Government of The People's Republic of Bangladesh

Ministry of Water Resources

Bangladesh Water Development Board

Environmental Impact Assessment (EIA)

Volume II (Annexes)

River Management Improvement Program (RMIP)

May 2015

Contents

Annex A. EIA Study Methodology

Citation in the main text (Volume I): **Section 1.4**.

The present EIA of the River Management Improvement Program (RMIP)[1] has been prepared following the standard methodology consisting of the steps listed below.

Review of the program details and meeting/discussions with the design team

Review of the policy and regulatory requirements

Reconnaissance field visit and initial scoping and screening

Collecting and analysis of baseline environmental and social data with the help of secondary literature review and field data collection

Consultations with the stakeholders including beneficiary/affected communities

Impact assessment

Preparing environmental management plan

Compilation of the present EIA.

These steps are discussed in the following sections.

A. 1. Review of the Program Details

At the outset of the study, detailed meetings were held with the main consultants (design team) in order to understand the project, its key components, the overall time schedule, and other relevant details. During these meetings, discussions were held regarding the need of close coordination among the various teams including the design team, social safeguard team, and the EIA team. It was agreed that the three teams will make efforts to hold fortnightly if not weekly meetings to ensure close coordination as well as sharing of information among the teams. Subsequent to this, all the necessary reports, documents, and maps were obtained from the design team. The EIA team reviewed these documents and held additional meetings with the design team to seek clarifications and further information on various aspects of the project.

A meeting was also held with the WB's environment specialists to discuss the understanding of the project, depth and breadth of the environment assessment, and the overall study schedule.

Initial scoping of the EIA study was also carried out at this stage and plans were made for the reconnaissance site visit.

A. 2. Reconnaissance Field Visit

A reconnaissance field visit was organized from 13 to 16 July to have a first-hand idea about the project, its components and its probable impacts on the local environment and community. Mr. Mohammad Omar Khalid, independent environment specialist was accompanied by Dr. Istiak Sobhan, EMP specialist and Md. Sunil Boron Debroy, Hydrologist and two field staff of IUCN. From the main consultant team, Mr. Habibur Rahman, Deputy Team Leader led the team in the field. During the reconnaissance visit,

[1] The Program was earlier named as the River Bank Improvement Program (RMIP).

the team also visited 13 proposed resettlement sites for an initial environmental screening. Some photographs showing the project area are presented in **Figure A.1** below.

(a)

(b)

(c)

(d)

Figure A.1: Present condition of project site (a) Baliaghugri existing embankment, Changacha union of Sirajganj (b); Pukuria Bhanderbari existing embankment in Goshaibari, Dhunat, Bogra; (c) Per Debdanga Fishpass, Sariakandi Bogra; (d) Erosion of Brahmaputra river bank in Kurigram Sadar

A. 3. Inception Report

Subsequent to the reconnaissance field visit, the Inception Report was prepared that included detailed methodologies particularly for the field data collection. The table of content of the Inception Report is given below.

A. 4. Program Influence Area/Study Area

As an outcome of the initial scoping and the reconnaissance field visit discussed above, the project area off influence was determined, as described below.

The influence area of the program has been derived considering areas that are likely to be directly or indirectly affected by the RMIP construction and operation, including but not limited to: the extent the program would have an impact on the floodplain areas, lateral fish migration, hydrological network and road network, and the project footprints. The following criteria have been considered to define the influence area:

Floodplain area: The extent of flood plain area that will be protected from the floods by the flood embankments (BRE) has been primarily considered as the program influence area. This area has been derived based on the latest satellite maps and GOB topographic maps through digital elevation model (DEM).

Flood Inundation: The extent of flood inundation caused by breaches of BRE. Satellite maps were analyzed for August-September, 2014 to understand the extent of flooding from breaches and internal rivers like the Dharla, Dudhkumar, Teesta, Karotoya, Bengal, Ichamati and Hurasagar.

Connectivity: The area is crisscrossed with a network of khals which carry flood waters from Jamuna to the internal rivers on the western side of the project area. The inundation area of the internal rivers was also considered during delineation of influence area. On the other hand, all these rivers are interconnected by numerous khals, tributaries and distributaries forming a hydrological network in the entire north west region. For example, Mahananda, Punorbhaba which are major rivers of the north west region, are connected to the Atrai-Karatoya-Bengali system which drains to the lower Jamuna through the Hurasagar/Baral in the south east corner of the region.

Lateral Fish Migration: Some fish species of Jamuna, such as major carps undergo lateral migration from Jamuna to floodplains for spawning. The migratory routes have been affected by the BRE and the proposed interventions also have a potential to impact these lateral migratory routes. The extent of lateral migration from Jamuna to floodplains is included in the project influence area. The other type of fish migration in Jamuna is longitudinal migration between upstream and downstream (e.g. hilsa migration from sea to Jamuna). Since the BRE and proposed interventions will not have any impacts on the longitudinal migratory routes, these areas are not included in the program influence area.

Road network: Road network and other flow barrier structures have been considered. The western boundary of the influence area is thus the Dhaka-Bogra highway which impedes flood waters to flow westward. The southern boundary is defined as Jamuna bridge since it will be connected with the road to be developed through phase 3 of the RMIP program.

Significant Habitats (Eco-dynamic area): There are many significant ecological habitats in the project area especially in the chars. The program will not have any impact on the chars. However, the nearest chars were also considered to be a part of the influence area.

Movement of inhabitants – resource harvest, communication, livelihoods.

Project footprints: Areas that are directly fall under foot prints of the projects, ancillary facilities, temporary construction areas and worker camp sites, borrow areas, access roads to the project facilities for transport of material, etc.; areas that will be affected by the emissions from construction and by operation of traffic; etc.

The Program influence area is shown in **Figure A.2** (next page).

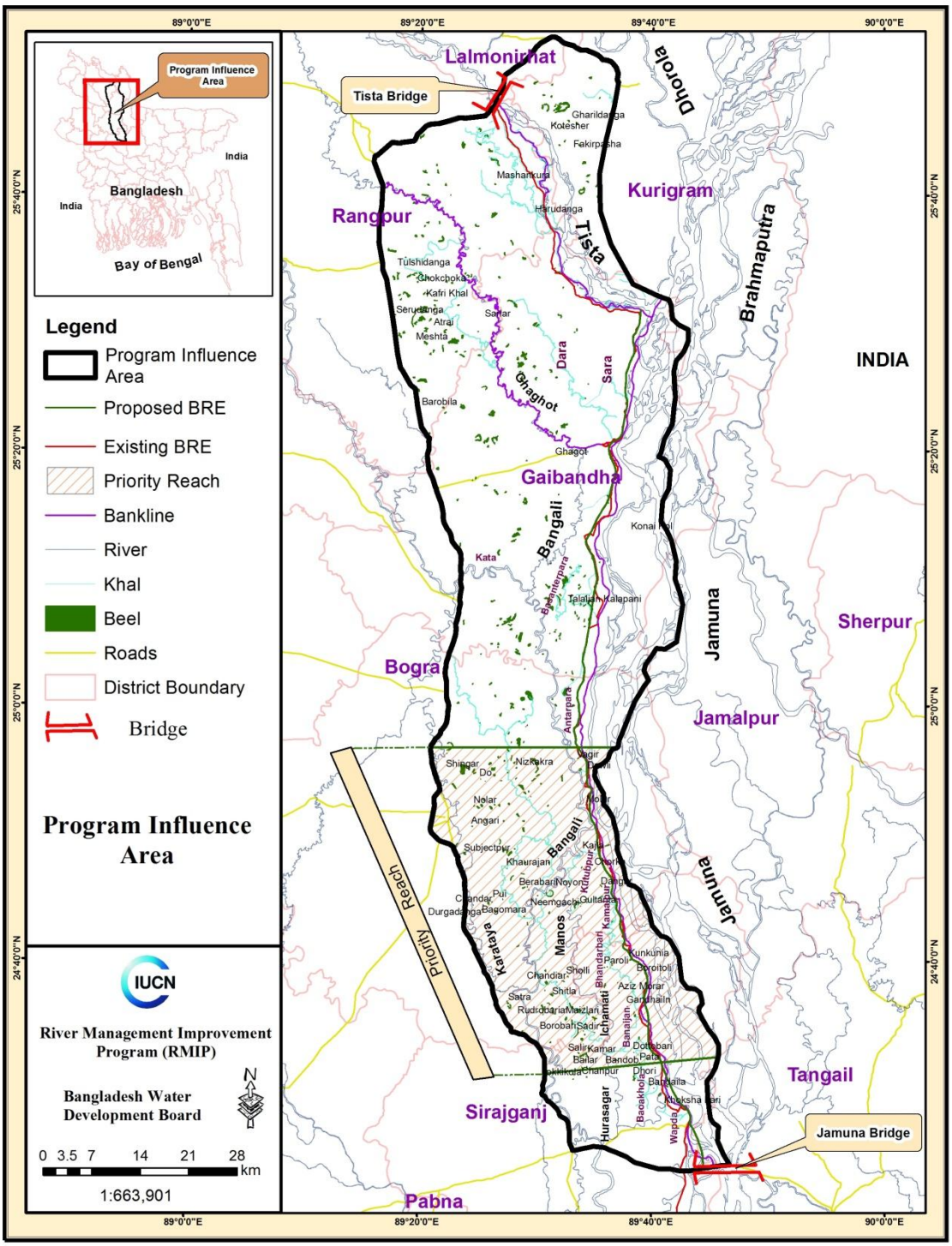


Figure A.2: RMIP Program Influence Area

A. 5. General Approach for Baseline Data Collection

The baseline condition of the project area has been formulated on the basis of the information collected from secondary and primary data sources through literature review, field investigations and consultations with different stakeholders. The baseline has been established in respect of air quality, noise, river morphology, surface and ground water quality, settlements, agriculture, livestock, fisheries, forestry, ecology, terrestrial and

aquatic flora and fauna, socio-economic and institutional condition. Primary data on water resources, air quality, noise, agriculture, livestock, fisheries, forestry, ecology, and terrestrial as well as aquatic flora and fauna has been collected by conducting an intensive field survey. Additional data and information has been collected through rapid rural appraisals (RRA), participatory rural appraisals (PRA), focus group discussions (FGD) and key informant interviews (KII).

Maps prepared by using GIS and Remote Sensing have been used in collection and development of baseline database. In this regard IUCN team coordinated with main consultant and their associates, such as CEGIS. The RS based GIS maps have been prepared and used in designing the traverse line surveys carried out the field work along the traverse lines. The field teams used appropriate survey instruments, e.g. checklists and semi-structured formats to record the information on different resources.

Secondary Literature review

All relevant secondary information was collected to describe the baseline of the environmental and ecological setup.

A. 6. Field Investigations

Field surveys have primarily been conducted by the field investigators with biology, fisheries and engineering background. They have been guided, monitored and supported by the senior specialists in the EIA team. The field team has collected field data using structured questionnaires in addition to FGD, PRA and KII.

The team has walked through the entire length of the RMIP[2] (182 km) and collected data from the proposed alignment of the embankment cum road and the nearest river channel from the right bank. The field investigations were carried out during September and October 2014. The field observations are included at the end of the Annex**.**

Soil Quality

To establish the baseline soil quality in the project area and to monitor future impacts, soil samples were collected near the proposed construction areas of the embankment and bank protection works. Seven sites are identified for soil sampling in a way to cover overall project area with adequate distribution. These locations Balighurghuri, Changacha union of Sirajganj, Pukuria Vandarbari and Anterpara of Bogra and analyzed various parameters such as pH, texture, total phosphorus, total Nitrogen, Total Potassium, Total Sulfur and Pesticide residue for quality. Locations of the sampling sites are shown in **Figure A.3**.

Air Quality

Ambient air quality has been measured in seven locations close to the proposed embankment alignment. The sampling sites are selected in a way to cover major towns where there is relatively high traffic and the areas dominated by agricultural lands where relatively there is no pollution sources. Two samples each in Sirajganj, Bogra and Kurigram districts. Air quality parameters proposed in national air quality standards are considered for sampling. Locations for the field data collection points are provided in **Figure A.3**.

Methodology and Equipment Used

- Equipment Used: High Volume Sampler (it works normally 6-8hr)

[2] Length of total RMIP (including priority embankment and future embankment)

- DOE, Bogra followed the ECR 1997 and Amendment of 2005 Rules. Suspended Particulate Matter (SPM) values are given by the collective values of $PM_{2.5}$ and PM_{10}.

Ambient Noise

Noise data has been collected from seven sites as the same location of air quality measurement. At each site, noise data has been recorded for two times-day and night. Locations for the field data collection points are provided in **Figure A.3**.

Methodology and Equipment Used

- Equipment used: Noise meter
- Averaging Period: Several measurements have been taken and maximum value of the noise has been chosen.
- DOE, Bogra followed the ECR 1997 and Amendment of 2006 Rules.

Water Resources

Surface Water. Data was collected on the general pattern of surface water distribution and major drainage patterns, including rivers, small waterways, *beels*, khals and flooded areas. FGD and public consultations were done at all sites to collect primary information and anecdotal data. In particular, the following information was collected from both primary data (Field Investigation) and secondary data:

- Drainage System (natural and artificial) and their distribution
- Seasonal changes in water level
- Seasonal changes in drainage
- Extent, periods of occurrence and causes of water logging
- Effects of existing infrastructure (roads, canals, building) on drainage
- Extent of interconnection
- River erosion
- River stages and discharges for standard return periods
- Water availability for irrigation

Secondary data was also collected on the hydrological cycle within the overall watershed encompassing the study area, giving mean, maximum and minimum discharges and water levels for all major (lotic) flowing water bodies including main rivers. Data on canal sources and also for lentic (standing) water bodies like *beels* were collected from field investigation. Information was also gathered on hydrological problems in study area are including; flooding (Flash floods and other types), water logging and inadequate drainage.

To understand the river water quality, historical record of water quality has been collected from the Department of Environment (DoE) at Teesta bridge, Jamuna bridge, downstream of Jamuna bridge near Jamuna Fertilizer Plant, and Nandina. Data of both dry and winter season has been collected.

During the field investigations, water samples were collected from surface water resources (rivers, beels) considering the connectivity of khals and location of proposed regulator. The parameters considered for water quality are: dissolved oxygen, biological oxygen demand, total dissolved solids, electrical conductivity, pH and temperature. Locations of

these sampling sites are shown in **Figure A.3**. Details of sampling methods and results are given later in the Annex.

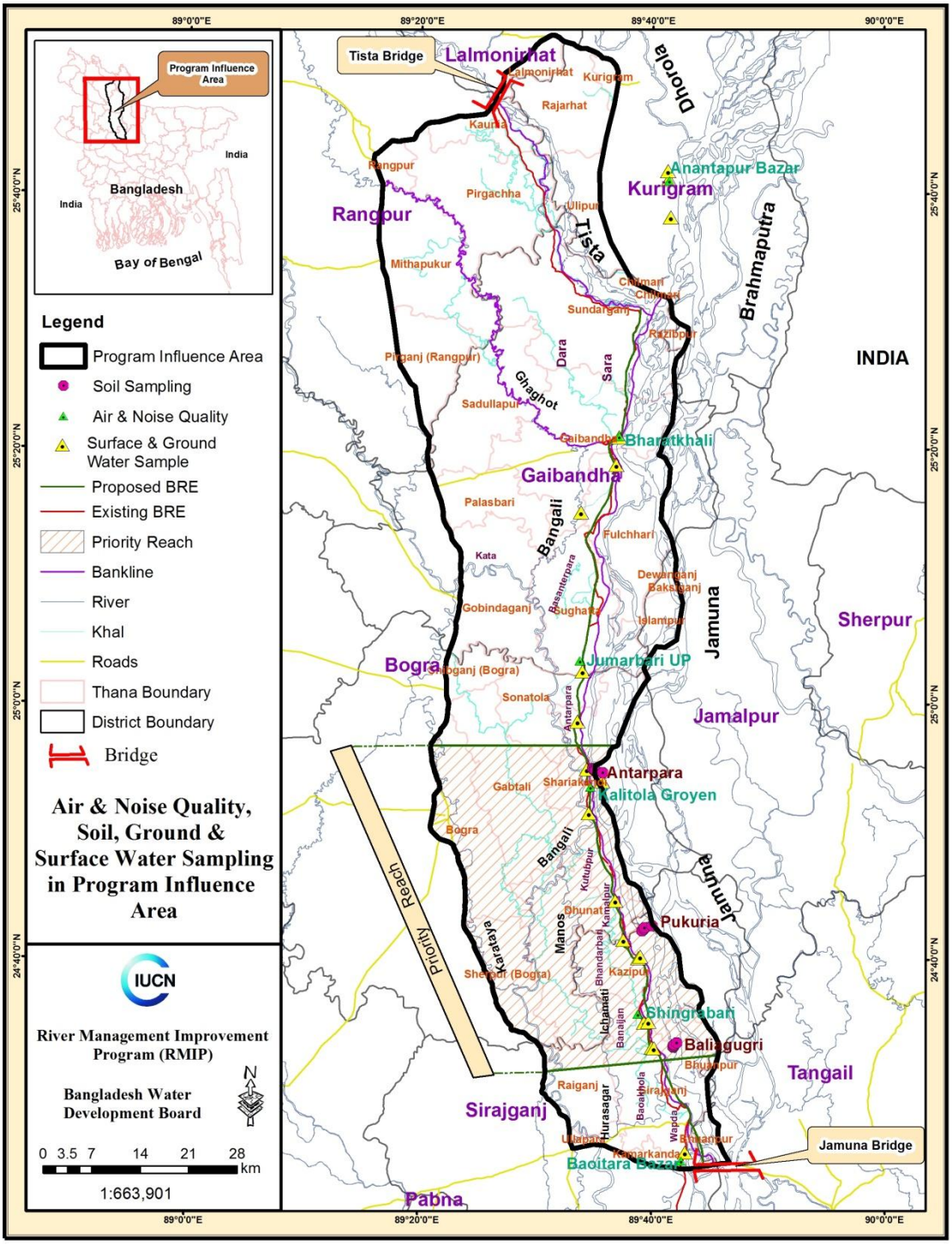


Figure A.3: Sites for Assessment of Air quality and Noise and sampling of Water and Soil

Ground water. Groundwater is the primary source of drinking in the project area. Ground water samples were collected from two tube wells, which are located upstream and downstream of the priority area. The groundwater samples have been tested against

drinking water standards (pH, chloride, iron, bicarbonate and total dissolved solids). Locations of groundwater sampling sites are shown in **Figure A.3.**

Ecology

Ecologically Sensitive Ecosystem. During the study, all sensitive ecosystems have been identified along the embankment alignment and into the river and nearby *charlands* (river islands or shoals). GPS locations have been collected for all ecologically important locations. All sensitive ecosystems have been mapped for the entire Area of Influence of the project. Questionnaires and data collection sheets for ecological field survey are provided in later in the Annex.

Terrestrial Environment. For development the baseline information of the terrestrial environment the following parameters have been collected by the field team:

Terrestrial flora

- General vegetation pattern on the site
- Nearby homestead vegetation including major tree species according to their canopy cover (estimation of canopy cover percentage)
- Information on plantation or orchards (if any)
- Cropland and woodland (if any) and their landuse
- Roadside vegetation
- Grassland (if any in the vicinity) composition and their importance for wildlife especially avifauna
- Fallow land (if any) why fallow and landuse and importance
- Utilization
- Wetland vegetation
- Recent trends (whether increasing or decreasing, key prevailing threats)

Terrestrial fauna

- Terrestrial wildlife species and their importance and status
- Identification of important wildlife habitats and their movement/migration pattern (especially for the wildlife that depends on the river for drinking and fishing, e.g. fishing cat)
- Recent trends (whether increasing or decreasing, key prevailing threats)

Biodiversity including terrestrial Species diversity

Homestead vegetation

Aquatic Environment

The following data was collected on the wetlands and types of aquatic habitat in the project's Area of Influence:

Aquatic flora

- Ecology and plant community
- Abundance and distribution

- Growing period
- Recent trends (whether increasing or decreasing, key prevailing threats)
- Utilization
- Recent trends (whether increasing or decreasing, key prevailing threats)

Aquatic fauna

- Aquatic wildlife species and their importance and status
- Identification of their habitats, breeding and migration patterns in the project area
- Wetland birds
- Recent trends (whether increasing or decreasing, key prevailing threats)
- Impact on aquatic wildlife from the project activity including short and long term impacts (impact from changed landuse, noise, human presence)
- Utilization
- Recent trends (whether increasing or decreasing, key prevailing threats)

Biodiversity (including aquatic Species diversity and recent trends.

Floral Survey

Baseline scenario of floral species has been prepared with special emphasis on endangered and protected species. Classification of satellite images and reconnaissance field visit has been made to assess the various vegetation types / ecosystems present within the direct impact area and charlands near the project site. The major ecosystems found from the images have been visited and a species assessment has been made. Standardized transects were established in order to assess species composition and vegetation structure. Also, recent trends have been determined on the basis of field data, interviews, and literature review.

Charland Survey

Data collection on charlands (river islands) included Remote Sensing image analysis, vegetation and wildlife survey. Also, recent trends will be determined on the basis of field data, interviews, and literature review.

Faunal Survey

Mammals have been assessed on an opportunistic basis by all of the teams. The small mammals (eg, like Small Indian Mongoose, Short-nosed fruit bat) are easily observed during walk over surveys. Interviews have also been held with known “hunters” in the area to assess the presence of game species.

For the assessment of amphibian and reptile species diversity in the study area line transects and opportunistic surveys have been used. Amphibian transects were selected focusing on croplands, stagnant water, running water and bushy areas as typical habitats. Additional interviews have been conducted with local people using photographs of amphibians and reptiles to determine the presence of species. The surveys were carried out during both day (5:30am-6:30am) and night (6pm-9pm) times by the following methods.

Gangetic Dolphin. Line transects survey were carried out to determine the population size of the Dolphin in the project sites. The length of line transects was 1km and during

survey team used a boat with a speed of 2 km. Surveys were conducted between 9.30 am and 11.30 am. Two observers scanned the water surface for the sign or dolphin, whereas a third observer took notes by direct counting the species. All sightings were noted with GPS coordinates.

Gharial (*Gavialis gangeticus*), also known as the gavial, and the fish-eating gharial, is a crocodilian of the family Gavialidae, native to the Indian Subcontinent. Although, the species is no longer have a viable population in the Jamuna river but it is still regarded as the most suitable habitat for this species. In last few years several juvenile has been captured by the fishermen. Anecdotal information was collected during interviews with the community about the presence and sighting of gharial. The probable habitats were also identified during the field investigations.

Birds including Migratory Birds. Birds have been assessed during walk-over surveys. Identification was done by both visual and vocal characteristics with added support from photographic evidence. The bird inventory has been linked to the vegetation / ecosystem types identified during the floristic survey. Interviews with the local villagers were held to find out the presence of migratory birds during winters. Further information on the migratory bird has been obtained through literature review.

Fish and Fisheries Resources

A fish and fisheries survey was carried out in the project influence area of the proposed RMIP to prepare a fisheries baseline of the study area and also to identify the important fishery components those need to be taken care of. At the initial stage the study, a baseline survey was conducted. The methodologies used are - direct field data collection and sighting, public consultation, secondary data analysis, focal points interview, market survey, fish catch assessment survey, application of remote sensing and GIS tools and extensive literature review. A logically designed fish catch assessment survey was carried out to identify fish biodiversity of the project study area. The survey conducted in 50km priority area was more intensive than that of the remaining 132km of the RMIP. The survey was conducted from 25 Aug to 15 Sep 2014 during the high flow season. A total of 33 FGD, 10 Catch Assessment Survey (of different gears), transect walk and in-situ observations were carried out during this period. Locations of FGDs and consultations carried out to collect baseline ecological data are presented in **Figure A.4**.

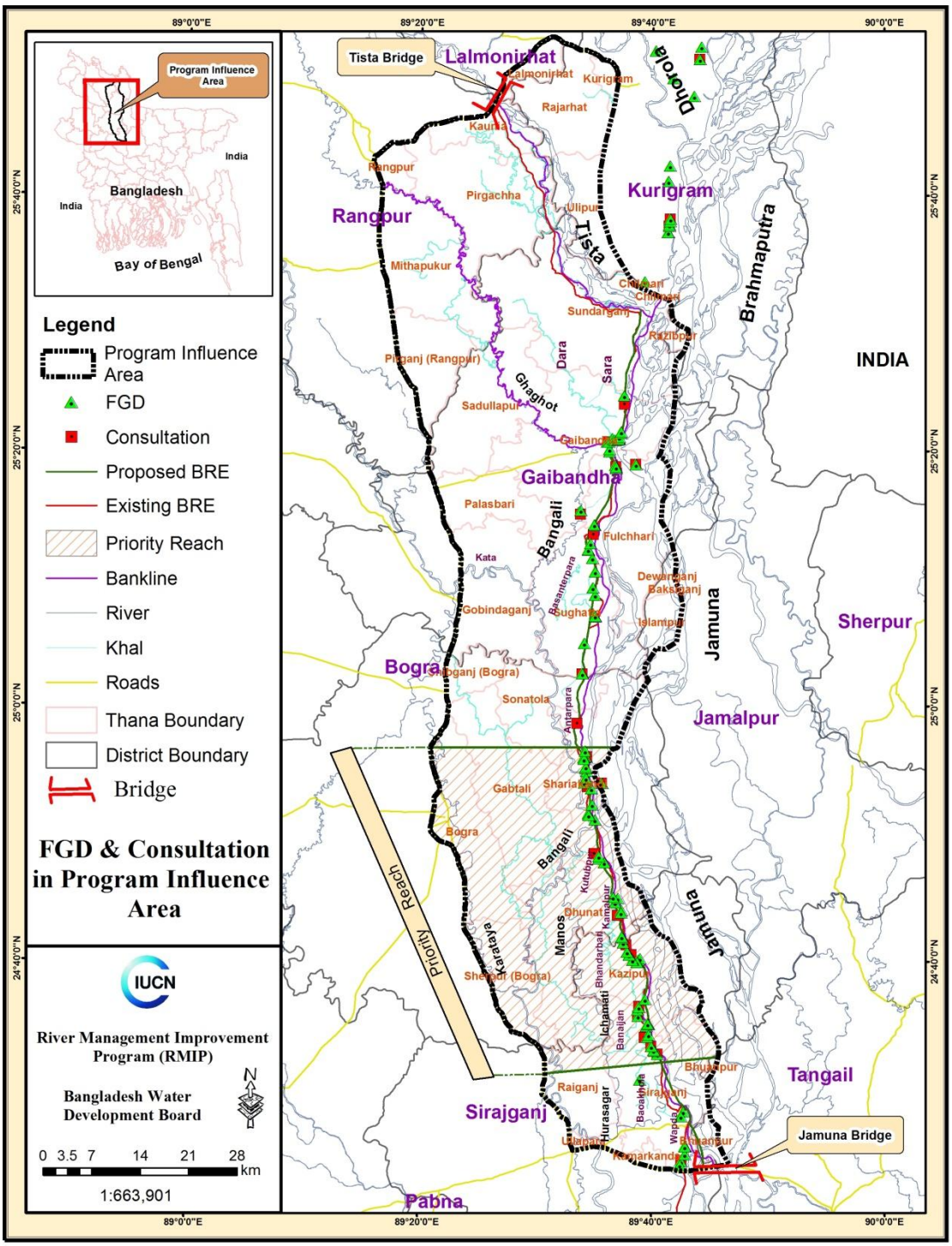


Figure A.4: Locations of FGDs and Consultations

Fisheries Survey

Survey methodology was selected on the basis of the reconnaissance survey outcome and various subsequent discussions held within the EIA team. Initial desk analysis was carried out to assess fish biodiversity and fisheries resource status. The survey was designed to fill up the knowledge gaps of the identified major fisheries resources. The key parameters of the survey are provided in the **Table A.1**.

Table A.1: Fish Survey Details

Parameters	Method	Sampling Site	Sampling Schedule
Species richness, Identification of pre-dominant indicator species those sensitive to the different constructions, Species composition, Biology of the indicator species, Fish production, Habitat analysis, Migration route/season, Breeding and feeding ground, Limnology, Fishing effort, Fishing Season	Catch assessment survey using different gears of fishermen, interview, FGD, market chain analysis, fishermen livelihood analysis, Area of conservation demarcation/GPS coordinating, Biodiversity analysis	Program Influence Area (1 Km buffer area from embankment location)	Year 2014: Aug-Sep

Site selection. Sampling sites were selected for each of the indicators by considering the characteristics of the sub-habitat types of the Jamuna river system, associated environmental factors, major fisheries characteristic, local knowledge, past and present scenarios, time and resource constraints. The study locations were selected after field visits and detail corresponding with the stakeholders of the project. Specific spots identified considering sampling strategies as per selected method. GPS readings were taken for each sampling spot. However, probable locations of the catch assessment survey were selected after a reconnaissance visit in the project area. In total, 20 sites along the 5 river cross sections at the distance interval of 10 km along the river and interval of 0.5 km across the river carried out within the **phase 1 project influence area along the 50 Km of the Jamuna Right Bank for which EIA is being conducted** (**Figure A.5**). In addition, catch assessment was carried out in another 5 locations of the connected canals of the right bank which are identified by local community as potential fish shelter grounds. Beside, a questionnaire survey was also carried out in different fishing village and among the associated stakeholders to collect the necessary fisheries information. The frequency for the remaining area was much lesser at an interval of 25 km along the proposed alignment of the embankment. The catch assessment survey also carried out for beels and khals.

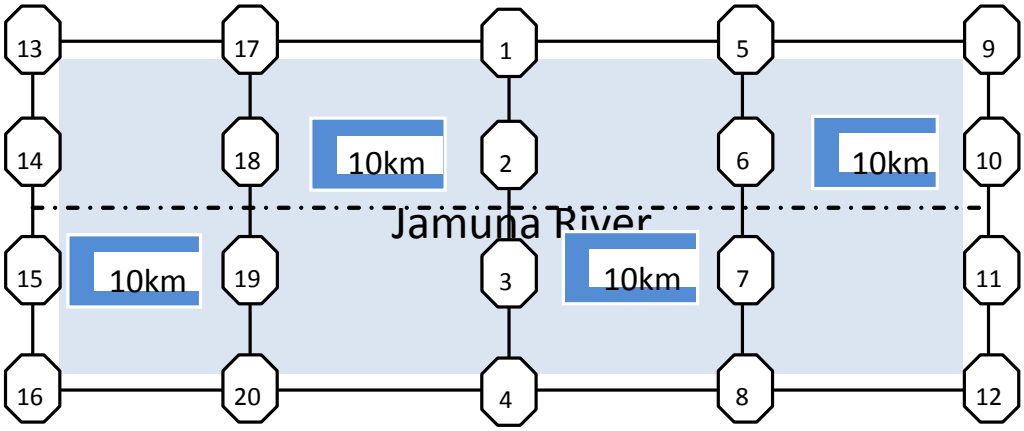


Figure A.5: Sampling Locations

Sampling materials. Specific depth and sampling time was recorded along with special information on weather condition e.g. sunny or rainy day. Local fishing gears and boats were used for catch assessment survey. Sampling times were recorded accordingly. Sorting, counting and identification of fishes were carried out in situ. Identification of the fish species has done by following standard literatures and FAO web tools for fish identification e.g. www.fishbase.org. Photographs of the identified fishes were collected giving unique code to identify at the later stage. Fish catch composition, total length, body weight, age, sex, were also collected in situ. A catch assessment survey sheet was used to record the collected data for each sample (provided at the end of the Annex). Different field equipment was used for sorting, identification and determination of the necessary measurements of captured fishes. Market survey was also carried out to compare the fish catch composition. FGD, market chain analysis and fishermen livelihood analysis has also been initiated this time using a checklist. Area of conservation significance i.e. fish breeding grounds were demarcated using GPS machine.

Fishing gears and traps. Set gill net, Drift gill net, Clap net, Cast net, Seine net and Lift net were used for sampling from different habitats of the study area. Range of the mesh sizes of the gears used were 0.4 inch to 2.5 inch. Length of gears was from 10m to 200m. Fishing depth was 1 to 6 meters. Besides, different types of locally made fishing traps were used for fishing the SIS (Small Indigenous Species) e.g. Dury, Chi, and Vaer.

Fishing craft. Fishing crafts those used for sampling were e.g. Kosha, Dingi, Chandi and Karki. Average length of the crafts was around 8-9 m.

Haul duration. Duration of fishing (haul) were different depend on the gears and crafts. However, average duration per haul was considered as 30 min.

Assessment techniques. The specific methodologies to collect fisheries data and information on the selected parameters and associated analysis are described below.

Catch assessment survey. Fish catch assessment survey is considered as a successful method which reflects the divergence of all the important fishery components. Catch assessment survey carried out through field sampling from the Jamuna River and its connected canals of the study area. Appropriate number of fish catch samples was collected from some pre-selected sites. Samples collected by using local available fishing gears for a specific duration to get the catch effort (catch/ haul) data. Catch composition, abundance of individual species, fish species diversity, total production and production rate assessed for each specific habitat. Fish migration channels demarcated by consulting with the local fishermen and historical catch location data analysis of the Jamuna River.

Breeding ground demarcation. Breeding ground demarcated using GPS machine by collecting the information from the local fishermen. Fry collectors interviewed to assess the overall status of breeding grounds.

Market survey. Local market surveys carried out to collect fish catch composition data. These data used to validate the field sampling catch composition and species diversity estimation through catch assessment survey. Market chain analysis will be carried out to identify the status of the fish fry collection and trading at different sites.

Key Informant interviews and focal group discussions. Selected key persons of the study area were interviewed to the get real scenario of changes in fisheries and to collect information on the fisheries resources and fishermen status. KII results were used to validate the field sampling data more authentically. In addition, several FGD conducted at different fishing villages of the both banks and Chars (River Island) using a checklist.

Socio-economic Aspects

Data was collected on present demographic and socio-economic status, educational and cultural properties of the area, area vulnerabilities and development activities. Demographic and socio-economic status refers to a wide variety of parameters. This study particularly refers to population, community structures, employment and labor market, income and expenditure patterns of households, public health, education, vulnerabilities, values and customs. Most of the data was obtained from the social safeguard team in addition to the secondary resources.

The methodology for the social assessment (SA) carried out by the social safeguard team is presented below. The social team has prepared three volumes of social documentation grouped under Social Action Plan (SAP), (i) Volume 1 Project Context, Socio-Economic Baseline, Consultations and Communication Strategy (ii) Volume 2 Resettlement Action Plan (RAP), and (iii) Volume 3 Social Development Plan (SDP).. Data for the EIA on social aspects was extracted from these reports.

Purpose and objectives. The social assessment provides the background for developing an understanding of the social fabric, the composition of the societies and the overarching impact of the afflicting factor to be addressed, in this case river erosion. It serves as a crucial foundation for all specific social safeguard components and measures to be designed. The social assessment has been carried out following the World Bank Guidelines.

The objectives of the SA is it to obtain a deep understanding and to tell the story about the life along the unstable riverbank and eroding embankment in a several kilometer wide swath of floodplain alongside 183 km of riverbanks from the Jamuna bridge access road to the Dudhkumar River including:

Social fabric and socio-economic, cultural, demographic, health, gender, livelihood, and communication situation

Development impacts on the local society facing the large-scale systematic retreat of the embankment due to persistent riverbank erosion,

Expected impact of the program on the target population and opportunities to maximize program development outcomes

Stakeholder and target populations. An initial stakeholders' analysis will be carried out for the identification of stakeholders and their interests relating to the project. Important stakeholder groups come from outside of the directly affected area and are

largely associated with Government, such as elected representatives and civil administration, but also local elites, religious leaders, and respected persons.

While primary target populations are those affected directly by program activities, there is a large group of indirectly affected populations who are either impacted during the construction only or who may be affected by the longer-term consequence of the program interventions.

The population living in the area can be stratified into

People living between riverbank and existing embankment and subject to regular flooding and a persistent erosion threat,

The large group of squatters, mostly erosion victims, living on the existing embankments, sometimes forced to move repeatedly due to the persistent erosion threat, and

People living in a few kilometer wide strip of land behind the existing embankment and exposed to embankment breaches and a mid-term erosion threat

The target groups will be finalized after the initial stakeholder analysis.

Scope of work

Existing socio-economic profile of the area

- Analyze poverty level of the RMIP area and identify economic constraints and prospects in the locality
- Assess if ethnic minorities and tribal populations are present

Understanding the impact of a constant retreat of the riverbank on the affected populations and their coping mechanisms to river erosion and flooding

- Describe the history of the embankment retirement
- Assess the impact of erosion on the socio-economic status of the population including poverty and vulnerability analysis related to the function of the embankment
- Identify and evaluate the indigenous coping strategies

Understanding of government policies and informal institutions addressing populations effected by riverbank erosion and flooding

- Analyze the disaster management strategies of the government as well as local community
- Evaluate the social indicators including land ownership status of the river bank erosion victims, earlier project implementation status in terms of paying compensation for land
- Evaluate legal issues and DC office records on payment modality and outstanding payments, if any, the local social networking, the role and status of these river bank erosion victims in the local power structure and their influence in the decision making process

Assessment of project affected peoples' aspiration and potential program implications to support these aspiration the potential program impact and desired outcomes

- Conduct socioeconomic surveys and a census to understand the socio-economic impact – positive and negative- on all persons who will be displaced by the

project and who will remain on the existing embankment by collecting appropriate socioeconomic baseline data

- Develop an understanding about the aspirations of people living along the unstable river and eroding embankment
- Assessment of impact of the riverbank protection on the population and their socio-economic status at a reference site in Pabna where a small-scale river bank improvement project (JMREMP) was successfully completed about eight years ago
- Understand how people perceive the suggested river bank improvement program and what they desire from the program

The following activities are included:

Screening and analysis of project impacts

Screening and review of past land compensation legacy issues

Public health assessment and related issues (to be summarized from health assignment)

Gender assessment (to be summarized from gender assessment)

Public consultations over project design and interventions as well as their expectations, recommendations and requests of the project

Screening for the presence of tribal and indigenous communities in the project areas and conclude whether WB IP policy is triggered or not

Stakeholder analysis

Review of laws, policies and mandates related to embankment construction, riverbank protection, land acquisition and population displacement

Review of the World Bank's Operational Policies on social safeguards and requirements for mainstreaming social development issues into project cycle (identification, design, implementation, operation, and monitoring and evaluation) related to infrastructure development, and population displacement

Review past experience and good practices related to land acquisition, embankment construction and maintenance, riverbank protection, and draw lessons and recommendations for BWDB in general and the project management in particular.

Assessment of project interventions and approach for implementation and identify application of relevant laws and policies active in the Country and the World Bank Operational Policies on Social Safeguards.

Note: While gender, public health and communication are dealt with at a more general level for 180 km, a detailed assessment of these aspects has been conducted for the 50km priority reach and is described later.

Approach. The Social Assessment (SA) report intends to narrate a 'story' on different dimensions – technical, human, environmental- about living in the fringe area and with the persistent threats of riverbank erosion leading to the retreat of the embankment lines and consequently to continuous loss of livelihood and. The 'story' integrates

A technical story of historic erosion losses and man's continuous struggle to maintain consistent flood embankments and

A human story of erosion victims living on fertile floodplain land that turned into major river channels.

An environmental story characterized by poor people coping with the resources provided by one of the largest and most unstable rivers in the world.

The SA interlinks with all the subcomponents of the social safeguard document. Derived from the thorough impact assessment, the SA report explores mitigation measures directly resulting in poverty reduction. It furthermore serves as a basis for a monitoring, including of benefits, and evaluation framework.

The methodologies below, which include qualitative and quantitative instruments, include but are not limited to the following:

Collection and analysis of secondary data: Secondary data related to the vicinity area and historical perspective of riverbank erosion collected and analyzed in the context of the study area and people

Stakeholder analysis of all relevant actors and their roles throughout the 183 km program

Socioeconomic survey: 20% of all households in the program area, which corresponds to approximately 4,000 households, surveyed throughout the 183 kilometers of the embankment. Among the 4,000 households, 50% are randomly selected from the people living on the embankment, 30% from the riverside and 20% from the country side. A total of 22 households are surveyed per kilometer. A structured questionnaire has been used to conduct the household survey.

A sample of about 100 households with the same distribution ratio has been collected from a reference site where a similar project, but at a smaller scale, was completed about 8 years ago. The reference site is called JMREMP and the sample has been drawn in the Pabna Irrigation and Rural Development Project from a 7km stretch between Koitola Pump Station and Mohanganj at the outfall of the Hurasagar/Baral River.

Focus Group Discussions (FGD): A total of 91 FGDs have been conducted, with different occupational and social groups like land losers, farmers, female-headed households, laborers, erosion victims, businessmen. A total of 43 FGD's have been conducted.

Open Consultation Meetings (OCM): A total of 91 open consultation meetings have been conducted in all 183 km (2 OCMs per kilometer). The OCMs have been conducted through discussion guidelines and checklists.

Key Informant Interview (KII): Appropriate key informers on different issues have been interviewed as required to get in-depth information. The key informants were from government officials like DC office, BWDB, local government representatives, local political leaders etc.

Secondary data has been gathered through literature review and reference project documents.

The approach adopted by the socioeconomic specialist of EIA team is presented below.

IDENTIFICATION OF THE SOCIAL PARAMETERS IN THE EIA FOR EMBANKMENT REHABILITATION IN FOUR NORTHERN DISTRICTS

1. Brief Appreciation of the Project

Four northern districts namely, Sirajganj, Bogra, Gaibandha and Kurigram are historically prone to severe flooding rendering hundreds of households landless and the destruction of crops and cattle. The vulnerability of the Sirajganj town is a national concern at present. Intervention was made in the past and embankment was raised along different parts of the four above districts. However, for further protection and rehabilitation of the existing embankment a new initiative is undertaken consisting of rehabilitation and fresh construction of 183 kilometers. However, at the initial phase 50 kilometers embankment will be rehabilitated/constructed on priority circumscribing four upazilla, namely, Kazipur, Sariakandi, Sirajganj and Dhunat. Notably, 40% of the total embankment will be newly aligned whereas rest would be rehabilitated with/without further widening and potential displacement. Similarly newly aligned part would require new land and resulting displacement. The main three goals of the project intervention are the following: i) Rehabilitation/new construction of 183 kilometer long embankment; ii) Along embankment construction of highway; and iii) Prevention of river erosion.

2. Study Approach

Global consortium has been entrusted with the implementation of the total project. A few components are subcontracted. Social Assessment is the responsibility of KMCL while the resettlement plan is that of CGIS. While the above already conducted 4000HH based data collection exercise in selected spots in four districts, resettlement plan focusing 3400HH is being done in four priority upazilla where 50 kilometers physical constriction will be done shortly. IUCN is responsible for the EIA of the project. Since social assessment and resettlement plan are also ready done, selected social data for EIA will be elicited from the above where not covered limited data gathering may be necessary.

3. Identification of Social Parameters

Society is a broad entity comprising of economy, politics, health and others. To concretize the notion of society empirical focus is always laid on the constituting components of society as indicated above. Ensuing embankment project will bring results on different components of society to a varying degree, however, a few components like livelihood activities or environmental safety of the adjoining people will be directly impacted rather the elements like social norms or values. On the other hand, prospective impact identification on the part of the people may remain superficial therefore their relevant experiences in the past could be an important way out to identify the perception of effect. Thus attention needs to be given on the past experience apart from the present situation and future implications. Keeping in mind the above issues the following parameters are propounded.

3.1: Flood Effect in the Past

3.1.1 Gathering experience of the residents close and very close to the present and future embankments about loss created by flood, where possible quantify. On the following loss will be accounted for:

i. Income;

ii. Cattle head;

iii. Trees & Crop;

iv. Houses.

v. Identifying trauma caused by the flood, narrative on fear.

3.1.2 Health problems faced during the flood such as drinking water crisis, diarrhea, and snake bite.

3.1.3 Schooling problem identification during flood.

3.2: Village Level Support Identification

3.2.1 Income opportunities in village.

3.2.2 Schooling opportunity in village.

3.2.3 Social safety net support in village.

3.2.4 Health support in village.

3.2.5 Kinship support in village.

3.2.6 Samaj (i.e., social capital) support in village .

3.3: Expected Outcome

3.3.1 On reduction/elimination of flood threat.

3.3.2 Protection of existing livelihood opportunities and the creation of new.

3.3.3 Bringing feeling of environmental safety with wider implication such as infusing entrepreneurial spirit.

3.4: Difficulties and Problems Anticipated

3.4.1 Displacement and, threatening of livelihood.

3.4.2 Losing kinship and samaj support.

3.4.3 Losing social safety net support.

3.5: Coping and Response to Possible Problems

3.5.1. In the event of displacement organizing livelihood activities.

3.5.2 In the event of losing land, plan to get access to land.

3.5.3 In the event of displacement of children's schooling plan and getting access to social safety net program if necessary.

Soil and Agriculture Resources

The production related data including soil resources were collected through secondary and primary sources. The secondary sources included: a) review and collection of data and documents available with other research teams of the RMIP like design, socio-economic; b) data and documents collected from the related organizations like DAE, BADC from the project area. The primary data were collected through: a) FGD (Focused Group Discussion), b) KII (Key Informant Interview), d) in-depth interview with potential farmers.

Review of Documents (Desk Review): Existing relevant documents available with the concerned organizations such as BWDB, DAE, BADC, BARI, and BRRI were collected and reviewed for having an initial idea and understanding of the crops and cropping of the areas. As part of project review, the environmental team attended workshop on RMIP organized by BWDB using national and international consultants.

Reconnaissance Field Visit cum Rapid Appraisal: After completion of the desk review, the consultant made a reconnaissance field visit to the embankment sites to further understand of the existing socio-economic conditions to identify the potential location for

organizing the FGDs. The visiting team members made a Rapid Appraisal/Assessment on crop production scenarios through discussions with key stakeholders (BWDB staff, Local NGO officials, officials of Government service departments like DAE, BRRI, BARI, DLS, DoF pesticide/fertilizer Dealers, farmers) both at group and individual levels.

Focus Group Discussions (FGDs): Numbers of FGDs, one in each Upazila (11 total) were carried out using semi structured checklists outlined on the basis of the issues relevant to study objective and scope. The numbers of participants in each FGD were 10-15 farmers.

Key Informant interview (KII): During the field study numbers of open-ended KIIs were also conducted with representative stakeholders especially with the field staff of DAE using semi-structured checklist.

A. 7. Consultations

In accordance with the WB requirements, consultations have been carried out during the scoping/screening stage where the EIA ToR has been shared with the stakeholders. The second round of consultations will be carried out after compiling the draft EIA report. The VECs for the cumulative impact assessment and IESC for the overall impact assessment have been selected as a result and outcome of these consultations.

For consultations, various modes have been used including FDGs, KIIs, and workshops at district and upazilla levels. Consultations have been held with the local government institutions and community representatives, knowledgeable persons e.g. teachers, journalists and political leaders, and the affected community. The feedback has been useful in understanding the concerns and priorities of the stakeholders particularly the communities, assessing the potential impacts of the project, identifying the appropriate mitigation measures to address these impacts, and finalizing the EIA report.

A. 8. Impact Assessment Methodology

The significance of potential impacts was assessed using the risk assessment methodology that considers impact magnitude and sensitivity of receptors, described below.

Impact Magnitude

The potential impacts of the project have been categorized as major, moderate, minor or nominal based on consideration of the parameters such as: i) duration of the impact; ii) spatial extent of the impact; iii) reversibility; iv) likelihood; and v) legal standards and established professional criteria. These magnitude categories are defined in **Table A.2**.

Table A.2: Parameters for Determining Magnitude

Parameter	Major	Medium	Minor	Nominal
Duration of potential impact	Long term (more than 35 years)	Medium Term Lifespan of the project (5 to 15 years)	Limited to construction period	Temporary with no detectable potential impact
Spatial extent of the potential impact	Widespread far beyond project boundaries	Beyond immediate project components, site boundaries or local area	Within project boundary	Specific location within project component or site boundaries with no detectable

Parameter	Major	Medium	Minor	Nominal
				potential impact
Reversibility of potential impacts	Potential impact is effectively permanent, requiring considerable intervention to return to baseline	Baseline requires a year or so with some interventions to return to baseline	Baseline returns naturally or with limited intervention within a few months	Baseline remains constant
Legal standards and established professional criteria	Breaches national standards and or international guidelines/obligations	Complies with limits given in national standards but breaches international lender guidelines in one or more parameters	Meets minimum national standard limits or international guidelines	Not applicable
Likelihood of potential impacts occurring	Occurs under typical operating or construction conditions (Certain)	Occurs under worst case (negative impact) or best case (positive impact) operating conditions (Likely)	Occurs under abnormal, exceptional or emergency conditions (occasional)	Unlikely to occur

Sensitivity of Receptor

The sensitivity of a receptor has been determined based on review of the population (including proximity / numbers / vulnerability) and presence of features on the site or the surrounding area. Each detailed assessment has defined sensitivity in relation to the topic. Criteria for determining receptor sensitivity of the Project's potential impacts are outlined in **Table A.3**.

Table A.3: Criteria for Determining Sensitivity

Sensitivity Determination	Definition
Very Severe	Vulnerable receptor with little or no capacity to absorb proposed changes or minimal opportunities for mitigation.
Severe	Vulnerable receptor with little or no capacity to absorb proposed changes or limited opportunities for mitigation.
Mild	Vulnerable receptor with some capacity to absorb proposed changes or moderate opportunities for mitigation
Low	Vulnerable receptor with good capacity to absorb proposed changes or/and good opportunities for mitigation

Assigning Significance

Following the determination of impact magnitude and sensitivity of the receiving environment or potential receptors, the significance of each potential impact has been established using the impact significance matrix shown below in **Table A.4**.

Table A.4: Significance of Impact Criteria

Magnitude of Impact	Sensitivity of Receptors			
	Very Severe	**Severe**	**Mild**	**Low**
Major	Critical	High	Moderate	Minimal
Medium	High	High	Moderate	Minimal
Minor	Moderate	Moderate	Low	Minimal
Nominal	Minimal	Minimal	Minimal	Minimal

Air Quality and Noise Measurement Spots

River Management Improvement Program (RMIP)

Environmental Study

Priority Zone (50 km)

Place	Upazila/Union	District
1.Sariakandi HP	Sariakandi	Bogra
2.Singrabari	Kajipur	Sirajganj
3.Ratankandi	Ratankandi	Sirajganj

Reaming Zone

1. Baoitara	Saidabad	Sirajganj
2.Jumarbari	Gaibandha Sadar	Gaibandha
3.Bharatkhali	Saghatta	Gaibandha
4.Anantapur	Ulipur	Kurigram

Survey Sheets for Ecological Study

River Bank Improvement Program
Environmental Study

Focused Group Discussion (Ecological Survey)

SL. No.	Date:	Time:
Vill:	Mouza:	Union:
P.S.:	District:	No. of Participant:
GPS:		Photo:

Trees

Species Name	Use	Species Name	Use	Species Name	Use

Shrubs & Herbs

Species Name	Use	Species Name	Use	Species Name	Use

Wildlife

Species Name	Hunting/Poaching	Species Name	Hunting/Poaching	Species Name	Hunting/Poaching

Use : 1=food; 2=timber; 3=fuel; 4=medicinal; 5=fiber/thatching; 6=others
Hunting/Poaching: Y=Yes, N=No

Ecological Survey

Plot No.:	Date:	Time:
Vill:	Mouza:	Union:
P.S.:	District:	
GPS:		Photo:

Landform Pattern
Landform Element

ALP= Alluvial Plain FLO=Floodplain

100=Plain	101=Sandy Plain	102=Limestone Plain
103=Drainage Depression	104=Stream Channel	105=Flood out
106= Lake	107= Swamp	

Crop cover

0= Nil	1= 1-25%	2= <50%	3= 51%-100%

Crop characteristics

Surface Soil Texture

Sand	Loamy Sand	Clayey Sand
Sandy loam	Clay loam	Silty loam
Loam	Sandy Clay Loam	Silty Clay Loam
Peat	Clay	

Wild Animal Composition

Species Name	Microhabitat	Niche

Floral Species composition

Species Name	Adult		Juvenile	Comments
	Total	Avg. Height	Total	

Canopy Coverage

Wet land information

Types	Month (Wet)	Month (Dry)	Types	Month (Wet)	Month (Dry)
Permanent canal			Seasonal canal		
Permanent lakes			Seasonal/intermittent lakes		
Seasonal/intermittent ponds			Irrigated land and irrigation channels		
Riverine floodplains			Permanent pond		

GPS Location of Sensitive Receptor

Environmental Receptor	N	E
Hospital		
College		
School		
Madrasa		
Mosque		
Graveyard		
Prayer Place		

Questionnaire for homestead vegetation survey

HHH Name:			Village:		
Sample No.		GPS Reading:	N:	E:	Date:
Homestead size (Decimal):			% of homestead covered with woods:		

Species Name	Total Number		Avg. Height (m) of Adult	Utilization	*Economic Value (Tk.)*		Ecological value	Flood susceptibility	% of total Coverage of species
	Adult	*Juvenile*			*Annual*	*Harvest Value*			

[1] Utilization : 1=food; 2=timber; 3=fuel; 4=medicinal; 5=fiber/thatching; 6=others
[1] Ecological value : 1=for wildlife; 2= for avi-fauna; 3=for micro ecosystem
[1] Flood susceptibility : 1=highly susceptible; 2=susceptible; 3=resistant

Questionnaire for homestead wildlife survey

HHH Name:				Village:			
Sample No.		GPS Reading:	N:	E:		Date:	
Homestead size (Decimal):				% of homestead covered with woods:			

Species name	Habitat[1]	Food habit[2]	Breeding time (month)	Status[3]	Migration status[4]

[1] Habitat : 1=homestead forest; 2=flood plain; 3=wetland; 4=river
[2] Food habit : 1=herbivore; 2=carnivore; 3=both
[3] Status : 1=very common; 2=common ; 3=rare; 4-very rare
[4] Migration status : 1=local; 2=local migratory; 3=migratory

Fisheries Catch Assessment Survey Sheets

Field Researcher: *Habitat Name:* *Survey date:*

Annex 1

Fisheries Catch Assessment Survey Sheet

Baseline Survey of the Jamuna RBIP Project

IUCN Bangladesh Country Office

Date:	Sample no.	Location:	GPS Reading: N	E

Time	Riverbank distance	Meteorological setting @time of sampling	Gear Description	Craft Description	Duration of Haul	Total no. of haul/sample
		Sunshine:	Name & Type:	Name:		
		Part of day:	Mesh:	Length:		
		Wind speed:	Materials:	Fishermen no.:		
		Flow (m/s):	Length:	Made of:		
		Lunar date:	Depth of fishing:	Mechanized/non-mechanized:		
		Water quality:	Target species:	Type of boat (Commercial/non-commercial):		

Catch composition		Species list	Abundance (Count)	Total Length (L∞) S: 1-10	Body weight (gm) S: 1-10	Specimen Details					Catch (Kg/haul)	Tot catch (kg)
Fish	%					Photo ID	Morphology	Egg	Age	Sex		

Additional Comment/Constraints:	Research Assistant:	Signature:

Signature:

Field Researcher: *Habitat Name:* *Survey date:*

Annex 2: Fisheries Baseline Checklist

Vill: **Mouza:** **Union:** **Upazila:** **District:** **BWDB Circle:** **BWDB Division:**

Background Water bodies: *Name: Alphabetic, Area: in Ha/% of area/Ana, Length: in km, Depth/Inundation depth: in Meter, Flood Duration: in Months, Production: metric ton*

Problem/Issue	Fishing Effort	Habitat Type	Water Quality	Avg. Production	Production Trend (+/-) and Reason	List of Gears	% of gears	List of Habitat Name	Present					Past (15-20 yrs back)				
									Area	Length	Width	Depth	Duration	Area	Length	Width	Depth	Duration
Capture Fisheries: 1. 2. 3.	a. Total No. of fisher HHs: b. %/No. of CFHHs:	River																
Culture Fisheries: 4. 5. 6.	c. %/No. of SFHHS: d. No. of Days spend annually in fishing by CFHHs: SFHHs:	Beel (Leased/non leased)																
Indiscriminate Fishing Activities: 7. 8. 9.	e. Hrs/Day spend in fishing by CFHHs: SFHHs:	Khal																
		Floodplain																
		Mangrove area																
		Fish pond																
		Baor																
		Ghers																

Signature:

Field Researcher: ***Habitat Name:*** ***Survey date:***

Fish Migration				Fish Biodiversity		Species List					Species Composition				
						River	Khal	Beel	Pond	Other	Group	River	Khal	Beel	Pond
Previous Migration Status				Fish diversity status (Poor/Moderate/Rich) /%							Major carp				
											Exotic carp				
											Other carp				
											Catfish				
											Snakehead				
Present Obstacle to fish migration:	1. 2. 3.			Reasons of increase or decrease	1. 2. 3. 4. 5.						Live fish				
											Other fish				
											Shrimp/prawn				
											Hilsa/Bombay duck/Indian salmon				
											Pomfret				
Important breeding, feeding and over wintering ground											Jew fish				
											Sea cat fish				
											Shark/Skates/ Rays				
											Rui				
											Catla				
Horizontal Migration pattern	Species: 1. 2. 3. 4. 5.	Season (Months):	Routes:	Significant areas	1. 2. 3.						Mrigal				
											Koi				
											Sarputi				
											Large shrimp				
											Small shrimp				
Vertical Migration Pattern	Species: 1. 2. 3. 4. 5.	Season (Months):	Habitats :	Species of Conservation Significance	Rare:						Silver carp				
											Carpio				
											Grass carp				
											Tengera				
					Unavailable:						Chapila				
											Others				

Signature:

Field Researcher: *Habitat Name:* *Survey date:*

Post Harvest Activities		Fishermen Lifestyle	
Fish edible quality:		Socio-economic Status of subsistence level fishermen:	
Source of pollution in each habitat:		Socio-economic Status of Commercial fishermen:	
Seasonal vulnerability:		Other conflict (with muscle men/ agriculture/ other sector/laws):	
Ice factory (Number, location and name):		Fishermen community structure (Traditional/Caste/Religion)	
Landing center, whole sale market, other district markets, etc.:		Traditional fishermen vulnerability (Occupation change/others):	
Storage facility (number, location and name):		Existing Fisheries Management	
Fish market (Number, location and name):		Fishermen Community Based Organizations (FCBOs):	
Marketing problems:		WMOs activity:	
Fish diseases (Name, Host species, Season, Syndrome, Reason, etc.):		Fishing right on existing fish habitats (Deprived/Ltd. access/Full access):	
Other backward and forward linkages (Number, location and name):		Leasing system:	
Transport facility (Mode of fish transportation, cost, other involvements)		Enforcement of fisheries regulation (Weak/strong):	
Dry fish industries (Number, location and name):		Department of Fisheries (DoF) activity:	
Others information:		NGOs activities:	

Note: 1. Major Carp - Rui, Catla, Mrigal, 2. Exotic Carp - Silver Carp, Common Carp, Mirror Carp, Grass Carp, 3. Other Carp - Ghania, Kalbasu, Kalia, 4. Cat Fish - Rita, Boal, Pangas, Silon, Aor, Bacha, 5. Snake Head - Shol, Gazar, Taki, 6. Live Fish - Koi, Singhi, Magur, 7. Other Fish - Includes all other fishes except those mentioned above.
Marine: Hilsa/Illish, Bombay Duck (*Harpoodon nehereus*), Indian Salmon (*Polydactylus indicus*), Pomfret (*Rup_Hail_Foli Chanda*), Jew Fish (*Poa, Lambu, Kalakatina* etc.), Sea Cat Fish (*Tachysurus spp.*), Sharks, Skates & Rays, Other Marine Fish.

Beels: Rui (Labeo rohita), Catla (Catla catla), Mrigal (Cirrhinus mrigala), Kalbasu (Labeo calbasu), Gonia (Labeo gonius), Boal (Wallago attu), Air (Mystus aor / Mystus seenghala), Shol/Gazar (Channa spp.), Chital/Phali (Notopterus chitala / N. notopterus), Koi (Anabas testudineus), Singi/Magur (Heteropneustes fossilis /Clarias batrachus), Sarpunti (Puntius sarana), Large Shrimp (Macrobrachium rosenbergii /M. malcomsonii), Small Shrimp, Silver Carp (Hypophthalmichthys molitrix), Carpio (Cyprinus carpio), Grass Crap (Ctenopharyngodon idellus), Pabda (Ompok pabda), Punti (Puntius spp.), Tengra (Mystus spp.), Baim (Mastacembelus spp.), Chapila (Gudusia chapra), Others.

Pond: Rui (Labeo rohita), Catla (Catla catla), Mrigal (Cirrhinus mrigala), Kalbasu (Labeo calbasu), Mixed Carp, Silver Carp (Hypophthalmichthys molotrix), Grass Carp(Ctenopharyngodon idellus), Mirror Carp (Cyprinus carpio var. specularis), Tilapia (Oreochromis mossambicus / O. niloticus), Shrimp, Aor (Mystus aor / Mystus seenghala), Boal (Wallago attu), Shol/Gazar & Taki (Channa spp.), Chital/Phali (Notopterus chitala / N. notopterus), Koi (Anabas testudineus), Singi/Magur (Heteropneustes fossilis / Clarias batrachus), Sarpunti (Puntius sarana), Thai Sarpunti (Puntius goniconotus), Punti (Puntius spp.), Others.

Signature:

Annex B. Terms of Reference of EIA Study

Citation in the main text (Volume I): **Section 1.4**.

1. Background

Bangladesh is mainly comprised of the fertile alluvial floodplains and the delta of the Ganges-Brahmaputra-Meghna river system (Brahmaputra south through Bangladesh, named as the Jamuna). These three rivers combine within the country to form the world's third largest river, the Lower Meghna, which drains into the Bay of Bengal via a constantly changing network of estuaries and tidal creeks. Bangladesh is one of the most vulnerable countries to natural disasters, mainly by upstream river floods during monsoon season and coastal cyclones from the Bay of Bengal. Floods are of recurring phenomena in Bangladesh, and in each year about 22 percent of the country is inundated. Major floods occur when upland flood flows of the three rivers converging to Bangladesh coincide and combine with the heavy monsoon rainfall. It is also difficult to regulate these flood flows as over 90 percent of their river catchments areas are outside the Bangladesh.

Brahmaputra is the largest of the three rivers with highest erosion and bank movements. Prior to the construction of Brahmaputra Right Embankment (BRE), over bank spills along the 220 km stretch of the right bank of the Brahmaputra River used to cause flooding on an area of about 240,000 ha. In early 1960s, the BRE was built to protect from this flooding problem and to foster agricultural growth in the protected area. The original BRE had a setback of about 1.5 km from the Brahmaputra's right bank and it was allowed to have bank erosion life of 25-30 year span. In the 1970s the embankment started to fall under sporadic erosion attacks. During 1980s, the frequency of the BRE breaches by erosion increased rapidly as longer sections came within the range of rapidly eroding river bends which could cause bank-line erosion rates of several hundred meters per year in early stages of bend formation. To prevent flooding, these breaches were typically closed by local BRE retirements at about 200 meter set-backs. As a result of this minimal set-back distance the BRE has been retired several times in many places and at present perhaps only 50 KM of the original BRE has remained in place. Currently, many long stretches of the BRE are very close to the river-bank line. Hence when embankment is breached at many places it is often left open as closing of such breaching is becoming impossible. Consequently, security of area protected by the BRE has been seriously threatened and large areas of land and cities with large population like Sirajganj are exposed to flooding.

Under Flood Action Program a Master Plan was prepared in 1993 (River Training Studies of the Brahmaputra River, 1993) for improving the performance of BRE that preparing a revamping program to be implemented over a period of 30 years with identified priority investments in phasing. Based on these studies several hard points were identified and river bank protection revetments were constructed at Sirajganj, Sariakandi, Mathurapar and Kalitola and the embankment sections were improved. These protection works have performed very well in keeping the BRE anchored without much ongoing maintenance. The proposed consulting services are for the Environmental Assessment for the revamping plan for BRE (220 KM) starting from Nagarbari to the upstream point of BRE via Sirajganj Kazipur.

The main focus of the BRE rehabilitation work is on its length alongside the Brahmaputra/ Jamuna River from Bangabandhu (Jamuna) Bridge to the Teesta River (Appendix A). The task needs to consider inclusion of the flood protection embankment of the Kurigram Irrigation Project alongside the Brahmaputra River. The priority works will cover the approximately 50-kilometre long priority reach from Sailabari to Hasnapara. This reach has the highest historic erosion rates.

The project may also include the option of a toll road (highway) associated with the flood embankment. The project's physical works will include:

- River bank protection on portions of the western(right) bank;
- Embankment upgrading, reconstruction and realignment , including adding drainage/control
- structures (regulators);
- A new road on the embankment, along with a new bridge crossing of the Teesta.

The project may also provide livelihood and resettlement support to the displaced people. Based on the field reconnaissance and the preliminary morphological assessment, the project works has been divided into two phases:

Reach	**Length (km)**	**Phase**
Jamuna Bridge to Sailabari	19	Remaining
Sailabari to Hasnapara	50	Priority
Hasnapara to Belka	77	Remaining
Upstream of Teesta River	36	Remaining
Total	182	

The proposed project will be financed by IDA with GoB contribution and the project has to comply with the policies and legislative requirement of the World Bank and the GoB. Proper environmental management will require ensuring that the project would be environmentally sound and sustainable, and thus decision making will take place. It is envisaged that the detail Environment Impact Assessment (EIA) along with Environmental Management Plan (EMP) needs to be developed for priority phase. The borrower is responsible for carrying out these activities. The project is expected to be classified as Category 'A' project in accordance Bank's policy. BWDB intends to hire a consulting firm (the Consultant) to carry out these environment activities of the proposed project at the preparation stage to ensure that the proposed infrastructure takes environmental concerns into account.

2. Objective

The objective of the assignment is to carry out the tasks related to environmental aspects in light of the TOR. These include preparation of the **Environmental Impact Assessment** (including EMP) of the priority phase (Sailabari to Hasnapara).

3. Scope of Services

Carry out an overall Environmental Assessment (EA) and prepare Environmental Management Plan (EMP) for the project area covered under the feasibility study. For the area covered under the detailed designs conduct detail Environmental Impact Assessment and prepare full Environmental Management Plan (EMP). EIA, and EMP would be prepared according to the World Bank Guidelines and Operational Policies and the GoB procedures. The Consultant shall familiarize themselves with the project details and components as well as the Consultant shall interact with other preparation consultants (i.e, design consultant, social consultant etc.) to determine best way of conduction environment activities and fits into overall project preparation/project cycle. Consultant shall appropriately plan the timing of the deliverables.

The major activities to be carried out will include, but not limited to the following.

3.1 Environmental Impact Assessment of Priority Phase (Document owned by the Implementing Agency and Requirement of GoB and World Bank)

3.1.1 Study Area and Likely Major Impacts.

i. Specify the boundaries of the study area for the assessment (project influence area): river basin/catchments, upstream land use, the drainage area and patterns, irrigation and other development scheme(s) – current and proposed, watersheds, access to sensitive/remote areas such as parks/ reserves/forests/agriculture land, elements of transport development program in the area.

