

# Environmental Monitoring Report

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For the period covering January–June 2020  
Project Number: 38412-023  
March 2022

## India: MFF - Assam Integrated Flood and Riverbank Erosion Risk Management Investment Program — Tranche 1

Prepared by the Flood and River Erosion Management Agency of Assam (FREMAA) for the State Government of Assam and the Asian Development Bank.

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# **BI-ANNUAL REPORT ON IMPLEMENTATION OF EMP**

**(OPERATION PHASE TRANCHE 1)**

**Project No.: 38412  
Loan No.: 2684-IND**

**India: Multitranche Financing Facility –  
Assam Integrated Flood and Riverbank Erosion Risk  
Management Investment Program**

**Reporting Period: January to June 2020**

Submitted by Executing Agency



**Flood and River Erosion Management Agency of Assam (FREMAA)**

Prepared for FREMAA by Project Management Consultancy (PMC-FREMAA)

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**Bi-Annual Report on Implementation of Environmental Management Plan  
(January to June 2020 Period)**

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## ABBREVIATIONS

ADB	– Asian Development Bank
AIFRERMIP	– Assam Integrated Flood and Riverbank Erosion Risk Management Investment Program
CBFRML	– Community based flood risk management and livelihood
EIA	– Environmental impact assessment
EMP	– Environmental management plan
EMoP	– Environmental Monitoring Plan
FRERM	– Flood and riverbank erosion risk management
FREMAA	– Flood and River Erosion Management Agency of Assam
MFF	– Multitranche financing facility
MIS	– Management information system
MoEF&CC	– Ministry of Environment Forests and Climate Change
GOI	– Government of India
NGOs	– Nongovernment organizations
PMU	– Project management unit
SEIA	– Summary environmental impact assessment
SGOA	– State Government of Assam
SIO	– Subproject implementation office
SPCB	– State Pollution Control Board
UNDP	– United Nations Development Program
WRD	– Water Resources Department

## LOAN PROCESSING HISTORY

Approval of PPTA	:	26 September 2008
Fact-finding Mission	:	27 January-7 February 2009
Management Review Meeting:		9 October 2009
Appraisal Mission-1	:	1-16 February 2010
Appraisal Mission (Final):		27 April – 10 May 2010
Staff Review Meeting	:	29 July 2010
Loan Negotiations for MFF and Tranche 1:		7-8 September 2010
Board Circulation	:	29 September 2010
Board Approval	:	19 October 2010
Project 1 Approval	:	IV October 2010
Loan Agreement Signing:		November/December 2010
Loan Effectiveness	:	December/January 2010
Physical Completion	:	31 March 2017
Loan Physical Completion:		31 July 2017
Loan Closing	:	30 September 2017

## 1. Introduction

Flood and Riverbank Erosion Risk Management Investment Program (AIFRERMIP) funded by ADB with provision of comprehensive, cost-effective and sustainable structural and non-structural measures in Palasbari, Gumi and Dibrugarh under Tranche 1, in accordance with government and ADB's policies and procedures. The **Flood and River Erosion Management Agency of Assam (FREMAA)** was set up in 2010-11 as an Executing Agency (EA) under Society Registration Act 1860. It is a special purpose vehicle established for implementation of the Assam Integrated

The project under the program of Tranche-1 was under **Category A** as the investment Program is likely to affect an area larger than the sites or facilities subject to physical works. Overall, the two subprojects - Dibrugarh, Palasbari and Gumi were needed primarily to safeguard the people, property and environment from frequent floods of the Brahmaputra River. The programme was strongly supported by the stakeholders. The FREMAA aims to integrate key environmental safeguards at all the levels of planning and implementation so that critical natural ecosystem and the flood plains of Brahmaputra and the resources, are not destroyed. Nevertheless, close monitoring during pre-construction, construction and operation phases is performed so that any unforeseen impact will be identified and mitigation measures were provided. This will help in maintaining environmental sustainability along with inclusive economic growth.

Sound environmental management is critical to sustainable development and poverty reduction. The objective of the environment safeguards is to avoid, or when avoidance is not possible, to minimize and mitigate adverse project impacts on the environment and affected people.

The goal of the ADB's Safeguard Policy Statement (SPS) 2009 is to promote the environmental and social sustainability of ADB supported projects by protecting people and their environment from potential adverse impacts and enhancing the benefits provided. This goal is integral to achieving environmentally sustainable and socially inclusive growth and poverty reduction in Asia and the Pacific, a defining element of ADB's Long-Term Strategic Framework, Strategy 2020.

In complying with the SPS requirements:

- (i) environmentally sustainable projects are primarily achieved through a good project design during project preparation and effective environmental management during project implementation;
- (ii) integrating environmental considerations into the project feasibility study and design calls for the incorporation of environmental assessment and management into the economic, financial, institutional, social, and technical analysis of a project; and

- (iii) good environmental assessment and management enables the continued improvement of environmental performance throughout the life of a project, and can lead to enhanced economic, financial, and social outcomes.

### **Provisions for compliance**

The FREMAA aims to integrate key environmental safeguards at all the levels of planning and implementation so that critical natural ecosystem and the resources are not destroyed in this biodiversity hotspot. There was a need for recognition and following the compliance with national and state system and regulations on environmental standards by the contractors during construction phase and by the Project Implementation Unit during operation phase. Some of the specific environmental parameters were to be monitored periodically to check the compliance during operation phase as per Environment Management Plan (EMP). This helps in maintaining environmental sustainability along with inclusive economic growth. Besides above, for achieving the compliance following specific arrangements were made in the EMP.

As stated in the EMP FREMAA and SIO are monitoring the Tranche - 1 project areas during the operation phase also. It is the third report of the operation phase for Tranche - 1.

Measures for monitoring are of air, water, noise, compensatory afforestation, crop cultivation, etc. are under the preview of the environmental safeguard measures under the project.

All the measures were followed in construction phase of Tranche-1. In the initial stages contractor did not complied the contract conditions as they were not aware of the ADB SPS 2009. In the later stage, after training by PMC and FREMAA, the contractors' abide by the contract stipulations. Operation phase monitoring were also carried out as per EMP.

Structural works of the two subproject areas under Tranche-1 were:

**Palasbari Subproject:**

**Palasbari Reach** (Construction works completed before June 2017)

1. Palasbari erosion protection under water works below LWL (4.9 Km).
2. Construction of Palasbari embankment and slope protection work above LWL along Brahmaputra river at Palasbari. (5.1 Km).

**Gumi Reach** (Construction works completed before December 2016)

3. Construction of under water and bank revetment with loose boulder crates over geobag apron including supply of boulders and wire mesh nets for Gumi erosion protection works along the Brahmaputra river. (4.5 Km).

