.00
Motka	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
Mutkura Baila	E	0.00	0.00	100.00	0.00	0.00	0.00	0.00
Nandi Bele	E	0.00	0.00	0.00	0.00	100.00	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	0.00	50.00	50.00	0.00	0.00
	C	0.00	0.00	50.00	50.00	0.00	0.00	0.00
	E	0.00	0.00	0.00	100.00	0.00	0.00	0.00
Pangas	A	0.00	0.00	0.00	0.00	0.00	100.00	0.00
Tairel	B	0.00	0.00	100.00	0.00	0.00	0.00	0.00
Teo Paissa	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

Source: CEGIS field survey, October, 2022

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

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



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

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

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

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

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

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
	Maidara	Juvenile and Age-1 Adult	-	-	-	-	-	-	Feeding and Growing	-	and Growing		-	-
	Chalna Point	Juvenile	-	-	-	-	-	-	-	-	-		Feeding and Growing	-
Potka	Haldikhali	Adult	Feeding and Breeding	-	-	-	-	-	-	-	-		-	-
	Chandpai	Fry	Spawning	Spawning and Nursing	-	-	-	-	-	-	-		-	-
		Juvenile	-	-	-	-	-	-	-	Feeding and Growing	-		-	Feeding
		Adult	-	-	-	Feeding	-	-	-	-	-		Feeding	-
	Mongla Point	Fry	Spawning	-	-	-	-	-	-	-	-		-	-
		Juvenile	-	-	-	-	-	-	-	-	Feeding and Growing		-	-
	Harbaria	Fry	-	-	-	-	-	Nursery	-	-	-		-	-
		Juvenile	-	-	-	-	-	-	-	Feeding and Growing	-		-	-
Paira Chanda	Akram Point	Adult	Feeding	-	-	-	-	-	-	-	-		-	-
	Chandpai	Fry	Breeding and Spawning	-	-	-	-	-	-	-	-		-	-
Chewa	Akram Point	Juvenile and Adult	Feeding	-	Feeding and Growing	-	-	-	-	-			-	-
	Chandpai	Fry and Juvenile	Spawning	-	Feeding and Growing	-	Nursing and Grazing	Nursery	Feeding and Growing	-	Nursing		-	-
		Adult	-	-	-	Feeding	-	Feeding	-	Feeding	-		-	-

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
	Haldikhali	Juvenile and Adult	-	-	Feeding and Growing	-	-	-	-	-	-		-	-
	Harbaria	Juvenile and Adult	-	-	Feeding and Growing	-	-	Feeding and Nursery	-	Feeding	-		-	-
	Mongla Point	Juvenile	-	Feeding and Growing	-	-	-	-	-	-	-		-	-
	South-west of the Project	Juvenile	-	Feeding and Growing	-	-	-	-	-	-	-		-	-
	Chalna Point	Adult	-	-	-	-	Feeding	-	-	-	-		-	-
		Age-1 Juvenile	-	-	-	-	-	-	-	-	Feeding and Growing		-	-
Bele	Akram Point	Adult	Feeding	-	Feeding	Feeding	-	-	-	-	-		-	-
		Juvenile	-	-	-	-	-	-	-	Feeding and Growing	-		-	-
	Haldikhali	Juvenile-1, Juvenile and Adult	-	-	Nursing and Growing	Feeding	-	-	-	-	-		-	-
	Harbaria	Juvenile and Adult	-	-	Feeding and Growing	-	Feeding and Growing	Nursery and Feeding	Feeding and Growing	-	-		-	-
	Chandpai	Fry	Breeding and Spawning	Nursing	-	-	Nursing	Nursery	-	-	Nursery		-	-
	Chandpai	Juvenile and Adult	-	-	Feeding and Growing	Feeding	-	Feeding	-	Feeding	-		Feeding and Growing	
	Harbaria	Juvenile and Age-1 Adult	-	-	-	-	-	-	Feeding and Growing				-	-



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

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
	Harbaria	Juvenile	-	-	-	-	-	-	-	-	Feeding And Growing		-	-
	Chalna Point	Juvenile and Adult	Feeding	Feeding and Growing	-	-	-	-	Feeding and Growing	-			-	-
		Adult	-	-	Feeding	Feeding	Feeding	-	Feeding	-	-		-	-
	Mongla Point	Adult	-	-	Feeding	Feeding	-	-	Feeding and Growing	-	-		Feeding	-
	Chandpai	Juvenile and Adult	Feeding	Feeding and Growing	-	-	Feeding and Growing	-		-	-		-	-
	Maidara	Juvenile and Adult	Feeding	Feeding and Growing	-	-	-	-	-	-	-		-	-
		Juvenile	-	-	-	-	-	-	Feeding and Growing	-	-		-	-
		Adult	-	-	Feeding	Feeding	-	Feeding	-	-	-		-	-
	Paissa	Akram Point	Juvenile and Adult	Feeding	-	Feeding and Growing	Feeding	-	-	-	Feeding and Growing	-	-	Feeding
			Brood	-	-	-	-	-	-	-	-	-	-	Spawning
			Juvenile	-	-	-	-	-	Feeding and Growing			-	-	-
		Haldikhali	Juvenile and Adult	Feeding	-	Feeding And Growing	Feeding	-	-	-	-	-	-	-
			Juvenile	-	-	-	-	-	Feeding and Growing	-	-		-	-
		Harbaria	Juvenile-1 and Juvenile	-	-	Feeding	-	Feeding and Growing	-	Feeding and Growing	-	-	-	-
			Adult	-	-	-	-	-	-	Feeding	-		-	-
		Chandpai	Fry	Breeding and	-	-	-	Nursing	-	-	-	Nursery	-	-

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

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
	Harbaria	Adult	-	-	-	-	-	-	-	Feeding	Feeding		Feeding	-
	Mongla Point	Fry and Adult	Feeding	Nursing	-	-	-	-	-	-	-		-	-
		Adult	-	-	-	Feeding	-	-	-	-	Feeding		-	-
	Maidara	Adult	-	-	Feeding	Feeding	-	Breeding and Spawning	-	-	-		-	-
	Chalna Point	Adult	-	-	Feeding	Feeding	-	-	-	-	-		-	-
Hilsa	Akram Point	Brood Fish	-	-	-	-	-	-	-	-	-		Breeding and Spawning	-
	Haldikhali	Brood Fish	-	-	-	-	-	-	-	-	-		Breeding and Spawning	-
		Juvenile	-	-	Feeding and Growing	-	-	-	-	-	-		-	-
	Harbaria	Brood Fish	-	-	-	-	-	-	-	-	-		Breeding and Spawning	-
	Chandpai	Adult and Brood Fish	-	-	-	-	-	-	Feeding and Breeding	-	-		-	-
	Mongla Point	Adult	-	-	Feeding	-	-	-	-	-	-		-	-
		Brood Fish	-	-	-	-	-	-	-	-	-		Breeding and Spawning	-
	Maidara	Age-1 Adult	-	-	-	-	-	-	-	-	-		Feeding	-
Pangas	Chalna Point	Brood fish	-	-	-	-	-	Breeding and Spawning	-	-	-		-	-
	Haldikhali	Juvenile	-	-	Feeding and Growing	-	-	-	-	-	-		-	-
	Harbaria	Adult	-	-	-	-	-	-	-	Feeding	-		-	-
	Mongla Point	Juvenile and Adult	-	-	Feeding	-	-	-	-	-	-		-	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																				
			13 <sup>th</sup> QM	14 <sup>th</sup> QM	15 <sup>th</sup> QM	16 <sup>th</sup> QM	17 <sup>th</sup> QM	18 <sup>th</sup> QM	19 <sup>th</sup> QM	20 <sup>th</sup> QM	21 <sup>st</sup> QM	22 <sup>nd</sup> QM	23 <sup>rd</sup> QM	25 <sup>th</sup> QM	26 <sup>th</sup> QM	27 <sup>th</sup> QM	28 <sup>th</sup> QM	29 <sup>th</sup> QM	30 <sup>th</sup> QM	31 <sup>st</sup> QM	32 <sup>nd</sup> QM	33 <sup>rd</sup> QM	34 <sup>th</sup> QM
Tapsi	Haldikhali	Juvenile and Age-1 adult	-	-	Grazing	-	-	-	-	-	-		-	-	-	-	-	-	-	Fish Species	-	-	-
	Akram Point	Juvenile and Age-1 adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Bagda Chingri	-	-	-
		Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		M&F	-	-
	Chalna Point	Age-1 adult and Brood fish	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-
		Adult	-	Feeding	-	-	Feeding	-	-	Feeding	Feeding		-	-	-	-	-	-	-		-	-	-
	Harbaria	Juvenile and Age-1 adult	Feeding	-	-	-	-	-	-	-	-		-	-	-	-	-	Feeding	Feeding		-	-	-
		Adult and Brood Fish	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Bairagi	-	-	-
	Chandpai	Juvenile	-	Feeding and Growing	-	Feeding and Growing	Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-		-	-	-
	Mongla Point	Juvenile	-	-	-	-	-	-	Feeding and Growing	-	-		-	-	-	-	-	-	-	Banshpata	-	-	-
		Adult	-	-	-	-	-	-	-	-	-		Feeding	-	-	-	-	-	-		-	-	-
		Age-1 adult	-	-	-	-	Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-		-	-	-
		Fry	-	-	Nursing	-	-	-	-	-	-		-	Nursing	-	-	-	-	-		-	-	-
	Maidara	Age-1 adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Bele	-	-	-
		Juvenile	-	-	-	-	-	Maturation	-	-	-		-	-	-	-	-	-	-		-	-	-
		Adult	-	-	-	-	Feeding	-	-	-	-		-	-	-	-	-	-	-		-	-	-
		Brood Fish	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-
Bairagi/ Amadi	Haldikhali	Juvenile and Age-1 adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-
	Akram Point	Juvenile and Age-1 adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	Feeding	Feeding		M&F	-	-
		Juvenile and Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-
	Chandpai	Fry	-	Nursing	-	Nursing	-	-		Nursing	-		-	-	-	-	-	-	-	Bhol	-	-	-
		Juvenile	-	Feeding and Growing	Feeding and Growing	Feeding and Growing	-	Maturation	Feeding and Growing	-	Nursing		-	-	-	-	-	-	-	Bhut Bele	F&G	-	-
	Chalna Point	Juvenile and Age-1 adult	-	-	-	-	-	-	-	Feeding	-		-	-	-	-	-		-		-	-	-
		Fry	Nursing	-	-	-	-	Nursing	-	Nursing	-		-	-	-	-	-	-	-	Chaka Chingri	M	-	-
	Harbaria	Juvenile	-	-	Feeding and Growing	-	Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-		-	-	-
	Mongla Point	Fry	Nursing	-	Nursing	-	-	-	-	-	-		Nursing	Nursing	-	-	-	-	-		-	-	-
		Juvenile	-	-	-	-	Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-		-	-	-
	Maidara	Juvenile	-	-	-	-	-	Maturation	-	-	-	Feeding and Growing	-	-	-	-	Feeding and Growing	-	-	Chali Chingri	-	-	-
		Fry	Nursing	-	Nursing	-	-	Nursing	-	Nursing	-		-	-	-	-	-	-	-		-	-	-
	Charaputia	Adult	-	-	-	-	-	-	-	Feeding	-		-	-	-	-	-	-	-	Chamua Chingri	-	-	-
	Jongra	Fry	-	-	-	-	-	-	-	Nursing	-		-	-	-	-	-	-	-		-	-	-
Chapila	Haldikhali	Juvenile	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-
	Akram Point	Juvenile	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																				
			13 <sup>th</sup> QM	14 <sup>th</sup> QM	15 <sup>th</sup> QM	16 <sup>th</sup> QM	17 <sup>th</sup> QM	18 <sup>th</sup> QM	19 <sup>th</sup> QM	20 <sup>th</sup> QM	21 <sup>st</sup> QM	22 <sup>nd</sup> QM	23 <sup>rd</sup> QM	25 <sup>th</sup> QM	26 <sup>th</sup> QM	27 <sup>th</sup> QM	28 <sup>th</sup> QM	29 <sup>th</sup> QM	30 <sup>th</sup> QM	31 <sup>st</sup> QM	32 <sup>nd</sup> QM	33 <sup>rd</sup> QM	34 <sup>th</sup> QM
	Harbaria	Juvenile	-	-	-	-	Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-	Chanda	F&G	F&G	-
	Mongla Point	Fry	-	-	-	-	Nursing	-	-	-	-		-	-	-	-	-	-	-	Chapila	-	-	-
		Juvenile	-	-	-	-	Feeding and Growing	-	-	-	-		-	Feeding and Growing	-	-	-	-	-	Chela	-	-	-
		Adult	-	-	-	-	Feeding	-	Maturation	-	-		-	-	-	-	-	-	-		-	-	-
	Chalna Point	Adult	-	-	-	-	Feeding	-	Maturation	-	Maturation	Feeding	-	-	-	-	-	-	-		-	-	-
		Fry	-	-	-	-	-	Nursing	-	-	-		-	-	-	-	-	-	-	Chewa	-	-	-
	Maidara	Juvenile to Age-1 adult	-	-	-	-	-	Growing and Maturation	-	-	-		-	-	-	-	-	-	-		-	-	-
Loitta	Haldikhali	Juvenile and Age-1 adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Chhati Icha	-	-	-
	Akram Point	Juvenile	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Chitra	-	-	-
	Akram Point	Age-1 adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-
	Chandpai	Juvenile	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		G	-	-
	Jongra	Fry	-	-	-	-	-	-	-	Nursing	-		-	-	-	-	-	-	-	Chota Bele	-	-	-
	Harbaria	Fry, Juvenile and Age-1 adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-
	Mongla Point	Fry	-	-	Nursing	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-
	Chalna Point	Age-1 adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-
		Fry	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Datina	-	-	-
Poma	Haldikhali	Juvenile	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-
	Akram Point	Juvenile	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-
		Age-1 adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	Maturation	-		-	-	-
		Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Dogri	-	-	-
	Charaputia	Brood Fish	-	-	-	Spawning	-	-		-	-		-	-	-	-	-	-	Maturation	Ekthuitta	-	-	-
		Juvenile and Adult	-	-	-	Feeding	-	-	Growing and Maturation	Feeding	-		Growing and Maturation	-	-	Growing and Maturation	Maturation		Nursing		-	-	-
	Chandpai	Fry and Juvenile	-	-	-	Nursing	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-
		Fry	-	-	-	-	Nursing	-	-	-	-		-	-	-	-	-	-	-	Gagra Tengra	-	-	-
		Juvenile	Feeding and Growing	-	-	Feeding and Growing	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-
		Adult		Feeding	Feeding	Feeding	-	-	-	-	-		-	-	-	-	Feeding	-	-	Gangania	M&F	M&F	-
		Brood Fish	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-
	Jongra	Fry	-	-	-	-	-	-	-	Nursing	-		-	-	-	-	-	-	-	Golda Chingri	-	-	-
	Haldikhali	Fry and Juvenile	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-
	Harbaria	Adult and Brood Fish	-	-	-	-	-	-	-	-	-			-	-	-	-	Maturation	-		-	-	-
		Adult	Feeding	-	-	-	-	Feeding	-	-	-		-	-	-	-	-	-	-	Gulsha Tengra	-	-	-
		Fry and Juvenile	-	-	-	-	-	-	-	-	-		Nursing	-	-	-	-	-	-		-	M&F	-
	Mongla Point	Fry, Juvenile and Age-1 adult	Nursing	-	-	-	Nursing	-	Feeding and Growing	-	-		Nursing and Maturation	-	-	-	-	-	-	Harina Chingri	-	-	-
		Fry	-	Nursing	-	-	-	-	-	-	-		-	Nursing	-	-	-	-	-		-	-	-
		Juvenile	-	-	-	-	-	-	-	-	Nursing		-	-	-	-	-	Maturation	-		-	-	-
		Age-1 Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-
		Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																				
			13 <sup>th</sup> QM	14 <sup>th</sup> QM	15 <sup>th</sup> QM	16 <sup>th</sup> QM	17 <sup>th</sup> QM	18 <sup>th</sup> QM	19 <sup>th</sup> QM	20 <sup>th</sup> QM	21 <sup>st</sup> QM	22 <sup>nd</sup> QM	23 <sup>rd</sup> QM	25 <sup>th</sup> QM	26 <sup>th</sup> QM	27 <sup>th</sup> QM	28 <sup>th</sup> QM	29 <sup>th</sup> QM	30 <sup>th</sup> QM	31 <sup>st</sup> QM	32 <sup>nd</sup> QM	33 <sup>rd</sup> QM	34 <sup>th</sup> QM
		Brood Fish	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Ilish	-	-	-
	Maidara	Adult	-	Feeding	-	-	-	-	Maturation and Feeding	-	-		Feeding	-	-	-	-	-	-	Java	-	-	-
		Juvenile	-	-	-	-	-	-	-	-	-	-	-	Maturation and Feeding	-	-	-	-	-		-	-	-
		Fry	-	-	-	-	-	Nursing	-	-	-	Nursing	-	-	-	-	-	-	-	Kain Magur	-	-	-
	Chalna Point	Juvenile and Adult	-	Feeding and Growing	-	-	-	Maturation and Feeding	Maturation and Feeding	-	Maturation and Feeding		-	Maturation and Feeding	-	-	-	-	-		-	-	-
		Fry	Nursing	-	-	-	-	-	-	-	-		-	-	-	-	-	Feeding	-	Kala Poa	-	-	-
Chhuri	Haldikhali	Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	M&F
	Akram Point		-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Kathali Chingri	-	-	-
Chela	Haldikhali	Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-
	Akram Point	Juvenile and Adult	-	-	-	-	-	-	-	-	-		-	-	-	Maturation and Feeding	-	-	-	Khoira	-	-	-
	Harbaria	Fry and Juvenile	-	-	-	-	-	-	-	-	-		-	-	Nursing and Maturation	-	-	-	Feeding and Growing	Kholla	-	-	-
	Chalna Point		-	-	-	Nursing and Feeding	-	-	-	-	-	Nursing and Maturation	-	Nursing and Maturation	-	-	-	-	-		-	-	-
	Chandpai		-	-	Feeding and Growing		-	-	-	Nursing	Nursing		-	-	Nursing and Maturation	-	Feeding and Growing	-	-	Kuchia	-	-	M&F
	Mongla Point		-	Nursing	-	-	-	-	-	-	-	Nursing and Maturation	-	-	-	-	-		-		-	-	-
Gang Tengra	Haldikhali	Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-
	Akram Point	Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-
	Harbaria	Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Kukurjib	-	F&G	-
	Chandpai	Adult	-	-	-	-	Feeding	-	-	-	-		-	-	-	-	-	-	-	Kumirer Khil	-	-	-
	Maidara	Fingerling	-	-	-	-	Nursing	-	-	-	-		-	-	-	-	-	-	-		-	-	-
	Mongla Point	Fingerling					Nursing	-	-	-	-		-	-	-	-	-	-	-	Menua	-	-	-
		Age-1 Adult					Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-		-	-	-
Ghagra Tengra	Chandpai	Juvenile and Age-1 adult	-	-	-	-	-	Maturation		-	-		-	-	Maturation	-	Maturation	-	-		-	-	-
		Brood Fish	-	-	Breeding	-	-	-	-	-	-		-	-	-	-	-	-	-	Motka Chingri	-	-	-
		Fry	-	-	-	-	Nursing	-	-	-	-		-	-	-	-	-	-	-		-	M	-
	Chalna Point	Age-1 adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	Nursing	-		-	-	-
	Mongla Point	Age-1 adult	-	-	-	-	-	-	Maturation and Feeding	-	Maturation and Feeding		-		-	-	-	-	-		-	-	-
		Juvenile	-	-	-	-	-	-	-	-	-	-	-	Feeding and Growing	-	-	-	-	-		-	-	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																				
			13 <sup>th</sup> QM	14 <sup>th</sup> QM	15 <sup>th</sup> QM	16 <sup>th</sup> QM	17 <sup>th</sup> QM	18 <sup>th</sup> QM	19 <sup>th</sup> QM	20 <sup>th</sup> QM	21 <sup>st</sup> QM	22 <sup>nd</sup> QM	23 <sup>rd</sup> QM	25 <sup>th</sup> QM	26 <sup>th</sup> QM	27 <sup>th</sup> QM	28 <sup>th</sup> QM	29 <sup>th</sup> QM	30 <sup>th</sup> QM	31 <sup>st</sup> QM	32 <sup>nd</sup> QM	33 <sup>rd</sup> QM	34 <sup>th</sup> QM
	Akram Point	Juvenile and Adult	Feeding	-	-	-	-	-	-	Feeding and Growing	-		-	-	Maturation	-	-	-	Feeding and Growing	Mutkura Bele	-	-	-
		Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	Feeding	Maturation		-	-	-
	Haldikhali	Juvenile	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Nandi Bele	-	-	-
	Harbaria	Adult	Feeding	Breeding	-	-	-	-	Feeding	-		-	-	-	Maturation	-	Maturation	-	Maturation		-	-	-
		Juvenile	-	-	-	-	Maturation	-	Maturation	-		-	-	-	-	-	-	-	-	Paissa	-	-	-
	Charaputia	Juvenile and Age-1 adult	-					Maturation	-	-		Maturation	-	-	Maturation	-	Maturation	-	-		-	-	-
Gulsha Tengra	Haldikhali	Adult	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-	
	Akram Point	Adult	-	-	-	-	-	-	-	-		-	-	-	-	-	-	Feeding and Growing		-	-	-	
	Chandpai	Age-1 adult	Feeding	-	Feeding and Growing	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-
		Juvenile	-	Feeding and Growing	-	Feeding and Growing	-	-	-	-	-		-	-	-	-	-	-	Maturation		-	-	-
	Charaputia	Juvenile	-	-	-		-	-	Feeding and Growing	-	-		-	-	-	-	-	-	-	Pangas	-	-	M&F
		Age-1 adult	-	-	-	-	-	-	-	-	-	-	-	-	-	Maturation	-	-	-	Phesa	-	-	-
	Mongla Point	Age-1 adult	-	-	-	-	Feeding and Growing	-	-	-	-		-	-	-	-	-	-		-	-	-	
		Juvenile	-	-	-	-	Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-	Poa	-	-	-
	Harbaria	Juvenile	-	-	-	-	Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-		-	-	-
		Age-1 adult	-	-	-	-	Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-		-	-	-
	Maidara	Juvenile and Age-1 Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-
	Chalna Point	Juvenile	-	-	-	-	-	-	-	-	-		-	Feeding and Growing		-	-	-	-		-	-	-
Potka	Haldikhali	Adult	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Poikka	-	F&G	-	
	Chalna Point	Fry	-	-	-	-	-	Nursing	-		-		-	-	-	-	-	-	Potka	-	-	-	
	Chandpai	Fry	-	-	-	-	-	-	-	Nursing	-		-	-	-	-	-	-	-		-	-	-
		Juvenile	Feeding	-	-	-	-	-	Feeding and Growing	-	-		-	-	-	-	Feeding and Growing	-	-	Punti	-	-	-
		Adult	-	Feeding and Growing	Feeding	-	-	-	-	-	-	-		-	-	-	-	-	-	Rekha	-	-	-
	Jongra	Fry	-	-	-	-	-	-	-	Nursing	-		-	-	-	-	-	-		-	-	-	
	Mongla Point	Fry	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	Serboti	-	-	M&F	
		Juvenile	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Tairel	-	-	-
	Maidara	Fry	-	-	-	Nursing	-	Nursing	-	Nursing	-		-	-	-	-	-	-	-	Tao Paissa	-	-	-
		Juvenile	-	-	-	-	-	Maturation	-	-	-		-	-	-	-	-	-	Feeding and Growing		-	-	-
	Harbaria	Fry	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-		-	-	F	
	Charaputia	Juvenile and adult	-	-	-	-	-	-	Feeding and Growing	-	-		-	-	-	Feeding and Growing	-	-	Feeding and Growing	Tengra	-	-	-
Paira Chanda	Akram Point	Adult	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	M&F	-	



Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																						
			13 <sup>th</sup> QM	14 <sup>th</sup> QM	15 <sup>th</sup> QM	16 <sup>th</sup> QM	17 <sup>th</sup> QM	18 <sup>th</sup> QM	19 <sup>th</sup> QM	20 <sup>th</sup> QM	21 <sup>st</sup> QM	22 <sup>nd</sup> QM	23 <sup>rd</sup> QM	25 <sup>th</sup> QM	26 <sup>th</sup> QM	27 <sup>th</sup> QM	28 <sup>th</sup> QM	29 <sup>th</sup> QM	30 <sup>th</sup> QM	31 <sup>st</sup> QM	32 <sup>nd</sup> QM	33 <sup>rd</sup> QM	34 <sup>th</sup> QM		
Chewa	Akram Point	Juvenile and Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	Feeding and Growing	Thurina	-	-	-		
	Chandpai	Fry and Juvenile	-	-	-	-	-	-	-	Nursing	-		-	-	-	-	Feeding and Growing	-	-	Tiger Chingri	-	-	-		
		Juvenile	-	Feeding and Growing	-	-	-	-	-	-	Feeding and Growing		-	-	-	-	-	-	-			-	-	-	
		Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-			-	-	-	
	Jongra	Fry	-	-	-	-	-	-	-	Nursing	-		-	-	-	-	-	Feeding	-	Topse	-	-	-		
		Fry and Juvenile	-	-	-	-	-	-	-	-	-	-	Nursing	-	-	-	-	-	-	Fish Species	-	-	-		
	Chandpai	Juvenile-1	-	-	-	-	Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-	Bagda Chingri	-	-	-		
	Mongla Point	Juvenile	-	-	-	-	-	-	-	-	Nursing	Maturation	Maturation	-	-	-	-	-	-			-	-	-	
		Fry	-	-	-	-	Nursing	-	-	-	-		-	-	-	-	Maturation	-	-			-	-	-	
	Maidara	Juvenile	-	-	-	-	-	-	-	-	-	Maturation	-	-	-	-	-	-	-	-			-	-	-
		Fry	-	-	Nursing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			-	-	-
	Chalna Point	Adult	-	-	-	-	-	Feeding	-	-	-	Feeding	-	Feeding	-	-	-	-	-	-	Bairagi	-	-	-	
		Age-1 Juvenile	-	-	-	-	-	-	-	-	-		Maturation	-	-	-	-	-	-	Feeding and Maturation		-	-	-	
Bele	Akram Point	Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Banshpata	-	-	-		
		Juvenile	-	-	-	-	-	-	-	-			-	-	-	Feeding	Maturation	-	-			-	-	-	
	Chandpai	Fry	-	-	-	Nursing	Nursing	-	-	Nursing	-	Nursing	-	-	-	-	-	-	-			-	-	G&M	
		Juvenile and Adult	Feeding and Growing	-	Feeding and Growing	-	-	-	-	Feeding and Growing		-	-	-	Maturation and Feeding	-	-	-	-	Feeding and Maturation		-	-	-	
	Jongra	Fry	-	-	-	-	-	-	Nursing	-		-	-	-	-	-	-	-	-	Bele	-	-	-		
	Harbaria	Juvenile and Age-1 Adult	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			-	-	-	
	Mongla Point	Fry	-	Nursing	-	-	Nursing	-	-	-	-	-	-	-	-	-	-	-	-			-	-	-	
		Juvenile and Adult	-	-	-	-	-	-	-	-	Maturation and Feeding	-	-	-	-	-	-	-	-			-	-	-	
	Chalna Point	Fry	-	-	Nursing	Nursing	-	-	-	-			-		-	-	-	-	-	Feeding and Maturation		-	-	-	
		Fingerling	-	-	-	-	Nursing	-	-	-	-		Nursing	Nursing	-	-	-	-	-			-	-	-	
		Juvenile and Age-1 adult	-	-	-	-	-	-	-	-	-	-	-	Maturation and Feeding	-	-	Feeding and Growing	Maturation	-			-	-	-	
	Maidara	Juvenile and Age-1 adult	-	-	Feeding and Growing	-	Feeding and Growing	Feeding and Growing	-	-	Maturation and Feeding	Maturation and Feeding	Maturation and Feeding	-	-	-	-	-	-	-	Bhol	-	-	-	
		Fry	Nursing	-	Nursing	-	-	-	-	-		-	-		-	-	-	-	-	-	Bhut Bele	-	-	-	
	Charaputia	Juvenile and Age-1 adult	-	-	-	-	-	Maturation	-	-		-	-	-	-	-	-	-	-			-	-	-	
Tular Dandi (Nona bele)	Akram Point	Adult	-	-	-	-	-	-	-	Feeding and Maturation	-		-	-	-	-	-	-	-	Chaka Chingri	-	-	-		
	Chandpai	Age-1 Adult	-	-	Feeding	-	-	-	-	-	-		-	-	-	-	-	-	-			-	-	-	
		Juvenile	-	-	-	-	-	-	Growing	-	-	-		-	-	-	-	-	-			-	-	G&M	

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																				
			13 <sup>th</sup> QM	14 <sup>th</sup> QM	15 <sup>th</sup> QM	16 <sup>th</sup> QM	17 <sup>th</sup> QM	18 <sup>th</sup> QM	19 <sup>th</sup> QM	20 <sup>th</sup> QM	21 <sup>st</sup> QM	22 <sup>nd</sup> QM	23 <sup>rd</sup> QM	25 <sup>th</sup> QM	26 <sup>th</sup> QM	27 <sup>th</sup> QM	28 <sup>th</sup> QM	29 <sup>th</sup> QM	30 <sup>th</sup> QM	31 <sup>st</sup> QM	32 <sup>nd</sup> QM	33 <sup>rd</sup> QM	34 <sup>th</sup> QM
		Fry	-	-	-	-	-	-	-	Nursing	-		-	-	-	-	-	-	-	-	-	-	-
	Jongra	Fry	-	-	-	-	-	-	-	Nursing	-	-	-	-	-	-	-	-	-	Chali Chingri	-	-	-
	Maidara	Adult	-	Feeding	-	-	-	-	Maturation	-	-	-	-	-	-	-	Maturation and Feeding	-	-		-	-	G&M
	Chalna Point	Adult	-	-	-	-	-	-	Maturation	Maturation	Maturation and Feeding	-	-	-	Maturation and Feeding	-	-	-	Maturation	Chamua Chingri	-	-	-
Tairel	Akram Point	Adult	-	-	-	Feeding	-	-	-	-	-	-	-	-	-		-	-	Maturation		-	-	G&M
		Age-1 Adult	-	-	-	-	-	-	-	-	-	-	-	-	-	Maturation	-	-	-		-	G&M	-
	Charaputia	Juvenile	-	-	-	-	-	-	-	Maturation	-		-	-	-	-	-	-	-		-	-	-
	Harbaria	Age-1 Adult	-	Feeding and Growing	-	-	-	-	-	-	-		-	-	-	-	-	-	-	Chanda	-	-	-
	Chandpai	Juvenile	-	-	-	-	-	Growing	-	-	Feeding and Growing		-	-	-	-	-	Maturation g	-	Chapila	-	-	-
	Chalna Point	Juvenile	-	-	-	-	-	-	-	-	Growing		-	-	-	-	-	-	Maturing	Chela	-	-	-
	Maidara	Juvenile	-	-	-	-	-	Growing	-	-	-		-	-	-	-	-	-	-		-	-	G&M
Pheksa	Akram Point	Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	G&M	-
	Charaputia	Juvenile and Adult	-	-	-	-	-	-	-	Feeding and Maturation	-			-	-	-	Maturation	-	Maturing	Chewa	-	G&M	-
	Chalna Point	Juvenile and Adult	-	-	-	Feeding and Growing	-	-	-	Maturation	Maturation			-	Maturation	-	-	-	-		-	-	-
	Mongla Point	Adult	-	Feeding	-	-	-	-	Maturation	-	-	Feeding		-	-	-	-	-	-	Chhati Icha	-	-	-
		Adult	-	-	-	-	-	-	Maturation	-	-		Feeding	-	-	-	-	-	-	Chitra	-	-	-
		Juvenile	-	-	-	Growing	-	-		-	-	-	-	-	-	-	-	-	-		-	-	-
	Chandpai	Juvenile and Adult	-	-	-	Feeding and Growing	-	-	Maturation	--	-	-	-	-	-	-	-	-	Growing and Maturation		-	-	-
	Maidara	Adult	-	Feeding	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Chota Bele	-	-	-
Paissa	Akram Point	Juvenile and Adult	Feeding	-	-	-	-	Growing and Maturation	-	-	-	-	-	-	-	Growing and Maturation	-	-	-		-	-	-
		Brood	Spawning	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Growing and Maturation		-	-	-
	Charaputia	Brood Fish	-	-	-	Spawning	-	-	-	-	-	-	-	-	-	-	-	Feeding	-		-	-	-
		Juvenile and Adult	-	-	-	-	-	-	-	-	-	-	-	-	-	Feeding	-	-	Growing and Maturation	Datina	-	-	-
		Fry	-	-	-	-	-	-	-	-	-	-	Nursing	-	-	-	-	-	-		-	-	-
	Harbaria	Juvenile-1 and Juvenile	-	Feeding and Growing	-	-	-	-	-	-	-		-	-	Feeding and Growing	-	-	-	-		-	-	-
		Adult	-	Feeding	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-
	Chalna	Fry	-	-	-	-	-	-	Feeding and Growing	-	Feeding and Growing		Nursing	Nursing	-	Feeding	Feeding and Growing	-	-	Dogri	-	-	-
	Chandpai	Fry	-	-	-	Nursing	-	-	Feeding and Growing	Nursing	Nursing	Nursing	Nursing	-	Feeding and Growing	Feeding	-	-	-	Ekthuitta	-	-	-

