

# Environmental Impact Assessment (draft)

---

Project No.: 44167-015  
August 2020

(2 of 2)

## Bangladesh: Flood and Riverbank Erosion Risk Management Investment Program – Project 2

Prepared by the Bangladesh Water Development Board for the Asian Development Bank.

This environmental impact assessment is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature. Your attention is directed to the [“terms of use”](#) section on ADB's website.

In preparing any country program or strategy, financing any project, or by making any designation of or reference to a particular territory or geographic area in this document, the Asian Development Bank does not intend to make any judgments as to the legal or other status of any territory or area.

## 10 ANALYSIS OF ALTERNATIVES

368. The three sub-reaches selected for Project-2 of the FRERMIP physical works: JRB-1, JLB-2 and PBL-1, were chosen from 13 sub-reaches into which the FRERMIP program area was divided based on discussions among BWDB, ADB and the PPTA consultant. These 13 sub-reaches were evaluated using a multi-criteria assessment approach taking into consideration three primary criteria (riverbank erosion, flooding, and poverty) and several secondary criteria (related to planning, design, cost-benefit and safeguards issues). Of the six sub-reaches scoring highest<sup>1</sup>, these three sub-reaches were screened out due to a lack of active erosion and/or conflicts with other immediately planned interventions.

369. While riverbank protection was placed according to immediate needs especially for growth centers (“something to defend”), embankment construction considered alternatives especially for the area JLB-2. BWDB contemplates the establishment of polders (ring-embankments) covering large parts of JLB-2 with very long ring embankment lines. These were compared to the solution of an embankment only along the riverbanks of the main rivers, reducing the length of the embankments and as such minimizing the footprint and related land acquisition and resettlement. In addition, open distributaries would allow all-year-round water flow to the area, which specifically enhances the dry season water management <sup>2</sup>.

370. As such various alternative interventions have been considered. One of these has been large-scale Capital Dredging for which a national feasibility study was conducted (2010-2015). However, large-scale capital dredging on the one hand, and riverbank protection on the other, are different solutions to the same problem, and it is neither logical nor cost-efficient to implement both on a large scale simultaneously. Large-scale dredging is believed not be sustainable due to (continued) high costs and the high sediment load of river waters (resulting in rapid refill), and is therefore not further considered as a viable scenario under the present river stabilization planning process. However, limited dredging of river sections may be considered to stimulate the development of a desired future river planform with more stable river channels and a narrower active river corridor by the river itself, whereby dredged material is placed at selected locations in the floodplain and on chars.

### 10.1 Without-Project scenarios

371. **Without JRB-1.** It is expected that without additional riverbank protection along JRB-1, the embankment and important infrastructure in the Enayetpur area will remain vulnerable and the goal of the project will not be achieved.

372. **Without JLB-2.** The future geometry of the two downstream Jamuna branches fully depends on the discharge distribution at the bifurcation. Without countermeasures (stabilization works) there is a risk that the bifurcation changes over time with increased discharge in the right channel and reduced in the left one or vice versa. Other changes could happen within the channel pattern, for example the cut-off channel at Chauhali could develop and change the downstream channel pattern. As a consequence of these changes, the downstream channel pattern would change in two ways: riverbank erosion would take place in yet unprotected

---

<sup>1</sup> The highest ranking sites scored between 300 and 370 points, while the lower ranking sites ranged between 200 and 260 points.

<sup>2</sup> Annex D of the feasibility study, “River and Charland Morphology and River Engineering” provides more background.

reaches, and existing work to stabilize the downstream channel might turn out to be ineffective as placed in the wrong location.

## 11 ENVIRONMENTAL MANAGEMENT PLAN

373. In previous chapters, the possible positive and negative impacts have been identified and evaluated. In addition to that, mitigation measures have been mentioned to address adverse impacts. This chapter presents the Environmental Management Plan (EMP) prepared by the study team. The EMP entails mitigation measures for the negative impacts, enhancement measures for the positive impacts, compensation for the non-mitigated impacts and contingency measures for the accidental events that might occur.

374. The EMP has been organized per construction and post-construction phase (operation and maintenance), to facilitate the monitoring process. Impacts and mitigation measures broadly cover the three topics: (i) construction, (ii) biodiversity and (iii) fisheries and aquaculture. Most construction related impacts are mitigated by contractors during construction. Issues pertaining to biodiversity and fisheries/aquaculture, especially related to the construction of the embankment at JRB-1 will be implemented through a specialist firm/NGO, following the principles established by the biodiversity program of GIZ at Pabna, now extended to Sirajganj, and as part of the livelihood program of the resettlement plan. In addition, fisheries/aquaculture will be supported to compensate for the loss of open water fisheries on the floodplain after the construction of the embankments. Fisheries and aquaculture have a strong relevance for the poor and is part of the livelihood component of the resettlement plan, which is a separate compensation mechanism.

375. The layout of the EMP is as follows:

### **Construction phase**

- Site offices
- Riverbank protection
- Embankment construction
- Drainage structures/regulators-cum-fish passes

### **Post construction phase per site**

- Decommissioning
- Water resources
- Land resources
- Agricultural resources
- Fisheries resources
- Ecological resources
- Socio-economic resources

376. In addition to mitigating direct impacts of the ongoing Tranche-1 and planned Project-2 works, a specialist firm/NGO may be retained to elaborate on the biodiversity baseline and study the establishment of fisheries sanctuaries, in accordance with future stabilization plans, looking beyond the localized Tranche-1 and Project-2 measures and aiming at identifying and mitigating any impacts from larger scale river-reach stabilization.

377. Note that mitigation of impacts on local community members and their livelihoods are addressed via the Resettlement Action Plan.

## 11.1 Construction Phase for Each Site

### 11.1.1 Site offices, labour sheds, stockyards, etc.

IESC	Location	Impacts	Mag. Of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
<b>Activity</b>	<b>Construction of site office, labour shed(s) with proper water and sanitation facilities, garbage disposal system, stock yard and construction camp(s), materials, equipment and other machines, construction of cc blocks at site</b>							
Air quality	River and roadsides	Minor impact may occur from dust generated due to movement of vehicles	-2	Mitigation: Construction materials should be covered with thick materials (i.e. polythene) during transportation to resist the generation of dust. Water to be sprinkled to control the generation and spreading of dust; as and where required.	-1	Short Term	N/A	Implementation: Contractor Monitoring: Nominated Engineer (SMO, BWDB)
Noise	Same as above	Low impacts caused due to noise generation for mobilization of construction materials and construction of site office, labour shed, stockyard and CC blocks	-2	Mitigation: Working hours to be restricted to 8 h to 17 h only; Noise levels due to vehicular movement are to be kept within permissible limit; Construction camps, office, labour shed, and sites for CC block construction are to be located sufficiently away from settlements.	-1	Short Term	N/a	Same as above

IESC	Location	Impacts	Mag. Of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
Land loss	Same as above	Loss of 200 ha of existing land	0	<p>Construction activities should be carried out as per design.</p> <p>Sites should preferably be constructed on fallow or khas land.</p> <p>Landowners affected by the construction of sites on agriculture land should be noticed ahead of time so that the area might not be affected for growing crops.</p> <p>Labour sheds, and other project related activities should be optimized with the purpose of minimum disruption to cultivable lands and standing crops.</p> <p>Adequate cash compensation should be provided to the land-owners /share croppers.</p> <p>The compensation should be determined based on the amount of land temporarily going out of cultivation.</p>	+1	Short Term	No cost or cost for land due to activities on site	Implementation: Deputy Commissioner, specialist NGO Monitoring: PMO
Health and safety	Same as above	Unsanitary and unsafe conditions on site leading to illness and accidents. Risk of spread of coronavirus disease	-4	<p>Proper sanitary facilities to be provided on site</p> <p>PPE equipment available on e.b. boats</p> <p>Prepare and implement a comprehensive</p>	-1	Short term	Contractor budget	Implementation: Contractor Engage health and safety supervisor to implement H&S measures and

IESC	Location	Impacts	Mag. Of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
		(COVID-19)		<p>COVID-19 Health and Safety Guidance following i) following national regulations and health advice, and (ii) international good practice recommendations. The guidance should include the protocols on the following: (i) Prerequisite measures before opening the worksites; (ii) Worksite entrance ; (iii) Worksite management; (iv) Camp management; (v) Worksite awareness-raising; (vi) Risk exposure assessment guidance; (vii) Engage an employee/staff to oversee health and safety issues, and (viii) Monitoring and reporting mechanism. The protocols should include requirements on wearing masks and PPE, physical distancing, hand washing, disinfection, checking body temperature, ventilation,</p>				<p>COVID-19 guideline Engage health worker for a daily temperature check and record for workers Engage EHS staff or assign an existing staff to handle COVID-19 in case if detected</p> <p>Monitoring: Nominated Staff (SMO, BWDB)</p>

IESC	Location	Impacts	Mag. Of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
				<p>management of waste, awareness, and morning briefings.</p> <p>Conduct a risk assessment of worksite and prepare on-site plan as per H&amp;S guideline;</p> <p>Avoid labor-intensive works as much as possible;</p> <p>Ensure all to use the Personal Protective Equipment (PPE) as appropriate;</p> <p>Ensure all equipment and vehicles used are routinely disinfected;</p> <p>Provide thermometer, soap, sanitizer, disinfectant, PPE at worksite/camp;</p> <p>Place adequate washbasins, disinfectant tub, dispenser for sanitizer;</p> <p>Provide regular briefing/training on preventive requirements to the workers and post enough COVID-19 awareness posters throughout the worksites; and</p> <p>Maintain COVID-19</p>				



IESC	Location	Impacts	Mag. Of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
				weekly monitoring and reporting mechanism at the worksite; including any necessary actions to be taken				

### 11.1.2 Riverbank Protection

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
Activity	Bank Protection: Slope pitching and turfing; dredging of sand from the river; filling and dumping of geo-textile bags on and along the riverbank, placing of cc blocks on the riverbank; movement of labourers and vehicles for carrying materials. Around 26km of riverbank protection, including: JRB-1: 10 km (3 km at Benotia and 7 km at Enayetpur), JLB-2: 15.5 km at Upstream Chauhali.							
Air quality	Places adjacent to the riverbank where bags will be dumped, and cc blocks placed	Minor amount of dust may be generated during the works	-2	Mitigation: Water to be sprinkled on regular intervals, as and where required	-1	Short term	N/a	Implementation: Contractor Monitoring: Nominated Engineer (SMO, BWDB)
Noise	Same as above	Low impacts would be caused during excavation & dredging of soil, operation of mixture machine and vehicular movements	-2	Mitigation: Working hours to be restricted to 8:00 AM to 5:00 PM only; Noise levels due to vehicular movement, excavation and dredging activities are to be kept within permissible limit; proper silencers on machinery, equipment and boat to be installed	-1	Short term	N/a	Same as above

<b>IESC</b>	<b>Location</b>	<b>Impacts</b>	<b>Mag. of impact*</b>	<b>Mitigation / Enhancement / Compensation / Contingency</b>	<b>Magn. with EMP*</b>	<b>Type of Impact</b>	<b>EMP cost (Lakh Tk)</b>	<b>Responsible Agency</b>
Surface water quality	Same as above including Tranche-1 area	Surface water quality might be affected due to the disposal of waste generated from labourers into the river. Additionally, minor quantity of sediments would be generated in the rivers during dredging of soil from river bed, which would temporarily hamper the quality of river water.	-4	Mitigation: The dredging locations should be selected so that dredge spoil would be minimized. Proper waste disposal system is to be implemented.	-1	Short term	6	Same as above
Fish habitat	Same as above	Temporary damage would occur in seasonal fish habitat along the riverbank due to either changes in water quality (e.g. turbidity) due to dredging/ dumping or clearance of	-2	Dredging to be done during the dry season Vegetation clearance should be done as low as possible  2 no regulators help to provide fish passage	-1	Long term	N/a	Implementation: Contractor Monitoring: Nominated Engineer (SMO, BWDB) in coordination with DoF

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
		vegetation cover or draped by the filling earth during earth work						
Fish Biodiversity	Same as above	Riverine fish species i. e. hilsa, major carp species, eel (baim), big and small catfish (boal, ayr, magur), etc. may leave the project area	-2	Dredging to be done during the dry season Vegetation clearance should be done as low as possible	-1	Long term, permanent	N/a	Same as above
Fish Migration	Same as above	Both longitudinal (Hilsa) and lateral migration for fish will temporarily be disturbed	-2	Dredging to be done during the dry season Vegetation clearance should be done as little as possible	-1	Short term	N/a	Same as above
Fish production	Same as above	Capture fish production would temporarily be declined within the project area	-2	Dredging to be done during the dry season Vegetation clearance should be done as low as possible	-1	Long term	N/a	Same as above
Terrestrial and aquatic ecosystem diversity	Same as above	Trees, shrub and herbs and nesting sites on riverbank and aquatic and flora and fauna	-5	Minimize damage as much a possible; create replacement habitat as part of post-construction mitigation (see below), incl.:	-3	Long term	50 Tk.500/no including planting and guarding	Implementation: Contractor Monitoring: Nominated Engineer (SMO, BWDB) in

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
		will be destroyed.		<p>Plantation of saplings (Bot, Pakur, Shimul, Jam, Pitali, Khajur, Tal and water tolerance fruit and timber are suggested for plantation)</p> <p>Do not dump large volume of excavated soil on bottom of the present trees.</p> <p>Awareness development on natural resources.</p> <p>Observation of national and international days.</p> <p>Nature club or Local committee should be formed to protect the saplings.</p> <p>Awareness development activities should be conducted by the committee or nature club</p>				coordination with DoF and DoE, NGO
Health and safety	Same as above	<p>Unsanitary and unsafe conditions on site leading to illness and accidents</p> <p>Risk of spread of coronavirus</p>	-4	<p>Proper sanitary facilities to be provided on site</p> <p>Sufficient and proper gangways to be provided on boats and landings</p> <p>PPE equipment available on e.b. boats</p> <p>Prepare and implement a comprehensive COVID-19 Health and Safety Guidance following i) following national</p>	-1	Short term	Contractor budget	<p>Implementation: Contractor</p> <p>Engage health and safety supervisor to implement H&amp;S measures and COVID-19 guideline</p> <p>Engage health worker for a daily</p>

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
		disease (COVID-19).		<p>regulations and health advice, and (ii) international good practice recommendations. The guidance should include the protocols on the following: (i) Prerequisite measures before opening the worksites; (ii) Worksite entrance ; (iii) Worksite management; (iv) Camp management; (v) Worksite awareness-raising; (vi) Risk exposure assessment guidance; (vii) Engage an employee/staff to oversee health and safety issues, and (viii) Monitoring and reporting mechanism. The protocols should include requirements on wearing masks and PPE, physical distancing, hand washing, disinfection, checking body temperature, ventilation, management of waste, awareness, and morning briefings. Conduct a risk assessment of a worksite and prepare on-site plan as per H&amp;S guideline;</p>				<p>temperature check and record for workers Engage EHS staff or assign an existing staff to handle COVID-19 in case if detected Monitoring: Nominated Staff (SMO, BWDB)</p>

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
				<p>Avoid labor-intensive works as much as possible;</p> <p>Ensure all to use the Personal Protective Equipment (PPE) as appropriate;</p> <p>Ensure all equipment and vehicles used are routinely disinfected;</p> <p>Provide thermometer, soap, sanitizer, disinfectant, PPE at worksite/camp;</p> <p>Place adequate washbasins, disinfectant tub, dispenser for sanitizer;</p> <p>Provide regular briefing/training on preventive requirements to the workers and post enough COVID-19 awareness posters throughout the worksites; and</p> <p>Maintain COVID-19 weekly monitoring and reporting mechanism at the worksite; including any necessary actions to be taken</p>				
Employment	Same as above	Temporary employment will	+1	Ensure employment for local people for both	N/a	Short term	N/a	Same as above

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
		be created for labourers		technical and non-technical works. If possible at least 60% labour should be recruited locally				
Community organizations	Same as above	Positive impacts, due to awareness-raising and employment provided to members.	+2	The community organizations should be formed prior to implementation of the project. The community organizations should be given orientation to protect their standing crops from riverbank protection work, spoil soils, on farm water management, LCS, EMG .	+4	Long term	Tk. 100	Implementation: specialist NGOs Monitoring: PMO / DDM / DAE