**Dibrugarh Subproject:** (Construction works completed before June 2017)

- (i) Raising, strengthening upgradation and construction of road works for Dibrugarh town protection (DTP) dyke along the Brahmaputra River in Dibrugarh – 8.53 Km.
- (ii) 1.8 km of bank protection through pro-siltation measures along the town protection dykes, (fabrication and launching of porcupines Lot-1, Lot 2, Lot 3 and Lot 4), and
- (iii) Construction of revetments, geobag aprons for Mothola Oakland bank area, Dibrugarh erosion protection works from Ch. 000 to Ch 2400m.

(Kaziranga Subproject– shifted to Tranche-2)

**Table 1. Achievement of Major Civil Works Packages**

Sl. No.	Description of the work	Physical Progress
1	Palasbari Erosion Protection underwater works below Working Low Water Level (WLWL) with two layers of sand filled geo-bags at apron.	100%
2	Gumi Erosion Protection Works	100%
3	Construction of Palasbari Embankment with black topped road and slope protection works above LWL along the Brahmaputra river	100%
4	Construction of Revetments, Geo-bag Apron, for Mothalla – Oakland bank protection works along the Brahmaputra River, Dibrugarh	100%
5	Raising, Strengthening, Up-gradation and Construction of Road Works for Dibrugarh Town Protection (DTP) Dyke	100%
6	Fabrication, Supply and Installation of Pre-Stressed Concrete (PSC) Porcupines (4 lots) at Oakland and DTP Dyke area.	100%

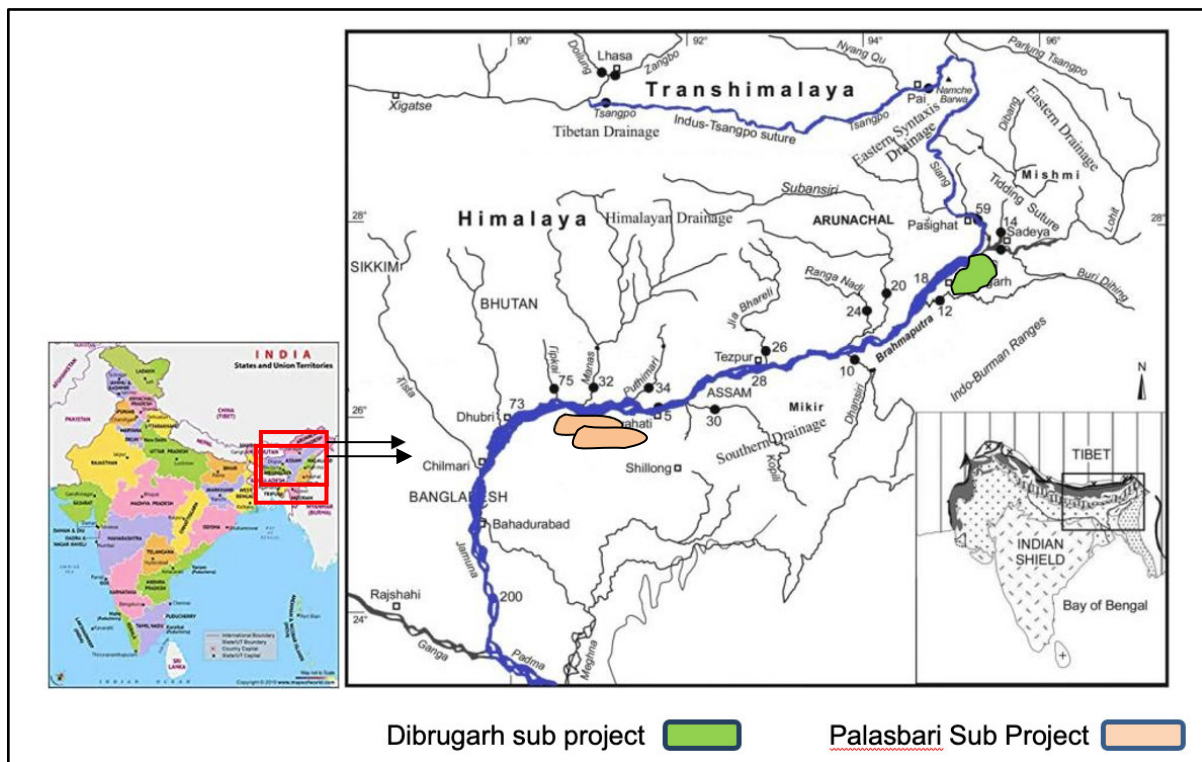
\* All civil works completed before 31<sup>st</sup> July 2017.

## 1.1. Purpose of the Report

The two sub-project sites under Tranche 1 i.e. Dibrugarh, Palashbari are in three reaches Dibrugarh, Palasbari and Gumi in Assam, which are implemented by FREMAA through Water Resource Department of Assam. Safeguards of the Tranche 1 has followed ADB's SPS of 2009 and Ministry of Environment, Forest and Climate Change (MoEF&CC). GOI guidelines. This is to ensure that all environmental monitoring measures and applicable environmental mitigation measures, as given in Environmental Impact Assessment (EIA) and Environmental Management Plans (EMPs) incorporating all the Environmental concerns of the project, are performed even in the operation stage.

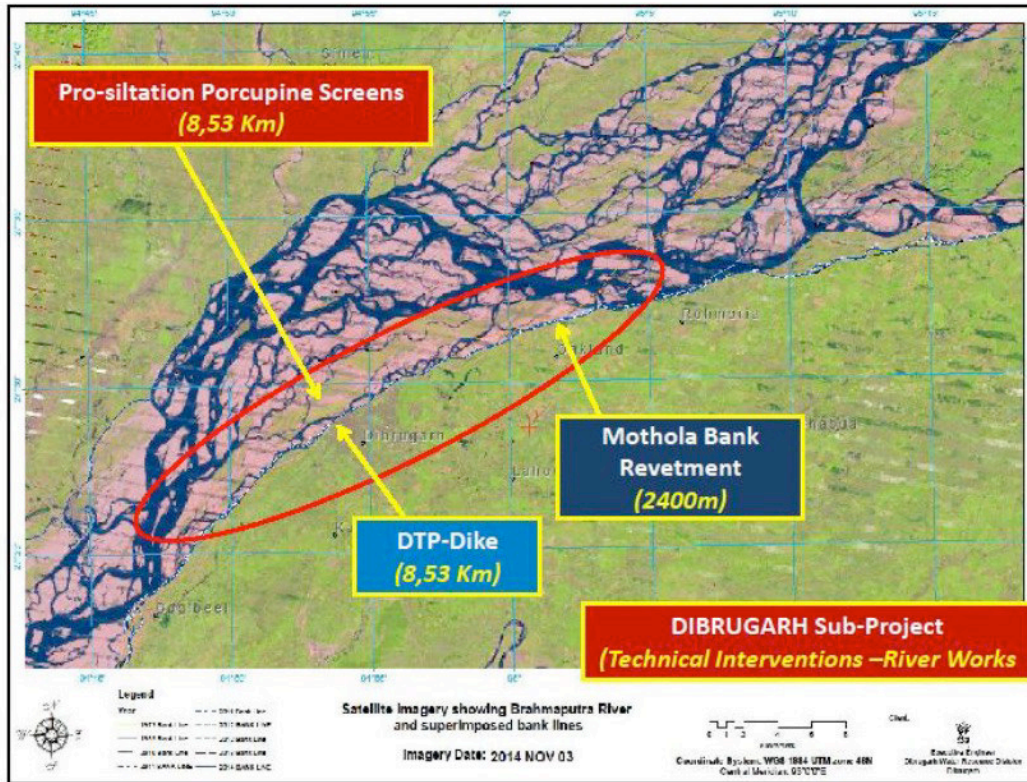
The main objectives of the report are to:

- To ensure environmentally compatible project implementation by avoiding and mitigation of negative impacts that arises from the project during the period January to June 2020.
- To ensure that EIA recommendations are adequately followed in EMP and EMoP to meet the Environmental Compliances of statutory requirements of MoEF&CC, GOI.



**Map-1. Project sites in Assam along the river Brahmaputra**





Map-2. Project sites in Dibrugarh



Map-3. Project sites in Palsbari and Gumi

The bi-annual report on the implementation of EMP ending June 2020 delineates:

- Environmental Monitoring of the project from January 2020 to June 2020 considering the environmental activities along with environmental compliances of statutory requirements of MoEF&CC, GOI and relevant agreements and conditions.

This report also highlights the gaps and deficiencies while executing the environmental management.

## **1.2. Project Implementation Progress**

Although the effectiveness of the loan started from December 2010 and January 2011, consideration of the environment safeguard of the project started in the early part of 2013. Construction works started in February 2012 in both the subprojects of Dibrugarh and Palasbari and Gumi. Kaziranga subproject could not be started as required environmental clearance from the Standing Committee of the National Board for Wildlife (NBWL), MoEF&CC, GOI could only be obtained in 3<sup>rd</sup> quarter of 2014 and hence, this work shifted to Tranche 2. Several meetings, trainings and workshops were conducted jointly by PMC and FREMAA with the contractors and SIO's in the month of April 2013, May 2014 and in subsequent months at the respective SIO office and in the site offices of the contractor for generating the awareness about the environmental safeguard and stipulations of the contract document on environment. Physical works completed on 31<sup>st</sup> July 2017. Environmental monitoring was carried out during the operation phase from August 2017 as per the EMP.

### **1.2.1. Provisions for compliance**

The FREMAA has integrated key environmental safeguards at all the levels, so the critical natural ecosystem and the resources are not adversely affected within the biodiversity hotspot. Some of the specific environmental parameters are to be monitored periodically to check the compliance. This helps in maintaining environmental sustainability along with inclusive economic growth. Besides above, for achieving the compliance following specific arrangements were made in the EMP during the operation phase.

- Measures for monitoring and preventing pollution of air, water, and noise, and
- Other measures like, emergency response plan, etc. are also under the preview of the environmental safeguard measures under the project.

## **2. Incorporation of Environmental Requirements into Project Contractual Agreements** (Implemented during construction and operation phase as per EMP)

The key design considerations and elements of environmental monitoring are incorporated in the contract agreement for construction and operation phase enabling

with ADB's Safeguard Policies and with environmental compliances of statutory requirements of MoEF&CC, GOI.

### **2.1. Tests to check the ambient environment (during operation stage)**

The following parameters are to be monitored with the frequencies described.

- *For Air Quality (SPM, RSPM, SO<sub>2</sub>, NO<sub>x</sub>, CO, Pb):* Within 100 m of sensitive locations/ settlement and continuous for 24 hours, twice a week, for two weeks once every year (summer period).
- *Surface Water (pH, BOD, COD, TDS, TSS, DO, Oil and Grease):* Along Brahmaputra River. Once during the dry season.
- *Groundwater (pH, BOD, DO, total coliform, As, Cd, Mn and Groundwater levels):* At construction sites, rehabilitation sites and service areas.
- *Noise level (dB(A)):* Near construction sites and sensitive locations close to embankments. Hourly measurement within 24 hours. Once in six months.

For the operation phase, SIOs carried out regular checks based on the measures mentioned in the EMP, but except for the tests on air, water and noise at the construction completed reaches. Tests of ambient environment were carried out for the period January to June 2020. Results of the tests are reflected in this report.

## **3. Summary of Environmental Mitigation and Compensation Measures Implemented**

### **3.1. Monitoring site specific environment conditions**

The implementation of environmental safeguards is satisfactory based on the findings of site visits, reviews of river morphology reports, water levels, and discussions with stakeholders. During the operation, no major safeguard issues were identified and no major gaps in EMP implementation noticed except for the test of ambient environment. Grievance redress mechanisms (GRMs) were established, and no complaints were received during January to June 2020.

### **3.2. Measures taken to reduce and monitor the occurrence of pollution**

Several measures were taken to reduce the environmental pollution, where levels may exceed the national standards and monitor ambient environment during operation phase. They are the following:

- **Air**
  - Conducted air quality tests by PCB approved laboratory (at Dibrugarh on 16/03/2020 and at Gumi on 22/06/2020)

- **Noise level**
  - Vehicle horns are recommended not to be used, unless essential
  - Conducted noise level by PCB approved laboratory (at Dibrugarh on 16/03/2020 and at Gumi on 23/06/2020)
- **Surface water quality**
  - Store fuel and lubricants away from the river channels (awareness for boat man)
  - Conducted surface water quality tests by PCB approved laboratory (from Gumi on 19/06/2020 and from Dibrugarh on 17/03/2020)
- **Ground water quality**
  - Conducted ground water quality tests by PCB approved laboratory ( from Dibrugarh on 17/03/2020)
- **Pollution**
  - Spills of oils on the site and on river regularly checked by SIO
  - Surface discharges monitored

### **3.3. Status of the mechanisms present for the Implementation of EMP during operation phase**

To improve the scenario approach of the operation phase, the following actions were taken:

- Meetings were organized to refresh and capacitate the SIO's on the environmental safeguards of ADB (strategy and directions), testing methods of environmental parameters, national environmental standards, acts and rules of MoEF&CC and state government of Assam.
- In all of the meetings with SIO's during field visits and review meetings, it has been emphasized to carry out the required numbers of tests as per EMP. Moreover, special efforts have been made by FREMAA and PMC so that the SIOs adheres to the EMP measures even after completion of the works.
- Monitoring terrestrial and aquatic fauna status.
- Benefit assessment of the support during the project as a whole (done by BME team.)
- Fish availability was also assessed.