Migratory Fish Species	Sampling Sites	Year Class*	Migration Purpose																				
			13 <sup>th</sup> QM	14 <sup>th</sup> QM	15 <sup>th</sup> QM	16 <sup>th</sup> QM	17 <sup>th</sup> QM	18 <sup>th</sup> QM	19 <sup>th</sup> QM	20 <sup>th</sup> QM	21 <sup>st</sup> QM	22 <sup>nd</sup> QM	23 <sup>rd</sup> QM	25 <sup>th</sup> QM	26 <sup>th</sup> QM	27 <sup>th</sup> QM	28 <sup>th</sup> QM	29 <sup>th</sup> QM	30 <sup>th</sup> QM	31 <sup>st</sup> QM	32 <sup>nd</sup> QM	33 <sup>rd</sup> QM	34 <sup>th</sup> QM
		Juvenile and Adult	Feeding	Feeding and Growing	-	Feeding and Growing	-	Maturation	-	-			-	-	-	-	-	-	Feeding and Growing		-	-	-
	Jongra	Fry	-	-	-	-	-	-	-	Nursing			-	-	-	-	-	-	-		-	-	-
	Harbaria	Juvenile	-	-	Feeding and Growing	-	-	Maturation	-	-			-	-	Feeding and Growing	-	-	-	-	Gagra Tengra	-	-	F
	Mongla Point	Fry	-	-	Nursing	-	-	-	-	-			-	-	-	-	-	-	-		-	-	-
		Age-1 Adult	-	-	-	-	-	-	-	-		Maturation	-	-	-	-	-	-	-	Gangania	-	-	-
	Maidara	Fry, Juvenile and Age-1 adult	-	-	-	-	-	-	Feeding and Growing	-	Feeding and Growing		-	-	Feeding and Growing	-	-	-	-		-	-	-
		Juvenile	-	-	-	-	-	Growing	-	-	-		Maturation	-	-	-	-	-	-	Golda Chingri	-	-	-
Banshpata	Chandpai	Juvenile	-	-	-	Growing	Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-		M&F	-	-
		Adult	-	Feeding	Feeding	-	-	-	-	-	-		-	-	-	-	-	-	Growing and Maturation		-	-	-
	Jongra	Juvenile	-	-	-	-	-	-	-	Maturation	-		-	-	-	-	-	-	-	Gulsha Tengra	-	-	-
	Charaputia	Juvenile and Age-1 Adult	-	-	-	Feeding	-	-	Growing and Maturation	-	-		-	-	-	Growing and Maturation	-	-	-		-	-	-
	Akram Point	Juvenile	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	Feeding and growing	Harina Chingri	-	-	-
	Haldikhali	Juvenile and adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-
	Harbaria	Adult	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-
	Mongla Point	Juvenile	-	-	-	-	Feeding and Growing	-	-	-	-		-	-	-	-	-	-	-		-	-	-
	Maidara	Juvenile and Age-1 Adult	-	-	-	-	-	Growing and Maturation	Growing and Maturation	-	-		-	-	Maturation	-	-	Maturation	-		-	-	-
		Adult	-	Feeding	-	-	-	Feeding	-	-	-		-	-	-	-	-	Maturation	-	Ilish	-	-	-
	Chalna Point	Juvenile and Age-1 Adult	-	-	-	-	-	-	Growing and Maturation	Feeding	Growing and Maturation		-	Growing and Maturation	-	-	-	-	Maturation	Java	-	-	-
Hilsa	Akram Point	Brood Fish	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	Maturation		-	-	-
	Maidara	Age-1 Adult	-	-	-	-	-	-	-	-	-	Maturation	-	-	-	-	-	-	Maturation	Kain Magur	-	-	-
	Chalna Point	Adult	-	-	-	-	-	Maturation	-	-	-	Feeding	-	-	-	-	-	Nursining	-		-	-	-
Pangas	Haldikhali	Juvenile	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	Maturation	Kala Poa	-	-	-
	Charaputia	Adult	-	-	-	-	-	-	-	Feeding	-		-	-	-	-	-	-	-		M&F	-	-
	Mongla Point	Juvenile	-	-	-	-	-	-	Feeding and Growing	-	Feeding and Growing		-	-	-	-	-	-	-	Kathali Chingri	-	-	-
	Maidara	Juvenile and Age-1 Adult	-	-	-	-	-	-	-	-	-	Feeding and Growing	-	-	-	-	-	-	-		-	-	-

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



## D.7: The Present Catch in Three Sampling Ghers

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

Sampling Site	Total Catch (ton): 2014-2015							
	1st QM (April, 2014)		2nd QM (July, 2014)		3rd QM		4th QM	
	Species	ton	Species	ton	Species	ton	Species	ton
	-	-	-	-	Catla	56	-	-
	-	-	-	-	Mrigel	50	-	-
Sub-total =		1.89		2.91		197.5	-	-
Grand-total =		17.00		11.33		226.5	-	-

Source: CEGIS Field Survey, 2014-2015

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

Sampling Site	Total Catch (ton): 2015-2016							
	5th QM		6th QM		7th QM		8th QM	
	Species	ton	Species	ton	Species	ton	Species	ton
	-	-	-	-	Tengra	0	-	0
	-	-	-	-	Paissa	0	-	0
<b>Sub-total=</b>	-	<b>0</b>	-	<b>3.02</b>	-	<b>0</b>	-	<b>0</b>
3	Bagda	-	Bagda	3.5	Bagda	0.4	-	0
	-	-	-	-	Paissa	3.2	-	0
	-	-	-	-	Vetki	0.4	-	0
	-	-	-	-	Tilapia	0.06	-	0
	-	-	-	-	Horina Chingri	0.35	-	0
	-	-	-	-	Chali Chingri	0.6	-	0
	-	-	-	-	Chaka Chingri	0.1	-	0
	-	-	-	-	Tengra	0	-	0
	-	-	-	-	Bele	0	-	0
	-	-	-	-	Tairel	0.06	-	0
	-	-	-	-	Bhangan	0	-	0
<b>Sub-total =</b>	-	-	-	-	-	<b>5.17</b>	-	<b>0</b>
<b>Grand-total =</b>	-	<b>1</b>		<b>3.5</b>		<b>36.17</b>	-	<b>9</b>

Source: CEGIS Field Survey, 2015-2016

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



Sampling Site	Total Catch (ton): 2016-2017							
	9th QM		10th QM		11th QM		12th QM	
	Species	ton	Species	ton	Species	ton	Species	ton
	-	0	-	-	Tilapia	3.2	-	0
<b>Sub-total =</b>	-	<b>2</b>	-		-	<b>4</b>	-	<b>2.01</b>
<b>Grand-total =</b>	-	<b>3.14</b>	-		-	<b>19</b>	-	<b>2.01</b>

Source: CEGIS Field Survey, 2016-2017

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

Sampling Site	Total Catch (ton): 2017-2018 and 2018-19													
	13th QM		14th QM		15th QM		16th QM		17th QM		18th QM		19 <sup>th</sup> QM	
	Species	ton	Species	ton	Species	ton	Species	ton	Species	ton	Species	ton	Species	ton
	-	-	Bhangan	0.7	-	-	Nilotica	0.00	Chali	0.04	Golda	0.08		
							Khorulla	0.00	Chel	0.01	Horina	1.8		
							Mrigel	0.00	Golda	0.00	Paissa	0.8		
							Catla	0.00	Horina	0.50	Rui	3		
							Grass Carp	0.11	Motka	0.05	Tengra	0.8		
							Common Carp	5.55	Paissa	0.03	Tilapia	8		
							Sarpunti	0.53	Rui	0.00	Vetki	2		
							Horina	1.91	Tengra	0.13				
							Chali Chingri	1.16	Tilapia	0.41				
							Bele	0.43	Vetki	0.01				
							Vetki	1.96						
							Tengra	4.20						
							Paissa	0.14						
							Tairel	0.003						
							Pheksa	0.001						
<b>Sub-total =</b>		<b>0</b>		<b>14.2</b>	-	-	=	<b>34.38</b>	=	<b>2.75</b>	=	<b>25</b>		
<b>3</b>	Bagda	0	Bagda	2	-	-	Bagda	0.50	Bagda	0.10	-	0	Bagda	-
	-	-	Paissa	8	-	-	Tilapia	1.50	Horina Chingri	0.00			Golda	-
	-	-	Tengra	2	-	-	Tengra	0.12	Paissa	0.00			Paissa	-
	-	-	Tilapia	5	-	-	Paissa	0.00	Tengra	0.00			Nilotica	-
	-	-	Rui	3	-	-	Horina Chingri	0.60	Tilapia	0.20			Khorsul	-
	-	-	Vetki	2	-	-								
	-	-	Catla	10	-	-								

Sampling Site	Total Catch (ton): 2017-2018 and 2018-19													
	13th QM		14th QM		15th QM		16th QM		17th QM		18th QM		19th QM	
	Species	ton	Species	ton	Species	ton	Species	ton	Species	ton	Species	ton	Species	ton
Sub-total =	-	0	-	32	-	-								
Grand-total =	-	1	-	49.8	-	-	=	2.72	=	0.30	=	0		

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

Total Catch (ton): 2019-20, 2020-21 and 2021-22																												
Sampling Site/ Location	20 <sup>th</sup> QM		21 <sup>st</sup> QM		22 <sup>nd</sup> QM		23 <sup>rd</sup> QM		25 <sup>th</sup> QM		26 <sup>th</sup> QM		27 <sup>th</sup> QM		28 <sup>th</sup> QM		29 <sup>th</sup> QM		30 <sup>th</sup> QM		31 <sup>st</sup> QM		32 <sup>nd</sup> QM		33 <sup>rd</sup> QM		34 <sup>th</sup> QM	
	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)
Bhekatkhali Khal, Rajnagar	Bagda	32	Bagda	2.72	Bagda	0.8	Harina	0.02	Bagda	1.2	Patari	0.2	-	-	Bagda	0.7	Bagda	0.5	Patari	0.30	-	-	Bagda	1.2	Bagda	1.2	Bagda	0.7
	Horina	48	Harina	3.44	Harina	1.0	-	-	Harina	2.0	Tilapia	0.5	-	-	Harina	0.15	Harina	0.6	Harina	0.10	-	-	Harina	0.5	Harina	0.2	Harina	0.2
	-	-	Tilapia	0.7	Chali	0.2	-	-	Tilapia	1.0	Paissa	0.05	-	-	-	-	Paissa	0.05	Tilapia	1.20	-	-					Tilapia	2.0
	-	-	Parse	0.17	Patari	0.3	-	-	-	-	Harina	0.2	-	-	-	-	Tilapia	2.0	Chali	0.10	-	-					Paissa	0.5
	-	-	-	-	Tairel	0.03	-	-	-	-	Carpu	1.0	-	-	-	-	Chali	0.3									Patari	0.05
	-	-	-	-	Tilapia	0.5	-	-	-	-	Rui	0.05	-	-	-	-												
	-	-	-	-	Datina	0.02	-	-	-	-	Grass Carp	0.05	-	-	-	-												
											Golda	0.02	-	-	-	-												
											Bagda	0.3	-	-	-	-												
Sub-total =		80		7.0		2.8		0.02		4.2		2.37	-	-		0.85		3.45		1.70	-	-		1.7		1.4		
Kapashdanga-Muralia	Bagda	1.41	Bagda	6.74	Bagda	3.42	Harina	0.01	Bagda	4.84	Bagda	1.45	-	-	Bagda	0.04	Bagda	2.73	Bagda	0.07	-	-	Bagda	3.2	Bagda	1.5	Bagda	0.07
	Paissa	0.60	Golda	0.01	Harina	3.96	-	-	Hatina	0.92	Hatina	1.08	-	-	Hatina	0.14	Harina	0.96	Harina	0.81	-	-	Harina	0.28	Harina	0.16	Harina	0.8
	Crab	0.00	Harina	0.65	Chali	0.38	-	-	Chali	0.20	Chali	0.30	-	-	Chali	0.03	Chali	0.11	Chali	0.01	-	-	Chali	0.12	Chali	0.1	Chali	0.12
	Tilapia	0.30	Chali	0.04	Bele	2.11	-	-	Bele	0.27	Bele	0.19	-	-			Bele	0.44	Bele	0.58			Bele	0.15	Bele	0.15	Bele	0.52