3.1.2 Describe the proposed project.

ii. Provide information on the following: location of all project-related development sites and general layout and extent of facilities at project-related development sites; flow diagrams of facilities/operations; design basis, size, capacity; pre-construction activities; construction activities (land clearing, land grading, worker camps, if any), schedule, staffing and support, facilities and services; operation and maintenance activities (water management, monitoring of flows and groundwater, etc.), staffing and support, facilities and services; management of risks, including health and safety; life expectancy for major components. Components may include any or all of the following: embankment, structural control measures; river channel modifications, dikes and levees; overflow basins; floodways and drainage and nonstructural measures (eg, zoning, floodplain regulations, building and sanitary ordinances and regulation of land use in basin/watershed areas), road route(s), types, ROWs, adjustments to alignments, including earthworks; repair/replacement of bridges; widening and stabilization of embankments; improvements to drainage and service ducts; sources of materials used during proposed road works; generation of wastes and their disposal expected volume of use and traffic impacts; necessary rehabilitation activities resettlement, land acquisition and temporary re-routing of traffic, safety features; staffing and accommodation of employees, including site clearance, scheduling of project activities; road paving and road signs and markings; operation and maintenance activities (eg, clearing of ditches, prevention of erosion, especially at culverts).

iii. Provide maps at appropriate scales to illustrate the general setting of project-related development sites, as well as surrounding areas likely to be environmentally affected. These maps shall include topographic contours, as available, as well as locations of major surface waters, roads, villages/towns, parks and reserves, and political boundaries. Also provide, as available, maps to illustrate existing land uses.

3.1.3 Description of the Environment

iv. Assemble and evaluate and baseline data on the environmental characteristics of the study area, including river basin/watershed, site of embankment, inundation, floodplain and biological features (habitats and rare species, fisheries), floodplain (recession) agriculture. Include information on any changes anticipated before the project commences.

(a). Physical environment: geology, topography, soils, climate, surface and ground water hydrology, annual peak discharge, ambient air quality; recurrence intervals of various peak discharges and peak stages of various discharges), erosion and sediment loading, existing/projected pollution discharges and receiving water quality; instances of flooding, siltation/erosion;

(b) Biological environment: ecology: flora and fauna, including rare or endangered species; sensitive natural habitats, including parks and reserves; potential vectors for disease; exotics and aquatic weeds; application of pesticides and fertilizers (current and projected as agriculture production is expected to be increased);

(c) Socio-cultural environment: land use (including current crops and cropping patterns - terracing or contour planting, population in the floodplain, etc.); fisheries and farm/industrial outputs and inputs; transportation; land tenure and land titling; present water supply and water uses (including current distribution of water resources); control over allocation of resource use rights; water-related human health problems; cultural sites, present and projected population; present land use/ownership; planned development activities; community structure; present and projected employment by industrial category; distribution of income, goods and services; recreation; public health; cultural properties; indigenous peoples, customs and aspirations; significant natural, cultural or historic sites, etc. Presence of HIV/AIDS and other sexually transmitted diseases;

(d) If resettlement sites and livelihood options are considered to support, find the physical, biological and socio economic conditions of the area;

v. Provide chainage wise information along the two sides of the project intervention and identify any critical aspect which needs special consideration during design, construction and operation.

3.1.4 Determination of the Potential Impacts of and Impacts on the Proposed Project.

vi. This analysis will require in depth interpretation. In this analysis, distinguish between significant positive and negative impacts, direct and indirect impacts, and immediate and long-term impacts. Identify impacts that are unavoidable or irreversible. Wherever possible, describe impacts quantitatively, in terms of environmental costs and benefits. Assign economic values when feasible. Characterize the extent and quality of available data, explaining significant information deficiencies and any uncertainties associated with predictions of impact. Compare the impact with the baseline. Provide TORs for studies to obtain the missing information. Special attention should be given to:

(a). Effects of the flood control embankment: direct environmental impacts of the embankment construction; effects on fisheries resources (creation of a reservoir fisheries, loss of downstream fisheries); effects on water quantity and quality; effects on floodplain ecology and estuarine, river hydrology, if applicable;

(b). Effects of flood control structures, intervention of river training structure and measures (e.g., channelization measures, floodways (high flow diversions or spillways), overflow basins, disposal of dredging spoils) on: aquatic ecology, particularly fish resources; hydrology, including groundwater recharge and exclusion of water from certain areas that may impact the hydrology and associated wildlife and agriculture; water quality; plant and animal ecology of the floodplain (habitat and species); and,

(c). Socio-economic impacts on populations in inundation area and downstream (floodplain dwellers, urban population, etc.) through: land use changes; impacts on water-related economic activities (e.g., fisheries, flood plain agriculture, transportation, etc.); health effects (e.g., increased incidence of water-borne and water related diseases). Additionally for road construction, consider loss of agricultural and residual lands; destruction of properties; loss of livelihood or other social disruption; relocation of infrastructures; unplanned settlements; noise; threat to cultural and historical sites or artifacts; demographic changes; potential for HIV/AIDS and other sexually-transmitted diseases. Also identify the impact due to resettlement and new livelihood options.

(d) Impact from road construction: Impact on air quality: air pollution from asphalt

plants; dust; noise from construction, equipment and blasting; impact on land resources: crossing of rivers, streams, canals and ravines, loss of habitat; foreclosure of other land uses; landslides; erosion; roadside litter; impact on hydrology: crossing of rivers, streams, canals and ravines; foreclosure of other land uses; landslides; erosion; modifications to natural drainage patterns and groundwater elevation; flash flooding; road side litter; impact on water quality: river/stream and lake sedimentation; use of pesticides; fuel and oil spills; water pollution from spills or accumulated contaminants on road surfaces; impact on biological environment: land clearance and loss of habitat; impacts on biodiversity caused by facilitation of access to and spontaneous settlements in natural areas; impacts on wetland management; control of hunting and poaching/wood-cutting

vii. Conduct model study on the water flow, geomorphology and water quality due to project intervention and predict the impact on ecology and socio economic activities after ten years.

viii. Identify the impact of the project intervention during lean period (seasonal variation) (impact on navigability, water variability).

ix. Determine the cumulative impact of the road construction and river bank improvement for the entire project area. Identify any steps to be taken to reduce the impact of the construction of remaining tasks on the current project.

3.1.5 Analysis of Alternatives to the Proposed Project.

x. Describe alternatives that were examined in the course of developing the proposed project and identify other alternatives that would achieve the same objectives. The concept of alternatives extends to siting and design of new alignments, rehabilitation techniques, choice of hydrological structures, and phasing, and operating and maintenance procedures, resettlement sites and livelihood support. Compare alternatives in terms of potential environmental impacts, capital and operating costs (including mitigation measures and their monitoring), and institutional, training, and monitoring requirements. To the extent possible, quantify the costs and benefits of each alternative, incorporating the estimated costs of any associated mitigating measures.

xi. Based on the above analysis identify and propose the best engineering design parameters to ensure minimal environment impacts due to the project.

xii. Closely work with the design consultants that those parameters are incorporated in the design.

3.1.6 Development of an Environmental Management Plan (EMP)

xiii. Identify key mitigation and enhancement approaches and prepare the impact specific mitigation measures. Estimate the impacts and costs of the mitigation measures and of the institutional and training requirements to implement them. If appropriate, assess compensation to affected parties for impacts that cannot be mitigated. Prepare an EMP, including proposed work programs, budget estimates, schedules, staffing and training requirements, and other necessary support services to implement the mitigating measures, monitoring, etc. Include measures for emergency response to accidental events (e.g. entry of raw sewage or toxic wastes into rivers, and streams).

xiv. Prepare a detailed plan to monitor the implementation of mitigating measures and the impacts of the project during rehabilitation and operation (eg, emission and ambient levels of pollutants where these may be detrimental to human health, soil erosion, changes in the

floodplain). Include in the plan an estimate of capital and operating costs and a description of other inputs (such as training and institutional strengthening) needed to implement the plan. Include a regular schedule of monitoring the quality of surface and ground waters to ensure that mitigation measures are effective. Provide guidance for reporting and enforcement and conducting environmental audits.

xv. Estimate the costing of EMP, ECoP and provide necessary clauses for incorporating in the bid document.

xvi. Review the responsibilities and capability of institutions at local, provincial/regional, and national levels and recommend steps to strengthen or expand them so that the EMP may be effectively implemented. The recommendations may extend to new laws and regulations, new agencies or agency functions, inter-sectoral arrangements, management procedures and training, staffing, operation and maintenance training, budgeting and financial support.

xvii. An outline of the contents of the EMP to be included in the project's Operational Manual should be provided along with environmental/social protection clauses for contracts and specifications**.**

3.1.7 Assist in Inter-Agency Coordination and Public/NGO Participation.

xviii. The Consultant will assist the government in coordinating the EIA with relevant agencies and the government will consult with affected groups likely to be affected by the proposed project and with local NGOs on the environmental and social aspects of the proposed project. These groups should be consulted when a draft EIA is available (a summary of the EIA will be available prior to the meeting). The draft EIA should also be available in a public place accessible to affected groups and local NGOs being consulted. The consultation workshops will be held locally, regionally and nationally.

Relevant materials will be provided to affected groups in a timely manner prior to consultation and in a form and language that is understandable and accessible to the groups being consulted. The Consultant should maintain a record of the public consultation (written and video and pictorial proof) and the records should indicate: means other than consultations) eg, surveys) used to seek the views of affected stakeholders; the date and location of the consultation meetings, a list of the attendees and their affiliation and contact address; and, summary minutes.

3.1.8 Institutional responsibility

xix. Define the roles and responsibilities of officials, staff, consultants and contractors of BWDB on environmental management;

xx. Describe in details who will (a) implement the environmental mitigation activities (b) carrying out environmental monitoring; (c) supervise environmental mitigation and monitoring; (d) design, implement and apply the environmental management information system (EMIS); and (e) prepare quarterly progress report on environmental management;

xxi. Finalize the draft EIA incorporating the comment from the consultation;

xxii. Translate and finalize the EIA in Bengali.

4. Consulting Team composition and qualifications

i. The studies outlined require interdisciplinary analysis with specialized sector knowledge (i.e., water resource and hydrology/embankment). The general skills required of the Environmental Safeguard team are: environmental management planning, civil/river /embankment engineer(s), with particular experience in dredging projects, river training and embankment construction and water-based transport; aquatic biologist depending upon the predicted impacts, land use planner, sociologist, archaeologist and communications / stakeholder engagement. The consulting team must be able to demonstrate appropriate skill mix and depth of experience to cover all areas of the proposed analysis, including incorporation of other specialized skill sets where required. The consulting team shall be led by a Team Leader with at least 10 years of experience leading EIA studies, including prior international experience on similar types of water resource projects, and prior experience as either team leader or deputy team leader on at least 3 previous major infrastructure EIAs for World Bank funded projects.

5. Schedule/Duration of the study

The study period shall be of **6 (six)** months from the date of commencement of the study.

6. Reports

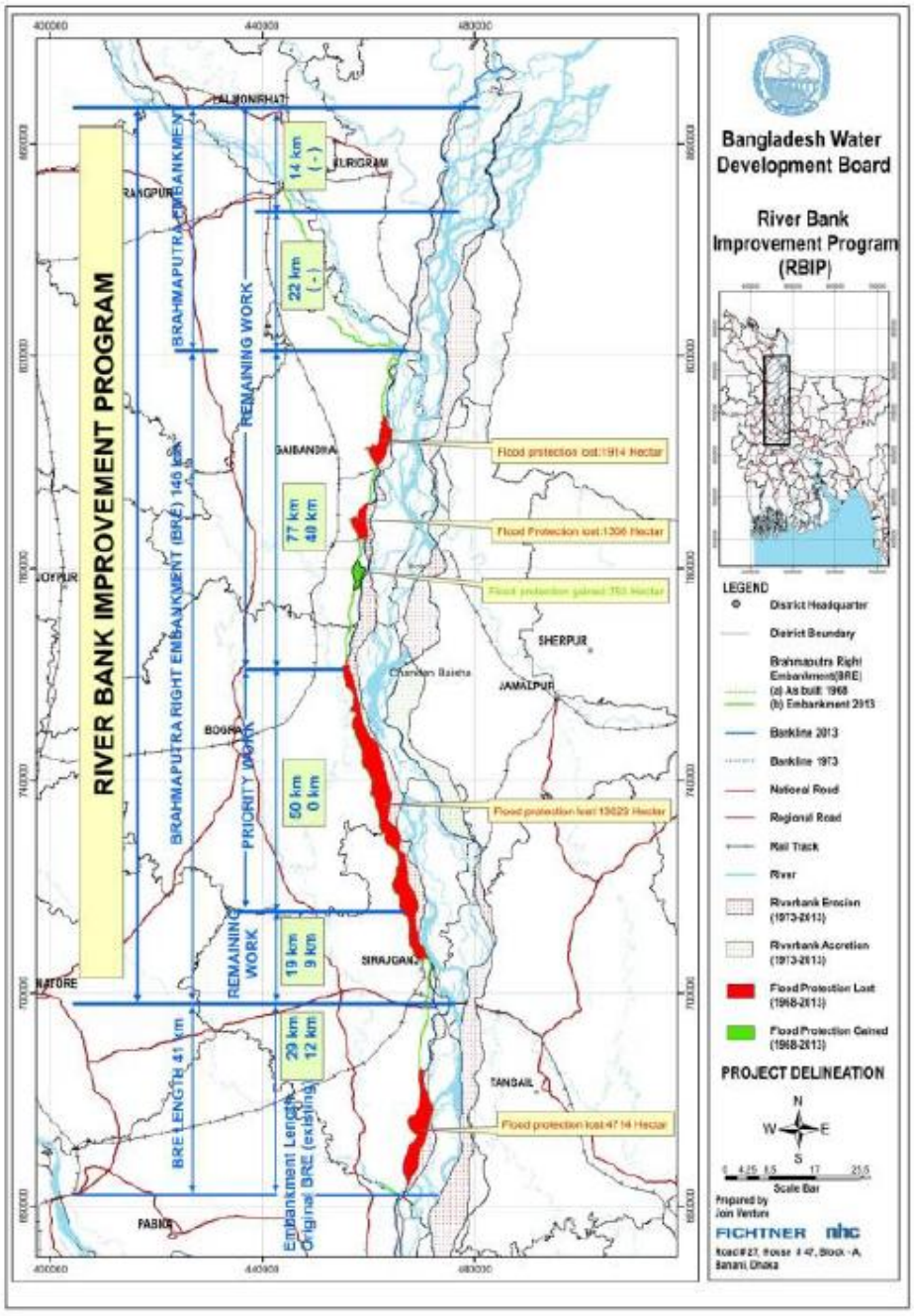
After commencement of the study the submission of the reports shall be both in **hard (3 copies) and soft copy** as follows:

- Draft Environmental Impact Assessment---submitted at the end of 4th month of signing the contract
- Final Environmental Management Framework--submitted at the end of 3rd month of signing the contract.
- Final Environmental Impact Assessment---submitted at the end of 5th month of signing the contract
- Bengali Translation of the Environmental Management Framework--submitted at the end of 5th month of signing the contract.
- Bengali Translation of the Environmental Impact Assessment--submitted at the end of 6th month of signing the contract.

8. Reporting

The consultant will report to the Project Director, River Bank Improvement Project, Bangladesh Water Development Board (BWDB).

Appendix A: Location of Priority (Phase I) and Remaining (Phase II) Project Location



Appendix B: Structure of EIA Report

The Consultant is required to prepare an EIA report that is concise and limited to significant environmental issues. The main text should focus on findings, conclusions and recommended actions, supported by summaries of the data collected and citations for any references used in interpreting those data. Detailed or uninterrupted data are not appropriate in the main text and should be presented in appendices or a separate volume. Unpublished documents used in the assessment may not be readily available and should also be assembled in an appendix. Organize the environmental assessment report according to the outline below.

The report should be prepared as per the following key contents:

1. Executive Summary (ES): The Executive Summary should mirror the report both in form and content and should be about 10 percent in length of the report. The significant findings and recommended actions should be clearly discussed in the ES.
2. Introduction: This section will include (i) purpose of the report and (ii) extent of the environmental study.
3. Policy, Legal and Administrative Framework: This section will describe relevant environmental policies, rules and administrative procedures that need to be followed for the proposed project. The relevant international environmental agreements to which Bangladesh is a party should also be discussed.
4. Project design and Description: This section will provide a brief but clear picture about (i) type of project; (ii) category of project; (iii) need for project; (iv) location (use maps showing general location, specific location, and project site); (v) size or magnitude of operation;(vi)Project influence area (vii) proposed schedule for implementation. The proposed project should be described with reasonable details so that the EIA report can be read as a standalone document without reference to other project documents.
5. Analysis of Alternatives: Systematic comparison for feasible alternatives to the proposed project site, technology, design, and operation--including the "without project" situation--in terms of their potential environmental impacts should be done. The feasibility of mitigating these impacts; their capital and recurrent costs; their suitability under local conditions; and their institutional, training, and monitoring requirements have to be provided. For each of the alternatives, the quantification of the environmental impacts to the extent possible, and economic values where feasible should be given. The basis for selecting the particular project design proposed and justification for recommended emission levels and approaches to pollution prevention and abatement have to be provided.
6. Environmental Baseline: *This section will provide sufficient information on the existing environmental baseline resources in the area affected by the project, including the following:*

   (i) Physical Resources: (e.g. atmosphere, air quality and climate), topography and soils, surface water & groundwater, geology/seismology)

   (ii) Water Resources: (e.g. hydrology, surface water and groundwater system, sedimentation, tidal influence, etc.)

   (iii) Land and Agriculture resources: (e.g. land type, land use, cropping pattern, crop production, etc.)

   (iv) Fisheries resources: (e.g. fisheries diversity, fish production, etc.)

   (v) Ecology: (e.g. ecosystems, wildlife, forests, rare or endangered species, protected areas, coastal resources, etc.)

   (vi) Socio-economic condition:(e.g. population and communities (e.g. numbers, locations, composition, employment), health facilities, education facilities, socio-economic conditions (e.g. community structure, family structure, social wellbeing), physical or cultural heritage, current use of lands and resources for traditional purposes by indigenous peoples, structures or sites that are of historical, archaeological, paleontological, or architectural significance, economic development (e.g. industries, infrastructure facilities, transportation, power sources and transmission, mineral development, and tourism facilities, etc.).

To assess the dimensions of the study area, the relevant physical, biological, and socioeconomic conditions before the project commencement should be discussed. The relevant data related to the issues have to be collected and reported.

7. Climate Change issues: *Climate change aspects in global, regional and local perspectives and the likely impacts on the Project area and its surroundings should be briefly discussed in this section.*

8. Significant Environmental Impacts: This chapter will need careful interpretation. Significant environmental and social impacts due to project location, and related to project design, construction, and operations phase should be discussed in detail in this section. The prediction and assessment of the project's likely positive and negative impacts, in quantitative terms to the extent possible should be made. The mitigation measures and any residual negative impacts that cannot be mitigated should be identified. The opportunities for environmental enhancement should also be explored. Estimates should be done on the extent and quality of available data, key data gaps, and uncertainties associated with predictions; and the topics that do not require further attention should be specified. Considering the impact the project has to be classified into Categories of A, B or C as per OP 4.01.

9. Cumulative and Induced Impacts: Cumulative impacts of the proposed Project and other projects as well as induced impacts should be provided in this section.

10. Design Parameters: This section should present the parameters which should be considered in the design for minimizing the environmental impact.

11. Environmental Management Plan: The environmental management plan (ESMP) will include mitigation and enhancement plan, compensation and contingency plan as well as monitoring plan including institutional arrangement for implementation of the EMP. The EMP should also include tentative cost of implementation of the plan. Guideline for preparation of EMP is included below.

12. Stakeholder Consultation and Disclosure: The proceeding of the consultations done as per OP4.01 has to be included in this section of the EIA report. It is to be noted that during the EIA process for all WB Category A and B projects, the proponents have to consults project-affected groups and local nongovernmental organizations (NGOs) about the project's environmental aspects and take their views into account. The proponents' initiates such consultations as early as possible. For Category A projects, the proponents consult these groups at least twice: (a) shortly after environmental screening and before the terms of reference for the EIA is finalized; and (b) once a draft EIA report is prepared. In addition, the proponent must consult with such groups throughout project implementation as necessary to address EIA-related issues that affect them.

13. Disclosure: For meaningful consultations between the borrower and project-affected groups and local NGOs on all Category A and B projects proposed for WB financing, the proponents must provide relevant material in a timely manner prior to consultation and in a form and language (i.e. Bangla) that are understandable and accessible to the groups being consulted. The disclosure details done as per OP 4.01 should be provided in this section.

14. Grievance Mechanism**:** A mechanism should be outlined to ensure that the project sponsor maintains appropriate external channels for communicating with and receiving feedback, questions, and complaints from local stakeholders, as well as internal

procedures for following up and resolving any complaints or grievances in a timely manner. The mechanism should include more than one channel for receiving communications and grievances (for example, a hotline, a public information office, boxes to receive written complaints or queries, etc. – depending on local preferences, literacy levels, etc.), as well as indicating requirements, responsibilities and budget for documenting, processing, and resolving issues that arise, including providing feedback to complainant(s) regarding the resolution. The existence of the grievance mechanism must be fully and proactively disclosed to the public.

15. Discussions and Conclusions**:** The essential issues in the EIA report should be summarily discussed and the conclusions are to be included in this section.

16. **References:** References should be provided to written materials both published and unpublished, used in study preparation.

1. Annexes:
   - ✓ List of Environmental Assessment Preparers
   - ✓ Record of interagency and consultation meetings, including consultations for obtaining the informed views of the affected people and local nongovernmental organizations (NGOs). The record specifies any means other than consultations (e.g., surveys) that were used to obtain the views of affected groups and local NGOs
   - ✓ Data and Unpublished Reference Documents

Guideline for Preparing Environment Management Plan

Environmental Management Plan (EMP)

The Consultant is required to develop an Environmental Management Plan (EMP) consisting of a set of feasible and cost-effective mitigation measures and monitoring and institutional plan to prevent or reduce significant negative impacts to acceptable levels. This will include measures for emergency response to accidental events (e.g., fires, explosions), as appropriate. The Consultant will provide an estimation of the impacts and costs of the mitigation measures, and of the institutional and training requirements to implement them. In particular this would include:

Environmental Mitigation & Enhancement Measures: Recommend feasible and cost-effective measures to prevent or reduce significant negative impacts to acceptable levels. Apart from mitigation of the potential adverse impacts on the environmental components, the EMP shall identify opportunities that exist for the enhancement of the environmental quality along the surrounding area. Residual impacts from the environmental measures shall also be clearly identified. The EMP shall include detailed specification, bill of quantities, execution drawings and contracting procedures for execution of the environmental mitigation and enhancement measures suggested, separate for pre-construction, construction and operation periods. In addition, the EMP shall include good practice guides related to construction and upkeep of plant and machinery. Responsibilities for execution and supervision of each of the mitigation and enhancement measures shall be specified in the EMP. A plan for continued consultation to be conducted during implementation stage of the project shall also be appended.

Capacity Building & Training: The EMPs shall describe the implementation arrangement needed for the project, especially the capacity building proposals including the staffing of the environment unit (as and when recommended) adequate to implement the environmental mitigation and enhancement measures. For each staff position recommended to be created, detailed job responsibilities shall be defined. Equipment and resources required for the environment unit shall be specified, and bill of quantities prepared. A training plan and schedule shall be prepared specifying the target groups for individual training programs, the content and

mode of training. Training plans shall normally be made for the client agency (including the environmental unit), the supervision consultants and the contractors.

Supervision & Monitoring: Environmental monitoring plan will be an integral part of an EMP, which outlines the specific information to be collected for ensuring the environmental quality at different stages of project implementation. The parameters and their frequency of monitoring should be provided along with cost of the monitoring plan and institutional arrangements for conducting monitoring. Reporting formats should be provided along with a clear arrangement for reporting and talk corrective action. The EMP shall list all mandatory government clearance conditions, and the status of procuring clearances. Additionally, the EMPs shall include as separate attachments, if applicable, Natural Habitat Plan and/or Cultural Properties Plan to satisfy the requirements of the World Bank safeguard policies.

Annex C. Location and Specification of Different Fish Habitats and Chars

Citation in the main text (Volume I): **Section 6.5.3.3**.

Sirajganj Sadar Upazila

Water body type	Country side (Name/ No.)	River side (Name/No.)	Specification
River		Jamuna	
	Ichhamoti		
Beel/ Wetlands	Aminpur beel		0.80 ha
	Joynagar beel		20 ha
	Charkhada		0.80 ha
	Chatiantolir beel		13.36 ha
	Ghuria beel		6.68 ha
	CNB Beel		2.67 ha
Khal/Canal	Kothir Pinjira		
	WAPDA Khal		
	Doi Vanger khal		
	Balia ghugri khal		
	Perpachil khal		
	Bahuka khal		
Kole (Embayment)		Simla	2.97 ha
		Mothiar kul - achthakuri	3.34 ha
	Balutia- Moshamara		334.01 ha
Pond	52 nos.	10 nos.	3.51 ha

	Name of Char	Location (From proposed Baliaghugri regulator)
1	Simla	4 km east
2	Kharoya	6 km east
3	Khas para	7 km north-east
4	Par Simla	3 km north-east
5	Noya para	5 km north-east

	Name of Char	Location (From proposed Baliaghugri regulator)
6	Dumber char	2 km north east
7	Jhumkal char	7 km north

Kazipur Upazila, Sirajganj

Water body type	Country side (Name/No.)	River side (Name/No.)	Specification
River		Jamuna	
Beel/ Wetlands	Paikartoli beel		500 ha
	Chalita danga beel		300 ha
	Vhut baria beel		240 ha
	Kachihara beel		1000 ha
	Pagol kandi beel		500 ha
Khal/Canal	Halot khal		37.5 ha
	Meghai khad		2 km long (15.36 ha)
Pond	70 nos.	18 nos.	4.99 ha

Dhunat upazila, Bogra

Water body type	Country side (Name/No.)	River side (Name/No.)	Specification
River	Manos river		8.75 ha
Beel/ Wetlands		Jagiar beel/ Vander bari	10 ha
	Bera danger beel		200 ha
	Houra khali beel		112.5 ha
Khal/Canal	Madhob Danga		8 ha
	Shimul bari khal		12 ha
Kole (lagoon)		Pukuria	8.02 ha
		Sariakandi	0.67 ha
		Shamol bari	1.07 ha
		Baniajan	0.67 ha
		Adhanagar	0.67 ha
		Boishakhi	5.34 ha

Water body type	Country side (Name/No.)	River side (Name/No.)	Specification
		Chunia para	40.08 ha
Pond	59	40	5.61 ha

	Name of Char	Location
1	Maiz bari	3 km east From proposed Pukuria- Vanderbari regulator
2	Vanger bari	2 km east From proposed Pukuria- Vanderbari regulator
3	New Sariakandi	3 km north-east From proposed Pukuria- Vanderbari regulator
4	Pukuria	East to proposed Pukuria- Vanderbari regulator
5	Boroikandi	East to proposed Pukuria Vanderbari regulator
6	Baniajan	East to proposed Pukuria Vanderbari regulator
7	Koiya gari	East to proposed Pukuria Vanderbari regulator
8	Atai	East to proposed Pukuria Vanderbari regulator
9	Sohora	East to proposed Pukuria Vanderbari regulator
10	Boishaki	1 km east from Shimul baria spur
11	Adhanagor	1 km East from Shamol bari spur
12	Fuljhur	2 km southeast from Shamol bari spur
13	Mollik para	3 km southeast from Shamol bari spur
14	Shree pur	3 km southeast from Shamol bari spur
15	Agura Maizbari	4 km southeast from Shamol bari spur
16	Dhakuria	5 km southeast from Shamol bari spur
17	Boyan char	3 km east from Chuniapara regulator
18	Majhira	4 km east from Chuniapara
19	Shanbandha	5 km east from Chuniapara
20	Promitibari	6 km north from Chuniapara
21	Noi khola	6 km north from Chuniapara

Sariakandi Upazila, Bogra

Water body type	Country side (Name/No.)	River side (Name/No.)	Specifications
River		Jamuna	
		Bangali	
Beel/ Wetlands	Dauli beel		1 km long (50 ha)
	Vakir beel		60 ha
	Bera beel		100 ha
	Dikdar beel		2 km N- W from Hasnapara , 30
	Dighol kandi beel		40.08 ha
	Satbilla beel		293.93 ha (5 km long)
	Kalaihata beel		26.72 ha
	Burungir beel		20 ha
	Gojariar beel		60 ha
Khal/ Canal	Kata khal		1 km long (3.50 ha)
		Kuripara canal	derived from Jamuna and directed to Shalukar char , 4 ha
		Shalukar canal	derived from Jamuna and directed to Shalukar char,5.25 ha
		Char bati canal	derived from Jamuna and directed to Shalukar char, 5 ha
Kole (lagoon)	Antarpara kole		East to Antarpara regulator (4.01 ha)
	Nich Kola		0.75 km north from Hasnapara (8.01 ha)
	Khurda boloi		0.5 km east- from Hasnapara (6.68 ha)
	Maiz bari		5952.02 ha
	Taltola		66.80 ha
	Kazlar kole		10.69 ha
	Gobindapur		7 ha
	Nolcia		5.5 ha
	Beragram		10 ha
	Holdia		14 ha
Pond	75 nos.	20 nos.	5.38 ha

	Name of Char	**Location/ Feature**
1	Kuripara	East to proposed Antarpara regulator
2	Khapur para	East to proposed Antarpara regulator
3	Antarpara	East to proposed Antarpara regulator
4	Kazla	East to proposed Antarpara regulator
5	Ghager char	East to proposed Antarpara regulator
6	Diga para	1 km northeast from Hasnapara
7	Chokorthinatha	3 km northeast from Hasnapara
8	Konnobari	4 km northeast from Hasnapara
9	Kormoja	2 km north from Hasnapara
10	Housherpur	1.5 km north from Hasnapara
11	Sujatpur	3 km north from Hasnapara
12	Bauliapara	4 km north from Hasnapara
13	Banupur	2 km east from Hasnapara
14	Dhorbon	1 km southeast from Hasnapara
15	Pakuria char	West to Shalukar char
16	Jamtoil	West to Shalukar char
17	Manik	North to Shalukar char
18	Nobboi	Northeast to Shalukar char
19	Barabajbari	East to Shalukar char
20	Indurmara	South to Shalukar char
21	Hasnapara	Southeast to Shalukar char
22	Dakat mara	Southeast to Shalukar char
23	Chanpara	Southeast to Shalukar char
24	Gobindapur	7 km northeast from Kundupara
25	Nolcia	4 km northeast from Kundupara
26	Fazilpur	6 km east from Kundupara
27	Joyantirpara	4 km east from Kundupara

Sonatola Upazila, Bogra

Water body type	Country side (Name/No.)	River side (Name/No.)	Specification
Beel/ Wetlands	Saluka beel		13.36 ha, perennial, average water depth= 15 feet
Pond	16	2	0.87 ha

	Name of Char	Location/ Feature
1	Khabilla	5 km southeast from Pakulla, Bogra
2	Boro vanga	10 km East from Pakulla
3	Shollia	8 km southeast from Pakulla
4	Auchar	10 km southeast from Pakulla
5	Patil char	11 km southeast from Pakulla

Saghata Upazila, Gaibandha

Water body type	Country side (Name/No.)	River side (Name/No.)	Specification
River		Jamuna	
Beel/ Wetlands	Kharkhara		0.5 km west from Saghata sluice gate,5 ha, Seasonal, water depth 8 feet
	Charagata		1.5 km west from Saghata sluice gate, 6 ha, Perennial, water depth 20 feet
	Ghoridaho		3 km west from Saghata sluice gate,3 ha, Perennial, water depth 15 feet
	Kachur beel		West to Kachuar regulator, 2.01 ha, perennial, culture
	Beel bosta		0.5 km south from Kachuar regulator, 2 ha, perennial, culture
	Vagir beel		0.81 ha, southeast of Nilkhuthi village , Bhorot khali union , Shaghata, Gaibandha
	Napiter beel		0.81 ha
Kole (Seasonal water body)		Hatbari	5 km east from Saghata sluice gate, 4 ha
		Pansi para	5 km north from Saghata sluice gate, 10 ha

Water body type	Country side (Name/No.)	River side (Name/No.)	Specification
		Shaghata	1 km east from Saghata sluice gate, 14 ha
		Kachuar kole	300 m west from Saghata sluice gate,50 ha, Perennial, water depth (R=25 feet, D=12 feet
		Bashhata	657,0.40 ha
		Shatilla	657,2.67 ha
Pond	40 nos.	6 nos.	2.79 ha

	Name of Char	Location / Feature
1	Hatbari	3 km east from Saghata sluice gate
2	Delabari	6 km east from Saghata sluice gate
3	Jamira	8 km east from Saghata sluice gate
4	Batoner char	1 km east from 657
5	Shatilar char	2 km east from 657

Fulchari Upazila, Gaibandha

Water body type	Country side (Name/No.)	River side (Name/No.)	Specification
		Brahmaputra	
River	Ghaghot	Ghaghot	
	Alai	Alai	
Beel/ Wetlands	Singrai beel		N-E to Catlamari sluice gate, 80.16 ha, Perennial, water depth(R= 15 feet, D= 5 feet)
	Gauchulki beel		N-W to Catlamari sluice gate, 20.16 ha, Seasonal, water depth(R= 7 feet, D= 0 feet)
	Khathuria beel		N-E to Ratanpur sluice gate, 26.72 ha, Perennial, water depth (R= 15 feet, D= 7.5feet)
	Kabilpur beel		4 km S from proposed Kanchipara regulator,30 ha

Water body type	**Country side (Name/No.)**	**River side (Name/No.)**	**Specification**
	Gun bhuri		5.5 km S from proposed Kanchipara regulator
	Ratanpur beel		5.5 km S from proposed Kanchipara regulator
Canal		Gopaldoba	6.01 ha, 1 km east from Catlamari regulator(2v)
Kole (Seasonal water body)		Khazjani Kole	0.5 km E from Hardanga Char, 26.73 ha, Perennial, water depth (R=30 feet, D=15 feet
		Coach khali kole	1.5 km N from Hardanga Char, 13.36 ha, Perennial, water depth (R=25.5 feet, D=7.5 feet
Pond	55 nos.	12 nos.	3.53 ha

	Name of Char	**Location / Feature**
1	Khatia mari	6 km S-E from proposed kanchipara regulator
2	Haro danga	3 km S from proposed kanchipara regulator
3	Satar danga	1.5 km E-N from proposed kanchipara regulator
4	Kauya para	3 km E from proposed kanchipara regulator
5	Kuch khali	1 km E from proposed kanchipara regulator
6	Jora bari	1.5 km E-S from proposed kanchipara regulator
7	Kabilpur	1.5 km E-S from proposed kanchipara regulator
8	Fazlur pur	3 km E-S from proposed kanchipara regulator
9	Kalosona	6 km S from proposed kanchipara regulator
10	Chomohan	4 km S from proposed kanchipara regulator
11	Krishnomoni	4.5 km S from proposed kanchipara regulator
12	Zira bari	10 km E from proposed kanchipara regulator
13	Khazjani	1.5 km E from Hardanga Char
14	Kauyabada	5 km E-N from Hardanga Char
15	Rahamatpur	4 km E-N from Hardanga Char
16	Satarkandi char	5 km E from Hardanga Char

Sadar, Gaibandha

Water body type	Country side (Name/No.)	River side (Name/No.)	Specification
River	Ghaghot		
	Manos River		
		Brahmaputra	
Floodplain/ Wetlands	Vela goa beel		0.25 km W from Baguria point ,two parts divided by WAPDA badh, 9.35 ha, Seasonal, water depth(R= 15 feet)
	Pakhimara beel		Adjacent to existing 8 vent regulator,1002.02 ha, Seasonal, Water depth =7 feet
	Puiya gara beel		Adjacent to proposed taltola regulator,240.49 ha, seasonal , water depth = 6 feet
	Purbo Baroboldia beel		Adjacent to(N-W) Proposed Kamarjani regulator, 280.57ha, Perennial , Average water depth = 7.5 feet
	Gidari beel		2.5 km S-W from Proposed Kamarjani regulator, 400.81ha, Perennial , Average water depth = 9 feet
Canal	Kamarjani khal		Along the WAPDA badh
		Dara/Canal	Brahmaputra to WAPDA badh
Kole (Seasonal water body)		Uttar gidari kole	10 km N from Hardanga Baguria point, 1.07 ha, Perennial, water depth (R=30 feet, D=10.5 feet
		Gorain kole	1.20 ha, Perennial, water depth (R=30 feet, D=12 feet
		Kalaibari	8 km E-S from first grown of Anarar chora,5.34 ha, Perennial, water depth (R=30 feet, D=12 feet, Fish culture practiced
		Khazjani	10 km E-S from first grown of Anarar chora, 3.34 ha, Perennial, water depth (R=25 feet, D=10 feet, Fish culture practiced
		Gidari	2 km N-W from first grown of Anarar chora,6.68 ha, perennial, water depth (R=22.5 feet, D=7.5 feet
		Khana bari	4 km northeast from proposed Kamarjani regulator, 9.35ha, Perennial , Average

Water body type	Country side (Name/No.)	River side (Name/No.)	Specification
			water depth = 12 feet
		Kamarjani	2 km E from Proposed Kamarjani regulator, 3.34 ha, Perennial , Average water depth = 10 feet
		Koraibari	2 km E-N from Proposed Kamarjani regulator, 8.02 ha, Perennial , Average water depth = 11 feet
		Matikhola	7 km S- E from Proposed Kamarjani regulator, 66.80 ha, Perennial , Average water depth = 12 feet
Pond	244 nos.	17 nos.	13.74 ha

	Name of Char	Location / Feature
1	Raidas bari	2 km N from Baguria point
2	Faliar gob	3 km E from Baguria point
3	Kalai bari	4 km E from Baguria point
4	Khas jani	5 km E from Baguria point
5	Patdiara	6 km E from Baguria point
6	Kundarpara	7 km E from Baguria point
7	Batkamari	9 km E from Baguria point
8	Fazlur pur	3 km E-S from proposed kanchipara regulator
9	Kalosona	6 km S from proposed kanchipara regulator
10	Chomohan	4 km S from proposed kanchipara regulator
11	Krishnomoni	4.5 km S from proposed kanchipara regulator
12	Zira bari	10 km E from proposed kanchipara regulator
13	Khazjani	1.5 km E from Hardanga Char
14	Kauyabada	5 km E-N from Hardanga Char
15	Rahamatpur	4 km E-N from Hardanga Char
16	Satarkandi char	5 km E from Hardanga Char
17	Folar cock	3 km E- N from Anarar chora
18	Sayedpur	5 km E- N from Anarar chora

	Name of Char	Location / Feature
19.	Satarkangi	10 km E from Anarar chora
20	Khazjani	10 km E- N from Anarar chora
21	Kalaibari	7 km E from Anarar chora
22	Aijaz bari	2 km E from Anarar chora
23	Khamarjani	6 km E from Proposed Kamarjani regulator
24	Karaibari	5 km E-S from Proposed Kamarjani regulator
25	Batkamari	9 km E-S from Proposed Kamarjani regulator
26	Kandolpara	25 km E-S from Proposed Kamarjani regulator
27	Kolmu	18 km E-S from Proposed Kamarjani regulator
28	Puran char	8 km E-N from Proposed Kamarjani regulator
29	Sidhai	25 km E from Proposed Kamarjani regulator

Chilmari Upazila, Kurigram

Water body type	Country side (Name/No.)	River side (Name/No.)	Specification
River	Sorai river	Sorai river	Brahmaputra to Shreepur
Beel/ Wetlands	Chang mari beel		713, Seasonal, water depth(R= 9 feet)
	Nakhali beel		713 ,Seasonal, water depth(R= 7 feet)
	Baharer beel		3 km N from Horichiri ghat (12 vent) regulator, 80.16ha, Perennial , Average water depth = 10 feet,
	Hasar dala beel		5 km N from Horichiri ghat (12 vent) regulator, Seasonal , Average water depth = 7 feet
	Mohisalar beel		N to Horichiri ghat (12 vent) regulator,, 13.36ha, Seasonal , Average water depth =

Water body type	**Country side (Name/No.)**	**River side (Name/No.)**	**Specification**
			8 feet
	Magurar beel		1 km N from kachkol (10 vent) regulator,160.32 ha, Seasonal Average water depth = 7 feet
	Shol dukri		2 km W from Kachkole regulator,120.24 ha
	Kodal daho beel		2.5 km N from Kachkole regulator
	Kalir pati		4 km W from Kachkole regulator
	Rajar ghat		4 km W from Kachkole regulator
	Ranigonj (Domer hat)		6km W from Kachkole regulator
	Khaye ghat		7 km W from Kachkole regulator
	Hagritola beel		80.16 ha
	Koyar beel		601.21 ha
Khal/Canal	Gidari canal		20 km long (28 ha)
	Antarpur canal		8 km long (12 ha)
Kole (Lagoon)		Agabor kole	E to Horichori ghat regulator, 2.67 ha, Perennial, Average water depth= 12 feet
		Horipur-1	2 km S to Horichori ghat regulator, Seasonal, Average water depth= 8 feet
		Horipur-2	3 km W to Horichori ghat regulator, Perennial, Average water depth= 10 feet
		Hasher beel kole	4.01 ha, Seasonal, water depth = 15 feet
		Bahattor kole	5 km E from kachkol (10 vent) regulator, 20.04 ha, Perennial, Average water depth = 30 feet
		Haser vita kole	3 km E from kachkol (10 vent) regulator, Perennial, 3.21 ha, average water depth = 18 feet
		Kachkole	0.5 km s from simultola/Magurar regulator, Perennial, average water depth=15 feet
		Kolapani	1.5 km E from Simultola/Magurar regulator, Perennial, 1.34 ha, average water depth= 9 feet

Water body type	Country side (Name/No.)	River side (Name/No.)	Specification
		Badhdhara	5 km E from Simultola/Magurar regulator , Perennial, 4.01 ha, Average water depth= 15 feet
		Uttarowari	5 km E-N from Simultola/Magurar regulator , Perennial
		Bongram	100.20 ha, perennial, Average water depth=30 ha

	Name of Char	Location / Feature
1	Gorghoti char	2 km E from Shimultola regulator
2	Chutarmari	20 km S from Shimultola regulator
3	Bagdhara badh	8 km S from Shimultola regulator
4	Nauer char	8 km S from Shimultola regulator
5	Boro vitar char	7 km W-S from 728
6	Bongram char	8 km E-N from 728
7	Damar char	1 km S-W from Horichorighat regulator
8	Char horipur	3 km S-W from Horichorighat regulator
9	Nil char	8 km S-W from Horichorighat regulator

Ulipur, Kurigram

Water body type	Country side (Name/No.)	River side (Name/No.)	Specification
River		Brahmaputra	
		Sorai	
Beel/ Wetlands	Anantapur beel		7 km W from proposed Anantapur regulator, perennial
	Paglir kuri		4 km W-S from proposed Anantapur regulator, perennial
	Nayantapur		8 km W-N from proposed Anantapur regulator, perennial
	Chirokhaoya dola		4 km S from proposed Anantapur regulator, perennial
	Malchar par		7 km S from proposed Anantapur regulator, perennial

Water body type	Country side (Name/No.)	River side (Name/No.)	Specification
	Kosulla		Adjacent to regulator, 1.5 km long, 500 m wide, Seasonal (3 month), water depth=9.5 feet
	Singramari		1 km N-W from regulator, seasonal (4 month), water depth=10.5 feet
	Kossa		3 km N-W from regulator, seasonal (5 months),15 feet
	Darki mari beel		1.5 km N from regulator, 4 km long, 3 km wide, perennial, water depth=14 feet
	Chokchoka beel		5 km N from regulator, 5 km long, 4 km wide, perennial
Kole (Lagoon)		Jolanger kuthi	2 km E from ...,48.09 ha,
		Anatapur kole	100 m E from Anantapur regulator , 320.65 ha, Perennial, Average water depth=30 feet
		Kolakata	4 km E-N from Anantapur regulator , 480.97 ha, Perennial, Average water depth=30 feet
		Gujimari	2 km E from Anantapur regulator , 40.08 ha, Perennial, Average water depth=30 feet
Pond	38 nos.	13 nos.	2.68 ha

	Name of Char	Location / Feature
1	Anantapur char	100 m E from Anantapur regulator
2	Gujimari	1 km E from Anantapur regulator
3	Uttar gujimari	2 km N from Anantapur regulator
4	Dakkhin gujimari	km S from Anantapur regulator
5	Sukherbati	25 km S from Anantapur regulator
6	Char Bagua	20 km S from Anantapur regulator
7	Parar char	7 km east from Balaijan regulator
8	Kaziar char	8 km E from Anantapur regulator
9	Durga pur	14 km E from Anantapur regulator

Sadar, Kurigram

Water body type	Country side (Name/No.)	River side (Name/No.)	Specification
River		Brahmaputra	
		Dhudkumar	
Beel/ Wetlands	Ponchasar beel		0.75 km W from Aragikodomtola regulator ,2.40 ha, Perennial, water depth=10 feet, fish culture practiced
	Jobber munsher beel		1 km W from Aragiodomtola regulator, Perennial, water depth=10.5 feet
	Amluddi hazir beel		2 km W from Aragikodom regulator, water depth=12 feet
	Kazol daho		2 km W from 743 regulator
	Dubba churi		2.5 km N-W from 743 regulator
	Gagla beel		1 km W from Existing Tangormarir patar regulator,40.08 ha, perennial, average water depth=9 feet
	Sarisui beel		1.5 km N from Existing Tangormarir patar regulator,60.12 ha, perennial, average water depth=16 feet
	Dolarpar beel		1.5 km N-W from Existing Tangormarir patar regulator,80.16 ha, seasonal, average water depth=8 feet
	Sonalir khuthi beel		1.5 km W from Existing Tangormarir patar regulator,10.69 ha, Seasonal, average water depth=10 feet
	Hodir beel		3 km W-N from Existing Tangormarir patar regulator,20.04 ha,Perennial, average water depth=15 feet
	Koi ghuri		4.5 km N-W from Tangormarir patar regulator
	Duba churi		7 km S-W from Tangormarir patar regulator, 8.02 ha, water depth=5 feet
	kazol daho		9 km S-W from Tangormarir patar regulator, 13.36 ha, seasonal, water depth= 6 feet
	Pachgaciar chora		5 km W from Tangormarir patar regulator,80.16ha, perennial, water

Water body type	**Country side (Name/No.)**	**River side (Name/No.)**	**Specification**
			depth=20 feet
	Misti parar beel		1 km N-W from Tangormarir patar regulator,2 ha, perennial, water depth = 10 feet
Khal/Canal	Girai nodi/Khal		1 km west from khama Rasulpur,4.8 ha,4 km long
Kole (Lagoon)		Gobindopur	2 km E from Aragikodomtola regulator,80.16 ha, perennial, Water depth=15 feet
		Perbotti pur	3 km E from Aragikodomtola regulator,140.28 ha, perennial, Water depth=18 feet
		Vushakuthi	2 ha, perennial, Water depth=10 feet
		Sarkerpara vanga	0.5 km N from Tangormarir patar regulator,40.08 ha, perennial, Water depth=14 feet
		Prothom alo kole	2 km E-S from Tangormarir patar regulator, 12.04 ha
		Bangar dola kole	1.5 km E-N from Tangormarir patar regulator, 10.69 ha
		Kath giri kole	2.5 km N from Tangormarir patar regulator , 10.69 ha
		Pocha kata kole	5 km N from Tangormarir patar regulator , 9.35 ha
		Shantiar kole	2.5 km E from Tangormarir patar regulator , 13.36 ha
		Rolakata kole	4 km E-N from Tangormarir patar regulator , 9.35 ha
		Narayanpur kole	8 km E from Tangormarir patar regulator , 133.60 ha, perennial
		Astoasi kole	7 km E-N from Tangormarir patar regulator , 13.36 ha, perennial
		Jhumkar kole	6 km E from Tangormarir patar regulator ,12.02 ha
Pond	47 nos.	3 nos.	2.43 ha

	Name of Char	**Location / Feature**
1	Prothom alo	2 km E-S from Tangormarir patar regulator, 12.04 ha
2	Bangar dola	1.5 km E-N from Tangormarir patar regulator, 10.69 ha
3	Kath giri	2.5 km N from Tangormarir patar regulator , 10.69 ha
4	Pocha kata	5 km N from Tangormarir patar regulator , 9.35 ha
5	Shantiar	2.5 km E from Tangormarir patar regulator , 13.36 ha
6	Rolakata	4 km E-N from Tangormarir patar regulator , 9.35 ha
7	Narayanpur	8 km E from Tangormarir patar regulator , 133.60 ha, perennial
8	Astoasi	7 km E-N from Tangormarir patar regulator , 13.36 ha, perennial
9	Jhumkar	6 km E from Tangormarir patar regulator ,12.02 ha
10	Raulia char	Adjacent and E to Tangormarir patar regulator
11	Char Rasulpur	1.5 km E from Tangormarir patar regulator
12	Majher char	3 km E from Tangormarir patar regulator
13	Catlar char	1.5 km E-N from Tangormarir patar regulator
14	Fakirere char	2 km E-N from Tangormarir patar regulator
15	Kathgirir char	2.5 km N from Tangormarir patar regulator
16	Motherganj char	4 km N from Tangormarir patar regulator
17	Barobisha	3 km E-N from Tangormarir patar regulator
18	Khaser char	3.5 kmE-S from Tangormarir patar regulator
19.	Balduba	3 km E-S from Tangormarir patar regulator
20	Porar char	4.5 km E-S from Tangormarir patar regulator
21	Mirgamari char	6 km W from Tangormarir patar regulator

Annex D. ToR for Integrated Pest Management Plan

Background

The lower Brahmaputra, named Jamuna in Bangladesh is one of largest rivers in the World. Following its avulsion (change of course) into the present day Jamuna River during the late 17th century, it has been constantly migrating westward and additionally widened by 50% from 8 to 12 km since the 1970s. These morphological changes have led to the loss of about 88,000 ha of floodplain from 1973 to 2014, affecting the ecology and livelihood of the floodplain dwellers by displacing hundreds and thousands of people. In addition to unpredictable riverbank erosion, floods are the other major natural hazard. While typically 20% of the country is flooded during the annual monsoon, severe floods have inundated up to two thirds of the country.

The Government of Bangladesh through Bangladesh Water Development Board (BWDB) is preparing the River Management Improvement Program (RMIP) to reconstruct the existing degraded embankment and secure it against riverbank erosion along 137 km length from the Teesta River to the Jamuna Bridge. The program will be designed and implemented in three phases. A 50 km long priority reach between Simla and Hasnapara will be protected in Phase 1. Phase 2 covers the remaining 87 km while Phase 3 focuses on and the construction of a highway on the countryside of the new flood embankment. The entire program will be implemented over a period of 10 years.

Objectives

An EIA has been carried out for the proposed RMIP. The EIA has identified full range of potential impacts of the project on environment and people and proposed appropriate mitigation measures to address those impacts. One of the potential impacts of the project is increase in the usage of agro-chemicals.

The interventions proposed under RMIP may induce some changes in the agricultural activities in the program influence area. These include changes in cropping pattern if not the further crop intensification, because of increased water availability and enhanced protection against floods and riverbank erosion. These changes in turn may cause to increase the usage of agro-chemicals such as fertilizers and pesticides. However these agro-chemicals if not used and handles judiciously and carefully can cause soil and water contamination and ultimately harmful effects on people, their livestock, and also flora and fauna. To address such as eventuality, an integrated pest management initiative will be prepared and implemented. For this purpose an integrated pest management plan (IPMP) needs to be prepared and implemented

The key objectives of the IPMP will include:

To increase the productivity of agricultural crops through IPM[3] and Integrated Plant and Soil Nutrient Management (IPSNM) practices, that includes the rational use of chemical pesticides and nutrients;

[3] As defined by World Bank OP 4.09 (Pest Management, footnote 3, "IPM refers to a mix of farmer-driven, ecologically based pest control practices that seeks to reduce reliance on synthetic chemical pesticides. It involves (a) managing pests (keeping them below economically damaging levels) rather than seeking to eradicate them; (b) relying, to the extent possible, on nonchemical measures to keep pest populations low; and (c) selecting and applying pesticides, when they have to be used, in a way that minimizes adverse effects on beneficial organisms, humans, and the environment."

to raise awareness of all stakeholders about the IPM approach to crop management, and train extension agents and farmers to become practitioners of IPM; and

to determine the level of pesticide residue on agricultural crops in normally-treated and IPM-treated areas and disseminate information to stakeholders on the usefulness of undertaking IPM practices.

Scope of the Assignment

. In particular, the consultant will build on existing information in these studies in order to develop a solid understanding of the prevailing cropping patterns, cropping intensity, cropping methodology, and usage of agro-chemicals. The consultant will also determine any adverse impacts associated with the usage of agro-chemicals and will carry out soil analysis for this purpose. The consultant will undertake extensive consultations with the farmers, any NGOs working on agricultural issues, other development partners as relevant, agro-chemical suppliers, general community in the area, healthcare providers, and related government officials. The consultant will also study and evaluate the nature and effectiveness of completed as well as on-going IPM initiatives/projects in the area (general information will be collected for the entire country based upon secondary resources). On the basis of this data collection, the consultant will prepare draft IPMP, in accordance with World Bank Operational Policy 4.09 on Pest Management. The consultant will share the draft IPMP with the key stakeholders mentioned earlier and in light of the comments and suggestions received, will finalize the Plan. The key steps of the assignments are listed below.

Review of the project and RMIP full program details

Review existing pest management practices and context in the project area, including by:

- Review existing RMIP reports and documents (including EIA, preliminary Baseline report for full program area, RAP, SDP, and others) Visit the areas in and around the project influence area, as well as nearby areas where IPM projects are underway.
- Undertake secondary literature review as well as field investigations and consultations / interviews with stakeholders, to develop a comprehensive understanding of existing pest management practices; current practices in storage and use of pesticides; policy and institutional/legal framework for regulating, procuring, and managing pesticides; and the extent to which all of these are consistent with an IPM approach, in the region particularly, as well as throughout the country. The key stakeholders include but not limited to local farmers, community, agro-chemicals suppliers, healthcare service providers, local government officials of related department (eg, agriculture, health, and environment), experts, other development partners working on related issues and relevant NGOs. Find out cultivation practices, cropping pattern, cropping intensity, usage of agro-chemicals, practice of handling, storing, and transporting these chemicals, awareness level of farmers and communities regarding the harmful effects of these chemicals, any IPM techniques being used, and effectiveness of such techniques.

Based on existing agricultural and pest management practices and context, and using information from project assessments including the EIA and economic feasibility analysis, project and analyze the potential pest management scenarios in the project area post-RMIP. Discuss the potential effects of such practices on water quality, human health, flora and fauna, etc. in the absence of IPM interventions.

Identify and review the plans and reports of recently completed as well as on-going IPM projects or initiatives in the Country, and especially in the program area or adjacent areas, and discuss with stakeholders including project implementing entities and participants as to the effectiveness of these programs and how they can inform the development of the IPMP.

Preparing draft IPMP.

Disclose and carry out consultations with stakeholders on draft IPMP

Finalization of IPMP on the basis of the comments and suggestions received during consultations.

With the help of the above tasks, prepare IPMP. The Plan should include but not limited to the following key elements:

Awareness/ dissemination of information to farmers;

training of facilitators (ToF) and establishing of Farmer Field Schools (FFS);

implementing Integrated Plant and Soil Nutrient Management (IPSNM) techniques (including organic fertilizers, composting and worm culture);

monitoring pesticide residue on crops and in soil and water supplies;

education/awareness and potential activities related to ensuring proper storage, use, and disposal of pesticides and pesticide-application equipment; and

strengthening institutional capacity on IPSNM.

Output

The consultant will draft version of the IPMP to the BWDB by end of sixth month of their mobilization and final version by end of the eighth month of their mobilization. All the data and information collected during the consultations and field investigations will also be provided in an annex to the Plan.

Plan Outline

The outline of the IPMP is presented below.

Introduction

Current practices of pest and pesticide management in the project influence area

Policy, regulatory and institutional framework and capacity

Projected agricultural scenarios in program area post-RMIP, and implications for pest management practices, in the absence of IPMP interventions

Rationale of IPMP

Proposed IPM interventions for RMIP area

Implementation and monitoring arrangements and responsibilities, including budget requirements.

Implementation of the IPMP

The IPMP will be implemented from third year onwards of RMIP-I construction. The implantation activities will cover all the tasks proposed in IPMP. The implementation will continue up to one year after completion of RMIP.

Annex E. Tree Plantation Plan

Citation in the main text (Volume I): **Section 9.4.1.4.**

This plantation raising program provides the following details:

Species to be used for establishing the plantation.

Seedlings availability.

Spacing and planting technique.

Rotation to be used.

Cost estimates of establishing tree plantation per unit area.

Plantation management or maintenance.

Yield prediction.

Participant involvement mechanism.

The site at which this plantation will be raised is the country side slope of embankment cum road. The slope is 33%. The aspect will be mostly eastern. This plantation will be something like the "strip plantation" that is raised by the Forest Department. The plantation raising modality should preferably be a "Participatory Approach". The required details in this connection are being described below.

1. Species that may be used for establishing the plantation

It is better to decide about the species through discussions with the participants. But in this sort of discussions technical support will be essential from the authority. In this case, since the land in question is owned by the Bangladesh Water Development Board (BWDB), this agency will require to play the role of "authority". It is generally expected that the local people will prefer to plant 'Eucalyptus' species, since they have a bias towards this species. The local people for various reasons prefer this species over others. In this connection, it has to be borne in mind that the government has an embargo in planting eucalyptus species. BWDB being an autonomous semi government agency, it will be better to avoid planting eucalyptus. The species that are commonly used in case of trip plantations include:

	Local name	Biological name	Some special features in connection with its use in road side or strip plantations
	Akashmoni	*Acacia auricoliformis*	Fast growing medium quality timber but looks like teak.
	Chattian	*Alstonia scholaris*	Fast growing match-wood, nice & strong smelling flowers.
	Kodom	*Anthocephealous kadamba*	Good match wood, fast growing, good looking flowers,
	Hijol	*Barringtonia acutangula*	A fresh water wetland species, branches produce "Khata" for open water fishing.
	Tal	*Borasus flabellifer*	Fibrous rooted slow growing long living plant,

	Local name	Biological name	Some special features in connection with its use in road side or strip plantations
			can with stand strong wind thrusts, juice and fruits fetches high price.
	Toon	*Cedrela toona*	Good timber, light weight, used in making rickshaw body, boat, etc.
	Chikrassia	*Chickrassia tabularis*	Faster growing, good timber species
	Narikal	*Cocos nucifera*	Fibrous rooted medium growing plant, can withstand strong wind thrusts, fruits green or ripe fetches high price.
	Kala Jam	*Eugenia spp / Syzygium cumini*	Good construction timber, fruits are highly priced.
	Puti jam	*Eugenia spp.*	Good and durable construction wood yielding tree.
	Gamar	*Gmelina arborea*	Wood is "A grade" timber, fast growing, high priced.
	Ghora Neem	*Melia azadericta*	Fast growing but soft, snaps off during strong wind,
	Neem	*Melia indica*	Possess good medicinal values, durable wood, used in musical instrument making (especially *tobla*)
	Khajoor	*Phoenix sylvestris*	Fibrous rooted medium growing plant, can withstand strong wind thrusts, juice used to make “gur” & fetches high price, long living tree.
	Amloki	*Phyllaenthus embellica*	Timber value is poor but it is a medicinal plant, fruits fetches high price, attract birds.
	Koroj	*Pongamia pinnata*	Fast growing, grow in wet areas, seeds yield oil, medium quality wood.
	Payaara	*Psidium guajava*	Timber is not good but the fruits fetches high price.
	Rain tree	*Samanea saman*	Large crown, occupy lots of space, drips are harmful to road pavements.
	Barapatar mehagony	*Swietenia macrophyla*	Slightly faster growing, very often affected by stem borer, produces good timber,
	Chotopatar Mehagony	*Swietenia mehagoni*	Slow growing, affected by stem borer, very good timber species.
	Tetool	*Tamarindus indica*	High caloric wood, heavy, slow growing, high water shed values, and fruits are highly priced.
	Arjun	*Termienalia arjuna*	Medicinal plant, medium quality wood, bark fetches high price, fruits attract deer.
	Hartaki	*Terminalia chebula*	Medicinal plant, medium quality wood, fruits fetches high price & attract deer.
	Harbarooi		Medicinal plant, wood quality poor, fruit fetches

	Local name	Biological name	Some special features in connection with its use in road side or strip plantations
			high price.

It is better to keep the number of species under a manageable number. The number species to be used should not exceed 10. In view of the above discussions, the following species may be used but this must be shared with the local communities so that they are 'on board' and own the selection of species.

	Local name	Biological name	Remarks
	Akashmoni	*Acacia auricoliformis*	Maximum 20%, to be felled in 8th year
	Barapatar mehagony	*Swietenia macrophyla*	To be felled in 12th year
	Chikrassia	*Chickrassia tabularis*	To be felled in 10th year
	Gamar	*Gmelina arborea*	To be felled in 8th year
	Neem	*Melia indica / Azadirachta indica*	To be felled in 10th year
	Toon	*Cedrela toona*	To be felled in 12th year
	Khajoor	*Phoenix sylvestris*	Never to be felled (may be replaced by another fruit or fresh water wetland species, including *Syzygium cumini, Phyllaenthus embellica*, etc. at the death of the tree).
	Narikal	*Cocos nucifera*	
	Tal	*Borasus flabellifer*	
	Hijol	*Barringtonia acutangula*	
	Payaara	*Psidium guajava*	To be planted on the (1+6+2.95=) 9.95 Meter wide strip, between the road and the river, at 4 X 4 Meter spacing.

2. Seedlings availability

Since the planting program will not continue for years, the seedlings may be procured from sources such as Forest Department Nurseries or Private Nurseries. It is expected that the quality of the seedlings from FD nurseries will be better. One will have to decide about the year in which these will be planted on the given site. For better success, at least 3.5 feet tall seedlings in 10" x 6" poly-bags, of about 1.5 years of age, are to be used. Under such situation orders may be placed officially (formally) with the nearby forest nursery at least 3 years ahead of the stipulated planting year, stating the number required species wise, with a tentative date of delivery solicited. The seedlings should never be transported from the nurseries to planting site, using tractor tailor, Niassimon, etc. The best mode of transporting seedlings is either by 'head load' or 'boat'. However the seedlings may be transported by slow moving smooth running pick-ups (to avoid jerks).

3. Spacing and planting technique

After the selection of planting site the following tasks need to be undertaken sequentially:

The planting site is to be surveyed, maps prepared, plantation journal initiated and history of the planting site is recorded in the plantation journal. The names of the participants are to be recorded in the plantation journal for future reference.

The planting site has to be cleared of unwanted bushes if any. The small vegetation such as grasses etc. should not be disturbed to avoid soil erosion of the embankment slopes. The bushes while being cleared should not be uprooted rather should be cut at ground level. The site should be cleared and made ready for planting without disturbing the soil and grass like vegetation on the ground.

Stacking at the desired spacing of 2m x 2m should be done.

All of these activities should be accomplished before April 1 i.e. before the first monsoon shower (by second week of April).

At every planting point (at the stacking point) pits are to be dug. The size of the pit should be 1ft by 1ft and the depth has to be 1.5 ft. The top half of the soil has to be put on the upper side (uphill) of the pit while the bottom half of the soil be put on one side (say on North) of the pit, but not on the down slope (downhill) side. This pit making work should be completed by the first week of April. *The pits after being dug should be left open for about 15 days.*

Planting activities are to be started after 15 days of pit-making. Compost @ 3 Kg is to be put in each pit. Before planting the seedlings, the top soil from the up-slope side of the pit is to be placed at the bottom and the bottom soil from the side of the pit is be placed on the top, so that the soil get turned over. Compost and all the soil in the pit are to be mixed properly, pulverized, all roots and foreign materials removed, so that 'seedling planting bed' looks nice, clean and ready. One seedling has to be planted in each 'seedling planting bed' so prepared. After 15 days of planting the seedling 70 to 75 grams of NPK (1:2:2) fertilizer should be applied in each pit. The fertilizers once mixed, must be used within 6 hours of mixing. Another dose of urea @ 25 gm per pit is to be applied after 2 months of planting.

Each and every operation must be recorded in the plantation journal, stating the duration of the operation with starting and ending dates, labor used, the then weather conditions, etc. for future use.

A word of caution: While planting the seedlings, the first thing to be identified is the locations of underground drainage pipes and planting of seedlings right on the top of that has to be meticulously avoided.

A schematic diagram of planting layout is as under (next page):

One hectare = 10,000 Sq M Spacing 2 M x 2 M

3 Fruit spp. in 4 positions. The sequence will be "Narikal", "Khajoor", "Tal", "Khajoor" "Narikal", "Khajoor", "Tal", "Khajoor" & so on at 4M x 4M = 625 plants per Ha

6 Tree spp. = (2500 – 625) = 1875 plants per Hectare

1875/3 = 625 plants (of each tree species) to be felled at 8th, 10th and 12th year

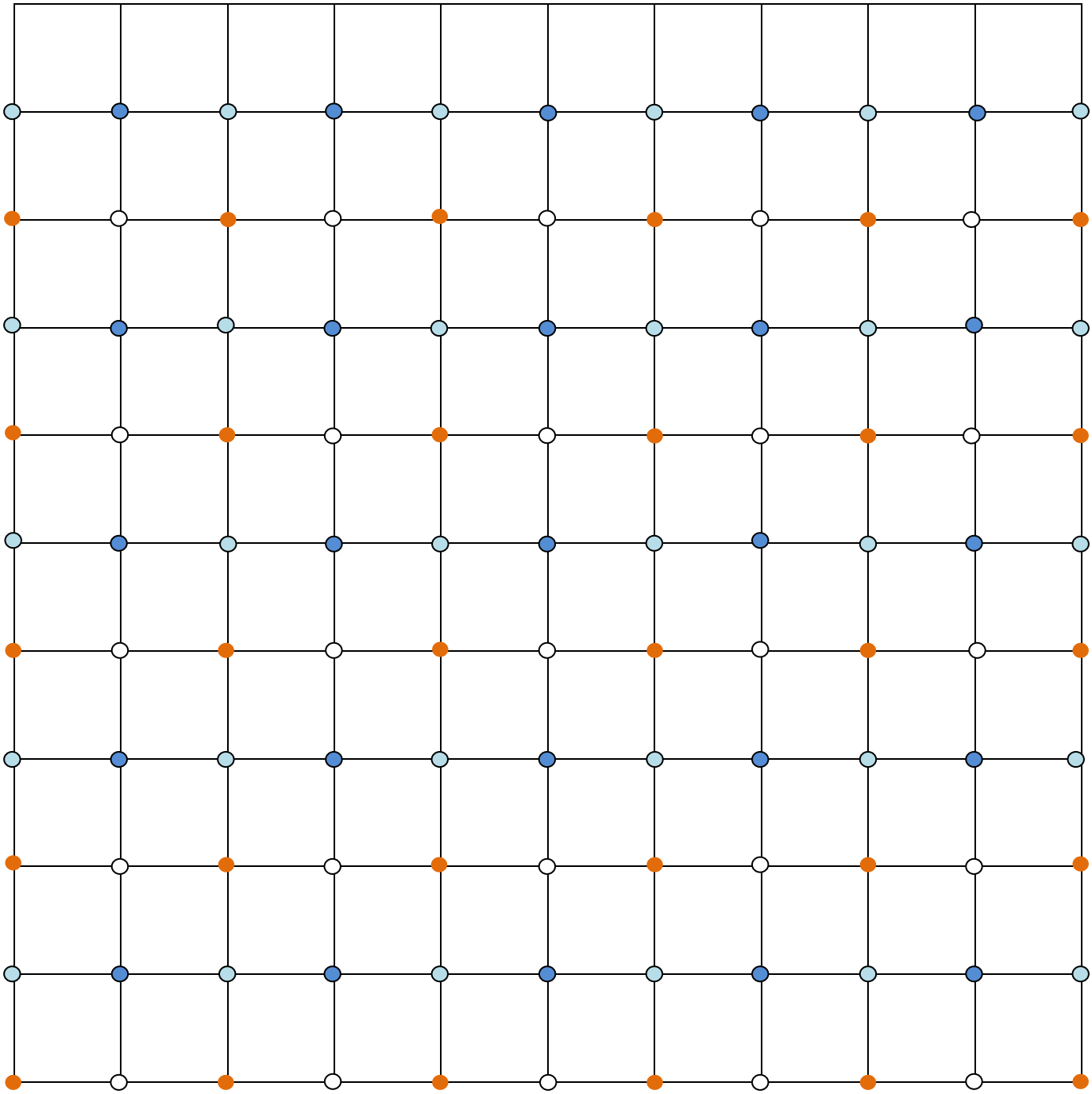
Design for 20M x 20M (= 0.04 ha) area

Legend:

●	Fruit tree ("Narikal", "Khajoor", "Tal", "Khajoor")	4M x 4M = 625 plants per Ha

○	Tree spp to be felled at 8th year	625 tree species such as Akashmoni & Gamar to be felled at 8th year
○	Tree spp to be felled at 10th year	625 tree species such as Chikrassi & Toon to be felled at 10th year
○	Tree spp to be felled at 12th year	625 tree species such as Neem & Mehagony to be felled at 12th year

20M x 20M Plot Showing 2M x 2M Grid



4. Rotation to be used

In case of these plantations, the planting will be initiated with about 10 species. Two of these species (Akashmoni & Gamar) the fastest growing ones will be felled (cut and extracted) in 8th year. Another two species namely Toon & Chikrassia, medium growing species will be felled in 10th year. The other two tree species namely Barapatar mehagony and Neem will be felled in 12th year. The other 3 fruit species (Narikal, Khajoor, Tal and Khajoor, at 4 positions) will continue to grow as long as they live at 4M x 4M spacing and yield fruits and juices for the participants. Thus there will be 4 types of rotations.