## **4. Summary of Environmental Monitoring**




### **4.1. Compliance Inspection**

Following the recommendations in the EMP, SIOs engage their officers to inspect the environmental safeguards implementation of the project areas. As an example, borrow areas are converted into fish ponds as per borrow area rehabilitation plan, and for other areas, top soil were spread properly. More results of the environmental monitoring are shown in the following tables.

#### 4.1.1. Summary of Inspection Activities

Officers are tasked to monitor the day to day environmental safeguards at the site and reports to the SIO. Moreover, FREMAA also monitors the implementation of the EMP (Table- 2).

**Table 2. Showing the site inspections by FREMAA and SIO**

No.	Date	Locations	Meetings Results	Key outcome	
1	9/1/2020 & 10/1/2020	Dibrugarh	Operation phase monitoring of EMP. Terrestrial and aquatic fauna status, and river morphology discussed for Tranche 1 works along with Tranche 2.	Monitoring of river morphology carried out in Tranche 1 site by ISC. Test of ambient environment.	
2	7/1/2020	Gumi	Operation phase monitoring of EMP. Fish productivity in the reach, monitoring of river morphology etc. discussed for Tranche 1 works along with Tranche 2.	Monitoring fish markets for fish availability and records of crop cultivation from SIO office.	
3	3/1/2020	Palasbari	Operation phase monitoring of EMP. Terrestrial and aquatic fauna status, River morphology discussed for Tranche 1 works along with Tranche 2.	Monitoring fish markets for fish availability from SIO office.	



**Table 3. Field visit carried out by the experts of PMC during January to June 2020**

No.	Date	Place of visit	Meeting with	Results
1	3/1/2020	Palasbari embankment and Palasbari Apron	WRD, Villagers, FREMAA	<ul style="list-style-type: none"> <li>• aquatic migratory birds visited in the reach.</li> <li>• dolphin sighted</li> <li>• fishes found in the reach</li> </ul>
2	7/1/2020	Gumi works	WRD, Villagers, FREMAA	<ul style="list-style-type: none"> <li>• aquatic migratory birds visited in the reach.</li> <li>• dolphin sighted</li> <li>• fishes found in the reach</li> <li>• crops cultivated in the area</li> </ul>
3	9/1/2020 & 10/1/2020	DTP Dyke, Mothola Oakland, Dibrugarh	WRD, Villagers, FREMAA	<ul style="list-style-type: none"> <li>• aquatic migratory birds visited in the reach.</li> <li>• fishes found in the reach</li> </ul>

### **Condition of the embankment**

The overall condition of the embankment is good. No inundation occurred after completion of the embankment in all the three sites (Palasbari, Gumi and Dibrugarh).

**Table 4. Compliance with ADB's Safeguard Requirements under Loan Covenants (Tranche I – Environment)**

Environmental Loan Covenants		Responsibility	Status of Compliance
1	All the project facilities are designed, implemented, operated and maintained in accordance with applicable laws, and regulations of the Government of India, State of Assam and ADB's SPS (2009)	FREMAA, SIO	Under Compliance in accordance with ADB Environmental Policy and SPS Guideline. Acts and rules related to Water, Air, Noise, Environment, Biodiversity of Government of India and Govt. of Assam. (Test of ambient

Environmental Loan Covenants		Responsibility	Status of Compliance
			environment carried out in the month of January to June 2020 in different reaches).
2	Social and environmental safeguard unit	FREMAA	Under Compliance; comprising of Land acquisition expert, resettlement expert and environmental expert.
3	Monitoring of quality of Air, Water Noise at the project sites	FREMAA, SIO, Contractor	Under Compliance. Within the acceptable limits of the environmental standards, CPCB, MoEF&CC, GOI for the projects where tests were already been conducted. During operation phase monitoring was done in the month of January to June 2020 near Tranche 1 reaches.
4	Prepare and implement Environmental Management Plan under all the contract packages of the works	Contractor, SIO, FREMAA,	Under Compliance. Works completed as per approved EMP during the operation phase of the project.
5	All monitoring and mitigations measures indicated in the EIA and respective EMP are undertaken for the project	SIO, FREMAA	Under Compliance. Any unpredicted environmental impacts monitored by SIO office. So far no issues identified.  Terrestrial and aquatic animals records were kept. Fish records were also kept at SIO office. Sites regularly monitored by SIO for compliance.
6	An environmental assessment and review framework for implementation of minor CBFRM measures	SIO, FREMAA	As highland were not created under CBFRM, but villagers were trained under DDMA's and kits were distributed to cope flood. Other than that ambient environment was monitored.
7	Semi Annual Report on implementation of EMP	FREMAA	Under Compliance. Semi / Bi-annual report submitted for the period of July 2019 to December 2019. Compilation going on for the period of January to June 2020 (this report).

**Photographs of the present conditions of the Tranche 1 works**  
**DTP Dyke**





## Mothola Oakland – Dibrugarh





## Gumi Works



## Palasbari Works



#### 4.1.2. Mitigation Compliance

Following measures were taken to meet the compliance.

- **Pollution monitoring**
  - Operation phase monitoring of ambient environment carried out near Tranche 1 sites during January to June 2020.
- **Preservation of trees**
  - Major trees near the embankment in Dibrugarh DTP Dyke (3 nos.) were protected.
  - Monitoring of the planted trees.  
Survival rate of the planted trees are 80 %.
- All **natural channels** were monitored by SIO and were monitored before monsoon season.
- **Consultation with Fisherman in the Tranche-1 reach**  
During the field visit fisherman were interviewed. List of species found in the reach were recorded.