Total Catch (ton): 2019-20, 2020-21 and 2021-22																												
Sampling Site/ Location	20 <sup>th</sup> QM		21 <sup>st</sup> QM		22 <sup>nd</sup> QM		23 <sup>rd</sup> QM		25 <sup>th</sup> QM		26 <sup>th</sup> QM		27 <sup>th</sup> QM		28 <sup>th</sup> QM		29 <sup>th</sup> QM		30 <sup>th</sup> QM		31 <sup>st</sup> QM		32 <sup>nd</sup> QM		33 <sup>rd</sup> QM		34 <sup>th</sup> QM	
	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)
	Golda	0.10	Bele	0.09	Paissa	2.62	-	-	Paissa	0.04	Paissa	1.80	-	-			Paissa	0.2	Paissa	0.34			Paissa	0.1	Paissa	0.2	Paisas	0.32
	Horina	2.92	Tilapia	0.22	Tilapia	9.85	-	-	Tilapia	3.87	Tilapia	6.93	-	-			Tilapia	12.9	Tilapia	7.82			Tilapia	4.5	Tilapia	1.5	Tilapia	7.0
	Chali	1.52	Tengra	0.57	Golda	0.04	-	-	Golda	0.03	Golda	0.03	-	-			Tengra	0.01	Tengra	0.02			Patari	0.4	Tengra	0.1	Tengra	0.02
	Bele	1.35	Bhangan	0.08	Tengra	0.17	-	-	Tengra	0.01	Tengra	0.17	-	-					Patari	1.76					Patari	0.6	Patari	1.60
	Tengra	0.27	-	-	Patari	2.25	-	-	Patari	0.11	Patari	0.25	-	-					Datina	0.06					Datina	0.14	Datina	0.06
	Major Carp	0.55	-	-	Chemo	0.02	-	-	Datna	0.01	Catol	0.04	-	-					Rui	0.27					Rui	0.6	Rui	0.24
	-	-	-	-	Datina	1.01	-	-	Rui	0.47	Chemo	0.32	-	-					Kailla	0.03					Kailla	0.1		
	-	-	-	-	Rui	1.27	-	-	Chaka	0.05			-	-														
	-	-	-	-	Chaka	0.01	-	-	-	1.56			-	-														
	-	-	-	-	Kailla	0.96	-	-	-	-			-	-														
	-	-	-	-	Nundi Bele	0.02	-	-	-	-			-	-														
	-	-	-	-	Kakra	0.49	-	-	-	-			-	-														
Sub-total =		9		8.0		29		0.01		12.38		12.57	-	-		0.21		17.38		11.76	-	-		8.39		5.15		
Chunkuri-2	Bagda	0.04	Patari	0.01	Tilapia	0.02	-	-	Paissa	0.05	Sada Chingri	0.03	-	-	Bagda	0.01	Paissa	0.12	Paissa	0.08	-	-	Bagda	0.04	Bagda	0.05	Kharalla	0.05
	Paissa	0.00	Tair/Tailla	0.01	Paissa	0.066	-	-	Golda	0.03	Paissa	0.03	-	-	Harina	0.06	Bagda	0.04	Bagda	0.04	-	-	Harina	0.07	Harina	0.4	Paissa	0.80
	Khorsula	0.00	Bhangan	0.01	Khorsul	0.009	-	-	Kharulla	0.01	Patari	0.02	-	-	Kakra	0.01	Tilapia	0.08	Tilapia	0.16	-	-			Paissa	0.4	Bagda	0.06
	Horina	0.10	Datina	0.03	Bagda	0.015	-	-	Bagda	0.10	Tengra	0.01	-	-			Harina	0.06	Harina	0.04							Patari	0.04
	Motka	0.04	Bagda	0.02	Golda	0.006	-	-	Bele	0.03	Datina	0.02	-	-			Kakra	0.12	Patari	0.04							Tilapia	0.12
	Chali	0.03	Golda	0.03	Patari	0.015	-	-	Harina	0.15	Ilish	0.005	-	-			Patari	0.02	Kala Chingri	0.04							Harina	0.40

Total Catch (ton): 2019-20, 2020-21 and 2021-22																														
Sampling Site/ Location	20 <sup>th</sup> QM		21 <sup>st</sup> QM		22 <sup>nd</sup> QM		23 <sup>rd</sup> QM		25 <sup>th</sup> QM		26 <sup>th</sup> QM		27 <sup>th</sup> QM		28 <sup>th</sup> QM		29 <sup>th</sup> QM		30 <sup>th</sup> QM		31 <sup>st</sup> QM		32 <sup>nd</sup> QM		33 <sup>rd</sup> QM		34 <sup>th</sup> QM			
	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)	Fish Species	Production (ton)		
	Chaka	0.01	Faissa	0.01	Harina	0.008	-	-	Tengra	0.02	Golda	0.01	-	-			Kala Icha	0.04	Sada Chingri	0.04										
	Bele	0.01	Chaka Chingri	0.01	Chali	0.009	-	-	Tairu	0.03	Nilotica	0.06	-	-			Sada Icha	0.04	Golda	0.01										
	Crab	0.03	Harina	0.02	China Punti	0.047	-	-	Chaka	0.01	Baila	0.004	-	-			Bele	0.01												
	-	-	-	-	Tengra	0.008	-	-	Datina	0.02	Goda Chingri	0.001	-	-			Golda	0.01												
	-	-	-	-	Baila	0.003	-	-	-	-	Chaka Chingri	0.2	-	-																
	-	-	-	-	Datina	0.02	-	-	-	-	Harina	0.02	-	-																
											Chitra	0.004	-	-																
											Pheksa	0.01	-	-																
											Bhangan	0.004	-	-																
											Tairel	0.01	-	-																
											Golda	0.01	-	-																
											Bagda	0.02	-	-																
Sub-total =		0.24		0.15		0.46		0.00		0.44		0.25	-	-		0.08		0.54		0.45	-	-		0.11		0.13				

CEGIS field survey: 2014-2022

## (E) Traffic Survey data

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

Date: October 27, 2022

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	57	112	0	25	50	0	18	54	0
Auto Rickshaw	0.8	0	2	2	0	0	0	0	0	0
Van	0.6	171	333	302	182	240	253	130	315	267
Cycle	0.2	24	111	27	29	23	10	63	25	18
Human Howler	0.6	10	0	6	4	5	5	11	37	29
CNG	0.5	20	39	30	15	24	20	24	22	23
Private Car	1	110	98	208	46	80	126	52	141	193
Motor Cycle	0.3	469	476	284	238	235	142	339	415	226
Jeep	1	29	11	40	7	17	24	9	16	25
Pick-up	2	18	70	176	17	40	114	16	71	174
Micro	1	63	51	114	27	42	69	38	86	124
Bus	2.5	167	116	708	84	114	495	69	132	503
Light Truck	2	40	5	90	23	20	86	38	20	116
Medium Truck	2	146	99	490	79	70	298	161	106	534
Heavy Truck	2	28	23	102	8	10	36	28	48	152
			<b>Total</b>	<b>2578</b>		<b>Total</b>	<b>1678.4</b>		<b>Total</b>	<b>2383.1</b>

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

Date: October 26, 2022

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	39	41	0	9	10	0	29	39	0
Auto Rickshaw	0.8	1	1	1.60	0	0	0	0	1	1
Van	0.6	64	132	117.60	82	125	124	93	98	115
Cycle	0.2	12	7	3.80	16	9	5	7	15	4
Human Howler	0.6	25	20	27.00	20	29	29	20	27	28
CNG	0.5	65	70	67.50	24	31	28	70	66	68
Private Car	1	28	12	40.00	10	15	25	21	19	40
Motor Cycle	0.3	145	63	62.40	81	91	52	165	177	103
Jeep	1	12	4	16.00	2	3	5	2	5	7
Pick-up	2	6	7	26.00	1	4	10	3	6	18
Micro	1	36	15	51.00	8	20	28	16	19	35
Bus	2.5	44	34	195.00	14	29	108	19	22	103
Light Truck	2	9	5	28.00	3	7	20	2	3	10
Medium Truck	2	50	27	154.00	15	32	94	25	23	96
Heavy Truck	2	15	5	40.00	12	8	40	11	23	68
			<b>Total</b>	<b>830</b>		<b>Total</b>	<b>567</b>		<b>Total</b>	<b>695</b>

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

Date: October 25, 2022

Vehicles		7:00 AM to 10:00AM			12:00 PM to 2:00PM			17:00 PM to 19:00PM		
Direction	Factor	Power Plant to Zero Point	Zero Point to Power plant	PCU	Power Plant to Zero Point	Zero Point to Power plant	PCU	Power Plant to Zero Point	Zero Point to Power plant	PCU
Pedestrian	0	35	10	0	15	5	0	35	14	0
Auto Rickshaw	0.8	0	0	0	0	0	0	0	0	0
Van	0.6	50	77	76.2	43	47	54	65	36	60.6
Cycle	0.2	19	83	20.4	19	8	5.4	30	11	8.2
Human Howler	0.6	15	19	20.4	12	10	13.2	20	16	21.6
CNG	0.5	23	21	22	12	3	7.5	17	10	13.5
Private Car	1	5	14	19	3	3	6	14	9	23
Motor Cycle	0.3	70	208	83.4	54	55	32.7	146	48	58.2
Jeep	1	0	2	2	4	1	5	1	1	2
Pick-up	2	9	9	36	8	7	30	5	5	20
Micro	1	10	20	30	7	7	14	13	7	20
Bus	2.5	4	3	17.5	0	0	0	1	0	2.5
Light Truck	2	0	0	0	0	0	0	0	1	2
Medium Truck	2	0	4	8	1	18	38	8	12	40
Heavy Truck	2	0	0	0	1	0	2	5	2	14
			<b>Total</b>	<b>335</b>		<b>Total</b>	<b>208</b>		<b>Total</b>	<b>286</b>










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



Year	Cropping Season	Monitoring Spot-1 (Baranpara)	Monitoring Spot-2 (Chunkuri-2)	Monitoring Spot-3 (Kapalirmet)	Monitoring Spot-4 (Chakgona)	Monitoring Spot-5 (Basherhula)	Monitoring Spot-6 (Bidyarbon)
2013-2014	Kharif-I	Fallow	Fallow	Fallow	Fallow	Fallow	-
	Kharif-II	Local Aman	HYV Aman	Local Aman	Local Aman	Local Aman	-
	Rabi	Fallow	Fallow	Fallow	Fallow	Fallow	-
2014-2015	Kharif-I	Fallow	Fallow	Fallow	Fallow	Fallow	-
	Kharif-II	HYV Aman	Local Aman	Fallow	Fallow	Local Aman	-
	Rabi	Fallow	Fallow	Fallow	Fallow	Fallow	-
2015-2016	Kharif-I	Fallow	Fallow	Fallow	Fallow	Fallow	-
	Kharif-II	HYV Aman	HYV Aman	Fallow	Fallow	Local Aman	-
	Rabi	Fallow	Fallow	Fallow	Fallow	Fallow	-
2016-2017	Kharif-I	Fallow	Fallow	Fallow	Fallow	Fallow	-
	Kharif-II	HYV Aman	Local Aman	Fallow	Fallow	Local Aman	-
	Rabi	Fallow	Fallow	Fallow	Fallow	Fallow	-
2017-2018	Kharif-I	Fallow	Fallow	Fallow	Fallow	Fallow	-
	Kharif-II	Local Aman	Local Aman	Fallow	Fallow	Local Aman	
	Rabi	Fallow	Fallow	Fallow	Fallow	Fallow	
2018-2019	Kharif-I	Fallow	Fallow	Fallow	Fallow	Fallow	Fallow
	Kharif-II	Local Aman	Local Aman	Fallow	Local Aman	Local Aman	Local Aman
	Rabi	Fallow	Fallow	Fallow	Fallow	Fallow	Fallow
2019-2020	Kharif-I	Fallow	Fallow	Fallow	Fallow	Fallow	Fallow
	Kharif-II	Local Aman	Local Aman	Fallow	Local Aman	Local Aman	Local Aman
	Rabi	Fallow	Fallow	Fallow	Fallow	Fallow	Fallow
2020-2021	Monitoring field visit was not taken place due to COVID-19 Pandemic						
2021-2022	Kharif-I	Fallow	Fallow	Fallow	Fallow	Fallow	Fallow
	Kharif-II	BR10	Local Aman	Fallow	Local Aman	Local Aman	BR10
	Rabi	Fallow	Fallow	Fallow	Fallow	Fallow	Fallow
2023-2023	Kharif-I	Fallow	Fallow	Fallow	Fallow	Fallow	Fallow
	Kharif-II	BR10	Local Aman	Fallow	Local Aman	Local Aman	BR10
	Rabi	Fallow	Fallow	Fallow	Fallow	Fallow	Fallow

Source: Based on field information and farmers interviewed.

## (F) Monitoring results

	<b>Government of the People's Republic of Bangladesh</b> <b>Office of the Chief Chemist</b> <b>Department of Public Health Engineering</b> <b>Central Lab, 38-39, Mohakhali C/A, Dhaka-1212</b> Phone: 88-02-9881927, Fax: 88-02-9882003, Email: wqrsc_central_lab@yahoo.com					
Lab Memo: 348/ CC, DPHE, CL, Dhaka		Date: 20-10-2022				
<b>Physical /Chemical/ Bacteriological Analysis of Water Sample</b>						
Sample ID: CEN2022100262	Sample Receiving date: 12-09-2022					
Ref. Memo No: 42.06.2626.119.37.001.22-2311 & Dated: 08-09-2022	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: 12/09/2022-20/10/2022					
<b>LABORATORY TEST RESULTS:</b>						
Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.002	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00016	mg/L	AAS	0.00015
3	Calcium (Ca)	75	17	mg/L	AAS	0.17
4	Chemical Oxygen Demand (COD)	4.0	4	mg/L	CRM	-
5	Chloride	150-500	70	mg/L	Titrimetric	-
6	Bi-Carbonate (HCO <sub>3</sub> <sup>-</sup> )	0.0	100	mg/L	Titrimetric	-
7	Cr (Total)	0.05	0.029	mg/L	AAS	0.0003
8	Hardness	200-500	140	mg/L	Titrimetric	-
9	Iron (Fe)	0.3-1	6.12	mg/L	AAS	0.05
10	Lead (Pb)	0.05	0.006	mg/L	AAS	0.001
11	Magnesium (Mg)	30-35	13	mg/L	AAS	0.05
12	Phosphate	6.0	4.2	mg/L	UVS	0.10
13	Potassium (K)	12.0	16	mg/L	AAS	-
14	Total Dissolved Solid (TDS)	1000	190	mg/L	Multimeter	-
15	Total Suspended Solid (TSS)	10	27	mg/L	Gravimetric Method	-
16	Turbidity	10	306	NTU	Turbidity Meter	-
17	Carbonate (CO <sub>3</sub> )	-	0.21	mg/L	Titrimetric	-

	<b>Government of the People's Republic of Bangladesh</b> <b>Office of the Chief Chemist</b> <b>Department of Public Health Engineering</b> <b>Central Lab, 38-39, Mohakhali C/A, Dhaka-1212</b> Phone: 88-02-9881927, Fax: 88-02-9882003, Email: wqrsc_central_lab@yahoo.com					
Lab Memo: 348/ CC, DPHE, CL, Dhaka		Date: 20-10-2022				
<b>Physical /Chemical/ Bacteriological Analysis of Water Sample</b>						
Sample ID: CEN2022100263	Sample Receiving date: 12-09-2022					
Ref. Memo No: 42.06.2626.119.37.001.22-2311 & Dated: 08-09-2022	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: 12/09/2022-20/10/2022					
<b>LABORATORY TEST RESULTS:</b>						
Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.002	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00015	mg/L	AAS	0.00015
3	Chemical Oxygen Demand (COD)	4.0	12	mg/L	CRM	-
4	Cr (Total)	0.05	0.030	mg/L	AAS	0.0003
5	Hardness	200-500	110	mg/L	Titrimetric	-
6	Lead (Pb)	0.05	0.005	mg/L	AAS	0.001
7	Phosphate	6.0	0.70	mg/L	UVS	0.10
8	Total Dissolved Solid (TDS)	1000	125	mg/L	Multimeter	-
9	Total Suspended Solid (TSS)	10	23	mg/L	Gravimetric Method	-
<b>Test Performed by:</b> 1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer  20.10.2022	<b>Countersigned/Approved by:</b> 1.) Name: Mita Sarker Designation: Senior Chemist  20.10.2022 2.) Name: Md. Biplab Hossain Designation: Chief Chemist  20.10.2022 <b>Md. Biplab Hossain</b> Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka					

	<b>Government of the People's Republic of Bangladesh</b> <b>Office of the Chief Chemist</b> <b>Department of Public Health Engineering</b> <b>Central Lab, 38-39, Mohakhali C/A, Dhaka-1212</b> Phone: 88-02-9881927, Fax: 88-02-9882003, Email: wqmsc_central_lab@yahoo.com	
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Lab Memo: 348/ CC, DPHE, CL, Dhaka

Date: 20-10-2022

**Physical /Chemical/ Bacteriological Analysis of Water Sample**

Sample ID: CEN2022100264	Sample Receiving date: 12-09-2022
Ref. Memo No: 42.06.2626.119.37.001.22-2311 & Dated: 08-09-2022	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: 12/09/2022-20/10/2022

**LABORATORY TEST RESULTS:**



Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.002	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00015	mg/L	AAS	0.00015
3	Chemical Oxygen Demand (COD)	4.0	4	mg/L	CRM	-
4	Cr (Total)	0.05	0.029	mg/L	AAS	0.0003
5	Hardness	200-500	115	mg/L	Titrimetric	-
6	Lead (Pb)	0.05	0.006	mg/L	AAS	0.001
7	Phosphate	6.0	1.2	mg/L	UVS	0.10
8	Total Dissolved Solid (TDS)	1000	122	mg/L	Multimeter	-
9	Total Suspended Solid (TSS)	10	24	mg/L	Gravimetric Method	-

Comments: Sample was collected &amp; supplied by client.