8 year rotation for tree species, Akashmoni & Gamar.

10 year rotation for species, Toon & Chikrassia.

12 year rotation for species, Barapatar mehagony and Neem.

Life-long for fruit species, Narikal, Khajoor, Tal and Khajoor.

After 12 years, these plantations will virtually become orchards.

5. Cost estimates of establishing tree plantation per unit area

The cost of establishing one hectare of plantation including its maintenance to its final stage is calculated here under.

Plantation in one hectare - Planting of 2500 seedlings

	Item of works	Number of Labor required	Cost of Labor per day in BDT	Cost of Labor in BDT	Material Required& Rate in BDT	Cost of Material in BDT
	Cutting of bushes to be done by participants but they will get the wages.	3	450	1350		
	Layout by participants. They will get the wages.	2	450	900	Jute rope, no nylon rope. LS	100
	Inter cropping. Participants to do this on wages.	2	450	900	Arhar seeds 6 Kg @ of Taka 200/Kg	1200
	Procure stacks carry to planting site fix them at 2M x 2M spacing, including fastening of sapling with the stack. Participants to be involved on wages.	3	450	1350	Price of 2750 (10% more to cover wastages) Stack @ of Taka 4/stack & Shootly etc. complete.	11000
	Pit making, keeping the pits open for about 2 weeks. 2500 pits are required per hectare. Each MD will make 75 pits. This has to be done by the participants on wages.	34	450	15300		
	Price of 2875 (15% more to cover wastages) seedlings in 10"x6" poly bags, including				Price of each seedling @ of Taka 12 each	34500

	Item of works	Number of Labor required	Cost of Labor per day in BDT	Cost of Labor in BDT	Material Required& Rate in BDT	Cost of Material in BDT
	transportation.					
	Procure compost or decomposed cow-dung, carry these to planting site. Put back the soil in the pit, apply 3 Kg of compost / decomposed cow dung in each pit, pulverize the soil, mix it with compost / cow dung, remove all debris, root pieces (especially the roots of sun grasses), plant the seedlings by taking off the poly-bags carefully. Participants need to do this but on payment of wages.	20	450	9000	Price of 8250 Kg (10% more to cover wastages) of compost of decomposed cow dung @ Taka 4/Kg.	33000
	Weeding and cleaning immediately after planting. To be done by participants but on wages.	5				
	Application of fertilizers (N:P:K::1:2:2 ; 75 gm/pit) after 15 days of planting. Participants will do this but on payments.	10	450	4500	Price of 207 Kg (2500*0.075*1.1; 10% more to cover wastages) of fertilizer @ of Taka 40/Kg	8280
	Application of nitrogenous fertilizers (Urea 25 gm/pit) after two months of planting to be done by the participants but on wages. Fertilizer required (2500*0.025*1.1 =) 68.75 Kg including 10% wastages.	10	450	4500	Price of 68.75 Kg of fertilizer (Urea) @ Taka 40/Kg.	2750
	First year maintenance, 3-4 weeding and mulching	50	450	22500		
	Second year maintenance, 2-3 weeding, cleaning & vacancy filling. Price of 2500*0.1=250 @ BDT 12 each = 3000	40	450	18000	Price of 250 seedlings @ BDT 12 each	3000
	Third year maintenance, 1 - 2 weeding and pruning of tree spp. Only. The pruned branches will go to the participants	30	450	13500		
	Fourth year maintenance, climber cutting & cleaning.	20	450	9000		
	Fifth year maintenance, pruning of tree spp only not fruit tree. The pruned branches will go to the participants.	10	450	4500		

	Item of works	Number of Labor required	Cost of Labor per day in BDT	Cost of Labor in BDT	Material Required& Rate in BDT	Cost of Material in BDT
	Fixing of a plantation Board (may be RCC board).	2	450	900	LS per hectare	1000
	Miscellaneous					
	TOTAL	241		**106200**		**94830**
	Total cost per hectare including maintenance in BDT					**201030**

The total cost for establishing one hectare of plantation till its final stage is BDT 201,030,00. At the final stage i.e. after 12 years of raising the plantation it will become an orchard and the participants will keep on getting the benefits continuously.

Cost for raising Hijol and Payaara plantation:

Cost for raising Hijol (*Barringtonia acutangula)* plantation per Km	**20,000 BDT/Km**
Cost for raising Payaara (*Psidium guajava)* plantation per Hectare.	**62,500 BDT/Ha**

6. Plantation management or maintenance (maintenance costs have been included in the plantation establishment costs)

Ideally the following maintenance program should be followed.

Intercropping by agricultural crop, especially of leguminous species may be done during first 1 & half year.

First year: three to four weeding and cleaning with vacancy filling & mulching.

Second year: two to three weeding and cleaning with vacancy filling.

Third year: One to two weeding. Pruning (first) lower 1/3rd of the bole of all TREE spp. Fruit species should not be pruned.

Fourth year: Climber cutting and cleaning, etc.

Fifth year: Pruning (second) lower 2/3rd of the bole of all TREE spp. Fruit species should not be pruned.

Hijol (B*arringtonia acutangula*) Plantation

Besides the establishment of the above stated plantation on the slope of the embankment, at the toe, along the village side a 2.5 Meter strip of land, that may remain inundated during monsoon, for about 3 to 6 months, shall have to be planted. This strip has to be planted with a fresh water wet land species. Thus a fresh water wet land species, which is likely to be attractive to the participants, has been identified. This could be Hijol (Barringtonia acutangula) for this given site. One row of Hijol (Barringtonia acutangula)

will be planted at a spacing of 4 meter, in this 2.5 meter wide strip. In every km, 250 such species will be planted. The cost of establishing such Hijol plantation will be about Taka 80 per plant. Thus the cost per km for raising Hijol plantation will be about Taka 20,000.00.

Payaara (*Psidium guajava*) Plantation

This Payaara (Psidium guajava) plantation will be established on the 9.95 Meter wide strip between the road and the river. The Payaara (Psidium guajava) plantation will be raised at 4 Meter by 4 Meter spacing. In every hectare 625 seedlings will be planted. The cost per hectare, for raising Payaara will be about Taka 62,500.00.

7. Yield prediction.

This prediction of yields is for a hectare. A total of 2500 seedlings will be planted over an area of one hectare. The following shows the assumptions used and yields predicted.

Yield Predictions

Plantation Types	Assumptions	No of plants survived per Ha	Fuel-wood production in 3rd yr per Ha in Kg	Fuel-wood production in 5th yr per Ha in Kg	Final yield in 8th, 10th & 12th year, in Cu. M. per Ha	Total final yield in Taka at 8th, 10th and 12 year per Ha	Fruit trees. Annual yield in Taka from 7th, 8th and 12th year per Ha.	Remarks
Acacia auricoliformis (Akashmoni) final felling at 8th yr.	Planted **312 seedlings** in one Ha	250	125	250	13.75	110375		
	Survival rate **80%**							
	1st pruning in 3rd year, each plant will yield **0.5 Kg** of fuel-wood. Price of each KG of fuel-wood will be **Taka 1**							
	2nd pruning in 5th year. Each plant will yield **1 Kg** of fuel-wood. Price of each KG of fuel-wood will be **Taka 1**							
	Final felling in 8th year. Each plant will yield **0.055 CuM** of wood. Price of each Cu. M. wood on an average will be about **Taka 8000**							
Gmelina arborea (Gamar) final felling at 8th year.	Planted **313 seedlings** in one Ha	219	109.5	219	10.95	82453.5		
	Survival rate **70%**							
	1st pruning in 3rd year, each plant will yield **0.5 Kg** of fuel-wood. Price of each Kg of fuel-wood will be **Taka 1**							
	2nd pruning in 5th year. Each plant will yield **1 Kg** of fuel-wood. Price of							

Plantation Types	Assumptions	No of plants survived per Ha	Fuel-wood production in 3rd yr per Ha in Kg	Fuel-wood production in 5th yr per Ha in Kg	Final yield in 8th, 10th & 12th year, in Cu. M. per Ha	Total final yield in Taka at 8th, 10th and 12 year per Ha	Fruit trees. Annual yield in Taka from 7th, 8th and 12th year per Ha.	Remarks
	each Kg of fuelwood will be **Taka 1**							
	Final felling in 8th year. Each plant will yield **0.05 CuM** of wood. Price of each Cu. M. of wood will be about **Taka 7500**							
Chickrassia tabularis (Chikrassia) final felling at 10th year	Planted **312 seedlings** in one Ha	218	65.4	152.6	13.08	65618		
	Survival rate **70%**							
	1st pruning in 3rd year, each plant will yield **0.3 Kg** of fuel-wood. Price of each Kg of fuel-wood will be **Taka 1**							
	2nd pruning in 5th year. Each plant will yield **0.7 Kg** of fuel-wood. Price of each KG of fuel-wood will be **Taka 1**							
	Final felling in **10th year**. Each plant will yield **0.06 CuM** of wood. Each Cu. M. of wood will fetch **Taka 5000**.							
Cedrela toona (Toon) final felling at 10th year	Planted **313 seedlings** in one Ha	219	65.7	153.3	13.14	92199		
	Survival rate **70%**							
	1st pruning in 3rd year, each plant will							

Plantation Types	Assumptions	No of plants survived per Ha	Fuel-wood production in 3rd yr per Ha in Kg	Fuel-wood production in 5th yr per Ha in Kg	Final yield in 8th, 10th & 12th year, in Cu. M. per Ha	Total final yield in Taka at 8th, 10th and 12 year per Ha	Fruit trees. Annual yield in Taka from 7th, 8th and 12th year per Ha.	Remarks
	yield **0.3 Kg** of fuel-wood. Price of each Kg of fuel-wood will be **Taka 1**.							
	2nd pruning in 5th year. Each plant will yield **0.7 Kg** of fuel-wood. Price of each Kg of fuel-wood will be **Taka 1**.							
	Final felling in 10th year. Each plant will yield **0.06 CuM** of wood. Price of each Cu. M. of wood will be **Taka 7000**.							
Swietenia macrophyla (Mehagony) final felling at 12th year	Planted **312 seedlings** in one Ha	188	56.4	75.2	13.16	105411.6		
	Survival rate **60%**							
	1st pruning in 3rd year, each plant will yield **0.3 Kg** of fuel-wood. Price of each Kg of fuel-wood will be **Taka 1**.							
	2nd pruning in 5th year. Each plant will yield **0.4 Kg** of fuel-wood. Price of each Kg of fuel-wood will be **Taka 1**.							
	Final felling in 10th year. Each plant will yield **0.07 CuM** of wood. Price of each Cu. M. wood will be **Taka 8000**.							
Melia indica (Neem)	Planted **313 seedlings** in one Ha	188	75.2	94	9.4	65969.2		

Plantation Types	Assumptions	No of plants survived per Ha	Fuel-wood production in 3rd yr per Ha in Kg	Fuel-wood production in 5th yr per Ha in Kg	Final yield in 8th, 10th & 12th year, in Cu. M. per Ha	Total final yield in Taka at 8th, 10th and 12 year per Ha	Fruit trees. Annual yield in Taka from 7th, 8th and 12th year per Ha.	Remarks
final felling at 12th year.								
	Survival rate **60%**							
	1st pruning in 3rd year, each plant will yield **0.4 Kg** of fuel-wood. Price of each Kg of fuel-wood will be **Taka 1**.							
	2nd pruning in 5th year. Each plant will yield **0.5 Kg** of fuel-wood. Price of each Kg of fuel-wood will be **Taka 1**.							
	Final felling in 10th year. Each plant will yield **0.05 CuM** of wood. Price of each Cu. M. will be about **Taka 7000**.							
Phoenix sylvestris (Khajoor) Juice production starts in 7th year	Planted 312 **seedlings** in one Ha	218					741200	From **7th year** annual yield in Taka
	Survival rate **70%**							
	Juice extraction will start from **7th yea**r. Yearly yield **200 Kg per plant**							
	200 Kg of juice will produce **20 Kg of gur**. Excluding gur production costs, each Kg of gur will fetch **Taka 170**.							

Plantation Types	Assumptions	No of plants survived per Ha	Fuel-wood production in 3rd yr per Ha in Kg	Fuel-wood production in 5th yr per Ha in Kg	Final yield in 8th, 10th & 12th year, in Cu. M. per Ha	Total final yield in Taka at 8th, 10th and 12 year per Ha	Fruit trees. Annual yield in Taka from 7th, 8th and 12th year per Ha.	Remarks
Cocos nucifera (Narikal) fruit production starts in 7th year	Planted **157 seedlings** in one Ha	126					252000	From **7th year** annual yield in Taka
	From **7th yr** annually **200 fruits** will be available. Price of each fruit will be about **Taka 10**.							
Borasus flabellifer (Tal) Juice or fruit production starts in 12th year	Planted 156 seedlings in one Ha	109					218000	From 12th year annual yield in Taka
	Survival rate **70%**							
	From **12th yr** annually **100 Kg of juice** will be available, which will produce **10 Kg of gur**. Price of each Kg of gur excluding processing cost will be about **Taka 200**.							
Psidium guajava Payaara Plantation	Planted **625 seedlings per hectare**	438					525,600	From 4**th year** annual yield in Taka per Ha
	Survival rate **70%**							
	From **4th year** each tree will produce about **40 Kg** of fruits which will fetch a price of **Taka 30 per Kg**.							

Plantation Types	Assumptions	No of plants survived per Ha	Fuel-wood production in 3rd yr per Ha in Kg	Fuel-wood production in 5th yr per Ha in Kg	Final yield in 8th, 10th & 12th year, in Cu. M. per Ha	Total final yield in Taka at 8th, 10th and 12 year per Ha	Fruit trees. Annual yield in Taka from 7th, 8th and 12th year per Ha.	Remarks
Barringtonia acutangula Hijol Plantation	Planted **250 seedlings per Km**	175					17500	From 7**th year** annual yield in Taka per Km
	Survival rate **70%**							
	From 7**th year** each tree will produce about 2 Khata, each will fetch a price of **Taka 50**							

Yield Predictions	
Descriptions	**BDT**
Total yield per Ha in Taka from the TREE CROPS during first 12 years	**522,026**
Annual yield/Ha from 7th year in Taka from Khajoor & Narikal	**993,200**
Annual yield/Ha from 12th year in Taka from Tal	**218,000**
Annual yield/Ha from 4th year in Taka from Payaara	**525,600**
Annual yield/Km from 7th year in Taka from Hijol	**17,500**

8. Participant involvement mechanism.

In case of Bangladesh, sustainability of project benefits (outputs), after the completion of the project very often get jeopardized, since none rightly shoulders the responsibility to take care of the plantations established under a project. The plantations, being a biological entity, will need to be taken care of on a routine basis for years after years. It is thus essential to associate some personnel with these plantations, so that they have some sort of ownerships and they take care of these plantations for years to come. Under such situation the best possible methods known till date, is to involve the local people as "participants" under a 'social forestry' context. The involvement of participants directly revolves around the tangible benefits that they can get from these plantations.

The yields from these plantations will be mostly as under.

1. Pruned branches in 3rd and 5th year of raising the plantation from forest tree species such as

Acacia auricoliformis (Akashmoni)

Gmelina arborea (Gamar)

Chickrassia tabularis (Chikrassia)

Cedrela toona (Toon)

Swietenia macrophyla (Mahogany)

Melia indica / Azadirachta indica (Neem)

2. Final yield of wood (timber, poles and some branches) forest tree species such as

Acacia auricoliformis (Akashmoni) (after 8 years of planting)

Gmelina arborea (Gamar) (after 8 years of planting)

Chickrassia tabularis (Chikrassia) (after 10 years of planting)

Cedrela toona (Toon) (after 10 years of planting)

Swietenia macrophyla (Mahogany) (after 12 years of planting)

Melia indica / Azadirachta indica (Neem) (after 12 years of planting)

3. Fruits from *Psidium guajava* (payaara)

4. Khatas from *Barringtonia acutangula* (Hijol)

5. Juices and fruits from:

Phoenix sylvestris (Khajoor)

Cocos nucifera (Narikal)

Borasus flabellifer (Tal)

From 12th year of plantation establishment, these plantations will get transformed to orchards. The juice (from Khajur and Tal) and fruits (from Narikal and Tatool) will be continuously produced.

The participant selection process should be such so that sincere and effective personnel are identified as "participants". In this connection the following guidelines may be used for the selection of participants.

Participant selection guidelines:

Under the present day context the protection of natural resources, especially tree resources have become a serious problem. Till date the general answer to solve this problem is 'Social Forestry' wherein the participants will be involved and they will actively protect these resources and in lieu of that they will share the benefits under agreements, with the land owning agency (in this case BWDB). These participants or the community will play the conspicuous role in protecting these plantations. The Social Forestry Rules 2010 (given in annexure 01), that the FD is using as such, though not binding for the BWDB to follow, can be of some use under this given context.

The criteria laid in the social forestry rules for selecting participants is to go for the poor and ultra-poor people of the society. Because of the prevailing low living standards of the people in general, many of the people are eligible to be participants according to the criteria laid down in the 'Social Forestry Rules 2010'. Though the criteria set in the rules are fine, the interferences by the influential personnel especially by the political people are very heavy and can hardly be mitigated. To avoid any underhand deal and to avoid external pressure, especially from political people, the participants may be selected through an open forum, in presence of the personnel from all concerned. This may be more transparent and acceptable to the members of the public.

The squatters, displaced due to land acquisition, river bank erosion, etc. should be given the priority while selecting participants for this program. Besides these while selecting participants, the people having privately owned lands adjoining the BWDB lands should also be taken into consideration. They have homesteads, agricultural lands, ponds, small wetlands, etc. in their privately owned lands adjoining the BWDB lands. These private land owners are very important towards the sustainability of the plantations that will be established under this given program. In some cases their role may be very vital as well. Under this situation all possible attempts must be lunched to let them be parties for the protection of these plantations. These people in some form or the other should be incorporated as participants' associates, if not as actual participants, in this program and at the same time, necessary safe guard measures need to be incorporated, so that their involvements benefit the plantations established and ensure sustainability.

The following steps may be taken to select participants.

The participants should be selected at least 6 months ahead of the initiation of the plantation activities.

The concerned authorized personnel (may be the Executive Engineer) will prepare the work plan by January, for the participatory plantations to be undertaken during the financial year (where the plantation works will start in April next).

This program of participatory afforestation should be announced among the nearby communities (hats and bazaars) by January.

An application form has to be developed by the concerned authority, which will be used as the application form by the probable applicants. This form must be available to all concerned, free of costs by January.

A public announcement has to be made through loud speakers in the local areas, especially in the local markets and *haats*, about the invitation of applications in prescribed format, for probable social forestry participants, elucidating the criteria and selection process, by January-February. This announcement has to be given by the local authority (may be the Executive Engineer).

The last date of receiving application may be March 15th.

On receipt of the applications, the facts and information given in the applications may be verified by the locally, as best as possible, with assistance from the local Union Parishad by last week of March.

One public meeting may be day long, will be arranged for every Union to finalize the participants for all plantations to be under taken within the jurisdiction of the given Union by the first week of April.

The date and venue of such public meeting has to be well announced through loud speakers, in the given locality including the local *haats* and *bazars*. All the applicants from the given union will be requested to remain present in this meeting. This has to be done by the concerned local authority (may be the local Executive Engineer).

The following personnel must be present in the above said public meeting.

- The local Union Parishad (UP) chairman must be present in the meeting. He will also preside in the meeting.
- The concerned local BWDB official may be an Assistant Engineer of BWDB.
- One BWDB official as representative of the concerned Executive Engineer.
- Local UP members. (Three to four of them may be selected locally as signatories. While selecting such ward members, preference will be given to those nearby the plantation site).
- Local elites. (Two of them will be locally nominated to function as signatories).

The local BWDB official concerned will arrange all of these.

All of these above mentioned 10 personnel will be the signatories in the final list of participants selected in the meeting.

The final selection will be done in this meeting publicly. The local BWDB official may do the required home works in this connection. The final list of participants selected, plantation wise, has to be endorsed by the above mentioned 9 personnel by putting their signatures.

The concerned local BWDB official will take the signatures of the participants on the agreement forms (the agreement form that the FD is using at present may be used by making small changes as required) at the closer of the meeting. The UP chairman will be the witness in each of these agreements.

The final list will be announced in this public meeting. The name and the required details will be sent to the concerned BWDB authority (may be the Executive Engineer) to process the agreements. The agreements must be ready for delivery to the incumbents within 2 weeks from the date of this public meeting.

A list of the selected participants, plantation wise will be sent to the concerned UNOs and DCs for their information.

Benefit sharing mechanism

Once the participants are selected and finalized, plantation wise, they will be involved in the plantation establishment activities.

An agreement has got to be signed between the participant group and the BWDB. For every 5 hectare of plantation, a group of 10 participants will be identified. One agreement will be signed between each such group (of 10 participants) and the BWDB.

Benefit sharing arrangement will be as under:

The participant group (of 10) will receive the following benefits:

All the produce or yield of intercropped crop.

The entire yield (branches etc.) from the first and second pruning of the trees.

At the time of final felling of the trees at 8^{th}, 10^{th} and 12^{th} year of the plantation; 75% of the total yield (or produce). Out of the rest, 20% will go to the BWDB, as their revenue or overhead, 5% will go to the management committee.

75% of the entire yield (juices & fruits) from the fruit trees as they come under production. Out of the rest, 20% will go to the BWDB, as their revenue or overhead, 5% will go to the management committee.

The participants will have the responsibilities to

Protect the plantations,

Maintain the plantation,

All the participants (100 in number for this 50 hectare plantation) will constitute (may be through election, selection or nomination) a 5 member (Chairman 1, General secretary 1, Treasurer 1 and Members 2) Management Committee to oversee, ensure proper management and sustainability of the plantation established. The management committee will run the show by formulating by laws etc. including the management of the fund that will go to them.

In association with the BWDB the management committee will lunch awareness programs, training programs, AIG programs etc. in future.

Annex F. ToR for Consulting Services for Preparation of Biodiversity Management Plan and Implementation of RMIP Monitoring Program

Citation in main text (Volume I): **Section 9.4.1.4**.

Background

The lower Brahmaputra, named Jamuna in Bangladesh is one of largest rivers in the World. Following its avulsion (change of course) into the present day Jamuna River during the late 17th century, it has been constantly migrating westward and additionally widened by 50% from 8 to 12 km since the 1970s. These morphological changes have led to the loss of about 88,000 ha of floodplain from 1973 to 2014, affecting the ecology and livelihood of the floodplain dwellers by displacing hundreds and thousands of people. In addition to unpredictable riverbank erosion, floods are the other major natural hazard. While typically 20% of the country is flooded during the annual monsoon, severe floods have inundated up to two thirds of the country.

The Government of Bangladesh through Bangladesh Water Development Board (BWDB) is preparing the River Management Improvement Program (RMIP) to reconstruct the existing degraded embankment and secure it against riverbank erosion along 137 km length from the Teesta River to the Jamuna Bridge. The program will be designed and implemented in three phases. A 50 km long priority reach between Simla and Hasnapara will be protected in Phase 1. Phase 2 covers the remaining 87 km while Phase 3 focuses on and the construction of a highway on the countryside of the new flood embankment. The entire program will be implemented over a period of 10 years.

Objectives

The proposed RMIP program is located in an area of high biological diversity in which many important and endangered aquatic species are present. The Jamuna, its floodplains and stabilized chars are home to a wide variety of terrestrial and aquatic birds and is an important area for migrating birds (winter visitors). The program footprints due to construction of river training works and flood embankments, highway and associated developments are affected to affect the aquatic and floodplain habitat. Historically also the biodiversity of the Jamuna is under threat from natural morphological process and floods. The RMIP program has taken an approach to address the impacts associated with natural processes and also with the project activities by development of sanctuaries for protection of biodiversity. Development of such conservation areas is expected to restore the riverine ecology and biodiversity conservation and create highly needed reproduction, nursing and feeding areas for aquatic biota.

Baseline data has been collected along the right bank of the Jamuna in the program area with more emphasis in the priority reach during detailed design stage of Phase 1 of the program. However, a detailed and more comprehensive ecological baseline data needs to be collected along the entire reach of the Jamuna including its floodplains on both sides considering cumulative development in the region.

The other objective of this study is to conduct impact monitoring for fish catches and populations and biodiversity of fish, birds, dolphins, herpeto-fauna, and wetland trees following consistent methodologies so as to enable the project to assess key performance indicators.

Detailed Scope of the Study

Component 1: Baseline Studies

Detailed ecological studies will be carried out, during implementation of Phase 1, both within the Jamuna river boundaries and on the floodplains alongside both river banks for the full length of the Jamuna covered within the area of influence of the RMIP program, to broaden the existing baseline data. The study will be carried out over a period of one year covering all the seasons and also all aspects of aquatic and terrestrial ecology.

The data to be collected for terrestrial ecosystem include: natural vegetation in the floodplains and chars, riparian vegetation, wetland vegetation, recent trends in natural vegetation and threats, homestead vegetation, terrestrial fauna; terrestrial wildlife species and their importance and status; identification of important wildlife habitats and their movement/migration pattern (especially for the wildlife that depends on the river for drinking and fishing, e.g. fishing cat); recent trends (whether increasing or decreasing, key prevailing threats); and biodiversity including terrestrial species diversity.

The data to be collected on aquatic ecosystem include: ecology and plant community; abundance and distribution; growing period; recent trends (whether increasing or decreasing, key prevailing threats); aquatic fauna (including fish, dolphin, gharial, and turtles); aquatic wildlife species and their importance and status; identification of their habitats, breeding and migration patterns; wetland birds and recent trends; impact on aquatic wildlife from the project activity including short and long term impacts (impact from changed landuse, noise, human presence), utilization and recent trends (whether increasing or decreasing, key prevailing threats); and biodiversity (including aquatic species diversity and recent trends). The baseline data on aquatic ecosystem will be analyzed on the basis of the river morphology[4] (bathymetry of the river and flow velocities), which will be collected from the construction supervision consultants.

Based on enhanced baseline data, the study will review the mitigation measures proposed for identified impacts, and update the mitigation measures and prepare additional management plans.

Component 2: Identification and Planning of Conservation Area Development and Management, and Implementation

The EIA of Phase 1 has identified six potential sites of fish conservation and two locations of dolphin conservation in the priority area. The proposed study will confirm these locations based on the baseline studies (Component 1) and identify additional locations of conservation significance (in the river, and or chars/shoals or the floodplains) and prepare detailed conservation plans. These plans will be implemented during Phase 1 of RMIP. The sites will be identified for entire reach of the Jamuna river in the broad area of influence of the program, including areas of potential cumulative influence. The sites

[4] The RMIP will strengthen the 'River Survey' department of BWDB by providing survey vessels and equipment to carryout annual monitoring of river morphology, both during dry and flood seasons. During construction, the contractor will be responsible to carry out these studies and the Construction Supervision Consultant will have access to this data. The bathymetry data will provide the data on the river channels and the chars in the project area.

are to be identified in consultation with local community and relevant stakeholders. The ecological criteria for the identification of potential conservation areas include, but not limited to (i) habitats of red listed species particularly the globally and nationally endangered species such as dolphins, fishing cat, turtles and gharails; (ii) ecosystem areas of conservation significance, (iii) conservation of charland ecology and habitat of migratory birds, (iv) spawning and breeding areas for fish, crustaceans, and other riverine species, (v) potential areas for eco-tourism development, etc. Detailed management plans will be prepared for each of the conservation areas. The study will also develop education and outreach programs for promotion of biodiversity conservation. A national stakeholder consultation workshop will be held with all the relevant stakeholders to present these plans and to obtain their feedback.

Once the sites have been approved by all necessary parties, the Consultant shall prepare all necessary documentation and follow procedures to get the legal status and recognition as "sanctuary". The core area of the protected sanctuary will be closed by legal means to unauthorized human encroachment, fishing, boating, or any other activity that significantly and adversely affect the habitat. However, the public will be allowed to enter selected areas including the buffer zones for guided visits in order to promote eco-tourism. The consulting team will be responsible for implementation of management plans for first two years. These conservation areas will be handed over to the local community or relevant government departments for future management. The study will also assess the possibility of developing ecotourism to generate revenue for the maintenance of the conservation areas and develop necessary plans to implement these plans.

Component 3: Capacity Building in Biodiversity

The study will prepare and implement capacity building programs for the BWDB implementation staff, construction workers, local community and relevant government agencies for conservation and promotion of biodiversity in the program area. A capacity building plan will be submitted for approval of BWDB for its approval.

Component 4: Monitoring during construction and post construction of priority reach works

The impact monitoring will be carried out through assessing the impact monitoring of representative intervention and control sites in the working areas of both project phases – with the sites having already been covered by baseline, through to the end of project. Improvement or change of biodiversity due to the project interventions such as revetments, embankment, road construction and others will be ultimately determined comparing the present and past status of biodiversity in the area. The detailed methodology for monitoring program is given in Appendix 1.

Selection of the biodiversity monitoring sites by category and indicator groups to be monitored

Category		Water body Type	Birds	Fish catch	Herpeto-fauna	Vegetation	Dolphins
Location	**Intervention**						
Potential impact area	Main interventions (revetment, embankment,	Jamuna River/Chars	Y	Y	Y	Y	Y
		Beel/flood plain	Y	Y	Y	Y	

Category		Water body Type	Birds	Fish catch	Herpeto-fauna	Vegetation	Dolphins
Location	**Intervention**						
	road)	Canal/linking river		Y	Y		
	Other interventions (Regulators, culverts, fish passes, markets, ramps, crossings, etc.)	Beel/flood plain	Y	Y	Y	Y	
		Canal/linking river		Y	Y	Y	
		Jamuna river/chars	Y	Y	Y	Y	Y
	Cumulative impact area	Left bank	Y	Y	Y	Y	Y
		Down stream	Y	Y			
		Up stream	Y	Y			
		Country side	Y		Y	Y	
Control area	No project interventions	Beel/flood plain	Y	Y	Y	Y	
		Chars	Y	Y	Y	Y	Y
		Jamuna River / chars	Y	Y	Y	Y	Y

Time frame

The baseline study will be carried out over a period of one year covering all seasons. The development of conservation areas will be carried out in the second year. The monitoring will be carried out during the entire construction period and for two years after the construction period. Detailed terms of reference for the consultant input will be developed by PMU during initial stages of project implementation. The consultant team will submit a detailed work plan based on these TOR, which will be reviewed and approved by PMU/BWDB prior to initiation of the work.

Reporting requirements

The Consultant will prepare and submit the following reports and deliverables during the course of the project:

- Inception Report (within one month after mobilization of the consultant indicating detailed work plan)
- Monthly Progress Reports (from second month onwards – in the first week of every month)
- Draft Seasonal Baseline Report (for every season with the time line agreed in the inception report)
- Draft Complete Baseline Report (within 14 months from mobilization)
- Final Complete Baseline Report (within 16 months from mobilization)
- Protected Area Design Report (within 14 months from mobilization)
- Capacity Building Plan (within 14 months from motivation)

- Monitoring Reports on Construction Impacts (six monthly during construction)
- Implementation of Conservation Programs (quarterly)

Consultant Key Qualifications and estimated staffing requirement

The consulting services will be open both national and international consulting firms. An association with a suitable national organization is recommended for international firms to complement consultant's local knowledge and experience. The consulting firms should have experience in carrying out similar assignments preferably international assignments of similar nature and World Bank funded projects, knowledge of field monitoring methodologies, and experience setting up and implementing conservation programs. The following key international and national staff will be required for carrying out the assignment. The consultants are free to propose a staffing plan and skill mix necessary to meet the objectives and scope of services.

	Position/Item	**Man months**
	International Consultants	
1	Hydro Ecologist/ Team Leader	30
2	Floodplain Ecologist	10
3	Protected Area Planner	10
	National Consultants	
1	Fish Biologist/Deputy Team Leader	40
2	Wildlife Specialist	30
3	Bird Expert	30
4	Vegetation Expert	20
5	Legal and policy Specialist	20
6	Tourism Specialist	20
7	Herpetologist	20
8	Limnologist	20
9	Conservation Specialist	20
10	GIS Specialist	30

International staff should have master's degree with minimum of 15 years of experience in biodiversity conservation and monitoring related projects. Doctorate degree is preferable.

National staff should have bachelor's degree with minimum 10 years of experience in biodiversity monitoring studies.

Appendix 1

Proposed Methodology for monitoring of Fish catches and diversity

For impact monitoring of RMIP intervention on "Fish Catch and Species Diversity" Catch Assessment Study will be undertaken in the RMIP intervened and controlled water bodies. Baseline data on Catch, fishing effort and species diversity of those water bodies are available. CPUE (Catch per Unit of Effort) of different fishing gears (Fishing Unit), total number of fishing units in operation and the number of species in the catch and their intensity/relative abundance of different species in the catch (to be determined by Shanon

Index) will be the measurable indicators of the project interventions on fish catches species diversity.

CPUE:

CPUE is generally defined as quantity of fish caught by a defined fishing unit of a particular type of fishing gear during a defined type period (An hour or a day etc.).

Fishing Unit:

Fishing unit is a fishing enterprise, which coincide with the 'fishing economic unit consisting of the fishing craft (if used), fishing gear and fishers (Bazigos, 1974). The fishing unit/economic units will be also considered under two categories: (i) the usual fishing unit (UFU), composed of the boat, fishing gear and the fishers necessary to carry out the fishing operation; and (ii) a minor fishing unit, composed of fishing gears and fishers (without a fishing boat).

Fisher/fisherman

Anybody operating a gear will be considered as a fisherman and each of the gear will be considered as a single fishing unit.

Catch assessment survey

Catch assessment including gear survey will be performed in each of the intervention and control sites at 10 (ten) days interval on sampling basis by following methods:

Fishing Effort Survey (FES) and Catch Assessment Survey (CAS) will be conducted on the sampling day for 24 hours from 6 a.m. to 6 a.m. on the next day in two shifts (1) Day shift and (2) night shift. Anybody operating a gear will be considered as a fisherman and each of the gear will be considered as a single fishing unit. Day catch will be monitored and recorded by all time observation, while the night catch will be observed and recorded in the following morning in the fishing ground or landing center.

All different types of fishing gear/fishing unit will be studied on sampling basis selected randomly, with fishers interviewed on each sampling day and data on the gear type, its length, width and mesh size, mode of operation, duration of fishing per day will be collected and recorded. Name of fisher, number of fish caught, and weight (gram) of the catch will be recorded by using a single pan balance.

On the sampling day all different types (categories) of fishing gears/efforts (fishing unit) in operation on that day in specified area (part or entire water body) will be surveyed/counted and recorded as per Form-1. Then from each category of fishing gear (fishing unit), sample fishing unit selected at random will be studied for catch and effort data as per Form-2. Number of Katha (Brush shelter) under fishing (if any) and their catch will be recorded separately by species for inclusion in the catch of the water body. If the observed catch is in large quantity, then a sample of the observed catch will be taken randomly and species-wise number and weight of the fishes in the sample will be recorded as per Form-2. Number of sampling fishing unit to be studied will be selected on the following principals:

Total no. of fishing units of a particular type in operation on sampling day		**No. of fishing units to be studied for each type of gear in operation**
1	1 – 3 nos.	All fishing units in operation

2	4 – 10 nos.	3 fishing units
3	11–30 Nos.	4 -5 fishing units
4	31 and above	10% of the total units with minimum 5 units.

The data will be analyzed statistically by using SPSS method for estimating CPUE, species-wise catch on monthly, quarterly and finally yearly basis. CPUE will be estimated based on the weight of fish caught during a fishing day (Catch per day per fishing unit).

Fish species diversity will be obtained from the species-wise catch data by number and weight.

Form 1

IMPACT MONITORING – CATCH ASSESSMENT (RMIP)

Format for Fishing Effort Survey (Gear Survey)

Biologist : Location:

Date : Upazila:

Site No.: District:

Site :

Habitat: Beel/River/F. Plain/Chars/Other specify

Sl. No.	Gear Type (Name)	Observed Number and Time					Comments
		With Boat (√)	Without Boat (√)	Katha fishing (√)	Fishing period		
					Start time	End time	
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

Form - 2

CATCH ASSESSMENT FORMAT

Impact Monitoring of RMIP

Fish Catch Assessment Form

Day/Night Catch

Site: ________________________________ Habitat: ☐

Date ☐☐☐☐☐☐ (Code: River-1, Canal-2, Beel-3, Floodplain-4, Char-5)

1. **Information about Gear and Fishermen type**

1.1 Gear: 1.2 No. of Gear: 1.3 Length (m): ☐☐☐☐☐

1.4 Width (m): ☐☐ 1.5 Diameter (m): ☐☐☐☐ 1.6 Mesh size (cm) ☐☐

1.7 Craft/boat: Boat/Donga

1.8 Fishers type: Professional/full time/part-time/subsistence

1.9 No. of person (Fishers): Male _____ Female _____ Total ______

1.10 Name of the Fisher(Head): __________1.11 Villages: ___________________

1.12 Total number of this type of gear operated today: ☐

2. **Fishing time**

2.1 Fishing began at: ☐☐☐☐ 2.3 Time spent for present catch ☐☐☐☐

2.2 Time of observation: ☐☐☐☐ 2.4 Observed catch (weight gm) ☐☐☐☐

2.5 Expected to end at: ☐☐☐☐ 2.6 Expected fishing hour: ☐☐☐☐

3. **Species, number and weight (gm) of observed catch:**

(a) Species composition from total observed catch or sample (code): ☐ (code: Total catch=5, sample=6)

(b) Weight of sample of observed catch: ☐☐☐☐

Species (Code)	Number	Weight	Species (Code)	Number	Weight
☐☐☐	☐☐☐	☐☐☐☐☐	☐☐☐	☐☐☐	☐☐☐☐☐
☐☐☐	☐☐☐	☐☐☐☐☐	☐☐☐	☐☐☐	☐☐☐☐☐
☐☐☐	☐☐☐	☐☐☐☐☐	☐☐☐	☐☐☐	☐☐☐☐☐
☐☐☐	☐☐☐	☐☐☐☐☐	☐☐☐	☐☐☐	☐☐☐☐☐
☐☐☐	☐☐☐	☐☐☐☐☐	☐☐☐	☐☐☐	☐☐☐☐☐
☐☐☐	☐☐☐	☐☐☐☐☐	☐☐☐	☐☐☐	☐☐☐☐☐
☐☐☐	☐☐☐	☐☐☐☐☐	☐☐☐	☐☐☐	☐☐☐☐☐
☐☐☐	☐☐☐	☐☐☐☐☐	☐☐☐	☐☐☐	☐☐☐☐☐

4. **Fi** **o** ☐ ☐

Name of Enumerator: _____

Fishing right Code, License-7, Permit-8, Leases-9, Free-10

List of Fishes (Species Code)	
Carp Species	41. Ranga Chanda,
1. Rui	42. Gol Chanda,
2. Catla	43. Lamba Chanda
3. Mrigel	44. Tepa, Potka
4. Kalibaus	45. Pabda,
5. Ghonia	46. Madu pabda,
6. Common carp (Carpio)	47. Kani pabda
7. Mirror Carp	48. Gutum,
Snake Head	49. Gora gutom/Guchi Gutom
8. Soal	50. Naftani
9. Gojar	51. Chela,
10. Taki, Cheng Taki	52. Chep chela,
11. Telo Taki	53. Nerkeli chela
	54. Moa
Live Fish/ Cat fish/Featherback	55. Sar punti(Desi)
12 Koi	56. Tin Choka
13 Sing	57. Rani
14. Magur	58. Tatkini,Bata
15 .Boal	59. Chapila/Mamoli chapila
16. Air	60 Kuchia
17 Baghair	61. Senia (Eusufi)
18. Chital	62. Bacha
19. Foli	63. Hilsa (Jatka)
20. Rita	64 Baspata
	65. Kazuli
Small Fishes	66. Chaka/Gangina
21. Jat punti,	67. Dela
22. Tit punti,	68. Kachki

23. Jhili punti,	69. Shilong
24. Futani Punti	70. Ghaura
25. Khalisa	71. Peali
26. Tengra,	72. Poa
27. Bujuri Tengra	73. Batasi
28. Icha/Gura Icha/Chingri	74. Tapasi
29. Galda Chingri	75. Chewa
30. Kaikla	76. Anju
31. Guchi Baim	77. Baicha
32. Tara Baim	78. Kanpona
33. Sal Baim	79. Mola
34. Bele,	80. Meni/Bedi/Roina
35. Gugri Bila	
36. Darkina	
37. Khalisa,	
38. Chuna Khalisa,	
39. Lal khalisa	
40. Chanda,	

Methodology for monitoring of Dolphins

The following major activities will be carried out for monitoring of dolphins:

Survey and monitoring of dolphin population

This project aims to thorough survey dolphin population at specified transact line along the Jamuna river at regular interval. The preliminary information will come from the baseline monitoring reports and consultation with the experts involved with the baseline study. It will help to design the survey. A three man team will be formed for the survey. A medium to large-sized engine boat will be used for counting of dolphins in the rivers. The survey team will visit dolphin transact line and spotted the dolphin population. Usually three observers used to participate in dolphin count: one stationed on left-side of the boat, one in front and the third one on right side of the boat. Sometimes, four observers participated in the dolphin count. On each side (left or right) of the boat, the observers/counters covered particularly during monsoon, 500 meters open eye. The survey will be conducted in two periods – one in monsoon (August-October) and the other in dry season (January-February) in each year. So, one survey in monsoon (August – October) and two survey in dry seasons (Jan-Feb and Jan-Feb) will be conducted.

Identification of dolphin hotspots: The survey team will count dolphin population at hotspots area which are already been identified in the baseline study and they will also

monitor the population status and threats of their habitat and food and feeding behavior. Furthermore the team will also search the newly dolphin hotspots which are not identified in and around the transact area.

GIS mapping: All information will be transferred into GIS database and maps produced to make a comparison between the past and present distribution scenario and to evaluate the threats and habitat, movement, nesting sites, etc.,

Methodology for monitoring of Herpetofauna

Herpetofauna include Amphibia (frogs and toads) and Reptilia (turtles and tortoises, lizards, snakes and crocodilians). The RMIP include four major habitat categories :(1) wetlands/water bodies (beels, Rivers and ponds) (2) agricultural lands (iii) settlements/homesteads; and (iv) grass lands and char areas. So, both terrestrial and wetland habitats particularly broadcast aman rice plots (deepwater rice) and grasslands chars within RMIP location will be considered for the survey as specified in the baseline study. Best time for Herpetofauna survey is rainy season. However, for more specific study, the survey team will count species in two season (monsoon and dry).

The broad activities for the herpetological survey are as follows:

Literature review

Identifying the transact line or specific site within RMIP project location and traversing for direct sighting of species by the survey team

Data collection of herpetofauna in two season (monsoon and dry). Survey will done by at early morning and night at selected transects

Preservation and taking photograph of uncommon herpetofauna for identification

Discussion with local community people, local snake charmers and other stakeholders for identification of uncommon herpetofauna

Data analysis and GIS Mapping of the survey area and transact line

Methodology for monitoring of Birds and Water birds

The bird survey will be carried out through field survey by applying different survey methods namely strip transact sampling, point sampling, opportunistic survey, focus group discussion methods in the identified transact line and some other project site where baseline monitoring survey was done; the methods are described in brief:

Strip Transect Sampling: Strip transect sampling (Buckland *et al.* 2001) was found most suitable to estimate the population density. In this method the observer(s) slowly walk on a relatively straight line through the study area and count the objects from both sides. The initial location of the object is always considered, because the object is might move away after watching the observer(s). If any object is sighted beyond the pre-decided observation-range, or if the object is coming from the back (in order to avoid duplication), the observation is not recorded. The survey is conducted in early morning and late afternoons when the birds are most active. Transects are located in areas which are suitable in terms observation in each study site.

Opportunistic survey: In opportunistic survey, any important or interesting observation/information is recorded at any time while in the field. This method is suitable

for recording the occurrences, relative abundance and distribution of different species of birds and other birds.

Focus group discussion: Focus Group Discussion will conducted in monitoring sites for gathering information on bird habitat condition, availability and seasonality of birds, migration of birds, etc.

Major Activities for bird monitoring:

Preparation of detail work plan and methodologies through consultation with team members and experts and literature review.

Bird survey in two season (post-monsoon (November) and dry (January)) in the identified transacts line. Two surveys in winter (Jan and Jan) and one survey in post monsoon (Nov) will be carried out.

Data compilation and threats identification

Comparison of the data with previous census data and impact the rationality

Identification of the major hotspots of birds in the project sites

Wetland trees monitoring

Success of wetland tree plantation will be evaluated based survival percentage (i.e., plantation establishment) through sample survey where plantation has been established by the project. The monitoring will be done for two different types of plantations: (1) for the trees planted surrounding the water bodies (Table 1) and (2) for distributed seedlings among the household (Table 2) in the project site. The data will be collected twice a year (one before monsoon and another in dry season).

For evaluating tree plantations surrounding water bodies, initially baseline information of density (number of seedlings planted in a given area), diversity, average height and average collar diameter along the strips (if available) will be collected from the baseline reports and from project personnel. The present density, diversity, height and collar diameter will be collected through sample survey in the project sites by following simple random sampling procedure. The sampling intensity will be 10% (of the area) in the control sites and the intervened sites. For example, for canal plantation, the density will be measured per kilometer (Km) basis and the success and failure will be evaluated on the basis of survival percentage (the Table 1). On top of that, diversity, average height and average collar diameter will be calculated through sample survey.

For evaluating seedling distributed to the households, number of seedlings distributed per household will be collected from project reports and their survival percentage will be evaluated. The growth related data (height and collar dia) will be collected performance will be investigated through sample field survey by following simple random sampling with a sampling intensity of 10%.

Table 1: For monitoring trees and other vegetation surrounding water bodies

Items	Baseline		Impact study		Monitoring Success/Failure
	Control sites	**Intervened sites**	**Control sites**	**Intervened sites**	
Number of seedlings/Km (Density)	baseline report, project personnel	baseline report	Sample survey	Sample survey	Survival percentage 80% and above- successful plantation 60%-less than 80%- Moderate

Items	Baseline		Impact study		Monitoring Success/Failure
					Below 60%- Poor
Diversity	baseline report, project personnel	baseline report	Sample survey	Sample survey	Higher diversity is desired
Average height (m)	baseline report, project personnel	baseline report	Sample survey	Sample survey	Growth performance
Average collar diameter (cm)	baseline report, project personnel	baseline report	Sample survey	Sample survey	Growth performance

Table 2: For monitoring trees distributed to the households

Items	Baseline (if available)	Impact study	Monitoring Success/Failure
Number of seedlings/household	baseline report, project personnel	Sample survey (10% sampling intensity)	Survival percentage 80% and above- successful plantation 60%-less than 80%- Moderate Below 60%- Poor
Average height (m)	baseline report, project personnel	Sample survey	Growth performance
Average collar diameter (cm)	baseline report, project personnel	Sample survey	Growth performance

Methodology for Participatory monitoring

Participatory biodiversity monitoring team will be formed and trained. The major activities to be carried out are as follows.

a. Development of participatory monitoring tools

The monitoring methods and formats used for the monitoring of fish, birds, herpetofauna, trees and dolphins under this study will be customized for the members of the BMOs (Beel Monitoring Organization) who will undertake biodiversity monitoring of indicator species in future. The formats will be finalized through consultation with BMOs and pilot testing in the area.

Matrix will be developed for all indicator faunal species showing the basic characteristics of the species in the project sites. The matrix will be used by the participatory monitoring team for identification of the indicator species during biodiversity monitoring survey. A sample of the matrix is shown below.

Name of the Indicator bird species	Food and habitat	Identification Characteristics	Status	Bird's Calling	Census time	Status without this species (red line)	
E-Purple Swamphen S-*Porphyrio porphyrio*	-Resident bird of Bangladesh -Largely feed on aquatic vegetation	Easily identifiable	-Once it was widely found in most of the wetlands of Bangladesh.	Can be easily identified by its calling	All around the year	-Decreasing of this species indicates reducing the reeds of the haor -Not only Purple	Photo

L-Kalim/Kayem	insects,small fishes and larvae -Builds nests inside the reed of elevated land of the haor		-Hard to be seen anywhere except in the haor			swamphen but also other birds, small mammals, frog, turtle/tortoise and fish will be reduced in numbers as it is suitable for their breeding	

Fish			
Species	Food and habitat	Status without this species (red line)	
E- ***Rohi or Rohu*** **S-Labeo rohita** L-Rou	-Natural breeding center. -Rapidly growing -Survival of this fish is interlinked with the depth of water -Thousands of fishermen sustain their livelihoods by Rohu fishing.	-If this fish decreases in the Tanguar Haor area, Bangladesh's most prosperous breeding center, the whole biodiversity of this area would be affected. - Living standards of the fishermen will decline - Protein crisis might occur	photo

Code: E- English name; S- Scientific name; L-Local name

For data collection, separate format will be developed for the participatory monitoring team. A sample of participatory biodiversity monitoring format, which are being used in Tanguar Haor, Sunamganj, is given as follows.

Bird's name	**Number**	**Obtained marks**
Purple Swamphen	**Census data:**	**Marks:…….**
Marking guidelines:0%=1,1-40%=2,41-60%=3,61-79%=4,80>=5		
Formula of result calculation:7000*100/10,000=70%=if 7,000 birds seen in one census, Marks=3		
Purple Swamphen= If 10,000 individuals are seen=100%= No management is required in case of scored more than 80% (5) marks If scored 4 management is going well If scored 3 management is required If scored 2 management is going down In case of not seen Red Line's causes are clear		

b. Capacity building of biodiversity monitoring team:

The interested members of BMOs having basic education skill will be selected for the biodiversity monitoring team. Several teams (each comprising of three educated local people interested in birds/nature conservation from villages/union) will be formed for the monitoring task. Local school teachers or even the students of schools and colleges could

be considered for the team. The teams will be given training with field sessions so that they can collect, analyze/ interpret and present the biodiversity monitoring information.

Annex G. Terms of Reference for Floodplain Fisheries Development (including List of Khals and Beels with Recommended Improvements)

Citation in main text (Volume I): **Section 9.3.1.6**.

Background

The lower Brahmaputra, named Jamuna in Bangladesh is one of largest rivers in the World. Following its avulsion (change of course) into the present day Jamuna River during the late 17th century, it has been constantly migrating westward and additionally widened by 50% from 8 to 12 km since the 1970s. These morphological changes have led to the loss of about 88,000 ha of floodplain from 1973 to 2014, affecting the ecology and livelihood of the floodplain dwellers by displacing hundreds and thousands of people. In addition to unpredictable riverbank erosion, floods are the other major natural hazard. While typically 20% of the country is flooded during the annual monsoon, severe floods have inundated up to two thirds of the country.

The Government of Bangladesh through Bangladesh Water Development Board (BWDB) is preparing the River Management Improvement Program (RMIP) to reconstruct the existing degraded embankment and secure it against riverbank erosion along 137 km length from the Teesta River to the Jamuna Bridge. The program will be designed and implemented in three phases. A 50 km long priority reach between Simla and Hasnapara will be protected in Phase 1. Phase 2 covers the remaining 87 km while Phase 3 focuses on and the construction of a highway on the countryside of the new flood embankment. The entire program will be implemented over a period of 10 years.

Objectives

The historic BRE, built in the 1960s, has acted as a barrier to lateral fish migration between the Jamuna and floodplains and hydrological connectivity between the Jamuna and khals (small rivulets) and beels (depressions on floodplains), which are major floodplain fish habitats. This has caused significant reduction in the production of floodplain fisheries and affected the livelihoods of the fishermen. During EIA studies of Phase I, four areas within the Phase I area have been identified where re-establishing of ecological connectivity will help to restore the biodiversity of the area, particularly facilitating fish migration. Four fish passes have been designed to restore the lost connectivity and will be constructed by the contractor along with the embankment works. In addition two regulators are proposed to provide supplementary irrigation water in the floodplain areas during the flood/monsoon season in case of long dry spells.

To complement the construction of fish passes, re-excavation of khals and beels will be carried out with community participation to further enhance the connectivity and improve fish habitat in the floodplain. In addition to restoring the connectivity through construction of fish passes and reexcavation of khals and beels, a comprehensive fisheries development program is proposed to restore the historical loss of floodplain fisheries through sustainable harvesting, which includes a series of programs such as community moblisation for operation and management of fish passes, training of fishermen, provision of fishing gear, and development of marketing facilities. The program will also cover formation and training of water management cooperatives for operation and maintenance of fish passes and regulators.

The above activities including excavation of khals and beels will be carried out through community participation in order to ensure sustainability of the initiative (khals and beels need to be excavated on a regular basis) and also because this activity cannot be contracted out since the contractor would face problems in accessing the khals and beels. For community mobilization and overall monitoring and supervision of task, the BWDB will engage a firm or NGO.

Detailed Scope of the Study

Component 1: Preparation of Fisheries Development Plan

The consulting/firm will prepare a detailed fisheries development plan after review of the EIA, carrying out additional studies and consultation with the relevant stakeholders. The plan will include prioritization of khals and beels to be excavated to maximize the potential of proposed fish passes, plan for excavation of khals and beels with community participation, identification of beneficiaries and formation of user communities for operation and management of fish passes and regulators, potential of fisheries development in the command area of proposed fish passes, and additional measures required to meet the objective of comprehensive fisheries development in the project area and their sustainability. The EIA study has identified Khals and beels in the Phase 1 area and and full list of them are given in Table 1. The EIA study has estimated that the proposed improvements will enhance the fisheries potential in the floodplain by 1880 tonnes per year. The assumptions behind this assessment are given in Appendix 1. These will be reviewed and verified during this study.

Component 2: Community Moblisation and O&M Committees

The firm/NGO will mobilize and sensitize the relevant communities and help them to form the committees for (i) carrying out the khals and beels excavation programs and (ii) operation and maintenance of fish passes and regulators.

Component 3: Excavation of Khals and Beels

The study in Component 1 will finalize the list of khals and beels to be excavated with reference to the regulators and fish passes being rehabilitated/constructed under the project, and also prioritize the excavation works. The extent of excavation will also be determined in the same way.

Once the works are prioritized, the firm/NGO will prepare the excavation plan with the community participation. The plan will include the name of the khal/beel, the relevant community members, extent of excavation, timeframe of excavation, and disposal mechanism for the excavated silt. Generally this silt will be taken away by the local community for using it as a filling material of home their homesteads which remains in great demand in the area. The plan will also include the labor charges to be paid to the community members involved in excavation. The plan will be disseminated to ensure complete ownership of the entire activity.

Subsequent to the above steps, community will initiate the khal excavation in accordance with the plan. The firm/NGO will maintain supervision and monitoring of the entire activity and will produce monthly reports to document and disseminate the excavation progress. Photographic record will be maintained of the entire activity. Complete record of the silt disposal will also be maintained to ensure that there is no inappropriate dumping of the excavated material.

Component 4: O&M of Fish Passes and Regulators, and Other Initiatives.

The firm/NGO will study the effectiveness of fish passes by studying the fish migration using under water video cameras and catch assessment surveys. The firm/NGO will develop a plan for effective operation and maintenance of fish passes and regulators and provide necessary training to the user committees/cooperatives responsible for O&M of these facilities. The firm/NGO will also implement other initiatives proposed in the fisheries development plan such as stocking of fingerlings in the beels and khals and training of the fisherman for sustainable harvesting, etc.

Time frame

The assignment will be carried out along with the construction of embankment works and excavation of khals and beels will be ready by the time construction of fish passes are completed. The embankment works will be carried out over a period of four years and hence the services of firm/NGO will be required for about five years to also cover one year of post construction period. Detailed terms of reference for the consultant input will be developed by PMU during initial stages of project implementation. The firm/NGO will submit a detailed work plan based on these TOR, which will be reviewed and approved by PMU/BWDB prior to initiation of the work.

Reporting requirements

The firm/NGO will prepare and submit the following reports and deliverables during the course of the project:

- Inception Report (within one month after mobilization of the NGO indicating detailed work plan)
- Monthly Progress Reports (from second month onwards – in the first week of every month and continue through out the assignment)
- Draft Fisheries Development Plan (within 6 months from mobilization)
- Final Fisheries Development Plan (within 8 months from mobilization)
- Reports on O&M of Fish Passes (six monthly after construction of fish passes)

Key Qualifications of NGOs and estimated staffing requirement

A firm or NGO with experience in carrying out similar assignments preferably the projects funded by international donor agencies (World Bank, ADB, JICA, etc.), knowledge of fisheries development programs, and implementing community development programs will be selected. Key staff members required to carry out the assignment are given below. The fisheries specialist should have a bachelor's degree with minimum 10 years of relevant experience. The EMP implementation cost covers the cost associated with this activity including the cost of engaging the firm/NGO, the wages to be paid to the community members for excavation activity, and any other associated miscellaneous expenses.

S.No.	Position/Item	Man months
1	Team Leader/Fisheries Specialist	40
2	Deputy Team Leader	40
3	Field Coordinators (2 no.)	80
4	Community Mobilisers (12 nos.)	360

Table 1: List of water bodies and enhancement measures needed to ensure functional connectivity between floodplain and the Jamuna river

	Name of the water body	Co-ordinate		Problem/Connectivity	Present situation of water flow	Mitigation / work needed
		Longitude	Latitude			
1	Bahuli Khal	89.66168	24.47354	Connectivity with Jamuna has been blocked by the BWDB embankment at Diarbari of Khoksha union, Kajipur Sirajganj	It is connected with Jamuna at Nolka	Have to be connected with the nearest canals that opened to the Jamuna river.
2	Bagdumur Khal	89.69330	24.39480	Connectivity with Jamuna has been blocked by the BWDB embankment	Dried up during dry season	Have to be connected with the nearest canals that opened to the Jamuna river.
3	Icamoti river	89.61576	24.48196	It is originated from Jamuna at Sariakandi , Bogra and falls into the Hurasagar at Baghabari, Pabna	Some parts of its dried up during dry season	Fish pass needs at this position
4	Bera daho	89.69330	24.39480	It is blessed with water from Jamuna, Sariakandi, Bogra and connected with Jamuna again at Baghabari, Pabna through Nolka river	Dried up during dry season	Re-excavation needed
5	Laxmi kola daho	89.55251	24.51404	It is blessed with water from Jamuna, Sariakandi, Bogra and connected with Jamuna again at Baghabari, Pabna through Nolka river		Re-excavation needed
6	Boilar beel			It is blessed with water from Jamuna, Sariakandi, Bogra	Rich in fish biodiversity and support livelihood to the surrounding people	Re-excavation needed
7	Fuljhor river	89.53297		It is blessed with water from Jamuna, Sariakandi, Bogra and connected with Jamuna again at Baghabari, Pabna through Nolka river		Re-excavation needed
8	Degree para khal	89.67097	24.53584	Connectivity with Jamuna has been	Dried up during dry season at	The proposed Balighugri Fish

	Name of the water body	Co-ordinate		Problem/Connectivity	Present situation of water flow	Mitigation / work needed
		Longitude	Latitude			
	(Icamoti river)			blocked by the BWDB embankment at Balighugri of Channgacha, sadar, Sirajganj Water start to flow from Balighugri of Channgacha, sadar, Sirajganj and it meets with Nolka river and finally falls into Jamuna again at Baghabari, Pabna	different places	pass will facilitate water flow throughout the year. Re-excavation needed.
9	Degree para khal (Icamoti river)	89.67140	24.53576	Connectivity with Jamuna has been blocked by the BWDB embankment at Balighugri of Channgacha, sadar, Sirajganj Water start to flow from Balighugri of Channgacha, sadar, Sirajganj and it meets with Nolka river and finally falls into Jamuna again at Baghabari, Pabna	Dried up during dry season at different places	The proposed Balighugri Fish pass will facilitate water flow throughout the year. Re-excavation needed.
10	Degree para khal (Icamoti river)	89.67079	24.53590	Connectivity with Jamuna has been blocked by the BWDB embankment at Balighugri of Channgacha, sadar, Sirajganj Water start to flow from Balighugri of Channgacha, sadar, Sirajganj and it meets with Nolka river and finally falls into Jamuna again at Baghabari, Pabna	Dried up during dry season at different places	The proposed Balighugri Fish pass will facilitate water flow throughout the year. Re-excavation needed.
11	Aminpur beel	89.65938	24.54013	It is blessed with water from Icamoti river		The proposed Balighugri Fish pass will enrich its fish biodiversity and overall agricultural production. Re-excavation needed.
12	Dattabari Daho	89.63949	24.54805	Durind rainy season it gets water from Icamoti river and connected		The proposed Balighugri Fish pass will facilitate more water

	Name of the water body	Co-ordinate		Problem/Connectivity	Present situation of water flow	Mitigation / work needed
		Longitude	Latitude			
				with Baghbati beel		to it. Re-excavation needed.
13	Bahuka khal	89.65561	24.56011	Connectivity with Jamuna has been blocked by the BWDB embankment near Bahuka bazar of Ratankandi, sadar, Sirajganj Water start to flow from Bahuka bazar of Ratankandi , sadar, Sirajganj and it meets with Nolka river and finally falls into Jamuna again at Baghabari, Pabna The khal is divided into two branches in this point ; 1. One branch meet again with the degree para khal (Icamoti river) 2. The second part falls into the Jamuna at Baghabari , Pabna	Dried up during dry season at different places	If the wanted regulator is constructed water flow will be normal, Need to re-excavate.
14	Bahuka khal	89.65595	24.56020	Connectivity with Jamuna has been blocked by the BWDB embankment near Bahuka bazar of Ratankandi, sadar, Sirajganj Water start to flow from Bahuka bazar of Ratankandi , sadar, Sirajganj and it meets with Nolka river and finally falls into Jamuna again at Baghabari, Pabna The khal is divided into two branches in this point ; 1. One branch meet again with the degree para khal (Icamoti river) 2. The second part falls into the Jamuna at Baghabari , Pabna	Dried up during dry season at different places	If proposed regulator is constructed water flow will be normal.
15	Bahuka- Gojaria khal	89.65436	24.56743	Connectivity with Jamuna has been blocked by the BWDB embankment near Chowdhury bari, Ratankandi,	Dried up during dry season at different places	If they wanted regulator is constructed water flow will be normal

	Name of the water body	Co-ordinate		Problem/Connectivity	Present situation of water flow	Mitigation / work needed
		Longitude	Latitude			
				sadar, Sirajganj		Need re-excavation about 1.5 km from Chowdhurybari
16	Gojaria khal (Part of Bahuka khal)	89.64542	24.55981	Connectivity with Jamuna has been blocked by the BWDB embankment near Chowdhury bari, Ratankandi, sadar, Sirajganj	Dried up during dry season at different places	If the wanted regulator is constructed water flow will be normal
17	Soratol Khal	89.63643	24.56538	Connectivity with Jamuna has been blocked by the BWDB embankment at Suvogacha, Ratankandi, sadar, Sirajganj Get water from Banaijan khal and have connection with Icamoti river	Dried up during dry season at different places	The proposed Ratankandi culvert will facilitate water flow to it
18	Khamar gati khal	89.62269	24.55285	It gets water from Bahuka- Gojaria khal and meets with Icamoti river through Brammagacha	Dried up during dry season at different places	If proposed Bahuka regulator is constructed water flow will be normal
19	Bahuka- Gojaria khal	89.62292	24.54940		Water flow and depth quite well in this point	
20	Baghbati beel	89.61644	24.53864	It gets water from Bahuka- Gojaria khal and Icamoti river during rainy season	Perinnial beel	If proposed Bahuka regulator is constructed water flow will be normal
21	Baghbati beel	89.61102	24.53899			Re-excavation needed.
22	Icamoti river	89.60017	24.54520			Re-excavation needed.
23	Icamoti river	89.59996	24.54534			Re-excavation needed.
24	Icamoti river	89.59985	24.54542			Re-excavation needed.
25	Icamoti river	89.59874	24.54614			Re-excavation needed.
26	Icamoti river	89.61088	24.53813			Re-excavation needed.
27	Baghbati beel	89.61063	24.53795			Re-excavation needed.

	Name of the water body	Co-ordinate		Problem/Connectivity	Present situation of water flow	Mitigation / work needed
		Longitude	Latitude			
28	Baghbati beel	89.64029	24.52005			Re-excavation needed.
29	Dublai beel	89.63970	24.51554	It gets water from Icamoti river during rainy season	Rich in fish biodiversity and support livelihood to the surrounding people	Re-excavation needed.
30	Pata beel	89.64901	24.53479	It gets water from Icamoti river during rainy season	Rich in fish biodiversity and support livelihood to the surrounding people	Re-excavation needed.
31	Bandhob beel	89.65004	24.53060			Re-excavation needed.
32	Badaila beel	89.66149	24.50610	No existence	No existence	-
33	Chilgacha bridge	89.64003	24.58013	Get water from Banaijan khal and moves towards Soratol khal		Re-excavation needed.
34	Banaijan khal	89.64654	24.59599	Starting point of Banaijan Khal		Re-excavation needed.
35	Kurala Beel	89.64363	24.59636	No existence; converted into agriculture land		Re-excavation needed.
36	Patagram Khal (Baoikhola khal)	89.64182	24.60700			Re-excavation needed.
37	Dublai beel	89.64348	24.62118	Get water from Banaijan khal	Rich in fish biodiversity and support livelihood to the surrounding people	If proposed Bahuka regulator is constructed water flow will be normal
38	Hunahanthor beel	89.64160	24.60024	Get water from Banaijan khal		If proposed Bahuka regulator is constructed water flow will be normal
39	Paikertali Daho	89.64005	24.66932	Connectivity with Jamuna has been blocked by the BWDB embankment		Re-excavation needed.
40	Halot khal	89.63930	24.66793	Connectivity with Jamuna has been blocked by the BWDB embankment , connected with Banaijan khal		Re-excavation needed.
41	Halot khal	89.63876	24.66695			Re-excavation needed.