Fishing activities in Palasbari



**Table 5: List of Fish species found in the 3 reaches during monitoring**

	<b>Palasbari</b>	<b>Gumi</b>	<b>Dibrugarh</b>
1	<i>Chitala chitala</i>	<i>Chitala chitala</i>	<i>Angilla bengalensis</i>
2	<i>Notopterus notopterus</i>	<i>Notopterus notopterus</i>	<i>Gudusia chapra</i>
3	<i>Gudusia chapra</i>	<i>Tenuulosa ilisha</i>	<i>Cirrhinus reba</i>
4	<i>Tenuulosa ilisha</i>	<i>Gonialosa manmina</i>	<i>Labeo calbasu</i>
5	<i>Gonialosa manmina</i>	<i>Setipinna phasa</i>	<i>Labeo gonius</i>
6	<i>Setipinna phasa</i>	<i>Chela cachius</i>	<i>Systomus sarana</i>
7	<i>Chela cachius</i>	<i>Amblypharyngodon mola</i>	<i>Pethia ticto</i>
8	<i>Amblypharyngodon mola</i>	<i>Danio rerio</i>	<i>Puntius sophore</i>
9	<i>Cabdio morar</i>	<i>Esomus danricus</i>	<i>Salmostoma bacaila</i>
10	<i>Danio rerio</i>	<i>Rasbora rasbora</i>	<i>Devario devario</i>
11	<i>Esomus danricus</i>	<i>Gibelion catla</i>	<i>Raiamas bola</i>
12	<i>Rasbora rasbora</i>	<i>Cirrhinus mrigala</i>	<i>Garra gotyla</i>
13	<i>Gibelion catla</i>	<i>Cirrhinus reba</i>	<i>Garra nasuta</i>
14	<i>Cirrhinus mrigala</i>	<i>Ctenopharyngodon idella</i>	<i>Psilorhynchus balitora</i>
15	<i>Cirrhinus reba</i>	<i>Cyprinus carpio</i>	<i>Acaanthocobitis botia</i>
16	<i>Ctenopharyngodon idella</i>	<i>Labeo bata</i>	<i>Schistura scaturigina</i>
17	<i>Cyprinus carpio</i>	<i>Labeo calbasu</i>	<i>Cantophrys gongota</i>
18	<i>Labeo bata</i>	<i>Labeo gonius</i>	<i>Botia dario</i>
19	<i>Labeo calbasu</i>	<i>Labeo rohita</i>	<i>Pseudocheneisis sulcatus</i>
20	<i>Labeo gonius</i>	<i>Acanthocobitis botia</i>	<i>Chanda nama</i>
21	<i>Labeo rohita</i>	<i>Botia dario guntea</i>	<i>Mastacembelus armatus</i>
22	<i>Pethia conchoniis</i>	<i>Sperata seenghala</i>	<i>Macrogathus pancalus</i>
23	<i>Pethia ticto</i>	<i>Mystus cavasius</i>	<i>Xenentodon cancila</i>
24	<i>Acanthocobitis botia</i>	<i>Mystus vittatus</i>	<i>Olyra longicaudata</i>
25	<i>Lepidocephalus guntea</i>	<i>Rita rita</i>	<i>Heteropneustes fossilis</i>
26	<i>Botia dario guntea</i>	<i>Ompok bimaculatus</i>	<i>Clarias batrachus</i>
27	<i>Sperata aor</i>	<i>Wallago attu</i>	<i>Laguvia shawi</i>
28	<i>Sperata seenghala</i>	<i>Eutropiichthys vacha</i>	<i>Glossobius giuris</i>
29	<i>Mystus cavasius</i>	<i>Xenentodon cancila</i>	<i>Channa punctatus</i>
30	<i>Mystus vittatus</i>	<i>Chanda nama</i>	<i>Channa striatus</i>
31	<i>Rita rita</i>	<i>Glossogobius giuris</i>	<i>Tor tor</i>
32	<i>Ompok bimaculatus</i>	<i>Laubuka laubuca</i>	
33	<i>Wallago attu</i>	<i>Devario devario</i>	
34	<i>Eutropiichthys vacha</i>		
35	<i>Xenentodon cancila</i>		
36	<i>Chanda nama</i>		
37	<i>Glossogobius giuris</i>		

\*Scientific name as per www.fishbase.org

\*Direct observation and during interview

\*No additional species recorded during January to June 2020

- Crop Cultivation in the area**

**Table 6: Crop cultivation in area after protection works in Tranche 1**

S.No.	<b>Dibrugarh</b>	<b>Palasbari</b>	<b>Gumi</b>
1	Rice	Rice	Brinjal
2	Mustard	Mustard	Cabbage

S.No.	Dibrugarh	Palasbari	Gumi
3		Sweet potato	Cauliflower
4		Tomato	German Turnip
5		Cabbage	Sweet potato
6		Potato	Tomato
7		Cauliflower	Rice
8			Potato
9			Brinjal
10			Pumpkin
11			Mustard



Gumi area- Mustard cultivation

- Discharge monitoring (Data of November, 2018 available, New data yet not received from CWC).

Category	Status	Explanatory comments
Overall Compliance	<b>Good</b>	<ol style="list-style-type: none"> <li>1. The results of the environmental standards of Central Pollution Control Board, MoEF&amp;CC, GOI applicable for the sites are kept at the SIO office for reference. This helps SIOs to compare the results of the tests of ambient environment.</li> <li>2. All the borrow areas were either rehabilitated or utilized by the community as per the Borrow Area Management Plan.</li> <li>3. Labour camp sites properly rehabilitated.</li> </ol>

Category	Status	Explanatory comments
		<p>4. Consultation with fisherman revealed that there was no impact on the fish catch and diversity.</p> <p>5. River morphology monitoring was done by SIO and DHI of FREMAA through Bathymetric survey and analysis of satellite images.</p> <p>6. Monitoring of the planted trees. Satisfactory survival rate monitored by the Forest Department and district administration. Maintenance of the tree saplings were poor. But supplementary plantation required against the dead saplings.</p> <p>7. Crop production also became stable after protection from erosion.</p> <p>8. Discharge data were also recorded by SIO from CWC, time to time.</p>

#### 4.1.3. Mitigation Effectiveness

- To determine the mitigation effectiveness the parameters mentioned in EMP were monitored (Table 7).
- No complaints were lodged to SIO on environmental pollution by any of the fringe villagers, NGO's or any other institutions during the reporting period (January to June 2020).
- Results of the ambient environmental tests carried out during January and June 2020 were within the permissible limit of Central Pollution Control Board, MoEF&CC, GOI.

**Table 7: Mitigation Effectiveness during January to June 2020**

Parameters	Palashbari– Embankment and Palashbari–Apron	Gumi	Dibrugarh – DTP Dyke & Mothola Oakland
Ambient Air quality	Within the permissible limit. Test done on 19/11/2019. During this reporting period no tests were conducted.	Within the permissible limit. Test Done on 22/06/2020.	Within the permissible limit. Test done on 17/03/2020).

Parameters	Palashbari– Embankment and Palashbari–Apron	Gumi	Dibrugarh – DTP Dyke & Mothola Oakland
Surface Water Quality	Within the permissible limit. Test done on 19/11/2019. During this reporting period no tests were conducted.	Within the permissible limit. Test done on 22/06/2020.	Within the permissible limit. Test done on 17/03/2020.
Ground water quality	Within the permissible limit. During this reporting period no tests were conducted.	Within the permissible limit. Test done on 22/06/2020.	Within the permissible limit. Test done on 17/03/2020.
Noise level	Within the permissible limit. Test done on 19/11/2019. During this reporting period no tests were conducted.	Within the permissible limit. Test done on 22/06/2020.	Within the permissible limit. Test done on 17/03/2020.
Complain lodged by the local residents on Environmental pollution January to June 2020.	No complaints lodged	No complaints lodged	No complaints lodged

Operation Phase ambient test carried out in the month of January to June 2020.