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

<b>Test Performed by:</b> 1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer Signature:  20.10.2022 2.) Name: Taslima Akhter Designation: Sample Analyzer Signature:  20.10.2022	<b>Countersigned/Approved by:</b> 1.) Name: Mita Sarkar Designation: Senior Chemist Signature:  20.10.2022 2.) Name: Md. Biplab Hossain Designation: Chief Chemist Signature:  20.10.2022 Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka
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Page 1 of 1

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Lab Memo: 348/ CC, DPHE, CL, Dhaka

Date: 20-10-2022

**Physical /Chemical/ Bacteriological Analysis of Water Sample**




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Ref. Memo No: 42.06.2626.119.37.001.22-2311 & Dated: 08-09-2022	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: 12/09/2022-20/10/2022

**LABORATORY TEST RESULTS:**


Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.002	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00015	mg/L	AAS	0.00015
3	Calcium (Ca)	75	17	mg/L	AAS	0.17
4	Chemical Oxygen Demand (COD)	4.0	8	mg/L	CRM	-
5	Chloride	150-800	50	mg/L	Titrimetric	-
6	Bi-Carbonate (HCO <sub>3</sub> <sup>-</sup> )	0.0	125	mg/L	Titrimetric	-
7	Cr (Total)	0.05	0.023	mg/L	AAS	0.0003
8	Hardness	200-500	120	mg/L	Titrimetric	-
9	Iron (Fe)	0.3-1	7.12	mg/L	AAS	0.05
10	Lead (Pb)	0.05	0.007	mg/L	AAS	0.001
11	Magnesium (Mg)	30-35	13	mg/L	AAS	0.05
12	Phosphate	6.0	3.8	mg/L	UVS	0.10
13	Potassium (K)	12.0	12	mg/L	AAS	-
14	Total Dissolved Solid (TDS)	1000	140	mg/L	Multimeter	-
15	Total Suspended Solid (TSS)	10	31	mg/L	Gravimetric Method	-
16	Turbidity	10	399	NTU	Turbidity Meter	-
17	Carbonate (CO <sub>3</sub> )	-	0.23	mg/L	Titrimetric	-

Comments: Sample was collected &amp; supplied by client.

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



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

Page 1 of 2

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Lab Memo: 348/ CC, DPHE, CL, Dhaka

Date: 20-10-2022

**Physical /Chemical/ Bacteriological Analysis of Water Sample**


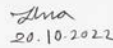
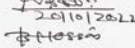
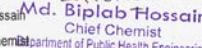
Sample ID: CEN2022100266	Sample Receiving date: 12-09-2022
Ref. Memo No: 42.06.2626.119.37.001.22-2311 & Dated: 08-09-2022	Sample Source: Surface Water
Sent by: Mohammed Mukteruzzaman, Director, P, E & Mineral Resources Division, CEGIS, Gulshan-1, Dhaka.	Dist: Bagerhat, Upa: Rampal
Care Taker: CEGIS (Sample ID : SW-05)	Union:, Vill.:
Sample Collection date:	Date of Testing: 12/09/2022-20/10/2022

**LABORATORY TEST RESULTS:**

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.002	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00020	mg/L	AAS	0.00015
3	Chemical Oxygen Demand (COD)	4.0	36	mg/L	CRM	-
4	Cr (Total)	0.05	0.025	mg/L	AAS	0.0003
5	Hardness	200-500	110	mg/L	Titrimetric	-
6	Lead (Pb)	0.05	0.009	mg/L	AAS	0.001
7	Phosphate	6.0	2.0	mg/L	UVS	0.10
8	Total Dissolved Solid (TDS)	1000	115	mg/L	Multimeter	-
9	Total Suspended Solid (TSS)	10	27	mg/L	Gravimetric Method	-

Comments: Sample was collected &amp; supplied by client.

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

<b>Test Performed by:</b> 1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer Signature:  20.10.2022 2.) Name: Taslima Akhter Designation: Sample Analyzer Signature:  20.10.2022	<b>Countersigned/Approved by:</b> 1.) Name: Mita Sarker Designation: Senior Chemist Signature:  20.10.2022 2.) Name: Md. Biplob Hossain Designation: Chief Chemist Signature:  20.10.2022 Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka
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Page 1 of 1

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Lab Memo: 348/ CC, DPHE, CL, Dhaka

Date: 20-10-2022

**Physical /Chemical/ Bacteriological Analysis of Water Sample**


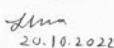
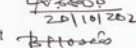
Sample ID: CEN2022100267	Sample Receiving date: 12-09-2022
Ref. Memo No: 42.06.2626.119.37.001.22-2311 & Dated: 08-09-2022	Sample Source: Surface Water
Sent by: Mohammed Mukteruzzaman, Director, P, E & Mineral Resources Division, CEGIS, Gulshan-1, Dhaka.	Dist: Bagerhat, Upa: Rampal
Care Taker: CEGIS (Sample ID : SW-06)	Union:, Vill.:
Sample Collection date:	Date of Testing: 12/09/2022-20/10/2022

**LABORATORY TEST RESULTS:**

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.002	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00016	mg/L	AAS	0.00015
3	Chemical Oxygen Demand (COD)	4.0	20	mg/L	CRM	-
4	Cr (Total)	0.05	0.025	mg/L	AAS	0.0003
5	Hardness	200-500	120	mg/L	Titrimetric	-
6	Lead (Pb)	0.05	0.007	mg/L	AAS	0.001
7	Phosphate	6.0	2.5	mg/L	UVS	0.10
8	Total Dissolved Solid (TDS)	1000	135	mg/L	Multimeter	-
9	Total Suspended Solid (TSS)	10	26	mg/L	Gravimetric Method	-



Comments: Sample was collected &amp; supplied by client.

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

<b>Test Performed by:</b> 1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer Signature:  20.10.2022 2.) Name: Taslima Akhter Designation: Sample Analyzer Signature:  20.10.2022	<b>Countersigned/Approved by:</b> 1.) Name: Mita Sarker Designation: Senior Chemist Signature:  20.10.2022 2.) Name: Md. Biplob Hossain Designation: Chief Chemist Signature:  20.10.2022 Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka
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Page 1 of 1



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Lab Memo: 348/ CC, DPHE, CL, Dhaka

Date: 20-10-2022

**Physical /Chemical/ Bacteriological Analysis of Water Sample**

Sample ID: CEN2022100268	Sample Receiving date: 12-09-2022
Ref. Memo No: 42.06.2626.119.37.001.22-2311 & Dated: 08-09-2022	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: 12/09/2022-20/10/2022

**LABORATORY TEST RESULTS:**



Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.003	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00015	mg/L	AAS	0.00015
3	Calcium (Ca)	75	16	mg/L	AAS	0.17
4	Chemical Oxygen Demand (COD)	4.0	4	mg/L	CRM	-
5	Chloride	150-600	60	mg/L	Titrimetric	-
6	Bi-Carbonate (HCO <sub>3</sub> <sup>-</sup> )	0.0	105	mg/L	Titrimetric	-
7	Cr (Total)	0.05	0.020	mg/L	AAS	0.0003
8	Hardness	200-500	125	mg/L	Titrimetric	-
9	Iron (Fe)	0.3-1	11.37	mg/L	AAS	0.05
10	Lead (Pb)	0.05	0.007	mg/L	AAS	0.001
11	Magnesium (Mg)	30-35	15	mg/L	AAS	0.05
12	Phosphate	6.0	4.9	mg/L	UVS	0.10
13	Potassium (K)	12.0	10	mg/L	AAS	-
14	Total Dissolved Solid (TDS)	1000	150	mg/L	Multimeter	-
15	Total Suspended Solid (TSS)	10	29	mg/L	Gravimetric Method	-
16	Turbidity	10	358	NTU	Turbidity Meter	-
17	Carbonate (CO <sub>3</sub> )	-	0.30	mg/L	Titrimetric	-

Comments: Sample was collected &amp; supplied by client.

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

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

Page 1 of 2

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Lab Memo: 348/ CC, DPHE, CL, Dhaka

Date: 20-10-2022

**Physical /Chemical/ Bacteriological Analysis of Water Sample**


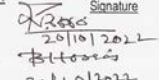
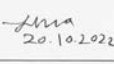

Sample ID: CEN2022100269	Sample Receiving date: 12-09-2022
Ref. Memo No: 42.06.2626.119.37.001.22-2311 & Dated: 08-09-2022	Sample Source: Surface Water
Sent by: Mohammed Mukteruzzaman, Director, P, E & Mineral Resources Division, CEGIS, Gulshan-1, Dhaka.	Dist: Bagerhat, Upa: Rampal
Care Taker: CEGIS (Sample ID : SW-08)	Union:, Vill.:
Sample Collection date:	Date of Testing: 12/09/2022-20/10/2022

**LABORATORY TEST RESULTS:**

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.002	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00015	mg/L	AAS	0.00015
3	Chemical Oxygen Demand (COD)	4.0	36	mg/L	CRM	-
4	Cr (Total)	0.05	0.023	mg/L	AAS	0.0003
5	Hardness	200-500	120	mg/L	Titrimetric	-
6	Lead (Pb)	0.05	0.006	mg/L	AAS	0.001
7	Phosphate	6.0	3.2	mg/L	UVS	0.10
8	Total Dissolved Solid (TDS)	1000	127	mg/L	Multimeter	-
9	Total Suspended Solid (TSS)	10	26	mg/L	Gravimetric Method	-



Comments: Sample was collected &amp; supplied by client.

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

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	 20.10.2022	1.) Name: Mita Sarker Designation: Senior Chemist	 20.10.2022
2.) Name: Taslima Akhter Designation: Sample Analyzer	 20.10.2022	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	 20.10.2022

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

Page 1 of 1

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Lab Memo: 348/ CC, DPHE, CL, Dhaka

Date: 20-10-2022

**Physical /Chemical/ Bacteriological Analysis of Water Sample**

Sample ID: CEN2022100270	Sample Receiving date: 12-09-2022
Ref. Memo No: 42.06.2626.119.37.001.22-2311 & Dated: 08-09-2022	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: 12/09/2022-20/10/2022

**LABORATORY TEST RESULTS:**

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.003	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00016	mg/L	AAS	0.00015
3	Chemical Oxygen Demand (COD)	4.0	48	mg/L	CRM	-
4	Cr (Total)	0.05	0.027	mg/L	AAS	0.0003
5	Hardness	200-500	130	mg/L	Titrimetric	-
6	Lead (Pb)	0.05	0.008	mg/L	AAS	0.001
7	Phosphate	6.0	2.0	mg/L	UVS	0.10
8	Total Dissolved Solid (TDS)	1000	125	mg/L	Multimeter	-
9	Total Suspended Solid (TSS)	10	24	mg/L	Gravimetric Method	-

Comments: Sample was collected &amp; supplied by client.

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

<b>Test Performed by:</b> 1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer <i>Signature</i> <i>20.10.2022</i>	<b>Countersigned/Approved by:</b> 1.) Name: Mita Sarker Designation: Senior Chemist <i>Signature</i> <i>20.10.2022</i> 2.) Name: Md. Biplab Hossain Designation: Chief Chemist <i>Signature</i> <i>20.10.2022</i> <b>Md. Biplab Hossain</b> Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka
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Page 1 of 1

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Lab Memo: 348/ CC, DPHE, CL, Dhaka

Date: 20-10-2022

**Physical /Chemical/ Bacteriological Analysis of Water Sample**

Sample ID: CEN2022100271	Sample Receiving date: 12-09-2022
Ref. Memo No: 42.06.2626.119.37.001.22-2311 & Dated: 08-09-2022	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: 12/09/2022-20/10/2022

**LABORATORY TEST RESULTS:**



Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.002	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00026	mg/L	AAS	0.00015
3	Chemical Oxygen Demand (COD)	4.0	4	mg/L	CRM	-
4	Cr (Total)	0.05	0.020	mg/L	AAS	0.0003
5	Hardness	200-500	140	mg/L	Titrimetric	-
6	Lead (Pb)	0.05	0.003	mg/L	AAS	0.001
7	Phosphate	6.0	2.8	mg/L	UVS	0.10
8	Total Dissolved Solid (TDS)	1000	134	mg/L	Multimeter	-
9	Total Suspended Solid (TSS)	10	30	mg/L	Gravimetric Method	-

Comments: Sample was collected &amp; supplied by client.

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

<b>Test Performed by:</b> 1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer <i>Signature</i> <i>20.10.2022</i> 2.) Name: Taslima Akhter Designation: Sample Analyzer <i>Signature</i> <i>20.10.2022</i>	<b>Countersigned/Approved by:</b> 1.) Name: Mita Sarker Designation: Senior Chemist <i>Signature</i> <i>20.10.2022</i> 2.) Name: Md. Biplab Hossain Designation: Chief Chemist <i>Signature</i> <i>20.10.2022</i> <b>Md. Biplab Hossain</b> Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka
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Page 1 of 1

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Lab Memo: 348/ CC, DPHE, CL, Dhaka

Date: 20-10-2022

**Physical /Chemical/ Bacteriological Analysis of Water Sample**

Sample ID: CEN2022100272	Sample Receiving date: 12-09-2022
Ref. Memo No: 42.06.2626.119.37.001.22-2311 & Dated: 08-09-2022	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: 12/09/2022-20/10/2022

**LABORATORY TEST RESULTS:**



Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.003	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00016	mg/L	Titrimetric	0.00015
3	Chemical Oxygen Demand (COD)	4.0	12	mg/L	CRM	-
4	Cr (Total)	0.05	0.019	mg/L	AAS	0.0003
5	Hardness	200-500	1000	mg/L	Titrimetric	-
6	Lead (Pb)	0.05	0.002	mg/L	AAS	0.001
7	Phosphate	6.0	1.3	mg/L	UVS	0.10
8	Total Dissolved Solid (TDS)	1000	2850	mg/L	Multimeter	-
9	Total Suspended Solid (TSS)	10	15	mg/L	Gravimetric Method	-

Comments: Sample was collected &amp; supplied by client.

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

<b>Test Performed by:</b> 1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer Signature: <i>Alam</i> 20.10.2022	<b>Countersigned/Approved by:</b> 1.) Name: Mita Sarker Designation: Senior Chemist Signature: <i>Mita Sarker</i> 20/10/2022 2.) Name: Md. Biplab Hossain Designation: Chief Chemist Signature: <i>Md. Biplab Hossain</i> 20/10/2022 Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka
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Page 1 of 1

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Lab Memo: 348/ CC, DPHE, CL, Dhaka

Date: 20-10-2022

**Physical /Chemical/ Bacteriological Analysis of Water Sample**

Sample ID: CEN2022100273	Sample Receiving date: 12-09-2022
Ref. Memo No: 42.06.2626.119.37.001.22-2311 & Dated: 08-09-2022	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.:
Sample Collection date:	Date of Testing: 12/09/2022-20/10/2022

**LABORATORY TEST RESULTS:**

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.002	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00015	mg/L	AAS	0.00015
3	Chemical Oxygen Demand (COD)	4.0	0.030	mg/L	CRM	-
4	Cr (Total)	0.05	0.030	mg/L	AAS	0.0003
5	Hardness	200-500	215	mg/L	Titrimetric	-
6	Lead (Pb)	0.05	0.006	mg/L	AAS	0.001
7	Phosphate	6.0	0.30	mg/L	UVS	0.10
8	Total Dissolved Solid (TDS)	1000	460	mg/L	Multimeter	-
9	Total Suspended Solid (TSS)	10	64	mg/L	Gravimetric Method	-


Comments: Sample was collected &amp; supplied by client.