\* No impact (0); Positive impact (+); Negative impact (-)

Low impact (1-3); Medium impact (4-6); High impact (7-8); Very high impact (9-10)

### 11.1.3 Embankment Construction/Reconstruction

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
Activity	Embankment Construction and Rehabilitation: Excavation of earth materials from the location of embankment; dredging of soil from the river; dumping of earthen materials on the embankment; embankment surface labeling through dumping machine; movement of vehicles for carrying materials. Around <del>65.3</del> 47.90 km of embankments including: a) JRB-1: 7.9 km at Kaijuri/ Shahjadpur, JLB-1: b) 40km of climate-smart embankment							
Air quality	Places adjacent to the riverbank where embankments will be built or	Minor amount of dust may be generated during excavating and dumping of earth materials, surface	-3	Mitigation: Water to be sprinkled on regular intervals, as and where required	-2	Short term	N/A	Implementation: Contractor Monitoring: Nominated Engineer (SMO,

<b>IESC</b>	<b>Location</b>	<b>Impacts</b>	<b>Mag. of impact*</b>	<b>Mitigation / Enhancement / Compensation / Contingency</b>	<b>Magn. with EMP*</b>	<b>Type of Impact</b>	<b>EMP cost (Lakh Tk)</b>	<b>Responsible Agency</b>
	rehabilitated	labeling with dumping machine and vehicular movements						BWDB)
Noise	Same as above	Low impacts would be caused during excavation and dredging of soil and vehicular movements	-2	Mitigation: Working hours to be restricted to 8 h to 17 h only; Noise levels due to vehicular movement, excavation and dredging activities are to be kept within permissible limit	-1	Short term	N/A	Same as above
Surface water quality	Same as above	The surface water quality might be affected due to the disposal of waste generated from the labour shed into the river. Additionally, minor quantity of sediments would be generated in the rivers during dredging of soil from riverbed, which would temporarily hamper the aesthetic quality of river water.	-4	Mitigation: The dredging locations should be selected so that dredge spoil would be minimized. Proper waste disposal system is to be implemented. Conducting a water quality monitoring program prior and during construction to record change, and adapt operation – as required	-1	Short term	Tk. 3.00	Same as above
Drainage congestion	Same as above	Low impact may occur due to the rehabilitation of embankment temporarily blocking offtakes	-2	Constructing regulators cum fish passes at appropriate locations	-1	Short term	Included in cost of construction of regulators with fish	Same as above



IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
							pass	
Land loss	Same as above	X ha of land	-1	<p>Topsoil (0-15cm) should be managed properly for conserve the soil fertility.</p> <p>Area for executing construction activities and other project related activities should be optimized with the purpose of minimum disruption to cultivable lands and standing crops</p> <p>Filling materials should be collected from khas/fallow land /river.</p> <p>Disposal of spoil/ constructing materials should preferably be stored on fallow or khas land so that the area might not be affected for growing crops.</p> <p>Compensation to be paid for any crop damage.</p> <p>Contractor to avoid cultivation fields during construction.</p> <p>Contractor to avoid agricultural land for material borrowing and material stockpiling.</p> <p>Contractor to ensure that no vehicular movements take place inside cultivation fields.</p>	+1	Short term	70.00	Same as above

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
				Contractor to ensure that no material is dumped inside cultivation fields. Contractor to maintain liaison with communities				
Crop production loss	Same as above	Loss of crop production is expected to be about x metric ton for bank rehabilitation, construction of new embankment, and disposal of spoil materials	-1	In cases where the disruption to farming becomes unavoidable, adequate cash compensation should be provided to the landowners / share-croppers. Exact amount of compensation should be determined based on the amount of land temporarily or permanently going out of cultivation. The rate should be decided on the basis of the one crop usually grown on the pieces of land. Constructing materials like sand, cement, construction of labour sheds, concrete, block, etc. should be placed in non-agricultural land as far as possible. These materials should not be placed in standing crops.	+3	Medium term	Included in RAP	Implementation: Deputy Commissioner NGO. Monitoring: BWDB

<b>IESC</b>	<b>Location</b>	<b>Impacts</b>	<b>Mag. of impact*</b>	<b>Mitigation / Enhancement / Compensation / Contingency</b>	<b>Magn. with EMP*</b>	<b>Type of Impact</b>	<b>EMP cost (Lakh Tk)</b>	<b>Responsible Agency</b>
Fish habitat	Same as above	Temporary damage would occur in the seasonal habitat due to either clearance of vegetation cover or by filling earth during construction work	-4	Assure connectivity between river and floodplain: construction of 2 regulators with fish passes in JLB-1. Average cost: \$ 1 million/regulator of which 35% for fish pass Vegetation clearing to be done as low as possible	-2	Short term	2520	Implementation: Contractor Monitoring: Nominated Engineer (SMO, BWDB) in coordination with consultant and DoF
Fish migration	Same as above	Lateral migration of fish will temporarily or permanently be disturbed	-4	Assure connectivity between river and floodplain (see fish pass - Section 10.1.4) Vegetation clearing to be done as low as possible	-2	Short term		Same as above
Terrestrial and aquatic ecosystem diversity	Same as above including Tranche-1 area	Trees, shrub and herbs and nesting sites on riverbank and aquatic and flora and fauna may be destroyed.	-5	Minimize damage as much a possible; create replacement habitat as part of post-construction mitigation (see below), incl.: Plantation of saplings (Bot, Pakur, Shimul, Jam, Pitali, Khajur, Tal and water tolerance fruit and timber are suggested for plantation) Do not dump large volume of excavated soil on bottom of the present trees. Awareness development on natural resources. Observation of national and international days. Nature club or Local	-3	Long term	200	Implementation: Contractor Monitoring: Nominated Engineer (SMO, BWDB) in coordination with DoF and DoE

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
				committee should be formed to protect the saplings. Awareness development activities should be conducted by the committee or nature club				
Health and safety	Same as above	<p>Unsanitary and unsafe conditions on site leading to illness and accidents</p> <p>Risk of spread of coronavirus disease (COVID-19)</p>	-4	<p>Proper sanitary facilities to be provided on site</p> <p>Sufficient and proper gangways to be provided on boats and landings</p> <p>PPE equipment available on e.b. boats</p> <p>Prepare and implement a comprehensive COVID-19 Health and Safety Guidance following i) following national regulations and health advice, and (ii) international good practice recommendations.</p> <p>The guidance should include the protocols on the following: (i) Prerequisite measures before opening the worksites; (ii) Worksite entrance ; (iii) Worksite management; (iv) Camp management; (v) Worksite awareness-raising; (vi) Risk exposure assessment guidance; (vii) Engage an employee/staff to oversee health and safety issues,</p>	-1	Short term	Contractor budget	<p>Implementation:</p> <p>Contractor Engage health and safety supervisor to implement H&amp;S measures and COVID-19 guideline</p> <p>Engage health worker for a daily temperature check and record for workers</p> <p>Engage EHS staff or assign an existing staff to handle COVID-19 in case if detected</p> <p>Monitoring:</p> <p>Nominated Staff (SMO, BWDB)</p>

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
				<p>and (viii) Monitoring and reporting mechanism. The protocols should include requirements on wearing masks and PPE, physical distancing, hand washing, disinfection, checking body temperature, ventilation, management of waste, awareness, and morning briefings.</p> <p>Conduct a risk assessment of a worksite and prepare on-site plan as per H&amp;S guideline;</p> <p>Avoid labor-intensive works as much as possible;</p> <p>Ensure all to use the Personal Protective Equipment (PPE) as appropriate;</p> <p>Ensure all equipment and vehicles used are routinely disinfected;</p> <p>Provide thermometer, soap, sanitizer, disinfectant, PPE at worksite/camp;</p> <p>Place adequate washbasins, disinfectant tub, dispenser for sanitizer;</p> <p>Provide regular briefing/training on preventive requirements to the workers and post</p>				

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
				enough COVID-19 awareness posters throughout the worksites; and Maintain COVID-19 weekly monitoring and reporting mechanism at the worksite; including any necessary actions to be taken				
Employment	Same as above	Temporary employment will be created for labourers	+1	Ensure employment for local people for both technical and non-technical works. If possible, at least 60% labour should be recruited locally	N/a	Short term	N/a	Same as above
Community organisations	Same as above	Positive impact	+2	The community organizations should be formed prior to implementation of the project. The community organizations should be given orientation to protect their standing crops from riverbank protection work, spoil soils, on farm water management, LCS, EMG.	+4	Long term	Tk. 100	Implementation: specialist NGOs Monitoring: PMO / DDM / DAE

\* No impact (0); Positive impact (+); Negative impact (-)

Low impact (1-3); Medium impact (4-6); High impact (7-8); Very high impact (9-10)

#### 11.1.4 Drainage Structure / Regulators cum fish passes/off-take Old Dhaleswari

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
Activity	Construction of a drainage structure / sluice / fish pass within the embankment/ Re-establish flow of the Dhaleswari offtake by diverting 245 m <sup>3</sup> /s from the Jamuna River into the Dhaleswari/Pungli/Bangshi/Turag/Buriganga river system, to improve water quality (e.g. DO levels up to 4 mg/l, from present 1 mg/l) and support fisheries and aquatic life, improve groundwater recharging, navigation, and so on.							
Air quality	Strategic location within rehabilitated/ new embankment	Minor amount of dust may be generated during construction works and vehicular movements	-2	Mitigation: Water to be sprinkled on regular intervals, as and where required	-1	Short term	N/a	Implementation: Contractor Monitoring: Nominated Engineer (SMO, BWDB)
Noise	Same as above	Low impacts would be caused during construction and works and vehicle movements	-2	Mitigation: Working hours to be restricted to 8:00 Am to 5:00 PM only; Noise levels due to vehicular movement to be kept within permissible limit	-1	Short term	N/a	Same as above
Surface water quality and surroundings	Same as above	The surface water quality might be affected due to the disposal of waste generated from the construction site into the river or surroundings.	-4	Mitigation: Proper waste disposal system is to be implemented.	-1	Short term	N/a	Same as above
Drainage congestion	Same as above	Low impact may occur due to the	-2	Constructing regulators cum fish	-1	Short term		Same as above

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
		rehabilitation of embankment temporarily blocking offtakes		passes at appropriate locations				
Health and safety	Same as above	<p>Unsanitary and unsafe conditions on site leading to illness and accidents</p> <p>Risk of spread of coronavirus disease (COVID-19)</p>	-4	<p>Proper sanitary facilities to be provided on site</p> <p>Sufficient and proper gangways to be provided on boats and landings</p> <p>PPE equipment available on e.b. boats</p> <p>Prepare and implement a comprehensive COVID-19 Health and Safety Guidance following i) following national regulations and health advice, and (ii) international good practice recommendations.</p> <p>The guidance should include the protocols on the following: (i) Prerequisite measures before opening the worksites; (ii) Worksite entrance ; (iii) Worksite</p>	-1	Short term	Contractor budget	<p>Implementation:</p> <p>Contractor Engage health and safety supervisor to implement H&amp;S measures and COVID-19 guideline</p> <p>Engage health worker for a daily temperature check and record for workers</p> <p>Engage EHS staff or assign an existing staff to handle COVID-19 in case if detected</p> <p>Monitoring:</p> <p>Nominated Engineer (SMO, BWDB)</p>



IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
				<p>management; (iv) Camp management; (v) Worksite awareness-raising; (vi) Risk exposure assessment guidance; (vii) Engage an employee/staff to oversee health and safety issues, and (viii) Monitoring and reporting mechanism. The protocols should include requirements on wearing masks and PPE, physical distancing, hand washing, disinfection, checking body temperature, ventilation, management of waste, awareness, and morning briefings. Conduct a risk assessment of a worksite and prepare on-site plan as per H&amp;S guideline; Avoid labor-intensive works as much as possible;</p>				

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
				<p>Ensure all to use the Personal Protective Equipment (PPE) as appropriate;            Ensure all equipment and vehicles used are routinely disinfected;            Provide thermometer, soap, sanitizer, disinfectant, PPE at worksite/camp;            Place adequate washbasins, disinfectant tub, dispenser for sanitizer;            Provide regular briefing/training on preventive requirements to the workers and post enough COVID-19 awareness posters throughout the worksites; and            Maintain COVID-19 weekly monitoring and reporting mechanism at the worksite; including any necessary actions to be taken.</p>				

<b>IESC</b>	<b>Location</b>	<b>Impacts</b>	<b>Mag. of impact*</b>	<b>Mitigation / Enhancement / Compensation / Contingency</b>	<b>Magn. with EMP*</b>	<b>Type of Impact</b>	<b>EMP cost (Lakh Tk)</b>	<b>Responsible Agency</b>
Employment	Same as above	Temporary employment will be created for labourers	+1	Ensure employment for local people for both technical and non-technical works. If possible at least 60% labour should be recruited locally	N/a	Short term	N/a	Same as above
Community organisations	Same as above	Positive impact	+2	The community organizations should be formed prior to implementation of the project. The community organizations should be given orientation to protect their standing crops from riverbank protection work, spoil soils, on farm water management, LCS, EMG etc.	+4	Long term	Tk. 100	Implementation: specialist NGOs Monitoring: PMO / DDM / DAE

\* No impact (0); Positive impact (+); Negative impact (-)      Low impact (1-3);      Medium impact (4-6);      High impact (7-8);      Very high impact (9-10)

## 11.2 Post-Construction Phase at Each Site

### 11.2.1 Decommissioning of Site Offices, Labour Sheds, Stock Yards

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
Activity	Decommissioning of site office, labour shed(s) with water and sanitation facilities, garbage disposal system, stock yard and construction camp(s), materials, equipment and other machines, construction of cc blocks at site							
Air quality	River and roadsides	Minor impact may occur from dust generated due to movement of vehicles	-2	Mitigation: Construction materials should be covered with thick materials (i.e. polythene) during transportation to resist the generation of dust. Water to be sprinkled to control the generation and spreading of dust; as and where required.	-1	Short term	N/a	Implementation : Contractor Monitoring: Nominated Engineer (SMO, BWDB)
Noise	Same as above	Low impacts caused due to noise generation for demobilization of construction materials and decommissioning of site office, labour shed, stockyard and CC blocks – as may be applicable	-2	Mitigation: Working hours to be restricted to 8 h to 17 h only; Noise levels due to vehicular movement are to be kept within permissible limit. Buildings and yards may remain and be given another purpose/ landowner / sold	-1	Short term	N/a	Same as above
Waste and disposal	Same as above	Littering of rest and waste materials from decommissioning of	-3	Reuse, recycle or sell left over materials Remove worker's camps	-1	Short term		Implementation : Contractor

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
		buildings, worker's camps and construction yards may affect the local environment		including sanitation facilities (toilets) in an environmentally sound way				Monitoring: PMO
Public health	Same as above	Limited access to toilet, unhygienic environment due to huge gathering of labourers can create disturbance to health	-5	The labour sheds and toilets including all materials used during construction should be removed in an environmentally sound way	-3	Short term		Same as above

\* No impact (0); Positive impact (+); Negative impact (-)

Low impact (1-3); Medium impact (4-6); High impact (7-8); Very high impact (9-10)

### 11.2.2 Water Resources

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
Erosion	Location adjacent to the bank protection work	Agricultural lands and settlements will be saved from erosion. Roadway communication will be established along Jamuna and Padma rivers	+6	Enhancement: Implementing Katkin and other small scale plantation along the slope of protective works and 6700 ha reclaimed land. Providing fencing, biological protection (bamboo, other trees) at the country side of	+7	Long term	200	Implementation: Community organizations Monitoring: Department of Forestry, BWDB Field Division