Category	Status	Explanatory comments
Mitigation Effectiveness	<b>Good</b>	<ul style="list-style-type: none"> <li>Results of the ambient environmental tests were within the permissible limit of Central Pollution Control Board, MoEF&amp;CC, GOI.</li> <li>Monthly environmental monitoring of the embankment, drainage, fish diversity, birds diversity, discharge, etc. reviewed by SIO's.</li> <li>No complaints were lodged to SIO on environmental pollution by any of the fringe villagers, NGO's or other institutions.</li> </ul>



## 4.2 Ambient Environment Monitoring Program

To monitor the ambient environment the following parameters are to be monitored with the frequencies described in the EMP. All the tests were performed from the Pollution Control Board, Assam and its approved labs during construction stage. Test of ambient environment initiated for operation phase as per EMP done between January and June 2020.

- *For Air Quality (SPM, RSPM, SO<sub>2</sub>, NO<sub>x</sub>, CO, Pb):* Within 100 m of sensitive locations/ settlement and continuous for 24 hours, twice a week, for two weeks once every year (summer period).
- *Surface Water (pH, BOD, COD, TDS, TSS, DO, Oil and Grease):* Along Brahmaputra River. Once during the dry season.
- *Groundwater (pH, BOD, DO, total coliform, As, Cd, Mn and Groundwater levels):* At construction sites, rehabilitation sites and service areas.
- *Noise level (dB(A)):* Near construction sites and sensitive locations close to embankments. Hourly measurement within 24 hours. Once in six months.

### 4.2.1. Summary of Monitoring

**Table 8: Ambient Environment Monitoring Plan (Operation Phase)**

Attribute	Parameter	Special Guidance	Standards	Duration	Location
<b>Air</b>	SO <sub>2</sub> , NO <sub>x</sub> , SPM, RSPM, CO, Pb	High volume sampler to be located 50m from the river bank site Downwind direction. Use method specified by PCB, Assam for analysis	Air (prevention and Control of Pollution) Rules, CPCB, 2009	24 hours Sampling	Along the river bank area
<b>Surface Water</b>	pH, BOD, COD, TDS, TSS, DO	Grab sample collected from source and Analyse as per Standard Methods for Examination of Water	Indian Standards for Inland Surface Waters (IS: 2296, 1982)	Grab Sampling	Along the Surface water sources
<b>Noise</b>	Noise levels on dB (A) scale	Equivalent noise levels using an integrated noise level meter kept at a distance of 15 m from the river bank.	MoEF&CC Noise Rules, 2000	Leq in dB(A) of day time and night time	Along the river bank

#### 4.2.2. Results

Results of the tests for air quality, noise, surface water and groundwater conducted by Pollution Control Board approved laboratories provide some indicators to compare them with the baseline information and national permissible standards during the construction phase. The test results of the samples collected lies within permissible limits described in the '*Environmental Standards for Ambient Air, Automobiles, Fuels, Industries and Noise, 2000*' (Central Pollution Control Board), and minor difference with the baseline test results and environmental monitoring during the construction works. This suggests that the project construction activities and operations is complying with the environmental protection standards.

For operation phase monitoring, between January to June 2020 tests were carried out as per management plan. Regular checking of the embankments was carried out by SIO. Following monitoring were also carried out during January to June 2020.

- Terrestrial and aquatic fauna status
- Fish productivity
- Cropping pattern
- Soil erosion and siltation
- Visual check on Drainage Congestion
- River Hydrology, Morphology and Sediment Transport

**Table 9: EMP monitoring parameters for operation Phase**

Location	Environmental Component	Parameter	Frequency	Remark
Dibrugarh and Gumi; and Palasbari	Fisheries	Fish productivity	Once in a year	TOR developed. The study will be carried out in next quarter. Findings of this study will be reported in the subsequent Bi-annual report.
Dibrugarh and Gumi; and Palasbari	Cropping Pattern	Survey of existing cropping pattern and effect of change in cropping pattern in the impacted areas	Once in a year	Monthly monitoring done. BME captured in their report.
Dibrugarh and Gumi; and Palasbari	Air Quality	SPM, RSPM, SO <sub>2</sub> , NO <sub>x</sub> , CO, Pb	Once during construction and once after six months of	Test carried out between July to December 2019.

Location	Environmental Component	Parameter	Frequency	Remark
			completion of project	
Dibrugarh and Gumi; and Palasbari	Surface Water Quality	pH, BOD, COD, TDS, TSS, DO, Oil & Grease	Once during the dry season.	Test carried out between July to December 2019.
Dibrugarh and Gumi; and Palasbari	Ground water and Drinking Water Quality	pH, BOD, DO, total coliform, As, Cd, Mn and water levels		Test carried out between July to December 2019.
Dibrugarh and Gumi; and Palasbari	Noise			Test carried out between July to December 2019.
Dibrugarh and Gumi; and Palasbari	Soil Erosion (inland erosion) and siltation		Once during operation of 1 <sup>st</sup> year	Monthly checking done by SIOs regularly.
Dibrugarh and Gumi; and Palasbari	Drainage Congestion	Visual check	After one year of construction.	Monthly checking done by SIOs regularly.
Dibrugarh and Gumi; and Palasbari	River Hydrology, Morphology and Sediment Transport	Scientific techniques applicable to the monitoring of these components	Regular	Bathymetric survey done by ISC and SIOs monitoring the results.
Dibrugarh and Gumi; and Palasbari	Tree Plantation	Scientific techniques applicable to the monitoring of these components	Regular	Monitored by Forest Department.
Palasbari	Hydrology	Water level, discharge, river cross sections	As per CWC guidelines	SIO's are doing it regularly.
Palasbari	Morphology	Bank line profiles, Sediment transport, velocity, float tracking	As per CWC guidelines	SIO's are doing it regularly.

**Table 10. Ambient Air Quality at the sites**

Parameter	DTP Dyke & Mothola Oakland (17 <sup>th</sup> March, 2020)	Gumi (22 <sup>nd</sup> June 2020)
PM 2.5	31.9	48
PM10	72.4	82.9
NO2	6.2	17.7
SO2	ND	7.4
CO	ND	ND
Pb	ND	ND
Weather	Clear	Clear

**Table 11. Noise Levels at the sites**

Parameter	Dibrugarh DTP Dyke & Mothola Oakland 16 <sup>th</sup> March, 2020	Gumi 22 <sup>nd</sup> June, 2020
Location	DTP Dyke	
Noise levels on dB (A) scale Day Time	57.2	69.3
Noise levels on dB (A) scale Night Time	NR	NR