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

<b>Test Performed by:</b> 1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer Signature: <i>Alam</i> 20.10.2022 2.) Name: Taslima Akhter Designation: Sample Analyzer Signature: <i>dim</i> 20.10.2022	<b>Countersigned/Approved by:</b> 1.) Name: Mita Sarker Designation: Senior Chemist Signature: <i>Mita Sarker</i> 20/10/2022 2.) Name: Md. Biplab Hossain Designation: Chief Chemist Signature: <i>Md. Biplab Hossain</i> 20/10/2022 Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka
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Page 1 of 1



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Lab Memo: 348/ CC, DPHE, CL, Dhaka

Date: 20-10-2022

**Physical /Chemical/ Bacteriological Analysis of Water Sample**

Sample ID: CEN2022100274	Sample Receiving date: 12-09-2022
Ref. Memo No: 42.06.2626.119.37.001.22-2311 & Dated: 08-09-2022	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.:
Sample Collection date:	Date of Testing: 12/09/2022-20/10/2022

**LABORATORY TEST RESULTS:**


Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.002	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00017	mg/L	AAS	0.00015
3	Chemical Oxygen Demand (COD)	4.0	4	mg/L	CRM	-
4	Cr (Total)	0.05	0.029	mg/L	AAS	0.0003
5	Hardness	200-500	930	mg/L	Titrimetric	-
6	Lead (Pb)	0.05	0.001	mg/L	AAS	0.001
7	Phosphate	6.0	1.0	mg/L	UVS	0.10
8	Total Dissolved Solid (TDS)	1000	1020	mg/L	Multimeter	-
9	Total Suspended Solid (TSS)	10	21	mg/L	Gravimetric Method	-

Comments: Sample was collected &amp; supplied by client.

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

<b>Test Performed by:</b> 1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer <i>Signature</i> <i>20.10.2022</i>	<b>Countersigned/Approved by:</b> 1.) Name: Mita Sarker Designation: Senior Chemist <i>Signature</i> <i>20.10.2022</i> 2.) Name: Md. Biplab Hossain Designation: Chief Chemist <i>Signature</i> <i>20.10.2022</i> Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka
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Page 1 of 1

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Lab Memo: 348/ CC, DPHE, CL, Dhaka

Date: 20-10-2022

**Physical /Chemical/ Bacteriological Analysis of Water Sample**

Sample ID: CEN2022100274	Sample Receiving date: 12-09-2022
Ref. Memo No: 42.06.2626.119.37.001.22-2311 & Dated: 08-09-2022	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.:
Sample Collection date:	Date of Testing: 12/09/2022-20/10/2022

**LABORATORY TEST RESULTS:**

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.002	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00017	mg/L	AAS	0.00015
3	Chemical Oxygen Demand (COD)	4.0	4	mg/L	CRM	-
4	Cr (Total)	0.05	0.029	mg/L	AAS	0.0003
5	Hardness	200-500	930	mg/L	Titrimetric	-
6	Lead (Pb)	0.05	0.001	mg/L	AAS	0.001
7	Phosphate	6.0	1.0	mg/L	UVS	0.10
8	Total Dissolved Solid (TDS)	1000	1020	mg/L	Multimeter	-
9	Total Suspended Solid (TSS)	10	21	mg/L	Gravimetric Method	-



Comments: Sample was collected &amp; supplied by client.

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

<b>Test Performed by:</b> 1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer <i>Signature</i> <i>20.10.2022</i>	<b>Countersigned/Approved by:</b> 1.) Name: Mita Sarker Designation: Senior Chemist <i>Signature</i> <i>20.10.2022</i> 2.) Name: Md. Biplab Hossain Designation: Chief Chemist <i>Signature</i> <i>20.10.2022</i> Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka
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Page 1 of 1



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Lab Memo: 348/ CC, DPHE, CL, Dhaka

Date: 20-10-2022

**Physical /Chemical/ Bacteriological Analysis of Water Sample**

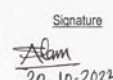
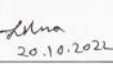
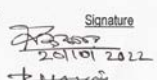
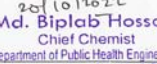
Sample ID: CEN2022100275	Sample Receiving date: 12-09-2022
Ref. Memo No: 42.06.2626.119.37.001.22-2311 & Dated: 08-09-2022	Sample Source: Surface Water
Sent by: Mohammed Mukteruzzaman, Director, P, E & Mineral Resources Division, CEGIS, Gulshan-1, Dhaka.	Dist: Bagerhat, Upa: Rampal
Care Taker: CEGIS (Sample ID : SW-14)	Union:, Vill.:
Sample Collection date:	Date of Testing: 12/09/2022-20/10/2022

**LABORATORY TEST RESULTS:**



Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.003	mg/L	AAS	0.001
2	Cadmium (Cd)	0.005	0.00015	mg/L	AAS	0.00015
3	Chemical Oxygen Demand (COD)	4.0	84	mg/L	CRM	-
4	Cr (Total)	0.05	0.025	mg/L	AAS	0.0003
5	Hardness	200-500	2500	mg/L	Titrimetric	-
6	Lead (Pb)	0.05	0.001	mg/L	AAS	0.001
7	Phosphate	6.0	0.95	mg/L	UVS	0.10
8	Total Dissolved Solid (TDS)	1000	6200	mg/L	Multimeter	-
9	Total Suspended Solid (TSS)	10	32	mg/L	Gravimetric Method	-

Comments: Sample was collected &amp; supplied by client.

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

<b>Test Performed by:</b> 1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer Signature:  20.10.2022 2.) Name: Taslima Akhter Designation: Sample Analyzer Signature:  20.10.2022	<b>Countersigned/Approved by:</b> 1.) Name: Mita Sarker Designation: Senior Chemist Signature:  20.10.2022 2.) Name: Md. Biplob Hossain Designation: Chief Chemist Signature:  20.10.2022 Md. Biplob Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka
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Page 1 of 1

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Lab Memo: 348/ CC, DPHE, CL, Dhaka

Date: 20-10-2022

**Physical /Chemical/ Bacteriological Analysis of Water Sample**

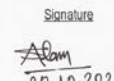
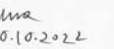
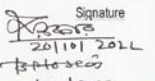
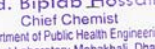
Sample ID: CEN2022100276	Sample Receiving date: 12-09-2022
Ref. Memo No: 42.06.2626.119.37.001.22-2311 & Dated: 08-09-2022	Sample Source: Ground Water
Sent by: Mohammed Mukteruzzaman, Director, P, E & Mineral Resources Division, CEGIS, Gulshan-1, Dhaka.	Dist: Bagerhat, Upa: Rampal
Care Taker: CEGIS (Sample ID : CW-01)	Union:, Vill.: Rajnagar
Sample Collection date:	Date of Testing: 12/09/2022-20/10/2022

**LABORATORY TEST RESULTS:**



Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.002	mg/L	AAS	0.001
2	Chemical Oxygen Demand (COD)	4.0	8	mg/L	CRM	-
3	Hardness	200-500	225	mg/L	Titrimetric	-
4	Lead (Pb)	0.05	0.001	mg/L	AAS	0.001
5	Phosphate	6.0	0.48	mg/L	UVS	0.10
6	Total Dissolved Solid (TDS)	1000	350	mg/L	Multimeter	-
7	Total Suspended Solid (TSS)	10	1	mg/L	Gravimetric Method	-

Comments: Sample was collected &amp; supplied by client.

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

<b>Test Performed by:</b> 1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer Signature:  20.10.2022 2.) Name: Taslima Akhter Designation: Sample Analyzer Signature:  20.10.2022	<b>Countersigned/Approved by:</b> 1.) Name: Mita Sarker Designation: Senior Chemist Signature:  20.10.2022 2.) Name: Md. Biplob Hossain Designation: Chief Chemist Signature:  20.10.2022 Md. Biplob Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka
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Page 1 of 1

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Lab Memo: 348/ CC, DPHE, CL, Dhaka

Date: 20-10-2022

**Physical /Chemical/ Bacteriological Analysis of Water Sample**

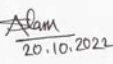
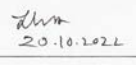
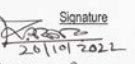
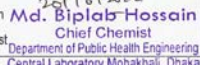
Sample ID: CEN2022100277	Sample Receiving date: 12-09-2022
Ref. Memo No: 42.06.2626.119.37.001.22-2311 & Dated: 08-09-2022	Sample Source: Ground Water
Sent by: Mohammed Mukteruzzaman, Director, P, E & Mineral Resources Division, CEGIS, Gulshan-1, Dhaka.	Dist: Bagerhat, Upa: Rampal
Care Taker: CEGIS (Sample ID : GW-02)	Union: Vill.: Karpasdanga
Sample Collection date:	Date of Testing: 12/09/2022-20/10/2022

**LABORATORY TEST RESULTS:**



Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.056	mg/L	AAS	0.001
2	Chemical Oxygen Demand (COD)	4.0	4	mg/L	CRM	-
3	Hardness	200-500	415	mg/L	Titrimetric	-
4	Lead (Pb)	0.05	0.002	mg/L	AAS	0.001
5	Phosphate	6.0	1.1	mg/L	UVS	0.10
6	Total Dissolved Solid (TDS)	1000	620	mg/L	Multimeter	-
7	Total Suspended Solid (TSS)	10	2	mg/L	Gravimetric Method	-

Comments: Sample was collected &amp; supplied by client.

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

<b>Test Performed by:</b> 1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer Signature:  20.10.2022 2.) Name: Taslima Akhter Designation: Sample Analyzer Signature:  20.10.2022	<b>Countersigned/Approved by:</b> 1.) Name: Mita Sarker Designation: Senior Chemist Signature:  20.10.2022 2.) Name: Md. Biplab Hossain Designation: Chief Chemist Signature:  20.10.2022 Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka
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Page 1 of 1

	<b>Government of the People's Republic of Bangladesh</b> <b>Office of the Chief Chemist</b> <b>Department of Public Health Engineering</b> <b>Central Lab, 38-39, Mohakhali C/A, Dhaka-1212</b> Phone: 88-02-9881927, Fax: 88-02-9882003, Email: wqmsc_central_lab@yahoo.com	
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Lab Memo: 348/ CC, DPHE, CL, Dhaka

Date: 20-10-2022

**Physical /Chemical/ Bacteriological Analysis of Water Sample**



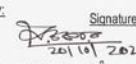
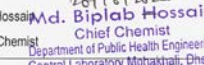
Sample ID: CEN2022100278	Sample Receiving date: 12-09-2022
Ref. Memo No: 42.06.2626.119.37.001.22-2311 & Dated: 08-09-2022	Sample Source: Ground Water
Sent by: Mohammed Mukteruzzaman, Director, P, E & Mineral Resources Division, CEGIS, Gulshan-1, Dhaka.	Dist: Bagerhat, Upa: Rampal
Care Taker: CEGIS (Sample ID : GW-03)	Union: Vill.: Project Site
Sample Collection date:	Date of Testing: 12/09/2022-20/10/2022

**LABORATORY TEST RESULTS:**

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.017	mg/L	AAS	0.001
2	Chemical Oxygen Demand (COD)	4.0	4	mg/L	CRM	-
3	Hardness	200-500	515	mg/L	Titrimetric	-
4	Lead (Pb)	0.05	0.002	mg/L	AAS	0.001
5	Phosphate	6.0	2.0	mg/L	UVS	0.10
6	Total Dissolved Solid (TDS)	1000	900	mg/L	Multimeter	-
7	Total Suspended Solid (TSS)	10	1	mg/L	Gravimetric Method	-

Comments: Sample was collected &amp; supplied by client.

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

<b>Test Performed by:</b> 1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer Signature:  20.10.2022 2.) Name: Taslima Akhter Designation: Sample Analyzer Signature:  20.10.2022	<b>Countersigned/Approved by:</b> 1.) Name: Mita Sarker Designation: Senior Chemist Signature:  20.10.2022 2.) Name: Md. Biplab Hossain Designation: Chief Chemist Signature:  20.10.2022 Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka
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Page 1 of 1

## Environmental Laboratory

Memo No. ELAB202212001924

Test Report

Date: 22/12/2022

Physical/Chemical/Bacteriological Analysis of water

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

Code: FPC007

Sample Type: Surface Water

ID: FPC007\_001

Collection Date: October/22

Location: N/A

Received From: Md. Mutasim Billah

Received Date: 12/12/2022

Testing Date: 13-22/12/22

### Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-01	NO <sub>3</sub> <sup>-</sup>	10	3.8507	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO <sub>4</sub> <sup>3-</sup>	6	1.0234	ppm	UV-VIS	
03		SO <sub>4</sub> <sup>2-</sup>	400	28.353	ppm	UV-VIS	

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

### Test Performed by

Name: Rafiqul Islam &amp; Rafiqul Alam

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

Signature:

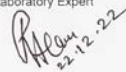


### Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature:



## Environmental Laboratory

Memo No. ELAB202212001925

Test Report

Date: 22/12/2022

Physical/Chemical/Bacteriological Analysis of water

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

Code: FPC007

Sample Type: Surface Water

ID: FPC007\_002

Collection Date: October/22

Location: N/A

Received From: Md. Mutasim Billah

Received Date: 12/12/2022

Testing Date: 13-22/12/22

### Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-02	NO <sub>3</sub> <sup>-</sup>	10	6.4799	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO <sub>4</sub> <sup>3-</sup>	6	0.6797	ppm	UV-VIS	
03		SO <sub>4</sub> <sup>2-</sup>	400	19.510	ppm	UV-VIS	

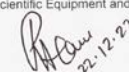
N.B: UV-VIS means UV-1800 Spectrophotometer

### Test Performed by

Name: Rafiqul Islam &amp; Rafiqul Alam

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

Signature:



### Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature:



## Environmental Laboratory

Memo No. ELAB202212001926

Test Report

Date: 22/12/2022

Physical/Chemical/Bacteriological Analysis of water

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

Code: FPC007

Sample Type: Surface Water

ID: FPC007\_003

Collection Date: October/22

Location: N/A

Received From: Md. Mutasim Billah

Received Date: 12/12/2022

Testing Date: 13-22/12/22

### Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-03	NO <sub>3</sub> <sup>-</sup>	10	10.432	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO <sub>4</sub> <sup>3-</sup>	6	1.2033	ppm	UV-VIS	
03		SO <sub>4</sub> <sup>2-</sup>	400	21.315	ppm	UV-VIS	

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

### Test Performed by

Name: Rafiqul Islam &amp; Rafiqul Alam

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

Signature:



### Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature:



## Environmental Laboratory

Memo No. ELAB202212001927

Test Report

Date: 22/12/2022

Physical/Chemical/Bacteriological Analysis of water

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

Code: FPC007

Sample Type: Surface Water

ID: FPC007\_004

Collection Date: October/22

Location: Jetty.