	Name of the water body	Co-ordinate		Problem/Connectivity	Present situation of water flow	Mitigation / work needed
		Longitude	Latitude			
42	Halot khal	89.63840	24.66523			Re-excavation needed.
43	Halot khal	89.63799	24.66519			Re-excavation needed.
44	Halot khal	89.63773	24.66519			Re-excavation needed.
45	Kunkunia Daho	89.63309	24.66938	Closed water body		Re-excavation needed.
46	Kunkunia Daho	89.63256	24.66942	Closed water body		Re-excavation needed.
47	Kunkunia Daho	89.63266	24.67018	Closed water body		Re-excavation needed.
48	Kunkunia Daho	89.63325	24.67039	Closed water body		Re-excavation needed.
49	Kunkunia Daho	89.63406	24.67013	Closed water body		Re-excavation needed.
50	Kunkunia Daho	89.63538	24.66955	Closed water body		Re-excavation needed.
51	Chalita Danga Daho	89.60832	24.66266	Closed water body		Re-excavation needed.
52	Paroli beel	89.60061	24.66002			Re-excavation needed.
53	Paroli beel	89.60047	24.66017			Re-excavation needed.
54	Paroli beel	89.60023	24.66034			Re-excavation needed.
55	Paroli beel	89.59675	24.65963			Re-excavation needed.
56	Paroli beel	89.59365	24.65883			Re-excavation needed.
57	Sonamukhi river	89.56406	24.65128			Re-excavation needed.
58	Paikpara kola	89.55166	24.66154	Connect with Icamoti river during rainy season		Re-excavation needed.
59	Chokibari khal	89.55060	24.65016			Re-excavation needed.
60	Chokibari khal	89.55059	24.64899			Re-excavation needed.
61	Chokibari khal	89.55098	24.64590			Re-excavation needed.
62	Sonamukhi river (Icamoti river)	89.55133	24.64374			Re-excavation needed.
63	Sholli beel	89.54406	24.64648	No connection with Jamuna and Icamoti River		Re-excavation needed.
64	Icamoti river	89.55570	24.63639			Re-excavation needed.

	Name of the water body	Co-ordinate		Problem/Connectivity	Present situation of water flow	Mitigation / work needed
		Longitude	Latitude			
65	Icamoti river	89.55935	24.62645			Re-excavation needed.
66	Chatla beel	89.56878	24.60757	Connected with Icamoti		Re-excavation needed.
67	Sonaidanga beel	89.58535	24.59346	Connected with Icamoti		Re-excavation needed.
68	Icamoti river	89.58594	24.60362			Re-excavation needed.
69	Icamoti river	89.59377	24.61765			Re-excavation needed.
70	Kachihara khal	89.59588	24.62603	Get water from Kachihara beel and fall into Icamoti during rainy season water	Dried up during dry season at different places	Re-excavation needed.
71	Kachihara khal	89.59881	24.62541			Re-excavation needed.
72	Kachihara khal	89.59941	24.62706			Re-excavation needed.
73	Kachihara khal	89.60216	24.62624			Re-excavation needed.
74	Aziz morar Daho	89.61810	24.62626	Connected with Dublai beel		Re-excavation needed.
75	Gandhail Daho	89.63000	24.60845			Re-excavation needed.
76	Gandhail Daho	89.63804	24.60125			Re-excavation needed.
77	Khokshabari daho	89.68393	24.47791			Re-excavation needed.
78	Khalifa potti Daho	89.68366	24.48085			Re-excavation needed.
79	Khalifa potti Daho	89.68349	24.48325			Re-excavation needed.
80	Khalifa potti Daho	89.67703	24.49436			Re-excavation needed.
81	Icamoti river	89.59623	24.54525			Re-excavation needed.
82	Koiccha beel	89.58709	24.54177	Once connected with Icamoti river		Re-excavation needed.
83	Kali bari beel	89.57187	24.53009	Connected with Brammagacha river		Re-excavation needed.
84	Chandpur daho	89.56605	24.52730	Connected with Jugi Daho		Re-excavation needed.
85	Jugi daho	89.55717	24.52691	Connected with Laxikhola Daho and Fuljhor river		Re-excavation needed.
86	Jugi daho	89.55634	24.52602			Re-excavation needed.
87	Laxmikhola Daho	89.55362	24.51917	Connected with B6 and B 7		Re-excavation needed.
88	Taltola Khal	89.54434	24.52985	Connected with Nolka river		Re-excavation needed.

	Name of the water body	Co-ordinate		Problem/Connectivity	Present situation of water flow	Mitigation / work needed
		Longitude	Latitude			
89	Bailar daho	89.55395	24.54366	Connected with Nolka river through Jugidaho		Re-excavation needed.
90	Sholir daho	89.56019	24.54623	Get water from Kutubpur, Sariakandi, Bogra		Re-excavation needed.
91	Mahishgari beel	89.56265	24.54375	Connected with Jamuna river		Re-excavation needed.
92	HurJapanna beel	500 m south from 902		get water from Jamuna and moves towards Nolka	500 m south from 902	Re-excavation needed.
93	Muchi daho	89.56610	24.56032	Connect with Sadir daho and Boga daho		Re-excavation needed.
94	Gobindapur danga	89.56467	24.56400	Closed		Re-excavation needed.
95	Sadir daho	89.55871	24.57404	Connected with Fuljhor river	all type of fishes are found here	Re-excavation needed.
96	Barobari dado	89.55066	24.59087	Connected with Sadir daho		Re-excavation needed.
97	Maizlani daho	89.54302	24.59458	Connected with Fuljhor river and Icamoti river		Re-excavation needed.
98	Satdaho beel	89.55683	24.60296	Connected with gopal nagor daho		Re-excavation needed.
99	Satdaho beel	89.55952	24.60139			Re-excavation needed.
100	Satdaho beel	89.56291	24.60199			Re-excavation needed.
101	Satdaho beel	89.56405	24.60365			Re-excavation needed.
102	Dakhir beel	89.56720	24.60855			Re-excavation needed.
103	Rudrabaria daho	89.52444	24.59469	Closed		Re-excavation needed.
104	Tangrakhali daho	89.50934	24.59763	Connected with Rudrabaria daho		Re-excavation needed.
105	Rudrabaria-Pirahati pond	89.52641	24.59951	Closed		Re-excavation needed.

	Name of the water body	Co-ordinate		Problem/Connectivity	Present situation of water flow	Mitigation / work needed
		Longitude	Latitude			
106	Baliadanga beel	89.52418	24.60518	Closed; once connected with Bau and Bangali river		Re-excavation needed.
107	Shitola beel	89.52383	24.61960	Connected with Vasha beel		Re-excavation needed.
108	Chandiar dara	89.52825	24.63966			Re-excavation needed.
109	Icamoti river	89.54726	24.68830			Re-excavation needed.
110	Icamoti river	89.55146	24.69253			Re-excavation needed.
111	Icamoti river	89.55509	24.69335			Re-excavation needed.
112	Borobila khal	89.58667	24.71617	Get water from Chitulia beel and then moves towards Manos and then fall into Bangali		Re-excavation needed.
113	Borobila khal	89.58919	24.72106			Re-excavation needed.
114	Manos river	89.57593	24.73605			Re-excavation needed.
115	Manos river	89.57550	24.73730			Re-excavation needed.
116	Choto Chikashi	89.57541	24.73853	Connected with Manos river		Re-excavation needed.
117	Chikashi khal	89.56906	24.73718	Connected with Jamuna river and Sonaimukhi khal		Re-excavation needed.
118	Sultanata pond	89.56254	24.73898	Closed; man made		Re-excavation needed.
119	Chikashi beel	89.56375	24.74285	Connected with Jamuna river		Re-excavation needed.
120	Chunipara khal	89.60487	24.74225	Connectivity with Jamuna has been blocked by the BWDB embankment , connected with Manos during rainy season		Re-excavation needed.
121		89.60570	24.75468			Re-excavation needed.

	Name of the water body	Co-ordinate		Problem/Connectivity	Present situation of water flow	Mitigation / work needed
		Longitude	Latitude			
122		89.60569	24.75825			Re-excavation needed.
123	Andhara beel	89.59713	24.76279	Get water from Jamuna river throughBari khal and meet with Bangali river after passing the Dander beel		Re-excavation needed.
124	Danger beel	89.59276	24.76321	Connected with Bangali	Pen culture	Re-excavation needed.
125		89.58337	24.78865		Pen culture	Re-excavation needed.
126	Burir beel	89.56433	24.79057	Connected with Bangali on 2 km south		Re-excavation needed.
127	Valukatola Mochra	89.55876	24.77841			Re-excavation needed.
128	Bilai chati beel	89.56951	24.75076	Connected with Jamuna		Re-excavation needed.
129	Harani beel	89.56729	24.75152	Connected with Jamuna		Re-excavation needed.
130	Bognali beel	89.56975	24.76222	Connected with Jamuna		Re-excavation needed.
131	Fish sanctuary on bangali river	89.53374	24.80312			Re-excavation needed.
132	Nayan beel	89.52835	24.76171	Get water when Bangali overflows		Re-excavation needed.
133	Ghoramara beel	89.52333	24.74808	Get water when Bangali overflows		Re-excavation needed.
134	Nander para khal	89.51768	24.75037			Re-excavation needed.
135	Nander para kola	89.51315	24.75345	Connected with Nander para beel		Re-excavation needed.
136	Uttar Kanto nagar beel	89.51281	24.74619	Connected with Nander para khal		Re-excavation needed.
137	Bangali branch	89.49290	24.75480			Re-excavation needed.
138	Bangali river	89.48886	24.75877			Re-excavation needed.

	Name of the water body	Co-ordinate		Problem/Connectivity	Present situation of water flow	Mitigation / work needed
		Longitude	Latitude			
	branch					
139		89.48516	24.76425			Re-excavation needed.
140	Chokivati Daho	89.47973	24.78126	Get water from Bangali river		Re-excavation needed.
141	Kharo khal	89.47749	24.77528	Get water from Jamuna river		Re-excavation needed.
142	Chander beel	89.45283	24.79038	Get water from kharo khal		Re-excavation needed.
143	Karotoya river	89.40497	24.74013			Re-excavation needed.
144	Bagomara beel	89.42257	24.73449	Get water from takur beel		Re-excavation needed.
145	Durga danga beel	89.42328	24.73920	Rain water	Fish culture is practised	Re-excavation needed.
146	Sonaidanga beel	89.43215	24.74156	Get water from Bangali river through Kashpata khal	Community based fisheries management	Re-excavation needed.
147	Satbeela	89.43452	24.74504	Get water from Bangali river through Kashpata khal	Fish culture is practised	Re-excavation needed.
148	Beel pui	89.43835	24.74597	Get water from Bangali river through Kashpata khal and Satbeela		Re-excavation needed.
149	Kachugari beel	89.44924	24.74556	Get water from Bangali river through Cholmari khal		Re-excavation needed.
150	Kashpathar khal	89.45717	24.75674			Re-excavation needed.
151	Kashpathar beel	89.45085	24.75305	Get water from Bangali river through Kashpata khal and Karotoya river via Madla canal		Re-excavation needed.
152	Bagtumari beel	89.44770	24.75289			Re-excavation needed.
153	Vhabra beel	89.44488	24.75544	Get water from Bangali river through Kashpata khal		Re-excavation needed.
154	Karotoya river	89.44739	24.62760			Re-excavation needed.

	Name of the water body	Co-ordinate		Problem/Connectivity	Present situation of water flow	Mitigation / work needed
		Longitude	Latitude			
155	Bangali	89.47812	24.61754			Re-excavation needed.
156	Bangali	89.46523	24.62604			Re-excavation needed.
157	Karotoya river meets with Bangali	89.47432	24.63037			Re-excavation needed.
158	Paddy field	89.46753	24.60966			Re-excavation needed.
159	Satra beel	89.46122	24.61151	Closed	Pen culture is practised	Re-excavation needed.
160	Sujabaz Daho	89.39687	24.80644	Connected with karotoya		Re-excavation needed.
161	Karotoya river	89.40605	24.80666			Re-excavation needed.
162	Dighar beel	89.44632	24.81971	Connected with Bangali		Re-excavation needed.
163	Pirir daho	89.45170	24.81626	Connected with Bangali		Re-excavation needed.
164	Dharma gacha Daho	89.45706	24.81232	Closed		Re-excavation needed.
165	Sonakanidoya daho	89.46321	24.81052	Get water from Branch of Bangali river/ Mohisaban khal		Re-excavation needed.
166	Branch of Bangali	89.46529	24.79370			Re-excavation needed.
167	Karotoya river	89.38919	24.82735			Re-excavation needed.
168	Angari beel	89.40704	24.84187	Get water from Karotoya		Re-excavation needed.
169	Karotoya	89.41679	24.84209			Re-excavation needed.
170	Karotoya	89.42217	24.84446			Re-excavation needed.
171	Karotoya	89.42276	24.84586			Re-excavation needed.
172	Dholir beel			Get water from Karotoya		Re-excavation needed.

	Name of the water body	Co-ordinate		Problem/Connectivity	Present situation of water flow	Mitigation / work needed
		Longitude	Latitude			
173	Dhondhonia beel	89.41430	24.86742	Get water from Karotoya and Bangali		Re-excavation needed.
174	Dhondhonia beel	89.41386	24.86840			Re-excavation needed.
175	Nolar beel	89.41061	24.86907	Get water from Karotoya		Re-excavation needed.
176	Kusar beel	89.42342	24.87745	Get water from Karotoya and Bangali via Dhondhonia beel		Re-excavation needed.
177	Upar danga beel	89.42840	24.86907	Get water from Karotoya and Bangali via Dhondhonia beel and Kusar beel		Re-excavation needed.
178	Nurail beel	89.39532	24.91359	Get water from Karotoya and Bangali		Re-excavation needed.
179	Nurail beel	89.39527	24.91603			Re-excavation needed.
180	Nurail beel	89.39503	24.91614			Re-excavation needed.
181	Marajan khal	89.41873	24.90452			Re-excavation needed.
182	Singar beel	89.42564	24.90241	Get water from Bangali River		Re-excavation needed.
183	Do beel	89.42564	24.90241	Get water from Bangali River	Merged with Singar beel	Re-excavation needed.
184	Hapania -Shaghat beel	89.44408	24.90150	Get water from Singer		Re-excavation needed.
185	Naruamala khal	89.45493	24.90198			Re-excavation needed.
186	Icamoti river	89.46289	24.90291			Re-excavation needed.
188	Gorar beel	0.5 km east-north from 1006				Re-excavation needed.
189	Nizkakza beel	89.48751	24.93151	Get water from Bangali River		Re-excavation needed.
191	Suk daho khal	89.51324	24.94915			Re-excavation needed.
192	Boira khal	89.53643	24.96608			Re-excavation needed.

	Name of the water body	Co-ordinate		Problem/Connectivity	Present situation of water flow	Mitigation / work needed
		Longitude	Latitude			
193	Suk daho beel	0.5 km north from 1010		Get water from Bangali River		Re-excavation needed.
194	Mahicharan beel	89.46846	24.91093			Re-excavation needed.
195	Branch of Icamoti	89.48320	24.87175			Re-excavation needed.
196	Branch of Icamoti	89.49667	24.86076			Re-excavation needed.
197	Branch of Icamoti	89.50040	24.85955			Re-excavation needed.
198	Branch of Icamoti	89.50349	24.85308			Re-excavation needed.
199	Branch of Icamoti	89.50686	24.85143			Re-excavation needed.
200	Bejora beel	89.39543	24.81822			Re-excavation needed.
201	Khaura jan beel	89.45013	24.79272			Re-excavation needed.
202	Khaura jan beel	89.45725	24.78784			Re-excavation needed.
203	Machbari beel	89.46482	24.78668			Re-excavation needed.
204	Sonaikhali khal	89.49549	24.77695	Meet with Bangali at 1.5 km south-west		Re-excavation needed.
205	Bangali	89.49316	24.75472			Re-excavation needed.
206	Nimgachi beel	89.50155	24.75198			Re-excavation needed.
207	Nimgachi khal	89.51022	24.75119	Meet with Bangali at 0.25 km north-west		Re-excavation needed.
208	Nander para khal	89.51787	24.75032			Re-excavation needed.
209	Chara gari Matchra	89.53926	24.77685			Re-excavation needed.
210	khal	89.55307	24.79847			Re-excavation needed.

	Name of the water body	Co-ordinate		Problem/Connectivity	Present situation of water flow	Mitigation / work needed
		Longitude	Latitude			
211	Kutubpur khal	89.58432	24.80751			Re-excavation needed.
212	Kutubpur khal	89.58185	24.80804			Re-excavation needed.
213	Branch of Bangali	89.56434	24.80184			Re-excavation needed.
214	Bangali river	89.56655	24.80478			Re-excavation needed.
215	Bangali and kutubpur meet point	89.56491	24.80923			Re-excavation needed.
216	Kazla beel	2 km north- east from 1042				Re-excavation needed.
217	Meet point of Kazla and kutubpur khal	89.56628	24.80983			Re-excavation needed.
218	Kholsha bari beel	89.57743	24.80746	Connected with Kutubpur khal during rainy season		Re-excavation needed.
219	Meet point of Manos river and kutubpur khal	89.58508	24.80691			Re-excavation needed.
220	Kutubpur - Manos beel	89.58766	24.81208	Merged with Manos river		Re-excavation needed.
221	Kutubpur - Manos beel	89.58769	24.81228	Merged with Manos river		Re-excavation needed.
222	Branch of Belai river	89.57469	24.86299			Re-excavation needed.
223	Bangali river	89.57147	24.86721			Re-excavation needed.
224	Molar beel	89.57145	24.87070	Closed		Re-excavation needed.
225	Deuli beel	89.57267	24.91768			Re-excavation needed.

	Name of the water body	Co-ordinate		Problem/Connectivity	Present situation of water flow	Mitigation / work needed
		Longitude	Latitude			
226	Vagir beel	89.55803	24.92871	Get water from Bangali and again meet with Bangali via Deuli beel and Taijur para khal		Re-excavation needed.
227	Taijur para khal	89.56252	24.92269			Re-excavation needed.
228	Taijur para khal	89.56242	24.91901			Re-excavation needed.
229	Meet point of Bangali and Taijur para khal	89.56255	24.91980			Re-excavation needed.
230	Bangali river	89.56763	24.89481			Re-excavation needed.
231	Manos river	89.58050	24.80426			Re-excavation needed.

Appendix 1

Write-up on the fisheries potential assessment and requirements for effective fish migration

Fish migration pattern in the Jamuna river dependent area:

On the basis of the fish behavior, mainly related to migration and reproduction, the fish species of the Jamuna river can be divided in two groups: "whitefish" and "blackfish" (Sao-Leang and Dom Saveun, 1955). "Blackfish" species are able to tolerate the de-oxygenated water conditions of dry season floodplain water-bodies and may spend most of their lives in a single water-body. These include species such as snakeheads (Channidae), catfish (Heteropneustidae) and climbing perch (Anabas testudineus). "Whitefish" migrate upstream and laterally to the inundated floodplains adjacent to the river channel in the late dry season or early rainy season in order to spawn in the nutrient-rich waters. The eggs and larvae of these species are drifting downstream and are entering the floodplain with the floodwater, where they feed on the developed plankton. At the end of the rainy season, the adults and young of the year escape/migrate to the main river channel in order to avoid the harsh conditions of the floodplain during the dry season.

Migration and spawning of the major carp in Bangladesh was first studied by Tsai and Ali in 1983-85 (Tsai & Ali, 1986). They found that the major carp in Bangladesh was comprised of three stocks: the Brahmaputra stock, Padma stock and the Upper Meghna stock. The Brahmaputra stock is the largest stock in Bangladesh, and its spawning grounds are located in the Southern tributaries of the Brahmaputra river in the Assam Hills and Letha Range, Assam, India (Alikhuni, 1957 and Jhingran, 1991). Upstream migration of adult major carps in the Jamuna/Brahmaputra River starts in March, coinciding with the gradual rise of water level. Spawning starts in May, with the onset of the Southwest monsoon, and continues until the end of July (Azadi, 1985, Shaha and Haque, 1976 and Tsai and Ali, 1986).

Timing of fish migration:

15 March - Broodstock (berried fish) starts migration towards upstream

15 April to 30 May - Most of the matured broods complete either partial or full breeding i.e. eggs/spawn, so need connectivity with the adjacent floodplains to facilitate drifting downstream migration.

01 to 30 July - Most of the fingerlings enter into the floodplains. After that, only lately recruited spawn/eggs drifted down to the floodplain.

15 September to 30 October - Adults and young fishes migrate to the main river channel.

Criteria for fish migration:

A very little information on the swimming and migration pattern of the fish and shrimp species is available. Considering all the limitation a detail study has carried out on the species life cycle and habitat, their migration pattern, responses to the water velocity, spawning season, seasonal occurrence and abundance, tidal condition, water depth, hydrological parameters, etc. by IUCN in 2005 (Chowdhury, M.S.M., 2005).

Fish migration is most commonly brought about by a behavioral response to currents. However, the nature of this response can change during the life cycle of the species. The most fundamental change is between active upstream migration, usually undertaken by adults moving to their spawning grounds, and the passive or combined active/passive downstream migrations of juveniles. River discharge provides the essential directional cues to physiologically prepared fishes to move upstream, whilst also offering increased resistance to progress. Some fish tend to follow their migratory pathways against the resistance of the current in one of two ways. Pelagic and some near bottom dwelling species move near the surface of the water, Illumination and not the time of day is the principal criterion for movement, hence the fullness of the moon is important in determining the timing of migrations. Species which rely upon mainly tactile orientation, for many of the catfishes, move against the current close to the bottom or near the banks at night. The moon or other sources of light can inhibit migratory movement of these species.

The early floods are not only important for transporting carp hatchlings, but they also carry a large number of other species. The development and drift of other species, such as *Chanda spp.,* and *Glossogobius spp.* and species of prawn correspond to later peaks in river discharge in August and September. Early water flow in March-April from the upper regime also influences the downstream migration of the prawn brood.

Fish normally migrate at an intermediate cruising speed and only rarely at maximum speed. If water velocity in the main river channel exceeds their swimming ability, the fish will move closer to the bank where velocities are generally slower. The presence of turbulence or whirlpools tends to disorientate the fish. The swimming speeds of bottom fish tend to be rather lower than those of pelagic species, of the order of 0.5-1.0 times the body length sec^{-1} compared to 3-4 times the body length sec^{-1} for pelagic species. Nevertheless, the rate of progress upstream is often similar, since the bottom fish are moving in slower currents.

Water velocity is the main initial stimulus to upstream migration, and there are two indices which define the ability of the current to stimulate movement and the ability of the fish to respond. These are ***Threshold water Velocity (V_{thr}) the minimum water velocity which lead to an orientation reaction against the current (value remain between 1-30cm sec^{-1})*** *and* ***Critical Velocity (V_{cr}) at which minimum water velocity fish begin to be carried away by the water flow.*** The V_{thr} and V_{cr} vary with size of fish and also according to the species or category of fish. Typically, bottom dwellers have critical velocities 2-3 times lower than those for species living in mid or upper level of the water column. For these species there is a tendency for threshold velocities to be high and critical velocities to be low. The reverse is true for pelagic species.

Fish are also generally attracted to faster currents: attracting velocities are frequently 0.6-0.8 m sec^{-1} of the V_{cr}. For a wide selection it could be 0.7-0.9 m sec^{-1} (Malevanchik and Nikonorov, 1984)i.e. 1.0 meter/sec. But maximum water velocity need to the orientation of the fish movement is generally remains within 0.3 meter sec^{-1} (approximately). *Critical velocity (V_{cr}) of current should be in between 0.6-0.8 meter sec^{-1} (approximately).* Minimum water depth will be required 0.8-1.0 meter in both side of the structure. Head difference should be maintained as 1-1.2 meter.

One final factor which is known to affect the performance and response of migratory fishes to water velocity is temperature. Maximum swimming speed affects both by temperature and length of the fish. The higher the temperature and length of the fish

species the higher of current velocity and faster the swimming speed of the fish. **The hydrostatic pressure caused by head difference across water control structures may sometimes be sufficient to kill hatchlings and berried fish female.**

Effectivity of the fish migration through fish pass:

Effectivity of the fish pass structure depends on the timing for hatchlings migration and fish mortality rate. The figures given in the following table showed effectivity (%) of the proposed fish passes at different invert level (LWL of the Jamuna river at Jamuna Bridge):

Period	L.W.L of Jamuna at EGB Year (2000-09) (mPWD)	Flood Plain Level (mPWD)	Proposed Invert level (mPWD)	Depth of Canal from Flood Plain (m)	Percentage of Effectivity	Age of fish
Col 1	Col 2	Col 3	Col 4 (Col 2-1.0 to 1.2 m)	Col 5 (Col 3-Col 4)	Col 6	Col 7
01 Apr	5.90	11.00	4.90	6.10	0%	-
15 Apr	6.60	11.00	5.60	5.40	100%	Eggs/spawn
01 May	7.50	11.00	6.50	4.50	90%	Eggs/spawn
15 May	7.80	11.00	6.80	4.20	75%	Eggs/spawn
01 Jun	8.40	11.00	7.40	3.60	50%	Eggs/spawn
15 Jun	8.85	11.00	7.85	3.15	25%	Eggs/spawn
30 Jun	9.40	11.00	8.40	2.60	10%	Eggs/spawn
15 Sep	10.40	11.00	9.40	1.60	100%	Young/Adult
30 Sep	10.60	11.00	9.60	1.40	100%	Young/Adult
15 Oct	9.50	11.00	8.50	2.50	90%	Young/Adult

* Minimum water depth required in canal/khal 1-1.2 m with velocity <1m/sec

Basis and Assumptions for Estimating the Increased Fish Production (discussed in Section 9.4.1.6)

1. Fish and Fisheries Resources Projection Methodology:

Proposed interventions of the RMIP will have impact on the following Important Environmental Components (IEC) of the fish and fisheries resources: Fish habitat, Fish productivity, Fish production, Fish migration and Fish diversity. Among these IECs, quantitative projection was carried out on the impacts on Fish habitat, Fish productivity and Fish production. Potential impacts on other two IECs i.e. Fish migration and Fish diversity has measured qualitatively in different sections of the impact assessment chapter. These quantifications have been done considering two potential scenarios that could happen, which are - FWIP-without EMP (Future with Project-without EMP) and FWIP-with EMP (Future with project-with EMP).

Future projection of the selected IECs has been done based on the trend analysis done during this EIA and also other studies done in Bangladesh. The findings of the trend analysis and the future projection have then been amalgamated with expert judgment to make it realistic given emphasis on the type of the proposed interventions of the project and mode of operation. The trend analysis has been done using best fitted curve method that fits with the 30 years of historical data (1982-2012) on fish habitat, fish productivity and fish production of the project area published by FRSS (Fisheries Resources Survey System) and the regression factors has been used to project another 20 years (up to 2032), which is reasonably viable to estimate the impacts of the RMIP at the given scenarios. Different assumptions have been superimposed on the projected curves generated for bonding with the likelihood of the impacts of the proposed interventions. The methodology used in assessing the project impact on the fish and fisheries resources has done following the steps described in the Chowdhury, M. S. M., 2009[5]. This similar method has been used in other similar impact assessment studies of Bangladesh.

1.1 Assumptions

Each resource projection work needs to make some assumptions to adjust with real time scenarios. Considering all of the limiting factors related to projecting fisheries resources four (4) assumptions were made for each of the two scenarios to conduct the fish forecasting up to 2032. However, assumptions given as follows have been verified through stakeholder consultations and Key Informant Interviews before using in the estimation. The impacts of similar other projects e.g. FCDI/FCD, River Bank Protection, River Restoration and Dredging, etc. in other aquatic areas were also compared during finalizing the assumptions. The assumptions were:

1.1.1 Scenario 01: FWIP-without EMP

Assumption 1: Baseline production scenario (2012) was considered as the best scenario in the recent past when estimating the moderate productivity rate of the different fish habitats.

Assumption 2: Area of the riverine fish habitats of the project influence area (Jamuna river and its Kole/embayments) will remain constant, whereas countryside fish habitats, i.e. Canals, Beel, Flood plain and Pond areas will be changed.

Assumption 3: Natural declining trend of fish production will continue at its current tendency that happened due to loss of connectivity between the Jamuna River and its flood plains (including canals and beels) after construction of the BRE.

Assumption 4: Area of culturable and derelict ponds will shift gradually into the culture ponds category and hence the production rate will also increase.

1.1.2 Scenario B: FWIP-with EMP

Assumption 1: Country best average production scenario for different habitat types was considered as the best when estimating the moderate expansion rate of different fish habitats of the project influence area.

[5] Chowdhury, M.S.M., 2009. FISHERIES RESOURCES PROJECTION ALONG WITH DEVELOPMENT OF METHODOLOGY TO ASSESS FISH WATER DEMAND IN BANGLADESH FOR 2050. M.Sc Dissertation under the M.Sc Programme on the Aquatic Resources Development (ARD), Institute of Aquaculture (IoA), University of Stirling (UoS), Stirling, United Kingdom, Year 2008-09, Reg. 1425844.

Assumption 2: Area of the capture fish habitats of the project influence area, i.e. the Jamuna river and its Kole/embayments, Canals, Beel and Floodplain will remain constant, whereas area of the culture fish habitats i.e. Culture ponds will be increased.

Assumption 3: Natural declining trend of fish production will be stopped and perform reversely (i.e. increasing trend) due to the restoration of the lost connectivity between the Jamuna River and its flood plains (including canals and beels).

Assumption 4: Area of culturable and derelict ponds will shift gradually into the culture ponds category and hence the production rate will also increase. Moreover, the availability of wild fish fry from the Jamuna river will ensure higher production rate.

1.2 Steps of estimation

Both national and regional fish production, habitat area and the production rate for different years have been projected for different fisheries categories. Marine fisheries production has been calculated separately and not included in the regional estimation due to its wide biological dimensions.

The steps used in the projection estimation were as follows:

Step 1: Converted regional fisheries resources data were arranged in a time series order (1981-2012) for 30 years in excel sheet for each region by habitat type. (Table 2)

Step 2: Trend (best fitted curve) analysis was carried out using above mentioned historical time series data to make projections for the future. In most of the cases linear regression projection was taken as the best curve fitted for resources forecasting of the regional fish habitats. The equations, those have given the most significant value of R^2 were considered as the best for future projection. (Table 2)

Step 3: A common projection tabulator table was developed for minimizing error in projection estimation. The regression equations, those generated from the excel trend line analysis were used in the tabulator table for projecting the following years. In that case, if trend analysis was done using 30 years' data (30 representing the year 2012) than the tabulation would use 31 for projecting the resources of the year 2013 and so on. (Table 2)

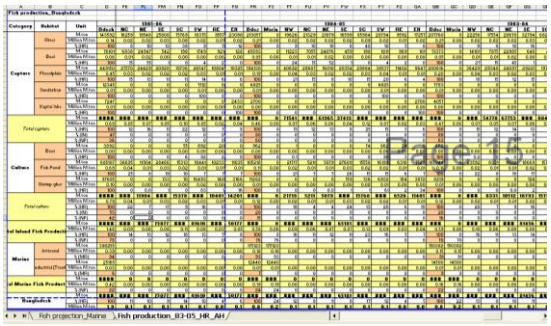
Step 4: The estimated results generated from trend analysis were adjusted with the national development plans/strategies and also with the proposed interventions (Table 2). The best historical fish production rate for each habitat type was used as the checking point for unrealistic production curves at regional level. Flat production rate was imposed in cases where negative and unrealistic trends were found. Additionally, over optimistic results those were derived from the best-fitted curve analyses have been discarded and balanced either by:

- best year production rate of that habitat in the region where the project located; or
- imposing the value of government sectoral strategies, future development plans and project interventions.

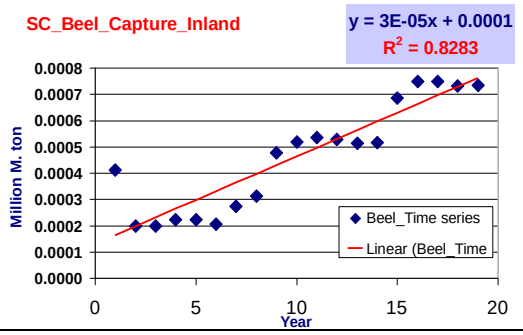
Step 5: Level of accuracy of the projected result was checked with the normal trend of production of the FRSS published data for the consecutive years till now and other projection works. (Table 2)

Table 2: Dummy figures of the five steps of fish impact assessment projections

Step 1: Data arrangement in time series (30 yrs) order



Step 2: Trend analysis using best fitted curve



Step 3: Using R^2 value and the best fitted equation in the tabulation sheet

	A	B	C	D	E	F	G	H
1	Fish production_projection _SC (Mil ton)		20 Yr_TS	28	38	48	57	
2			10 Yr_TS	22	32	42	51	
3	Category	Habitat	2001-02	2010-2011	2020-21	2030-31	2040-41	2050
4	Capture fisheries	River	0.061	0.074	0.089	0.104	0.118	0
5		Beel	0.001	=0.00003*D1+	0.0016	0.0020	0.0023	0.0
6		Floodplain	0.05	0.0001	0.09	0.11	0.13	
7								

Step 4: Checking and smoothening unrealistic and overoptimistic results

Category	Habitat	Baseline 2001	2010	2020	2030	2040	2050
Capture	River	0.005	0.005	0.005	0.005	0.005	0.005
	Beel	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003
	Floodplain				0.02	0.02	0.02
	Sundarbans				0.00	0.00	0.00
	Kaptai lake				0.02	0.02	0.02
	Sub-total=				0.04	0.04	0.04
Culture	Baor	0.0	0.0	0.0	0.0	0.0	0.0
	Fish pond	0.06	0.08	0.12	0.15	0.19	0.22
	Shrimp gher	0.02	0.03	0.05	0.06	0.08	0.09
	Sub-total=	0.08	0.12	0.17	0.22	0.26	0.31
Eeastern Hill	Total	0.11	0.14	0.18	0.22	0.26	0.30

SMC: River produciton of EH will be constant as linear projection shows negative trend which is not realistic.

Step 5: Level of accuracy checking

Level of Accuracy

Fisheries Category	Data type	2001-02	2002-03	2003-04	2004 05	2010	2020	2030	2040	2050
Capture	Projected	-	0.7	0.7	0.9	1.0	1.2	1.5	1.7	2.0
	Actual	0.7	0.7	0.7	0.9	-	-	-	-	-
Culture	Projected	-	0.9	0.9	0.9	1.2	1.8	2.3	2.8	3.3
	Actual	0.8	0.9	0.9	0.9	-	-	-	-	-
Inland Total	Projected	-	1.6	1.6	1.7	2.2	3.0	3.8	4.5	5.3
	Actual	1.5	1.6	1.6	1.7	-	-	-	-	-
Marine Total	Projected	-	0.4	0.5	0.5	0.5	0.6	0.7	0.8	0.9
	Actual	0.4	0.4	0.5	0.5	-	-	-	-	-
National	Projected	-	2.0	2.1	2.2	2.6	3.6	4.5	5.3	6.2
	Actual	1.9	2.0	2.1	2.2	-	-	-	-	-

Accuracy level is highly satisfactory

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Annex H. Emission Factors

Citation in main text (Volume I): **Section 9.4.3.2**.

Emission Factors for Equipment to be Used during Construction

Equipment	Emission Factors (lb/hr)							
	ROG	CO	NO_X	SO_X	PM	CO_2	CH_4	N_2O
Concrete Mixer								
Concrete Static Mixer 0.25 M3	0.0075	0.0386	0.0475	0.0001	0.0023	6.3	0.0007	0.0003048
Concrete Vibrator	0.0075	0.0386	0.0475	0.0001	0.0023	6	0.0007	0.0003048
Concrete Batching Plant (Computerized)								
Batch/Mix RCC Plant 500 m3/hr	0.1525	0.5829	0.9172	0.0010	0.0851	83.1	0.0138	0.0061903
Asphalt Plant								
Capacity 20 Ton	0.1927	0.5215	0.4545	0.0006	0.0462	44.0	0.0174	0.0078241
Bull-Dozer								
Komatsu D-85	0.2545	0.7124	2.1985	0.0021	0.0942	183	0.0230	0.0103347
Bull-Dozer 90 HP	0.2209	0.8528	1.6304	0.0015	0.0945	129	0.0199	0.0089691
Bull-Dozer 120 HP	0.2209	0.8528	1.6304	0.0015	0.0945	129.5	0.0199	0.0089691
Bull-Dozer 200 HP	0.2545	0.7124	2.1985	0.0021	0.0942	183	0.0230	0.0103347
Front End Loader								
Front End Loader 1.5 M3	0.1045	0.4187	0.6404	0.0007	0.0576	58.9	0.0094	0.0042419
Front End Loader 2.5 M3	0.1312	0.6288	1.0135	0.0012	0.0583	106	0.0118	0.0053287
Front End Loader 3.00 M3	0.1330	0.3838	1.3129	0.0017	0.0462	149	0.0120	0.0054
Grader								
Road Roller								
Tandem Roller (10 Ton to 12 Ton)	0.0392	0.3801	0.2647	0.0007	0.0137	59.0	0.0035	0.0015925
Tandem Vibratory Roller 1.5 Ton	0.0392	0.3801	0.2647	0.0007	0.0137	59.0	0.0035	0.0015925
Dumpers/Trucks								
Truck Mercedes 10W (500 ft^3 (14.16 M^3) Capacity)	0.1533	0.7593	1.1072	0.0014	0.0666	125	0.0138	0.0062243
Dumper 10 Ton Capacity	0.1533	0.7593	1.1072	0.0014	0.0666	125	0.0138	0.0062243
Excavator (Chain Excavator)								
Hitachi 220	0.1183	0.5220	0.7300	0.0009	0.0657	73.6	0.0107	0.0048023
Hitachi 200	0.1183	0.5220	0.7300	0.0009	0.0657	73.6	0.0107	0.0048023
Power Generators								
150 KVA	0.0157	0.0698	0.1063	0.0002	0.0061	10.2	0.0014	0.0006363
250 KVA	0.0276	0.0951	0.1632	0.0002	0.0096	17.6	0.0025	0.0011217
Diesel Delivery Truck								
Diesel Delivery Truck with 100 mm (4 “) diameter Pump, 6000 Liters	0.034	0.3304	0.0336	0.0004	0.0036	44.094	0.0032	0.002
Diesel Delivery Truck with 100 mm (4") Diameter Pump, 10,000 Liters (Capacity)	0.034	0.3304	0.0336	0.0004	0.0036	44.094	0.0032	0.002
Bitumen Distributor Truck								
Capacity 2000 Ton	0.034	0.3304	0.0336	0.0004	0.0036	44.094	0.0032	0.002
Dewatering Pump								
Dewatering Pump with Delivery Pipe 4" Ø (Diesel)	0.0386	0.1051	0.1803	0.0002	0.0117	19.5	0.0035	0.0015671

Equipment	Emission Factors (lb/hr)							
	ROG	CO	NO_X	SO_X	PM	CO_2	CH_4	N_2O
Asphalt Recycling & Cold Milling Machine								
Asphalt Recycling Machine	0.0185	0.0632	0.1170	0.0002	0.0045	15.3	0.0017	0.0007518

Source: US South Coast Air Quality Management District - OFFROAD Model Mobile Source Emission Factors (http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook/off-road-mobile-source-emission-factors).

Annex I. Environmental Codes of Practice

Citation in main text (Volume I): **Section 9.4.3.2**.

ECoP 1: Waste Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
General Waste	Soil and water pollution from the improper management of wastes and excess materials from the construction sites.	The Contractor shall • Develop waste management plan for various specific waste streams (e.g., reusable waste, flammable waste, construction debris, food waste etc.) prior to commencing of construction and submit to CSC for approval. • Organize disposal of all wastes generated during construction in an environmentally acceptable manner. This will include consideration of the nature and location of disposal site, so as to cause less environmental impact. • Minimize the production of waste materials by 3R (Reduce, Recycle and Reuse) approach. • Segregate and reuse or recycle all the wastes, wherever practical. • Prohibit burning of solid waste • Collect and transport non-hazardous wastes to all the approved disposal sites. Vehicles transporting solid waste shall be covered with tarps or nets to prevent spilling waste along the route • Train and instruct all personnel in waste management practices and procedures as a component of the environmental induction process. • Provide refuse containers at each worksite. • Request suppliers to minimize packaging where practicable. • Place a high emphasis on good housekeeping practices. • Maintain all construction sites in a cleaner, tidy and safe condition and provide and maintain appropriate facilities as temporary storage of all wastes before transportation and final disposal.
Hazardous Waste	Health hazards and environmental impacts due to improper waste	The Contractor shall • Collect chemical wastes in 200 liter drums (or similar sealed container), appropriately labeled

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	management practices	for safe transport to an approved chemical waste depot. • Store, transport and handle all chemicals avoiding potential environmental pollution. • Store all hazardous wastes appropriately in bunded areas away from water courses. • Make available Material Safety Data Sheets (MSDS) for hazardous materials on-site during construction. • Collect hydrocarbon wastes, including lube oils, for safe transport off-site for reuse, recycling, treatment or disposal at approved locations. • Construct concrete or other impermeable flooring or secondary containment to prevent seepage in case of spills

ECoP 2: Fuels and Hazardous Goods Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Fuels and hazardous goods.	Materials used in construction have a potential to be a source of contamination. Improper storage and handling of fuels, lubricants, chemicals and hazardous goods/materials on-site, and potential spills from these goods may harm the environment or health of construction workers.	The Contractor shall • Prepare spill control procedures and submit the plan for CSC approval. • Train the relevant construction personnel in handling of fuels and spill control procedures. • Store dangerous goods in bunded areas on a top of a sealed plastic sheet away from watercourses. • Refueling shall occur only within bunded areas. • Make available MSDS for chemicals and dangerous goods on-site. • Transport waste of dangerous goods, which cannot be recycled, to a designated disposal site approved by DoE. • Provide absorbent and containment material (e.g., absorbent matting) where hazardous material are used and stored and personnel trained in the correct use. • Provide protective clothing, safety boots, helmets, masks, gloves, goggles, to the

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		construction personnel, appropriate to materials in use. • Make sure all containers, drums, and tanks that are used for storage are in good condition and are labeled with expiry date. Any container, drum, or tank that is dented, cracked, or rusted might eventually leak. Check for leakage regularly to identify potential problems before they occur. • Store hazardous materials above flood plain level. • Put containers and drums in temporary storages in clearly marked areas, where they will not be run over by vehicles or heavy machinery. The area shall preferably slope or drain to a safe collection area in the event of a spill. • Put containers and drums in permanent storage areas on an impermeable floor that slopes to a safe collection area in the event of a spill or leak. • Take all precautionary measures when handling and storing fuels and lubricants, avoiding environmental pollution. • Avoid the use of material with greater potential for contamination by substituting them with more environmentally friendly materials. • Return the gas cylinders to the supplier. However, if they are not empty prior to their return, they must be labeled with the name of the material they contained or contain, information on the supplier, cylinder serial number, pressure, their last hydrostatic test date, and any additional identification marking that may be considered necessary.

ECoP 3: Water Resources Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Hazardous Material and Waste	Water pollution from the storage, handling and disposal of hazardous materials and	The Contractor shall • Follow the management guidelines proposed in ECPs 1 and 2.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	general construction waste, and accidental spillage	• Minimize the generation of sediment, oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes). These substances must not enter waterways, storm water systems or underground water tables
Discharge from construction sites	During construction both surface and groundwater quality may be deteriorated due to construction activities in the river, sewerages from construction sites and work camps. The construction works will modify groundcover and topography changing the surface water drainage patterns of the area including infiltration and storage of storm water. These changes in hydrological regime lead to increased rate of runoff, increase in sediment and contaminant loading, increased flooding, groundwater contamination, and effect habitat of fish and other aquatic biology.	The Contractor shall • Install temporary drainage works (channels and bunds) in areas required for sediment and erosion control and around storage areas for construction materials • Install temporary sediment basins, where appropriate, to capture sediment-laden run-off from site • Divert runoff from undisturbed areas around the construction site • Stockpile materials away from drainage lines • Prevent all solid and liquid wastes entering waterways by collecting solid waste, oils, chemicals, bitumen spray waste and wastewaters from brick, concrete and asphalt cutting where possible and transport to an approved waste disposal site or recycling depot • Wash out ready-mix concrete agitators and concrete handling equipment at washing facilities off site or into approved bunded areas on site. Ensure that tires of construction vehicles are cleaned in the washing bay (constructed at the entrance of the construction site) to remove the mud from the wheels. This shall be done in every exit of each construction vehicle to ensure the local roads are kept clean.
Soil Erosion and siltation	Soil erosion and dust from the material stockpiles will increase the sediment and contaminant loading of surface water bodies.	The Contractor shall • Stabilize the cleared areas not used for construction activities with vegetation or appropriate surface water treatments as soon as practicable following earthwork to minimize erosion • Ensure that roads used by construction vehicles are swept regularly to remove sediment. • Water the material stockpiles, access roads and bare soils on an as required basis to minimize dust. Increase the watering frequency during periods of high risk (e.g. high winds)

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction activities in water bodies	Construction works in the water bodies will increase sediment and contaminant loading, and effect habitat of fish and other aquatic biology.	The Contractor Shall • Dewater sites by pumping water to a sediment basin prior to release off site – do not pump directly off site • Monitor the water quality in the runoff from the site or areas affected by dredge plumes, and improve work practices as necessary • Protect water bodies from sediment loads by silt screen or bubble curtains or other barriers • Minimize the generation of sediment, oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes). These substances must not enter waterways, storm water systems or underground water tables. • Use environment friendly and nontoxic slurry during construction of piles to discharge into the river. • Reduce infiltration of contaminated drainage through storm water management design • Do not discharge cement and water curing used for cement concrete directly into water courses and drainage inlets.
Drinking water	Groundwater at shallow depths is contaminated with arsenic and hence not suitable for drinking purposes.	The Contractor Shall • Pumping of groundwater shall be from deep aquifers of more than 300 m to supply arsenic free water. Safe and sustainable discharges are to be ascertained prior to selection of pumps. • Tube wells will be installed with due regard for the surface environment, protection of groundwater from surface contaminants, and protection of aquifer cross contamination • All tube wells, test holes, monitoring wells that are no longer in use or needed shall be properly decommissioned
	Depletion and pollution of groundwater resources	• Install monitoring wells both upstream and downstream areas near construction yards and construction camps to regularly monitor the water quality and water levels. • Protect groundwater supplies of adjacent lands

ECoP 4: Drainage Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Excavation and earth works, and construction yards	Lack of proper drainage for rainwater/liquid waste or wastewater owing to the construction activities harms environment in terms of water and soil contamination, and mosquito growth.	The Contractor shall • Prepare a program for prevent/avoid standing waters, which CSC will verify in advance and confirm during implementation • Provide alternative drainage for rainwater if the construction works/earth-fillings cut the established drainage line • Establish local drainage line with appropriate silt collector and silt screen for rainwater or wastewater connecting to the existing established drainage lines already there • Rehabilitate road drainage structures immediately if damaged by contractors' road transports. • Build new drainage lines as appropriate and required for wastewater from construction yards connecting to the available nearby recipient water bodies. Ensure wastewater quality conforms to the relevant standards provided by DoE, before it being discharged into the recipient water bodies. • Ensure the internal roads/hard surfaces in the construction yards/construction camps that generate has storm water drainage to accommodate high runoff during downpour and that there is no stagnant water in the area at the end of the downpour. • Construct wide drains instead of deep drains to avoid sand deposition in the drains that require frequent cleaning. • Provide appropriate silt collector and silt screen at the inlet and manholes and periodically clean the drainage system to avoid drainage congestion • Protect natural slopes of drainage channels to ensure adequate storm water drains. • Regularly inspect and maintain all drainage channels to assess and alleviate any drainage congestion problem. • Reduce infiltration of contaminated drainage through storm water management design
Ponding of water	Health hazards due to mosquito breeding	• Do not allow ponding of water especially near the waste storage areas and construction camps

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		• Discard all the storage containers that are capable of storing of water, after use or store them in inverted position

ECoP 5: Soil Quality Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Filling of Sites with dredge spoils	Soil contamination will occur from drainage of dredged spoils	The Contractor shall • Ensure that dredged sand used for land filling shall be free of pollutants. Prior to filling, sand quality shall be tested to confirm whether soil is pollution free. Sediments shall be properly compacted. Top layer shall be the 0.5 m thick clay on the surface and boundary slopes along with grass. Side Slope of Filled Land of 1:2 shall be constructed by suitable soils with proper compaction as per design. Slope surface shall be covered by top soils/ cladding materials (0.5m thick) and grass turfing with suitable grass. • Leaching from the sediments shall be contained to seep into the subsoil or shall be discharged into settling lagoons before final disposal. • No sediment laden water in the adjacent lands near the construction sites, and/or wastewater of suspended materials excessive of 200mg/l from dredge spoil storage/use area in the adjacent agricultural lands.
Storage of hazardous and toxic chemicals	Spillage of hazardous and toxic chemicals will contaminate the soils	The Contractor shall • Strictly manage the wastes management plans proposed in ECP1 and storage of materials in ECP2 • Construct appropriate spill contaminant facilities for all fuel storage areas • Establish and maintain a hazardous materials register detailing the location and quantities of hazardous substances including the storage, use of disposals • Train personnel and implement safe work practices for minimizing the risk of spillage • Identify the cause of contamination, if it is reported, and contain the area of contamination.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		The impact may be contained by isolating the source or implementing controls around the affected site • Remediate the contaminated land using the most appropriate available method to achieve required commercial/industrial guideline validation results
Construction material stock piles	Erosion from construction material stockpiles may contaminate the soils	The Contractor shall • Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, straw bales or bunds

ECoP 6: Erosion and Sediment Control

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Clearing of construction sites	Cleared areas and slopes are susceptible for erosion of top soils, that affects the growth of vegetation which causes ecological imbalance.	• Reinstate and protect cleared areas as soon as possible. • Mulch to protect batter slopes before planting • Cover unused area of disturbed or exposed surfaces immediately with mulch/grass turfings/tree plantations
Construction activities and material stockpiles	The impact of soil erosion are (i) Increased run off and sedimentation causing a greater flood hazard to the downstream, (ii) destruction of aquatic environment in nearby lakes, streams, and reservoirs caused by erosion and/or deposition of sediment damaging the spawning grounds of fish, and (iii) destruction of vegetation by burying or gullying.	The Contractor shall • Locate stockpiles away from drainage lines • Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, straw bales or bunds • Remove debris from drainage paths and sediment control structures • Cover the loose sediments and water them if required • Divert natural runoff around construction areas prior to any site disturbance • Install protective measures on site prior to construction, for example, sediment traps • Control drainage through a site in protected channels or slope drains • Install ‘cut off drains’ on large cut/fill batter slopes to control water runoff speed and hence erosion

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		• Observe the performance of drainage structures and erosion controls during rain and modify as required.

ECoP 7: Top Soil Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Land clearing and earth works	Earthworks will impact the fertile top soils that are enriched with nutrients required for plant growth or agricultural development.	The Contractor shall • Strip the top soil to a depth of 15 cm and store in stock piles of height not exceeding 2m. • Remove unwanted materials from top soil like grass, roots of trees and similar others. • The stockpiles will be done in slopes of 2:1 to reduce surface runoff and enhance percolation through the mass of stored soil. • Locate topsoil stockpiles in areas outside drainage lines and protect from erosion. • Construct diversion channels and silt fences around the topsoil stockpiles to prevent erosion and loss of topsoil. • Spread the topsoil to maintain the physico-chemical and biological activity of the soil. The stored top soil will be utilized for covering all disturbed area and along the proposed plantation sites • Prior to the re-spreading of topsoil, the ground surface will be ripped to assist the bunding of the soil layers, water penetration and revegetation
Transport	Vehicular movement outside ROW or temporary access roads will affect the soil fertility of the agricultural lands	• Limit equipment and vehicular movements to within the approved construction zone • Construct temporary access tracks to cross concentrated water flow lines at right angles • Plan construction access to make use, if possible, of the final road alignment • Use vehicle-cleaning devices, for example, ramps or wash down areas

ECoP 8: Topography and Landscaping

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Land clearing and earth works	Flood plains of the existing Project area will be affected by the construction of various project activities. Construction activities especially earthworks will change topography and disturb the natural rainwater/flood water drainage as well as will change the local landscape.	The Contractor shall • Ensure the topography of the final surface of all raised lands (construction yards, approach roads, access roads, bridge end facilities, etc.) are conducive to enhance natural draining of rainwater/flood water; • Keep the final or finished surface of all the raised lands free from any kind of depression that insists water logging • Undertake mitigation measures for erosion control/prevention by grass-turfing and tree plantation, where there is a possibility of rain-cut that will change the shape of topography. • Cover immediately the uncovered open surface that has no use of construction activities with grass-cover and tree plantation to prevent soil erosion and bring improved landscaping

ECoP 9: Sand Extraction

Project Activity/ Impact Source	**Environmental Impacts**	**Mitigation Measures/ Management Guidelines**
Sand extraction	Sand extraction can potentially impact the aquatic habitat, water quality, and key aquatic species and their food availability.	The Contractor shall: • not extract sand from the river bed in long continuous stretches; alternate patches of river bed will be left undisturbed to minimize the potentially negative impacts on the aquatic habitat (about 50 m of riverbed to be left undisturbed between every 100 m stretch of sand extraction). • not collect large quantities of sand from any single location • not excavate deeper than 2 m at any single location. • not carry out sand extraction near chars that have sensitive habitats • not carry out sand extraction during the night particularly near the chars • obtain approval from CSC before starting sand

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		extraction from any location. • carry out sand extraction from sand bars to the extent possible. • maintain record of all sand extraction (quantities, location shown on map, timing, any sighting of key species) • provide silt fences, sediment barriers or other devices around the extraction areas to prevent migration of sediment rich water in to the river channels. • refuel of barges and boats with a proper care to avoid any spills. • make available spill kits and other absorbent material at refueling points on the barges. • properly collect, treat and dispose the bilge water from of barges, and boats. • regularly service all waterborne plant as per the manufacturer's guidelines and be inspected daily prior to operation. CSC will: • carry out survey of the area prior to sand extraction • identify any sensitive receptors/habitats (eg, turtle nesting area, birds colony) at or near the proposed sand extraction locations. • determine 'no-go' areas for sand extraction, based upon the above survey, • monitor the activity to ensure that the contractor complies with the conditions described earlier. • survey the area after sand extraction to identify any left over impacts.

ECoP 10: Air Quality Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Air quality can be adversely affected by vehicle exhaust emissions and combustion of fuels.	The Contractor shall • Fit vehicles with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition. • Operate the vehicles in a fuel efficient manner

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		• Cover haul vehicles carrying dusty materials moving outside the construction site • Impose speed limits on all vehicle movement at the worksite to reduce dust emissions • Control the movement of construction traffic • Water construction materials prior to loading and transport • Service all vehicles regularly to minimize emissions • Limit the idling time of vehicles not more than 2 minutes
Construction machinery	Air quality can be adversely affected by emissions from machinery and combustion of fuels.	The Contractor shall • Fit machinery with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition in accordance with the specifications defined by their manufacturers to maximize combustion efficiency and minimize the contaminant emissions. Proof or maintenance register shall be required by the equipment suppliers and contractors/subcontractors • Focus special attention on containing the emissions from generators • Machinery causing excess pollution (e.g. visible smoke) will be banned from construction sites • Service all equipment regularly to minimize emissions • Provide filtering systems, duct collectors or humidification or other techniques (as applicable) to the concrete batching and mixing plant to control the particle emissions in all its stages, including unloading, collection, aggregate handling, cement dumping, circulation of trucks and machinery inside the installations
Construction activities	Dust generation from construction sites, material stockpiles and access roads is a nuisance in the environment and can be a health hazard.	• Water the material stockpiles, access roads and bare soils on an as required basis to minimize the potential for environmental nuisance due to dust. Increase the watering frequency during periods of high risk (e.g. high winds). Stored materials such as gravel and sand shall be covered and confined to avoid their being wind-

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		drifted • Minimize the extent and period of exposure of the bare surfaces • Reschedule earthwork activities or vegetation clearing activities, where practical, if necessary to avoid during periods of high wind and if visible dust is blowing off-site • Restore disturbed areas as soon as practicable by vegetation/grass-turfing • Store the cement in silos and minimize the emissions from silos by equipping them with filters. • Establish adequate locations for storage, mixing and loading of construction materials, in a way that dust dispersion is prevented because of such operations • Crushing of rocky and aggregate materials shall be wet-crushed, or performed with particle emission control systems

ECoP 11: Noise and Vibration Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Noise quality will be deteriorated due to vehicular traffic	The Contractor shall • Maintain all vehicles in order to keep it in good working order in accordance with manufactures maintenance procedures • Make sure all drivers will comply with the traffic codes concerning maximum speed limit, driving hours, etc. • Organize the loading and unloading of trucks, and handling operations for the purpose of minimizing construction noise on the work site
Construction machinery	Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment.	The Contractor shall • Appropriately site all noise generating activities to avoid noise pollution to local residents • Use the quietest available plant and equipment • Modify equipment to reduce noise (for example, noise control kits, lining of truck

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		trays or pipelines) • Maintain all equipment in order to keep it in good working order in accordance with manufactures maintenance procedures. Equipment suppliers and contractors shall present proof of maintenance register of their equipment. • Install acoustic enclosures around generators to reduce noise levels. • Fit high efficiency mufflers to appropriate construction equipment • Avoid the unnecessary use of alarms, horns and sirens
Construction activity	Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment.	The Contractor shall • Notify adjacent landholders prior any typical noise events outside of daylight hours • Educate the operators of construction equipment on potential noise problems and the techniques to minimize noise emissions • Employ best available work practices on-site to minimize occupational noise levels • Install temporary noise control barriers where appropriate • Notify affected people if major noisy activities will be undertaken, e.g. pile driving • Plan activities on site and deliveries to and from site to minimize impact • Monitor and analyze noise and vibration results and adjust construction practices as required. • Avoid undertaking the noisiest activities, where possible, when working at night near the residential areas

ECoP 12: Protection of Flora

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Vegetation clearance	Local flora are important to provide shelters for the birds, offer fruits and/or timber/fire wood, protect soil erosion and	The Contractor shall • Reduce disturbance to surrounding vegetation • Use appropriate type and minimum size of machine to avoid disturbance to adjacent vegetation.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	overall keep the environment very friendly to human-living. As such damage to flora has wide range of adverse environmental impacts.	• Get approval from supervision consultant for clearance of vegetation. • Make selective and careful pruning of trees where possible to reduce need of tree removal. • Control noxious weeds by disposing of at designated dump site or burn on site. • Clear only the vegetation that needs to be cleared in accordance with the plans. These measures are applicable to both the construction areas as well as to any associated activities such as sites for stockpiles, disposal of fill and construction of diversion roads, etc. • Do not burn off cleared vegetation – where feasible, chip or mulch and reuse it for the rehabilitation of affected areas, temporary access tracks or landscaping. Mulch provides a seed source, can limit embankment erosion, retains soil moisture and nutrients, and encourages re-growth and protection from weeds. • Return topsoil and mulched vegetation (in areas of native vegetation) to approximately the same area of the roadside it came from. • Avoid work within the drip-line of trees to prevent damage to the tree roots and compacting the soil. • Minimize the length of time the ground is exposed or excavation left open by clearing and re-vegetate the area at the earliest practically possible. • Ensure excavation works occur progressively and re-vegetation done at the earliest • Provide adequate knowledge to the workers regarding nature protection and the need of avoid felling trees during construction • Supply appropriate fuel in the work caps to prevent fuel wood collection

ECoP 13: Protection of Fauna

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction activities	The location of construction activities can result in the loss of wild life habitat and habitat quality,.	The Contractor shall • Limit the construction works within the designated sites allocated to the contractors • check the site for animals trapped in, or in danger from site works and use a qualified person to relocate the animal
	Impact on migratory birds, its habitat and its active nests	The Contractor shall • Not be permitted to destruct active nests or eggs of migratory birds • Minimize the tree removal during the bird breeding season. If works must be continued during the bird breeding season, a nest survey will be conducted by a qualified biologist prior to commence of works to identify and located active nests • Minimize the release of oil, oil wastes or any other substances harmful to migratory birds to any waters or any areas frequented by migratory birds.
Vegetation clearance	Clearance of vegetation may impact shelter, feeding and/or breeding and/or physical destruction and severing of habitat areas	The Contractor shall • Restrict the tree removal to the minimum required. • Retain tree hollows on site, or relocate hollows, where appropriate • Leave dead trees where possible as habitat for fauna • Fell the hollow bearing trees in a manner which reduces the potential for fauna mortality. Felled trees will be inspected after felling for fauna and if identified and readily accessible will be removed and relocated or rendered assistance if injured. After felling, hollow bearing trees will remain unmoved overnight to allow animals to move of their own volition.
Construction camps	Illegal poaching	• Provide adequate knowledge to the workers regarding protection of flora and fauna, and relevant government regulations and punishments for illegal poaching.

ECoP 14: Protection of Fisheries

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction activities in River	The main potential impacts to fisheries are hydrocarbon spills and leaks from riverine transport and disposal of wastes into the river	The Contractor shall • Ensure the riverine transports, vessels and ships are well maintained and do not have oil leakage to contaminate river water. • Contain oil immediately on river in case of accidental spillage from vessels and ships and in this regard, make an emergency oil spill containment plan to be supported with enough equipment, materials and human resources • Do not dump wastes, be it hazardous or non-hazardous into the nearby water bodies or in the river
Construction activities on the land	The main potential impacts to aquatic flora and fauna River are increased suspended solids from earthworks erosion, sanitary discharge from work camps, and hydrocarbon spills	The Contractor shall • follow mitigation measures proposed in ECoP 3 : Water Resources Management and EC4: Drainage Management
	Filling of ponds for site preparation will impact the fishes.	The Contractor shall • Inspect any area of a water body containing fish that is temporarily isolated for the presence of fish, and all fish shall be captured and released unharmed in adjacent fish habitat • Install and maintain fish screens etc. on any water intake with drawing water from any water body that contain fish

ECoP 15: Road Transport and Road Traffic Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Increased traffic use of road by construction vehicles will affect the movement of normal road traffics and the safety of the road-users.	The Contractor shall • Prepare and submit a traffic management plan to the CSC for his approval at least 30 days before commencing work on any project component involved in traffic diversion and management. • Include in the traffic management plan to ensure uninterrupted traffic movement during construction: detailed drawings of traffic arrangements showing all detours, temporary

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines

		road, temporary bridges temporary diversions, necessary barricades, warning signs / lights, and road signs.
		• Provide signs at strategic locations of the roads complying with the schedules of signs contained in the Bangladesh Traffic Regulations.
		• Install and maintain a display board at each important road intersection on the roads to be used during construction, which shall clearly show the following information in Bangla:
		  • Location: chainage and village name
		  • Duration of construction period
		  • Period of proposed detour / alternative route
		  • Suggested detour route map
		  • Name and contact address/telephone number of the concerned personnel
		  • Name and contact address / telephone number of the Contractor
		  • Inconvenience is sincerely regretted.

	Accidents and spillage of fuels and chemicals	• Restrict truck deliveries, where practicable, to day time working hours. • Restrict the transport of oversize loads. • Operate road traffics/transport vehicles, if possible, to non-peak periods to minimize traffic disruptions. • Enforce on-site speed limit

ECoP 16: River Transport management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction activities in River	The presence of construction and dredging barges, pipe lines and other construction activities in the river can cause hindrance and risks to the river traffic.	The Contractor shall • Not obstruct other normal riverine transport while doing riverine transport and works • Identify the channel to be followed clearly using navigation aids such as buoys, beacons, and lighting • Provide proper buoyage, navigation lights and markings for bridge and dredging works to guide the other normal riverine transport

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		• Keep regular and close contacts with Bangladesh Inland Water Transport Authority (BIWTA) regarding their needs during construction of the project • Plan the river transport and transportation of large loads in coordination with BIWTA to avoid traffic congestions. • Provide signage for river traffic conforming to the BIWTA requirements • Position the dredge and pipeline in such a way that no disruption to the channel traffic will occur
	Accidents	The Contractor shall • Prepare an emergency plan for dealing with accidents causing accidental sinking of the vessels and ships • Ensure sufficient equipment and staffs available to execute the emergency plans • Provide appropriate lighting to barges and construction vessels.

ECoP 17: Construction Camp Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Siting and Location of construction camps	Campsites for construction workers are the important locations that have significant impacts such as health and safety hazards on local resources and infrastructure of nearby communities.	The Contractor shall • Locate the construction camps at areas which are acceptable from environmental, cultural or social point of view. • Consider the location of construction camps away from communities in order to avoid social conflict in using the natural resources such as water or to avoid the possible adverse impacts of the construction camps on the surrounding communities. • Submit to the CSC for approval a detailed layout plan for the development of the construction camp showing the relative locations of all temporary buildings and facilities that are to be constructed together with the location of site roads, fuel storage areas (for use in power supply generators), solid waste management and dumping locations, and drainage facilities, prior to the

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		development of the construction camps. • Local authorities responsible for health, religious and security shall be duly informed on the set up of camp facilities so as to maintain effective surveillance over public health, social and security matters
Construction Camp Facilities	Lack of proper infrastructure facilities , such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	Contractor shall provide the following facilities in the campsites • Adequate housing for all workers • Safe and reliable water supply. Water supply from deep tube wells of 300 m depth that meets the national standards • Hygienic sanitary facilities and sewerage system. The toilets and domestic waste water will be collected through a common sewerage. Provide separate latrines and bathing places for males and females with total isolation by wall or by location. The minimum number of toilet facilities required is one toilet for every ten persons. • Treatment facilities for sewerage of toilet and domestic wastes • Storm water drainage facilities. Both sides of roads are to be provided with shallow v drains to drain off storm water to a silt retention pond which shall be sized to provide a minimum of 20 minutes retention of storm water flow from the whole site. Channel all discharge from the silt retention pond to natural drainage via a grassed swale at least 20 meters in length with suitable longitudinal gradient. • Paved internal roads. Ensure with grass/vegetation coverage to be made of the use of top soil that there is no dust generation from the loose/exposed sandy surface. Pave the internal roads of at least haring-bond bricks to suppress dusts and to work against possible muddy surface during monsoon. • Provide child crèches for women working construction site. The crèche shall have facilities for dormitory, kitchen, indoor and outdoor play area. Schools shall be attached to these crèches so that children are not deprived of education whose mothers are construction workers • Provide in-house community/common

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		entertainment facilities. dependence of local entertainment outlets by the construction camps to be discouraged/prohibited to the extent possible.
Disposal of waste	Management of wastes is crucial to minimize impacts on the environment	The Contractor shall • Ensure proper collection and disposal of solid wastes within the construction camps • Insist waste separation by source; organic wastes in one pot and inorganic wastes in another pot at household level. • Store inorganic wastes in a safe place within the household and clear organic wastes on daily basis to waste collector. Establish waste collection, transportation and disposal systems with the manpower and equipment/vehicles needed. • Dispose organic wastes in a designated safe place on daily basis. At the end of the day cover the organic wastes with a thin layer of sand so that flies, mosquitoes, dogs, cats, rats, are not attracted. One may dig a large hole to put organic wastes in it; take care to protect groundwater from contamination by leachate formed due to decomposition of wastes. Cover the bed of the pit with impervious layer of materials (clayey or thin concrete) to protect groundwater from contamination. • Locate the garbage pit/waste disposal site min 500 m away from the residence so that peoples are not disturbed with the odor likely to be produced from anaerobic decomposition of wastes at the waste dumping places. Encompass the waste dumping place by fencing and tree plantation to prevent children to enter and play with. • Do not establish site specific landfill sites. All solid waste will be collected and removed from the work camps and disposed in approval waste disposal sites.
Fuel supplies for cooking purposes	Illegal sourcing of fuel wood by construction workers will impact the natural flora and fauna	The Contractor shall • Provide fuel to the construction camps for their domestic purpose, in order to discourage them to use fuel wood or other biomass. • Made available alternative fuels like natural gas or kerosene on ration to the workforce to

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		prevent them using biomass for cooking. • Conduct awareness campaigns to educate workers on preserving the protecting the biodiversity and wildlife of the project area, and relevant government regulations and punishments on wildlife protection.
Health and Hygiene	There will be a potential for diseases to be transmitted including malaria, exacerbated by inadequate health and safety practices. There will be an increased risk of work crews spreading sexually transmitted infections and HIV/AIDS.	The Contractor shall • Provide adequate health care facilities within construction sites. • Provide first aid facility round the clock. Maintain stock of medicines in the facility and appoint fulltime designated first aider or nurse. • Provide ambulance facility for the laborers during emergency to be transported to nearest hospitals. • Initial health screening of the laborers coming from outside areas • Train all construction workers in basic sanitation and health care issues and safety matters, and on the specific hazards of their work • Provide HIV awareness programming, including STI (sexually transmitted infections) and HIV information, education and communication for all workers on regular basis • Complement educational interventions with easy access to condoms at campsites as well as voluntary counseling and testing • Provide adequate drainage facilities throughout the camps to ensure that disease vectors such as stagnant water bodies and puddles do not form. Regular mosquito repellant sprays during monsoon. • Carryout short training sessions on best hygiene practices to be mandatorily participated by all workers. Place display boards at strategic locations within the camps containing messages on best hygienic practices
Safety	In adequate safety facilities to the construction camps may create security problems and fire hazards	The Contractor shall • Provide appropriate security personnel (police / home guard or private security guards) and enclosures to prevent unauthorized entry in to the camp area. • Maintain register to keep a track on a head count of persons present in the camp at any

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		given time. • Encourage use of flameproof material for the construction of labor housing / site office. Also, ensure that these houses/rooms are of sound construction and capable of withstanding wind storms/cyclones. • Provide appropriate type of firefighting equipment suitable for the construction camps • Display emergency contact numbers clearly and prominently at strategic places in camps. • Communicate the roles and responsibilities of laborers in case of emergency in the monthly meetings with contractors.
Site Restoration	Restoration of the construction camps to original condition requires demolition of construction camps.	The Contractor shall • Dismantle and remove from the site all facilities established within the construction camp including the perimeter fence and lockable gates at the completion of the construction work. • Dismantle camps in phases and as the work gets decreased and not wait for the entire work to be completed • Give prior notice to the laborers before demolishing their camps/units • Maintain the noise levels within the national standards during demolition activities • Different contractors shall be hired to demolish different structures to promote recycling or reuse of demolished material. • Reuse the demolition debris to a maximum extent. Dispose remaining debris at the designated waste disposal site. • Handover the construction camps with all built facilities as it is if agreement between both parties (contactor and land-owner) has been made so. • Restore the site to its condition prior to commencement of the works or to an agreed condition with the landowner. • Not make false promises to the laborers for future employment in O&M of the project.