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
				protective works to ensure soil stability				
Drainage congestion	Water will be drained out from the sub reaches to Jamuna and Padma rivers	Low impact may be generated as the conveyance capacity of internal rivers and lakes will be stressed, resulting in drainage congestion problems	-1	Mitigation: Operation of regulators cum fish passes and places where required	0	Short term	N/A	Implementation: Joint committee Monitoring: DoF, DAE, BWDB Field Division
Flood	Sub-reaches	Significant impact in flooding. This would lead to a better control in both irrigation and social status of the people in the sub-reaches	+5	Enhancement: Providing vegetative cover along the slope of the embankments and afforestation works in the countryside of the embankment	+8	Long term		Implementation: PMO BWDB Monitoring: BWDB, DoE Community organizations Monitoring Department of Forestry, Field Division, BWDB
Water Availability and Use	Agricultural lands near the possible location of regulators and sluices	Socio-economic status of farmers would be enhanced due to their increased chances of practicing Aman crops	+3	Enhancement: Providing inlets through embankments to allow farmers in using river water in irrigation	+5	Long term	N/a	Implementation: Joint committee Monitoring: DAE, DoF, BWDB Field Division
Water quality	Surface	Pollution (waste	-3	Monitoring	+2	Long term	2.00	DoE, DoF, or

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
	waters disconnected from the river	accumulation) and clogging with water weeds		through visual observation and with portable online kits				other appropriate organization
Water quality (2)	Old Dhaleswari channel, after construction of the off-take	Improved water quality due to improved flow from the Jamuna (aim is to divert 245 m <sup>3</sup> /s from the Jamuna River into the Dhaleswari).	+6	Monitoring of various water quality parameters esp. DO, BOD, suspended sediment.	+6	Medium term to Long term		DoE, DoF, or other appropriate organization

\* No impact (0); Positive impact (+); Negative impact (-) Low impact (1-3); Medium impact (4-6); High impact (7-8); Very high impact (9-10)

### 11.2.3 Drainage Structure / Regulators cum fish passes/off-take Old Dhaleswari

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
Activity	Construction of a drainage structure / sluice / fish pass within the embankment/ Re-establish flow of the Dhaleswari offtake by diverting 245 m <sup>3</sup> /s from the Jamuna River into the Dhaleswari/Pungli/Bangshi/Turag/Buriganga river system, to improve water quality (e.g. DO levels up to 4 mg/l, from present 1 mg/l) and support fisheries and aquatic life, improve groundwater recharging, navigation, and so on.							
Regulator with fish pass	Other sites (15-17)	Maintaining connectivity between the river and the (former) floodplain	--	Proper location	+3	Long term	Tk. 800/ regulator, of which est. 35% for fish pass (total 9)	BWDB
Construction of off-take structure to	Mouth of Old Dhaleswari river	Improved connectivity between river	--	Use of off-take structure	+6	Medium to Long term	TBC	BWDB

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
divert 245 m3/s from Jamuna to Dhaleswari		and floodplain, improved water quality, fisheries, navigation & groundwater recharging						

#### 11.2.4 Land Resources

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
Land type change	Entire project area	Minimize riverbank erosion, drainage congestion/water logging, flooding, siltation etc to x ha of agricultural land	+2	Formation of community organizations, strengthening through imparting training need to be done. Involvement of community organizations in project activities (maintenance of embankment, functioning of regulators, etc) would improve the project situation. Crop rotation with leguminous crops, application of more organic materials, organic manure, and green manuring and soil management should be	+4	Long term	See section 10.1.2	Implementation : specialist NGOs Monitoring: PMO / DDM / DAE



IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
				<p>practiced to improve soil fertility in the project area.</p> <p>Crop diversification with multi-crops might improve environmental condition of the soil.</p>				
Sand carpeting	Entire study area	Sand carpeting minimized due to proposed interventions	+4	<p>Formation of community organizations, strengthening through imparting training need to be done.</p> <p>Involvement of community organizations in project activities (maintenance of embankment, functioning of regulators, etc) would improve the project situation.</p> <p>Land of sand carpeting area might bring under cultivation through removal of coarse sand from field, incorporation of organic manure in the land, practicing of green manure, crop diversification through leguminous crops etc.</p>	+6	Long term	Estimate is to be done as observed field condition	Implementation : specialist NGOs Monitoring: PMO / DDM / DAE

\* No impact (0); Positive impact (+); Negative impact (-)

Low impact (1-3); Medium impact (4-6); High impact (7-8); Very high impact (9-10)

### 11.2.5 Agricultural Resources

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
Crop production	Entire project area	Additional rice production due to improved productivity.	+3	Organic manure should be applied for the increase of soil fertility; Farmers group should have close contact with DAE for adaptation of various measures of IPM/ICM; Irrigation should be provided in optimum level with minimum conveyance loss; Involvement of Community organizations in project activities would enhance crop production.	+6	Long term	N/a	Implementation: specialist NGOs Monitoring: PMO / DDM / DAE
Improved irrigation facilities	Entire project area	Additional surface water irrigated area would be increased due to re-excavation of khals	+3	Farmers expand surface irrigation during rabi and boro season Community organizations get training in irrigation management	+4	Long term	Tbd	Implementation: Community organizations Monitoring: DAE
Agrochemicals	Entire project area	Increase in use of agrochemicals, due to improved livelihood security.	-2	Awareness raising about judicious use of pesticides, fertilisers and agrochemicals in general.	0	Medium to Long-term	TDB	Implementation: community organizations & agricultural extension officers

\* No impact (0); Positive impact (+); Negative impact (-)

Low impact (1-3); Medium impact (4-6); High impact (7-8); Very high impact (9-10)

### 11.2.6 Fisheries Resources

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
Fish habitat	Whole project area	Estimated net loss of 6,700 ha of fish habitat due to land reclamation + habitat altered due to the revetment 1,300 ha	-7	1. Proper protective device will have to take to protect the deep pools (dor/duars). Use of surface water during the breeding period should be stopped. Culture fisheries should be developed Perennial beels should be developed under sanctuary program Some flood water from the river should be allowed during normal or low floods (through sluice gates)	-4	Long term	Tbd	Implementation : specialist NGOs, community organizations Monitoring: PMO in coordination with Department of Fisheries
Fish migration	Along riverbanks and connection to floodplain	Obstructed fish migration	-5	Fish friendly operation of regulator cum fish pass gates	-3	Long term	N/a	Implementation : Trained Sluice gate/Fish Pass operation Committee , Monitoring: Department of Fisheries (DoF)
Fish biodiversity & production enhancement	Whole project area	Capture fish species diversity would be moderate to low.	-7	1. River fish sanctuary by installing 100 buoys along 100 km of Project-2 area (1 km	+3	Long term	1040	Implementation : specialist NGOs,

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
		Fish production loss est. at 1,400 ton (loss due to revetment and fish migration impediment ignored)		<p>apart, 300 m from left bank) for navigation guidance and preventing indiscriminate fishing.</p> <p>2. Proper protective device at 9 regulators.</p> <p>3. Establishment of 12 perennial beels as Fish Sanctuaries @ \$ 13,000/sanctuary, one per upazila</p> <p>4. Re-excavation of khals: 12 x 5 = 60 km @ 2/m3: \$ 42,000/km</p> <p>5. Beel nurseries in 12 fish sanctuaries</p> <p>6. Beel restocking</p> <p>7. Regulators with fish passes.</p> <p>8. Training to increase the aquaculture practices of high-valued fish species.</p>			<p>93.60</p> <p>124.80</p> <p>2000.00</p> <p>\$ 12.00</p> <p>12.00</p> <p>300.00</p>	community organizations Monitoring: PMO / DoF
Sub-Total including regulators with fish passes							6102.00	

\* No impact (0); Positive impact (+); Negative impact (-)

Low impact (1-3); Medium impact (4-6); High impact (7-8); Very high impact (9-10)

### 11.2.7 Ecological Resources

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
Ecosystem composition and diversity	Whole project area	Protection of homestead, roadside and social forest habitat. Vegetation coverage of the project area will improve. Faunal composition and diversity would be deteriorated.	+3	Do not dump large volume of excavated soil on bottom of the present trees. Observation of national and international days. Awareness development activities should be conducted by the committee or nature club to protect the saplings.	+5	Long term	3.00	Implementation : specialist NGOs, community organizations Monitoring: PMO / Department of Forestry
Protected areas	Whole project area	Reduced habitat suitable for endangered and threatened wildlife species and plants	-5	Establish one or more wildlife sanctuaries focusing on dolphins and migratory birds in consultation with key conservation organizations such as DoE, IUCN, WWF and Bangladesh Bird Club	-3	Long term	5.00	Implementation : specialist NGOs, community organizations Monitoring: PMO / Department of Forestry

\* No impact (0); Positive impact (+); Negative impact (-)

Low impact (1-3); Medium impact (4-6); High impact (7-8); Very high impact (9-10)

### 11.2.8 Socio-Economic Resources

IESC	Location	Impacts	Mag. of impact*	Mitigation / Enhancement / Compensation / Contingency	Magn. with EMP*	Type of Impact	EMP cost (Lakh Tk)	Responsible Agency
Communication	Whole project area	Road transport will improve if embankments will be provided with crest pavements	+3	N/a	N/a	Long term	Project Cost	BWDB
Employment	Whole project area	Job opportunities are expected to increase, e.g. in farming and fish culture	+2	Ensure/arrange training from DAE and DoF for local labourers	N/a	Long term		Implementation : Tbd Monitoring: PMO
Income generation	Whole project area	Income is expected to increase for all levels of society	+4	Implement livelihood program for vulnerable groups directly affected by the project interventions	N/a	Long term		Implementation : Tbd Monitoring: PMO

\* No impact (0); Positive impact (+); Negative impact (-)      Low impact (1-3); Medium impact (4-6); High impact (7-8); Very high impact (9-10)

### 11.3 Monitoring Plan

#### 11.3.1 Monitoring during the Construction Phase

378. A preliminary standard checklist for monitoring of EMP compliance is provided below. Alternatively, use can be made of the EMP compliance monitoring formats that were developed and used by ISPMC during implementation of the Tranche-1 works as from November 2015.

Book No. \_\_\_\_\_

Monitoring Report No. \_\_\_\_\_

Date: \_\_\_\_\_

Time: \_\_\_\_\_

Contract: \_\_\_\_\_

Contractor: \_\_\_\_\_

Work Sites (s): \_\_\_\_\_

A	DAILY CHECKLIST EHS	Yes	No	Score Yes=+5 No=-5	A	DAILY CHECKLIST EHS	Yes	No	Score Yes=+5 No=-5
1	Correct Disposal of Construction Solid Waste				15	Dispensary working, Doctor present			
2	Correct Disposal of Liquid Waste				16	Ambulance Functional			
3	Vehicles and dredger With No Smoke or Noise				17	No Loss to Flora or Fauna (Specially Tree)			
4	Vehicles Within Speed Limit				18	Re-excavation work			
5	No Pollution from construction site				19	Placement of dredging spoil			
6	No Oil/Diesel Spills on Land or Water				20	Top-soil protection system from embankment area			
7	No Social Issue Created				21	Placement of Top Soil			
8	Any Threat Caused to Riverine area				22	Plantation system			
9	Water Sprinkled on embankment				23	Presence of Child Labour			
10	No embankment and riverbank soil erosion				24	Labour camp location & management in order			
11	Safety dress, helmet and field boots used				25	Drinking water and sanitation facilities for labour			
12	Health precautions taken				26	No Burning of wood in camp			
13	Placement of C.C blocks				27	Women wage			
14	Turfing materials				28	Water quality			



<b>B. EXPLANATION (of any of above points)</b>	<b>Total Scores = _____%</b>

C. NON COMPLIANCE:

<b>Non Compliance # Period Description</b>	<b>Class</b>
	1. Minor: Under One Month (Contractor alerted)
	2. Moderate: Over One Month but under Two Months (Contractor warned)
	3. Major: About Two Months (Contractor's local bill withheld by RE* till compliance)
	4. Critical: Over Three Months (Contractor's overall bill withheld by RE and PM* till compliance)

D. CIRCULATION

- 1) DG, DOE, 2) DG, BWDB, 4) EE, Local BWDB Office

Field EHS* Monitor of Consultant (Full Name & Signature) *EHS- Environment Health & Safety *RE – Resident Engineer *ES – Environmental Supervisor of Consultants.	Field EHS Expert of Contractor (Full Name & Signature)
---	---

**11.3.2 Monitoring during the Post-Construction Phase**

379. A monitoring plan has been prepared to be carried out during the post-construction phase of the project. The monitoring plan has been prepared considering environmental indicators related to the project interventions. The methods of carrying out the monitoring plan as well as the desired schedule of monitoring have also been recommended.

**Water Resources**

Indicator	Method	Location	Frequency	Monitoring Cost (Lakh Tk per year)*	Responsible Agency
Physical condition (crest level, crest width and slope) of the new and rehabilitated embankments	To check whether any breaching or physical failures have occurred in the new and rehabilitated embankments	At places along the embankments	Twice in a year (pre-and post-monsoon)	Tbd	BWDB
Technical performance of the drainage sluices	To examine the functionality of drainage sluices	At the locations of sluices (in every sub reach)	Once in a year (post monsoon)	Tbd	BWDB
Physical condition of the riverbank protection	To check if the CC blocks and Geo-bags are in place	Locations where bank protection works have	Twice in a year (pre-and post-monsoon)	Tbd	BWDB

works		been carried out (Benotia, Chauhali, Zaffarganj)			
River planform	Checking the diversion phenomenon, conveyance characteristics and plan forms of a number of rivers	Karatoya offtake (JRB-1)	Once in a year (post monsoon)	Tbd	BWDB
Water quality	Visual observation and portable online kits	Surface waters in river and disconnected beels	Bi-annual	Tbd	DoE, DoF, else
Sub-total				Tbd	

### Fisheries Resources

Indicator	Method	Location	Frequency	Monitoring Cost (Lakh Tk/Yr)*	Responsible Agency
Fish habitat status	Habitat observation	Selected locations in the whole project area	Two times per year, and continue for 2 years after project completion	2	DoF/Consultant Team
Fish migration	Catch monitoring, RRA and FGD Ichthyoplankton sampling	Selected locations in the whole project area. At regulator/Fish Pass point	Two month e.g. May-Oct per year. (2 years beyond the project period)	2	DoF/Consultant Team
Fish species and fish production	Catch monitoring and Fish Market Survey	Entire study area	Once per month in each location for 2 year after completion of proposed activities.	2	DoF/Consultant Team
Aquaculture	Interviewing fish farmers and Fish Market Survey	Selected ponds and flood land culture system	One time per month (Will continue 2 year)	2	DoF//Consultant Team
Public awareness	Participate in national and international days, e.g. Fish Week, Environment Day, Wetland Day etc.	In the study area	Selected schedule (Will continue 2 year)	2	Consultant Team /DoF, Community based FMOs, CBOs and other nature clubs.
<b>Sub-total</b>				<b>10</b>	

## Ecological Resources

Indicator	Method	Location	Frequency	Cost (Lakh Tk.)	Responsible Agency
Survival rate of planted saplings	Observation and counting	Selected locations in the project area	1 year after plantation, but every day by the recruited guard	Tbd	BWDB in coordination with local group
<b>Sub-total</b>				<b>Tbd</b>	

## Socio-economic Resources

Indicator	Method	Location	Frequency	Monitoring Cost (Lakh Tk)*	Responsible Agency
Land tenure and land use				Tbd	
Roadway communication	RRA	Selected locations in the project area	Once	Tbd	BWDB/consultant and contractor
Income generation					
Protection of municipal area including markets and homesteads					
<b>Sub-total</b>				<b>Tbd</b>	

## 12 CONCLUSIONS AND RECOMMENDATIONS

### 12.1 Conclusions

380. The program has inbuilt mechanisms to reduce environmental impacts, and many mitigation measures have been mainstreamed into program planning and engineering designs. The flexibility of a phased MFF approach supports minimization and mitigation of potential negative impacts in a gradual manner. Works implemented in Tranche-1 with protection of critically eroding riverbanks along the Lower Jamuna and Padma rivers and were completed by the 2019 flood season while embankment construction is ongoing.

381. Extensive feasibility studies are currently being finalized for the Project-2 works, of which the present EIA is a part. These cover future impacts of river stabilization and associated embankment works. During Project-2, first measures for larger scale river stabilization are planned, with the design based on the Tranche-1 study outcomes and supported by environmental monitoring and mitigation measures.