Received From: Md. Mutasim Billah

Received Date: 12/12/2022

Testing Date: 13-22/12/22

### Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-04	NO <sub>3</sub> <sup>-</sup>	10	8.8341	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO <sub>4</sub> <sup>3-</sup>	6	1.7484	ppm	UV-VIS	
03		SO <sub>4</sub> <sup>2-</sup>	400	23.560	ppm	UV-VIS	

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

### Test Performed by

Name: Rafiqul Islam &amp; Rafiqul Alam

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

Signature:



### Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature:





## Environmental Laboratory

Memo No. ELAB202212001928

Test Report

Date: 22/12/2022

Physical/Chemical/Bacteriological Analysis of water

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

Code: FPC007

Sample Type: Surface Water

ID: FPC007\_005

Collection Date: October/22

Location: N/A

Received From: Md. Mutasim Billah

Received Date: 12/12/2022

Testing Date: 13-22/12/22

### Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-05	NO <sub>3</sub> <sup>-</sup>	10	13.068	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO <sub>4</sub> <sup>3-</sup>	6	0.4916	ppm	UV-VIS	
03		SO <sub>4</sub> <sup>2-</sup>	400	21.324	ppm	UV-VIS	

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

### Test Performed by

Name: Rafiqul Islam &amp; Rafiqul Alam

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

Signature:

### Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature:

## Environmental Laboratory

Memo No. ELAB202212001929

Test Report

Date: 22/12/2022

Physical/Chemical/Bacteriological Analysis of water

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

Code: FPC007

Sample Type: Surface Water

ID: FPC007\_006

Collection Date: October/22

Location: N/A

Received From: Md. Mutasim Billah

Received Date: 12/12/2022

Testing Date: 13-22/12/22

### Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-06	NO <sub>3</sub> <sup>-</sup>	10	12.261	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO <sub>4</sub> <sup>3-</sup>	6	0.4079	ppm	UV-VIS	
03		SO <sub>4</sub> <sup>2-</sup>	400	22.277	ppm	UV-VIS	

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

### Test Performed by

Name: Rafiqul Islam &amp; Rafiqul Alam

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

Signature:

### Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature:

## Environmental Laboratory

Memo No. ELAB202212001930

Test Report

Date: 22/12/2022

Physical/Chemical/Bacteriological Analysis of water

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

Code: FPC007

Sample Type: Surface Water

ID: FPC007\_007

Collection Date: October/22

Location: N/A

Received From: Md. Mutasim Billah

Received Date: 12/12/2022

Testing Date: 13-22/12/22

### Laboratory Test Results:

SL#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-07	NO <sup>3-</sup>	10	8.2033	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO <sup>4</sup> -	6	0.4420	ppm	UV-VIS	
03		SO <sup>4</sup> -	400	30.073	ppm	UV-VIS	

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

### Test Performed by

Name: Rafiqul Islam &amp; Rafiqul Alam

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

Signature:

### Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature:

## Environmental Laboratory

Memo No. ELAB202212001931

Test Report

Date: 22/12/2022

Physical/Chemical/Bacteriological Analysis of water

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

Code: FPC007

Sample Type: Surface Water

ID: FPC007\_008

Collection Date: October/22

Location: N/A

Received From: Md. Mutasim Billah

Received Date: 12/12/2022

Testing Date: 13-22/12/22

### Laboratory Test Results:

SL#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-08	NO <sup>3-</sup>	10	8.1822	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO <sup>4</sup> -	6	0.3060	ppm	UV-VIS	
03		SO <sup>4</sup> -	400	14.262	ppm	UV-VIS	

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

### Test Performed by

Name: Rafiqul Islam &amp; Rafiqul Alam

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

Signature:

### Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature:

## Environmental Laboratory

Memo No. ELAB202212001932

Test Report

Date: 22/12/2022

Physical/Chemical/Bacteriological Analysis of water

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

Code: FPC007

Sample Type: Surface Water

ID: FPC007\_009

Collection Date: October/22

Location: N/A

Received From: Md. Mutasim Billah

Received Date: 12/12/2022

Testing Date: 13-22/12/22

### Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-09	NO3 <sup>-</sup>	10	11.820	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO4 <sup>3-</sup>	6	0.5004	ppm	UV-VIS	
03		SO4 <sup>2-</sup>	400	21.189	ppm	UV-VIS	

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

### Test Performed by

Name: Rafiqul Islam &amp; Rafiqul Alam

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

Signature:

### Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature:

## Environmental Laboratory

Memo No. ELAB202212001933

Test Report

Date: 22/12/2022

Physical/Chemical/Bacteriological Analysis of water

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

Code: FPC007

Sample Type: Surface Water

ID: FPC007\_010

Collection Date: October/22

Location: N/A

Received From: Md. Mutasim Billah

Received Date: 12/12/2022

Testing Date: 13-22/12/22

### Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-10	NO3 <sup>-</sup>	10	11.526	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO4 <sup>3-</sup>	6	0.7169	ppm	UV-VIS	
03		SO4 <sup>2-</sup>	400	35.245	ppm	UV-VIS	

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

### Test Performed by

Name: Rafiqul Islam &amp; Rafiqul Alam

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

Signature:

### Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature:

## Environmental Laboratory

Memo No. ELAB202212001934

Test Report

Date: 22/12/2022

Physical/Chemical/Bacteriological Analysis of water

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

Code: FPC007

Sample Type: Surface Water

ID: FPC007\_011

Collection Date: October/22

Location: N/A

Received From: Md. Mutasim Billah

Received Date: 12/12/2022

Testing Date: 13-22/12/22

### Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-11	NO <sub>3</sub> <sup>-</sup>	10	13.145	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO <sub>4</sub> <sup>3-</sup>	6	0.6888	ppm	UV-VIS	
03		SO <sub>4</sub> <sup>2-</sup>	400	33.718	ppm	UV-VIS	

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

### Test Performed by

Name: Rafiqul Islam &amp; Rafiqul Alam

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

Signature:

### Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature:

## Environmental Laboratory

Memo No. ELAB202212001935

Test Report

Date: 22/12/2022

Physical/Chemical/Bacteriological Analysis of water

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

Code: FPC007

Sample Type: Surface Water

ID: FPC007\_012

Collection Date: October/22

Location: Mongla.

Received From: Md. Mutasim Billah

Received Date: 12/12/2022

Testing Date: 13-22/12/22

### Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-12	NO <sub>3</sub> <sup>-</sup>	10	15.704	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO <sub>4</sub> <sup>3-</sup>	6	2.5382	ppm	UV-VIS	
03		SO <sub>4</sub> <sup>2-</sup>	400	92.535	ppm	UV-VIS	

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

### Test Performed by

Name: Rafiqul Islam &amp; Rafiqul Alam

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

Signature:

### Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature:



## Environmental Laboratory

Memo No. ELAB202212001936

Test Report

Date: 22/12/2022

Physical/Chemical/Bacteriological Analysis of water

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

Code: FPC007

Sample Type: Surface Water

ID: FPC007\_013

Collection Date: October/22

Location: Harbaria.

Received From: Md. Mutasim Billah

Received Date: 12/12/2022

Testing Date: 13-22/12/22

### Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-13	NO <sub>3</sub> <sup>-</sup>	10	15.962	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO <sub>4</sub> <sup>3-</sup>	6	1.7096	ppm	UV-VIS	
03		SO <sub>4</sub> <sup>2-</sup>	400	79.753	ppm	UV-VIS	

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

### Test Performed by

Name: Rafiqul Islam & Rafiqul Alam  
 Designation: Research Associate & In-Charge of Scientific Equipment and Laboratory Expert  
 Signature: *Rafiqul Islam* 22.12.22

### Approved by

Name: Rafiqul Alam  
 Designation: Laboratory Expert  
 Signature: *Rafiqul Alam* 22.12.22

## Environmental Laboratory

Memo No. ELAB202212001937

Test Report

Date: 22/12/2022

Physical/Chemical/Bacteriological Analysis of water

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

Code: FPC007

Sample Type: Surface Water

ID: FPC007\_014

Collection Date: October/22

Location: Akrapoint.

Received From: Md. Mutasim Billah

Received Date: 12/12/2022

Testing Date: 13-22/12/22

### Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-14	NO <sub>3</sub> <sup>-</sup>	10	11.294	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO <sub>4</sub> <sup>3-</sup>	6	1.0483	ppm	UV-VIS	
03		SO <sub>4</sub> <sup>2-</sup>	400	172.39	ppm	UV-VIS	

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

### Test Performed by

Name: Rafiqul Islam & Rafiqul Alam  
 Designation: Research Associate & In-Charge of Scientific Equipment and Laboratory Expert  
 Signature: *Rafiqul Islam* 22.12.22

### Approved by

Name: Rafiqul Alam  
 Designation: Laboratory Expert  
 Signature: *Rafiqul Alam* 22.12.22

## Environmental Laboratory

Memo No. ELAB202212001938

Test Report

Date: 22/12/2022

Physical/Chemical/Bacteriological Analysis of water

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

Code: FPC007

Sample Type: Surface Water

ID: FPC007\_015

Collection Date: October/22

Location: Hironpoint.

Received From: Md. Mutasim Billah

Received Date: 12/12/2022

Testing Date: 13-22/12/22

### Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	SW-15	NO <sup>3</sup> -	10	9.6121	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO <sup>4</sup> -	6	0.7428	ppm	UV-VIS	
03		SO <sup>4</sup> -	400	207.35	ppm	UV-VIS	

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

### Test Performed by

Name: Rafiqul Islam &amp; Rafiqul Alam

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

Signature:

### Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature:

## Environmental Laboratory

Memo No. ELAB202212001939

Test Report

Date: 22/12/2022

Physical/Chemical/Bacteriological Analysis of water

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

Code: FPC007

Sample Type: Ground Water

ID: FPC007\_016

Collection Date: October/22

Location: PPJ RO drinking.

Received From: Md. Mutasim Billah

Received Date: 12/12/2022

Testing Date: 13-22/12/22

### Laboratory Test Results:

SL.#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	GW-1	NO <sup>3</sup> -	10	4.8810	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO <sup>4</sup> -	6	1.1702	ppm	UV-VIS	
03		SO <sup>4</sup> -	400	1.4115	ppm	UV-VIS	

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

### Test Performed by

Name: Rafiqul Islam &amp; Rafiqul Alam

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

Signature:

### Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature:

## Environmental Laboratory

Memo No. ELAB202212001940

Test Report

Date: 22/12/2022

Physical/Chemical/Bacteriological Analysis of water

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

Code: FPC007

Sample Type: Ground Water

ID: FPC007\_017

Collection Date: October/22

Location: Rajnagar.

Received From: Md. Mutasim Billah

Received Date: 12/12/2022

Testing Date: 13-22/12/22

### Laboratory Test Results:

SL#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	GW-2	NO <sub>3</sub> <sup>-</sup>	10	0.8018	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO <sub>4</sub> <sup>3-</sup>	6	0.4900	ppm	UV-VIS	
03		SO <sub>4</sub> <sup>2-</sup>	400	1.3608	ppm	UV-VIS	

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

### Test Performed by

Name: Rafiqul Islam &amp; Rafiqul Alam

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

Signature:

### Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature:

## Environmental Laboratory

Memo No. ELAB202212001941

Test Report

Date: 22/12/2022

Physical/Chemical/Bacteriological Analysis of water

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

Code: FPC007

Sample Type: Ground Water

ID: FPC007\_018

Collection Date: October/22

Location: Kapashdanga.

Received From: Md. Mutasim Billah

Received Date: 12/12/2022

Testing Date: 13-22/12/22

### Laboratory Test Results:

SL#	Name of Sample	Water quality parameters	Bangladesh standard	Concentration Present	Unit	Analysis Method	Remarks
01	GW-3	NO <sub>3</sub> <sup>-</sup>	10	4.3343	ppm	UV-VIS	Sample was collected and supplied by assigned professional. This report is valid only for particular sample tested.
02		PO <sub>4</sub> <sup>3-</sup>	6	1.3664	ppm	UV-VIS	
03		SO <sub>4</sub> <sup>2-</sup>	400	3.3183	ppm	UV-VIS	

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

### Test Performed by

Name: Rafiqul Islam &amp; Rafiqul Alam

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



Signature:



### Approved by

Name: Rafiqul Alam

Designation: Laboratory Expert

Signature:

		জীবনের জন্য বিজ্ঞান 'শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন'		
বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর) BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (BCSIR)				
Institute Name: Institute of National Analytical Research & Service (INARS)				
<b>Analysis Report</b>				
Analytical Service Cell Ref No: Aug2022033989		Unit (Lab/Inst.) Ref No: A-231-247		
Lab ID: INS-231-247		Sample Receiving Date: 23/08/2022		
Sample ID: A-231-247		Submission Date: 22 Aug 2022		
		Report Delivery Date: 15/09/2022		
Sample Description: Mercury sample no-1,2,3,4,5,6,7,8,9,10,11,12 (Mongla), 13(Herbaria), 14(Akram Point), Rajnagar, Kapashdanga, Project site				
Client's Details: Mahadi Hassan Center For Environmental And Geographic Information Services House#House No. 06, , Road No. 23/C, Dhaka-1216				
Number of Sample: 17				
<b>Report Details:</b>				
Lab ID	Particulars of supplied sample	Parameter	Concentration	Test Method (APHA)
A-231	River water (Sample-01)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
A-232	River water (Sample-02)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
A-233	River water (Sample-03)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
A-234	River water (Sample-04)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
A-235	River water (Sample-05)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
A-236	River water (Sample-06)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
A-237	River water (Sample-07)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
A-238	River water (Sample-08)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
A-239	River water (Sample-09)	Mercury (Hg)	Less than 0.001 mg/L	3112.B
				
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Pages 1 of 2		15th of September 2022 12:31 PM		


		জীবনের জন্য বিজ্ঞান 'শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন'	
বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর) BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (BCSIR)			
Institute Name: Institute of National Analytical Research & Service (INARS)			
<b>Analysis Report</b>			
A-240	River water (Sample-10)	Mercury (Hg)	Less than 0.001 mg/L 3112.B
A-241	River water (Sample-11)	Mercury (Hg)	Less than 0.001 mg/L 3112.B
A-242	River water (Sample-12, Mongla)	Mercury (Hg)	Less than 0.001 mg/L 3112.B
A-243	River water (Sample-13, Harbaria)	Mercury (Hg)	Less than 0.001 mg/L 3112.B
A-244	River water (Sample-14, Akram Point)	Mercury (Hg)	Less than 0.001 mg/L 3112.B
A-245	River water (Sample-15, Rajnagar)	Mercury (Hg)	Less than 0.001 mg/L 3112.B
A-246	River water (Sample-16, Kapashdanga)	Mercury (Hg)	Less than 0.001 mg/L 3112.B
A-247	River water (Sample-17, Project site)	Mercury (Hg)	Less than 0.001 mg/L 3112.B
			
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Pages 2 of 2		15th of September 2022 12:31 PM	


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 Analyst  
**Mehedi Hasan**  
 Scientific Officer  
 Institute of National Analytical  
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15.09.22  
 Section/Division In-Charge  
**Dr. Muhammad Abdullah Al-Mansur**  
 Principal Scientific Officer  
 Institute of National Analytical  
 Research & Service (INARS)  
 BCSIR, Dhaka-1205

15.09.22  
 In-Charge/Director  
**Shamim Ahmed**  
 Director (In-Charge)  
 Institute of National Analytical  
 Research & Service (INARS)  
 BCSIR, Dhaka-1205




		জীবনের জন্য বিজ্ঞান 'শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন' বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর) BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (BCSIR)		
Institute Name: Institute of National Analytical Research & Service (INARS)				
Analysis Report				
Analytical Service Cell Ref No: Aug2022033990 Lab ID: INS-248-251 Sample ID: A-248-251		Unit (Lab/Inst.) Ref No: A-248-251 Sample Receiving Date: 23/08/2022 Submission Date: 22 Aug 2022 Report Delivery Date: 14/09/2022		
Sample Description: passur maidara confluence, Mongla confluence, Herbaria, Akram point				
Client's Details: Mahadi Hassan Center For Environmental And Geographic Information Services House#House No. 06, Road No. 23/C, Dhaka-1216				
Number of Sample: 4				
Report Details:				
Lab ID	Particulars of supplied sample	Parameters	Concentration	Test Method (APHA)
A-248	Water (Sample:01, Maidara Confluence)	Oil and Grease	Less than 2.0 mg/L	5520.B
A-249	Water (Sample:02, Mongla Confluence)	Oil and Grease	Less than 2.0 mg/L	5520.B
A-250	Water (Sample:03, Harbaria)	Oil and Grease	Less than 2.0 mg/L	5520.B
A-251	Water (Sample:04, Akram Point)	Oil and Grease	Less than 2.0 mg/L	5520.B
Analyst Dr. Sabina Yasmin Senior Scientific Officer Institute of National Analytical Research & Service (INARS) BCSIR, Dhaka-1205		Section/Division In-Charge Dr. Muhammad Abdullah Al-Mansur Principal Scientific Officer Institute of National Analytical Research & Service (INARS) BCSIR, Dhaka-1205		
In-Charge/Director Shamim Ahmed Director (In Charge) Institute of National Analytical Research & Service (INARS) BCSIR, Dhaka-1205				
Note: a. The results reported here pertained to the sample received in this laboratory only. b. Complain and/or query regarding delivered test report should be lodged within one month of report delivery date. c. The laboratory is not responsible for the data quality affected due to sampling, transporting and storage conditions of the sample(s) maintained before received in the laboratory. d. The report shall not be reproduced/published partly or fully without prior approval of the authority.				
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Pages 1 of 1		14th of September 2022 03:04 PM		