ECoP 18: Cultural and Religious Issues

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction activities near religious and cultural sites	Disturbance from construction works to the cultural and religious sites, and contractors lack of knowledge on cultural issues cause social disturbances.	The Contractor shall • Communicate to the public through community consultation and newspaper announcements regarding the scope and schedule of construction, as well as certain construction activities causing disruptions or access restriction. • Do not block access to cultural and religious sites, wherever possible • Restrict all construction activities within the foot prints of the construction sites. • Stop construction works that produce noise (particularly during prayer time) shall there be any mosque/religious/educational institutions close to the construction sites and users make objections. • Take special care and use appropriate equipment when working next to a cultural/religious institution. • Stop work immediately and notify the site manager if, during construction, an archaeological or burial site is discovered. It is an offence to recommence work in the vicinity of the site until approval to continue is given by the CSC/PMU. • Provide separate prayer facilities to the construction workers. • Show appropriate behavior with all construction workers especially women and elderly people • Allow the workers to participate in praying during construction time • Resolve cultural issues in consultation with local leaders and supervision consultants • Establish a mechanism that allows local people to raise grievances arising from the construction process. • Inform the local authorities responsible for health, religious and security duly informed before commencement of civil works so as to maintain effective surveillance over public health, social and security matters

ECoP 19: Worker Health and Safety

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Best practices	Construction works may pose health and safety risks to the construction workers and site visitors leading to severe injuries and deaths. The population in the proximity of the construction site and the construction workers will be exposed to a number of (i) biophysical health risk factors, (e.g. noise, dust, chemicals, construction material, solid waste, waste water, vector transmitted diseases etc.), (ii) risk factors resulting from human behavior (e.g. STD, HIV etc.) and (iii) road accidents from construction traffic.	The Contractor shall • Implement suitable safety standards for all workers and site visitors which shall not be less than those laid down on the international standards (e.g. International Labor Office guideline on 'Safety and Health in Construction; World Bank Group's 'Environmental Health and Safety Guidelines') and contractor's own national standards or statutory regulations, in addition to complying with the national standards of the Government of Bangladesh (e.g. `The Bangladesh Labor Code, 2006') • Provide the workers with a safe and healthy work environment, taking into account inherent risks in its particular construction activity and specific classes of hazards in the work areas, • Provide personal protection equipment (PPE) for workers, such as safety boots, helmets, masks, gloves, protective clothing, goggles, full-face eye shields, and ear protection. Maintain the PPE properly by cleaning dirty ones and replacing them with the damaged ones. • Safety procedures include provision of information, training and protective clothing to workers involved in hazardous operations and proper performance of their job • Appoint an environment, health and safety manager to look after the health and safety of the workers • Inform the local authorities responsible for health, religious and security duly informed before commencement of civil works and establishment of construction camps so as to maintain effective surveillance over public health, social and security matters
	Child and pregnant labor	The Contractor shall • not hire children of less than 14 years of age and pregnant women or women who delivered a child within 8 preceding weeks, in accordance with the Bangladesh Labor Code, 2006
Accidents	Lack of first aid facilities and health	• Provide health care facilities and first aid facilities are readily available. Appropriately

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	care facilities in the immediate vicinity will aggravate the health conditions of the victims	equipped first-aid stations shall be easily accessible throughout the place of work • Document and report occupational accidents, diseases, and incidents. • Prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, so far as reasonably practicable, the causes of hazards. In a manner consistent with good international industry practice. • Identify potential hazards to workers, particularly those that may be life-threatening and provide necessary preventive and protective measures. • Provide awareness to the construction drivers to strictly follow the driving rules • Provide adequate lighting in the construction area and along the roads
Construction Camps	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	The Contractor shall provide the following facilities in the campsites to improve health and hygienic conditions as mentioned in ECoP 17 Construction Camp Management • Adequate ventilation facilities • Safe and reliable water supply. Water supply from deep tube wells that meets the national standards • Hygienic sanitary facilities and sewerage system. The toilets and domestic waste water will be collected through a common sewerage. • Treatment facilities for sewerage of toilet and domestic wastes • Storm water drainage facilities. • Recreational and social facilities • Safe storage facilities for petroleum and other chemicals in accordance with ECoP 2 • Solid waste collection and disposal system in accordance with ECP1. • Arrangement for trainings • Paved internal roads. • Security fence at least 2 m height. • Sick bay and first aid facilities
Water and sanitation facilities at the	Lack of Water sanitation facilities at construction sites cause	• The contractor shall provide portable toilets at the construction sites, if about 25 people are working the whole day for a month. Location

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
construction sites	inconvenience to the construction workers and affect their personal hygiene.	of portable facilities shall be at least 6 m away from storm drain system and surface waters. These portable toilets shall be cleaned once a day and all the sewerage shall be pumped from the collection tank once a day and shall be brought to the common septic tank for further treatment. • Contractor shall provide bottled drinking water facilities to the construction workers at all the construction sites.
Other ECPs	Potential risks on health and hygiene of construction workers and general public	The Contractor shall follow the following ECPs to reduce health risks to the construction workers and nearby community • ECoP 2: Fuels and Hazardous Goods Management • ECoP 4: Drainage Management • ECoP 10: Air Quality Management • ECoP 11: Noise and Vibration Management • ECoP 15: Road Transport and Road Traffic Management • ECoP 16: River Transport management
Trainings	Lack of awareness and basic knowledge in health care among the construction workforce, make them susceptible to potential diseases.	The Contractor shall • Train all construction workers in basic sanitation and health care issues (e.g., how to avoid malaria and transmission of sexually transmitted infections (STI) HIV/AIDS. • Train all construction workers in general health and safety matters, and on the specific hazards of their work Training shall consist of basic hazard awareness, site specific hazards, safe work practices, and emergency procedures for fire, evacuation, and natural disaster, as appropriate. • Commence the malaria, HIV/AIDS and STI education campaign before the start of the construction phase and complement it with by a strong condom marketing, increased access to condoms in the area as well as to voluntary counseling and testing. • Implement malaria, HIV/AIDS and STI education campaign targeting all workers hired, international and national, female and male, skilled, semi- and unskilled occupations, at the time of recruitment and thereafter pursued throughout the construction phase on

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		ongoing and regular basis. This shall be complemented by easy access to condoms at the workplace as well as to voluntary counseling and testing.

Annex J. Assessment of Upstream Impacts

Prepared by: Dr. Dave McLean, River Engineer/River Morphologist
Reviewed by: Knut Oberhagemann, Team Leader, and Sharif Al Kamal, Advisor PMO

Introduction

Purpose

This report summarizes information on potential upstream effects from the physical works that have been planned for the River Management Improvement Program (RMIP)[6]. The effects that have been assessed include:

(i) changes to discharge;
(ii) changes to water levels; and
(iii) changes to channel morphology such as scour, erosion, channel pattern.

The upstream extent of the effects is defined at the border between Bangladesh and India.

Supporting Information

The draft Inception Report, describing the scope of work under the RMIP, was issued on February 17, 2014, and an inception workshop was held on February 25, 2014, followed by the draft final Inception Report on March 12, 2014 and the final version on March 24, 2014.

Technical Note 1 was issued in March 2014. The purpose of this technical note was to assess alternative river bank protection works in terms of their hydraulic design requirements, observed long-term performance, capital cost and maintenance cost, and impacts to the surrounding river channel.

The draft Numerical Modelling Annex was issued in September 2014 and an updated draft was submitted in December. This annex contains results of hydraulic investigations using two dimensional and three dimensional numerical models to assess the effects of various river training structures on local hydrodynamics and scour.

CEGIS issued "Report on Flooding and Drainage Issues along the Brahmaputra Right Embankment" in August 2014. This report summarized information on flooding and drainage issues in the project area and the effects of climate change. Additional hydrological information was compiled in the draft Flood Hydrology Annex, issued in December 2014. This report assessed the hydrological characteristics of the region, the hydrological effect of existing embankment breaches and the effectiveness of the project in reducing the frequency of breaches. Results of one dimensional hydraulic flood modelling carried out by IWM were summarized.

The draft Geomorphology Annex was issued in September 2014 and an updated report was submitted in December 2014. This report provides information on the spatial and temporal pattern of bank erosion along the Jamuna River. It also assessed the effects of planned river training measures on river morphology.

[6] The Program has been renamed from River Bank Improvement Program (RBIP) to River Management Improvement Program (RMIP).

Project Description

Setting

Figure 1 shows the main river systems in Bangladesh. The Brahmaputra River enters Bangladesh from India and from this point it is called the Jamuna River. The Dudhkumar, Dharla, and Teesta Rivers enter the right bank of the Jamuna River just downstream of the India border.

Figure 1 Main rivers of Bangladesh

The Old Brahmaputra River, which was the former main course of the river in the 18th century, branches off from the left bank just upstream of Bahadurabad. The flow into the Old Brahmaputra River has continued to gradually decrease over time in response to this change. The Hurashagar/Baral River enters the Jamuna on its right bank about 30 km upstream of its confluence with the Ganges River.

History of the BRE

The 220 kilometer Brahmaputra Right Bank Embankment (BRE) was constructed in the 1960s from the Teesta Bridge at Kaunia in Rangpur District to Verakola at the outfall of the Hurashagar/Baral River in Pabna District to protect areas along the river from flooding and to improve agricultural production. Prior to construction of the BRE, overbank spills regularly

caused flooding to a 240,000 hectare area. At construction, the BRE was set back approximately 1.5 kilometers from the river bankline.

Bank erosion has continued to attack the BRE, causing it to breach at many locations (Figure 2). At these locations, and at locations not yet breached but under erosion threat, the BRE has been retired from its original alignment (Figure 3). In many places, it has been retired several times. Presently, only 41 kilometers of the original BRE remains intact upstream of Jamuna Bridge, and many long reaches are close to the river bank. Consequently, the integrity of the BRE is threatened and large areas of rural and urban areas are increasingly being exposed to flooding. Since the mid-1990s, the Bangladesh Water Development Board (BWDB) has continued to attempt to stabilize the river bank.

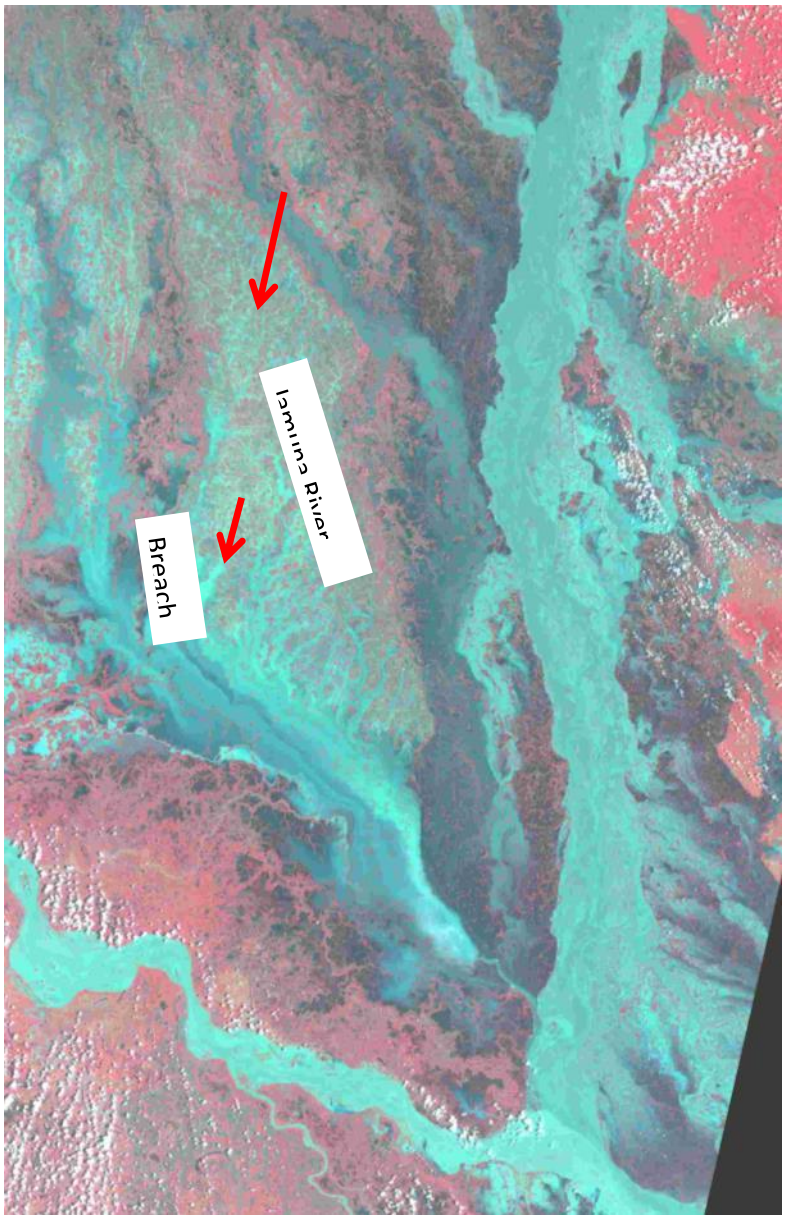

Figure 2: Breach of BRE causing widespread flooding in 1987 shown on Landsat Imagery

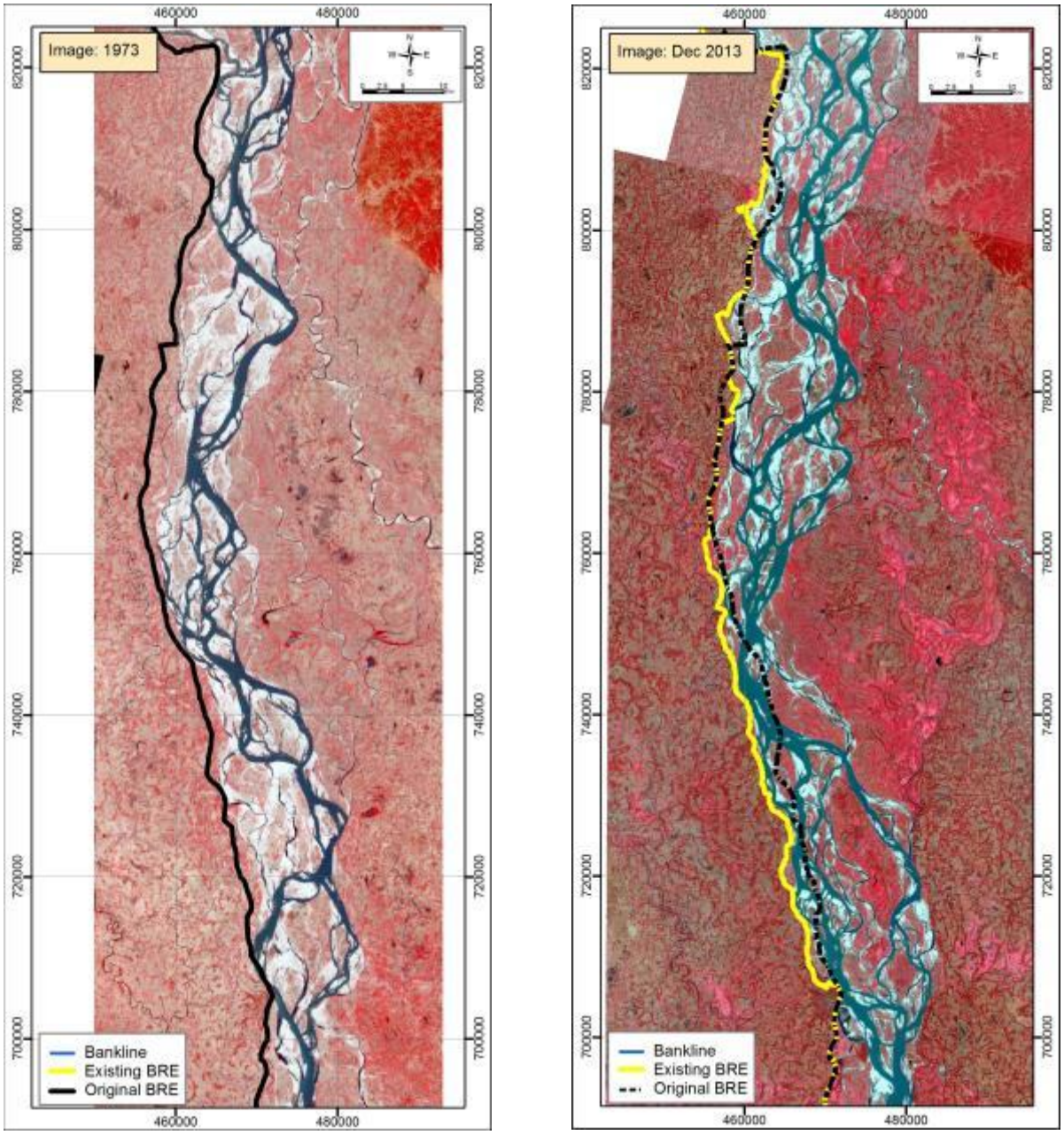

Figure 3: Retirements of BRE from 1973 to 2013

Without Project Scenario

Under the "future without project" scenario, the BRE will continue to be maintained by the BWDB in response to specific erosion threats and breaches. Based on past experience, the embankment in the Priority Reach has failed in two years out of three due to erosion and it is expected that this would continue to occur in the future. River bank protection is presently being constructed by BWDB in response to specific erosion threats. This work is also expected to continue in the "without project" scenario.

River Bank Improvement Program

The primary objective of the River Management Improvement Program (RMIP) is to reconstruct the BRE and to provide systematic river bank protection along the right bank of the Jamuna River to increase the security of the embankment and of related infrastructure against river bank erosion. According to the Terms of Reference (TOR):

> *"…The Consulting Services are divided into two phases (separate contracts): (1) Assignment A: Technical Feasibility Studies and Detailed Design of Initial Batch of Works [Priority Works] and (2) Assignment B: Detailed Design of Rest of the Batches of Works [Remaining Works]".*

The TOR delineated a priority reach:

> *"…starting from the already constructed Sirajganj hard point and proceeding upwards to Kazipur to protect the river bank, and to fix the most suitable BRE alignment for effective protection of the area behind the BRE".*

The program is planned in three phases, largely covering the physical infrastructure for reconstructing of embankment and securing it with riverbank protection consisting of long guiding revetments built alongside the existing riverbank. The 1st phase covers priority works over a length of 50 km which ends some 120km downstream of the border between Bangladesh and India. Phase 2 will cover the remaining physical works, which ends at the Teesta River, some 55km downstream of the border, while the third phase is limited to the construction of a road on the countryside of the embankment. The extent of the works and the phasing are shown in **Figure 4**. Detailed plans and designs have been prepared for works under the 1st phase.

There are two main components to the physical works:

(i) Upgrading the existing embankment, including minor re-alignments to reduce the threat of erosion and raising the embankment crest to achieve a 1:100 level of flood protection, with freeboard and an allowance for climate change. The total planned length of embankment upgrading is 137km of which 50km will be part of Phase I.

(ii) Upgrading the existing river bank protection along the right bank of the river in the Program by using standard guiding revetments. The planned revetments build on existing and BWDB approved works along the right bank, and will maintain a setback of generally 400 m to the embankment. The total length of new revetment is 42 km for the entire Program and 17kmin Phase I.

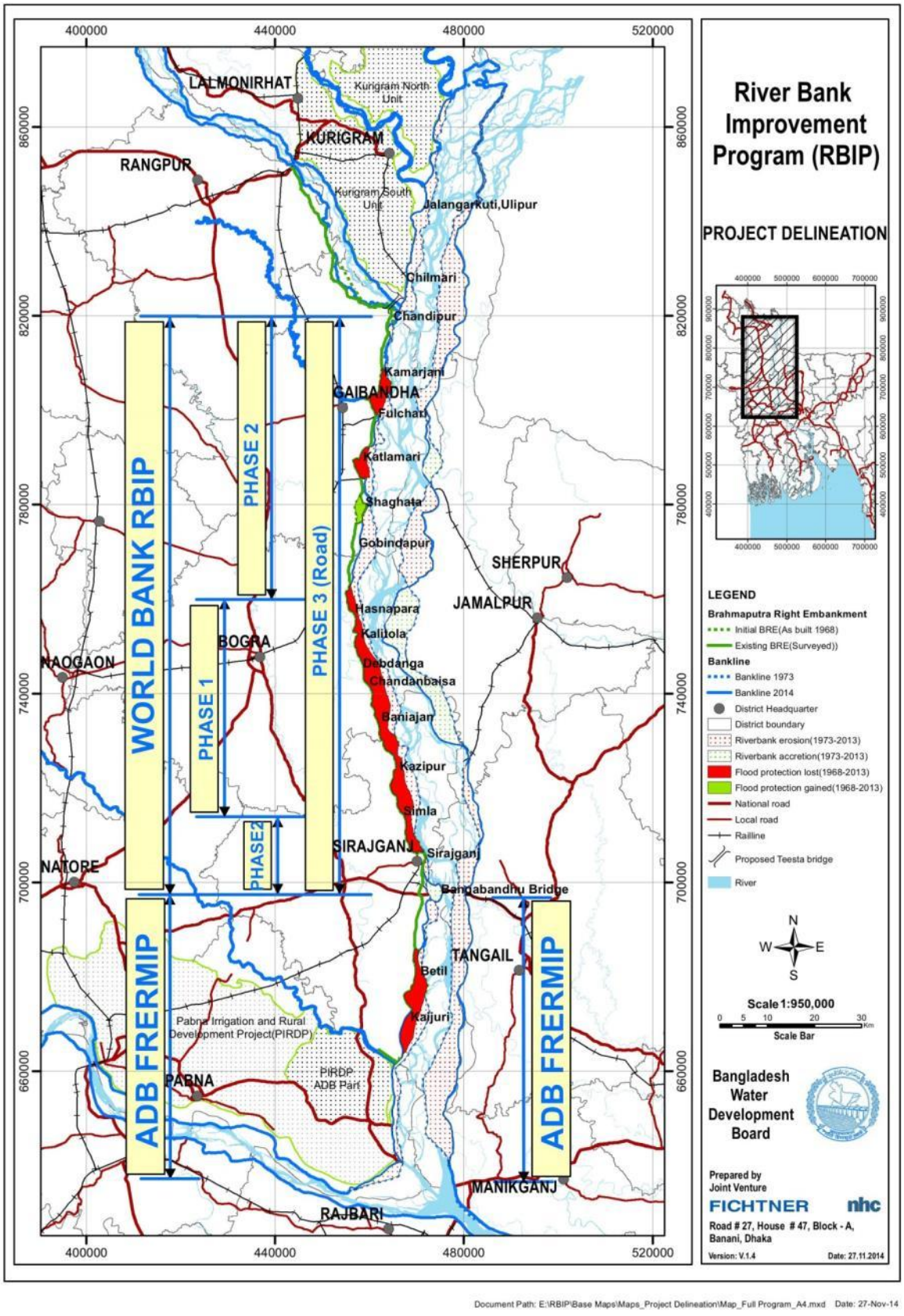

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Figure 4: Project location and delineation of priority reach

Project Effects

Project Operations

The existing Brahmaputra Right Embankment (BRE) has operated since the early 1960s. The upgraded BRE embankment will be set back from the river and will only be exposed to flows from the river when bankfull conditions are exceeded. This occurs only during the flood season between June and September when the flow in the Jamuna exceeds a 1.5 year return period flood. During the remainder of the year, the embankment is on dry land and does not interact with the river. Therefore, the focus of this assessment is on conditions during extreme flood conditions when the embankment prevents spills from the Jamuna River onto the adjacent floodplain.

The RMIP will reduce the risk of the embankment breaching from river bank erosion and overtopping. Under the "future without project" scenario, this will occur in two out of three years on average. After the RMIP is implemented, breaching will be eliminated and the BRE's effectiveness as a flood control project will be restored.

Therefore, the physical works being undertaken are intended to improve the operation and effectiveness of the existing BRE flood control project.

Effect on River Discharge

The planned works of the Program do not involve diversion of water courses or withdrawal of water from the river and therefore have no effect on the overall water balance or dry season flow regime. However, over the last 20 years the existing BRE has breached in two out of three years, on average. The amount of water spilled from the Jamuna River through a breach in the embankment was estimated by IWM using a one dimensional hydrodynamic model of the Jamuna River and the right bank floodplain. The model showed that during the peak of a large flood event (1998 flood year), up to 1.4% of the Jamuna River spilled onto the floodplain. The amount of spill decreased to zero by the end of the flood season at the end of September (**Figure 5**). These spills will be eliminated by the RMIP works. Eliminating the spill has no effect on the discharge in the river upstream of the breach location and therefore has no effect on the quantity of water in India.

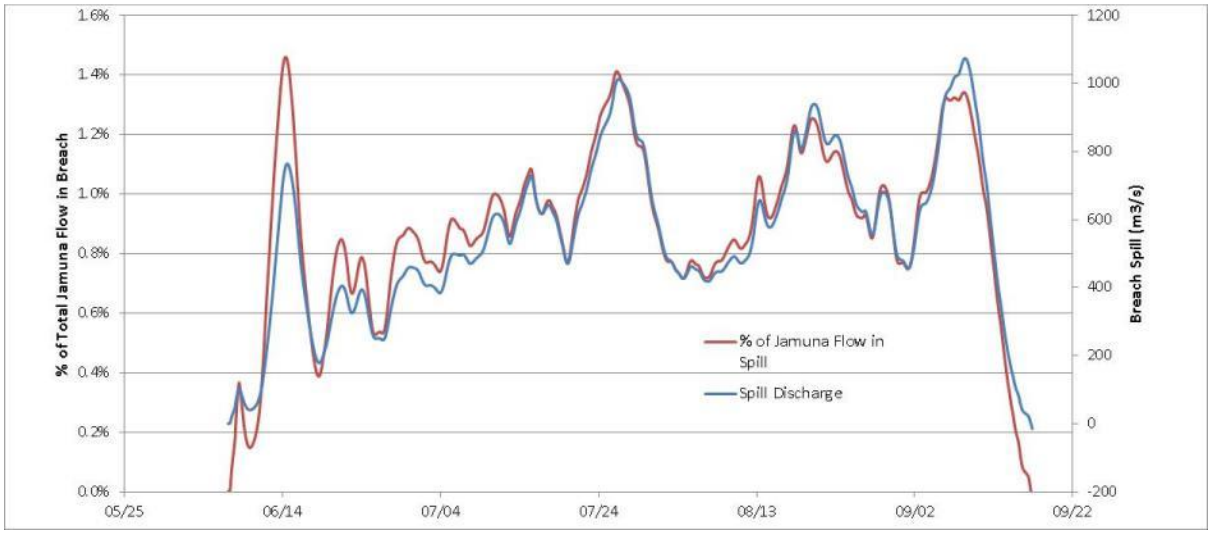


Figure 5: Effect of an embankment breach on the discharge spilled from the Jamuna River onto the floodplain. Upgrading the BRE will reduce the risk of such spills in the future.

Effect on Water Levels

The upgraded right bank embankment will be set back further from the river and raised to reduce the risk of overtopping. The project does not reduce the conveyance of the river or its floodplain and will not cause higher flood levels on the Jamuna River. The project will reduce the risk of embankment breaching, which has caused significant flood damages to low-lying areas behind the embankments. Preventing embankment breaching will allow the embankment to operate as originally planned and will eliminate unintended spills from the Jamuna River to the floodplain. Results from the one dimensional hydraulic model were used to assess the effect of preventing a breach on the water levels in the Jamuna River upstream of the breach location. **Figure 6** shows the water level hydrograph on the Jamuna River for 1998 flood conditions. The red line represents the difference in water levels between the "with project" and "without project" conditions. The difference is zero throughout the year, indicating that there was no effect on water levels over the 12 month simulation period.

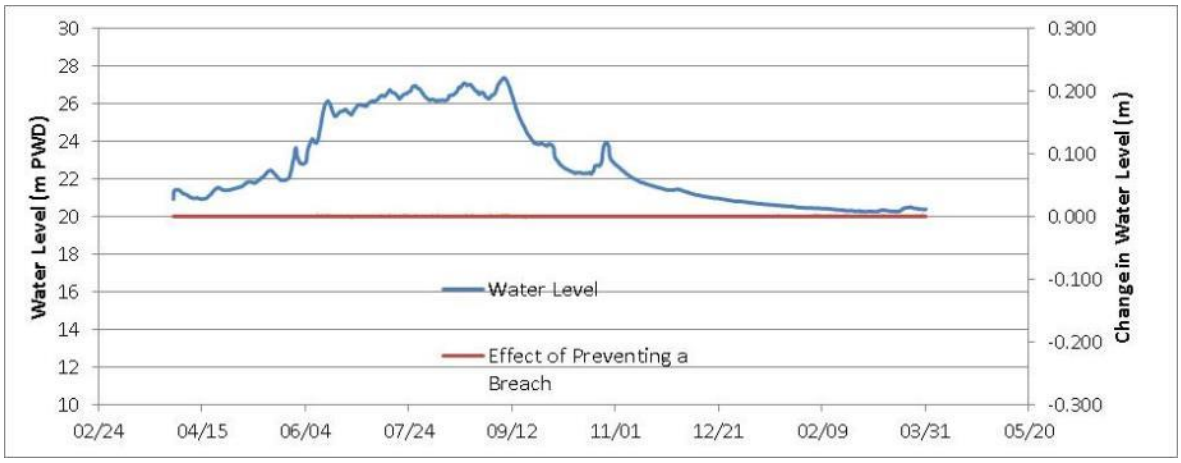


Figure 6: Conditions on the Jamuna River upstream of the BRE with and without a breach to the embankment in the Priority Reach. The red line shows that closing a breach has no effect on upstream water levels

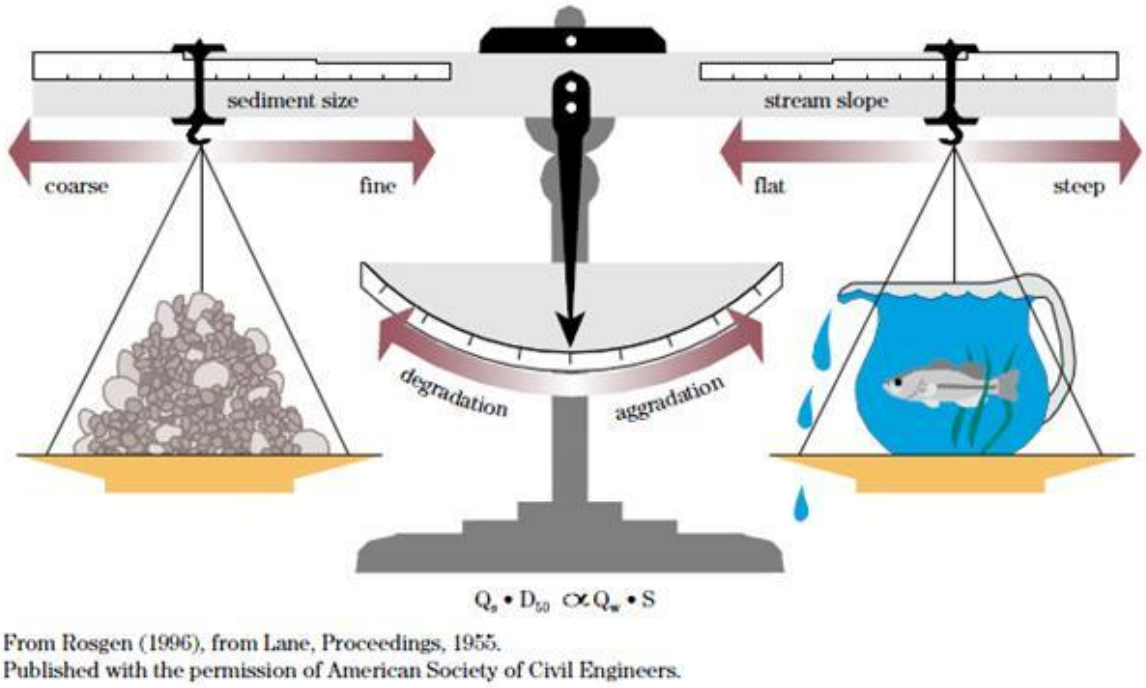
Therefore, this analysis verifies that the planned works under RMIP will not have any effect on upstream water levels at the Bangladesh-India Border.

Effect on River Morphology

Geomorphology Investigations

There are several parameters, alteration of which has impacts on the large-scale temporal and spatial processes of the rivers. In addition to the natural process, these parameters may be altered by human interventions either within the catchment or within the banklines of the rivers. These parameters mainly are discharges, amount and texture of sediment, location and elevation of river base (level) and bed slope of the river.

To assess the responses of the rivers to the alteration of these parameters most widely used models are from Lane (1955). These models are however simple and only can provide qualitative results. Lane's (1955) equation relation is summarized graphically in **Figure 7**.



From Rosgen (1996), from Lane, Proceedings, 1955.
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Figure 7: Lane's sediment balance relation for rivers showing the inter-relationship between sediment quantity, sediment size, river discharge and channel slope

The sediment balance relation indicates:

$$Q\_(s\ )\ D\_50\ \propto Q\_w\ S$$

where Qs is the sediment load, D50 is the size of the sediment, Qw is the quantity of water and S is the slope of the river.

This relation indicates how the slope of a channel responds to a change in any of the three independent variables: discharge, sediment load and sediment size, given that the width and planform of the channel remain constant. The planned river works under the RMIP are limited to strengthening the existing embankment and bank protection works. The RMIP works will not change the quantity of flow, the sediment supply or the width of the river. Therefore, the effect of the project on the river's morphology is expected to be very small.

The potential effects of the river bank protection are mainly to restrict the migration of the river bank. This will cause some changes to the flanking channels and to increase the local scour depth at the structures. Thus, it is very unlikely that the disturbances in the river generated by RMIP interventions will propagate several tens of kilometers of upstream of the disturbed location. Previous monitoring of more major river training structures, such as construction of the Jamuna Bridge, have demonstrated that local effects have hardly any visible impacts 10 km upstream (Sarker et al., 2003). The scale of planned interventions into the channel under the RMIP is insignificant in comparison to the Jamuna Bridge project, which narrowed the river from nearly 10 km to only 4.5 km. Therefore, based on considerations of the river's geomorphology, we expect the 15 km of new river bank protection (Priority Works) will have no detectable effect on the morphology of the river at the Bangladesh-India border.

Numerical Modelling Investigations

The influence of the proposed bank protection structures on the morphodynamics of the Jamuna River was studied by IWM using the MIKE 21C morphodynamic model developed by the

Danish Hydraulic Institute (DHI). The effects were evaluated for two flood events: an extreme flow event similar to the 1998 flood (Qmax = 102,000 m3/s) and an average flow event similar to the 2005 flood (Qmax = 66,000 m3/s). The simulations were conducted for the existing conditions without the proposed RMIP bank protection structures ('without structures') and with six proposed continuous revetments ('with structures'). The evaluated river bank protection structures are shown on **Figure 8**. The overall location of the reach is shown on **Figure 4**.

The response of the Jamuna River to the proposed structures was evaluated in terms of water levels, near-bank velocity, bank erosion, and riverbed level (aggradation or degradation). No changes in water levels could be detected. In general, the proposed revetments follow the bankline and do not induce significant change in near bank velocity; changes between 'with' and 'without' structures condition were found negligible (**Table 1**). Velocity seemed more dependent on the river morphology than the presence of the revetment structures.

The values of maximum scour depths predicted by the model at each of the structures ranged between 0.1 and 9.6 m. These scour depths are not particularly large and are well within the range of natural scour depths observed in the Jamuna River. The results agree with field observations that have shown very limited scour depth along continuous revetments compared with other more intruding structures such as spurs or hard points.

Figure 9 shows an example of bed changes predicted by the numerical model for the extreme flood event, in the area where proposed structures 1, 2 and 3 are located. Notice that except for very localized effects right near the structures, the general morphology of the river is practically identical with and without the structures. Also, the proposed continuous revetments produced no discernible morphological impact on nearby chars.

Based on the results of the MIKE 21C morphodynamic model, it can be concluded that the proposed structures produce only a very small and localized increase in near-bank velocity and local scour, but that its effects over the general river hydraulics (water levels and velocity) or morphology are imperceptible. No effects are expected to propagate upstream to the Bangladesh-India border.

Table 1: Predicted effect of structures on local velocity

RTW Structure No.	Maximum Near-Bank Velocity (m/s)			
	Extreme Flood Event (1998)		Average Flood Event (2005)	
	With Structure	Without Structure	With Structure	Without Structure
1	2.6	2.6	2.6	2.6
2	2.2	2.4	2.0	2.1
3	1.7	2.3	1.4	1.6
4	2.1	2.3	2.2	2.3
5	1.6	1.7	1.5	1.5
6	1.5	1.6	1.3	1.7

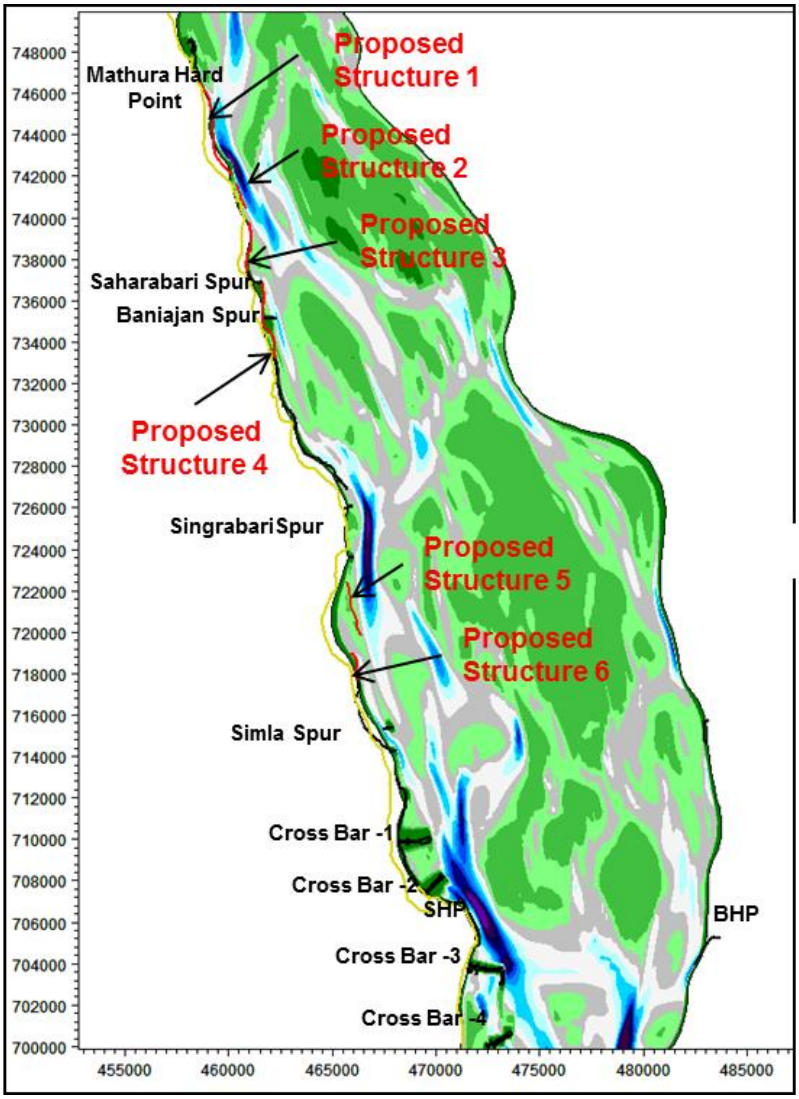

Figure 8: RTW structures used to assess potential effects of bank protection on channel morphology.

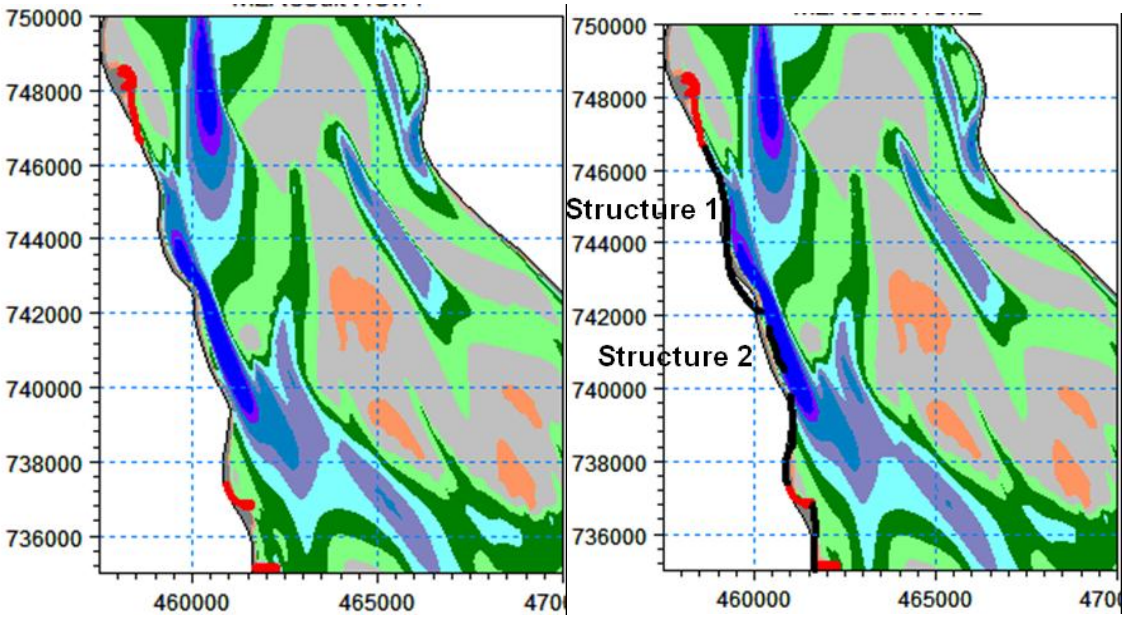

Figure 9: Example of bed changes predicted for an extreme flood

Conclusions

(i) The RMIP is intended to upgrade and improve the performance of the Brahmaputra Right Embankment (BRE), which was constructed originally in the 1960s. The program included strengthening the flood embankment and constructing additional bank protection revetments to prevent the river from eroding the embankment. The work represents a continuation of other ongoing rehabilitation works that have been carried out by BWDB over the last several decades.

(ii) Upgrading and strengthening the existing BRE will reduce the occurrence of breaches that cause damages to land behind the embankment. At present, the embankment breaches during the flood season in two out of three years. Eliminating embankment breaching will have no effect on the magnitude and timing of flows in the Jamuna River upstream from the project area. Results of one dimensional hydrodynamic modelling showed there is no effect on water discharge or waters from the planned works at the Bangladesh-India border.

(iii) The river bank protection works involve constructing long guiding revetments: approximately 32 km of new revetments are planned in the 145km reach downstream of the Teesta River. Unlike other more aggressive river training structures such as groynes or hard points, the revetments will not intrude into the flow and do not reduce the river's width or conveyance. Geomorphic studies have shown that river bank protection revetments placed in this manner induce only minor, localized effects on the river morphology. Therefore, the upstream effects of the works are will be imperceptible.

(iv) Morphodynamic modelling was carried out to assess the effects of river bank protection structures on water levels, near-bank velocity, bank erosion, and riverbed level. These model investigations confirmed the geomorphic assessment. The planned river bank protection works will only induce localized bed changes and there will be no impacts on the quality and quantity of water in the river at the Bangladesh-India Border.

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Lane, E. 1955. Design of Stable Channels. Trans. American Society of Civil Engineers, paper no. 2776, 20, 1234-1279.

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Annex K. EMP for Resettlement Sites

Citation in the main text (Volume I): **Section 11.11**.

K.1. Introduction

Nearly 40 percent of the displaced households are willing to relocate to the resettlement sites. The project will provide 15 resettlement sites with a provision to relocate 1870 households with all basic infrastructure facilities such as water supply, sanitation, internal roads, drains, mosques, and schools. The resettlement site planning includes around 10 percent contingency space knowing that during the process more people opt for the resettlement villages. Cash compensation will be provided for households who opt for self-relocation and provisions are made in RAP budget for augmenting civil amenities in host villages.

The resettlement sites were selected in consultation with the affected communities in such a way that they are close to their original location of residence and not located in any environmentally sensitive areas. In addition, a series of due diligence measures are taken while designing of the resettlement sites for the safety of the relocated people. These include: (i) resettlement sites are located minimum 100 m away from the protected riverbanks (similar to 100 m minimum setback distance adopted for embankments to avoid impacts from localized bank failures. According to design consultant, if any localized failures occur for bank protection works, the bank erosion will extend maximum of 50 m distance inland and hence minimum100 m is suggested between the bank protection works and resettlement sites for the Phase I, and this minimum distance may differ for Phase II); (ii) immediate river bank protection works will be carried out before developing the resettlement sites (and is part of the resettlement village construction contract) to prevent them to be exposed to the risk of bank erosion; (iii) the resettlement sites will be raised to a 100-year flood level (including climate change allocation) and properly compacted, and (iv) slopes of the resettlement sites that are exposed to flood waves will be protected with concrete blocks against wave erosion similar to the main embankment.

Figure K.1 shows the proposed resettlement sites in the entire project influence area; **Figures K.2** to **K.16** show maps of the individual sites.

K.2. Description of Individual Sites

Please see the following pages.

Resettlement Site No: 1

Location:

Coordinates: 24°32'21.07"N, 89°40'47.77"E
Village: Panch Thakuri
Union: Chhangacha
Upazila : Sadar
District: Sirajganj

Area Description:

Total 2.80 ha area has been selected which is on the riverside with respect to both existing Brahmaputra Right Embankment (BRE) and the proposed alignment. People have shown willingness to be resettled in this site. This area consists of mainly agriculture land where rice is the main crop. Several depressions and ponds are found in the area. These ponds and depressions are used as cultured pond.

Important Existing Structures:

Simla Spur-2 is about 500 m away from the resettlement site 01. Almost 1-1.5 km under construction revetment works is found which is mainly for strengthening the flood protection and safety issue of the community.

Sensitive Receptors:

No such receptor is located around the site.

Potential Risk/ Threat:

As the site will be on the riverside, it will face the threat of erosion and flooding.

Requirement for the future :

Flood protection work should be important for the security of the site.

Resettlement Site 1

Resettlement Site No: 2

Location:

Coordinates: 24°33'52.72"N,89°39'47.43"E
Village: Bahuka
Union: Changacha
Upazila : Sadar
District: Sirajganj

Area Description
:
Total 7.00 ha area has been selected beside the BRE. The location is along the riverside with respect to the proposed alignment. People have shown willingness to be resettled in this site. This area is fully agriculture land where paddy and wheat are the main crops. No depression land and pond are found near the resettlement site.

Important existing Structure:
There is no such hydraulic structure near the resettlement site.

Sensitive Receptors:

No such receptor is located around the site.

Potential Risk/ Threat:

As it will be in between the proposed alignment and existing BRE , water logging and inundation will be a common phenomenon during rainy season

Requirement for the future :

Erosion of BRE is the major concern as the shifting of the river is rushing forward to the countryside.

Resettlement Site 2

Resettlement Site No: 3

Location:

Coordinates: 24°35'37.16"N ,89°39'4.46"E
Village: Ratankandi
Mauza: Ratankandi
Upazila : Kajipur
District: Sirajganj

Area Description:
Total 14.85 ha area has been selected along the countryside from the proposed alignment. People have shown willingness to be resettled in this site. This area is fully agriculture land where paddy and wheat are the main crops. No depression land and pond are found near the resettlement site.

Important existing Structure:
There is no such structure near the resettlement site. A box culvert of 1 vent has been proposed near this location for reconnecting the stream flow from Jamuna to Banaijan khal.

Sensitive Receptors:

No such receptor is located around the site.

Potential Risk/ Threat:

Potential water pollution source point should be considered from the resettlement site for conserving biodiversity as like domestic waste disposal, improper sanitation facilities.

Resettlement Site 3

Resettlement Site No: 4

Location:

Coordinates: 24°37'51.26"N ,89°39'26.83"E
Village: Singrabari
Mauza: Singrabari
Upazila : Kazipur
District: Sirajganj

Area Description:
Total 13.15 ha area has been selected along the countryside corresponding to both the BRE & the proposed alignment. People have shown willingness to be resettled in this site. This area is agriculture land where paddy, maze and wheat are the main crops. No depression land and pond are found near the resettlement site.

Important existing Structure:
Singrabari Spur-1 is about 1.5 km away along the south east direction from the proposed resettlement site.

Sensitive Receptors:

No such receptor is located around the site.

Potential Risk/ Threat:

Potential air pollution and sound pollution source should be under consideration for the proposed resettlement site if new embankment and 4 lane highway will be constructed.

Resettlement Site 4

Resettlement Site No: 5

Location:

Co-ordinates: 24°38'55.91"N , 89°39'41.08"E
Village: Machuakandi
Mauza: Machuakandi, Meghai
Upazila : Kazipur
District: Sirajganj

Area Description:
Total 14.90 ha area has been selected along the riverside corresponding to both the proposed alignment and existing BRE. People have shown willingness to be resettled in this site. This area is generally agriculture land where paddy and wheat are the main crops. No depression land and pond are found near the resettlement site.

Important existing Structure:

Meghai Spur-3 which was built in 2002-03 but now most of the part of it has become damaged due to the erosion, water pressure and lack of maintenance.

Sensitive Receptors:

No such receptor is located around the site.

Potential Risk/ Threat:

As the proposed site is on the riverside, it will face the threat of erosion and flooding

Requirement for the future :

Proper bank protection work should be needed for reduction of erosion and security of the proposed resettlement site.

Resettlement Site 5

Resettlement Site No: 6

Location:

Coordinates: 24°40'14.31"N ,89°38'25.41"E
Village: Paikartoli
Mauza: Kuliagacha
Upazila : Kazipur
District: Sirajganj

Area Description:
Total 12.50 ha area has been selected along the riverside corresponding to both the proposed alignment and existing BRE. People have shown willingness to be resettled in this site. This area is fully agriculture land where paddy and wheat are the main crops. No depression land and pond are found near the resettlement site.

Important existing Structure:

Meghai revetment of 5km exists near the resettlement site.

Sensitive Receptors:

No such receptor is located around the site.

Potential Risk/ Threat:

As the proposed site is on the riverside, it will face the threat of erosion and flooding. Drainage congestion should be under consideration.

Requirement for the future :

Local access road will be needed for the potential site from the proposed alignment

Resettlement Site 6

Resettlement Site No: 7

Location:

Coordinates: 24°42'35.65"N 89°37'36.59"E
Village: Pukuria Bhandarbari
Mauza: Bhandarbari
Upazila : Dhunat
District: Bogra

Area Description:

Total 7.80 ha area has been selected along the riverside corresponding to both the proposed alignment and existing BRE. People have shown willingness to be resettled in this site. This area was agricultural land before using the area for revetment construction. No depression land and pond are found near the resettlement site.

Important existing Structure:

Pukuria revetment (2km length) and Bhanderbari revetment (0.7km length) are the existing protection work near the proposed resettlement site.

Sensitive Receptors:

No such receptor is located around the site.

Potential Risk/ Threat:

As the proposed site is on the riverside, it will face the threat of flooding. Drainage congestion should be under consideration.

Requirement for the future :

Local access road will be needed for the potential site from the proposed alignment

Resettlement Site 7

Resettlement Site No: 8

Location:

Coordinates: 24°44'25.43"N , 89°37'8.44"E
Village: Shimulbari
Mauza: Shimulbari
Upazila : Dhunat
District: Bogra

Area Description:
Total 12.46 ha area has been selected along the riverside corresponding to both the proposed alignment and existing BRE. People have shown willingness to be resettled in this site. This area consists of mainly agriculture land where rice is the main crop. No depression land and pond are found near the resettlement site but there is a small canal is found along the existing BRE which is near the site.

Important existing Structure:

Shaharabari Spur and Banaijan Spur are the existing hydraulic structure near the proposed resettlement site.

Sensitive Receptors:

No such receptor is located around the site.

Potential Risk/ Threat:

As the site will be on the riverside, it will face the threat of erosion and flooding

Requirement for the future :

Local access road will be needed for the potential site from the proposed alignment

Resettlement Site 8

Resettlement Site No: 9

Location:

Coordinates: 24°46'17.55"N ,89°36'31.72"E
Village: Icamara
Mauza: Kamalpur
Upazila : Sariakandi
District: Bogra

Area Description:
Total 5 ha area has been selected along the country side corresponding to both the proposed alignment and existing BRE. People have shown willingness to be resettled in this site. This area consists of mainly agriculture land where rice is the main crop. No depression land and pond are found near the resettlement site.

Important existing Structure:

No revetment or hydraulic structure has been found.

Sensitive Receptors:

No such receptor is located around the site.

Potential Risk/ Threat:

As the site will be on the countryside, it will face the threat of inundation if flood occurs.

Requirement for the future :

Local access road will be needed for the potential site from the proposed alignment

Resettlement Site 9

Resettlement Site No: 10

Location:

Co-ordinates: 24°49'5.14"N , 89°35'10.74"E
Village: Kutubpur
Mauza: Kutubpur
Union: Kutubpur
Upazila : Sariakandi
District: Bogra

Area Description:
Total 22.6 ha area has been selected along the country side corresponding to both the proposed alignment and existing BRE. People have shown willingness to be resettled in this site. This area consists of mainly agriculture land where rice is the main crop. No depression land and pond are found near the resettlement site. Kutubpur khal is moving on the north east side.

Important existing Structure:

- Destroyed Chandan Baisha Spurs.
- Erosion of the existing BRE bank.

Sensitive Receptors:

A mosque and a graveyard are found there nearby the site (adjacent to the existing BRE)

Potential Risk/ Threat:

As the site will be on the countryside, it will face the threat of inundation if flood occurs.

Requirement for the future :

Local access road will be needed for the potential site from the proposed alignment. Potential water pollution source point should be considered from the resettlement site for conserving biodiversity as like, domestic waste disposal, improper sanitation facilities.

Resettlement Site 10

Resettlement Site No: 11

Location:

Co-ordinates: 24°50'57.19"N ,89°35'1.98"E
Village: Devdanga
Mauza: Kutubpur
Upazila : Sariakandi
District: Bogra

Area Description:
Total 12.22 ha area has been selected along the riverside corresponding to both the proposed alignment and existing BRE. People have shown willingness to be resettled in this site. This area consists of mainly agriculture land where rice is the main crop. No depression land and pond are found near the resettlement site.

Important existing Structure:

Mothurapara Hard Point has been found near the site.

Sensitive Receptors:

No such receptor is located around the site.

Potential Risk/ Threat:

Water logging and inundation will be common phenomena during rainy season.

Requirement for the future :

Local access road will be needed for the potential site from the proposed alignment and protection work will be needed.

Resettlement Site 11

Resettlement Site No: 12

Location:

Coordinates: 24°52'46.43"N , 89°34'35.36"E
Village: Boraipara
Mauza: Boraipara and Sariakandi
Upazila : Sariakandi
District: Bogra

Area Description:

Total 5.18 ha area has been selected along the country side corresponding to both the proposed alignment and existing BRE. People have shown willingness to be resettled in this site. This area consists of mainly agriculture land where rice is the main cultivating crop. Several depression lands and ponds are found in the area. There is a 25 decimal pond on the south of the site which is used for aquaculture. There is a Boroi Para khal which became restricted due to the existing BRE.

Important existing Structure:

Sariakandi Hardpoint has been found near the site on the North East side.

Sensitive Receptors:

There is a brick kiln on the south direction (just about 30 ft far) which is a major source of pollution.

Potential Risk/ Threat:

As it will be in between the proposed alignment and existing BRE , water logging and inundation will be a common phenomenon during rainy season

Requirement for the future :

Local access road will be needed for the potential site from the proposed alignment and protection work will be needed.

Resettlement Site 12

Resettlement Site No: 13

Location:

Co-ordinates: 24°53'5.93"N ,89°34'48.98"E
Village: Baghber
Mauza: Sariakandi
Upazila : Sariakandi
District: Bogra

Area Description:

Total 6. 70ha area has been selected along the river side corresponding to both the proposed alignment and existing BRE. People have shown willingness to be resettled in this site. This area consists of mainly agriculture land where rice is the main crop though several depression land and ponds are found in the area. These ponds and depression lands are basically used as cultured pond. About 0.5 ha borrow pit is within the site where aquaculture is done by the influential.

Important existing Structure:

Kalitola Groyne has been found near the site on the North East side.

Sensitive Receptors:

No such receptors is located around the site

Potential Risk/ Threat:

During rainy season the site will face the threat of flooding and erosion

Requirement for the future :

Local access road will be needed for the potential site from the proposed alignment and protection work will be needed.

Resettlement Site 13

Resettlement Site No: 14

Location:

Coordinates: 24°53'43.09"N ,89°34'23.86"E
Village: Partitparol
Mauza: Sariakandi
Upazila : Sariakandi
District: Bogra

Area Description:

Total 11.24 ha area has been selected along the country side corresponding to the proposed alignment. People have shown willingness to be resettled in this site. This area consists of mainly agriculture land where rice is the main crop though several depression land and ponds are found in the area. These ponds and depression lands are basically used as cultured pond. There are two ponds (49.5 deci and 30 deci) on the south-east side which are used for aquaculture.

Important existing Structure:

Two Pipe Sluices connecting Bangali river with the Jamuna have been found near the site on the North East side.

Sensitive Receptors:

There is a school located around the site

Potential Risk/ Threat:

As it will be in between the proposed alignment and existing BRE , water logging and inundation will be a common phenomenon during rainy season

Requirement for the future :

Local access road will be needed for the potential site from the proposed alignment and protection work will be needed.

Resettlement Site 14

Resettlement Site No: 15

Location:

Co-ordinates: 24°56'6.58"N ,89°33'55.31"E
Village: Nizboloi
Mauza: Hatsherpur
Upazila : Sariakandi
District: Bogra

Area Description:

Total 7.75 ha area has been selected along the country side corresponding to the proposed alignment. People have shown willingness to be resettled in this site. This area consists of mainly borrow pit area of about 7 ha is within the proposed resettlement site, where aquaculture is practiced.

Important existing Structure:

Hasnapara Spur-1 has been found near the site on the North East side.

Sensitive Receptors:

No such receptors is located around the site

Potential Risk/ Threat:

As it will be in between the proposed alignment and existing BRE , water logging and inundation will be a common phenomenon during rainy season

Requirement for the future :

Local access road will be needed for the potential site from the proposed alignment and protection work will be needed.