382. With respect to flood mitigation and river stabilization, the program considers the following detailed approach: the program aims to reduce flood risks at two priority sub-projects (JRB-1, JLB-2) along the Lower Jamuna and Padma Rivers by providing new/rehabilitated embankments in all tranches.

383. The program intends to mitigate negative impacts at the planning and design level, and through additional compensation measures. Planning and design account for:

- (i) leaving key distributaries open to limited flood flows to support the continued deposition of fertile sediments as well as flood season navigation;
- (ii) designing the offtakes of the distributaries as part of the river stabilization work, in order to improve dry season flows;
- (iii) providing embankments with sluice gates specifically for local drainage<sup>3</sup>, and
- (iv) designing embankments in accordance to international practice to reduce the risk of failure, while mitigation measures address:
  - (v) loss in floodplain biodiversity, and
  - (vi) open water fisheries.

384. At community-level, flood risk management training will be provided to the flood affected population to raise the awareness to the residual risk after strengthening the existing flood embankment lines.

385. To protect the flood embankments, riverbanks will be progressively stabilized through riverbank protection, starting in Tranche-1 at critically eroding reaches on an emergency basis. Over time, this approach may lead to general river stabilization. To avoid transforming the geomorphology of the Padma/Jamuna in an unprecedented manner, for example if a single-channel solution is implemented, as studied in the Capital Dredging and Sustainable River Management Project, the following approach has been adopted:

- (i) a multi-disciplinary river stabilization study<sup>4</sup> covering the whole Brahmaputra system from the Indian border is being conducted, supported by
- (ii) piloting stabilization measures, focusing on bio-engineering techniques or “building with nature”;

---

<sup>3</sup> As it is not possible to locate sluice gates, cost have been reflected in the embankment kilometer cost.

<sup>4</sup> encompassing potential future river morphologies including the system response to man-made impacts on global (e.g. climate change), basin (e.g. sediment wave) and local (e.g. stabilization) scale, plus socio-economic and environmental impacts of potential stabilization scenarios on floodplain and char habitats and biodiversity.

- (iii) siting of physical works will be planned using an innovative dynamic methodology that responds to evolving river behaviour. Mitigation of potentially negative impacts of the planned river stabilization will be based on
- (iv) a river sanctuary study covering river- and floodplain land and planned start during 2017 potentially followed by implementation of one or more sanctuaries in a suitable river reach.

## 12.2 Recommendations

386. Mitigation of embankment and revetment operation-phase impacts described in Chapter 8 – on aquatic habitats and their biodiversity including fisheries, and on people who depend on them, will be implemented in three work packages:

- (i) Aquaculture expansion (from Project-2). Compensation measures rely on aquaculture or culture-based methods to increase fish production and thereby compensate for lost tonnage of fish due to flood control. In contrast, mitigation measures are designed to reduce or avoid losses during capturing fisheries (see 8.3.7).
- (ii) Wetland biodiversity mitigation and rehabilitation (from Project-2). This will occur via the improved off-takes and flow of the distributaries, desilting of beels, and the installation of regulators and fish passes (2 at Shahjadpur, 6 at Harirampur-Dohar; in addition, 1 regulator without fish pass at H-D). The proposed fish and bird sanctuaries (see below) all contribute to mitigation of wetland biodiversity loss.
- (iii) Sanctuaries (studied under Project-2, implemented during the subsequent River Stabilization Plan). Details on the nine (9) proposed bird sanctuaries and the 52 proposed fish sanctuaries are included in Appendices C (bird) and D (fish). Note that these sanctuaries also contribute to maintaining wetland biodiversity.

387. The anticipated environmental impacts of Tranche-1 have proved to be acceptable under the circumstances, and those of Project-2 are expected to be of a similar nature and extent, provided the mitigation measures set forth in the EMP under Chapter 11 are implemented.

388. Finalization of the Tranche-1 major construction works (in 2020) can proceed without further environmental study, other than completion of the SESA and continued environmental management and monitoring.

## APPENDIX A - SPECIES TABLES

*Table A1-1: Terrestrial Flora*

<b>Terrestrial Flora</b>				
<b>Scientific name</b>	<b>Local name</b>	<b>Habit</b>	<b>Importance</b>	<b>Status</b>
<i>Acacia nilotica</i>	Babla	Tree	Ornamental	Common
<i>Aegle marmelos</i>	Bel	Tree	Medicinal fruits	Common
<i>Adhatoda zeylanica</i>	Bashak	Shrub	Medicinal	Rare
<i>Aeschynomene aspera</i>	Shola	Shrub	Fuel	Rare
<i>Albizzia odoratissima</i>	Shrish	Tree	Timber	Common
<i>Albizzia richardiana</i>	Gagon serish	Tree	Firewood, timber, Avenue	Common
<i>Abroma augusta</i>	Ulatkambal	Shrub	Medicinal	Rare
<i>Acacia moniliformis</i>	Akashmoni	Tree	Note known	Common
<i>Acalypha indica</i>	Muktajhuri	Shrub	Medicinal	Common
<i>Achyranthes aspera</i>	Apang	Herb	Medicinal	Common
<i>Adenantha sp.</i>	Rakton	Tree	Firewood	Rare
<i>Alstonia macrophylla</i>	Chatim	Tree	Ornamental	Common
<i>Alstonia scholaris</i>	Shatim/Shatian	Tree	Timber	Rare
<i>Amaranthus spinosa</i>	Katanatea	Herb	Medicinal	Common
<i>Anthocephalus chinensis</i>	Kadam	Tree	Timber and fuelwood	Common
<i>Aphanamixis polystachya</i>	Pitraj	Tree	Timber	Rare
<i>Areca catechu</i>	Supari	Tree	Fruit and Timber	VC
<i>Artocarpus heterophyllus</i>	Kanthal	Tree	Timber, Fruits	Common
<i>Artocarpus lakoocha</i>	Deoa	Tree	Fruits	Rare
<i>Averrhoa carambola</i>	Kamranga	Tree	Fruits	Common
<i>Azadirachta indica</i>	Nim	Tree	Timber and medicine	Common
<i>Bambusa sp.</i>	Bash	Woody Herb	Furniture	Common
<i>Barringtonia acutangula</i>	Hijal	Shrub	Fuelwood	Common
<i>Bauhinia sp.</i>	Kanson	Tree	Ornamental	Rare
<i>Bombax ceiba</i>	Shimul	Tree	Cotton and Fuelwood	Common
<i>Borassus flabellifer</i>	Tal	Tree	Timber	Common
<i>Calamus tenuis</i>	Bet	Shrub	Thatching	Common
<i>Calophyllum inophyllum</i>	Sultan Chapa/Punnag	Tree	Ornamental	Rare
<i>Calotropis gigantea</i>	Akand	Shrub	Medicinal	Common
<i>Calotropis procera</i>	Akand	Shrub	Medicinal	Common
<i>Carica papaya</i>	Papay	Shrub	Fruit	Common
<i>Carissa carandas</i>	Karamcha	Shrub	Fruit	Common
<i>Cassia fistula</i>	Sonalu	Tree	Ornamental	Common
<i>Cassia alata</i>	Dardmardon	Shrub	Medicinal	Common
<i>Cassia occidentalis</i>	Barahalkasunda	Shrub	Fuelwood	Common
<i>Centella asiatica</i>	Thankuni	Herb	Medicinal and Vegetables	Common

<b>Terrestrial Flora</b>				
<b>Scientific name</b>	<b>Local name</b>	<b>Habit</b>	<b>Importance</b>	<b>Status</b>
<i>Cestrum nocturnum</i>	Hasnahena	Shrub	Ornamental	Rare
<i>Citrus grandis</i>	Jambura	Tree	Fruits	Common
<i>Clerodendrum viscosum</i>	Bhat	Shrub	Medicinal	Common
<i>Cocos nucifera</i>	Narikel	Tree	Fruit and Fuelwood	V.Common
<i>Crataeva nurvala</i>	Baroon	Tree	Fuel wood	Common
<i>Cuscuta australis</i>	Swarnalata	Herb	Medicinal	Common
<i>Cynodon dactylon</i>	Durba Gash	Herb	Medicinal	Common
<i>Dalbergia sissoo</i>	Sissoo	Tree	Timber	Common
<i>Datura metel</i>	Dhutura	Shrub	Medicinal	Rare
<i>Delonix regia</i>	Krichnochura	Tree	Ornamental	Common
<i>Dillenia indica</i>	Chalta	Tree	Fruit	Common
<i>Diospyros discolor</i>	Bilatigab	Tree	Fruit	Common
<i>Diospyros perigrina</i>	Deshigab	Tree	Fruit and Timber	Rare
<i>Eichhornia crassipes</i>	Kachuripana	Herb	Fertilizer	Common
<i>Enhydra fluctuans</i>	Halencha	Herb	Vegetable	Common
<i>Erythrina ovalifolia</i>	Talimandar	Tree	Fuelwood	Common
<i>Erythrina variegata</i>	Mander	Tree	Firewood, Ornamental	Common
<i>Excoecaria agallocha</i>	Gheoa	Tree	Fuel wood	Common
<i>Ficus hispida</i>	Dumur	Tree	Fuel wood	Common
<i>Ficus benghalensis</i>	Bot	Tree	Fuel wood	Common
<i>Ficus hispida</i>	Dumur	Shrub	Fruit and Fuelwood	VC
<i>Ficus religiosa</i>	Assawath	Tree	Fuel wood	Common
<i>Gardenia jasminoides</i>	Ghandhoraj	Shrub	Flower	Common
<i>Heliotropium indicum</i>	Hatisuri	Herb	Medicinal	Common
<i>Hoya parasitica</i>	Parghaca	Climber	Medicinal	Common
<i>Ipomea fistulosa</i>	Dhol Kalmi	Shrub	Fuel	Common
<i>Leucaena leucocephala</i>	Ipil ipil	Tree	Timber	Common
<i>Litchi chinensis</i>	Lichu	Tree	Fruit	Common
<i>Mangifera indica</i>	Aum	Tree	Fruit and Timber	Common
<i>Marsilea quadrifolia</i>	Susnishak	Herb	Medicinal	Common
<i>Mimosa pudica</i>	Lajjaboti	Shrub	Medicinal	Common
<i>Moringa oleifera</i>	Sajna	Tree	Vegetable	Common
<i>Muntingia calabura</i>	Chinese chari	Tree	Ornamental	Very Rare
<i>Musa paradisiaca</i> var. <i>sapientum</i>	Kala	Shrub	Fruit	Common
<i>Nerium odorum</i>	Karobi	Shrub	Medicinal	Common
<i>Nicotiana plumbaginifolia</i>	Bantamak	Herb	Wild	Common
<i>Nyctanthes arbortristis</i>	Safali	Herb	Ornamental	Common
<i>Nymphaea nouchli</i>	Sapla	Herb	Medicinal, Vegetable	Common

<b>Terrestrial Flora</b>				
<b>Scientific name</b>	<b>Local name</b>	<b>Habit</b>	<b>Importance</b>	<b>Status</b>
<i>Ocimum americanum</i>	Tulshi	Herb	Medicine	Common
<i>Oryza sativa</i>	Dhan	Herb	Food	Common
<i>Phoenix paludosa</i>	Hental	Tree	Wildlife	Common
<i>Phoenix sylvestris</i>	Khejur	Tree	Fruit and Fuel wood	Common
<i>Pistia stratiotes</i>	Topapana	Herb	-	Common
<i>Pithecolobium dulce</i>	Dakshnia Babul	Tree	Ornamental, Avunue	Common
<i>Polyalthia longifolia</i>	Debdaru	Tree	Ornamental	Common
<i>Psidium guajava</i>	Peyara	Shrub	Fruit	Common
<i>Rauwolfia serpentina</i>	Sarpagandha	Shrub	Medicinal	Rare
<i>Ricinus communis</i>	Reri	Shrub	Oil	Common
<i>Sesbania grandiflora</i>	Bakphul	Shrub	Medicinal	Rare
<i>Sesbania rostrata</i>	Dhaincha	Herb	Fuel / Fertilizer	Common
<i>Spondias dulcis</i>	Amra	Tree	Fruit	Common
<i>Streblus asper</i>	Sheora	Shrub	Fuel wood	Common
<i>Swietenia mahagoni</i>	Mahogoni	Tree	Timber, Medicinal	VC
<i>Tamarindus indica</i>	Tetul	Tree	Fruit	Common
<i>Tectona grandis</i>	Segun	Tree	Timber	Common
<i>Terminalia arjuna</i>	Arjun	Tree	Timber and Medicinal	Common
<i>Terminalia bellirica</i>	Bhorae	Tree	Medicinal	Rare
<i>Terminalia catappa</i>	Katbadam	Tree	Fruit	Common
<i>Trewia nudiflora</i>	Pitali/Latim	Tree	Timber and fuel wood	Common
<i>Typha angustifolia</i>	Hogla	Herb	Domestic use	Common
<i>Zizyphus mauritiana</i>	Baroi	Tree	Fruit	Common

**Table A1-2: Cropfield Vegetation**

<b>Cropfield Vegetation</b>				
<b>Scientific name</b>	<b>Local name</b>	<b>Habit</b>	<b>Importance</b>	<b>Status</b>
<i>Acalypha indica</i>	Muktajhuri	Herb	Medicinal	C
<i>Achyranthes aspera</i>	Apang	Herb	Medicinal	C
<i>Alternanthera sessilis</i>	Sachishak	Herb	Vegetable	VC
<i>Amaranthus spinosus</i>	Kata note	Herb	Vegetable	VC
<i>Calotropis gigantea</i>	Akand	Shrub	Medicinal	C
<i>Calotropis procera</i>	Akand	Shrub	Medicinal	C
<i>Carissa carandas</i>	Karamcha	Shrub	Fruits	R
<i>Cotula hemispherica</i>	Kancha ghash	Herb	Domestic food	C
<i>Crotalaria retusa</i>	Ban-san	Herb	Medicinal	VC
<i>Cuscuta australis</i>	Swarnalata	Herb	Medicinal	C
<i>Cynodon dactylon</i>	Durba	Herb	Medicinal	VC
<i>Dentella repens</i>	Hachuti	Herb	Medicinal	C



<i>Marsilea quadrifolia</i>	Susnishak	Herb	Vegetable	C
<i>Nicotiana plumbaginifolia</i>	Bantamak	Herb	Wild	C
<i>Nyctanthes arbortristis</i>	Sefali	Herb	Ornamental	C
<i>Rhynchospora rufescens</i>	Shimbhatraji	Herb	Medicinal	VC
<i>Rorippa indica</i>	Bansarisha	Herb	Medicinal	C
<i>Sesbania rostrata</i>	Dhaincha	Herb	Fuel/Fertilizer	VC

C – Common, VC – Very Common, R – Rare

**Table A1-3: Wetland Vegetation**

Wetland Vegetation				
Scientific name	Local name	Habit	Importance	Status
<i>Alternanthera philoxiroides</i>	Helencha	Herb	Medicinal	VC
<i>Aponogeton natans</i>	Ghentu	Herb	Medicinal	C
<i>Azolla pinnata</i>	Kutipana	Herb	Fish food	C
<i>Ceratophyllum demersum</i>	Jhangi	Herb	-	C
<i>Colocasia esculenta</i>	Kachu	Herb	Medicinal	C
<i>Cyperus sp.</i>	Mutha	Herb	Domestic food	VC
<i>Cheratopteris sp</i>	Fern	Herb	-	C
<i>Eichhornia crassipes</i>	Kochuripana	Herb	Fertilizer	VC
<i>Enhydra fluctuans</i>	Helencha	Herb	Vegetable	VC
<i>Ipomoea aquatica</i>	Kalmi sak	Herb	Vegetable	VC
<i>Lemna perpusilla</i>	Khudipana	Herb	-	C
<i>Limnophila sessiliflora</i>	Bijatighas	Herb	Domestic food	C
<i>Ludwigia abscondens</i>	Keshordam	Herb	Medicinal	C
<i>Ludwigia hyssopifolia</i>	Keshordam	Herb	Medicinal	VC
<i>Marsilea quadrifoliata</i>	Susnisak	Herb	Vegetable	VC
<i>Nachamendra alternifolia</i>	Kaisha	Herb	Domestic food	C
<i>Nymphaea nouchali</i>	Shapla	Herb	Vegetable	VC
<i>Nymphaea stellata</i>	Nilshapla	Herb	Vegetable	R
<i>Phragmites karka</i>	Nol Khagra	Herb	Fuel	VC
<i>Pistia stratiotes</i>	Topapana	Herb	-	VC
<i>Polygonum barbatum</i>	Bishkatali	Herb	Medicinal	C
<i>Salvina cucullata</i>	Kuripana	Herb	-	C
<i>Scirpus juncooides</i>	Chasra	Herb	Fuel	C
<i>Spirodela polyrhiza</i>	Khudipana	Herb	-	C
<i>Trapa natans</i>	Singra	Herb	Fruit	R
<i>Vetiveria zizanioides</i>	Binna	Herb	Domestic use	C
<i>Wolffia microscopica</i>	Guripana	Herb	-	C