NR – Not Recorded

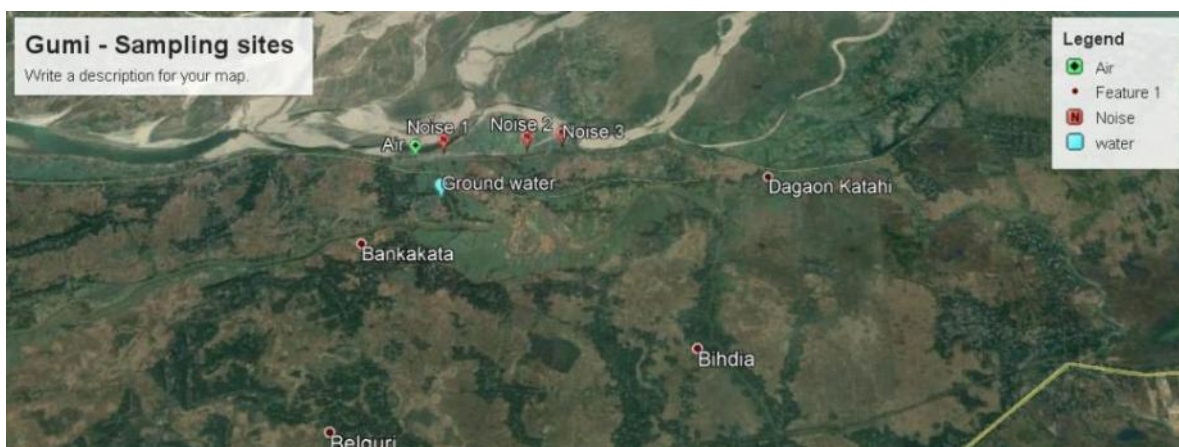
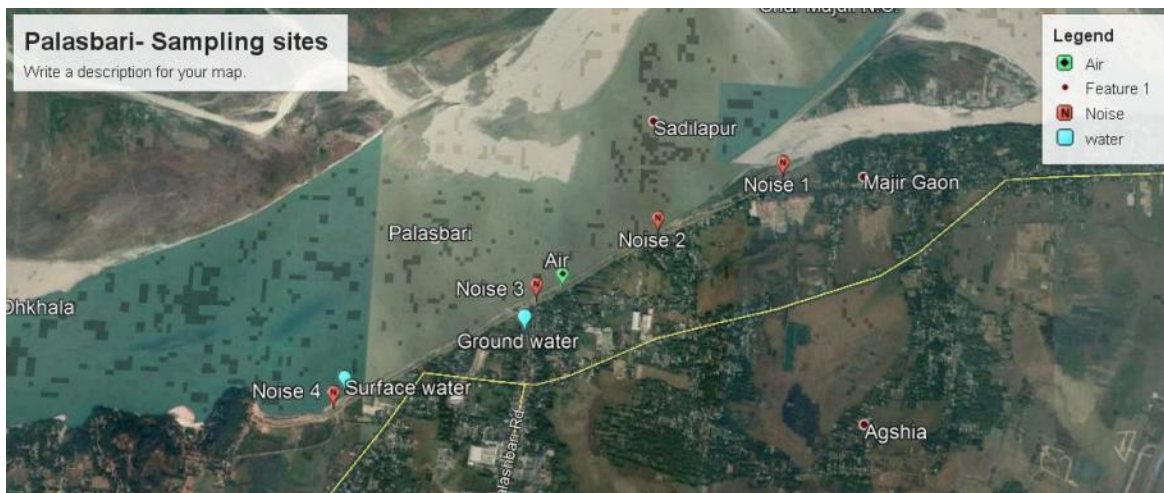
**Table 12. Ground Water Quality at the sites**

Parameters	Unit	Dibrugarh 17/03/2020
	Source	Tube well
Colour	Hazen	10
Odour		Un objectionable
Temperature	°C	23.8
Turbidity	NTU	1
pH		7.84
TDS	mg/l	376
Oil & Grease	mg/l	<5
CaCO <sub>3</sub>	mg/l	284.4
Chloride as Cl	mg/l	30.9
Sulphates as SO <sub>4</sub>	mg/l	28.35
Phenols	mg/l	
BOD	mg/l	-
Lead Pb	mg/l	<0.01
Arsenic as As	mg/l	<0.01
Iron as Fe	mg/l	0.02
Phosphates	mg/l	
Sulphates	mg/l	
Copper	mg/l	
Calcium	mg/l	
Fluoride	mg/l	
Manganese	mg/l	
Zinc	mg/l	
Nitrate	mg/l	
Total Coliforms	MNP/100ml	-
E Coli	MNP/100ml	Absent

**Table 13. Quality of Surface Water at the site**

		<b>Gumi</b>	<b>Dibrugarh</b>
<b>Parameters</b>	<b>Unit</b>	19/06/2020	17/03/2020
		Brahmaputra River (US)	Brahmaputra River
Temp	°C	21.4	22.5
BOD		3.5	<2
Chloride as Cl	mg/l		9.9
Colour	Hazen		40
Copper Cu	mg/l	0.021	<0.05
Chromium Cr	mg/l		<0.01
Cyanide CN	mg/l		<0.05
DDT	mg/l		
Detergents	mg/l		
Dissolved Oxygen	mg/l	7.6	5.8
Iron as Fe	mg/l		<0.06
Fluorides as F	mg/l	0.29	<0.1
Lead Pb	mg/l	BDL	<0.1
Oil & Grease	mg/l		<2
pH		7.57	8.31
Phenols	mg/l		<0.005
Selenium Se	mg/l	BDL	<0.05
Sulphates as SO <sub>4</sub>	mg/l	17.8	96.4
TDS	mg/l	114	142
Total Coliform	MNP/100ml		Absent
Turbidity		1.12	
COD		9.1	

## Locations of ambient environment monitoring sites



Category	Status	Explanatory comments
Ambient Environment condition	Good	<ul style="list-style-type: none"> <li>• Operation phase monitoring performed in the month of January to June 2020.</li> <li>• Air qualities are within prescribed limits of CPCB.</li> <li>• Noise levels are within the levels of Residential area and commercial area.</li> <li>• Surface water at the site contains grease and oils less than 5 mg/l.</li> <li>• For those sites where the tests are being conducted in operation phase, the results are within the prescribed limits of the Central Pollution Control Board, MoEF&amp;CC, GOI.</li> <li>• Other monitoring such as hydrology, sediment flow, drain congestion, fish diversity, cropping pattern were monitored on regular basis.</li> </ul>

#### 4.2.3 Assessment

**Table 16. Comparison of environmental quality at the site with the baseline data and National Standards**

##### Ambient Air

Parameter	Limits	DTP Dyke & Mothola Oakland (17 <sup>th</sup> March 2020)	Gumi (22 <sup>nd</sup> June 2020)
PM 2.5	60	74	87.1
PM10	100	34	50.3
NO2	80	7	11.7
SO2	80	16	24.0
CO	2	ND	ND
Pb	1	<0.1	ND



### Noise

Parameter	Category of the Area / Zone Limit in dB(A) Leq		Dibrugarh DTP Dyke & Mothola Oakland 16 <sup>th</sup> March, 2020	Gumi 23 <sup>rd</sup> June 2020
Noise levels on dB (A) scale Day Time	Industrial Area	75	57.2	69.3
	Commercial area	65		
	Residential area	55		
	Silence Zone	50		
Noise levels on dB (A) scale Night Time	Industrial Area	70	NR	NR
	Commercial area	55		
	Residential area	45		
	Silence Zone	40		