Resettlement Site 15

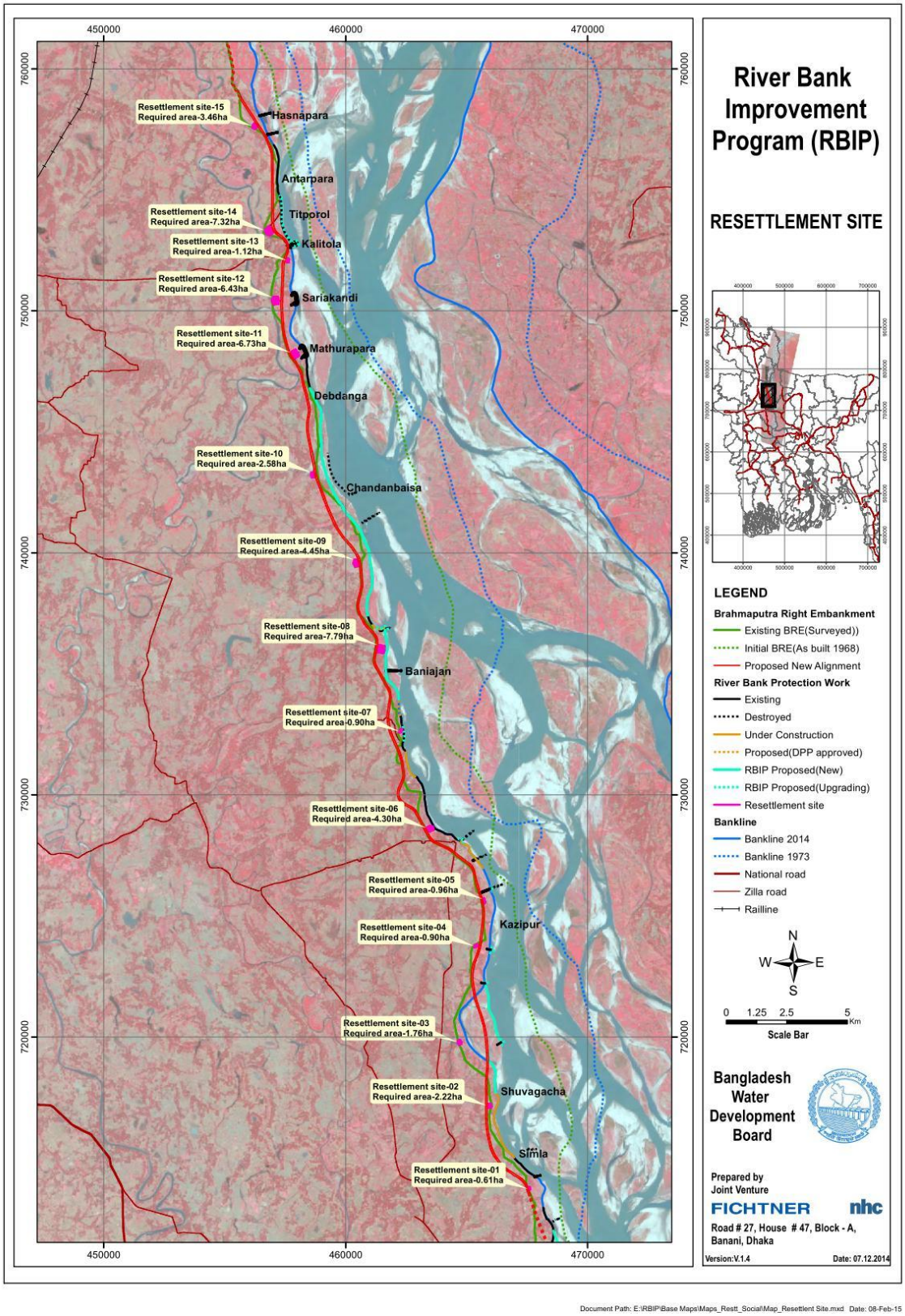

Figure K.1: Resettlement Sites

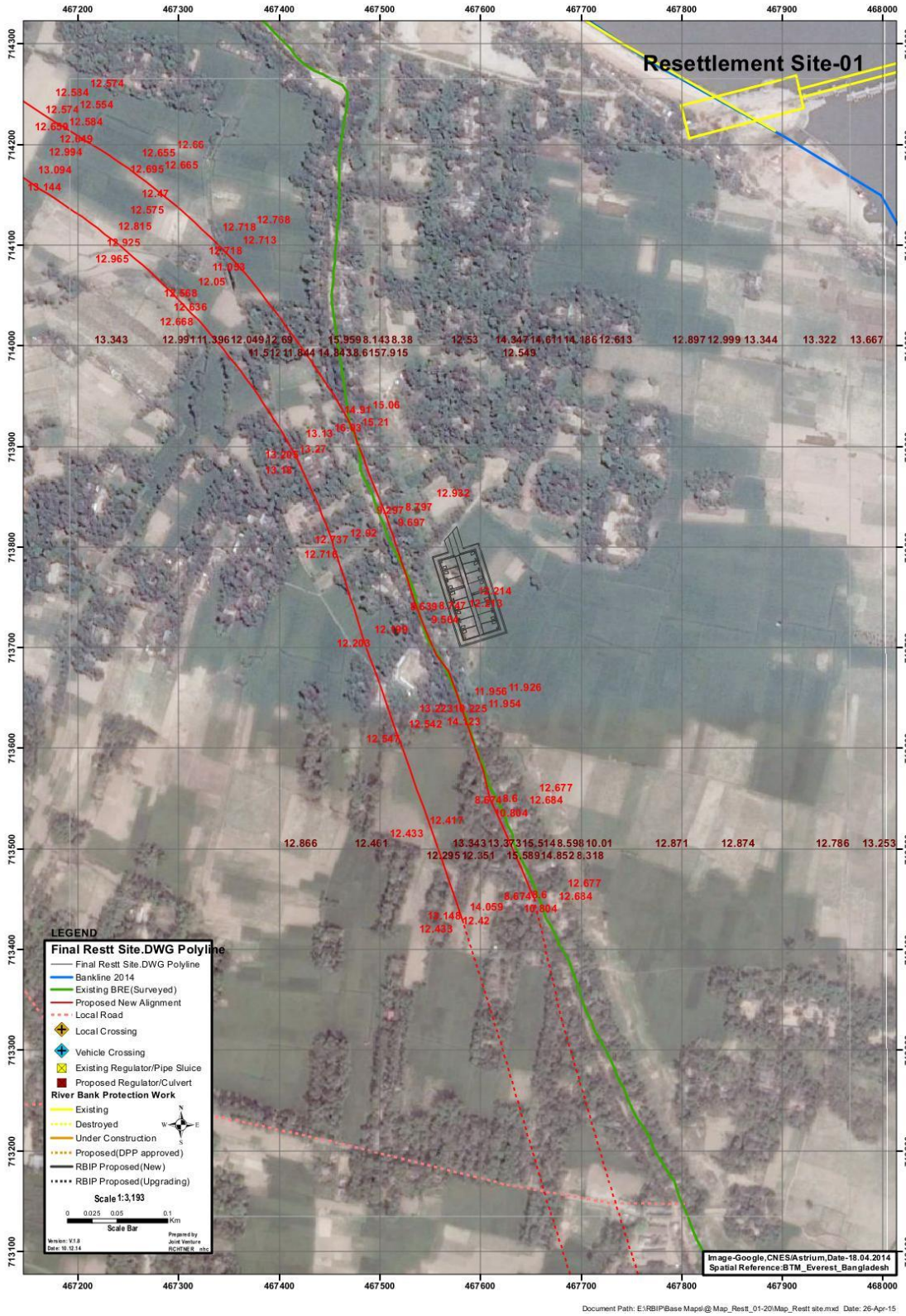

Figure K.2: Resettlement Site 1

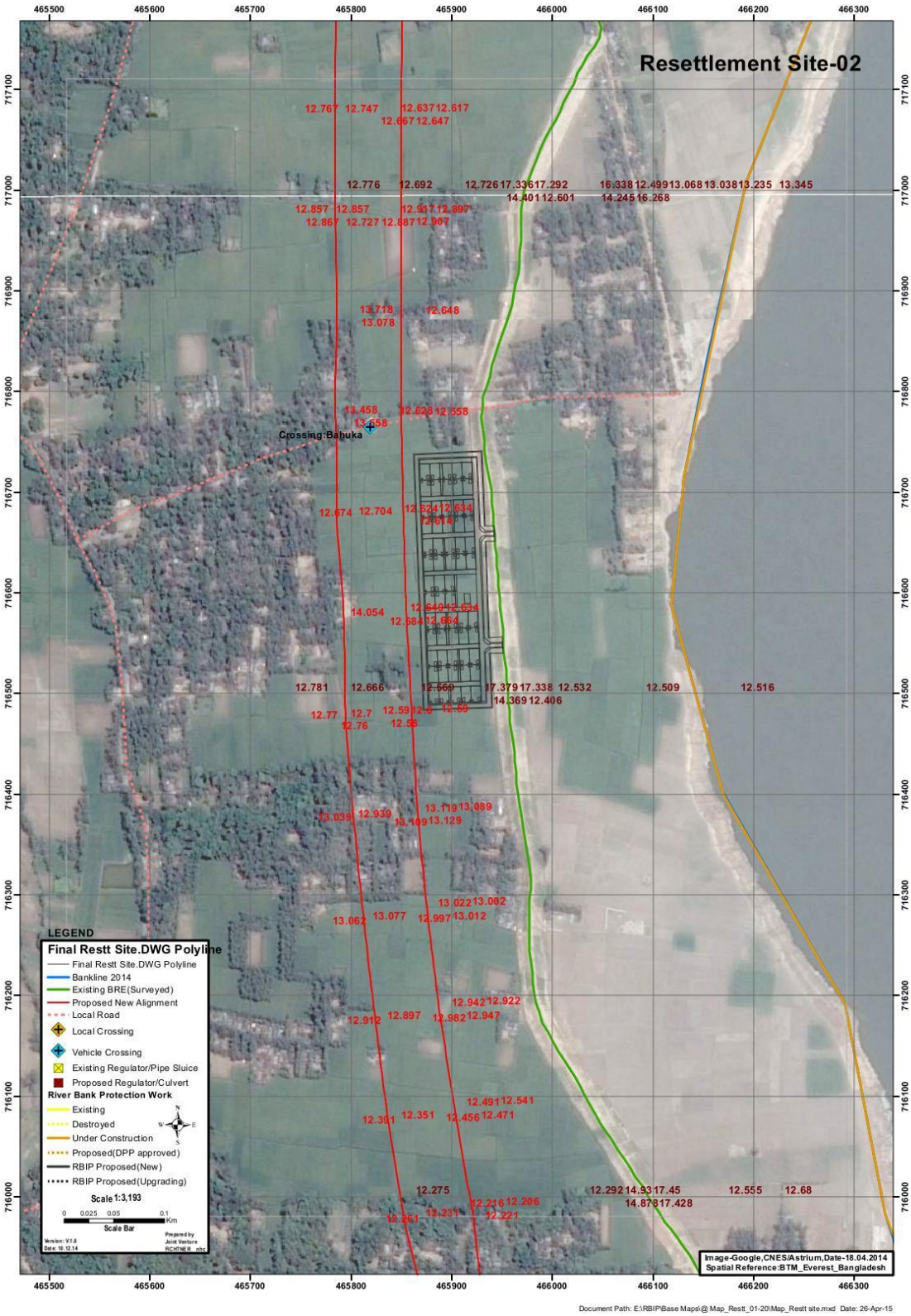

Figure K.3: Resettlement Site 2

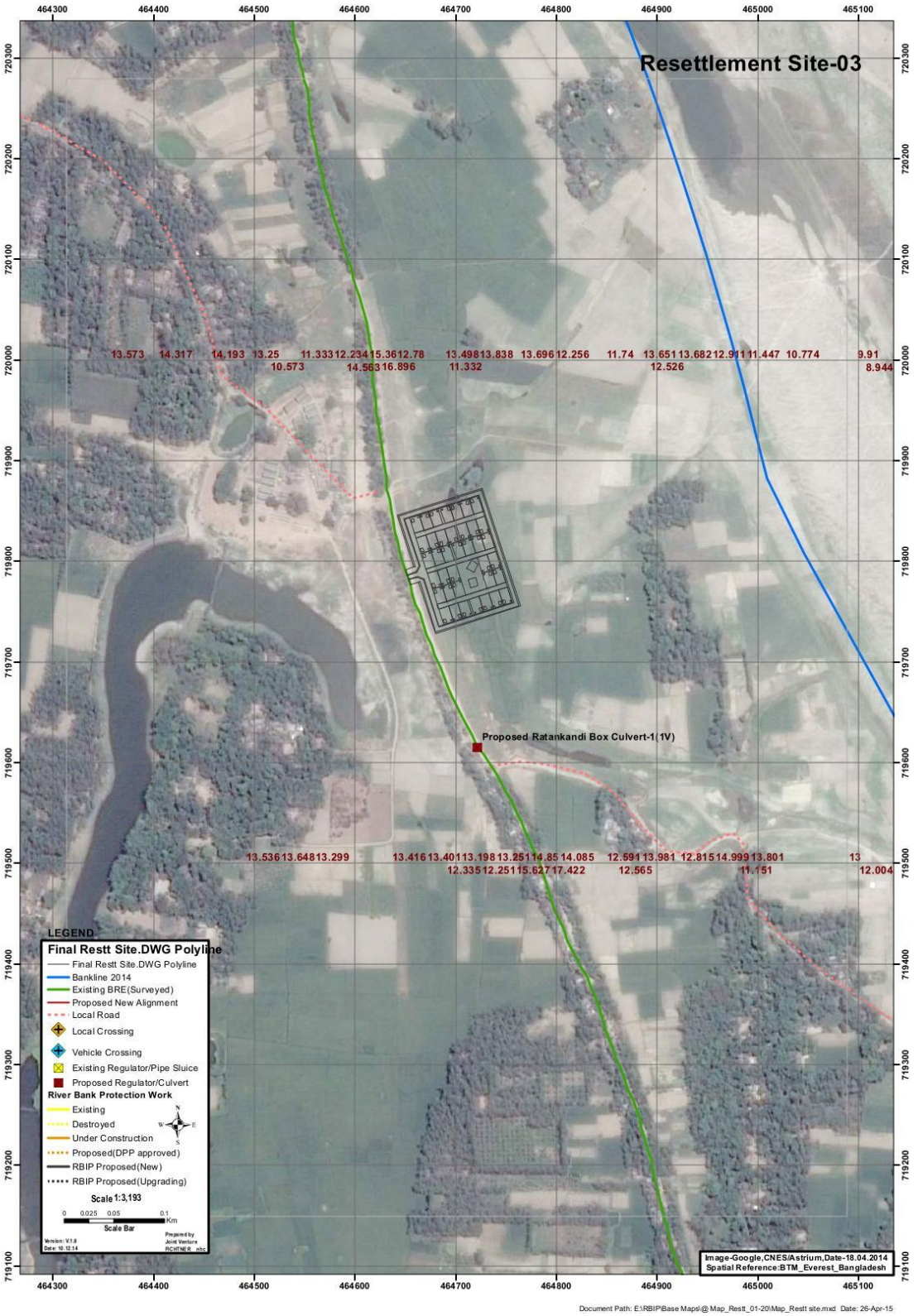

Figure K.4: Resettlement Site 3

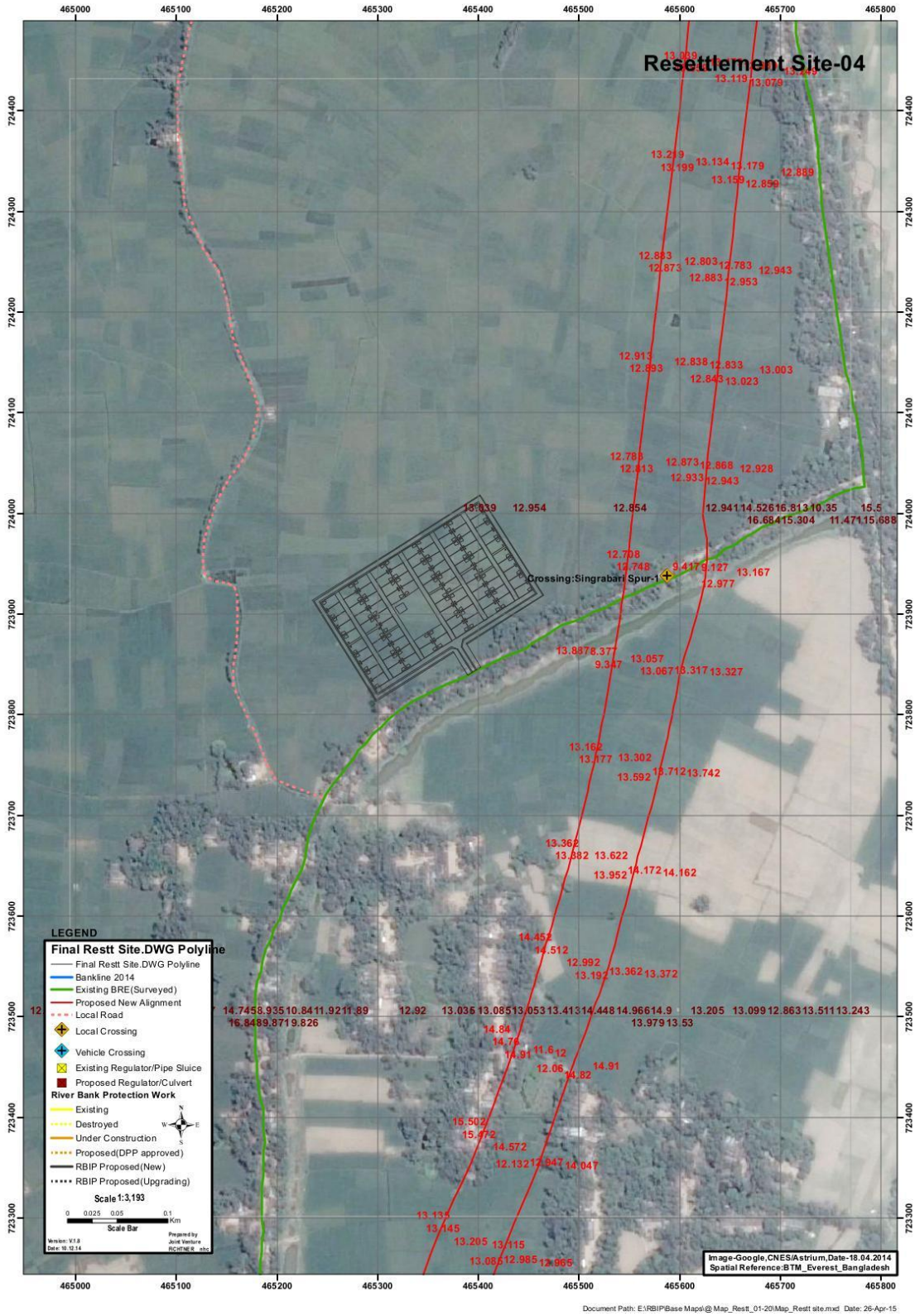

Figure K.5: Resettlement Site 4

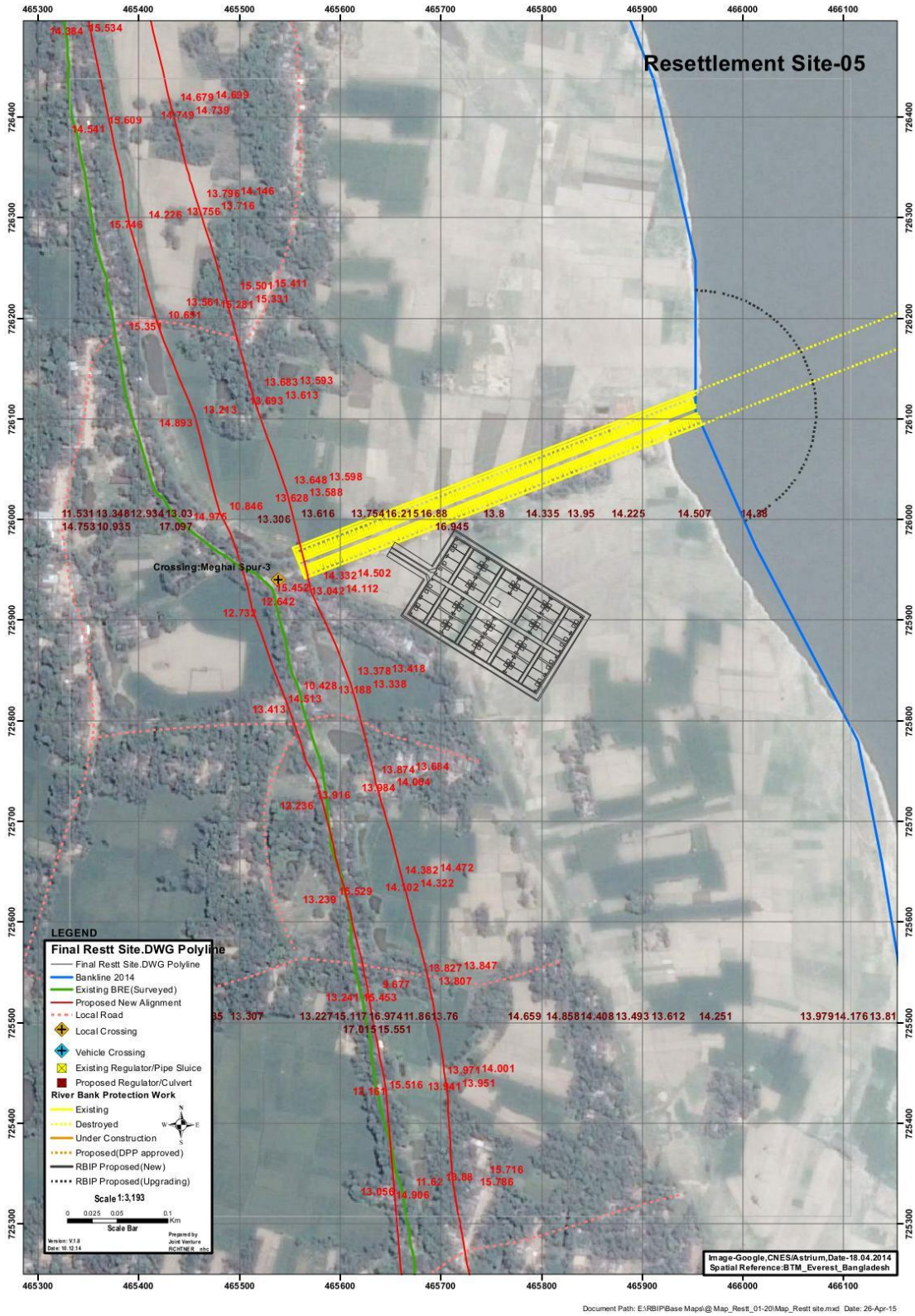

Figure K.6: Resettlement Site 5

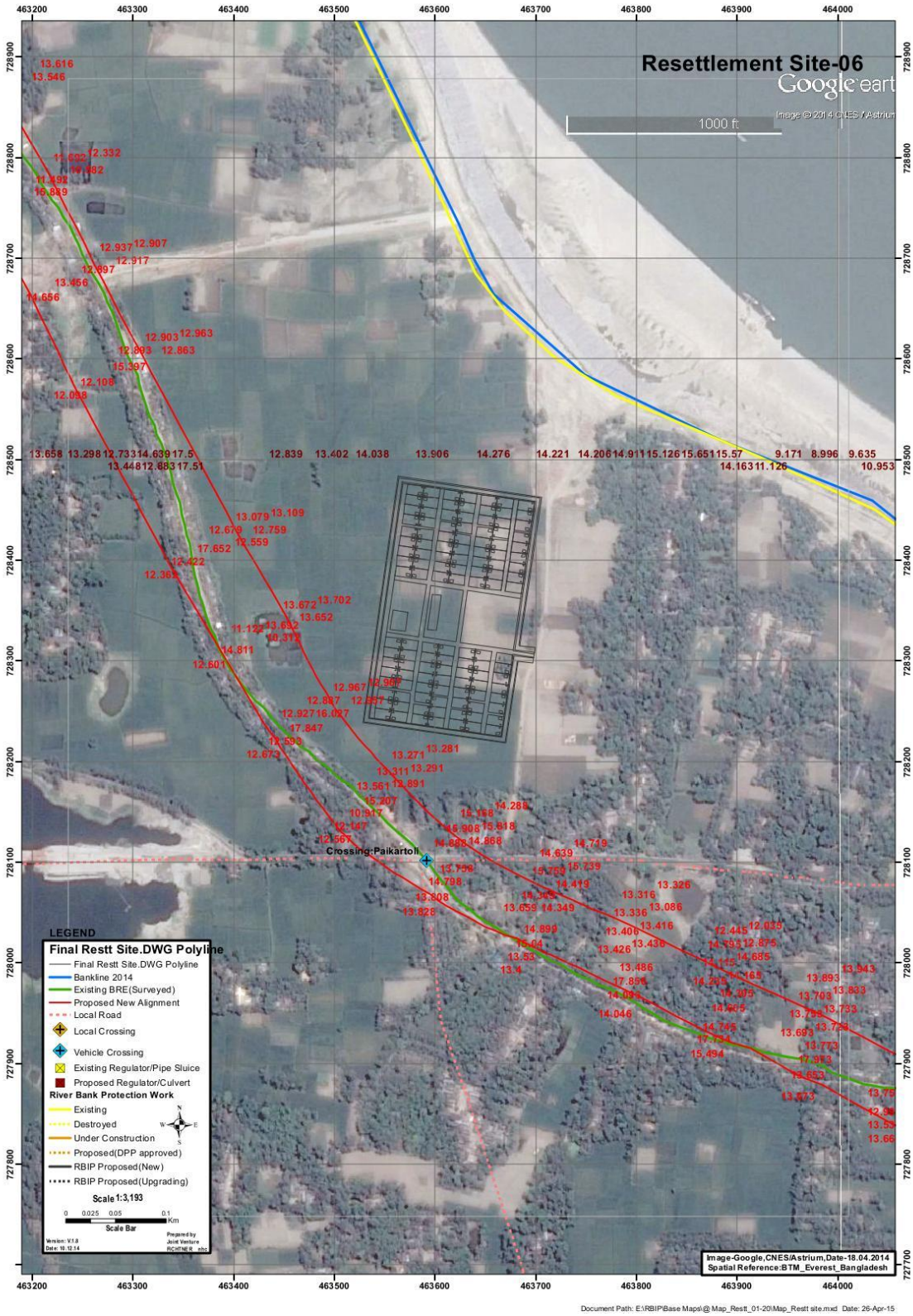

Figure K.7: Resettlement Site 6

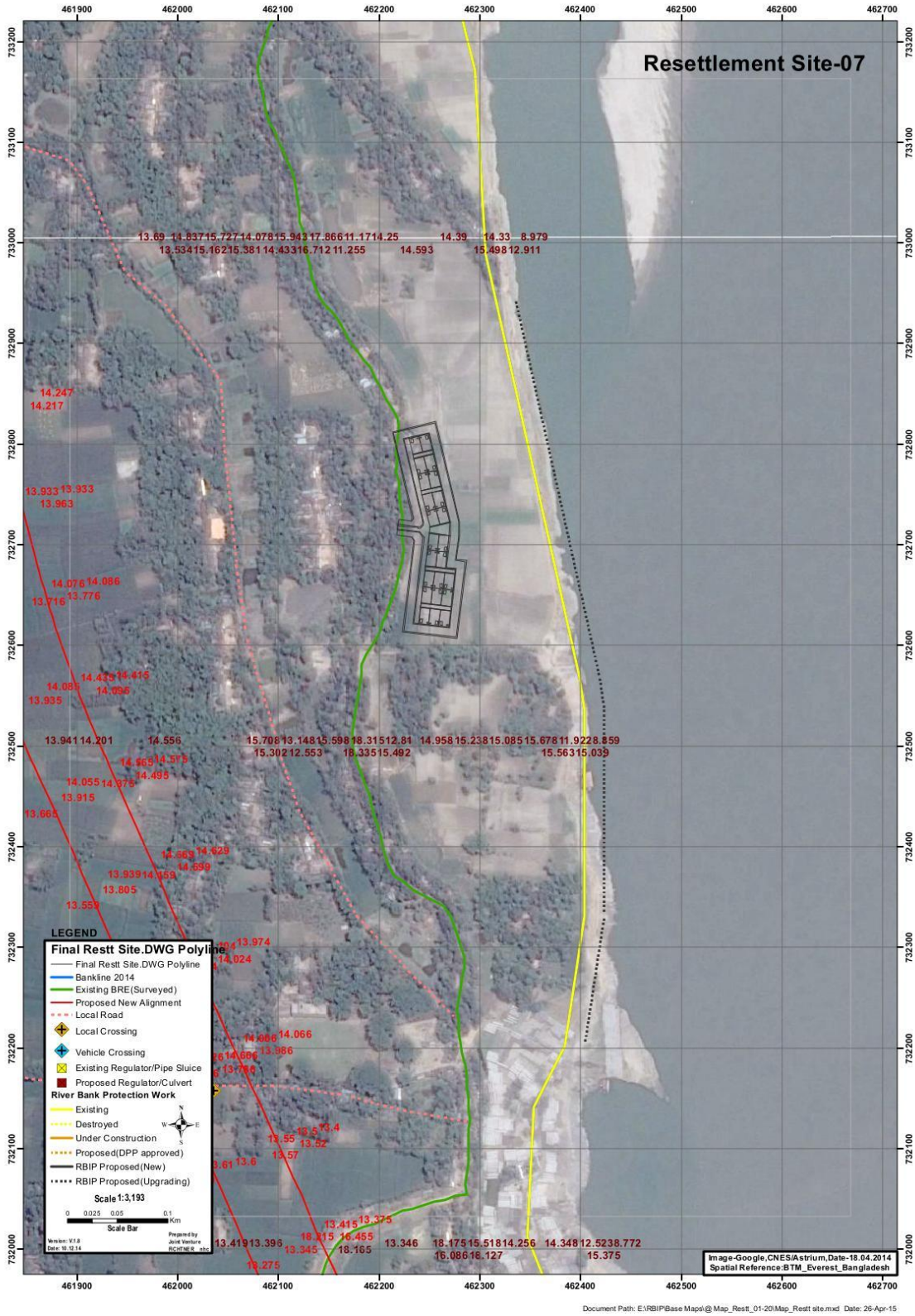

Figure K.8: Resettlement Site 7

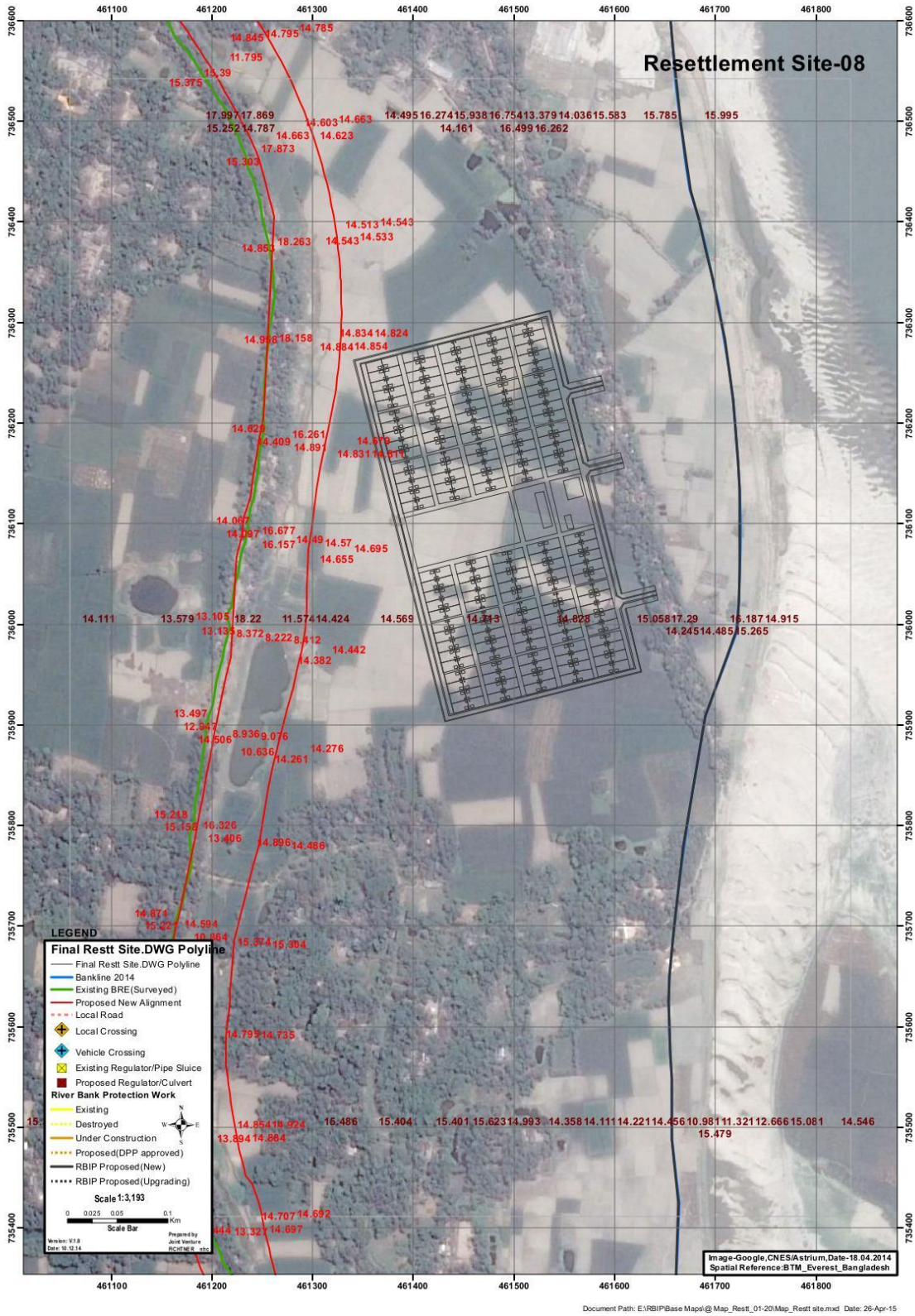

Figure K.9: Resettlement Site 8

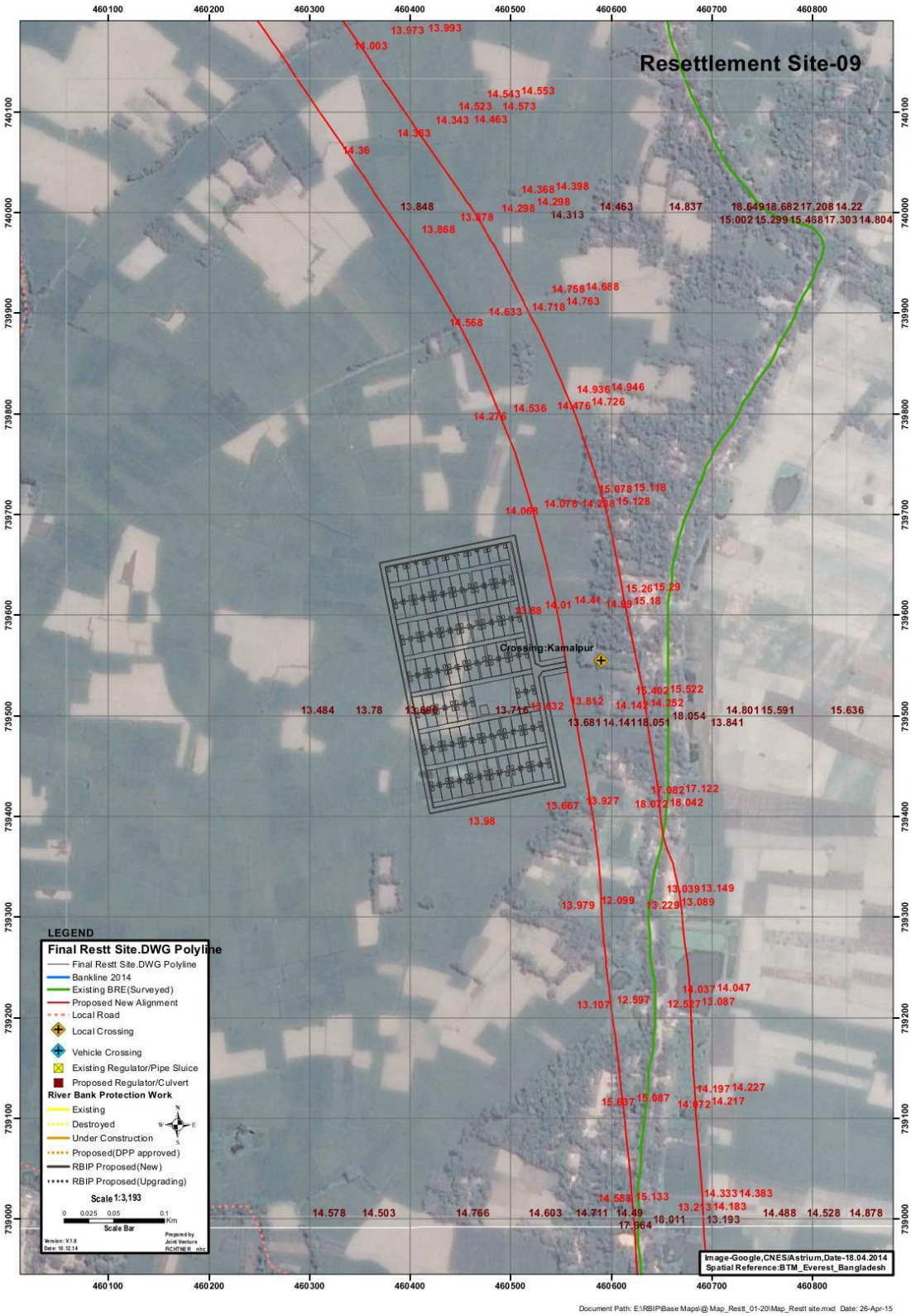

Figure K.10: Resettlement Site 9

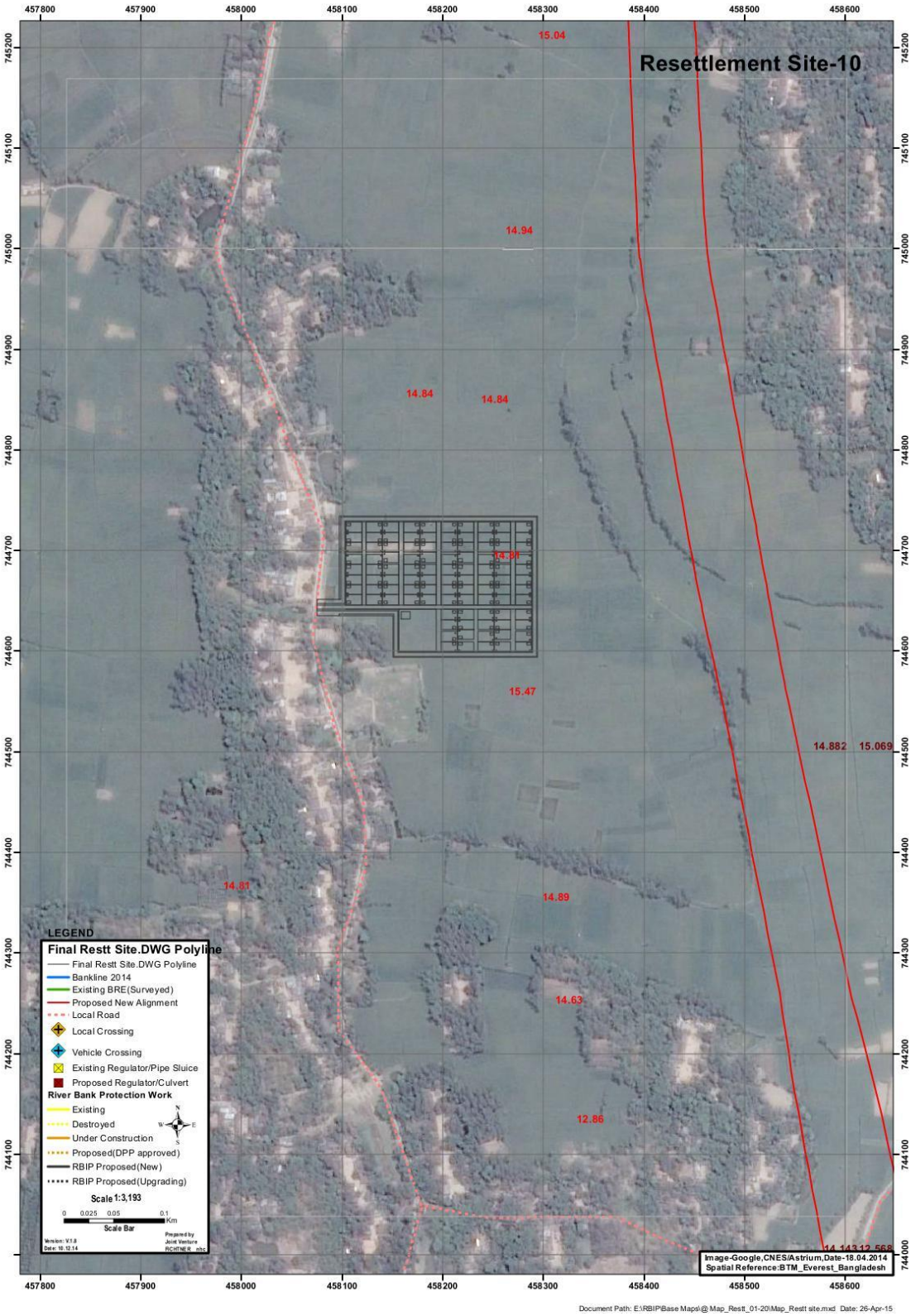

Figure K.11: Resettlement Site 10

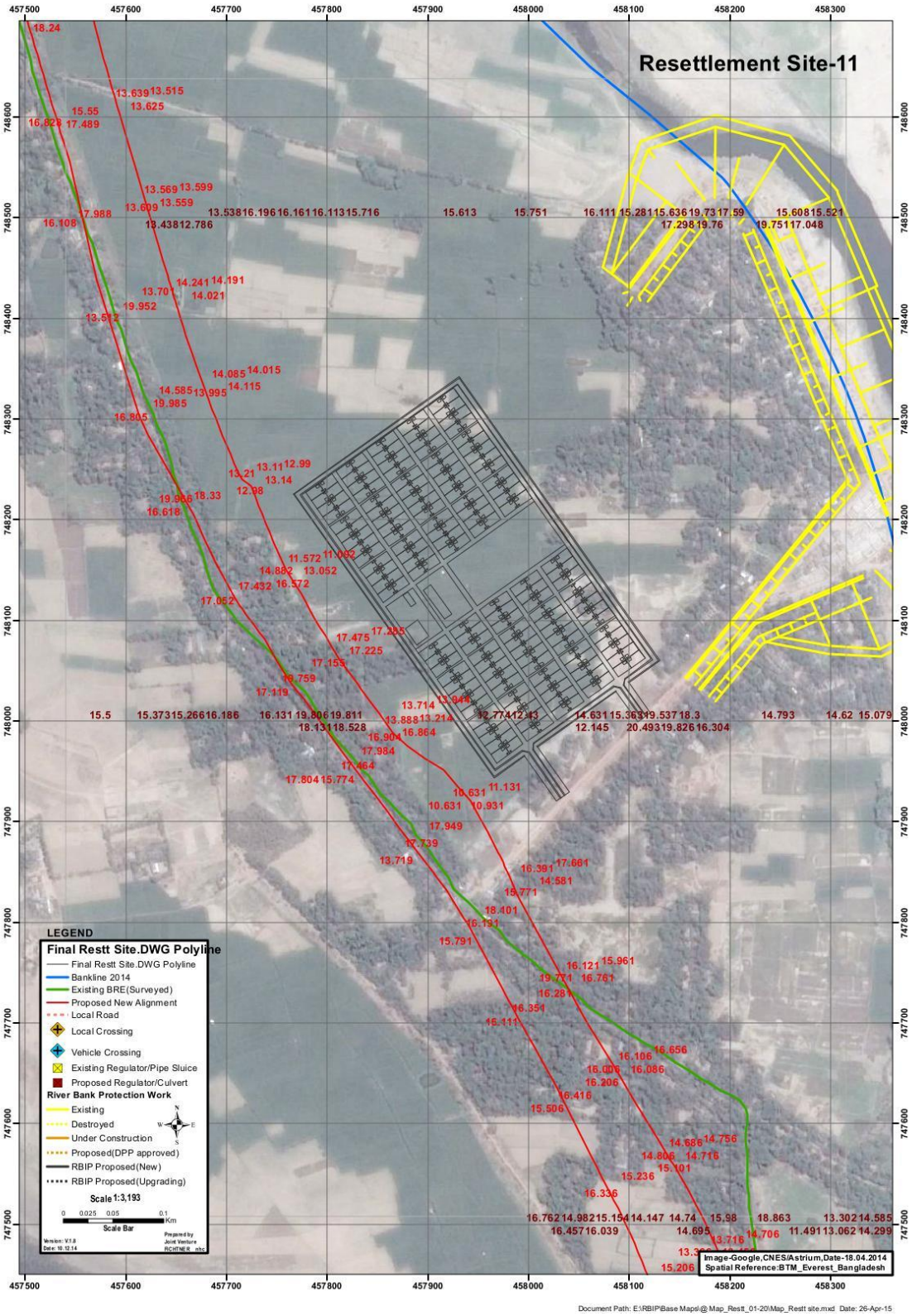

Figure K.12: Resettlement Site 11

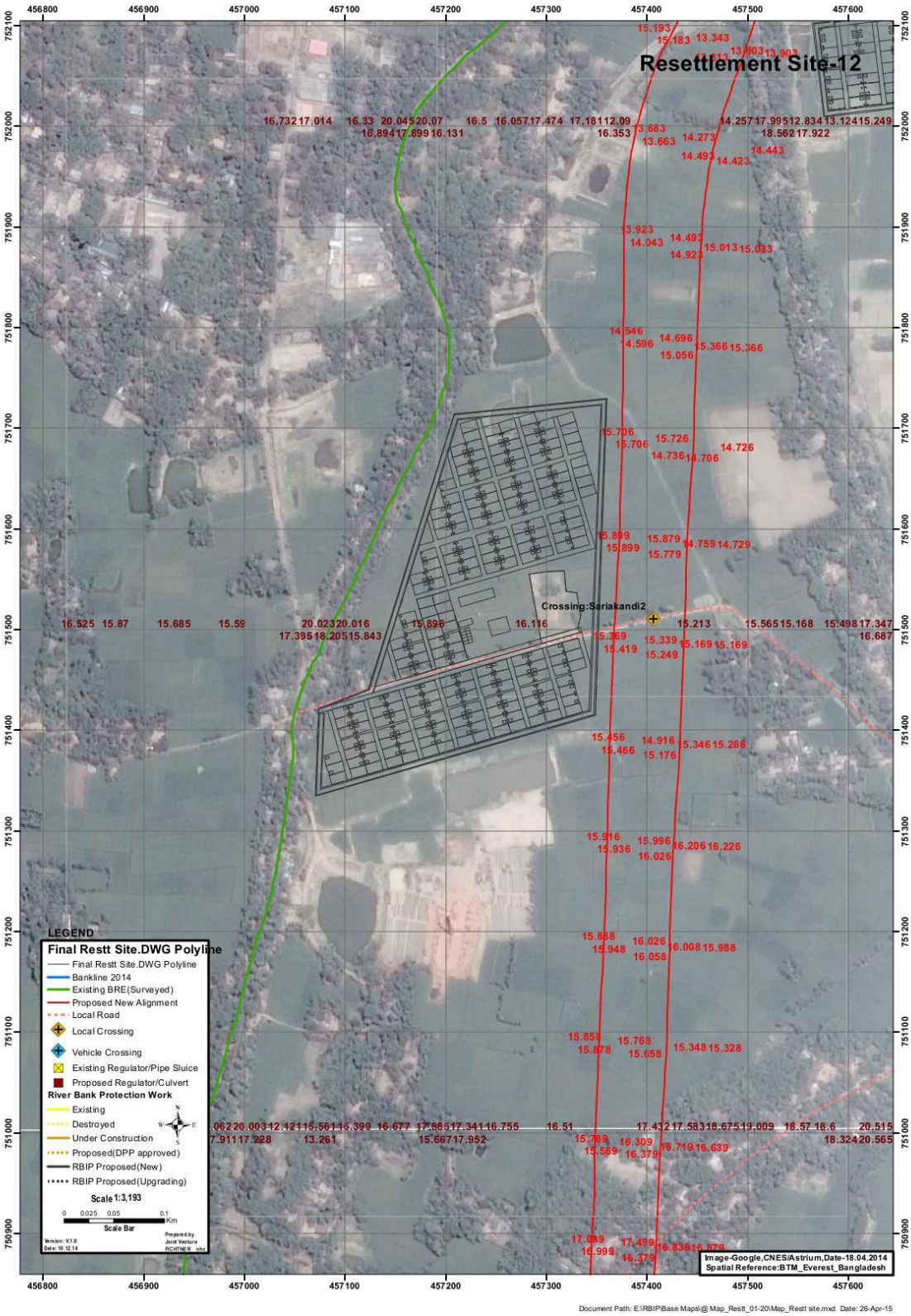

Figure K.13: Resettlement Site 12

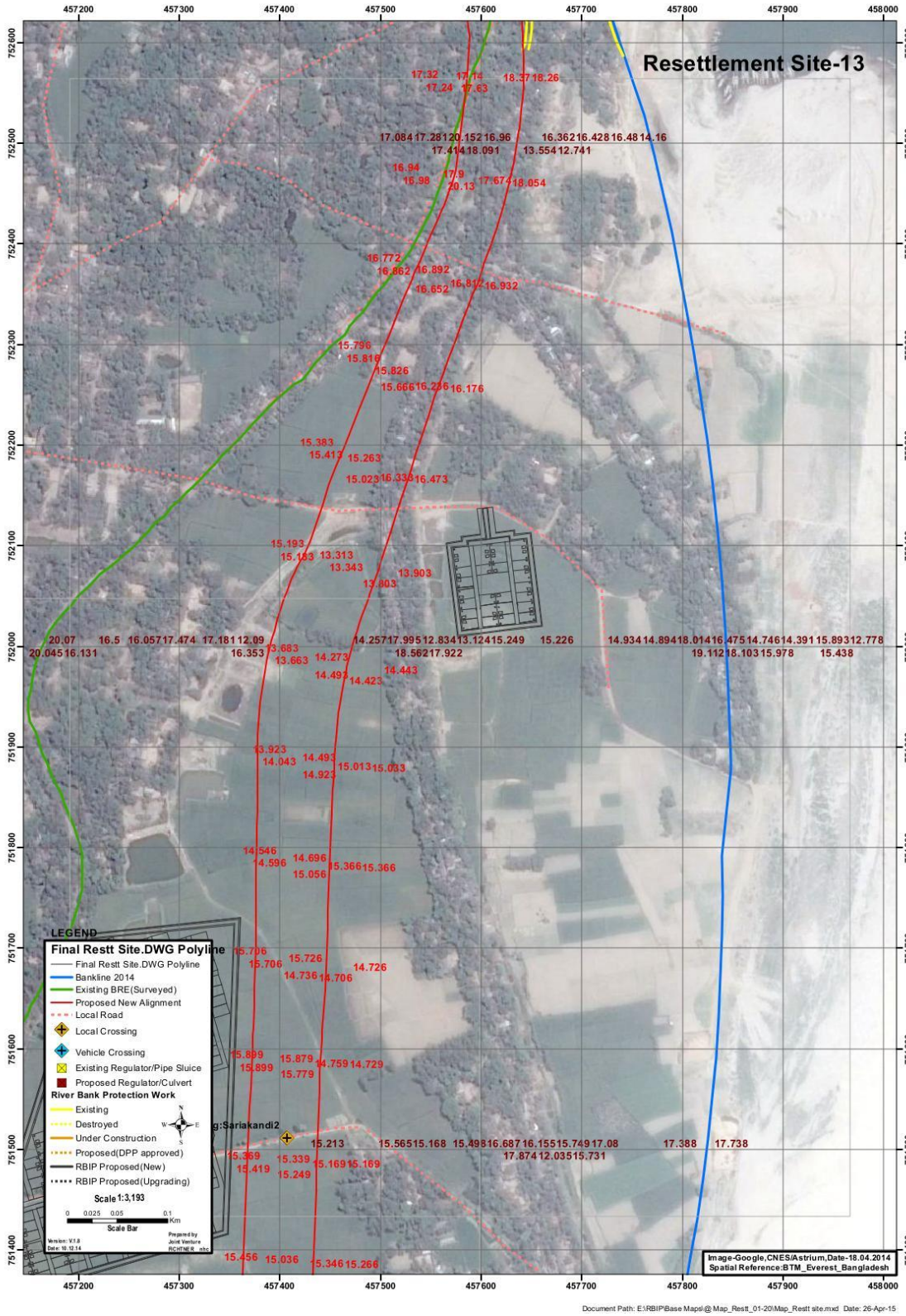

Figure K.14: Resettlement Site 13

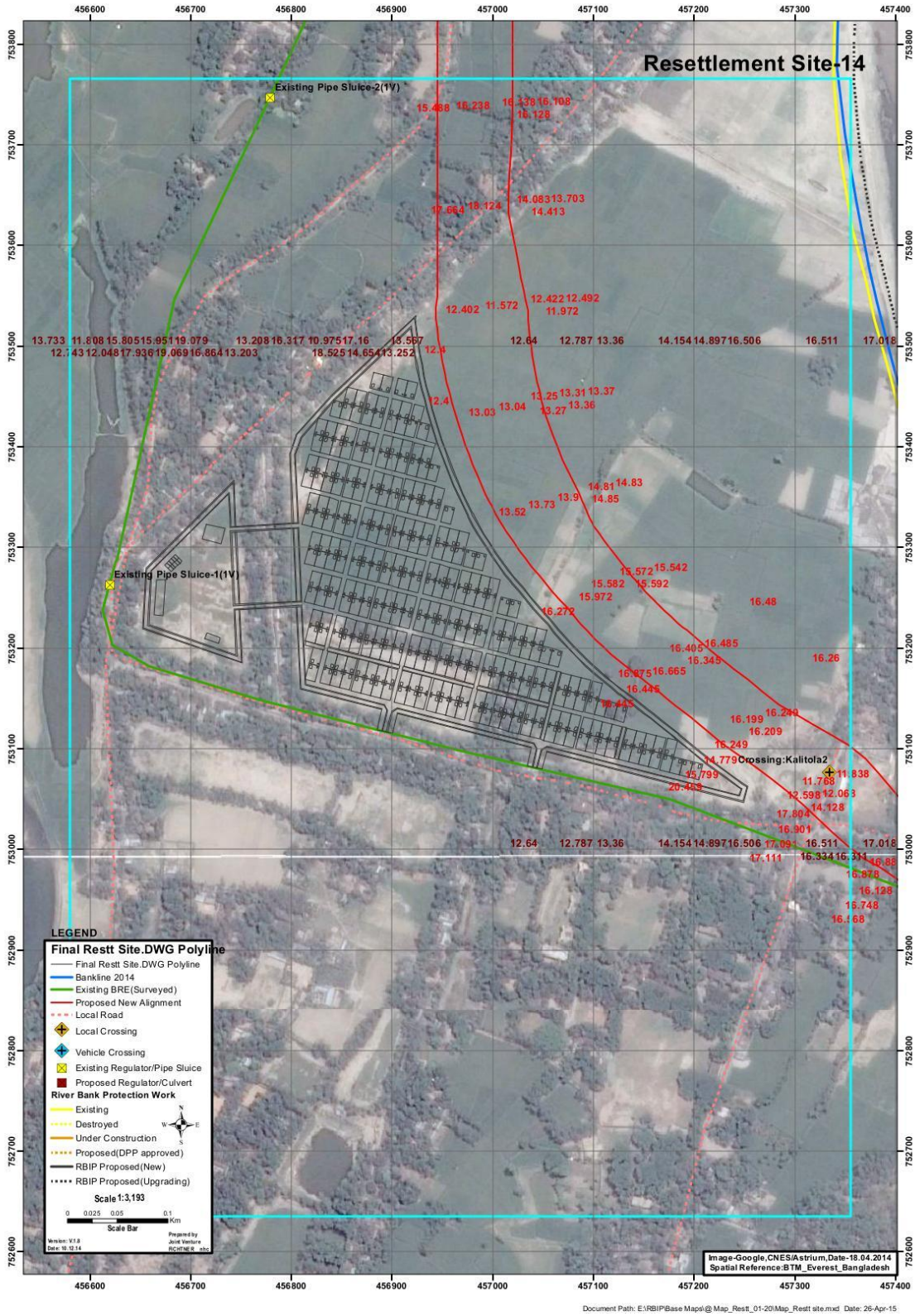

Figure K.15: Resettlement Site 14

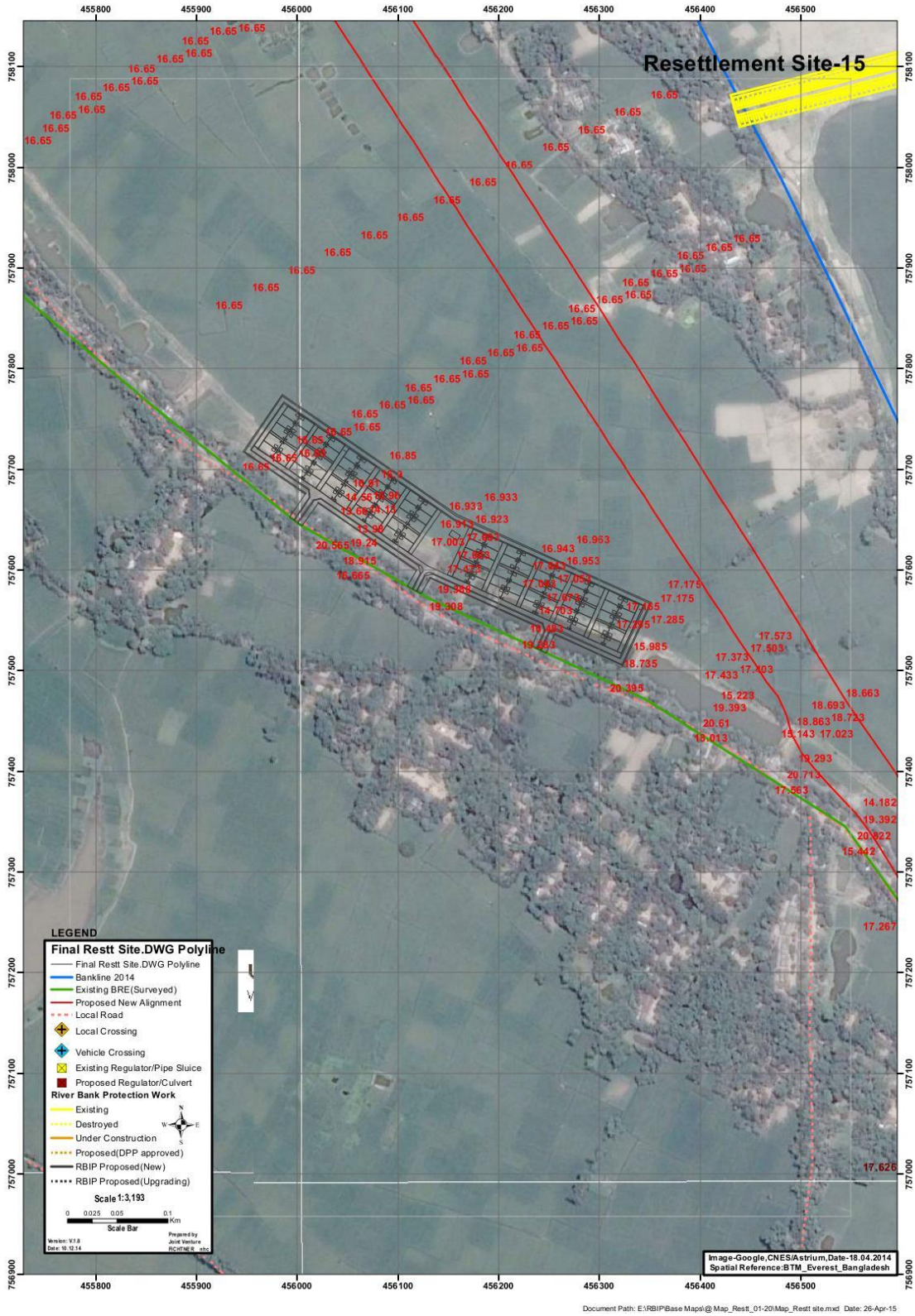

Figure K.16: Resettlement Site 15

K.3. Institutional Arrangements

BWDB will set-up a project specific Social, Environment, and Communication Office (SECO) in the PMU of RMIP. This SECO under the leadership of a Superintending Engineer will assist the PMU on issues related to environmental and social management of the entire project including construction of the resettlement sites. SECO will oversee the Construction Supervision Consultant (CSC) and contractors and will compile quarterly monitoring reports on EMP compliance, to be sent to the Project Director and also shared with the World Bank, throughout the construction period. The SECO will also provide trainings to the BWDB field personnel responsible for monitoring of environmental compliance during construction.

The overall responsibility of environmental performance including EMP implementation of the RMIP will rest with the PMU. Aside from their in-house environmental and social specialists, the PMU will engage construction supervision consultants (CSC) (described as the Project Management Consultants in the feasibility report) to supervise the contractors including on their execution of construction-related environmental and social management requirements and measures. . The CSC will ensure adherence to the design parameters including quality requirements, as well as all EMP measures related to construction.

The SECO will have adequate numbers of environmental and social scientists/specialists and maintain coordination and liaison with CSC for effective EMP implementation. Similarly, the CSC will also have environmental and social monitors who will supervise and monitor the contractors for effective EMP implementation. The contractors in turn will also have HSE supervisors who will ensure EMP implementation during construction activities and will be tasked to develop necessary detailed HSE plans as per this EMP, and oversee their implementation. The PMU will also engage an independent organization to carry out third party environmental monitoring during project implementation. The roles and responsibilities of SECO, CSC, external monitor, and contractors are presented in **Table K.1** below.

Table K.1: Roles and Responsibilities for EMP Implementation

Organizations	Responsibilities
PMU (RMO)	• Ensure that all project activities are well-managed and coordinated. • Procurement of works and goods. • Payment of compensation to the project affectees • Recruitment and supervision of Construction Supervision Consultants (CSC) • Recruitment and supervision of external monitor and independent Panel of Experts
SECO	• Ensuring inclusion of EMP in bidding documents • Providing training on EMP principles and requirements to CSC, contractors, BWDB field staff, and others as needed to ensure effective implementation of EMP • Supervising CSC for the implementation of EMP • Ensure that all the project activities are carried out in environmentally sound manner.

Organizations	Responsibilities
	• Closely coordinate with other concerned agencies, local governments and communities to support implementation of EMP • Preparation of progress reports on implementation of EMP. • Ensure effective implementation of EMP components not directly tasked to the contractor including components dealing with indirect, induced and cumulative effects, as well as operations and maintenance stage plans and measures. • Commissioning and oversight/review of consultant reports for EIAs/EMPs to be developed for subsequent phases of RMIP.
CSC	• Supervise civil works, ensuring compliance with all design parameters including quality requirements • Supervising contractors for EMP implementation • Prepare monthly reports and submit to PMU • CSC will have dedicated environmental and social staff
Contractor	• Responsible for implementation of mitigation and monitoring measures proposed in the EMP • Each contractor will recruit an Environmental, Health, and Safety Manager (EHSM), who will be responsible for implementing the contractors' environmental, health and safety responsibilities, and liaising with government agencies. S/he will have adequate number of staff to support him/her for these tasks.
External Monitor (M&E Consultant)	• Independent monitoring of implementation of EMP • External Monitoring and evaluation
IPoE	• Independent strategic level advice on adequacy of EMP and SAP measures and implementation systems to ensure effective environmental and social management of the project.

Construction Supervision Consultants (CSC)

The CSC will be responsible for supervising the contractors for the implementation of EMP of the main works as well as for the resettlement sites. For this purpose, the CSC will appoint dedicated environment and social staff to ensure EMP implementation during the project. They will supervise the contractor for the EMP implementation, particularly the mitigation measures. They will also be responsible for implementing the monitoring of effects of these measures.

CSC will have the following environmental staff appointed at the site for the entire RMIP Phase I including the construction of resettlement sites:

- Team Leader (international environmental specialist)
- Environmental Specialists (two national specialists)
- Ecologist (one national specialist)
- Ichthyologist (one national specialist)
- Occupational Health and Safety Specialist (one national specialist)

- Environmental Surveyors (four national)

The environment staff of CSC will closely supervise the construction team to ensure that all environmental commitments are incorporated into the construction activities and work processes. Specific responsibilities include:

- Supervising and supporting contractors in fulfilling their responsibilities as outlined in the EMP;
- Issuing non-compliance notices to the contractors;
- Providing input, advice, and approval on activity specific work plans relating to EMP;
- Supervising the implementation of activity specific work plans;
- Regularly reviewing and assessing environmental risks throughout the construction phase;
- Identifying and preparing environmental induction and training materials;
- conducting environmental trainings;
- Assist SECO in addressing and resolving environment-related complaints and grievances
- Responding to environmental incidents as required;
- Managing compliance reporting as it relates to the Project, and preparing quarterly EMP compliance reports;
- Liaise with SECO for effective environmental management at site;
- Reviewing EMP and revising it if required on six-monthly basis.

Contractors

The contractor for construction of the resettlement sites will be required to appoint adequate number of dedicated Environment/Social Officers at the site for the implementation of EMP in the field, particularly the mitigation measures. The contractor will also be responsible for communicating with and training of its staff in the environmental/social aspects. The contractor will develop the various plans directed towards health, safety, the environment and social issues (discussed later in the Chapter), and get them approved by the CSC before the commencement of the physical works on site. Appropriate numbers of the following personnel are required in the contractor's environmental team:

- Environmental Specialists
- Occupational Health and Safety Specialists
- Environmental Technicians (both for lab and field investigations)

The construction contracts will have appropriate clauses to bind the contractors for the above obligations.

K.4. Environmental Codes of Practice

The environmental codes of practice (ECoPs) are generic, non site-specific guidelines. The ECoPs consist of environmental management guidelines and practices to be followed by the contractors for sustainable management of all environmental issues. The contractor will be required to follow them and also use them to prepare site-specific management plans (discussed later in the Section). The ECoPs are listed below and attached in **Annex I**.

- ECoP 1: Waste Management
- ECoP 2: Fuels and Hazardous Substances Management
- ECoP 3: Water Resources Management
- ECoP 4: Drainage Management
- ECoP 5: Soil Quality Management
- ECoP 6: Erosion and Sediment Control
- ECoP 7: Top Soil Management
- ECoP 8: Topography and Landscaping
- ECoP 9: Borrow Areas Management
- ECoP 10: Air Quality Management
- ECoP 11: Noise and Vibration Management
- ECoP 12: Protection of Flora
- ECoP 13: Protection of Fauna
- ECoP 14: Protection of Fisheries
- ECoP 15: Road Transport and Road Traffic Management
- ECoP 16: River Transport management
- ECoP 17: Construction Camp Management
- ECoP 18: Cultural and Religious Issues
- ECoP 19: Workers Health and Safety.

K.5. Environmental Mitigation and Compliance Monitoring

The environmental mitigation and compliance monitoring plan is given in **Table K.2**.