C – Common, VC – Very Common, R – Rare

**Table A1-4: Birds**

<b>Birds</b>				
<b>Scientific name</b>	<b>English name</b>	<b>Local name</b>	<b>IUCN status</b>	<b>Local status</b>
<i>Artamus fuscus</i>	Ashy Woodswallow	Metey Bonbabil	LC	CR
<i>Eudynamys scolopaceus</i>	Asian Koel	Ashio Kalakokil	LC	CR
<i>Anastomus oscitans</i>	Asian Openbill	Ashio Shamkhol	LC	CR
<i>Terpsiphone paradisi</i>	Asian Paradise-flycatcher	Ashio Shabulbuli	LC	UR
<i>Acridoteres ginginianus</i>	Bank Myna	Gaang Shalik	LC	UR
<i>Anser indicus</i>	Bar-headed Goose	Dagi Rajhash	LC	UWV
<i>Tyto alba</i>	Barn Owl	Lokkhi Pecha	LC	UR
<i>Ploceus philippinus</i>	Baya Weaver	Deshi babui	LC	CR
<i>Dicrurus macrocercus</i>	Black Drongo	Kala Fingey	LC	CR
<i>Milvus migrans</i>	Black Kite	Bhubon Chil	LC	CR
<i>Ciconia nigra</i>	Black Stork	Kala Manikjor	VU	WV
<i>Sterna acuticauda</i>	Black-bellied Tern	Kalapet Panchil	CR	UR
<i>Nycticorax nycticorax</i>	Black-crowned Night Heron	Kalamatha Nishibok	LC	CR
<i>Lonchura malacca</i>	Black-headed Munia	Kalamatha Munia	LC	UR
<i>Oriolus xanthornus</i>	Black-hooded Oriole	Kalamatha Benebou	LC	CR
<i>Alcedo hercules</i>	Blyth's Kingfisher	Machranga	DD	RR
<i>Haliastur indus</i>	Brahminy Kite	Shonkho Chil	LC	CR
<i>Metopidius indicus</i>	Bronze-winged Jacana	Dol Pipi	LC	UR
<i>Ketupa zeylonensis</i>	Brown Fish Owl	Khoira Mechopecha	LC	UR
<i>Larus brunnicephalus</i>	Brown-headed Gull	Khoiramatha Gangchil	LC	CWV
<i>Lanius cristatus</i>	Brown Shrike	Khoira Latora	LC	CWV
<i>Bubulcus ibis</i>	Cattle Egret	Go Boga	LC	CR
<i>Ixobrychus cinnamomeus</i>	Cinnamon Bittern	Khoira Bogla	LC	UR
<i>Motacilla citreola</i>	Citrine Wagtail	Sitrin Khonjon	LC	CWV
<i>Acrocephalus stentoreus</i>	Clamorous Reed Warbler	Bachal Nolfutki	LC	CWV
<i>Sarkidiornis melanotos</i>	Comb Duck	Nakta Hash	NT	RWV
<i>Larus ridibundus</i>	Common Black-headed Gull	Kalamatha Gangchil	LC	CWV
<i>Dinopium javanense</i>	Common Goldenback	Pati Kaththokra	LC	CR
<i>Tringa nebularia</i>	Common Greenshank	Pati Shobujpa	LC	CWV
<i>Hierococcyx varius</i>	Common Hawk-Cuckoo	Pati Chokhgelo	LC	CR
<i>Aegithina tiphia</i>	Common Iora	Pati Fatikjal	LC	CR
<i>Alcedo atthis</i>	Common Kingfisher	Pati Machranga	LC	CR
<i>Acridotheres tristis</i>	Common Myna	Bhat Shalik	LC	CR
<i>Columba livia</i>	Common Pigeon	Gola Paira	LC	CR
<i>Atthya ferina</i>	Common Pochard	Pati Bhutihash	LC	CWV
<i>Tringa totanus</i>	Common Redshank	Pati Lalpa	LC	CWV
<i>Actitis hypoleucos</i>	Common Sandpiper	Pati Batan	LC	CWV
<i>Tadorna tadorna</i>	Common Shelduck	Pati Chokachoki	LC	CWV
<i>Gallinago gallinago</i>	Common Snipe	Pati Chega	LC	CWV
<i>Orthotomus sutorius</i>	Common Tailorbird	Pati Tuntuni	LC	CR
<i>Megalaima haemacephala</i>	Coppersmith Barbet	Shekra Boshonto	LC	CR

<b>Birds</b>				
<b>Scientific name</b>	<b>English name</b>	<b>Local name</b>	<b>IUCN status</b>	<b>Local status</b>
<i>Nettapus coromandelianus</i>	Cotton Pygmy Goose	Dhola Balihash	LC	UR
<i>Phylloscopus fuscatus</i>	Dusky Warbler	Kalchey Futki	LC	CWV
<i>Upupa epops</i>	Eurasian Hoopoe	Pati Hoodhood	LC	UR
<i>Platalea leucorodia</i>	Eurasian Spoonbill	Kodali Bok	CR	RR
<i>Saxicola torquatus</i>	Eurasian Stone Chat	Pati Shilafidda	LC	CWV
<i>Anas crecca</i>	Eurasian Teal	Pati Tilihash	LC	CWV
<i>Dendrocygna bicolor</i>	Fulvous Whistling Duck	Raj Shorali	LC	CWV
<i>Spatula querquedula</i>	Garganey	Giria Hash	LC	CWV
<i>Prinia gracilis</i>	Graceful Prinia	Shundori Prinia	LC	RR (DD)
<i>Larus brunnicephalus</i>	Great Black-headed Gull	Palasi Gangchil	LC	CWV
<i>Phalacrocorax carbo</i>	Great Cormorant	Boro Pankouri	LC	CWV
<i>Casmerodius albus</i>	Great Egret	Boro Boga	LC	CR
<i>Parus major</i>	Great Tit	Boro Tit	LC	CR
<i>Centropus sinensis</i>	Greater Coucal	Boro Kubo	LC	CR
<i>Chrysocolaptes lucidus</i>	Greater Goldenback	Boro Kaththokra	LC	CR
<i>Charadrius leschenaultii</i>	Greater Sand Plover	Boro Dhuljiria	LC	CWV
<i>Merops orientalis</i>	Green Bee-eater	Shobuj Shuichora	LC	CR
<i>Tringa ochropus</i>	Green Sandpiper	Shobuj Batan	LC	UWV
<i>Phaenocophaeus tristis</i>	Green-billed Malkoha	Shobujthot Malkoha	LC	CR
<i>Ardea cinerea</i>	Grey Heron	Dhupni Bok	LC	CR
<i>Charadrius squatarola</i>	Grey Plover	Metey Jiria	LC	CWV
<i>Motacilla cinerea</i>	Grey Wagtail	Metey Khonjon	LC	UWV
<i>Dendrocopos canicapillus</i>	Grey-capped Woodpecker	Pygmy Metetooi Batkurali	LC	UR
<i>Ichthyophaga ichthyaetus</i>	Grey-headed Fish Eagle	Metematha Kura-eegol	NT	UR
<i>Gelochelidon nilotica</i>	Gull-billed Tern	Kalathot Panchil	LC	CR
<i>Corvus splendens</i>	House Crow	Pati Kak	LC	CR
<i>Passer domesticus</i>	House Sparrow	Pati Chorui	LC	CR
<i>Phalacrocorax fuscicollis</i>	Indian Cormorant	Deshi Pankouri	LC	V
<i>Cuculus micropterus</i>	Indian Cuckoo	Bokotakou Kokil	LC	CR
<i>Ardeola grayii</i>	Indian Pond Heron	Deshi Kanibok	LC	CR
<i>Coracias benghalensis</i>	Indian Roller	Bangla Nilkanto	LC	CR
<i>Lonchura malabarica</i>	Indian Silverbill	Deshi Chandithot	LC	UR
<i>Rynchops albicollis</i>	Indian Skimmer	Panikata	CR	RR
<i>Anas poecilorhyncha</i>	Indian Spot-billed Duck	Metey Hash	LC	UR
<i>Turdoides striata</i>	Jungle Babbler	Bon Satarey	LC	CR
<i>Acridotheres fuscus</i>	Jungle Myna	Jhuti Shalik	LC	CR
<i>Corvus macrorhynchos</i>	Large-billed Crow	Dar Kak		CR
<i>Caprimulgus macrurus</i>	Large-tailed Nightjar	Lenja Ratchora	LC	CR
<i>Leptoptilos javanicus</i>	Lesser Adjutant	Modontak	VU	RR
<i>Centropus bengalensis</i>	Lesser Coucal	Bangla Kubo	LC	CR
<i>Dinopium benghalense</i>	Lesser Goldenback	Bangla Kaththokra	LC	CR
<i>Charadrius mongolus</i>	Lesser Sand Plover	Soto Dhuljiria	LC	CWV

<b>Birds</b>				
<b>Scientific name</b>	<b>English name</b>	<b>Local name</b>	<b>IUCN status</b>	<b>Local status</b>
<i>Dendrocygna javanica</i>	Lesser Whistling Duck	Pati Shorali	LC	CR
<i>Megalaima lineata</i>	Lineated Barbet	Dagi Boshonto	LC	CR
<i>Phalacrocorax niger</i>	Little Cormorant	Choto Pankouri	LC	CR
<i>Egretta garzetta</i>	Little Egret	Choto Boga	LC	CR
<i>Charadrius dubius</i>	Little Ringed Plover	Choto Nothjiria	LC	CR/CWV
<i>Arachnothera longirostra</i>	Little Spiderhunter	Choto Makormar	LC	CR
<i>Calidris minuta</i>	Little Stint	Choto Chapakhi	LC	CWV
<i>Buteo rufinus</i>	Long -Legged Buzzard	Lombapa Tishabaj	LC	RWV
<i>Lanius schach</i>	Long-tailed Shrike	Lenja Latora	LC	CR
<i>Tringa stagnatilis</i>	Marsh Sandpiper	Bil Batan	LC	UWV
<i>Heliopais personata</i>	Masked Finfoot	Giolo Hansh	EN	RR
<i>Anas acuta</i>	Northern Pintail	Utturey Lenjash	LC	CWV
<i>Anthus hodgsoni</i>	Olive-backed Pipit	Jolpaipith Tulika	LC	CWV
<i>Copsychus saularis</i>	Oriental Magpie-Robin	Udoi Doel	LC	CR
<i>Alauda gulgula</i>	Oriental Skylark	Udoi Ovrobhorot	LC	CR
<i>Zosterops palpebrosus</i>	Oriental White-eye	Udoi Dholachokh	LC	CR
<i>Pluvialis fulva</i>	Pacific Golden Plover	Proshanto Shonajiria	LC	CWV
<i>Anthus rufulus</i>	Paddyfield Pipit	Dhani Tulika	LC	CR
<i>Mycteria leucocephala</i>	Painted Stork	Rangila bok	CR	RR
<i>Alauda erythrorhynchos</i>	Pale-billed Flowerpecker	Metethot Fuljhuri	LC	CR
<i>Ceryle rudis</i>	Pied Kingfisher	Pakra Machranga	LC	CR
<i>Sturnus contra</i>	Pied Myna	Ashio Pakrashalik	LC	CR
<i>Gallinago stenura</i>	Pin-tailed Snipe	Lenja Chega	LC	CWV
<i>Prinia inornata</i>	Plain Prinia	Nirol Prina	LC	CR
<i>Nectarinia zeylonica</i>	Purple-rumped Sunbird	Begunikomor Moutushi	LC	CR
<i>Streptopelia tranquebarica</i>	Red Turtle Dove	Lal Konthighughu	LC	CR
<i>Pycnonotus cafer</i>	Red-vented Bulbul	Bangla Bulbul	LC	CR
<i>Vanellus indicus</i>	Red-wattled Lapwing	Hot Titi	LC	UR
<i>Anthus richardi</i>	Richard's Pipit	Richarder Tulika	LC	CWV
<i>Vanellus duvaucelii</i>	River Lapwing	Nodi Titi	NT	UR
<i>Sterna aurantia</i>	River Tern	Nodia Panchil	NT	UWV
<i>Psittacula krameri</i>	Rose-ringed Parakeet	Modna Tia	LC	CR
<i>Anthus roseatus</i>	Rosy Pipit	Golapi Tulika	LC	CWV
<i>Halcyon coromandra</i>	Ruddy Kingfisher	Lal Machranga	LC	RR
<i>Tadorna ferruginea</i>	Ruddy Shelduck	Khoira Chokachoki	LC	CWV
<i>Dendrocitta vagabunda</i>	Rufous Treepie	Khoira Harichacha	LC	CR
<i>Celeus brachyurus</i>	Rufous Woodpecker	Khoira Khathkurali	LC	CR
<i>Lonchura punctulata</i>	Scaly-breasted Munia	Butibook Munia	LC	CR
<i>Asio flammeus</i>	Short-eared-Owl	Chotokan Pecha	LC	RWV
<i>Pericrocotus cinnamomeus</i>	Small Minivet	Choto Saheli	LC	CR
<i>Glareola lactea</i>	Small Pratincole	Soto Babubatan	LC	
<i>Streptopelia chinensis</i>	Spotted Dove	Tila Ghughu	LC	CR
<i>Athene brama</i>	Spotted Owlet	Khuruley Kutipecha	LC	CR

<b>Birds</b>				
<b>Scientific name</b>	<b>English name</b>	<b>Local name</b>	<b>IUCN status</b>	<b>Local status</b>
<i>Pelargopsis capensis</i>	Stork-billed Kingfisher		LC	UR
<i>Ploceus manyar</i>	Streak Weaver	Dagi Babui	LC	RR(DD)
<i>Picus xanthopygaeus</i>	Streak-throated Woodpecker	Dagigola Kathkurali	LC	UR
<i>Turdoides earlei</i>	Striated Babbler	Dagi Satarey	LC	UR
<i>Megalurus palustris</i>	Striated Grassbird	Dagi Ghashpakhi	LC	CR
<i>Butorides striata</i>	Striated Heron	Khude Bok	LC	CR
<i>Gallicrex cinerea</i>	Watercock	Deshi Kora	LC	UR
<i>Motacilla flava</i>	Western Yellow Wagtail	Holdey Khonjon	LC	CWV
<i>Chlidonias hybrid</i>	Whiskered Tern	Julphi Panchil	LC	CR/WV
<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle	Sindhu Eagle	LC	RR
<i>Amauornis phoenicurus</i>	White-breasted Waterhen	Dholabook Dahuk	LC	UR
<i>Motacilla madaraspatensis</i>	White-browed Wagtail	Dholavru Khonjon	LC	UR
<i>Rhipidura albicollis</i>	White-throated Fantail	Dholagola Chatighurani	LC	CR
<i>Halcyon smyrnensis</i>	White-throated Kingfisher	Dholagola Machranga	LC	CR
<i>Motacilla alba</i>	White Wagtail	Dhola Khonjon	LC	CWV
<i>Tringa glareola</i>	Wood Sandpiper	Bon Batan	LC	CWV
<i>Egretta intermedia</i>	Yellow-billed Egret	Majhla Boga	LC	CR
<i>Treron phoenicopterus</i>	Yellow-footed Green Pigeon	Holdepa Horial	LC	CR
<i>Cisticola juncidis</i>	Zitting Cisticola	Bhomra Soton	LC	CR