NR Not recorded

### Surface water quality

		Limits IS:2296 (Class C)	Gumi	Dibrugarh
Parameters	Unit		19/06/2020	17/03/2020
			Brahmaputra River (US)	Brahmaputra River
Temp	°C		21.4	22.5
BOD		<3	3.5	<2
Chloride as Cl	mg/l	600		9.9
Colour	Hazen	300		40
Copper Cu	mg/l	1.5	0.021	<0.05
Chromium Cr	mg/l	0.05		<0.01
Cyanide CN	mg/l	0.05		<0.05
DDT	mg/l			
Detergents	mg/l	1		
Dissolved Oxygen	mg/l	4	7.6	5.8
Iron as Fe	mg/l	0.5		<0.06
Fluorides as F	mg/l	1.5	0.29	<0.1
Lead Pb	mg/l	0.1	BDL	<0.1
Oil & Grease	mg/l			<2
pH		6-9	7.57	8.31
Phenols	mg/l	0.005		<0.005
Selenium Se	mg/l	0.05	BDL	<0.05
Sulphates as SO <sub>4</sub>	mg/l	400	17.8	96.4
TDS	mg/l	1500	114	142
Total Coliform	MNP/100ml	5000		Absent
Turbidity			1.12	
COD		100	9.1	



### Ground water quality

Parameters	Unit	Limits IS:2296 (Class C)	Dibrugarh
			17/03/2020
	Source		Tube well
Colour	Hazen		10
Odour		300	Un objectionable
Temperature	°C		23.8
Turbidity	NTU		1
pH			7.84
TDS	mg/l	6-9	376
Oil & Grease	mg/l	1500	<5
CaCO <sub>3</sub>	mg/l		284.4
Chloride as Cl	mg/l		30.9
Sulphates as SO <sub>4</sub>	mg/l	600	28.35
Phenols	mg/l	400	
BOD	mg/l		-
Lead Pb	mg/l	3	<0.01
Arsenic as As	mg/l	0.1	<0.01
Iron as Fe	mg/l	0.2	0.02
Phosphates	mg/l	0.5	
Sulphates	mg/l		
Copper	mg/l		
Calcium	mg/l		
Floride	mg/l		
Manganese	mg/l		
Zinc	mg/l		
Nitrate	mg/l		
Total Coliforms	MNP/100ml	5000	-
E Coli	MNP/100ml		Absent

Category	Status	Explanatory comments
Ambient Environment condition	<b>Good</b>	<ul style="list-style-type: none"> <li>Noise level was within the prescribed limit for Commercial areas under Dibrugarh and Industrial area under Gumi.</li> <li>Surface Water quality of the river bank in Dibrugarh, and Gumi area were found within the limit.</li> </ul>

Category	Status	Explanatory comments
		<ul style="list-style-type: none"> <li>• Ground Water quality of the river bank in Dibrugarh was found within the limit, DO is slightly more.</li> <li>• Air quality was within the prescribed standards in all the sites.</li> <li>• Operation phase monitoring of the ambient air, water and noise initiated. Tests carried out in the month of January to June 2020.</li> </ul>

## 5. Key Environmental Issues

### 5.1. Highlights

- SIOs are continuing the monitoring of operation phase for the completed works in regular quarterly reviews of the EMP measures.
- SIOs were aware of the tests to be conducted during operation phase to determine the quality of ambient air, surface water, groundwater and noise levels.
- Documentation of environmental safeguards was satisfactory.
- Monitoring by SIO's has improved on safeguard issues but still they need training on ADB's safeguard procedures.
- Checking the PUC of the vehicles plying on the embankment were not possible as implementing agency (i.e. DTO) is different.

### 5.2. Action Taken

- Operation phase monitoring continued for:
  - Terrestrial and aquatic fauna status
  - River Hydrology, Morphology and Sediment Transport
  - Visual check on Drainage Congestion
  - Fish productivity
  - Cropping pattern
  - Soil erosion and siltation
- Meetings were organized to inform the SIO's on the environmental safeguard of ADB (strategy and directions), stipulations of the operation phase EMP, testing of selected environmental parameters, national environmental standards, acts and rules of MoEF&CC, GOI and State Government of Assam.

### 5.3. Additional Action Required

- Awareness on environmental safeguards – SIO and local residents / fringe communities.
- Constant monitoring and providing suggestions on the implementation of the operation phase EMP by FREMAA and PMC.
- Initiate study on terrestrial and aquatic fauna status, cropping pattern, soil erosion and siltation.
- Complete the fish productivity study to compare the impact of the interventions on the fish production after flood.

## 6. Conclusion

### 6.1. Overall Progress of implementation of Environmental Management Measures

Category	Status	Explanatory comments
EMP implementation and monitoring	Good	<ul style="list-style-type: none"><li>• SIOs have started monitoring of operation phase EMPs like terrestrial and aquatic fauna status, cropping pattern, soil erosion and siltation, visual check on drainage congestion etc. under FREMAA.</li><li>• SIOs become aware about the importance of the environmental safeguards during operation phase.</li><li>• Monitoring of the drainages throughout the year along the Tranche 1 sites done.</li><li>• Operation phase monitoring of implementation of EMP during operation phase was initiated in all the Tranche 1 sites. Test of ambient environment done in the month of January to June 2020 near the Tranche 1 sites.</li><li>• Test of ambient environment carried out as per EMP during operation phase.</li><li>• Camp sites were restored as per SIO's satisfaction.</li><li>• Borrow area were rehabilitated as per the plan.</li><li>• Awareness carried out for safe use of oil by the boatman.</li><li>• Discharge data recorded and maintained.</li></ul>

## **6.2. Problems Identified and Actions Recommended**

### **6.2.1 Problems**

- Local people have less knowledge on the environmental issues, safeguards; so no grievances reported or registered so far.
- Awareness about the importance of environmental safeguards monitoring during operation phase, to be strengthened.
- Documentation and reporting on environment safeguard were still to be improved.
- Plantation was done by district administration and (District Rural Development Agency) DRDA in designated sites not under the jurisdiction of WRD. So, maintenance and monitoring of the survival rates as per EMP was difficult for WRD.

### **6.2.2 Actions Recommended**

- Regular reporting to FREMAA on implementation of EMP during operation phase to be strengthened.
- Regular awareness training on environmental safeguards required for the SIOs for implementation of construction and operation phase EMP.
- In future projects following can be thought of:
  - Afforestation sites to be monitored and maintained by Forest Department for next 5 years.
  - Exposure of the environment and safety officers (SIO office) to the best sites (on Implementation of EMP) of the nearby project within the state.