		জীবনের জন্য বিজ্ঞান 'শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন' বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর) BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (BCSIR)		
Institute Name: Institute of National Analytical Research & Service (INARS)				
Analysis Report				
Analytical Service Cell Ref No: Aug2022033991 Lab ID: IN-252-253 Sample ID: A-252-253		Unit (Lab/Inst.) Ref No: A-252-253 Sample Receiving Date: 23/08/2022 Submission Date: 22 Aug 2022 Report Delivery Date: 14/09/2022		
Sample Description: Jetty site, Herbaria				
Client's Details: Mahadi Hassan Center For Environmental And Geographic Information Services House#House No. 06, Road No. 23/C, Dhaka-1216				
Number of Sample: 2				
Report Details:				
Lab ID	Particulars of supplied sample	Parameters	Concentration	Test Method (APHA)
A-252	Water (Sample: 01, Jetty Site)	TOC (Total Organic Carbon)	10.5 mg/L	5310.B
		TOC (Total Organic Content)	65.0 mg/L	5310.B
A-253	Water (Sample: 02, Harbaria)	TOC (Total Organic Carbon)	12.7 mg/L	5310.B
		TOC (Total Organic Content)	239 mg/L	5310.B
Analyst H. M. Shoful Islam Molla Jamal Senior Scientific Officer Institute of National Analytical Research & Service (INARS) BCSIR, Dhaka-1205		Section/Division In-Charge Dr. Muhammad Abdullah Al-Mansur Principal Scientific Officer Institute of National Analytical Research & Service (INARS) BCSIR, Dhaka-1205		
In-Charge/Director Shamim Ahmed Director (In Charge) Institute of National Analytical Research & Service (INARS) BCSIR, Dhaka-1205				
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Pages 1 of 4		14th of September 2022 01:12 PM		

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Institute Name: Institute of National Analytical Research & Service (INARS)			
<b>Analysis Report</b> 			
Analytical Service Cell Ref No: Aug2022033991		Unit (Lab/Inst.) Ref No: A-252-253	
Lab ID: IN-252-253		Sample Receiving Date: 23/08/2022	
Sample ID: A-252-253		Submission Date: 22 Aug 2022	
		Report Delivery Date: 14/09/2022	
Sample Description: Jetty site, Harbaria			
Client's Details: Mahadi Hassan Center For Environmental And Geographic Information Services House#House No. 06, , Road No. 23/C, Dhaka-1216			
Number of Sample: 2			
Report Details:			
Lab ID	Particulars of supplied sample	Parameters	Concentration (mg/L)
			Test Method (APHA)
			
			
Note: a. The results reported here pertained to the sample received in this laboratory only. b. Complain and/or query regarding delivered test report should be lodged within one month of report delivery date. c. The laboratory is not responsible for the data quality affected due to sampling, transporting and storage conditions of the sample(s) maintained before received in the laboratory. d. The report shall not be reproduced/published partly or fully without prior approval of the authority.			
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Pages 2 of 4		14th of September 2022 01:12 PM	

		জীবনের জন্য বিজ্ঞান 'শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন' বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর) BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (BCSIR)	
A-252 Water, Poly Aromatic Hydrocarbon (PAH) Sample: 01, Jetty Site			
Acenaphthylene	Not detectable	6440.B	
Anthracene	Not detectable	6440.B	
Benzo(A) Anthracene	Not detectable	6440.B	
Benzo(A) Pyrene	Not detectable	6440.B	
Benzo(B) Fluoranthene	Not detectable	6440.B	
Benzo(G,H,I) Perilene	Not detectable	6440.B	
Benzo(K) Fluoranthene	Not detectable	6440.B	
Chrysene	Not detectable	6440.B	
Dibenzo(A,H) Anthracene	Not detectable	6440.B	
Fluorene	Not detectable	6440.B	
Phenanthrene	Not detectable	6440.B	
Pyrene	Not detectable	6440.B	
A-253 Water, Poly Aromatic Hydrocarbon (PAH) Sample: 02, Harbaria			
Acenaphthylene	Not detectable	6440.B	
Anthracene	Not detectable	6440.B	
Benzo(A) Anthracene	Not detectable	6440.B	
Benzo(A) Pyrene	Not detectable	6440.B	
Benzo(B) Fluoranthene	Not detectable	6440.B	
Benzo(G,H,I) Perilene	Not detectable	6440.B	
Benzo(K) Fluoranthene	Not detectable	6440.B	
Chrysene	Not detectable	6440.B	
Dibenzo(A,H) Anthracene	Not detectable	6440.B	
Fluorene	Not detectable	6440.B	
Phenanthrene	Not detectable	6440.B	
Pyrene	Not detectable	6440.B	
			
			
Note: a. The results reported here pertained to the sample received in this laboratory only. b. Complain and/or query regarding delivered test report should be lodged within one month of report delivery date. c. The laboratory is not responsible for the data quality affected due to sampling, transporting and storage conditions of the sample(s) maintained before received in the laboratory. d. The report shall not be reproduced/published partly or fully without prior approval of the authority.			
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Pages 3 of 4		14th of September 2022 01:12 PM	




		জীবনের জন্য বিজ্ঞান 'শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন' বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর) BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (BCSIR)		
Institute Name: Institute of National Analytical Research & Service (INARS)				
Analysis Report				
Analytical Service Cell Ref No: Aug2022033992 Lab ID: INS-254-258 Sample ID: A-254-258		Unit (Lab/Inst.) Ref No: A-254-258 Sample Receiving Date: 23/08/2022 Submission Date: 22 Aug 2022 Report Delivery Date: 14/09/2022		
Sample Description: Jetty site, Moldara, Mongla, Herbaria, Akram point Client's Details: Mahadi Hassan Center For Environmental And Geographic Information Services House#House No. 06, , Road No. 23/C, Dhaka-1216 Number of Sample: 5				
Report Details:				
Lab ID	Particulars of supplied sample	Parameters	Concentration	Test Method (APHA)
A-254	Sediment (Sample-01, Jetty Site)	Arsenic (As)	3.07 mg/kg	3114.C
		Lead (Pb)	8.85 mg/kg	3111.B
		Mercury (Hg)	0.20 mg/kg	3112.B
		pH at 25.2° C	8.70 (5% Solution)	4500-H+.B
		Sulphate (SO <sub>4</sub> )	288 mg/kg	4110.B




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Pages 1 of 2  
 14th of September 2022 12:41 PM

		জীবনের জন্য বিজ্ঞান 'শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন' বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর) BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (BCSIR)		
Institute Name: Institute of National Analytical Research & Service (INARS)				
Analysis Report				
Analytical Service Cell Ref No: Aug2022033992 Lab ID: INS-254-258 Sample ID: A-254-258		Unit (Lab/Inst.) Ref No: A-254-258 Sample Receiving Date: 23/08/2022 Submission Date: 22 Aug 2022 Report Delivery Date: 14/09/2022		
Sample Description: Jetty site, Moldara, Mongla, Herbaria, Akram point Client's Details: Mahadi Hassan Center For Environmental And Geographic Information Services House#House No. 06, , Road No. 23/C, Dhaka-1216 Number of Sample: 5				
Report Details:				
Lab ID	Particulars of supplied sample	Parameters	Concentration	Test Method (APHA)
A-254	Sediment (Sample-02, Maidara)	Arsenic (As)	3.04 mg/kg	3114.C
		Lead (Pb)	8.39 mg/kg	3111.B
		Mercury (Hg)	0.06 mg/kg	3112.B
		pH at 24.7° C	8.15 (5% Solution)	4500-H+.B
		Sulphate (SO <sub>4</sub> )	226 mg/kg	4110.B
A-256	Sediment (Sample-03, Mongla)	Arsenic (As)	3.02 mg/kg	3114.C
		Lead (Pb)	8.42 mg/kg	3111.B
		Mercury (Hg)	0.13 mg/kg	3112.B
		pH at 25.1° C	8.11 (5% Solution)	4500-H+.B
		Sulphate (SO <sub>4</sub> )	151 mg/kg	4110.B
A-257	Sediment (Sample-04, Harbaria)	Arsenic (As)	2.73 mg/kg	3114.C
		Lead (Pb)	6.73 mg/kg	3111.B
		Mercury (Hg)	0.04 mg/kg	3112.B
		pH at 25.1° C	8.70 (5% Solution)	4500-H+.B
		Sulphate (SO <sub>4</sub> )	303 mg/kg	4110.B
A-258	Sediment (Sample-05, Akram Point)	Arsenic (As)	2.58 mg/kg	3114.C
		Lead (Pb)	8.90 mg/kg	3111.B
		Mercury (Hg)	0.05 mg/kg	3112.B
		pH at 25.3° C	8.71 (5% Solution)	4500-H+.B
		Sulphate (SO <sub>4</sub> )	612 mg/kg	4110.B




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Pages 2 of 2  
 14th of September 2022 12:41 PM

প্রকল্প ড. মাহমুদ হোসেন  
কক্সবন্দী এন্ড উড টেকনোলজি ডিসপ্লিন  
খুলনা বিশ্ববিদ্যালয়, খুলনা-৯২০৮  
বাংলাদেশ।




Prof. Dr. Mahmood Hossain  
Forestry & Wood Technology Discipline  
Khulna University, Khulna-9208  
Bangladesh.

**Results for June 2022 Samples**

Sample ID	Sample weight for Bulk density (g)	Organic carbon (%)	EC (ms/cm)	pH	Nitrogen final concentration (mg/g)	Phosphorus final concentration (mg/g)
1	107.40	2.52	4.96	6.19	1.98	0.43
2	115.98	1.76	6.03	6.45	1.08	0.37
3	100.13	1.20	9.36	6.24	1.29	0.42
4	112.47	1.25	8.48	6.34	1.53	0.41
5	102.42	1.31	5.53	6.45	1.21	0.40
6	122.03	1.44	3.33	6.41	1.26	0.32
7	125.14	1.46	5.61	6.27	1.69	0.40
8	126.43	1.67	7.64	6.27	0.57	0.38
9	114.80	2.40	6.56	6.16	0.57	0.41
10	122.32	1.97	8.92	6.27	1.59	0.49
11	124.13	1.73	8.67	6.28	1.65	0.54
12	107.14	2.26	3.39	6.16	0.81	0.38
13	96.43	2.81	2.84	6.36	0.89	0.36
14	104.85	2.40	5.40	6.20	0.87	0.36
15	110.40	2.26	3.51	6.36	1.89	0.38
16	101.18	2.38	3.19	6.19	1.08	0.59
17	110.19	2.06	3.86	6.35	0.91	0.39
18	131.08	1.96	7.31	6.12	1.11	0.40
19	124.73	1.83	6.98	6.29	0.88	0.34
20	126.82	1.89	6.97	6.42	0.97	0.42
21	94.73	2.87	3.46	6.47	1.30	0.43
22	100.88	2.08	3.88	6.23	1.94	0.37
23	111.49	2.12	6.03	6.29	1.88	0.35
24	108.42	2.58	2.73	6.35	1.63	0.37
25	102.41	1.82	9.52	6.18	1.27	0.38
26	116.02	1.67	8.17	6.29	1.41	0.36
27	110.23	2.00	7.44	6.15	1.67	0.36
28	91.31	2.26	4.39	6.08	1.61	0.26
29	115.35	2.29	5.31	6.57	1.80	0.42
30	108.10	2.52	6.44	6.43	1.91	0.40
31	107.47	2.72	6.23	6.38	1.90	0.39
32	106.55	2.53	6.64	6.41	1.65	0.39
33	97.72	2.67	4.01	6.61	1.88	0.39
34	97.27	2.83	3.02	6.50	1.24	0.28
35	119.07	2.30	3.37	6.56	1.76	0.42
36	124.88	2.28	4.72	6.50	1.64	0.44
37	118.34	1.77	2.47	6.72	1.22	0.28
38	135.57	1.98	4.28	6.41	1.52	0.34
39	126.24	2.26	6.06	6.51	1.57	0.29
40	115.14	2.22	2.63	6.82	1.17	0.20
41	126.42	2.14	4.50	6.61	1.78	0.27
42	117.74	2.49	6.62	6.53	1.74	0.39
43	116.04	2.68	7.73	6.54	1.54	0.38
44	118.53	1.59	3.53	6.57	1.17	0.43
45	122.11	1.48	3.17	6.64	1.47	0.37
46	117.92	2.15	6.54	6.43	1.51	0.35
47	113.46	2.54	7.91	6.54	1.47	0.40
48	96.36	2.09	3.97	6.59	1.31	0.34

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A House of Complete Environmental Management Solutions

**AECL LABORATORY ANALYSIS REPORT  
AMBIENT AIR QUALITY TEST REPORT**

Project Title: 2x660 MW Maitree Super Thermal Project  
Project Location: Rampal, Bagherhat  
Description of Sample: Ambient Air  
Sample collector: Adroit Environment Consultants Ltd. (Monitoring team)  
Sampling date: 20th October to 3rd November 2022  
Reporting date: 22nd November, 2022

**Description of analysis**

Sample Location ID	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>x</sub>	CO	O <sub>3</sub>	Remarks
AQ1	61.47	84.89	158.26	23.49	39.35	1.0	49
AQ2	42.84	71.49	127.77	13.27	20.63	1.1	14
AQ3	39.63	67.26	109.27	10.18	17.64	0.6	19
AQ4	49.63	58.48	123.62	16.71	25.45	0.4	14
AQ5	46.32	64.18	139.24	14.66	21.43	0.2	13
AQ6	30.22	39.66	77.36	10.52	18.03	0.1	14
AQ7	41.59	64.71	111.39	13.88	20.31	0.1	33
AQ8	58.46	93.43	170.28	21.41	34.0	1.9	59
AQ9	53.98	76.18	142.09	12.37	20.41	0.3	41
AQ10	57.2	89.22	164.2	16.82	27.87	0.5	28
AQ11	35.35	50.14	99.42	11.06	18.2	1.0	19
AQ12	48.3	74.05	138.51	15.42	22.14	0.6	24
AQ13	63.57	92.2	169.49	21.71	36.56	1.6	64

Units	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>	mg/m <sup>3</sup>	µg/m <sup>3</sup>
Test Duration (Hours)	24	24	8	8	8	8	8
Method of Analysis	Gravimetric	Gravimetric	Gravimetric	West-Gaeke	Jacob & Hochreiter	CO Meter	O <sub>3</sub> Meter
DoE Standard	65	150	NF	80	80	5	100
IPC/NW Standard	75	150	NF	125	200	NF	160

(NF - not found, DoE - Department of Environment.)

Note: This monitoring report was usually accomplished by - Respirable Dust Sampler (Model-Envirotech India APM-460BL) and Fine Particulate Sampler (Model- Envirotech India AAS-127 Mini).

1. Fine Particulate Matter (PM<sub>2.5</sub>).
2. Respirable Dust Content (PM<sub>10</sub>).
3. Suspended Particulate Matter (SPM).
4. Oxides of Nitrogen (NO<sub>x</sub>).
5. Oxides of Sulfur (SO<sub>2</sub>).
6. Carbonyl Mono-Oxide (CO).

Comment: All the stated parameters do conform to the standard allowable limits.

Md. Faisal Bin Mahmud  
Associate Consultant

Md. Saiful Islam  
Chief Operating Officer

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