IUCN Status (Red List 2015): CR – Critically Endangered, EN – Endangered, VU – Vulnerable, NO – Not Threatened; NT – Near Threatened; LC – Least Concern; DD – Data Deficient

Local Status (2013): CR – Common Resident; UR – Uncommon Resident; CWV – Common Winter Visitor; UWV – Uncommon Winter Visitor; RR – Rare Resident; DD – Data Deficient; WV – Winter Vagrant; RWV – Rare Winter Visitor

**Table A1-5: Mammals**

<b>Mammals</b>				
<b>English name</b>	<b>Local name</b>	<b>Scientific name</b>	<b>IUCN status</b>	<b>Local status</b>
Asian House Shrew	Chika/Chucho	<i>Suncus murinus</i>	LC	CR
Asian Palm Civet	Gandhagakul	<i>Paradoxurus hermaphroditus</i>	LC	CR
Asiatic Brush-tailed Porcupine	Shajaru	<i>Atherurus macrourus</i>	DD	RR
Asiatic Longtailed Climbing Mouse	Gecho Indur	<i>Vandeleuria oleracea</i>	LC	CR
Bengal Fox	Khek Shial/Shial	<i>Vulpes bengalensis</i>	VU	CR
Common Tree Shrew	Gecho Chucho	<i>Tupaia glis</i>	NT	RR
Eastern House Mouse	Nenti indur	<i>Mus musculus</i>	NO	CR
Eurasian Otter	Ud Biral	<i>Lutta lutra</i>	CR	UR
Eurasian Wild Boar	Buno Shukar	<i>Sus scrofa</i>	LC	CR
Finless Porpoise	Shishu	<i>Neophocaena phocaenoides</i>	NT	UR
Fishing Cat	Mecho Biral/Baghailla	<i>Prionailurus viverrinus</i>	EN	UR
Ganges River Dolphin	Shishu / Shushuk	<i>Platanista gangetica</i>	VU	CR

<b>Mammals</b>				
<b>English name</b>	<b>Local name</b>	<b>Scientific name</b>	<b>IUCN status</b>	<b>Local status</b>
<i>Golden Jackal</i>	<i>Shihal</i>	<i>Canis aureus</i>	LC	CR
<i>Greater Bandicoot Rat</i>	<i>Dhari indur</i>	<i>Bandicota indica</i>	LC	CR
<i>Greater False Vampire Bat</i>	<i>Badur</i>	<i>Megaderma lyra</i>	LC	CR
<i>Greater Short-nosed Fruit Bat</i>	<i>Kola badur</i>	<i>Cynopterus sphinx</i>	LC	CR
<i>House Rat</i>	<i>Indur</i>	<i>Rattus rattus</i>	LC	CR
<i>Indian Crested Porcupine</i>	<i>Shojaru</i>	<i>Hystrix indica</i>	LC	UR
<i>Indian Flying Fox</i>	<i>Baro Badur</i>	<i>Pteropus giganteus</i>	LC	CR
<i>Indian Hare</i>	<i>Khargosh</i>	<i>Lepus nigricolis</i>	EN	UR
<i>Indian Pipistrelle</i>	<i>Chamchika/ Cham Badur</i>	<i>Pipistrellus coromandra</i>	LC	CR
<i>Irrawaddy Dolphin</i>	<i>Mohonar Shushuk</i>	<i>Orcaella brevirostris</i>	NT	CR
<i>Jungle Cat</i>	<i>Ban Biral</i>	<i>Felis chaus</i>	NT	RR
<i>Large Indian Civet</i>	<i>Baro Baghdash</i>	<i>Viverra zibetha</i>	NT	CR
<i>Lesser Bandicoot Rat</i>	<i>Baro indur</i>	<i>Bandicota bengalensis</i>	LC	CR
<i>Little Indian Field Mouse</i>	<i>Metho indur</i>	<i>Mus booduga</i>	LC	CR
<i>Northern Palm Squirrel</i>	<i>Khatbirali</i>	<i>Funambulus pennantii</i>	LC	CR
<i>Oriental Small-clawed Otter</i>	<i>Bhodor/ Ud Biral</i>	<i>Amblonyx cinereus</i>	EN	CR
<i>Rofous-tailed Hair</i>	<i>Khorgosh</i>	<i>Lepus nigricolis</i>	EN	RR
<i>Small Indian Civet</i>	<i>Choto Bagdash</i>	<i>Viverricula indica</i>	NT	CR
<i>Small Indian Mongoose</i>	<i>Benji, Nakul</i>	<i>Herpestes auropunctatus</i>	LC	CR
<i>Smooth-coated Otter</i>	<i>Ud Biral</i>	<i>Lutrogale perspicillata</i>	CR	RR

IUCN Status (Red List 2015): CR – Critically Endangered, EN – Endangered, VU – Vulnerable, NO – Not Threatened; NT – Near Threatened; LC – Least Concern; DD – Data Deficient

Local Status (2013): CR – Common Resident, C – Common UR – Uncommon Resident, RR – Rare Resident, V – Vagrant, WV – Winter Visitor; UWV – Uncommon Winter Visitor.

**Table A1-6: Amphibians**

<b>Amphibians</b>				
<b>English name</b>	<b>Local name</b>	<b>Scientific name</b>	<b>IUCN status</b>	<b>Local status</b>
<i>Asian Brown Tree Frog</i>	<i>Gecho Bang</i>	<i>Polypedates leucomystax</i>	LC	CR
<i>Balloon Frog</i>	<i>Photka Bang</i>	<i>Uperodon globulosis</i>	VU	CR
<i>Cricket Frog</i>	<i>Jhijhi Bang</i>	<i>Limnonectes limnoccharis</i>	LC	CR
<i>Green Frog</i>	<i>Sabuj Bang</i>	<i>Euphyctis hexadactylus</i>	LC	UR
<i>Indian Bull Frog</i>	<i>Sona Bang</i>	<i>Hoplobatrachus tigerinus</i>	LC	CR
<i>Indian Common Toad</i>	<i>Kuno Bang</i>	<i>Duttaphrynus meanostictus</i>	LC	CR
<i>Indian Tree Frog</i>	<i>Gecho Bang</i>	<i>Polypedates maculatus</i>	LC	UR
<i>Large Tree Frog</i>	<i>Baro Gecho Bang</i>	<i>Rhacophorus maximus</i>	VU	UR
<i>Leaping Frog</i>	<i>Pana bang</i>	<i>Hylarana tytleri</i>	LC	UR
<i>Ornate Microhylid</i>	<i>Cheena Bang</i>	<i>Microhyla ornate</i>	LC	CR
<i>Southern Cricket Frog</i>	<i>Jhijhi Bang</i>	<i>Fejervarya syhadrensis</i>	LC	CR
<i>Two-striped Grass Frog</i>	<i>Kaad Bang</i>	<i>Hylarana taipehensis</i>	DD	RR

IUCN Status (Red List 2015): CR – Critically Endangered, EN – Endangered, VU – Vulnerable, NO – Not Threatened; NT – Near Threatened; LC – Least Concern; DD – Data Deficient

Local Status (2013): CR – Common Resident, C – Common, UR – Uncommon Resident, RR – Rare Resident, V – Vagrant, WV – Winter Visitor; UWV – Uncommon Winter Visitor.

**Table A1-7: Reptiles**

<b>Reptiles</b>				
<b>English name</b>	<b>Local name</b>	<b>Scientific name</b>	<b>IUCN Status</b>	<b>Local Status</b>
Banded Krait	Shakini	<i>Bungarus fasciatus</i>	LC	CR
Bengal Monitor	Ghuy Shap	<i>Varanus bengalensis</i>	NT	CR
Brooks House Gecko	Tiktiki	<i>Hemidactylus brookii</i>	LC	CR
Brown Roofed Turtle	Baro Kori Kasim	<i>Pangshura smithii</i>	NT	UR
Checkered Keelback	Dhora Shap	<i>Xenochropis piscator</i>	LC	CR
Common Garden Lizard	Roktochosha	<i>Calotes versicolor</i>	LC	CR
Common House Gecko	Tiktiki	<i>Hemidactylus frenatus</i>	LC	CR
Common Krait	Kal-keutey Shap	<i>Bungarus caeruleus</i>	LC	UR
Common River Terrapin	Boro Kasim	<i>Batagur baska</i>	CR	RR
Common Smooth Water Snake	Painna Shap	<i>Enhydryis enhydryis</i>	LC	CR
Common Vine Snake	Laodoga Shap	<i>Ahaetulla nasuta</i>	LC	UR
Common Wolf Snake	Gharginni Shap	<i>Lycodon aulicus</i>	LC	CR
Crowned River Turtle	Kali Kasim	<i>Hardella thurjii</i>	EN	UR
Estuarine Crocodile	Lonapanir Kumir	<i>Crocodylus porosus</i>	EN	UR
Ganges softshell Turtle	Khalua Kasim	<i>Nilssonia gangetica</i>	EN	UR
Gharial	Ghorial/Baishal	<i>Gavialis gangeticus</i>	CR	UR
Indian Rat Snake	Daraj Shap	<i>Ptyas mucosa</i>	LC	CR
Indian Roofed Turtle	Kori/Hali Kasim	<i>Pangshura tecta</i>	LC	CR
Jerdon's Blind Snake	Dumukh Shap	<i>Indotyphlops jerdoni</i>	LC	CR
Keeled Grass Skink	Anjoni	<i>Eutropis carinata</i>	LC	CR
King Cobra	Raj Gokra	<i>Ophiophagus hannah</i>	VU	UR
Median Roofed Turtle	Majhari Kaitta	<i>Pangshura tentoria</i>	NT	UR
Monocled Cobra	Gokhra Shap	<i>Naja kaouthia</i>	NT	RR
Narrow-headed Softshell Turtle	Sim Kasim	<i>Chitra indica</i>	CR	UR
Olive Keelback	Maita Shap	<i>Atretium schistosum</i>	LC	CR
Olive Ridley Turtle	Jalpaironga Samudrik Kasim	<i>Lepidochelys olivacea</i>	VU	CR
Peacock-marked Softshell Turtle	Dhum Kasim	<i>Aspideres hurma</i>	EN	CR
Pond Tortoise	Kalo Kasim	<i>Melanochelys trijuga</i>	NT	UR
Red Crowned Roofed Turtle	Kori Kasim	<i>Batagur kachuga</i>	CR	UR
Spectacled Cobra	Khoiya Gokhra Shap	<i>Naja naja</i>	NT	CR
Spotted Flapshell Turtle	Patapori	<i>Lissemys punctate</i>	LC	UR
Spotted Litter Skink	Anzoni	<i>Sphenomorphus maculatus</i>	LC	CR
Spotted Pond Turtle	Mogom Kasim	<i>Geoclemys hamiltonii</i>	EN	UR
Three-Striped Roofed Turtle	Dhoor Kasim	<i>Batagur dhongoca</i>	CR	UR
Tokay Gecko	Takkhak	<i>Gekko gekko</i>	LC	CR
Yellow Monitor	Sona Guy	<i>Varanus flavescens</i>	NT	RR

Reptiles				
English name	Local name	Scientific name	IUCN Status	Local Status
Yellow-bellied House Gecko	Tiktiki	<i>Hemidactylus flaviviridis</i>	LC	CR
Ring Lizard	Ram Godi	<i>Varanus salvator</i>	VU	
Painted Bronzeback Tree Snake	Gecho	<i>Dendrelaphis pictus</i>	LC	

IUCN Status (Red List 2015): CR – Critically Endangered, EN – Endangered, VU – Vulnerable, NO – Not Threatened; NT – Near Threatened; LC – Least Concern; DD – Data Deficient

Local Status (2013): CR – Common Resident, C – Common, UR – Uncommon Resident, RR – Rare Resident, V – Vagrant, WV – Winter Visitor; UWV – Uncommon Winter Visitor.

**Table A1-8: Fish (Jamuna River March 1993 – February 1994)**

Riverine Fish Species					
Nr	Local name	English name	Scientific name	IUCN assessment	
				Global status	Local status
1	Bali chata	Balitora Minnow	<i>Psilorhynchus balitora</i>	LC	LC
2	Ghora Poia	Gongota Loach	<i>Canthophrys gongota</i>	LC	NT
3	Kachki	Ganges River-sprat	<i>Corica soborna</i>	LC	LC
4	Phasa	Gangetic Hairfin Anchovy	<i>Setipinna phasa</i>	LC	LC
5	Nuna Baila	Short Goby	<i>Brachygobius nusus</i>	NE	LC
6	Chiring	Gobi	<i>Apocryptes bato</i>	LC	LC
7	Ghaura	Garua Bacha	<i>Clupisoma garua</i>	NE	EN
8	Baghair	Dwarf Goonch	<i>Bagarius bagarius</i>	NT	CR
9	Kajuli	Gangetic Ailia	<i>Ailia coila</i>	NT	LC
10	Magur	Indian Torrent Catfish	<i>Amblyceps mangois</i>	LC	LC
11	Rita	Rita	<i>Rita rita</i>	LC	EN
12	Gang Tengra	Gangetic Gagata	<i>Gagata youssoufi</i>	LC	NT
13	Gang Tengra	Kosi Tengra	<i>Nangra nangra</i>	LC	LC
14	Sisor	Sisor Catfish	<i>Sisor rhabdophorus</i>	LC	CR
15	Kauwa/Ceni a	Indian Gagata	<i>Gagata cenia</i>	LC	LC
16	Ilish	Hilsa Shad	<i>Tenulosa ilisha</i>	LC	LC
17	Gang Magur	Canine Catfish	<i>Plotosus canius</i>	NE	NT
18	Koi Puti	Shirnod Gizzaerd Shad	<i>Anodontostoma chacunda</i>	LC	LC
19	Khorsula	Yellowtail Mullet	<i>Sicamugil cascasia</i>	LC	VU
20	Piali	Aspidopara	<i>Aspidoparia morar</i>	LC	VU
21	Kalabata	Gangetic Latia	<i>Crossocheilus latius</i>	LC	EN
22	Rani	Necktie Loach	<i>Botia Dario</i>	LC	EN
23	Khorsula	Corsula Mullet	<i>Rhinomugil corsula</i>	LC	LC
24	Shilong	Silond Catfish	<i>Silonia silondia</i>	LC	LC
25	Kutakanti	Kosi Hara	<i>Hara hara</i>	LC	LC
26	Poa	Pama Croaker	<i>Otolithoides pama</i>	NE	LC



Riverine Fish Species					
Nr	Local name	English name	Scientific name	IUCN assessment	
				Global status	Local status
27	Shangus		<i>Himantura sp.</i>		

IUCN Status (Red List 2015): LC – Least Concern, NT – Near Threatened, NE – Not Evaluated, CR – Critically Endangered, EN – Endangered, VU – Vulnerable (Ref. EIA FRERMIP Tranche-1, 2014, FAP 1994)

Migratory Fish Species					
Nr	Local name	English name	Scientific name	IUCN assessment	
				Local status	Global status
1	Catla	Catla	<i>Catla catla</i>	LC	NE
2	Kalibaus	Organfin Labio	<i>Labeo calbasu</i>	LC	LC
3	Rui	Rohu	<i>Labeo rohita</i>	LC	LC
4	Mrigal	Mrigal	<i>Cirrhinus cirrhosus</i>	NT	VU
5	Bata	Bata Labeo	<i>Labeo bata</i>	LC	LC
6	Raik	Reba	<i>Cirrhinus reba</i>	NT	LC
7	Chital	Humped Featherback	<i>Chitala chitala</i>	VU	LC
8	Ayre	Long-whiskered Catfish	<i>Sperata aor</i>	VU	LC
9	Guzza Ayre	Giant River Catfish	<i>Sperata seenghala</i>	VU	LC
10	Golsha Tengra	Bleeker's Mystus	<i>Mystus bleekeri</i>	LC	LC
11	Kabashi Tengra	Gangetic Mystus	<i>Mystus cavasius</i>	NT	LC
12	Bacha	Batchwa Vacha	<i>Eutropiichthys vacha</i>	LC	LC
13	Batashi	Indian Potasi	<i>Pseudeutropius atherinoides</i>	LC	LC
14	Boal	Freshwater Shark	<i>Wallago attu</i>	VU	NT
15	Kani Pabda	Pabda Catfish	<i>Ompok pabda</i>	EN	NT
16	Modhu Pabda	Butter Catfish	<i>Ompok bimaculatus</i>	EN	NT
17	Pabda	Pabo Catfish	<i>Ompok pabo</i>	CR	NT
18	Katari	Large Razorbelly Minnow	<i>Salmophasia bacaila</i>	LC	LC
19	Fulchela	Finescale Razorbelly Minnow	<i>Salmostoma phulo</i>	NT	LC
20	Ghora Chela		<i>Securicula gora</i>	NT	LC
21	Chapila	Indian River Shad	<i>Gudusia chapra</i>	VU	LC
22	Kash Khaira	Indian Glass Barb	<i>Chela laubuca</i>	LC	NE