Table K.2: Mitigation and Compliance Monitoring Plan

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
1. Activity: Design / pre-construction						
1.1 Changes in land use, loss of properties, cultivated land and grazing land, relocation of settlements and amenities	– The RAP will be implemented for permanent land acquisition and loss of assets/livelihood and other similar impacts	BWDB PMU	SECO	– Documentary evidence of RAP implementation – Establishment of resettlement sites – Payment of compensation amounts – People resettling in new villages – Income levels of displaced households – Number of public grievances re resettlement and compensation	Before construction	Included in overall Project cost
	– Contractors will lease the land for construction facilities on temporary basis. Proper documentation will be carried out for this leasing. Site selection will be carried out in consultation with the community and local officials; approval from CSC will also be required for the selected sites.	Contractor	CSC/SECO	– Documentary evidence of land leasing for temporary facilities – CSC approval for the selected site(s) – Absence of grievances regarding temporary facilities	Before contractor mobilization	Included in contractors' costs
1.2 borrowing construction material	– A material (particularly river sand) borrowing plan will be prepared in accordance with ECoPs and findings of study on aquatic habitat and migratory birds (item 1.12)	Contractor	CSC/SECO	– Approved plan – Plan itself will outline appropriate KPIs for its implementation.	Before construction	Included in contractors' costs
1.3 Disposal of	– Identification of re-use of excavated	Contractor	CSC/SECO	– Availability of plan to dispose	Before	Included in

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
excavated material	material on site, to reduce off site effects – Maximization of use excavated material in construction.			excavated material.	construction	contractors' costs
1.4 Water quality	– Drainage system will be designed so that all spills will be drained and collected in a sump for further appropriate disposal; and – Oil and chemical storage and vehicle wash and oil change facilities will be established on impermeable surfaces to avoid percolation	Contractor	CSC/SECO	- Monitoring in accordance with Drinking Water and Sanitation Plan. - No breaches of Material Safety Data Sheet (MSDS) for hazardous substances.	Before construction	Included in contractors' costs
1.5 Traffic Management	A Traffic Management Plan (TMP) will be prepared in accordance with ECoP	Contractors	CSC/SECO	Approved TMP Plan itself will outline appropriate KPIs for its implementation.	Before mobilization of contractor	Included in contractors' costs
1.6 Construction camp (and other temporary facilities) site selection	– Site for construction camp will be selected with approval from the Construction Supervision Consultants (CSC). – Areas having thick/dense vegetation will be avoided as far as possible. No *beels* (water ponds) or *khals* (water channels) will be affected.	Contractor	CSC	Approval from SECO	Before mobilization of contractor	Included in contractors' costs
1.7 Construction camp management	Construction Camp Management Plan will be prepared per ECoP and approval obtained from CSC.	Contractor	CSC	Approved Plan Plan itself will outline appropriate KPIs for its implementation.	Before mobilization of contractor	Included in contractors' costs
1.8 Waste	A Waste Management Plan will be	Contractor	CSC	Approved Plan	Before	Included in

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
management	prepared per ECoP and approval obtained from CSC.			Plan itself will outline appropriate KPIs for its implementation.	mobilization of contractor	contractors' costs
1.9 Fuels and hazardous substances management	A fuels and hazardous substances management plan will be prepared per ECoP and approval obtained from CSC.	Contractor	CSC	Approved Plan Plan itself will outline appropriate KPIs for its implementation.	Before mobilization of contractor	Included in contractors' costs
1.10 Water resource management	A Drinking Water Supply and Sanitation Plan will be prepared per ECoP and approval obtained from CSC.	Contractor	CSC	Approved Plan Plan itself will outline appropriate KPIs for its implementation.	Before mobilization of contractor	Included in contractors' costs
1.11 Occupational Health and Safety (OHS) management	An OHS management plan will be prepared per ECoP and WBG EHS Guidelines, and approval obtained from CSC.	Contractor	CSC	Approved Plan Plan itself will outline appropriate KPIs for its implementation.	Before mobilization of contractor	Included in contractors' costs
1.12 Impacts on aquatic habitat and migratory birds	A detailed study on aquatic habitat and migratory birds will be carried out by a team of qualified experts, with appropriate impact avoidance and mitigation measures outlined. CSC to ensure that contractors' material borrowing plan (item 1.2) takes these measures into account (for example to avoid sensitive habitats in sand extraction activities).	BWDB	SECO/CSC	Presence of Study report Implementation of recommended impact avoidance and mitigation measures	Before construction is commenced	Included in overall Project cost
2. Activity: Contractor Mobilization and Demobilization						
2.1 Traffic management	– The approved TMP will be followed. – Traffic facilities, such as speed limits and signal lights, are to be strengthened	Contractors (with BWDB's assistance)	CSC/SECO	– Number of any non-compliance reports – Number of complaints / grievances.	During mobilization and demobilization	Included in contractors' costs

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	– Support to be provided to the local traffic authorities to engage traffic police at the busy junctions – Implement the mitigation measures proposed in ECoP			– Number of traffic accidents/incidents involving project vehicles and lorries bringing materials and supply to project		
2.2 Soil Erosion and Contamination	– Vehicular traffic on unpaved roads will be avoided as far as possible. Operation of vehicles and machinery close to the beels and khals will be minimized. – Vehicles and equipment will not be repaired in the field. If unavoidable, impervious sheathing will be used to avoid soil and water contamination. – Waste management plan will be implemented – EQS compliance will be ensured. – ECoP 1, ECoP 5, ECoP 6, and ECoP 7 will be implemented.	Contractor	CSC	Number of any non-compliance reports	Throughout contractor mobilization and demobilization	Included in contractors' costs
2.3 Air Quality	– -Pollution prevention plan will be implemented. – Construction machinery and vehicles will be kept in good working condition and properly tuned, in order to minimize the exhaust emissions, and in compliance with the EQS. – Fugitive dust emissions will be minimized by appropriate methods, such as spraying water on soil, where required and appropriate. – Project vehicles will avoid passing	Contractor	CSC	– Number of non-compliance reports. – Number of community complaints. – Ambient air quality found beyond the national standards (EQS)	Throughout contractor mobilization and demobilization	Included in contractors' costs

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	through the communities as far as possible. If unavoidable, speed will be reduced to 15 km/h to avoid excessive dust emissions. – Air quality will be properly monitored, especially near the population centers and sensitive receptors. Appropriate actions will be undertaken in case ambient air quality at the population centers deteriorates beyond EQS limits. – ECoP 10 for air quality management will be implemented.					
2.4 Noise	– -Pollution prevention plan will be implemented. – Noise barriers will be installed where needed particularly near sensitive receptors such as schools – Vehicles will have exhaust mufflers (silencers) to minimize noise generation. – Nighttime traffic will be avoided near the communities. Local population will be taken in confidence if such work is unavoidable. – Vehicular traffic through the communities will be avoided as far as possible. Vehicle speeds will be kept low, and horns will not be used while passing through or near the communities. – Compliance with EQS and WBG EHS	Contractor	CSC	– Number of non-compliance reports; – Noise measurement data – Number of community complaints.	Throughout contractor mobilization and demobilization	Included in contractors' costs

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	Guidelines will be ensured. – ECoP-11 will be enforced. – Continued consultations with affected communities will be carried out.					
2.5 Public Safety	– Occupational health and safety procedures and OHS Plan will be enforced. – Implement fuels and hazardous substances management plan – Fencing would be provided around construction sites as appropriate to minimize public safety risks. – A Traffic Management Plan will be implemented that will aim at ensuring access to residential areas, and preventing of unsafe situations, especially near schools, housing areas, construction areas, camps and offices. – Special attention should be focused on safety training for workers to prevent and restrict accidents and on the knowledge how to deal with emergencies. – Road signage will be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic. – Liaison with traffic police will be maintained – Project drivers will be trained on defensive driving.	Contractor	CSC	– Number of any non-compliance reports; – Number of any related public complaints – Number of accidents, incidents and near-misses.	Throughout contractor mobilization and demobilization	Included in contractors' costs

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	– Vehicle speeds near / within the communities will be kept low, to avoid safety hazards. – ECoP-15 and ECoP-18 will be implemented.					
2.6 Damage to Infrastructure	All damaged infrastructure will be restored to original or better condition.	Contractor	CSC	– Number of any non-compliance reports; – Number of any public complaints.	Throughout contractor mobilization and demobilization	Included in contractors' costs
3. Activity: Construction workers camp establishment and operation						
3.1 Soil erosion; soil and water contamination	– Camp management plan will be implemented – location of camp will be selected after obtaining CSC's approval and in consultation with local community – Photographs will be taken to record the site conditions prior to the establishment of the camp. – Land clearing, leveling and grading will be minimized, and carried out in a manner to minimize soil erosion. – Camp will have rainwater drainage arrangements – Camps will have protection arrangements against soil erosion – Vehicular traffic on unpaved roads will be avoided as far as possible. Operation of vehicles close to the water channels, water reservoirs will be minimized.	Contractor	CSC	– Compliance to the Camp Management Plan, Waste Management Plan – Number of any non-compliance reports – Results of soil and water quality analysis – Number of related complaints	Before and throughout the construction phase	Included in contractors' costs

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	– Contractors will prepare and implement a Waste Management Plan. – For the domestic sewage, appropriate treatment and disposal system (e.g., septic tank and soaking pits) will be constructed having adequate capacity – Waste oils will be collected in drums and sold to the recycling contractors. – The inert recyclable waste from the site (such as cardboard, drums, and broken/used parts) will be sold to recycling contractors. The hazardous waste will be kept separate and handled according to the nature of the waste. – Domestic sold waste from the camp site will be disposed off in a manner that does not cause soil contamination. – The contractor will identify suitable sites for disposal of hazardous and non- hazardous waste. The selection will be done in consultation with the PMU and the local municipal authorities. No waste disposal will be carried out in *khals*, *beels* and rivers. – The camp site area will be completely restored after completion of construction works. All temporary structures will be demolished, – EQS compliance will be ensured. – ECoP-1, ECoP-2, ECoP-3, ECoP 4, ECoP 5, ECoP 6, ECoP 7, ECoP 8,					

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	ECoP 16, and ECoP-18 will be implemented.					
3.2 Air Quality	– -Pollution prevention plan will be implemented. – Generators and vehicles will be kept in good working condition and properly tuned, in order to minimize the exhaust emissions. – Fugitive dust emissions will be minimized by appropriate methods, such as spraying water on soil, where required and appropriate. – Air quality will be properly monitored, especially near the population centers – EQS compliance will be ensured. – ECoP-10 will be implemented.	Contractor	CSC	– Number of any non-compliance reports – Air quality monitoring data – Number of related grievances	Throughout the construction phase	Included in contractors' costs
3.3 Vegetation loss; threat to wildlife	– Clearing natural vegetation will be avoided as far as possible. – The camp will be established in a natural clearing, to the extent possible. – Any loss or damage to crops or cultivation land will be compensated in accordance with RAP – Complete record will be maintained for any tree cutting. – The camp staff will not indulge in any animal shooting, trapping, catching, or killing activities. – The construction crew will be	Contractor	CSC	– Number of any non-compliance reports – Number of tree felled – Number of sighting of key wild species	Before and throughout the construction phase	Included in contractors' costs

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	provided with liquefied petroleum gas (LPG) as cooking (and heating, if required) fuel. Use of fuel wood will be avoided. – Include information on wildlife protection in all tool-box orientation briefings for camp staff – Contractors shall use lower wattage flat lens fixtures that direct light down and reduce glare, and shall avoid use of flood lights. – Contractors will also raise awareness about the protection of birds and other wildlife species among the work force to reduce impacts such as disturbance and poaching – ECoP-12, ECoP-13, and ECoP-14 will be implemented.					
3.4 Noise	– -Pollution prevention plan will be implemented. – Noise barriers will be installed where needed particularly near sensitive receptors such as schools – Generators and vehicles will have exhaust mufflers (silencers) to minimize noise generation. – Liaison with the communities will be maintained. – Noise monitoring will be carried out. – EQS compliance will be ensured.	Contractor	CSC	– Number of any non-compliance reports – Noise monitoring data – Number of grievances regarding noise	Throughout the construction phase	Included in contractors' costs

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	– ECoP-11 will be implemented.					
3.5 Health and Safety	– OHS plan will be prepared and implemented – Implement fuels and hazardous substances management plan – Drinking water management plan will be implemented – Protective fencing to be installed around the Camp to avoid any accidents. – Contain all fuel tanks in a fully bunded area with a storage capacity of at least 110 percent of the potential storage volume. – Spill control arrangements to be made for hazardous substances (e.g., fuels) – Firefighting equipment will be made available at the camps. – The camp staff will be provided OHS training. – All safety precautions will be taken to transport, handle and store hazardous substances, such as fuel. – Construction camps will have first aid kits – Camp crew will be provided with awareness for transmissible diseases (eg, HIV, hepatitis B and C). – ECoP-2 and ECoP-18 will be implemented.	Contractor	CSC	– Number of any non-compliance reports – Number of trainings conducted – Number of accidents, incidents, and near misses.	Before and throughout the construction phase	Included in contractors' costs

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
3.6 Social and Gender Issues	– Local norms and customs will be respected – Camp crew will avoid entering the villages – No child labor will be employed in the camps. – Liaison with the community will be maintained. – ECoP 17 will be implemented	Contractor	CSC	Number of non-compliance reports; Number of related complaints	Throughout the construction phase	Included in contractors' costs
3.7 Damage to PCRs	– In case any artifacts or sites of archeological, cultural, historical, or religious significance are discovered during construction activities, the works will be stopped, and the Archeological Department will be informed.	Contractor	CSC	– Number of non-compliance reports – Number of reports of any PCR discovery	Throughout the construction phase	Included in contractors' costs
3.8 Increased Load on Local Services and Supplies	– The contractors to procure their supplies in a manner not significantly affecting the availability of essential commodities in the area for the residents. – Grievance redress mechanism will be established to address community complaints and grievances.	Contractor	CSC	Number of related public grievances	Construction phase	Included in contractors' costs
4. Activity: Transportation of Equipment and Construction Material						
4.1 Traffic management	– The approved TMP will be followed. – Traffic facilities, such as speed limits and signal lights, are to be strengthened – Support to be provided to the local	Contractor	CSC	– Number of any non-compliance reports – Number of complaints / grievances. – Number of traffic	Throughout the construction phase	Included in contractors' costs

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	traffic authorities to engage traffic police at the busy junctions – Implement the mitigation measures proposed in ECoP 15. – Sensitive habitats to be avoided (Figures 6.2, 6.3, and Table 6.15) – Construction-related boat movement will be restricted to within 500 m of river bank, which should minimize their impact on river dolphins. Motor boat speed will be limited to 15 km/h in accordance with best international practices. Pingers will be used to chase away dolphins form the construction areas thus minimizing the chances of any collision. – Excessive lighting, noise generation and navigation to be avoided near the chars during the night-time.			accidents/incidents involving project vehicles and lorries bringing materials and supply to project		
4.2 Soil Erosion and Contamination	– -Pollution prevention plan will be implemented. – Vehicular traffic on unpaved roads will be avoided as far as possible. Operation of vehicles and machinery close to the water channels, water reservoir will be minimized. – Vehicles and equipment will not be repaired in the field. If unavoidable, impervious sheathing will be used to avoid soil and water contamination. – EQS compliance will be ensured.	Contractor	CSC	Number of any non-compliance reports	Before and during construction	Included in contractors' costs

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	– ECoP 1, ECoP 5, ECoP 6, and ECoP 7 will be implemented.					
4.3 Air Quality	– -Pollution prevention plan will be implemented. – Construction machinery and vehicles will be kept in good working condition and properly tuned, in order to minimize the exhaust emissions, and in compliance with the EQS. – Fugitive dust emissions will be minimized by appropriate methods, such as spraying water on soil, where required and appropriate. – Project vehicles will avoid passing through the communities as far as possible. If unavoidable, speed will be reduced to 15 km/h to avoid excessive dust emissions. – Trucks and conveyor belts carrying construction material and excavated soil will be covered if required to avoid air quality deterioration. – Air quality will be properly monitored, especially near the population centers and BWDB colonies – ECoP 10 for air quality management will be implemented.	Contractor	CSC	– Number of any non-compliance reports – Air quality monitoring data – Number of related grievances	Before and during construction	Included in contractors' costs
4.4 Noise	– -Pollution prevention plan will be implemented. – Noise barriers will be installed where	Contractor	CSC	– Number of any non-compliance reports – Number of related public	Before and during construction	Included in contractors' costs

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	needed particularly near sensitive receptors such as schools – Vehicles will have exhaust mufflers (silencers) to minimize noise generation. – Nighttime traffic will be avoided near the communities. Local population will be taken in confidence if such work is unavoidable. – Vehicular traffic through the communities will be avoided as far as possible. Vehicle speeds will be kept low, and horns will not be used while passing through or near the communities. – Liaison with the communities will be maintained. – Noise monitoring will be carried out – Compliance with EQS and WBG EHS Guidelines will be ensured. – ECoP-11 will be enforced.			complaints – Noise monitoring data		
4.5 Public Safety	– OHS plan will be implemented – Implement fuels and hazardous substances management plan – Road signage will be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic. – Liaison with traffic police and communities will be maintained – Project drivers will be trained on	Contractor	CSC	– Number of any non-compliance reports – Number of accidents, incidents and near misses – Number of related public complaints – Number of trainings provided	Before and during construction	Included in contractors' costs

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	defensive driving. – Vehicle speeds near / within the communities will be kept low, to avoid safety hazards. – ECoP-15 and ECoP-18 will be implemented.					
4.6 Damage to Infrastructure	All damaged infrastructure will be restored to original or better condition.	Contractors	CSC	Number of any non-compliance reports	Before and during construction	Included in contractors' costs
4.7 Blocked routes	• On-going community consultations to be carried out • Proper scheduling of works to minimize blockage of access to places such as boat jetties • Road signage • Community awareness	Contractors	CSC	Number of any non-compliance reports	Before and during construction	Included in contractors' costs
5. Activity: Material Borrowing						
5.1 Impacts on aquatic habitat	• Borrow area management plan will be implemented. • Sand extraction will be carried out leaving alternate stretches of the river bank undisturbed, only small quantity of sand will be extracted from any single location • The contractor will obtain clearance from the CSC before sand extraction can be carried out at any particular location. The CSC will issue this clearance after surveying the area and ensuring that no critical habitat exists at such location	Contractor	CSC	Number of any non-compliance reports	Construction phase	Included in contractors' costs

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	• Sensitive habitats to be avoided for sand extraction • Construction-related boat movement will be restricted to within 500 m of river bank, which should minimize their impact on river dolphins. Motor boat speed will be limited to 15 km/h in accordance with best international practices. Pingers will be used to chase away dolphins form the construction areas thus minimizing the chances of any collision. • Excessive lighting, noise generation and navigation to be avoided near the chars during the nighttime. • GRM will be put in place.					
	• Ecological monitoring to be carried out to determine any long lasting impact of sand extraction.	Consultants	SECO	Monitoring reports	During construction	Included in EMP cost
5.2 Soil erosion	– Borrow pits/areas to be restored to the extent possible/ necessary – Road edge buffers will be re-planted – Replanting to be carried out after completing the quarrying, using fast-growing native species; and grasses to assist slope and soil stability. – ECoP-6 will be implemented.	Contractor	CSC	Number of any non-compliance reports	construction phase	Included in contractors' costs
5.3 Soil and water contamination	– Small quantity of sand extraction will be carried from a single location to minimize increase in water turbidity	Contractor	CSC	– Monthly auditing of management of hazardous materials against Material	construction phase	Included in contractors' costs

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	– Silt fences or sediment barriers will be provided around the sand extraction areas to prevent migration of high sediment loads. – Pollution prevention plan and waste disposal plan will be implemented. – Any discharges to the river or streams should have turbidity of less than 2 mg/l – Regular waste water streams are to be passed through settling basins. – Undertake pH monitoring of site runoff to ensure alkaline runoff is not leaving the site. – EQS compliance will be ensured. – ECoP-1, ECoP-2, ECoP-4, ECoP-5, and ECoP-7 will be implemented.			Safety Data Sheet – Soil and water quality monitoring data – Number of reports if any non-compliance – Number of related complaints		
5.4 Air Quality	– Pollution prevention plan will be implemented. – Exhaust from construction vehicles, boats, and equipment will comply with EQS – Construction materials will be stored in designated areas away from sensitive receptors and covered to minimize dust on site from site construction works – Water spraying will be carried out to suppress dust emissions where needed – Construction vehicles will be sprayed with water when entering and leaving	Contractor	CSC	– Number of dust-related complaints. – Number of air quality-related complaints, – Air quality monitoring data – Compliance with Traffic Management Plan.	construction phase	Included in contractors' costs

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	the site, covered if transporting materials, adhere to speed limits, and engines will be turned off when idling. – Target zero dust related complaints – Target zero air quality related complaints. – ECoP-10 will be implemented.					
5.5 Health and Safety	– Construction workers on boats to have life jackets – Compliance with Occupational Health and Safety standards and OHS Plan – Implement Fuels and hazardous substances management plan – Develop controls and standard operating procedures for the use of fuels and other hazardous substances to prevent spills, accidents – Train and designate personnel for various OHS aspects such as spill control procedures, fire fighting – Establish firefighting system and fire safety (fire extinguishers) at the construction sites where fire is an hazard – Transport of hazardous goods and fuel to be done in closed containers and ISO certified tanks – Provision of respiratory protective devices for workers where needed – Designate agreed routes for traffic (set	Contractor	CSC	– Number of respiratory protective devices and other PPEs issues to workers. – Monitoring of compliance with Health and Safety standards (including monthly reporting of accidents). – Number of accidents, incidents and near misses. – Number of trainings provided.	construction phase	Included in contractors' costs

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	out in the Traffic Management Plan) – Boats to have first aid boxes – WBG's EHS Guidelines to be implemented – ECoP 2, ECoP 16, and ECoP-18 will be implemented.					
5.6 Noise and Vibration	– Pollution prevention plan will be implemented. – Construction plants and vehicles producing sound in excess of 85dB will be fitted with mufflers; – EQS compliance will be ensured. – ECoP-11 will be implemented.	Contractor	CSC	– Number of record of equipment used on site capable of producing over 85dB and whether equipment has been fitted with mufflers – Number of related community complaints – Noise monitoring data	construction phase	Included in contractors' costs
5.7 Damage to infrastructure	Any damaged infrastructure such as boat jetties will be repaired	Contractor	CSC	Number of any non-compliance reports	construction phase	Included in contractors' costs
5.8 Impacts on cultivation fields	No borrowing will be carried out from the cultivation fields.	Contractor	CSC	Any non-compliances	construction phase	Included in contractors' costs
6. Activity: Construction of Resettlement Sites						
6.1 Changes in Land Use, loss of agriculture	• Sites having minimum displacement requirements will be selected • Sites with minimum impacts on agriculture activities and cultivated land will be selected • Sites will be located at a safe distance from sensitive habitats • Community consultation will be carried out to finalize the sites	SECO	Independent monitors	– Documentary evidence of RAP implementation – Percentage of affectees that have received full payment. – Number of related grievances	Before construction	Included in overall project cost

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	• RAP will be implemented. • GRM will be put in place.					
6.2 Changes to land form and topography	– Changes to the land form and topography will only occur in designated areas to accommodate defined project features. – Excavation of material will be kept to a minimum. – Implement ECoP 8.	Contractor	CSC	– Volume of spoil extracted (monitor against predictions). – All excavated materials to be disposed of in designated sites. – Number of non-compliances observed/reported	Throughout the construction phase	Included in contractors' costs
6.3 Soil erosion	– Slopes will be re-vegetated – Areas exposed during construction will be re-vegetated ('greened') immediately – Adopt measures set out in the Landscaping and Plantation Plan – Replanting to occur prior to the commencement of operation, using fast-growing native species; and grasses to assist slope and soil stability. – ECoP-6 will be implemented.	Contractor	CSC	Compliance with the Landscaping and Plantation Plan. All replanting to be commenced prior to operation.	Throughout the construction phase and prior to operation	Included in contractors' costs
6.4 Soil and water contamination	– The contractor will prepare and implement a Pollution Prevention Plan prior to the start of the work. Proper baseline data will be collected. – Construction materials will be stored, used and handled appropriately. – Excavated material disposal methods to include measures to reduce risk of	Contractor	CSC	– Monthly auditing of management of hazardous materials against Material Safety Data Sheet – Soil and water quality monitoring data – Number of reports if any non-compliance	Throughout the construction phase	Included in contractors' costs

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	environmental pollution. – Reduce risk of a pollution event through adoption of measures set out in Solid Waste Management Plan and (Drinking Water) and Sanitation Plan – Hazardous and toxic materials stored separately – The contractor will identify suitable sites for disposal of hazardous and non- hazardous waste. The selection will be done in consultation with the PMU and the local municipal authorities. *Beels*, *khals*, and rivers will not be used for waste dumping. – Fuels and hazardous substances management plan will be implemented. – Design drainage for the batching plant area to direct runoff into a sump/basin for inspection for pollutants prior to discharge – Design settling basins for the discharges from tunnel construction areas – Any discharges to the river or streams should have turbidity of less than 2 mg/l – Regular waste water streams are to be passed through settling basins. – Undertake pH monitoring of site runoff to ensure alkaline runoff is not			– Number of related complaints		

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	leaving the site. – Construct a designated, signposted concrete wash down bay that is fully contained and bunded for all excess concrete and concrete wash down, e.g. – Plastic lined. – Regularly maintain the concrete – Washout bay, treating any water prior to release to natural systems. – EQS compliance will be ensured. – ECoP-1, ECoP-2, ECoP-4, ECoP-5, and ECoP-7 will be implemented.					
6.5 Air Quality	– -Pollution prevention plan will be implemented. – Construction materials will be stored in designated areas away from sensitive receptors and covered to minimize dust on site from site construction works – Construction vehicles will be sprayed with water when entering and leaving the site, covered if transporting materials, adhere to speed limits, and engines will be turned off when idling. – Water spraying will be carried out to suppress dust emissions where needed – Batching plants, asphalt plants, and crushers will have appropriate dust and emission abatement systems (e.g., wet scrubber) as appropriate.	Contractor	CSC	– Number of dust-related complaints. – Number of air quality-related complaints, – Compliance with Traffic Management Plan. – Air quality monitoring data	Throughout construction phase	Included in contractors' costs

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	– Target zero dust related complaints – Target zero air quality related complaints. – EQS compliance will be ensured. – Monitoring of ambient air quality – Near settlements and sensitive receptors such as schools. – Appropriate actions to be undertaken in case ambient air quality deteriorates beyond EQS limits. – ECoP-10 will be implemented.					
6.6 Health and Safety	– Compliance with Occupational Health and Safety standards and OHS Plan – Implement fuels and hazardous substances management plan – Use of personal protective equipment (PPE) – Construction sites to be cordoned off to stop unauthorized access – Develop controls and standard operating procedures for the use of fuels and other hazardous substances to prevent spills, accidents, and pilferage – Train and designate personnel for various OHS aspects such as spill control procedures, fire fighting – Establish firefighting system and fire safety (fire extinguishers) at the construction sites where fire is an	Contractor	CSC	– Number of respiratory protective devices and other PPEs issues to workers. – Monitoring of compliance with Health and Safety standards (including monthly reporting of accidents). – Number of accidents, incidents and near misses. – Number of trainings provided.	Throughout construction phase	Included in contractors' costs

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	hazard – Spill kits and trained personnel are to be made available at the workshops. – Contain all fuel tanks in a fully bunded area with a storage capacity of at least 110 percent of the potential storage volume. – Use auto shut down valves for fuel transfer pipes – Transport of hazardous goods and fuel to be done in closed containers and ISO certified tanks – Provision of respiratory protective devices for workers where needed – Designate agreed routes for traffic (set out in the Traffic Management Plan) – Provision of insurance-backed compensation scheme for major injury or loss of life reflecting settlement sums that are consistent with national/international benchmarks. – Contractor to engage a doctor at the site/camp – Construction sites to have first aid boxes – Site to have ambulance to transfer injured/sick workers to nearest hospital – WBG's EHS Guidelines to be implemented – ECoP 2 and ECoP-18 will be					

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	implemented.					
6.7 Noise and Vibration	– -Pollution prevention plan will be implemented. – Construction plant producing sound in excess of 85dB will be fitted with mufflers; – Noise barriers will be provided in areas where significant noise is expected. – EQS compliance will be ensured. – ECoP-11 will be implemented.	Contractor	CSC	– Record of equipment used on site capable of producing over 85dB and whether equipment has been fitted with mufflers – Number of related community complaints – Noise monitoring data – Number of non-compliances	Throughout construction phase	Included in contractors' costs
6.8 Landscape and Visual Intrusion	– Landscaping and Plantation Plan will be implemented – New planting and landscape restoration as soon as practicable at the end of construction phase – Replanting of flora/vegetation alongside embankment and road – Enhance floral environment by planting fruit trees and ornamental shrubs. – ECoP 8 to be implemented	Contractor	CSC	Compliance with Landscaping and Plantation Plan	Before the completion of the construction phase	Included in contractors' costs
6.9 Vegetation loss	– Compensatory tree plantation will be carried out mostly along the embankment and road and also in resettlement sites – A public education program should be designed and implemented to discourage cutting of trees by the construction workers	Contractor	CSC	– Number of trees felled – Number of saplings planted Survival rate of saplings after one year	Throughout construction phase	Included in contractors' costs

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	– Avoid dumping material in vegetated areas. – Avoid unnecessary loss of vegetation – ECoP-12 will be implemented.					
6.10 Fauna / Wildlife	– Awareness raising of workers, employees and general public; – Include information on wildlife protection in all construction related tool-box orientation briefings for new construction staff – A public education program will be designed and implemented to discourage poaching of wildlife – Avoid positioning spoil in areas used by fauna – No hunting or poaching – Keeping away from sensitive habitats such as water channels (*khals*) and water ponds (*beels*) – No dumping of effluents or solid waste in water bodies – ECoP-13 and ECoP 14will be implemented.	Contractor	CSC	– Number of reported incidences of hunting or poaching on the Project site / in land ownership. – Number of reports of sighting of key wild species	Throughout construction phase	Included in contractors' costs
	– Environmental enhancement measuresto be implemented	BWDB	ESC	Evidence of implementation of enhancement measures	During construction phase	Included in overall project cost
6.11 Mortality of Fish	– No untreated effluents will be released in water bodies. Care will be observed to minimize sliding of soil and spoil in water bodies.	Contractor	CSC	– Number of any non-compliance reports – Number of related grievances	construction phase	Included in contractors' costs

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	– Keeping away from sensitive habitats such as water channels (*khals*) and water ponds (*beels*)					
6.12 Damage to infrastructure	Any damaged infrastructure such as roads, bridges and culverts will be repaired	Contractor	CSC	– Number of any non-compliance reports – Number of related grievances	construction phase	Included in contractors' costs
6.13 Damage to PCRs	– In case any artifact or site of archeological, cultural, historical, or religious significance are discovered during construction activities, the works will be stopped, and the Archeological Department will be informed.	Contractor	CSC	– Number of any non-compliance reports – Number of reports of any new PCR discovered/reported	construction phase	Included in contractors' costs
6.14 Disturbance of Visual Landscape and Natural Habitats	– Proper landscaping will be done and an overall Landscape and Plantation Plan will be implemented that will be worked out in more detail for the area where the project infrastructure is located. – Tree planting will be well organized and where possible vegetation and natural habitats will have to be restored or newly created.	Contractor	CSC	Number of any non-compliance reports	construction phase	Included in contractors' costs
6.15 Social conflict due to the Influx of Workers and In-migrants	– Liaison will be maintained with the communities – Contractors and workforce to follow code of conduct – Respect of local norms and values – Implementation of awareness campaign	PMU	SECO	Number of public grievances relating to in-migrants	Construction phase	Included in contractors' costs

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	– Complaints from the local community will be addressed by the Grievance Mechanism that will be developed.					
6.16 Adverse Effects on Health Situation	– The Public Health Action Plan will be implemented – Raising awareness of the associated risks for the local population. – The awareness campaign will also be aimed at the risk of interaction between the resident population and the construction work force, including the spreading of sexually transmitted diseases such as HIV/AIDS. – The medical health facilities in the project influence area will be facilitated to deal with such incidences.	PMU and contractor	CSC	Number of patients being treated in the local hospitals	Construction phase	Included in contractors' costs
6.17 Increased Load on Local Services and Supplies	– The contractors to procure their supplies in a manner not significantly affecting the availability of essential commodities in the area for the residents. – Grievance redress mechanism will be established to address community complaints and grievances.	Contractor	CSC	Number of related public grievances	Construction phase	Included in contractors' costs
6.18 Blockage of local routes	– Local access routes will not be blocked to the extent possible – Boat/launch jetties will not be blocked to the extent possible – If blockage of routs, roads, or boat jetties is unavoidable, consultations	Contractor	CSC	– Number of related community complaints	construction phase	Included in contractors' costs

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	will be carried out with the affected community and alternates will be identified. – Work schedule will be prepared in consultation with the communities to minimize impact of blocked access or routes.					
7. Activity: Waste management						
7.1 Soil and water contamination	– Contractors will implement the Waste Management Plan. – Appropriate hazardous, industrial and domestic waste disposal facilities must be established – For the domestic sewage, appropriate treatment and disposal system (e.g., septic tanks and soaking pits) will be constructed having adequate capacity – Waste oils will be collected in drums and sold to the recycling contractors. – The inert recyclable waste from the site (such as cardboard, drums, and broken/used parts) will be sold to recycling contractors. – The hazardous waste will be kept separate and handled according to the nature of the waste. – Domestic solid waste will be disposed off in a manner that does not cause soil contamination. – Awareness raising for minimizing use of non-biodegradable substances	Contractor	CSC	– Monthly auditing of management of hazardous materials against Material Safety Data Sheet – Soil and water quality monitoring data – Reports if any non-compliance – Number of related complaints	construction phase	Included in contractors' costs

Environmental Impact/Issue	Actions	Responsibility		Key Performance Indicator	Timing	Cost Allocation
		Execution	Monitoring			
	– Regular maintenance of waste management facilities will be undertaken – No waste dumping/release will be carried out in environmental sensitive areas including *beels*, *khals*, and rivers – Implement ECoP 1					
7.2 Odor	– Waste disposal sites will be located away from the communities – Regular maintenance of waste management facilities will be undertaken	Contractor	CSC	Number of related complaints	construction phase	Included in contractors' costs
8. Activity: Sire Restoration						
8.1 Site restoration	• Demolition of temporary structures • Removal of all debris, excess construction material, scraps, spoils, other wastes • Landscaping • Restoration of sites for camps and office buildings	Contractor	CSC	• Photographic record • Clearance from CSC	construction phase	Included in contractors' costs

K.6. Capacity Building

Capacity building for effective implementation of the environmental and social safeguard requirements is a key element of the EMP. Capacity building for environmental and social safeguard management will need to be carried out at all tiers of the project, including BWDB, SECO, CSC, and contractors. At the construction site, CSC will take the lead in implementing the capacity building plan, though the contractors will also be responsible to conduct trainings for their own staff and workers. The various aspects that are covered under the capacity building will include general environmental and social awareness, key environmental and social sensitivities of the area, key environmental and social impacts of the project, EMP requirements, OHS aspects, and waste disposal. **Table K.3** provides a summary of various aspects of the environmental and social trainings to be conducted at the construction site. SECO may revise the plan during the Project implementation as required.

Table K.3: Environmental and Social Trainings

Contents	Participants	Responsibility	Schedule
General environmental and socioeconomic awareness; Environmental and social sensitivity of the project influence area; Key findings of the EIA; Mitigation measures; EMP; Social and cultural values of the area.	Selected staff of BWDB, CSC, and contractors	CSC	Prior to the start of the Project activities. (To be repeated as needed.)
General environmental and socioeconomic awareness; Environmental and social sensitivity of the project influence area; Mitigation measures; Community issues; Awareness of transmissible diseases Social and cultural values.	PMU; CSC; selected contractors' crew	CSC	Prior to the start of the field activities. (To be repeated as needed.)
EMP; Waste disposal; OHS	Construction crew	Contractors	Prior to the start of the construction activities. (To be repeated as needed.)
Road/waterway safety; Defensive driving/sailing; Waste disposal; Cultural values and social sensitivity.	Drivers; boat/launch crew	Contractors	Before and during the field operations. (To be repeated as needed.)
Camp operation; Waste disposal; OHS	Camp staff	Contractors	Before and during the field operations. (To be repeated as

Contents	Participants	Responsibility	Schedule
Natural resource conservation; Housekeeping.			needed.)
Restoration requirements; Waste disposal.	Restoration teams	Contractors	Before the start of the restoration activities.

K.7. Chance Find Procedure

The contractors will be responsible for familiarizing themselves with the following "Chance Finds Procedures" in case culturally valuable materials are uncovered during excavation or any project activities as per the Antiquities Act, 1968 and the WB OPs, including:

(1) Cultural property includes monuments, structures, works of art, or sites of significant points of view, and are defined as sites and structures having archaeological, historical, architectural, or religious significance, and natural sites with cultural values. This includes cemeteries, graveyards and graves.

(2) In the event of finding of properties of cultural value during construction, the following procedures for identification, protection from theft, and treatment of discovered artifacts should be followed and included in standard bidding document.

(a) Stop the construction activities in the area of the chance find;

(b) Delineate the discovered site or area;

(c) Secure the site to prevent any damage or loss of removable objects.

(d) Notify the supervisory Engineer who in turn will notify the responsible local authorities;

(e) Responsible local authorities and the relevant Ministry would be in charge of protecting and preserving the site before deciding on subsequent appropriate procedures.

(f) Decisions on how to handle the finding shall be taken by the responsible authorities and the relevant Ministry. This could include changes in the layout (such as when finding an irremovable remain of cultural or archeological importance), conservation, restoration and salvage.

(g) Implementation of the authority decision concerning the management of the finding shall be communicated in writing by the relevant Ministry.

(h) Construction work could resume only after permission is given from the responsible local authorities and the relevant Ministry concerning safeguard of the heritage (e.g. Upazila Nirbahi Officer, Deputy Commissioner and Department of Archeology).

(3) These procedures must be referred to as standard provisions in construction contracts. During project supervision, the Site Engineer shall monitor the above regulations relating to the treatment of any chance find encountered.

(4) Relevant findings will be recorded in World Bank Supervision Reports and Implementation Completion Reports will assess the overall effectiveness of the project's cultural property mitigation, management, and activities, as appropriate.

K.8. Documentation

The SECO with assistance from CSC and contractors will produce the following environmental reporting documentation:

- *Environmental Monitoring Reports:* The environmental monitoring reports will include environmental mitigation measures undertaken, environmental monitoring activities undertaken, details of monitoring data collected, analysis of monitoring results particularly the non-compliances, recommended mitigation and corrective measures, environmental training conducted, and environmental regulatory violations observed. The environmental monitoring reports will be submitted quarterly during the construction period and annually for three years after completion of construction.
- *Project Completion Environmental Monitoring Report:* One year after completion of construction, the SECO will submit a Project Completion Environmental Monitoring Report which will summarize the overall environmental impacts from the Project to all the co-financiers.

BWDB will engage External Monitors during construction period to measure the effectiveness and outcome/impact of EMP, as stated earlier. The External monitors will submit the quarterly reports throughout the contract time, impact evaluation report at the end of each year and finally a completion Report at the end of contract period.

K.9. EMP Implementation Cost

The estimated costs for the environmental management and monitoring activities for the entire project including the construction of resettlement sites are already set out in **Table 11.8** in the main volume. This cost has been included in the overall project cost.

Annex L. ToR for External Environmental Monitoring (Environmental Team of External Monitoring & Evaluation Consultants)

Citation in the main text (Volume I): **Section 11.5.3**.

Background

The lower Brahmaputra, named Jamuna in Bangladesh is one of largest rivers in the World. Following its avulsion (change of course) into the present day Jamuna River during the late 17th century, it has been constantly migrating westward and additionally widened by 50% from 8 to 12 km since the 1970s. These morphological changes have led to the loss of about 88,000 ha of floodplain from 1973 to 2014, affecting the ecology and livelihood of the floodplain dwellers by displacing hundreds and thousands of people. In addition to unpredictable riverbank erosion, floods are the other major natural hazard. While typically 20% of the country is flooded during the annual monsoon, severe floods have inundated up to two thirds of the country.

The Government of Bangladesh through Bangladesh Water Development Board (BWDB) is preparing the River Management Improvement Program (RMIP) to reconstruct the existing degraded embankment and secure it against riverbank erosion along 137 km length from the Teesta River to the Jamuna Bridge. The program will be designed and implemented in three phases. A 50 km long priority reach between Simla and Hasnapara will be protected in Phase 1. Phase 2 covers the remaining 87 km while Phase 3 focuses on and the construction of a highway on the countryside of the new flood embankment. The entire program will be implemented over a period of 10 years.

Objectives

The RMIP will be supported by a specialized an External or Third Party Monitoring and Evaluation (M&E) firm that will be responsible for monitoring and evaluation of implementation progress of all project works and activities and it's impacts as well the implementation of the EMP, and the SAP/RAP. The M&E reports will evaluate the success in project implementation in terms of meeting the project's objectives, and assess its physical, hydrological, environmental, social, and economic impacts. The M&E activities will provide continuous feedback to the PMU on the project's performance, and on mitigation of negative impact under various components, so that corrective actions can be undertaken in a timely manner if necessary.

In terms of implementation of EMP, the main purpose of the external monitoring – the third tier of the monitoring program - will be to ensure that all the key entities including SECO, CSC, and contractors are effectively and adequately fulfilling their designated role for EMP implementation, and that all the EMP requirements are being implemented in a timely and effective manner. The primary objective for engaging M&E Consultants is to review the efficacy of EMP implementation as well as internal monitoring, and conduct periodic third party monitoring and provide feedback to BWDB and WB on policy improvement and enhancement of implementation process. The environmental team of the M&E Consultants hereafter referred as the External Environmental Monitoring Consultants (EMC). The EMC will review implementation process as per set

procedures and tasks given in the EMP and assess the achievement of overall environmental management objectives.

Scope of Work

The scope of work of the EMC will include the following specific tasks:

To develop specific monitoring indicators, checklists, and questionnaires to undertake external monitoring (a preliminary list of monitoring indicators has been given in the ESMP) in consultation with BWDB and WB.

To review and verify the implementation progress of various EMP elements, particularly, mitigation plan, compliance and effects monitoring, environmental trainings, documentation, and grievance redress mechanism.

To review and verify the functioning of the key entities – SECO, CSC, and contractors - for environmental management.

Identify the strengths and weaknesses of the design of EMP and its implementation, and also the entities tasked to undertake various tasks detailed in the EMP.

Evaluate and assess the institutional arrangements established for the environmental management of the project. Evaluate and assess the effectiveness and appropriateness of the key personnel of SECO, CSC, and contractors tasked to implement various aspects of the EMP.

Evaluate and assess the adequacy of the mitigation measures proposed in the Mitigation Plan in addressing the potentially negative impacts of the project activities and propose changes as appropriate.

Review results of internal monitoring (compliance and effects monitoring) and verify its effectiveness through community consultations, spot checks, and field observations.

Review the process and outcome of environmental trainings conducted by different project entities in line with the training program given in the EMP.

Review the process and outcome of the documentation and reporting being carried out by various project entities in line with the EMP requirements.

Identify, quantify, and qualify the types of EMP-related conflicts and grievances reported and resolved and the consultation and participation procedures. Provide recommendations to strengthen the grievance management and redress system.

Provide a summary of whether EMP is being effectively implemented

Describe any outstanding actions that are required to bring EMP implementation in line with the GoB and WB requirements as stated in the EIA. Describe further mitigation measures and or corrective actions needed to ensure that the project remains environmentally and socially acceptable. Provide a timetable and define budget requirements for these supplementary mitigation measures / corrective actions.

Recommend and describe any additional measures to strengthen capacity of implementing entities to ensure full and effective implementation of required mitigation and management measures.

Describe any lessons learned that might be useful for environmental assessment and management of future projects.

Approach and Methodology

The general approach will include monitoring of EMP implementation activities and to identify any environmental impacts actually caused by the project. The EMC will conduct biannual field visits for external monitoring (the frequency of the visits may be increased for critical periods of construction). During the field visits, the EMC will carry out meetings with the key project entities including PMU, SECO, CSC, and contractors; review reports and record of EMP implementation; conduct consultation meetings with key stakeholders particularly communities and local government officials; carry out field investigations including spot checks and visual observations, and identify need of any sampling and laboratory analysis.

The EMC will prepare checklists and questionnaires for the field investigations, comprising both qualitative and quantitative parameters. After each field visit, the EMC will prepare external monitoring report comprising field observations and findings, assessment of ESMP implementation, key gaps identified, conclusions, and recommendations for addressing the gaps.

Responsibility of BWDB

The BWDB through its PMU will ensure timely supply of background references, data and project options to the EMC. It will ensure uninterrupted access to work sites, relevant offices of the GOB and BWDB in particular. The EMC will participate in quarterly coordination meetings with the BWDB in presence of the CSC.

Recommendation based on the result of the external monitoring will be provided to BWDB to cover up the deficiencies identified by the EMC. BWDB will accept the recommendations of the EMC if they are within the scope of work and there is nothing incorrect in the report.

Responsibility of CSC

The CSC will provide appropriate protocol at site or at its Project Office for the field visit of the EMC. It will on behalf of BWDB ensure free access to work sites, impact areas and the database on EMP implementation. The CSC will ensure timely intimation of its works planning as and when made or updated during the construction period and keep the EMC informed.

Team Composition of the EMC

The tasks of the key members of the EMC are given below.

Position/expertise	Qualification and experience
1. EMP Implementation Specialist	Masters in environment engineering or environmental science with 15 years working background in planning, implementation and monitoring of environmental management for large infrastructure projects. Experience in institutional capacity analysis, preparation and implementation of ESMPs, and knowledge of latest environmental safeguard policies of the international development financing institutions in Bangladesh are required.
2. Environment Specialist	Masters in environment engineering or environmental science with 10 years working experience in environmental impact assessment including field surveys, stakeholder consultations, and analyzing environmental impacts to identify mitigation measures in compliance with environmental safeguard policies of the

Position/expertise	Qualification and experience
	international development financing institutions and national legislations. Experience of preparing and implementing ESMP for externally financed projects is essential.
3. Ecologist	Masters in biological sciences with 15 years working experience in relevant fields. Thorough knowledge of ecological issues (natural vegetation, terrestrial as well as aquatic fauna, fish, and birds) and their implications for development projects; research and work experience relating to ecological issues; and knowledge of techniques for data collection and analysis.

Time Frame and Reporting

The EMC (M&E Consultant) will be employed over a period of five years with intermittent inputs from the professional team to continue one year after completion of the RMIP implementation.

Biannual and annual monitoring reports (with more frequent report as needed) should be submitted to the BWDB with copies to the WB. An evaluation report at the end of the Project should be submitted to the BWDB and WB with critical analysis of the achievement of the programs and the environmental performance of RMIP.

The EMC will provide monitoring and evaluation report covering the following aspects:

Field observations, results of any field investigations and or laboratory analysis

Assessment of whether the EMP is being implemented as planned and budgeted

Assessment of the extent to which the specific EMP objectives and the expected outcomes/results have been achieved and the factors affecting their achievement or non achievement, and in particular whether national and World Bank requirements on environmental and social management are being met

Major areas of improvement and key risk factors

Major lessons learnt and

Recommendations.

Formats for collection and presentation of monitoring data will be designed in consultation with BWDB.

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Annex M. Summary of National Stakeholder Consultation Workshops

25 January 2015, Brac Inn Center

The national stakeholder consultation workshop on the feasibility study and detailed design of the RMIP was held on 25 January 2015, at the BRAC Center Inn in Dhaka. It precedes the disclosure workshops being part of the environmental and social safeguard preparation.

The key note was presented by Mr. Rob Davinroy, comparing the Mississippi development with the Jamuna River. The main points of the presentation (attached) were:

(i) The Mississippi development started without a master plan in response to riverbank erosion.
(ii) The work started with construction of revetments along eroding bends and later focused on the opposite bank where river training dikes (spurs or cross bars) were constructed in areas with lower energy flows.
(iii) The riverbank protection and subsequent river training has gradually developed favorable conditions for navigation along the Mississippi, which provides a very viable and economic alternative to using trucks, savings ten thousands of truckloads of land transport, and reducing road congestion.
(iv) The Mississippi flows through the heart of the United States which provides a major economic advantage to the country, something the Jamuna, flowing through the heart of Bangladesh, could also attain.

Subsequently, speeches were held by participants from the Ministry of Water Resources, the BWDB, and the World Bank. The highlights are:

World Bank, Mr. Abedalrazq Khalil, Senior Water Resources Specialist:

(i) Recurrent flooding and erosion along the main rivers of Bangladesh poses a challenging and seemingly insurmountable problem to the population of Bangladesh. However, the population and its organizations show a high resolve to meet the challenge and stabilize the Jamuna River, which drives the World Bank to share this vision.
(ii) The Riverbank Improvement Program reflects this vision in targeting the transformation of the Northwestern Region through an ambitious program of embankment with road and riverbank protection construction, making use of the most recent and affordable technologies suitable for the huge river with huge powers.
(iii) Now, 50 years after building the Brahmaputra Right Embankment, the World Bank is back supporting upgrading the work, and strengthening the BWDB operations through regular monitoring, flood hazard mapping, and asset and O&M management information systems leading to a decision support system. This combination helps to break the cycle of build – neglect – build and so on.
(iv) The Minister is asked to think about an effective maintenance system as core element of BWDB to start river management exemplary to the world.
(v) The RMIP has the potential to transform a central part of Bangladesh, fight poverty, and contribute to achieving mid-income level by 2021.

The Secretary MOWR mentioned:

(i) From his experience gained from a study tour to the Mississippi and the US Army Corps of Engineers facilities in July 2014 he agrees with Rob Davinroy on the similarities of stabilizing the Mississippi and Jamuna rivers.

(ii) The Jamuna Bridge is a good learning example – the bridge was initially refused for donor support as being infeasible or not viable, but is now widely acknowledged as a success. Similarly a large scale and integrated river stabilization approach can create a new navigation potential, even though this is not visible immediately.

(iii) The Ministry has an interest to overcome the negative impression on the Ministry's work through seriousness in building permanent protective works that does not fail and is appreciated by the population. One approach discussed with the Minister is to focus on fewer, highly visible projects instead of taking up 50 or so new projects every year. Given the high demand all over the country this will be challenging but could be rewarding specifically when looking at the government's goal of achieving mid-income level status by 2021.

(iv) The Secretary looks forward to the successful implementation of the project in the near future.

Subsequently, the Minister highlighted:

(i) While there are many similarities between the Mississippi and Jamuna River, there are some noticeable differences, primarily that 93% of the catchment area lies outside of Bangladesh. This notwithstanding, Bangladesh can learn in the field of planning, maintenance and operational strategy.

(ii) It is important for people outside of Bangladesh to recognize the serious detrimental effect that riverbank erosion has on people and property. Flooding and drainage is well understood. Beginning in the 1950s and 60s, studies initiating construction began of embankments throughout the country, most notably the construction of the Brahmaputra Right Embankment. It is now recognized that riverbank erosion also affects the performance of embankments, and that erosion protection must be combined with flood protection. In some ways erosion behaves like diabetes, the effects of which cannot be seen immediately but then strike the more seriously.

(iii) The country as a whole lacks most in maintaining completed works. Financing for new projects has always been secured often with support from donors, but unfortunately donors do not contribute to maintaining the works. An example is many big irrigation projects that have changed the lifestyle of people fundamentally. However, properly maintained they would contribute even more to sustainable growth.

(iv) To avoid this in future, especially the sensitive investments into river interventions, maintenance requirements must be considered from the beginning. BWDB should come up with institutionalized rehabilitation to maximize the benefits from their investments.

(v) In the same context, the capacity of BWDB needs to be improved, specifically in the field of supervision. It reflects poorly on BWDB that the organization employs the best students in the country but cannot supervise work correctly. In defense of BWDB, it needs to be mentioned that the number of employees in the organization has been reduced dramatically, which has reduce its capacity to respond appropriately. The organization should be restructured, especially considering that an investment of US$ 1.5 billion is being proposed for the RMIP.

(vi) Another point is that the country has changed much over the last 50 years and it is important to involve local people, especially in the Bangladesh context. The local stakeholders have to be informed so that they understand the interventions and can fully appreciate the benefits and also understand the potential sacrifices.

(vii) The Minister is personally committed to the RMIP, however asks that the left bank and river training be considered as part of the program. The presentation from Mr. Davinroy and the speech of Mr. Khalid point in the right direction.

The Director General in his closing speech summarized the development of the BRE from the 1960s, its initial success to flood risk mitigation and later problem with riverbank erosion. He mentioned that riverbank protection work implemented since the 1990s has not been effective and that the RMIP's integrated approach of flood protection and riverbank protection develops the country's ability.

After the tea break the technical session provided three presentations (attached):

(i) The project summary
(ii) The environmental summary
(iii) The social summary

Subsequently, the floor was open for discussion and questions. A broad number of participants contributed and their questions were answered, while the four presenters and the Deputy Team Leader of the consulting team provided the answers. The summary is provided in the following table:

	Question, Clarifications	**Reply**
1	Selim Bhuyian, Director General WARPO: 1. How was the western boundary of the program area established? 2. What is with stabilization of the left bank and does the opted strategy mean land reclamation takes place on the left bank only? 3. Any impact on the left bank studied?	1. The western was established through a combination of floodplain modelling and reviewing the digital terrain model with observed inundation patterns. 2. The high energy flow in the priority reach indicates that here reclamation will take largely place at the left bank. This is different in other areas, which will be studied in Phase I. 3. The social Team conducted consultation in two chars. People consulted welcome the project; however, attention left bank, particularly reducing the river width and land reclamation was emphasized.
2	Wahidur Rahman, CE Rangpur, BWDB Has 12 years of experience with work on the Jamuna: 1. For embankment construction the use of dredged material from the river is suggested which contains	1. The embankment body can make use of sandy material from the river. This has been investigated geo-technically.

	Question, Clarifications	Reply
	mica, silt, fine and coarse sand. Is that suitable? 2. Earth from the toe is suggested for the cover layer – is that suitable? 3. The project needs a long-term monitoring and maintenance perspective. 4. Have the effects of the existing work from Kalitola and Mathurapara to Jamuna Bridge been taken into account? 5. Erosion in the Kurigram area does not only come from the Jamuna but also the many tributaries.	2. A part of the earth from the toe will be use, specifically clayey, silty material. Unsuitable material will be rejected. 3. The implementation arrangements focus very much on monitoring, including most modern equipment, and provide a strategy for adaptation and maintenance. 4. The river reach from Sariakandi to Jamuna bridge has been investigated in a number of numerical models. 5. This is acknowledged and the Kurigram Project has been postponed as the influence area from the Jamuna is too small and a study of the whole area is warranted.
3	Mahbubur Rahman, retired BWDB, TL M&E Consultant CEIP: 1. The project development depends on objectives and inputs, outputs, and outcomes. These have not been mentioned. 2. Does the environmental study only cover the right bank or extend to both banks? 3. How does the resettlement team deal with changes during implementation? 4. The Mississippi has been protected from both sides, how does the RMIP envision to provide protection?	1. The feasibility report elaborates on these and provides potential baselines. 2. Yes, both banks and the river were considered specifically for trans-boundary impacts. 3. Resettlement is a dynamic process. At this time, it is a planning tool and must be adjusted eventually to meet needs of the affected communities. Adaptive mechanisms are already in built in the RAP policies. 4. The RMIP starts with the high energy reach in the priority area on the right bank while the other bank with potential land reclamation will come later.
4	Sharafat Hossain Khan, PD CEIP: 1. The project seems to be more embankment rehabilitation than river stabilization 2. The BRE stops the sediment distribution on the floodplain which normally builds land. 3. The technical session has	1. The first phase concentrates on the riverbank stabilization along the high energy reach of the right bank and rehabilitates the embankment. 2. Two regulators and four sluice gates will help opening the

	Question, Clarifications	Reply
	presented nothing on morphology, design parameters, management of anabranches 4. There are no lessons learned and analysis of past performance.	embankment for fish and supplementary irrigation water carrying some sediment onto the floodplain. 3. The final report contains one Annex exclusively dealing with morphology, sediment waves and the interaction between river and riverbank protection. 4. The lessons learned have been presented in two technical notes, submitted prior to the final report.
5	Nurul Amin Talukdar, retired BWDB, TL ECRRP: 1. Did the design consider earthquake? 2. What is the sequence of work with respect to river stabilization. 3. Does the design consider the crossing of local people and cattle etc? 4. The new embankment destroys some 126,000 trees, are there compensation measures. 5. Have you considered the experience of Model village (Guchha Gram) in RAP planning and any provision for raising livestock as a source of income?	1. Yes, alone and in combination with other loads. 2. Stabilization starts with the revetment and riverbank protection works along the high energy reach in the priority area on the right bank followed by river training that can work from the left bank. 3. Apart from crossings for motorized vehicles there are some 30 crossings for local people, consisting of steps. 4. The new embankment also provides space for tree plantation, specifically on the countryside slope. The amount of planted trees there is around double the amount destroyed. 5. RAP has many income generating programs, including livestock.
6	Khaleduzzaman, RNE: 1. It is wonderful that Government takes up this program and World Bank's role is appreciated, so is the flexible phased approach. 2. The name should be changed to River Management Improvement Program. 3. The gradual narrowing down should be planned and navigation, as mentioned by the Secretary, could provide additional benefits. 4. A Master Plan is needed which	1. Noted 2. Agreed 3. Agreed, could be part of the river training study planned for Phase I. 4. This is part of the Phase I. 5. There are no fixed plans and designs so it is difficult to anticipate something that might take decades to implement. 6. Agreed, more potential is at the lower energy left bank.

	Question, Clarifications	Reply
	might look at the suggested 6km wide river, including floodplains some 8kms. 5. How is the Brahmaputra barrage related to the RMIP? 6. 165ha of land reclamation is a good start but the potential could be up to 2,500km² 7. The Prime Minister suggests to develop industrialized zones along the major river banks.	7. This is definitely a future possibility.
7	Abu Taher, Kazipur People should be resettled first before demolition of their structures	Yes, that is exactly what has been planned in the RAP.
9	Mohammad Shafique, Kazipur Is there any policy on payment for outstanding compensation for past acquisition for retired embankment?	BWDB will look into the matter. The proposed LA for this project will pay compensation for land and other assets prior to relocation.
10	Bokul Sarker, Upazila Chairman Kazipur Welcomed the project and the RAP prepared based on consultation with the local people. The RAP policies reflect the desires of the people. There should be focus on training, capacity build for alternative employment and income; also provision for tourism are recommended	The team appreciated the continued support of the Upazila Chairman and the comments well received. Briefly explained the provisions for training and alternative employment.
12	Md.Abdul Hamid, Estimator , PD/ECRRP office The main causes of all past failure and damage of bank protection and river training works are under prediction of scour depth and inadequate provision of scour protection. Has the observed scour depth near Sirajgong hard-point been reflected in this study?	The design is based on the analysis of all survey data over the last 15 years including Sirajganj.
13	Aminul Islam, CE Rajshahi 1. What is the connection to the dredging program? 2. There is some negative experience with foreign contractors. How does the RMIP avoid this? 3. Any income-generating program for the squatters?	1. The RMIP Phase I concentrates on the high energy reach providing riverbank protection some of which will be implemented through dredging. Dredging as tool for river training will play a role during the Phase I study. 2. The work will be tendered internationally based on pre-qualified contractors, supervised

	Question, Clarifications	Reply
		through international supervisors. 3. Yes, a 6-year social development program has been design for livelihood, gender and health for affected and beneficiary groups.
14	Sarker, Chairman Bogra Bandarbari When is the project starting? DC should pay compensation cheques at the project site.	Likely start time is Dec 2015. Yes, the law requires payment of cheques by DC Office in the field/project sites.
15	Dept. of Geology. University of Dhaka 1. How was the location and effectiveness of the fish passes assessed? 2. With respect to Mr. Khaleduzzaman from RNE mentioned industrialization, which will lead to navigation pollution and negative impacts on aquatic biodiversity.	1. The locations of fish passes and their effectiveness are assessed through detailed field investigations by fish experts of IUCN, Bangladesh 2. Impacts of related to navigation such as dredging and risk of pollution from oil spills and disposal of bilge water have been considered in the cumulative impact assessment of the study.
16	Abuld Hossain Shubon, PD GIZ biodiversity project: 1. The RMIP seems to be ecofriendly 2. Please consider the national policy on fish 3. What are the maintenance arrangements for the time after the project ends? 4. It is important to focus on the property of the people. 5. How many fisher communities and fishers are in the program area?	1. Agreed 2. Noted 3. A number of activities are managed by local stakeholders (community forestry, operation of regulators) which continue after project implementation. BWDB will carry out post construction monitoring on effectiveness on implementation of these activities 4. Agreed 5. There are two fishing communities in the priority reach
17	Dr. M. Niamul Naser, University of Dhaka 1. Impact of the project on fish migration and how many fish passes are proposed?	1. Currently the fish migration is blocked by the BRE. Four fish passes are recommended in Phase 1 to restore fish migration between the Jamuna and floodplains.

In addition to the comments received during the workshop, the following written comments were received.

	Comments	Reply
1	Dr. Rezaur Rahman, IWFM, BUET I was very happy to see the use of our joint work in RMIP. I very much appreciate and thank you for your initiative in this regard. After attending this seminar, I have become convinced that water sector projects in Bangladesh are entering a new phase. From my academic interest, I shall closely follow future developments and continue to argue for ecological considerations in water sector interventions.	1. Noted
2	DR. Munir Ahmed, fish specialist, Tara 1. Fish Passes- Designed Velocity, Sil Level, Seasonal connectivity: Nice that several fishpasses planned. Hope all will not have 1.5m/sec velocity design like in Sarikandi and Manu Irrigation Project. During Fourth Fisheries Project DoF-BWDB along with BETS designed most probably 1.25 or 1.30 m/sec capacity. For small fish velocity of about 0.5m/sec (head drop of about 1 cm per buffle) would be required. Out of the total number of Fishpass planned, silt level to keep lower for more time/to allow pre-monsoon connectivity. If hatchling movement (of carps) is targeted additional fish pass may be planned split type just at bank level to work as seasonal connectivity, these may be less costly too. 2. Specific Comment: Fish Sanctuary on Migration Route: Once the fishpass is planned the entire route including fishpass structure should declare as Fish sanctuary which will reduce fishing in the structure itself. One such sanctuary was declared in Khorodari Khal in MIP but did not enforced properly. That may be reviewed again. 3. Specific Comment: Fish Sanctuary Wetland and Khals: Nice that re-excavation of beel and khals are	1. Fish passes and design velocities are finalized based on extensive fisheries studies carried out by IUCN, Bangladesh. The design velocities are 0.2 m/sec and these velocities will facilitate all types of fish migration in the Jamuna 2. The project will support the formation of a fishermen user s association committee to operate and maintain the fish passes.

	Comments	Reply
	planned (under fisheries or Environmental plan). It would be nice if number of Fish Sanctuaries are established. In side pocket areas of khals sanctuary can be established. Fish sanctuary can also be established in private ditches where beel is not much perennial type.	3. Noted. Under the proposed fisheries development program, capacity development programs will be carried out for sustainable harvesting of fisheries and establishment of fish sanctuaries.
	4. Specific Comment: Fish Sanctuary in Deeper Scours/Channels and in Shallow Koles In the main river part Sanctuary can be considered in number of deeper scours and also in trenches in Primary, Secondary and Tertiary channels. Seasonal sanctuary in Koles usually near village within Isolated or attached Char can protect juvenile fish and invertebrates (Snails, mussels etc.).	4. Fish sanctuaries will develop in the river also. The IUCN study has identified 8 kholes as potential sites for development of fish sanctuaries. Further studies will be carried out in the Phase 1 to confirm these locations and establish additional locations if required.
	5. Specific Comment: Fish Sanctuary in Upstream Indian Part- Transboundary Collaboration To give long term benefit this can be done. This will also ensure safe breeding of Carp in Assam and protect brood fish and hatchlings/fertilized eggs. Nice that plantation is considered and also steps taken for Re-excavation of Beel, Wetland and Khals.	5. Noted.
	6. Specific Comment: Plantation vs Swamp Forestry Usually Forestry is better than Plantation (like opposite to aquaculture and openwater fisheries). Thus near the beel/beel periphery and excavated khals/canals plants should be Swamp Forestry Concept with minimum 5+1 species (Hizol, Koroch, Barun, Pitali, Kadam) and number of Reeds. One may refer Swamp Forestry and Guideline of CBRMP, LGED or similar guideline available with PSSWRSP, LGED.	6. Noted. Community forestry programs are planned around beel, khal and also inside the charlands.

	Comments	Reply
	7. Specific Comment: Re-excavation of Beel/Khal and Slope, Excavated Soil Management During this process re-excavation will be prioritized over Excavation. For Re-excavation time dependent approach to be applied for sustainability and for predicting benefit period in future. For example if re-excavation to work about next 15 years than where was the beel bottom line about 15 years ago, to re-excavate up to that. Proper slope to maintain. For beel it should not be less than 1:30 on an average and with 2-3 steps. Such designs if required is available with PSSWRSP or CBRMP, LGED also. Excavated soil management is very important. No where this should be dumped nearby and to make barricade movement of fish and invertebrates. 8. Specific Comment: Fisher Community Request to consider resettlement of Fisher community with care in the re-settlement areas. They are not investor rather harvester and any investment based alternate livelihoods may not sustain with them. 9. Each of the Re-settlement area needs a small bush/forest block as common property (not planation rather re-generation of forestry) which has multiple benefit. 10. Few multistoried units may be considered as most of them are day laborers. This may increase social dignity, reduce pressure on land and keep more health and hygienic condition and security also.	7. Re-excavation of beels and khals will be carried out to restore the ecological connectivity. The recommended guidelines will be followed in developing the re-excavation program. 8. Yes and noted. A separate resettlement site will be developed for the fishermen community. 9. There will be public/common area in each site.

	Comments	Reply
		10. The project will provide a plot and the affected households/squatters will build their own houses. The health and hygiene issues have been considered in the RAP.

List of the Participants

	Name	Designation	Organization
1	Mr. Anisul Islam Mahmud, M.P.	Honorable Minister	Ministry of Water Resources
2	Mr. Md. Mijanur Rahman	PS to Hon'ble Minister	Ministry of Water Resources
3	Dr. Zafar Ahmed Khan	Secretary	Ministry of Water Resources
4	Md. Jahangir Alam	PRO	Ministry of Water Resources
5	Mr. Mozammel Haque Bokul Sarker	Upzila Chairman, Kazipur Upzila	Local Government
6	Mr. Md. Kamruzzaman	Chairman, Kazipur Union Porisod	Local Government
7	Mr. Md. Uzzol Hossain	Chairman, Gosaibari & Vandarbari Union Porisod	Local Government
8	Mr. Md. Gaziul Haque Gazi	Chairman, Kutubpur Union Porisod	Local Government
9	Mr. Md. Jahangir Chakladar	NGO, Kazipur	NGO
10	Atiqul Karim	UP Chairman, Bhanderbari	
11	Mr. Dr. Abedalrazq Khalil	Senior Water Resources Specialist	The World Bank
12	Ms. Laila Kasturi	Water Engineer	The World Bank
13	Mr. Md. Rafiqul Islam	Water Resources Consultant	The World Bank
14	Mr. Chaohua Zhang	Lead Social Specialist	The World Bank
15	Mr. Md. Afzal Hossain	Director General	Bangladesh Water Development Board
16	Mr. Abdur Rob Miah	Additional Director General(Western Region)	Bangladesh Water Development Board
17	Mr. Md. Giash Uddin Ahmed	Additional Director General(Planning)	Bangladesh Water Development Board
18	Mr. Abdul Halim Molla	Additional Director General(Administration)	Bangladesh Water Development Board
19	Mr. Md. Masud Ahmed	Chief Monitoring	Bangladesh Water Development Board
20	Mr. Khandakar Khalequzaman	Director Program	Bangladesh Water Development Board
21	Mr. Md. Mosadaque Hossain	Superintending Engineer/Procuring and Flood Forecasting Circle	Bangladesh Water Development Board
22	Md. Kaykobad	Asst. Eng.	Bangladesh Water Development Board
23	Md. Abul Kashem	SDE	Bangladesh Water Development

	Name	Designation	Organization
			Board
24	Most. Salma Akther	Sub. Et. Eng.	Bangladesh Water Development Board
25	Md. Ansar Ali	AGD(placed, BWDB, LPF)	Bangladesh Water Development Board
26	Md. Aktaruzzaman	Public Relation	Bangladesh Water Development Board
27	A. Awal	Deputy Director,ECRRP	Bangladesh Water Development Board
28	Md. Liaqut Akter	SDE/ECRRP	Bangladesh Water Development Board
29	SS Haque	PD/ECRRP	Bangladesh Water Development Board
30	RobDevenroy		Bangladesh Water Development Board
31	Venkata Nukala	Env. Advisor	Bangladesh Water Development Board
32	Mr. Md. Aminul Islam	Chief Engineer, North- Wastern Zone, Rajshahi	Bangladesh Water Development Board
33	Muhammad Shafiul Islam	Research officer BWDB- Field Office	Bangladesh Water Development Board
34	Abdullah Al Amin	SDE BWDB- Field Office	Bangladesh Water Development Board
35	Md. Mahfuzur Rahman	Executive Eng. , Kurigram BWDB- Field Office	Bangladesh Water Development Board
36	Mr. Obaidur Rahman	Chief Engineer, Northern Zone, Rangpur BWDB- Field Office	Bangladesh Water Development Board
37	Mr. Md. Salim Bhuiyan	Director General	Water Resources Planning Organization
38	Prof. Dr. Mohammad Monowar Hossain	Executive Director	Institute Of Water Modelling(IWM)
39	Mr. Mir Mustafa Kamal	River Engineering Division	Institute Of Water Modelling(IWM)
40	Mr. Md. Waji Ullah	Executive Director	Environmental and Geographic Information Services (CEGIS)
41	Mr. Milik Fida A. Khan	Director, Climate Change Study Division	Environmental and Geographic Information Services (CEGIS)
42	Md. Sharfarat wahed		Environmental and Geographic Information Services (CEGIS)
43	Mr. GM Akram Hossain	Director	Resource Planning and Management Consultants (Pvt.) Ltd.
44	Md. Shalud M		IUCN
45	Dibyendu Chatterjee		IUCN
46	Sakib Muhammad	FI(WR)	IUCN

	Name	Designation	Organization
47	Md. Selim Reza	FI(Fisheries)	IUCN
48	Prof. Dr. Mohammad Rezaur Rahman	Professor, Institute of Water & Flood Management(IWFM)	Bangladesh University of Engineering & Technology(BUET),Dhaka
49	Dr. Haseeb Md. Irfanullah	Program Coordinator	IUCN Bangladesh Country Office
50	Mahmudul Hassan	GIS	IUCN
51	Dr. M. Niamul Naser	Professor, Department of Zoology	University of Dhaka
52	Mr. Md. Abul Hashem (Sumon)	Project Director	Wetland Biodiversity Rehabilitation Project Department of Fisheries
53	Dr. Md. Samsuddoha Khondaker	Chairman	Bangladesh Inland Water Transport Authority
54	Mr. Kh. Mesbah Uddin Ahmed	Managing Director	AQUA Consultant and Association Ltd.
55	Md. Abul Kasem	Consultent	AQUA Consultant and Association Ltd.
56	Mr. A.T. M. Khaleduzzaman	Senior Advisor	The Embassy
57	Md. Shaker Bin Shams	Asst. Deputy TL	Bangladesh Delta Plan
58	Md. Shaker Bin Shams	Asst. Deputy TL	Bangladesh Delta Plan
59	Kh. Khairul Matin	MD	KMC
60	Shariful Islam	SDE	KMC
61	Kazi Akmal	SDE	KMC
62	Maymuna Sh.	SDE	KMC
63	Ershta ya	SDE	KMC
64	Abu Bern	SDE	KMC
65	Md. Salim	DG	WARPO
66	Dr. M. Zaman		RMIP
67	Mr. Yousuf		RMIP
68	Md. Tarikuzzaman	Account/Administration Officer	KMC
69	Md. Abu Bakar	Pild officer	KMC
70	Afrina Akter	Business Development associates	KMC
71	Aleh Abid	RMIP	NHC-Fitchner
72	Md. Noorul Amin Talukder	TL	ECRRP
73	Muklesuzzaman	Consultant	RMIP
74	Jahangir	Chairman	K.G.D.K.S.
75	Md. Nuruzzaman	As. Director	MOWR
76	Habibul Hossain	Jr. Eng.	RMIP
77	Dr. Moniruzzaman	CMC	RMIP
78	Md. Ruhul Amin	Sr. Reporter	B.Betar

	Name	Designation	Organization
79	Juliuan Anhaft		FWT-Fichtner
80	Knut Oberhagemann	Consultant	Nhc
81	Mr. Ashraf Ali	J.B. Eng.	RMIP
82	Famil	Cameraman	BTV
83	Mahmudul	Reporter	BTV
84	Abu Bakar siddiki	Ast. Cameraman	BTV
85	Md. Zahidul Hossain Jahangir	Director	
86	Md. Shafiul Haqu Khan		XEN
87	Md. Abdul Hamid		SAE/SO
88	Abu Naser Wahid Khan	A.E.	
89	A.H.M. Mahbubur Rahman	TL	M & E
90	Md. Ismail		Hunman
91	Giauddin Chowdhury	DTL	Bangladesh Delta Plan
92	Md. Mustafizur Rahman	Deputy Director	National River Conservation Commission
93	Md. Ilias		FM Radio
94	Sayed Mahbub Murshed		Naya Diganta
95	Mr. Baker Siddqur		Dhaka Fm
96	Md. Motiur Rahman	Dat. Analyzer	
97	Motinuzzaman Mitu	Stuff Reporter	Thereporters24.com
98	Md. Aminul Islam	Economist	RMIP
99	Zakis Hossain	Rd. Eng.	RMIP
100	Bushra Nushrat	Project Manager, South Asia	
101	Prof. Dr. Ainun Nishat	International Panel of Expert	RMIP
102	Anwar Hossain	Affected Person:	Kazipur, Kazipur
103	Md. Kamrul Hasan	Affected Person:	Baliaghugri, Sirajganj Sadar
104	Md. Belal Khondokar	Affected Person:	Bauekha, Sirajganj Sadar
105	Md. Abul Kalam	Affected Person:	Bauekha, Sirajganj Sadar
106	Md. Sobuj Member	Affected Person:	Kazipur, Kazipur
107	Abul Kalam Azad	Affected Person:	Chandon Baisha, Shariakandi
108	Md. Moklesur Rahman	Affected Person:	Kamalpur, Shariakandi
109	Md. Abu Bakkor	Affected Person:	Rohdoho, Shariakandi
110	Md. Lipton Ahmad	Affected Person:	Kutubpur, Shariakandi
111	Moniruzzaman Babu	Affected Person:	Dokkhin digolkandi, Shariakandi

	Name	Designation	Organization
112	Md. Motafizur Rahman	Affected Person:	Debdanga, Shariakandi
113	Md. Mozzamel Haque	Affected Person:	Debdanga, Shariakandi
114	Md. Abdul Baset	Affected Person:	Bagber, Shariakandi
115	Md. Moklesar Rahman	Affected Person:	Ontarpara, Shariakandi
116	Md. Samsul Haque	Affected Person:	Patchthakuri, Sirajganj Sadar
117	Md. Abdul khalek	Affected Person:	Kuddrobolail, Shariakandi

Photos of the Workshop


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Disclosure Workshops in the Project Influence Area

Overview

Four public disclosure workshops have been organized in the four upazillas along the Brahmaputra Right Embankment (BRE). These four upazillas are Sirajganj Sadar, Kajipur, Dhunat and Sariakandi. The first two upazillas are in Sirajganj and the others are in Bogra. Workshops were organized in the Upazilla parishad office hall rooms or conference rooms which were easily accessible to people. Local people, local level government stakeholders, elected representatives and other community representatives were invited to participate in the workshops to create opportunity to play a role and express their views. The workshops were held from 6 April, 2015 to 16 April, 2015.