Ref. EIA RFERMIP Tranche-1 2014; FAP-1994; IUCN 2015

Floodplain Resident Fish Species					
Nr	Local name	English name	Scientific name	IUCN assessment	
				Local status	IUCN status

1	Baro Baim	Tiretrack Eel	<i>Mastacembelus aramatus</i>	EN	NE
2	Guchi Baim	Striped Spinyeel	<i>Macrognathus pancalus</i>	LC	LC
3	Tara Baim	One striped Spinyeel	<i>Macrognathus aculeatus</i>	NT	NE
4	Lal Chanda	Ranga Chanda	<i>Pseudambassis lala</i>	LC	NE
5	Nama Chanda	Elongate Glass	<i>Chanda nama</i>	LC	LC
6	Kata Chanda	Indian Glassy Fish	<i>Chanda baculis</i>	NT	LC
7	Shing	Stinging Catfish	<i>Heteropneus fossilis</i>	LC	LC
8	Magur	Walking Catfish	<i>Clarias batrachus</i>	LC	LC
9	Shol	Snakehead Murrel	<i>Channa striatus</i>	LC	LC
10	Taki	Spotted Snakehead	<i>Channa punctatus</i>	LC	LC
11	Gojar	Giant Snakehead	<i>Channa marulius</i>	EN	LC
12	Tit Puti	Twospot Barb	<i>Pethia ticto</i>	VU	LC
12	Puti	Spotfin Swamp Barb	<i>Puntius sophore</i>	LC	LC
14	Deshi Sarputi	Olive Barb	<i>Systemus sarana</i>	NT	LC
15	Phutani Puti	Spotted Sail Barb	<i>Pethia phutunio</i>	LC	LC
16	Gilli Puti	Golden Dwarf Barb	<i>Pethia gelius</i>	NT	LC
17	Kanchon Puti	Red Barb	<i>Pethia conchonius</i>	LC	LC
18	Kanpona	Blue Panchax	<i>Aplocheilichthys panchax</i>	LC	LC
19	Gutum	Peppered Loach	<i>Lepidocephalichthys guntea</i>	LC	LC
20	Chep Chala	Silver Hatchlet Barb	<i>Chela cachius</i>	VU	LC
21	Baila	Freshwater Goby	<i>Glossogobius giuris</i>	LC	LC
22	Napit Koi	Blue Perch	<i>Badis badis</i>	NT	LC
23	Darkina	Blackline Rasbora	<i>Rasbora daniconius</i>	LC	LC
24	Chebli	Giant Danio	<i>Devario aequipinnatus</i>	DD	LC
25	Anju	Zebra Danio	<i>Danio rerio</i>	NT	LC
26	Mola	Mola Carplet	<i>Amblypharyngodon mola</i>	LC	LC
27	Keti	Cotio	<i>Osteobrama cotio cotio</i>	NT	LC
28	Kaikla	Freshwater Garfish	<i>Xenentodon cancila</i>	LC	NE
29	Soto Kholisa	Hick-lipped Gourami	<i>Trichgaster labiosus</i>	LC	LC
30	Lal Kholisa	Red Gourami	<i>Trichgaster lalius</i>	LC	LC
31	Kholisa	Striped Gourami	<i>Trichgaster fasciata</i>	LC	LC
32	Tengra	Striped Dwarf	<i>Mystus vittatus</i>	LC	LC
33	Bajari Tengra	Tengra Mystus	<i>Mystus tengara</i>	LC	LC
34	Potka	Ocellated Pufferfish	<i>Tetraodon cutcutia</i>	LC	LC

## **APPENDIX B - DOLPHIN THREATS**

### **THREATS**

1. Dolphins have been very adversely affected by human use of the river systems in the sub-continent. Entanglement in fishing nets can cause significant damage to local population numbers. Some individuals are still taken each year and their oil and meat used as a liniment, as an aphrodisiac and as bait for catfish. Irrigation has lowered water levels throughout the ranges. Poisoning of the water supply from industrial and agricultural chemicals may have also contributed to population decline. Perhaps the most significant issue is the building of more than 50 dams along many rivers, causing the segregation of populations and a narrowed gene pool in which dolphins can breed.

2. This species is particularly threatened by overfishing (incidental by-catch, direct exploitation, resource depletion), and high industrial and agricultural pollutant loads may also have a severe impact on dolphin immune competence and fertility. The immediate danger for the resident population of dolphin in the haor basin is the decrease in river depth due to sedimentation.

### **USE OF DOLPHIN PRODUCTS**

3. Dolphin oil is used by people as a liniment, claimed to be effective for treating rheumatism, burns, and nervous disorders, and a tonic for treating impotence and asthma. It is noted that pregnant women sometimes drink the oil in the belief that it will ensure a healthy baby and that the oil is mixed with banana leaves and fed to cows to fatten them before being taken to market. Pelletier and described a factory in Chandpur used for processing dolphin oil. Recent survey recorded that the dolphin oil is used as mosquito repellent. On the bank of Kushiyara River near Kawadighi Haor, people are using oil of dolphin as mosquito repellent for the cattle and buffalo. They used to rub the oil over the body of cow and buffalo

### **FISHERIES BYCATCH**

4. Cetaceans worldwide are threatened from incidental mortality in gillnets. According to local fishermen, incidental catch in monofilament gill nets, called current jals, is their primary source of dolphin products. It is difficult to determine if the catch of dolphins in nets is deliberate or accidental, especially since dolphin products are highly valued and nets are often deployed for multispecies catch (Reeves and others 1993). Although current jals with a stretched mesh size of below 4.5 cm are prohibited in Bangladesh, their use is increasing throughout the country. We were told by fishermen that dolphins are sometimes caught in jam jals. These rectangular nets have an 8-10-cm mesh size and are used to catch large broodstock in river duars.

### **DIRECTED CATCH**

5. Local villagers appeared to be unaware that hunting dolphins is prohibited under the laws of Bangladesh. In villages along the Kalni-Kushiyara river, a small group of fishermen from a Hindu minority caste in the Bhawal (Sylhet District) come every year during December or January to hunt dolphins in major duars. They hunt dolphins at night with long iron-tipped harpoons made from bamboo.

### **OVEREXPLOITATION OF FISHERIES**

6. The Rivers of Bangladesh sustain one of the most productive freshwater fisheries in the world. Significant declines in carp and catfish production suggest that exploitation may be exceeding sustainable yields. Major factors cited for declines are the use of small mesh gillnets (current jals and kona ber jals) in tributaries and harvesting large fish in duars during their breeding season. The strong correlation between the distribution of river dolphins and large fish species and the reported decline of these fishes may indicate a potential problem in maintaining an adequate food base to support dolphins.

## POLLUTION

7. The main sources of water pollution in Bangladesh are leather, paper and pulp, fertilizer, pharmaceutical, sugar, jute, textile, and petrochemical industries, which generally discharge untreated wastes directly into rivers. The widespread use of fertilizers and pesticides for “green revolution” rice crops also creates serious water-quality problems. Recent studies of the biodegradation capacity and residue patterns of organochlorines in dolphins inhabiting the Ganges river in India indicate that, similar to marine cetaceans, *P. gangetica* is unable to metabolize these chemicals. The high concentrations of heavy metals (Fe, Mn, Zn, Cu, Pb, Ni, and Cd) found in the tissues of one neonatal male dolphin and one slightly larger immature male dolphin suggest considerable transfer of these contaminants across the fetal membrane and through milk (Reeves and others 1993). The lack of systematic monitoring of pollutant levels in Bangladesh.

8. Scientists believe that eddy countercurrents, called duars in Bengali (or koom or khari in larger rivers), are essential to the survival of river dolphins and to the productivity of riverine biota. A recent fisheries study in the northeast region of Bangladesh supports the idea of a linkage between dolphin occurrence and duars. The same study also found that duars are essential overwintering habitat for boromaach (commercially important fishes including major carp, catfish, and other large migratory species). During surveys in the Kushiya River, all sightings of dolphins were located within the eddy boundaries of obvious duars. Larger duars, created by sharp meanders and convergent or divergent channels, contained a greater number of dolphins than smaller duars, created by gentle meanders. River channels in the Kushiya River are a few hundred meters wide and are generally contained within well-defined banks. The aggregate nature of river dolphin distribution can also be used to the dolphins’ advantage by allowing conservation strategies to focus on areas that already require judicious stewardship for protecting vital fishery resources. The concentration of dolphins in limited and circumscribed areas makes them particularly vulnerable to habitat disturbance from water development, direct exploitation, accidental entanglement in fishing nets, and local sources of pollution.

## REFERENCES

Biswas, S. P. and R. G. Michael (1992): Fishery characteristics and the present status of fisheries of the river Brahmaputra. Proc. Seminar on Conservation of River Dolphin in Indian Sub-continent, 18-19 August, New Delhi. (Abst.)

Biswas, S. P. and S. Baruah (2000): Ecology of river dolphin (*Platanista gangetica*) in the Upper Brahmaputra. *Hydrobiologia*, 430: 97 – 111. Choudhury, A. U. (1997): Checklist of the Mammals of Assam. Gibbons Books, Guwahati. 103 pp.

Mohan, R. S. L., S. C. Dey and S. P. Bairagi (1998): On a residential dolphin population of the Ganges river dolphin, *Platanista gangetica* in the Kulsi river (Assam), a tributary of Brahmaputra. *Ibid*, 95(1): 1 – 7.

Reeves, R. R., S. Leatherwood and R. S. L. Mohan (eds.) (1993): A Future for Asian River Dolphins: Report from the Seminar on the Conservation of River Dolphins of the Indian Subcontinent, 18-19 August 1992, New Delhi, India.

Whale and Dolphin Conservation Society, Bath, U.K. Reeves, R. R. and S. Leatherwood (1994): Dams and river dolphins: can they co-exist? *Ambio* 23: 172-175.

B. D. Smith and T. Kasuya), pp. 54-61. IUCN, Gland, Switzerland. Sinha, R. K. and G. Sharma (2003): Current status of the Ganges river dolphin, *Platanista gangetica* in the rivers Kosi and Son, Bihar, India. *J. Bombay nat. Hist. Soc.*, 100(1): 27-37.

Sinha, R. K., N. K. Das, N. K. Singh, G. Sharma and S. N. Ahsan (1993): Gut content of the Gangetic dolphin, *Platanista gangetica*. *Invest. Cetacea*, 24: 317-321. Smith, B. D. (1993): 1990 status and conservation of the Ganges River Dolphin (*Platanista gangetica*) in the Karnali River, Nepal. *Biological Conservation*, 66: 159-169.

Smith, B. D., A. K. M., Haque, M. S. Hussain and A. Khan (1998): River dolphins in Bangladesh: conservation and the effects of water development. *Environmental Management*, 22: 323-335.

Smith, B. D. and R. R. Reeves (2000): Survey methods for population assessment of Asian river dolphins. In *Biology and Conservation of Freshwater Cetaceans in Asia*, Occasional Papers of the IUCN Species Survival Commission no. 23 (eds. R. R. Reeves, B. D. Smith and T. Kasuya), pp. 97-115. IUCN, Gland, Switzerland.

Smith, B. D., R. K. Sinha, Z. Kaiya, A. A. Choudhury, L. Renjun, W. Ding, B. Ahmed, A. K. M. A. Haque, R. S. L. Mohan, K. Sapkota (2000): Register of water development projects affecting river cetaceans in Asia. In *Biology and Conservation of Freshwater Cetaceans in Asia*, Occasional Papers of the

Ahmed, A.T.A., Kabir, S.M.H.,M.,Ahmed,Z. U., Begum, Z.N.T., Hassan, M. A., and Khondker, m. (eds.).2009. *Encyclopedia of Flora and Fauna of Bangladesh*, Vol.27 Mammals. Asiatic Society of Bangladesh, Dhaka.264 p.

## Embankment and Dredging Projects Affecting River Cetaceans in Bangladesh

Project	River and location	Purpose	Technical and Hydrological Specifications	Status	Summary of dolphin occurrence and potential or realized impacts
<b>Embankments</b>					
Bank Protection and River Training Pilot Projects (FAP 21/22)	Right bank of Jamuna River near Kamarjani and left bank of Jamuna River near Bahadurabad	Prototype works to investigate whether river training is feasible or desirable.	Three embankments on right bank. Eight slope revetments on right and left banks.	Embankments recently constructed. Slope revetments currently in construction.	Dolphins observed in the area during surveys in April 1996. Project will reduce hydraulic complexity and eliminate spawning habitat for floodplain-dependent fish.
Brahmaputra Right Embankment (BRE)	Jamuna River near Serajgonj, Rajshahi	Protection of Serajgonj and adjacent floodplain.	Embankment length 220km. Over half the length of the embankment has been eroded.	Completion date unknown.	Dolphins observed in the area during surveys in October 1995 and in April 1996. The embankment has reduced hydraulic complexity and eliminated spawning habitat for floodplain-dependent fish.
Brahmaputra River Bank Priority Works (BPW)	Jamuna River near Serajgonj, Rajshahi	Protection of Serajgonj from migration of Jamuna River	Two hard points linking the existing realigned BRE with low earth embankments.	Advanced stages of planning	Dolphins observed in the area during surveys in October 1995 and in April 1996. Additional impacts beyond the effects of the existing BRE are unknown.
Jamuna Bridge Project Embankments	Jamuna River slightly upstream of Serajgonj, Rajshahi	Protection of bridge foundation from erosive flooding.	Paired embankments upstream and a hard point/guide bund on the right bank downstream. Embankment on left bank will be linked to BPW.	Completed in 1998	Dolphins observed in the area during surveys in October 1995 and in April 1996. Project will reduce hydraulic complexity and eliminate spawning habitat for floodplain-dependent fish.
Jamalpur Priority Project (FAP 3.1)	Divergence of Jamuna and Old Brahmaputra rivers near Jamalpur	Flood control and drainage	82km embankment along left bank of the Jamuna river and a 43km embankment along the right bank of the Old Brahmaputra River.	Detailed engineering study in progress.	Dolphins observed in the area during surveys in April 1996. Project will reduce hydraulic complexity and eliminate spawning habitat for floodplain-dependent fish.
<b>Dredging</b>					
Jamuna Bridge Project Dredging	Jamuna River upstream of Serajgonj, Rajshahi	Facilitate construction of bridge	?	Dredging believed to have been completed after bridge commissioned in 1998	Dolphins observed in the area during surveys in October 1995 and in April 1996. Potential problem with increased turbidity during dredging operations and increased sedimentation downstream.
Kalni-Kushiyara River Improvement Project	Kushiyara River between Asmiriganj and Katkhal, Chittagong	Facilitate passage of water in the Kushiyara River during the monsoon season.	Dredging at three sites extending for 0.25-1.0 km each. If successful, 10 additional sites will be dredged in the 50km stretch of river between Markuli and Mudha.	Advanced stages of planning	Dolphins observed in the area during surveys in October 1995. Potential problem with increased turbidity during dredging. Project could potentially benefit dolphins by increasing counter-current habitat.