In addition to the above, disclosure and public consultations were organized in the nine upazillas of Sirajganj, Bogra and Gaibandha districts which are along the proposed alignment of new embankment. These disclosure and public consultation meetings were organized in the grass root level community areas to share the current activities of the project, to share the EIA and EMF with the local communities and other stakeholders, and to obtain their views on the project and the assessment carried out.

Objectives

The key objectives of the disclosure workshops and public consultations carried out for the RMIP was to inform the relevant stakeholders about the project, its key objectives, and its salient features and also share with the stakeholders the present EIA study. Discussing project and its objectives, its impacts and benefits for the vulnerable groups, their expectation regarding project benefits, and identify strategies to minimize potential social and environmental adverse impacts were among the discussion agenda of the workshops and consultations.

Tables M. 1 and **M. 2** show the location and occurrence date of the Workshop and public consultation. The detailed overviews of Workshops in f our upazillas of the project areas and public consultation in nine upazillas of the program areas have been described later.

Table M.1: Disclosure Workshops Locations in 4 Upazillas

	Date	Time	Meeting Place	Participants		
				Male	Female	Total
1	06-04-2015	10.30 AM	Dhunat Upazilla parishad Hall room Bogra	28	02	30
2	08-04-2015	10.30 AM	Kajipur Upazilla parishad Hall room,Sirajganj	29	03	32
3	13-04-2015	3.00 PM	Sadar Upazilla parishad Hall room, Sirajganj	29	07	36
4	16-04-2015	10.30 AM	Sariakandi Upazilla parishad Hall room, Bogra	43	04	47
			Total	**129**	**16**	**145**

Table M.2: Disclosure Workshops Locations in 9 Upazillas

	Date	Time	Meeting Place	Participants		
				Male	Female	Total
01.	31-03-2015	10.00 AM	Chongacha, Sadar, Sirajganj	26	04	30

	Date	Time	Meeting Place	Participants		
				Male	Female	Total
02.	31-03-2015	12.30 PM	Meghai, Kazipur, Sirajganj	18	12	30
03.	01-04-2015	10.00 AM	Bhandarbari, Dhunat, Bogra	19	03	22
04.	01-04-2015	11.30 AM	Titporol, Sariakandi, Bogra	13	04	17
05.	01-04-2015	3.00 PM	Pakulla, Sonatola, Bogra	15	05	20
06.	04-04-2015	10.00 AM	Saghata, Gaibanda	17	02	19
07.	04-04-2015	12.30 PM	Konchipara, Fulchari, Gaibanda	16	03	19
08.	04-04-2015	3.00 PM	Gidari, Sadar, Gaibanda	16	03	19
09.	04-04-2015	5.00 PM	Chondipur, Sundorganj, Gaibanda	19	00	19
			Totals	**159**	**36**	**195**

Findings of the Disclosure Workshop and Public Consultations

During the workshop and consultation, the participants responded positively through sharing several views. The key observations and comments shared by the participants are listed below.

Comment	Response
Soil should be taken for the embankment from outside and it should not be taken from the land beside the proposed alignment which may affect the local people.	Soil will not be obtained from the country side. It is a binding on the contractors.
Project implementation needs to be expedited.	BWDB is taking all measures to expedite the project.
Vulnerable groups should be considered in terms of project design and its benefits	A comprehensive Resettlement Action Plan with Social Development Plan has been developed and will be implemented with community participation and in a transparent way. These plans address the needs of the vulnerable groups as well.
Bridges and fly over should be considered at key locations	This aspect will be considered in later phases of the program.
Integrity of river bank protection works	The riverbank protection works are being designed to ensure adequate protection from any future erosion.
Khals and beels need to be rehabilitated / re-excavated	This will be carried out with community involvement.
Improved management system for the maintenance of the embankment should be ensured for the safety and security of the affected people.	Sound design of the new embankment and O&M procedures have been included in the project.
Tree like koir, Neem, Jackfruit should be	Tree plantation plan is included in the EIA.

Comment	Response
planted under consideration for the plantation system for the embankment. Grass carpeting may be another alternative for the protection of embankment. Proper drainage system should be introduced to control the inundation situation occurrence.	It includes local fruit trees to be planted along the embankment and in resettlement sites.
River training must be corruption free. Navigation routes should be improved. Proper maintenance for the spur and other hydraulic structures should be under consideration.	Maintenance and upgradation of hydraulic structures is included in the project. Sound supervision and project management is also included in the project. Internal khals will be excavated with community participation.
Fish-pass friendly environment should be introduced for the enhancement of economic values of the certain project area. Fish passes and regulators have to be built for drainage, irrigation and fish migration.	Fish passes are included in the project. Their O&M will be carried out with community participation.
There should be a confirmed proposal of environment friendly railway transportation system for the upgraded communication system.	Not under the purview of BWDB.
People resettlement site should be 500m away from the road for the health and safety issue.	Efforts will be made to keep them as far away from the road as possible. Plantation will be carried out along the road to address air pollution concerns. Road design will include all safety measures; additional measures for resettlement sites will be implemented if needed (this aspect will be covered in later EIA)
The migration of project affected people and land pricing should be logical. School, college and mosque should be introduced in the resettlement site. There should be a transparent rule in land acquisition	A comprehensive Resettlement Action Plan with Social Development Plan has been developed and will be implemented with community participation and in a transparent way. A grievance redress mechanism is also included in the project.
Different local co-operatives should have to be considered within the project	Several of the project activities will be carried out with involvement from community based organizations.
Tourism development must be considered within the project.	With the improved riverbank protection, a dependable embankment, and enhanced road connectivity, the area will offer recreation opportunities for the local communities and also for outsiders.
Every project activities should be monitored for maintaining eco-friendly environment.	Comprehensive supervision and monitoring activities are included to ensure complete compliance with the EIA. EIA also includes environmental enhancement measures.
Re-excavation of river	Not included in the project
More discussion meeting and workshop should	Consultations will be continued during the

Comment	Response
be arranged for the awareness of the mass people.	project implementation.
Fisheries sector needs to be developed	Fisheries improvement activities are included in the project
Studies on left bank of Jamuna river	These studies may be included in later phases of the program
Protection measures against the hazards of construction works	EIA includes measures to protect people and environment from the hazards of the construction works.
Protection of sensitive receptors	Measures are included in the EIA to protect and or rebuild sensitive receptors.
Dolphin sanctuary should be established	EIA has identified areas where dolphin sanctuary can be established. Funds have been allocated for this purpose as well.
Has cropping pattern and cropping intensity been studied as part of the EIA	A comprehensive study has been conducted as part of EIA for cropping intensity and patter. Project is likely to cause increase in crop production.
What should people with grievances do for the redress of their complaints?	The project includes a grievance redress mechanism.
What steps will be taken if flood occurs during project implementation?	BWDB and contractors will implement emergency response mechanism. The works will be carried out during dry season.
Climate change considerations	Climate change considerations have been incorporated in the project design.
Water logging problem	Regulators are included for enhanced drainage of the area.
Making Jmuna a single channel river	Not included in present project (Phase I)
Increase in the river flow	Beyond the scope of the project.
River navigation	Beyond the scope of the project.
Influence of using geo-bag in the design of embankment	Geo-bags will protect the river bank from erosion. This will in turn protect the embankment and its integrity.
Exotic trees in the area	No exotic species will be planted as part of the project.
Waste disposal system should be developed.	Project will provide assistance to develop waste management plan.

Public Disclosure Workshop No 1

Place: Dhunat Upazilla Parishad Conference Room, Dhunat, Bogra

Date: 6 April, 2015

Time: 10.30 am to 2.00 am

Participants: 30

Findings from Open Discussion

Persons	Comments/Questions
Md.Hafizur Rahman, UNO, Dhunat, Bogra	• The activities of the project should be eco-friendly. • Fish-pass friendly environment should be introduced for the enhancement of economic values of the certain project area.
Rafiqul Islam, UAO, Dhunat, Bogra.	Q: when will the fantastic planning of the activities of the project be implemented?
Hazrat Ali, UP member, Bhanderbari, Dhunat	Q: Is there any extended plan for the establishment of school, mosque or temple in the selected resettlement site?
Nurunnobi, UP member Baniajan	Q: What will be the role of activities if there are any school, mosque or community clinic along the proposed alignment?
Bulbuli Khatun, UP member, Bhanderbari, Dhunat	Q: What will be the plan for the helpless women affected by the project activities?
Md.Atiqul Karim (Apel) UP Chairman, Bhanderbari, Dhunat	Q: when will the fantastic planning of the activities of the project be implemented? Q: What will be the role of reimbursement system for the project affected people whose lands will be acquired for the implementation of proposed alignment?
Saiful Islam,UP member, Ward no.1, Dhunat	Q: If there is any scope for the implementation of bridge/flyover in the Shaharabari ghat for the ease of communication of the certain area
Mozahar Ali,UP member,Goshaibari, Dhunat	Q: What will be the role of reimbursement system for the project affected people whose lands will be acquired for the implementation of proposed alignment? Are there any transparent rule created for the reimbursement for the project affected people?
Abdus Salam, UP member, Chunaiapara,Goshaibari	Q: What will be the alternative activities except dumping in case of eroded areas?

Participants

Fig 1: Participants in the public disclosure workshop

Attendance List of Disclosure Workshop No 1

Workshop-(1)

Upazila Parishad Auditorium
Dhunat, Bogra.

IUCN

Attendance List
Disclosure Workshop
Environmental Assessment of River Bank Improvement Program (RBIP)

DATE: 06/04/2015

SI no.	Name	Designation	Address (District : Bogra)			Signature
			Village	Union	Upazilla	
1	Md. Hafizur Rahman	UNO			Dhunat	6/4/15
2	Md. Jahangir Alam	UAO			Dhunat	6.4.15
3	Md. Ali Haidere Akhand 01711-343768	Asstt. Engineer			Bogra BWDB	6/4/15
4						
5.	MD. Aleiqul Karim/Apel 01718-216915	Chairman	Bhaldere bari	Bhaldere bari	Dhunat	Akram 6.4.15
6.	MD. Rabiqul Islam 01716726237					
7.	(illegible) 01731582288	(illegible)	(illegible)	(illegible)	(illegible)	(illegible)
8.	Md. Saiful Islam 01740-934438	U.P Member	Vendor bari U.P	Vendor bari	Dhunat	(illegible)
9.	(illegible) 01820-934438	(illegible)	(illegible)	(illegible)	(illegible)	(illegible)
10.	(illegible) 01721-231882	(illegible)	(illegible)	(illegible)	(illegible)	(illegible)
11	(illegible) 01929602906	(illegible)	(illegible)	(illegible)	(illegible)	(illegible)
12	(illegible) 01772791491	—	(illegible)	〃	〃	(illegible)
13	(illegible) 01741 170868	—	(illegible)	(illegible)	(illegible)	(illegible)

IUCN

Attendance List

Disclosure Workshop

Environmental Assessment of River Bank Improvement Program (RBIP)

DATE: 06/05/2015

SI no.	Name	Designation	Address (District :.....Bogra.....)			Signature
			Village	Union	Upazilla	
14.	Md. Mominur Rahman 01723-584428	[illegible]		[illegible]		
15.	01719[illegible] KHOKON	CA		[illegible]		
16	. Shomon	Comp[illegible]				
17	N.M. MAMUNUR, 01714-527117 RASHID	P.S		[illegible]		
18	MD. MAHBUBER RAHMAN	O.S- 01714-512827				
19	Amena [illegible]	[illegible] UP [illegible]				
20.	[illegible]	01797 73084				
21	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
22	[illegible] 01730-163785	[illegible]	[illegible]	[illegible]	[illegible]	
23	[illegible] 02988[illegible]	[illegible]	11	11	11	
24	[illegible] 01746-240572		U.P.O	office Dhunat		
25	[illegible] 01752119100	[illegible]	11	11		
26	[illegible] 02968-[illegible]	UDA	U	[illegible]		

IUCN

Attendance List

Disclosure Workshop

Environmental Assessment of River Bank Improvement Program (RBIP)

DATE : 06/04/2015

Sl no.	Name	Designation	Address (District :...Bogra...)			Signature
			Village	Union	Upazilla	
27.	MD: Abdul Hannan	[illegible]	Khaleshangoi Sut [illegible]	Gossain beri	Dhunot	[signature]
28.	MD: [illegible] / মো: [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[signature]
	01920485032[illegible]					
29.	মো: [illegible] 01928[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[signature]
30/	মো: [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[signature]
	মো: [illegible] ইসলাম 01710-310452	[illegible]	[illegible]	[illegible]	[illegible]	[signature]

Public Disclosure Workshop No 2

Place: Kajipur Upazilla Parishad Conference Room, Kajipur, Sirajganj

Date: 08 April, 2015

Time: 10.30 pm

Participants: 36

Findings from Open Discussion

Person	Comments/Questions
Mozammel Haque Sarker, Upazila Chairman , Kazipur , Sirajganj	Q: What steps will be taken to restore the occupied Banaijan Khal? Q: In many parts Boropit along the BRE has been accreted by the influential. What step will be taken to make it free? Q: When the study of left bank will be initiated? Q: What there have in the project for fisheries sector? **Proposal:** • To protect the migration of project affected people, land pricing should be logical • Fish passes and regulators have to be built for drainage, irrigation and fish migration • There should have school, tree and open places in the proposed resettlement side • Different local co-operatives should have to be considered within the project • Tourism development must have to be considered with in the project • Propose to prepare a list of the schools, colleges, NGOs, Co-operatives, clubs with in the project area
Md. Shafiul Islam , Upazila Nirbahi Officer, Kazipur, Sirajganj	Q: The proposed alignment should be according to the local people Q: Is there any study to measure the hazard from construction work? Q: Is there are measures to protect or rebuild the sensitive receptors?
Upazila Fisheries Officer, Kazipur, Sirajganj	Q: Is there will be any steps for fish pass operation and management? Q: Is there will be steps to remove the deposited silt on the both side of the fish pass and regulator? Q: Is there is any plan to re-excavate the Icamati River? Q: Is there is any plan to re-excavate the connected beels and khals? Q: Is Dolphin sanctuary will be declared?
Upazila Agriculture officer, Kazipur, Sirajganj	Q: Is there any study on cropping pattern, cropping intensity?

Nazrul Islam , Journalist	Q: To whom the people yet not enlisted fallen on the proposed alignment will go for their compensation?
Person	**Comments/Questions**
Jahangir Alam Chairman MaijbariUnion , Kazipur, Sirajganj	Q: What steps will be taken if flood occurs during project implementation? Q: How many fish sanctuaries are there in Sirajganj? Q: How the new threats arise from climate change will be faced by the project? Q: What are the plans to mitigate the water logging problem due to project work? Proposal: Lacks and gaps of the project should be considered?
Shah Jahan Ali ,Journalist	Q: How the continuous work of BRE for river erosion and RBIB will be combined?
Abdur Rashid Sarkar ,Union member	Q: When the project work will commence?
Abul Hossain ,Care Bangladesh	Q: Is there any plan to make the river into one channel
Nazrul Islam Lavlu	Q: Is the proposed design will be changed if the proposed places erode?
S. M. Ziaul Haque	Proposal: River flows reduced to 70 %. The flow should be increased to the extent possible
Shariful Islam ,NGO Representative ,R-CHES	Q: Is there any measure for restoration of river navigation? Q: Pond are dried up during dry season, what steps will be taken?
Sabujmondal	Q: What steps will be taken for the household missed in the list prepared for resettlement?

Participants

Fig2: Participants in the public disclosure workshop

Attendance List of Disclosure Workshop No 2

Workshop – ②

Upazilla Parishad Conference Room

Kajipur Upazilla, Kajipur

1

Attendance List

Disclosure Workshop

Environmental Assessment of River Bank Improvement Program (RBIP)

Date: 8.4.15

SI no.	Name & Phone No:	Designation	Address (District : Sirajganj)			Signature
			Village	Union	Upazilla	
1.	Md. Mozammel Haque Sar.	UZC			Kazipur	[illegible]
2.	Md. Shafiul Islam	UNO			Kazipur	[illegible]
3.	Prodeep Kumer Sarker	UFO			Kazipur	[illegible]
4.	Md. Mamunur Rahman	UAO			Kazipur	[illegible]
5.	MD. Shahjahan	[illegible]	Kazipur	-	Kazipur	[illegible]
6.	MD. ATIQUR RAHMAN	CHAIRMAN	SHIMUL DAIR	CHALITA-DANGA	KAZIPUR	[illegible]
7.						
8.						
9.						
10.						

2

Attendance List

Disclosure Workshop

Environmental Assessment of River Bank Improvement Program (RBIP)

Date: 8.4.15

Sl no.	Name & Phone No:	Designation	Address (District : Sirajganj) Village	Union	Upazilla	Signature
1.	Md. Shariful Islam 01912389905	SDE	Sirajganj O&M Division BWDB, Sirajganj			[signature] 08/04/15
2.	Md. Abul Kashem 01711-061817	SAE/SO	Sirajganj O&M Division BWDB, Sirajganj.			[signature] 08/4/2015
3	[illegible] 01739015526	U. P	Khudd bari			[signature]
4.	Md. Alam Gir 01718-723390	U. P	Kazipur	Kazipur		[signature]
5.	[illegible] 01724836380	[illegible]	[illegible]	[illegible]	[illegible]	[signature]
6.	[illegible] 01714-552495	[illegible]	[illegible]	[illegible]	[illegible]	[signature]
7.	[illegible] 01771817020	11	[illegible]	[illegible]	[illegible]	[signature]
8.	[illegible] 01932-[illegible]	11	[illegible]	[illegible]	[illegible]	[signature]
9.	[illegible]	11	[illegible]	[illegible]	[illegible]	[signature]
10.	[illegible] 01457235971	11	[illegible]	[illegible]		[signature]
11.	Md. Sona ullah. 01716-991013	11	[illegible]	[illegible]	[illegible]	[signature]
12.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[signature]
13	MD. Zoharul Islam	Correspondent	Kazipur	Kazipur	Kazipur	[signature]

Daily amardesh – 01716-773887

3

Attendance List
Disclosure Workshop
Environmental Assessment of River Bank Improvement Program (RBIP)

Date: 8.4.15

Sl no.	Name & Phone No:	Designation	Address (District : Sirajganj)			Signature
			Village	Union	Upazilla	
14.	S.M. Ziaul Haque	Chairman	Chargirish	Chargirish	Kazipur	[illegible]
15.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16.	[illegible]	0 S 984	[illegible]		[illegible]	[illegible]
17.	Md. Afzal Hossain	Infras. Officer	01720 56133			[illegible]
18.	[illegible]	[illegible]	01723-335305		[illegible]	[illegible]
19.	Md. Shoorful Islam 01779922254	Program Coordinator	ARCHES	—	Kazipur	[illegible] 08.4.15
20.	[illegible] 01752-481618	[illegible]	[illegible]		[illegible]	[illegible]
21.	Most Jui Parvin 01745333720	U.P	Borokoly	Kazipur	Kazipur	[illegible]
22.	[illegible] 01960-00991	[illegible]	01960	800991	[illegible]	[illegible]
23.	MD: Sobuz Mondol 01722322941	Panal. Caraman	Paikar toli	Mayzbari	Kazipur	Sobuzmondol
24.	Talukder Zahangir Alom 01733292602	Chairman	Maizbari	Maizbari UP	Kazipur	[illegible]
25.	MD: RUHUL AMIN 01716966668	U.P	"	"	"	[illegible]
26.	Abdul Jalil 01740-992321	Journalist	Kazipur	"	"	[illegible]

Public Disclosure Workshop No 3

Place: Sadar Upazilla Parishad Conference Room, Sirajganj Sadar, Sirajganj

Date: 13 April, 2015

Time: 3.00 pm to 6.00 pm

Participants: 36

Findings from Open Discussion

Person	Comments/Questions
Pulok Kumar Guho, Businessman(key Informant)	Q: What will be the future outcome for the project affected people? If there is any good benefit for those people whose land will be acquired?
Saiful Islam (Farmer)	Q: When the work will start? What area the remaining information which will propagate the project work starting quickly?
Anowar Hossain, ED, SUK	Q: Is there any way to share or aware the mass people about the project activities? Q: What will the plantation system for the improved maintenance of the embankment? Q: What will be the future of the damaged existing hydraulic structure as like spur?
Nurul Islam, UP member	Q: Is there any implementation of the plan in the Changacha Union in the current year?
Mr.Brenjon Chambugong UNO, Sirajganj Sadar, Sirajganj	Q: How can be the mass community involvement with the project activities improved?
Md. Riaz Uddin,Chairman Sirajganj Sadar, Sirajganj	• River training must be corruption free. • Soil should be taken for the embankment from outside and it should not be taken from the land beside the proposed alignment which may affect the local people. • Work should be completed fully.
Rafiqul Islam, BWDB	Q: Is there any scope for the upgraded communication system like railway transportation beside the four lane highway?
Dr. Salma Laizoo,UAO	• There should be a confirmed proposal of environment friendly railway transportation system for the upgraded communication system. • More discussion meeting and workshop should be arranged for the awareness of the mass people. • Improved management system for the maintenance of the embankment should be ensured for the safety and security of the affected people. • Tree like koir, Neem, Jackfruit trees plantation should be under consideration for the plantation system for the embankment. • Grass carpeting may be another alternative for the protection of embankment. • Proper drainage system should be introduced to control the inundation situation occurance. • Navigation route and system should be improved. • Every project activities should be monitored for maintaining environment friendly resemblance.

Participants

Fig 3: Participants in the public disclosure workshop

Attendance List of Disclosure Workshop No 3

Workshop-(3)

Upazilla parishad Hallroom, Sirajganj Sadar

IUCN

Attendance List

Disclosure Workshop

Environmental Assessment of River Bank Improvement Program (RBIP)

Date: 13.4.15

Sl no.	Name & Phone No:	Designation	Address (District :..Sirajganj..)			Signature
			Village	Union	Upazilla	
1	Md. Rafiqul Islam Cell: 01711397219	SAE/SO BWDB				[signature]
2.	Dr. Salma Laizoo UAO, Sadar	UAO Sadar				Salma 13.4.15
3.	Boenjon Chambugong	UNO, Sadar			Sirajganj Sadar	[signature] 13.4.15
4.	Md Sohel Rana 01725332649	CA Upazilla parishad			Sirajganj Sadar	[signature] 26/8/15
5	MD. Kamruzzaman 01717-277690	OA UNO office			Sadar	[signature] 26/8/15
6	MD. Abdul Alim	student			sirajganj	Alim
7	MD. Saiful Islam	farmer			Sirajganj	[signature]
8	Pulok Kumar Gupta	Farmer Representative			Sirajganj	Pulok
9	MD. Zakirull Hasan 01717626298	student	Hossian Pur (Khali	pha pur)	Sirajganj	Zakirul
10	Md. Mahfuzur Rahman 01730-321561	District BRAC Representative	—	—	Sirajganj	[signature]
11.	Md. Anowar Hossain - 01711467567	ED - SUK			Sirajganj	[signature]
12	Noore-E-Jannat 01916-201508	Student			Sirajganj	[signature]
13	Ayesha Siddika 01926-493146	House Wife			Sirajganj	Shilpi

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Attendance List
Disclosure Workshop
Environmental Assessment of River Bank Improvement Program (RBIP)

SI no.	Name & Phone No:	Designation	Address (District : Sirajganj...)			Signature
			Village	Union	Upazilla	
	Amina khatun 01675585023	Lecturer	Sirajganj	Govt. College, Sirajganj		
	Ex Chairman 01712342745	Ex-Chairman				

3

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Attendance List

Disclosure Workshop

Environmental Assessment of River Bank Improvement Program (RBIP)

SI no.	Name & Phone No:	Designation	Address (District : Sirajganj)			Signature
			Village	Union	Upazilla	
	Md. NURUL ISLAM 01740867106	UP	Panchlagay	Chhangasha	Sirajgonj	[signature]
	MD. RASHIDUL ISLAM 01918-246711		PANCHTAGAR	CHHANGASA	SIRAJGONJ	[signature]
	MD. Lokman Hossain	Asst. teacher	Shohid gonj	Pourosova	Sirajgonj	[signature]
	MD. MURAD	[illegible]				[signature]
	MD. MANJURUL ISLAM	[illegible]	[illegible]			[signature]
	Razib Ahmed	Student				[signature]
	Md. Reaz Uddin	UPJ. chairman	Sirajgonj sadar	Raton Kandi	Sirajgonj	[signature]
	[illegible]					[signature]
	[illegible]					[signature]
	[illegible]	[illegible]				[signature]

Public Disclosure Workshop No 4

Place: Sariakandi Upazilla Parishad Conference Room, Sariakandi, Bogra

Date: 16 April, 2015

Time: 10.30 pm

Participants: 47

Findings from Open Discussion

Person	Comments/Questions
Gaziul Hoque, Union Chairman, Kutubpur	Q: What will be the influence of using geo-bag in the design of embankment?
Apel Chairman, Dhunat	Q: What will be the pay back rule for the affected persons?
Nurul Islam, Changacha union, Sirajganj.	The price of the land for the proposed alignment is very low. If the price will be paid, another land cannot be bought with that amount of money. What will be the solution?
Chairman, Fulbari Union, Sariakandi , Bogra	Q: Is there any scope of eco-tourism along the proposed alignment? Q: Is there any scope of link road connecting Sariakandi and Bogra town?
Md. Mahfuzur Rahman,UFO	Q: Is there any plan of fish sanctuary in Bangali river?
Touhidul Islam, Chairman,Dhunat, Bogra	Q: What will be activities for mitigation the negative impact of Eucalyptus tree in the project areas? Proposal: • All activities should be done maintaining the Environment conservation rule. • Soil excavation for the embankment should not be from the land in the project area. • School, college and mosque should be introduced in the resettlement site. • Proper maintenance for the spur and other hydraulic structures should be under consideration. • Railway transportation should be introduced as another opportunity for the improvement of the communication. • People resettlement site should be 500m away from the road for the health and safety issue. • There should be transparent role in land acquisition
Masudur Rahman, Upazilla chairman, Sariakandi	Proposal: All work should be started quickly.
Md. Sakil Mahmud, UNO, Sariakandi ,Bogra	Fish pass friendly structure should be introduced for the improvement of the coordination of agriculture and fisheries.

Participants:

Fig 4: Participants in the public disclosure workshop

Attendance List of Disclosure Workshop No 4

Works-hop-(4)

1

Upazilla Parishad Hall room,
Sariakandi, Bogra

IUCN

Attendance List

Disclosure Workshop

Environmental Assessment of River Bank Improvement Program (RBIP)

DATE: 16.4.15

SI no.	Name	Designation	Address (District : Bogra)			Signature
			Village	Union	Upazilla	
1	Md Shakil Mahmud.	VNO, Sariakandi				[illegible]
2	Md. Masuder Rahman	Chairman Upazilla Parishad	Sharia kandi			[illegible]
3	A.K.M TWOHEDUL ALAM MAMUN	"	Dhunat		Dhunat	[illegible] 16.4.15
4	Md. Ruhul Amin	XEN BWDB, Bogra.				[illegible] 16.4.15
5	Md. Mahfuzur Rahman	U.F.O	–	–	Shariakandi	[illegible] 16.04.15
6	Anowarul Tariq	Chairman	Fulbari	Fulbari	Skdi	[illegible]
7	MD GAZIUL HAQUE	Chairman	KUTUBPUR	KUTUBPUR	Shariakandi	[illegible] 16.04.15
8	MD. Aliqul Karim	Chairman	Bhander Bari	DO	DHunat	Akarim 16.4.015
9	Md. Shahadat Hossain Kiron	Chairman	Gopalnagar	Sonatala	Sariakandi	[illegible] 16.04.15
10	Md. Shamsul	Chairman	Sharia kandi			[illegible] 16-4-15
11	Md. Tojul Islam	Chairman	Chalubari		Sharia kandi	[illegible] 16.04.15
12	MD, ALTaf Hossain	Chairman	Narchi		"	[illegible]
13	MD. Sobuz mondal	Panel-chairman	Paikortali	Mazbariy	Raj UR	[illegible] 16/08/20[illegible]

2

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Attendance List

Disclosure Workshop

Environmental Assessment of River Bank Improvement Program (RBIP)

DATE: 16.4.15

SI no.	Name	Designation	Address (District: Bogra) Village	Union	Upazilla	Signature
১	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
৩	MAMUN ZIAUL HOQUE 01716-943410		SHARIAKANDI-BAZAR BOGRA		SHARIAKANDI	[illegible]
৪	[illegible] 01725014933	P.S.U.S	[illegible]		//	[illegible]
৫	[illegible]		[illegible]	[illegible]		[illegible]
৬	MD. Mostafizar Rahman	News	Sharikandi	Chaluabari	Shariakandi.	[illegible]
৭	M.D. ANWAR HOSSIN 01724861284	U.P.S	SAHRA BARI	VANDER BARI	Dunat	[illegible]
৮	Md. Abdul Khaleque (01721-716174)	Head master	Khorda-balail	Hatsherpur	Shariakandi	[illegible]
৯	Md. ZAKIR HOSSAIN DIGHAL KANDI	SAPPO.	Dighal kandi	Sariakandi	Sariakandi	[illegible]
10	Md. Safiqul Islam		Sariakandi	Sariakandi	Bogra	[illegible]
11	[illegible] 01718-231444	[illegible]	[illegible]			[illegible]
12	[illegible] 01712-951281	[illegible]	"			[illegible]
13	[illegible] 01770656518	SKS MAC project	[illegible]	[illegible]	[illegible]	[illegible]

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Attendance List
Disclosure Workshop
Environmental Assessment of River Bank Improvement Program (RBIP)

DATE: 16.4.15

SI no.	Name	Designation	Address (District :....Bogura....)			Signature
			Village	Union	Upazilla	
1						
2						
3						
4						
5						
6						
7						
8						
9						01712348681
10	01710 - 310452					
11	01720 33 84728					
12	01740-932472					
13	01731582288					

4

IUCN

Attendance List

Disclosure Workshop

Environmental Assessment of River Bank Improvement Program (RBIP)

DATE: 16.4.2015

Sl no.	Name	Designation	Address (District :...Bogra...)			Signature
			Village	Union	Upazilla	
1	খাদেজা বেগম	ইউপি সদস্য ১,২,৩	[illegible]	বোহাইল	সারিয়াকান্দি	খাদেজা
2	মোছাঃ রোকেয়া বেগম	ইউপি সদস্য	দীঘলকান্দি	সারিয়াকান্দি	সারিয়াকান্দি	রোকেয়া
3	মোঃ আলিলুর রহমান	ইউ.পি সদস্য	মানিকদাইর	চালুয়াবাড়ী	সারিয়াকান্দি	[illegible]
4	মোছাঃ আছিলা বেগম	ইউ.পি সদস্য	কাজলাপুর	চালুয়াবাড়ী	সারিয়াকান্দি	আছিলা
5	মোছাঃ হেবী খাতুন	ইউ.পি.সদস্য	[illegible]	বোহাইল	"	হেবী
6	মোঃ নুরুল ইসলাম	ইউপি সদস্য	[illegible]	[illegible]	[illegible]	[illegible]
7	মোঃ রবিউল ইসলাম 01721-210927 ([illegible])	[illegible]	কুতুবপুর	কুতুবপুর	সারিয়াকান্দি	[illegible]
8	মোঃ আকতারুজ্জামান	সাংবাদিক	বাংলাদেশ সারিয়াকান্দি প্রেসক্লাব	সারিয়াকান্দি	সারিয়াকান্দি	[illegible]

Public Consultation No-1
Consultation meeting of RMIP (Dry Season) Held in Sirajganj
Place: Changacha, Sirajganj Sadar, Sirajganj
Date: 31 March 2015 **Time:** 10.00 AM – 11.00 PM

Total Participants: 30
No. of Male Participants: 26
No. of Female Participants: 4

Findings, Discussions and Recommendations:

- River protection work was the priority issue
- Local people suggested that indigenous plants and fruiting trees should be planted on roadside and near resettlement sites. As there are only few fruiting trees there.
- They also emphasized on strict monitoring to protect the trees.
- Exotic trees species like *Acacia* sp. and *Eucalyptus* sp. plantation should be banned by Government.
- Migratory birds and Ganges River Dolphins are not much abundant as it was in last decades.
- For agricultural purposes and fish availability connection between Khals and canals with rivers should be established.
- If proposed Fish pass in the Baliaghugri will be constructed on proposed alignment, fish cultivation as well as crop cultivation will flourish manifolds.
- Fish pass should be maintained with strict monitoring.
- Cost of irrigation will be minimized if Ichamoti River will be dredged properly.

Figure 1. Consultation at Changacha, Sirajganj

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River Bank Improvement Program (RBIP)
Dry Season
FGD/Consultation

GPS – 691

SN	Respondent Name	Father Name	Contract No	Address				Sign
				Village	Union	Thana	District	
০১.	[illegible]	[illegible]	01718 708473	[illegible]	[illegible]	Sadar	[illegible]	[illegible]
২.	[illegible]	[illegible]	01773201430	〃	〃	〃	〃	[illegible]
৩.	[illegible]	[illegible]	01726615092	[illegible]	〃	〃	〃	[illegible]
৪.	[illegible]	[illegible]	0177432558	〃	〃	〃	〃	[illegible]
৫.	[illegible]	[illegible]	—	〃	〃	〃	〃	
৬.	[illegible]	[illegible]	01721168092	[illegible]	〃	〃	〃	[illegible]
৭.	[illegible]	[illegible]	—	〃	〃	〃	〃	[illegible]
৮.	[illegible]	[illegible]	01749241819	〃	〃	〃	〃	[illegible]
৯.	[illegible]	[illegible]	01725592559	[illegible]	〃	〃	〃	[illegible]
১০.	[illegible]	[illegible]	01762173930	〃	〃	〃	〃	
১১.	[illegible]	[illegible]	01771664981	[illegible]	〃	〃	〃	Shorif
১২.	[illegible]	[illegible]	01939423618	〃	〃	〃	〃	Sohag
১৩.	[illegible]	[illegible]	—	[illegible]	〃	〃	〃	[illegible]
১৪.	[illegible]	[illegible]	01962616229	[illegible]	〃	〃	〃	[illegible]
১৫.	[illegible]	[illegible]	—	〃	〃	〃	〃	
১৬.	[illegible]	[illegible]	01721163081	〃	〃	〃	〃	
১৭.	[illegible]	[illegible]		〃	〃	〃	〃	
১৮.	[illegible]	[illegible]	01869309266	〃	〃	〃	〃	[illegible]
১৯.	[illegible]	[illegible]	01768811326	〃	〃	〃	〃	[illegible]

IUCN

River Bank Improvement Program (RBIP)
Dry Season
FGD/Consultation

SN	Respondent Name	Father Name	Contract No	Address				Sign
				Village	Union	Thana	District	
20.			01719 302345					
21.			-					
22.			-					
23.			-					
24.			-					
25.			01760867480					
26.			-					
27.			-					
28.			-					
29.			-					
30.			-					

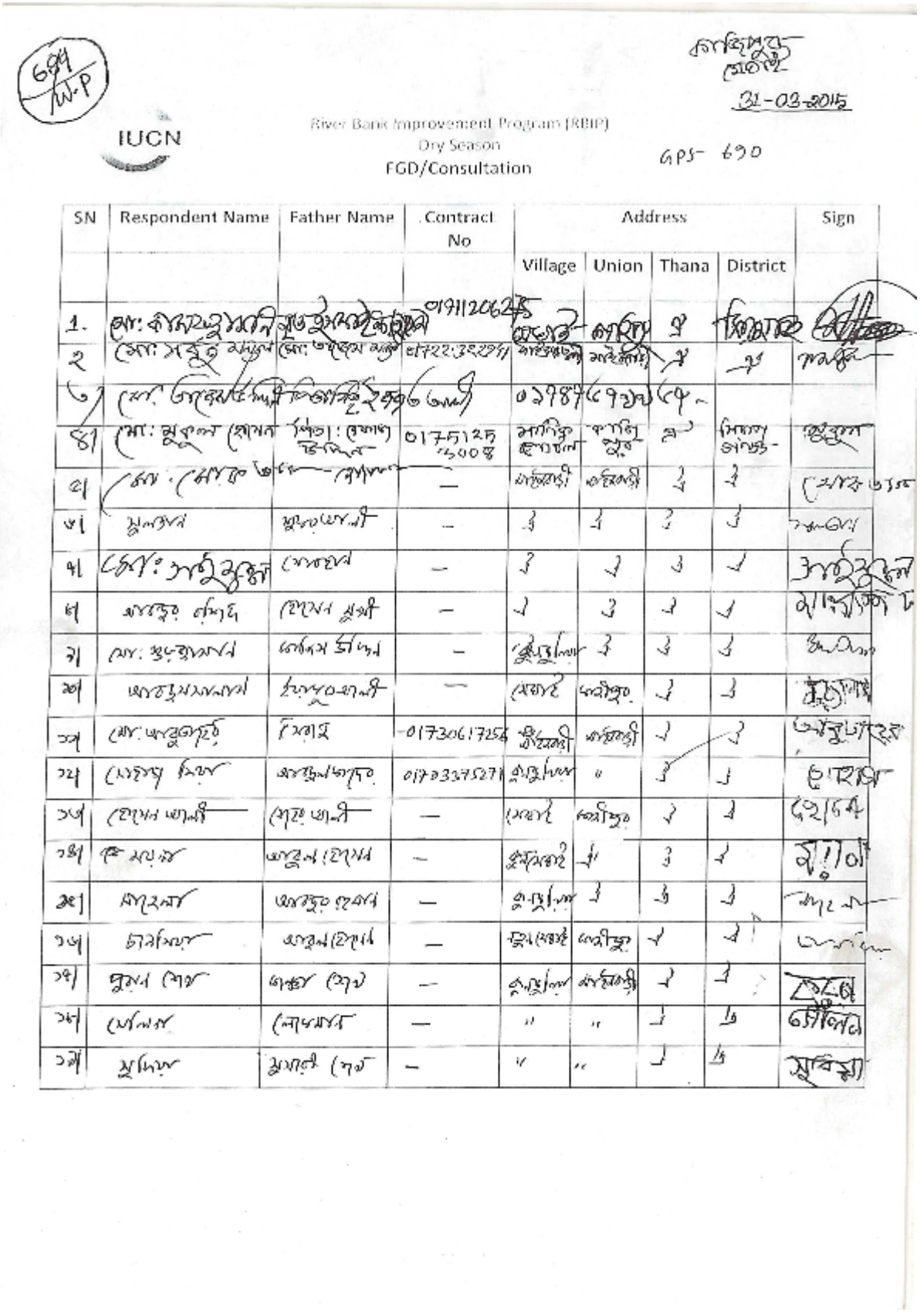
Public Consultation No-2
Consultation meeting of RMIP (Dry Season) Held in Sirajganj
Place: Meghai, Kazipur, Sirajganj
Date: 31 March 2015 **Time:** 12.30 PM – 1.20 PM

Total Participants: 30
No. of Male Participants: 18
No. of Female Participants: 12

Findings, Discussions and Recommendations:

- River training is the most important issues among the people.
- They are highly interested about resettlement site and its plan. Some people showed their keen interest to register their name and wish to inhabit there if possible because at first they were not aware about the amenities of resettlement site.
- Sensitive sites like school, Mosque, temple, important institutions should avoid from proposed alignment.
- Proper waste management plan should be undertaken.
- According to some people there should be some income generating opportunities for old and disable persons in resettlement sites like grocery shops.
- They were highly interested in social forestry besides highway and resettlement sites.
- Banaijan Canal and Baoaikhola khal should be dredged as early as possible for proper connectivity with the Ichamoti River on the west side and which will help to reduce the pressure on ground water irrigation through the deep tube well.
- According to an aged fishermen, sporadic captures of turtles occur in fishing net and are very rare now a days.
- Ganges River Dolphins are very abundant in Meghai ghat of Kazipur and proper steps should be taken while undertaking construction work. Pollution from ships and vessels will affect the Dolphin population of this region.

Figure 2. Consultation at Meghai, Kazipur



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W.P

IUCN

River Bank Improvement Program (RBIP)
Dry Season
FGD/Consultation

কাশিমপুর
সোহাগী
21-03-2015

GPS- 690

SN	Respondent Name	Father Name	Contract No	Address				Sign
				Village	Union	Thana	District	
1.								
2								
3								
4								
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7								
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14								
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IUCN

River Bank Improvement Program (RBIP)
Dry Season
FGD/Consultation

GPS – 690

31-3-15

SN	Respondent Name	Father Name	Contract No	Address				Sign
				Village	Union	Thana	District	
১০।	[illegible]	[illegible]	–	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
১১।	[illegible]	[illegible]	—	"	[illegible]	"	"	[illegible]
১২।	[illegible]	[illegible]	01705198042	"	"	"	"	[illegible]
১৩।	[illegible]	[illegible]	—	[illegible]	[illegible]	"	"	[illegible]
১৪।	[illegible]	[illegible]	01719752681	"	"	"	"	[illegible]
১৫।	[illegible]	[illegible]	01793454120	"	"	"	"	[illegible]
১৬।	[illegible]	[illegible]	01729715928	"	"	"	"	[illegible]
১৭।	[illegible]	[illegible]	—	[illegible]	[illegible]	"	"	[illegible]
১৮।	[illegible]	[illegible]	01735209549	[illegible]	[illegible]	"	"	[illegible]
১৯।	[illegible]	[illegible]	—	"	"	"	"	[illegible]
২০।	[illegible]	[illegible]	—	"	"	"	"	[illegible]
২১।								
২২।								
২৩।								
২৪।								
২৫।								
২৬।								
২৭।								
২৮।								

Public Consultation No-3
Consultation meeting of RMIP (Dry Season) Held in Bogra
Place: Bhandarbari, Dhunat, Bogra
Date: 1 April 2015 **Time:** 10.00 AM – 11.00 PM

Total Participants: 22
No. of Male Participants: 19
No. of Female Participants: 03

Findings, Discussions and Recommendations:

- River training and flood control should be the priority work in this region.
- Bhanderbari khal should be dredged which will minimized be cost of irrigation in dry season and fish will be available year round.
- People seek proper way to receive their money from the authority when their lands become incorporated with the alignment and who are not interested to stay in resettlement site.
- Waste disposal management should be improved in case of resettlement site.
- To save the migratory birds, turtles and dolphins strict rules and monitoring must be done as some incidence of hunting occurs during the winter.
- More sluice gates should be constructed to avoid further river erosion according to the local people.
- Sensitive sites like school, Mosque and Temple should be avoided from the proposed alignment.
- Exotic tree species should be avoided while tree plantation will be carried out along road sides and near resettlement sites.
- Local people are highly interested in planting indigenous fruit and timber yielding species.

Figure 3. Consultation at Bhandarbari, Bogra

WP - 695

Date 03 - 04 - 15
Bhandarbari

IUCN

River Bank Improvement Program (RBIP)
Dry Season
FGD/Consultation

	SN	Respondent Name	Father Name	Contract No	Address				Sign
					Village	Union	Thana	District	
UP Chairman	1.	MD. Aliqul Karim	Late Rahmat Ullah Sarkar	01718-716915	Bhandarbari	Do	Dhunot	Bogra	Karim
UP Member	2.	Md. Saiful Islam	Late Abul Khashem	01740-937438	UP member	Vandarbari	Dhunot	Bogra	S Islam
UP Member	3.	মো: [illegible]	[illegible]	01722-7[illegible]	UP [illegible]		[illegible]	বগুড়া	[illegible]
	4.	" [illegible]	" [illegible]	01772-87818			[illegible]	"	[illegible]
	5	শ্রী রবীন্দ্র	[illegible]	01772[illegible]			[illegible]	"	রবীন্দ্র
	6.	শ্রী জীবন	[illegible]	01797997[illegible]	[illegible]	"	"	"	জীবন
	7.	নিতাই চন্দ্র সরকার	[illegible]	—	"	"	"	"	নিতাই
	8.	মো: জসিম	[illegible]	01749-79423	[illegible]	"	"	"	[illegible]
	9.	শ্রী [illegible]	[illegible]	0176[illegible]	"	"	"	"	[illegible]
	10.	মো: [illegible]	[illegible]	—	"	"	"	"	[illegible]
	11.	[illegible]	[illegible]	0171591767[illegible]	"	"	"	"	[illegible]
	12.	[illegible]	[illegible]	-	"	"	"	"	[illegible]
	13.	রবি	[illegible]	-	"	"	"	"	রবি[illegible]
	14.	[illegible]	[illegible]	01768628124	"	"	"	"	[illegible]
	15.	[illegible]	[illegible]	01785372737	"	"	"	"	[illegible]
	16	[illegible]	[illegible]	01723871464	"	"	"	"	Faruk
	17.	[illegible]	[illegible]	01720338478	"	"	"	"	[illegible]
Member	18.	[illegible]	[illegible]	01720338478	"	"	"	"	[illegible]
	19.	[illegible]	[illegible]	01715421139	"	"	"	"	[illegible]

WP-695

Date, 01-04-15
Bhandarkani

IUCN

River Bank Improvement Program (RBIP)
Dry Season
FGD/Consultation

SN	Respondent Name	Father Name	Contract No	Address				Sign
				Village	Union	Thana	District	
20.	নাসিমা খাতুন	নূরনবী	-	রামচন্দ্রপুর	Bhandarkani	Muradnagar	Comilla	নাসিমা
21.	মোসলেম আক্তার	সিরাজ শেখ	—	"	"	"	"	মুক্তিনা
22.	মিরিন বেগম	মুহাম্মদ উল্লাহ	-	"	"	"	"	মিরিন

Public Consultation No-4

Consultation Meeting of RMIP held in Sonatola, Bogra

Place: Pakulla, Sonatola, Bogra

Date: 1 April, 2015**. Time:** 3.00 – 4.30 PM

GPS Location: N 25.64219, E 89.9278

Total Participants: 20 (Male-15, Female-05)

Findings, Discussions and Recommendations:

People showed positive impression about the proposed alignment and environmental study.

- River training and flood protection were the priority issues
- Sluice gate is needed to drain out the rain water from low lying areas during monsoon and to enter the river water during dry for irrigation and aquaculture.
- Several Ponds and Beels should be under proper care due to the fish production and breeding ground protection.
- People requested to construct the embankment near the riverside so that they can save their public property like school, mosque etc from river erosion.
- Vegetation pattern is characterized with Eucalyptus, jackfruit, mango, mahagoni, bot, pitalu etc.
- People plant eucalyptus species the most, because this species produce good poles in a short period of time and they need poles very often since they need to shift their homesteads often, being subjected to river erosion.

Figure4: Consultation Meeting at Pakulla, Sonatola.

pakulla, sonatola
Bogra
01. 04. 2015

IUCN

River Bank Improvement Program (RBIP)
Dry Season
FGD/Consultation

SN	Respondent Name	Father Name	Contract No	Address				Sign
				Village	Union	Thana	District	
১.	সালাম শেখ	রহমান প্রামানিক	–	[illegible]	পাকুল্লা	সোনাতলা	বগুড়া	সালাম
২.	মোস্তাফিজুর	মৃত: আব্দুল গনি	01731032598	"	"	"	"	মোস্তাফিজুর
৩.	সাখাওয়াত	মৃত: লাল মোহাম্মদ	01725341269	"	"	"	"	Shawkat
৪.	হাসান আলী	কালাম উদ্দিন		"	"	"	"	হাসান আলী
৫.	কাশেম	বাদল মন্ডল		"	"	"	"	কাশেম
৬.	মকবুল শেখ	সিরাজ উদ্দিন		"	"	"	"	মকবুল
৭.	আনোয়ার	আমানত আলী		"	"	"	"	আনোয়ার
৮.	[illegible]	[illegible]		"	"	"	"	[illegible]
৯.	[illegible]	[illegible]		"	"	"	"	
১০.	[illegible]	[illegible]		"	"	"	"	[illegible]
১১.	[illegible]	[illegible]		"	"	"	"	[illegible]
১২.	[illegible]	[illegible]		"	"	"	"	[illegible]
১৩.	[illegible]	[illegible]		"	"	"	"	—
১৪.	[illegible]	[illegible]		"	"	"	"	—
১৫.	[illegible]	[illegible]		"	"	"	"	[illegible]
১৬.	[illegible]	[illegible]		"	"	"	"	[illegible]
১৭.	[illegible]	[illegible]		"	"	"	"	[illegible]
১৮.	[illegible]	[illegible]		"	"	"	"	[illegible]
১৯.	[illegible]	[illegible]		"	"	"	"	[illegible]
২০.	[illegible]	[illegible]		"	"	"	"	

Public Consultation No-5

Consultation Meeting of RMIP held in Fulchari, Gaibandha

Place: Konchipara, Fulchari, Gaibanda

Date: 4 April, 2015**. Time:** 12.30 – 1.30 PM

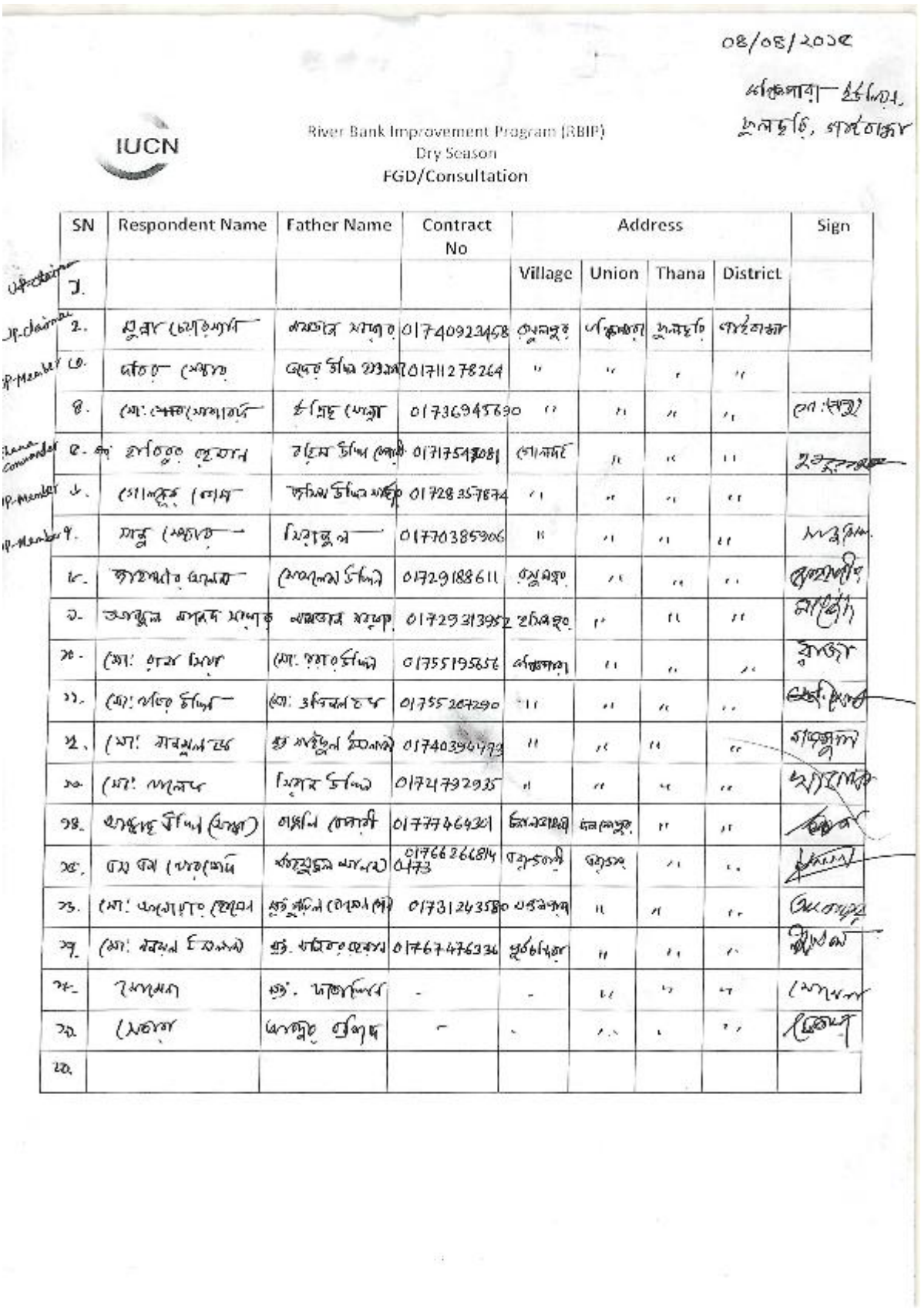
GPS Location: N 25.5145 E 90.0161

Total Participants: 19 (Male-16, Female-03)

Findings, Discussions and Recommendations:

- Embankment Construction and River training was the priority issue.
- Proper Maintenance and reconstruction of the regulator to maintain water connectivity.
- A connecting khal from Jamuna to the proposed regulator have to be excavated if the regulator is constructed fishes will migrate to the beels and floodplains of the country side and breeds there.
- Communication system should be quick and updated through improving the existing BRE.
- Char land harbor a large amount of 'migratory bird' like; Ruddy Shelduck, Spot billed Duck, Bar headed Goose etc, but the number is decreasing due to anthropogenic effects like fishing and agriculture activities in char area etc. Bird Hunting is not occurred frequently.
- Rainfall is very low in this area and irrigation system is mainly based on deep tubewell.
- Peoples like to plant 'Eucalyptus', 'Mahagoni', 'Akashmoni' for timber and plant 'Jackfruit', 'Mango', 'Drumstick' etc for their food, fuel wood and other purposes.
- People collect thatch grasses from char to roof their cottages.
- Drainage system should be reconstructed so that irrigation cost can be curtailed.
- If proposed regulator is constructed on proposed alignment, fish cultivation can be started in low lying areas with huge productivity.

Figure 5: Consultation meeting at Fulchari, Gaibandha.



০৪/০৪/২০১৫

IUCN

River Bank Improvement Program (RBIP)
Dry Season
FGD/Consultation

SN	Respondent Name	Father Name	Contract No	Address				Sign
				Village	Union	Thana	District	
1.								
2.			01740923468					
3.			01711278264					
4.			01736945690					
5.			01717548081					
6.			01728357874					
7.			01770385906					
8.			01729188611					
9.			01729313952					
10.			01755195856					
11.			01755267290					
12.			01740396473					
13.			01741792935					
14.			01777464301					
15.			01766266814					
16.			01731263580					
17.			01674476336					
18.			-	-				
19.			-	-				
20.								

Public Consultation No-6

Consultation Meeting of RMIP held in Saghata, Gaibandha

Place: Jhumarbari, Saghata, Gaibandha

Date: 4 April, 2015**. Time:** 10.00 – 10.45 AM

GPS **Location: N 25.1757 E 89.9754**

Total Participants: 19 (Male-17, Female-02)

Findings, Discussions and Recommendations:

People showed positive impression about the proposed project work and environmental study conducted by IUCN Bangladesh, but rehabilitation and the land acquisition topics were the priority part of the consultation.

- River training and flood protection were the priority issues of local people.
- BRE was at worse condition due to lack of proper maintenance and Flood occurred due to the flow from upstream to the downstream and it inundated 90% of riverside area.
- Reconstruction of the existing BRE properly to increase transportation facilities.
- Water cannot go to the country side as the existing regulator is damaged that result in hindering the migration of fishes and over all agriculture production.
- Reconstruction of the Jhumarbari Regulator for removing drainage congestion, improving fish migration route and water connectivity.
- Huge area along country side became waterlogged due to drainage congestion.
- Canal excavation should be made for proper surface irrigation system to reduce the pressure on ground water irrigation through the deep tubewell.
- People know fully that eucalyptus is an exotic species and do not favor wild life; the local people go for this, because of their compulsion to get poles intermittently, as when they need to shift their homesteads due to river erosion.

Figure 6: Consultation meeting at Jhumarbari, Saghata.

08/08/২০১৮
[illegible]
[illegible]

IUCN

River Bank Improvement Program (RBIP)
Dry Season
FGD/Consultation

SN	Respondent Name	Father Name	Contract No	Address				Sign
				Village	Union	Thana	District	
১.	[illegible]	[illegible] ~~01716619725~~	01716619725	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
২.	[illegible]	[illegible]	–	–	–	–	–	[illegible]
৩.	[illegible]	[illegible]	01720610593	[illegible]	"	"	"	
৪.	[illegible]	[illegible]	01718783803	[illegible] "	"	"	"	[illegible]
৫.	[illegible]	[illegible]	–	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
৬.	[illegible]	[illegible]	–	[illegible]	[illegible]	"	"	[illegible]
৭.	[illegible]	[illegible]	01743767728	"	"	"	"	[illegible]
৮.	[illegible]	[illegible]	01967458391	[illegible]	[illegible]	"	"	[illegible]
৯.	[illegible]	[illegible]	01964618566	"	"	"	"	[illegible]
১০.	[illegible]	[illegible]	–	"	"	"	"	[illegible]
১১.	[illegible]	[illegible]	01740550574	[illegible]	[illegible]	"	"	[illegible]
১২.	[illegible]	[illegible]	01726777593	[illegible]	[illegible]	"	"	[illegible]
১৩.	[illegible]	[illegible]	01740950584	"	"	"	"	[illegible]
১৪.	[illegible]	[illegible]	–	[illegible]	"	"	"	[illegible]
১৫.	[illegible]	[illegible]	01704490160	"	"	"	"	[illegible]
১৬.	[illegible]	[illegible]	01719 [illegible]	[illegible]	"	"	"	[illegible]
১৭.	[illegible]	[illegible]	01782199962	[illegible]	"	"	"	[illegible]
১৮.	[illegible]	[illegible]	–	"	"	"	"	–
১৯	[illegible]	[illegible]	–	"	"	"	"	[illegible]

Public Consultation No-7

Consultation Meeting of RMIP held in Sundargonj, Gaibandha

Place: Chondipur, Sundorganj, Gaibanda

Date: 4 April, 2015**. Time:** 02.00 – 2.45 PM

GPS Location: N 25.8488 E 90.0715

Total participants: 19 (Male-19, Female-00)

Findings, Discussions and Recommendations:

- Huge areas of land became flooded due to monsoon flood.
- River training works with flood protection management were the priority issues.
- Khal passing through the Culvert must be under control for protection from inundation.
- The proposed regulator will increase the fish diversity of the connecting water bodies.
- People derive both tangible and intangible benefits from the prevailing vegetation.
- Multiple cropping can be cultivated throughout the year.
- Aquaculture on the country side will be practiced extensively if existing BRE is improved.
- Major Crops are Aus Rice, Maize, Chilly, Vegetables etc.

Figure 7: Consultation meeting at Sundargonj, Gaibandha.

০৯/০৮/১৫
চন্ডিপুর ইউনিয়ন
সুন্দরগঞ্জ, গাইবান্ধা

IUCN

River Bank Improvement Program (RBIP)
Dry Season
FGD/Consultation

SN	Respondent Name	Father Name	Contract No	Address				Sign
				Village	Union	Thana	District	
১ (UP chairman)	[illegible] মিয়া	-	01718865107	উজান [illegible]	Chandipur	সুন্দরগঞ্জ	গাইবান্ধা	
2. (Up member)	[illegible]	[illegible]	01724621645	"	"	"	"	
৩.	মো: [illegible]	মো: [illegible]	-	"	"	"	"	[illegible]
৪.	মো. [illegible]	মো: [illegible] হোসেন	01941151664	উজান [illegible]	চন্ডিপুর	সুন্দরগঞ্জ	গাইবান্ধা	[illegible]
৫.	মো: [illegible]	[illegible]	01742269229	উজান [illegible]	চন্ডিপুর	সুন্দরগঞ্জ	গাইবান্ধা	[illegible]
৬.	মো: [illegible] আলী	[illegible] মন্ডল	01911375200	উজান [illegible]	চন্ডিপুর	সুন্দরগঞ্জ	গাইবান্ধা	[illegible]
৭.	[illegible] মিয়া	[illegible] উদ্দিন	01921422981	[illegible]	"	"	"	[illegible]
৮.	[illegible] চন্দ্র দাস	[illegible]	—	উজান [illegible]	"	"	"	[illegible]
৯.	শ্রী [illegible]	[illegible]	0159253H308	[illegible]	"	"	"	[illegible]
১০.	মো: [illegible]	[illegible]	01861086598	"	"	"	"	[illegible]
১১.	মো: [illegible]	[illegible] মিয়া	019393893	"	"	"	"	[illegible]
১২	মো: [illegible]	[illegible]	—	"	"	"	"	[illegible]
১৩	মো: সবুজ	[illegible]	01758161987	"	"	"	"	[illegible]
১৪	[illegible] হক	[illegible] উদ্দিন	—	"	"	"	"	[illegible]
১৫	শ্রী [illegible] চন্দ্র দাস	[illegible] দাস	01738630325	"	"	"	"	[illegible]
১৬	মো: আবুল [illegible]	আব্দুল [illegible]	—	"	"	"	"	[illegible]
১৭	[illegible] মিয়া	[illegible] উদ্দিন	01713864830	"	"	"	"	[illegible]
১৮	[illegible]	[illegible]	01752910847	"	"	"	"	[illegible]
১৯	[illegible]	[illegible] উদ্দিন	—	"	"	"	"	[illegible]

Public Consultation No-8

Consultation Meeting of RMIP held in Sadar, Gaibandha

Place: Gidari, Sadar, Gaibanda

Date: 4 April, 2015. Time: 05.00 –5.30 PM

GPS Location: N 25.5905 E 90.0306

Total participants: 19 (Male-16, Female-03)

Findings, Discussions and Recommendations:

- Embankment Construction was the priority issue.
- Communication system should be updated through improving the existing BRE.
- Baguria Kumarervita area needs a regulator for Drainage and flashing purpose respectively to maintain water connectivity.
- Ghagoat Pochakura and Manos regulator are needed for reducing drainage congestion for the purpose of irrigation and agricultural field for post Monsoon period.
- River training works must needed for the proper protection of the river erosion.
- Ghagot Bridge is the urgent need of the people for proper communication.
- Water remains 7-8 months (May - January) on the low lying areas and only Boro rice can be cultivated. If a regulator is constructed, the people can also cultivate T. Aman and other crops on the low lying areas during monsoon and post monsoon period.
- Major Crops are Boro Rice, T. Aman, Maize, Pulses, Wheat and Dhoincha etc.
- People depend on char in many ways. They grow agricultural crops on the char areas and get cereals, pulses, ground nuts, etc. They also collect fodder from the char areas.

Figure 8: Consultation meeting at Gidari, Gaibandha Sadar.

08/08/2012

IUCN

River Bank Improvement Program (RBIP)
Dry Season
FGD/Consultation

SN	Respondent Name	Father Name	Contract No	Address				Sign
				Village	Union	Thana	District	
1.			01716420326					
2.	মো: ইছাহাক মিয়া		01736002016					
3.	মো: ইসলাম মিয়া		01713 710497					
4.	মো: জাহাঙ্গীর আলী		01710-824702					
5.	মো: ফরিদ মিয়া		01740-192306					
6.			01745180798					
7.			01703264012					
8.								
9.								
10.			01740362896					
11.			01722536924					
12.			01731329924					
13.			01712501804					
14.			01983207388					
15.								
16.			01931502128					
17.								
18.								
19.								

Public Consultation No-9
Consultation meeting of RMIP (Dry Season) Held in Bogra
Place: Titporol, Sariakandi, Bogra
Date: 05 April 2015 **Time:** 11.30 AM – 12.15 PM

Total Participants: 17
No. of Male Participants: 13
No. of Female Participants: 04

Findings, Discussions and Recommendations:

- River protection work, embankment and existing regulator should be updated.
- The people of the area suggested changing the proposed alignment position from existing to slightly north.
- They showed mixed impression about fish passes because the previous one which is situated in Devdanga is not effective at all.
- People emphasized on the strict monitoring for regulation of fish pass.
- People are not generally interested in exotic tree like *Acacia* plantation but due to availability and highly productivity they plant this species. Climatic condition like frequent storms also influence people to plant exotic species like *Acacia.*
- Sanitation and waste management problem should be carefully handled.
- Anthropogenic factors like overfishing and entangled by net might be the probable reasons for reduction of number of dolphins in the area.
- Dredging the existing Khals and Canals will increase agricultural production and fish diversity of this region.
- Some people suggested that railway system should be included on the design for the transport facilities of this region.

Figure 9: Consultation at Titporol, Sariakandi, Bogra

৬ নং ইউনিয়ন পরিষদ
সাবলাকান্দি, বগুড়া
05.04.15

IUCN

River Bank Improvement Program (RBIP)
Dry Season
FGD/Consultation

SN	Respondent Name	Father Name	Contract No	Address				Sign
				Village	Union	Thana	District	
UP Chairman ০১	আবদুল কাদির		01716711551	উত্তরচর	সাবলাকান্দি	শেরপুর	বগুড়া	
UP member ২.	চন্দু মেম্বার		—	"	"	"	"	
৩.	[illegible]	[illegible]	01746908635	"	"	"	"	
৪.	[illegible]	[illegible]	—	"	"	"	"	
৫.	[illegible]	[illegible] (ইউপি)	01736096872	"	"	"	"	
৬.	[illegible]	[illegible]	01754624556	"	"	"	"	
৭.	[illegible]	[illegible]	01740020314	"	"	"	"	
UP member ৮.	[illegible]	[illegible]	01-35759425	"	"	"	"	
৯.	[illegible]	[illegible]	01764584[illegible]	"	"	"	"	
১০.	[illegible]	[illegible]	01763[illegible]	"	"	"	"	
UP member ১১	[illegible]	[illegible]	01736462990	"	"	"	"	
১২.	[illegible]	[illegible]	—	"	"	"	"	
১৩	[illegible]	[illegible]	01912878062	"	"	"	"	
১৪	[illegible]	[illegible]	—	"	"	"	"	
UP member ১৫.	[illegible]	[illegible]	01722376048	"	"	"	"	
১৬.	[illegible]	[illegible]	—	"	"	"	"	
১৭.	[illegible]	[illegible]	—	"	"	"	"	