Source: Brian D. Smith, Ravindra K. Sinha, Zhou Kaiya, A. Aleem Chaudhry, Liu Renjun, Wang Ding, Benazir Ahmed, A.K.M. Aminul Haque, R.S.L. Mohan, and Kumar Sapkota. 2000. "Register of Water Development Projects Affecting River Cetaceans in Asia." In *Biology and Conservation of Freshwater Cetaceans in Asia*, edited by Randall R. Reeves, Brian D. Smith, and Toshio Kasuya. Occasional Paper 23. IUCN Species Survival Commission. <http://data.iucn.org/dbtw-wpd/edocs/ssc-op-023.pdf>.

## APPENDIX C - POTENTIAL BIRD SANCTUARIES

The Bangladesh Bird Club (BBC) provided a draft report on Proposed Bird Sanctuaries along Jamuna and Padma Rivers by Sayam Chowdhury in October 2017. The following sections have been taken from this report.

Sanctuaries were identified based on the results of the surveys conducted during the dry seasons of last six years and by compiling secondary information. The following criteria were used to identify sanctuaries: 1) number and species of breeding pairs and nests of River Tern, River Lapwing, Little Tern, Small Pratincole, Indian Spot-billed Duck, Bristled Grassbird, Stonechats and Prinias; 2) used for roosting and feeding by maximum number of species of migratory species such as ducks, terns, shorebirds, raptors and passerines; and 3) relatively undisturbed and away from human settlements.

### Proposed site along Jamuna and Padma Rivers north of Jamuna Bridge

#### 1. Site: Sirajganj – Jamuna River

Area: 15,580 Acres (63 Km<sup>2</sup>)

Habitat Type: Mainly sand dunes but also mudflat, small patches of grasslands and river channels.

GPS Coordinates:

North-west: 24°36'47.34"N, 89°39'28.93"E

North-east: 24°34'17.52"N, 89°43'49.80"E,

South-east: 24°30'28.68"N, 89°43'10.78"E

South-west: 24°33'4.83"N, 89°40'20.88"E



**Figure 1: Map of the proposed sanctuary at Sirajganj, Jamuna River.**

Description: A total of 86 species of birds were recorded at this site, comprising 44 residents and 42 migratory species of which 8 are globally and 7 are nationally threatened. Of the 8 globally threatened species, one is listed as Endangered (Steppe Eagle *Aquila nipalensis*), three as Vulnerable and four as Near Threatened. Nationally threatened species include Critically Endangered Woolly-necked Stork *Ciconiaeapiscopus*, One Endangered, two Vulnerable and three Near Threatened species. Ground nesting birds such as Terns, Pratincoles, Lapwings and Ringed Plovers use the sand dunes of this area to breed during the dry season. Stonechats, Prinias, Munias, and Grassbirds use grassland areas for foraging, roosting and breeding. Mudflat portions are also considered as major habitats for resident and migratory waterbirds.

### Proposed sites along Jamuna and Padma Rivers south of Jamuna Bridge

#### 2. Site: Belkuchi – Jamuna River

Area: 859 Acres (3.48 Km<sup>2</sup>)

Habitat Type: Mainly Sand dunes with short grasses and mudflats.

GPS Coordinates:

North-west: 24°18'50.91"N, 89°46'16.50"E

North-east: 24°17'53.21"N, 89°46'25.51"E

South-east: 24°16'48.18"N, 89°45'39.81"E

South-west: 24°17'46.13"N, 89°45'46.63"E



**Figure 2: Map of the proposed sanctuary at Belkuchi, Jamuna River.**

Description: A total of 32 species occur at Belkuchi site, comprising 20 resident and 12 migratory bird species. The site is a foraging area for Indian Spotted Eagle *Aquila hastata*, which is considered as nationally Endangered (EN) and globally Vulnerable (VU). As the habitat of this mostly sand dunes, it is important for ground nesting birds such as Terns (River Tern), Pratincoles, Lapwings. Mudflat portion of this area offers important habitat for waterbirds.

### **3. Site: Andharmanik – Jamuna River**

Area: 2,055 Acres (8.32 Km<sup>2</sup>)

Habitat Type: Andharmanik supports different habitat types, which is dominated by grassland habitats, sand dunes, wide river channel and small area of mudflats.

GPS Coordinates:

North-west: 24°15'2.44"N, 89°43'55.73"E

North-east: 24°14'10.56"N, 89°44'44.88"E

South-east: 24°13'15.18"N, 89°43'7.45"E

South-west: 24°14'19.83"N, 89°43'12.52"E





**Figure 3: Map of the proposed sanctuary at Andharmanik, Jamuna River.**

Description: Among 66 species of Andharmanik site, 37 are resident and 29 are migratory including 4 globally and nationally threatened species. These include the Steppe Eagle *Aquila nipalensis* (EN) three other globally vulnerable species such Greater and Indian Spotted Eagle and Woolly-necked Stork. Sand dunes of this area used by ground nesting birds like River Tern, Pratincoles, Larks and Lapwings. The grassland offers important breeding, feeding and roosting habitat to Stonechats, Prinias, Munias, Grassbirds including globally threatened (VU) Bristled Grassbird.

#### **4. Site: Maddhapara – Jamuna River**

Area: 6,860 Acres (27.8 Km<sup>2</sup>)

Habitat Type: Dominated by sand dunes and followed by mudflats and grasslands with narrow channels.

GPS Coordinates:

North-west: 24°10'40.63"N, 89°45'57.94"E,  
 North-east: 24° 8'43.66"N, 89°47'59.42"E,  
 South-east: 24° 6'22.91"N, 89°43'54.42"E,  
 South-west: 24° 8'36.24"N, 89°45'13.69"E



**Figure 4: Map of the proposed sanctuary at Moddhapara, Jamuna River.**

Description: Amongst the 50 species that occur at Moddhapara site, 23 are resident and 27 are migratory species. This site supports 4 globally and 2 nationally threatened species including the globally Endangered Steppe Eagle, Vulnerable Indian Spotted Eagle and Bristled Grassbird. At this site, sand dunes are used by ground nesting birds like Terns, Pratincoles, Lapwings and Larks. On the other hand, Stonechats, Prinias, Munias and Grassbirds (including globally Vulnerable Bristled Grassbird) use this area for foraging, nesting and roosting. The wet sands, mudflats and narrow channels are also important for resident and migratory waterbirds.

#### 5. Site: Ghior Khal Mouth – Jamuna River

Area: 2,584 Acres (10.5 Km<sup>2</sup>)

Habitat Type: The site comprises sand dunes, mudflats and grasslands. A narrow and shallow river channel also runs through the site.

GPS Coordinates:

North-west: 24° 1'29.63"N, 89°44'50.33"E,  
North-east: 24° 0'52.68"N, 89°46'39.17"E,  
South-east: 23°58'44.62"N, 89°45'18.04"E,  
South-west: 24° 0'17.36"N, 89°45'8.40"E



**Figure 5: Map of the proposed sanctuary at Ghior Khal, Jamuna River.**

Description: At Ghior Khal site supports a total of 62 species of which 36 are resident and 26 migratory. 4 species globally threatened and 3 species nationally threatened. Out of 4 globally threatened species one Endangered (Steppe Eagle *Aquila nipalensis*), two Vulnerable and one Near Threatened species use this habitat type. Dry and sandy areas of this site are used by ground nesting birds like Terns, Pratincoles, Lapwings, Bee-eaters and Larks. The grassland in the northwest corner of this site is utilized by Stonechats, Prinias, Munias, Grassbirds including globally threatened (VU) Bristled Grassbird for nesting, foraging and roosting.

#### 6. Site: Aricha Ghat – Jamuna River

Area: 2,768 Acres (11.2 Km<sup>2</sup>)

Habitat Type: Mainly dry sand and sand dunes with shallow water channels and some mudflats.

GPS Coordinates:

North-west: 23°49'19.64"N, 89°45'7.65"E

North-east: 23°47'45.70"N, 89°45'44.34"E  
 South-east: 23°46'42.50"N, 89°44'1.90"E  
 South-west: 23°47'58.69"N, 89°43'47.34"E



**Figure 6: Map of the proposed sanctuary at Aricha Ghat, Jamuna River.**

Description: This site supports 33 species including 17 resident and 16 migratory. Although is this is largely disturbed as it is located very near to the ferry station, the area is still likely to support ground nesting birds like Terns including River Tern, Pratincoles, Lapwings, Bee-eaters and Larks.

#### **7. Site: Moinot Ghat – Padma River**

Area: 3,544 Acres (14.3 Km<sup>2</sup>)

Habitat Type: Grassland dominates this site with some sandy and wet areas.

GPS Coordinates:

North-west: 23°39'7.03"N, 90° 0'21.58"E,  
 North-east: 23°37'35.82"N, 90° 1'41.77"E,  
 South-east: 23°34'51.79"N, 90° 2'16.35"E,  
 South-west: 23°37'19.43"N, 90° 0'31.14"E



**Figure 7: Map of the proposed sanctuary at Moinot Ghat, Padma River.**

Description: Moinot Ghat site supports a total of 79 species including 49 resident and 30 migratory. Amongst the 79 species, 7 are considered as globally and 6 as nationally threatened. Out of 7 globally threatened species, the Endangered Steppe Eagle and

Vulnerable Indian and Greater Spotted Eagles use this site for foraging during winter. It is hotspot for globally vulnerable Bristled Grassbird as a number of breeding pairs were observed from this area in summer 2017. Two other globally Near Threatened species such as Painted Stork and Black-headed Ibis were also recorded from this area. This grassland is a major habitat for breeding resident birds such as Bush Chats, Prinias, Munias, Avadavats and Grassbirds. This area is also used by migratory quails, swallows, martins, pipits and wagtails.

#### 8. Site: Mawa Ghat– Padma River

Area: 3,049 Acres (12.3 Km<sup>2</sup>)

Habitat Type: This site is mixed with grassland and sandy habitat; the grassland part is important for birds.

GPS Coordinates:

North-west: 23°27'30.18"N, 90°14'7.78"E

North-east: 23°26'57.96"N, 90°16'44.06"E

South-east: 23°26'1.68"N, 90°14'24.28"E

South-west: 23°26'59.60"N, 90°12'30.74"E



**Figure 8: Map of the proposed sanctuary at Mawa Ghat, Padma River.**

Description: A total 47 species were recorded from this site including 31 resident and 16 migratory species. The grassland part of this area is breeding habitat for Globally Threatened Bristled Gassbird and are used by other birds for breeding, foraging and roosting such as Bush Chats, Weavers, Prinias, Munias and Avadavats. This area is also used by migratory quails, swallows, martins, pipits and wagtails.

#### 9. Site: Naria– Padma River

Area: 11,040 Acres (44.7 Km<sup>2</sup>)

Habitat Type: Naria site supports a wide variety of habitats including grasslands, sand due and shallow water channels.

GPS Coordinates:

North-west: 23°23'39.90"N, 90°23'0.76"E

North-east: 23°19'45.46"N, 90°31'48.41"E

South-east: 23°19'25.63"N, 90°29'53.45" E

South-west: 23°21'3.33"N, 90°24'11.56"E



**Figure 9: Map of the proposed sanctuary at Naria, Padma River.**

Description: A total of 74 species of birds are likely to occur here including 47 resident and 27 migratory of which 6 are considered as globally and 5 nationally threatened. Out of 6 globally threatened species, the Endangered Steppe Eagle and Vulnerable Indian and Greater Spotted Eagles use this site for foraging during winter. It is hotspot for globally vulnerable Bristled Grassbird as a number of breeding pairs were observed from this area in summer 2017. This grassland is a major habitat for breeding resident birds such as Bush Chats, Prinias, Munias, Avadavats and Grassbirds including the globally threatened (VU) Bristled Grassbird. This area is also used by migratory quails, swallows, martins, pipits and wagtails. The sandy area of this site is likely to support ground nesting birds like Terns including River Tern, Pratincoles, Lapwings, Bee-eaters and Larks.

### **Declaration and Management of Riverine Sanctuaries**

These riverine sanctuaries could follow any of the following protected area status and follow guidelines as per government rules. The legal status of land designated as a protected area, invariably all the protected area in Bangladesh is declared under the Bangladesh Wildlife (Preservation) Order 1973 are 'reserved forest' declared under the Forest Act, 1927 and Wildlife (Conservation and Security) Act, 2012.

### **Declaration of sanctuary**

- (i) The Government may, by notification in the official Gazette, in the light of national forest policy and forest master plan, and considering natural, geomorphological features, biodiversity and environmental significance, declare any Government forests or part of such forests or any Government land or wetland or any specified area as sanctuary, specifying the demarcation, for the conservation of forest and habitat of wildlife.
- (ii) The sanctuary declared under sub-section (1) may be called as wildlife sanctuary, bird sanctuary, elephant sanctuary or wetland dependent animal sanctuary or, as the case may be, marine protected area.
- (iii) When a wetland is declared as sanctuary, measures shall be taken to protect the occupational, traditional or the right of livelihood of local community of the area such as – fishermen, boatmen, etc.

### **Prohibitions related to sanctuary**

In a sanctuary no person shall:

- Cultivate any land;

- Establish or undertake any industrial operation;
- Harvest, destroy or collect any plant;
- Set any kind of fire;
- Enter into a sanctuary with any weapon without the permission of the Chief Warden or the officer authorised by him in this behalf;
- Disturb or threat any wildlife, or use chemicals, explosives or any other weapon or substances which may Destroy wildlife habitat;
- Introduce any exotic animal or plant;
- Introduce any domestic animal or allow any domestic animal to stray;
- Dump any materials detrimental to wildlife;
- Explore or dig for extraction of minerals;
- Fell any plant or part thereof except silvicultural operations required for natural regeneration of plants;
- Divert, stop or pollute watercourse; or
- Introduce any alien and invasive plant species.

Notwithstanding anything contained in sub-section (1), after the commencement of this Act, no person, institution or company shall establish or operate any industrial factory or brickfield within 2 (two) kilometers from the boundary of a sanctuary.

#### **Management of sanctuary**

The Government may, for each sanctuary, prepare a management plan in accordance with the manner prescribed by rules. The Chief Warden shall bear all responsibilities of implementation and management of management plan. Proposed regulations could be:

- (i) MoFE and DoE shall bear all responsibilities of implementations and management
- (ii) The Government (MoFE & DoE) may for each sanctuary, prepare a management plan in accordance with manner prescribed by rules
- (iii) Allow the operation of tourism shop for any commercial purpose which is essential for management of sanctuary
- (iv) Take necessary steps for ensuring the safety of wildlife and its habitats
- (v) Improve habitat, protect breeding ground, prevent disturbance during breeding and raise plantation suitable for wildlife in limited scale for ensuring food security
- (vi) Prohibition of fishing activities on movement on movement of watercrafts
- (vii) Prohibit after identifying the activities detrimental to environment within 2 (two) kilometers from the border of sanctuary area
- (viii) Undertake necessary step in minor resettlement is needed under resettlement framework
- (ix) The authority may conduct public awareness campaign program about wildlife conservation
- (x) Government may constitute a committee for co-management specifying the terms of reference of the committee.
- (xi) Government may ensure imposition of penalties mentioned in Art 38(1) & 38(2) of wildlife (Conservation and Security) Act, 2012.

## APPENDIX D - PROPOSED FISH SANCTUARIES

### D1 Introduction

#### D1-1 Background

A Fish Sanctuary is a demarcated protected area where fish along with other aquatic biota can live and propagate safely without being indiscriminately fished or disturbed. Establishment of a fish sanctuary is one of the effective tools for conserving fish stock, preserving biodiversity and increasing fish production. Prior to the 1980's, there was no need for fish sanctuaries in Bangladesh because the fishery was rich and underexploited. In the backdrop of floodplain fishery degradation, mainly due to the creation of water management infrastructure to support HYV rice production, the flooding of fish habitat diminished, and this restricted the movement of fish, particularly for breeding and early development. Efforts to establish fish sanctuaries started in the 1980s and by 2005, the Department of Fisheries (DoF) had established 550 Fish Sanctuaries in the inland waters of Bangladesh including 52 in the FRERMIP area (Table D1-1) and fish production enhanced up to 140% due to the positive effect of the fish sanctuaries (DoF 2015).

**Table D1-1. List of existing fish sanctuaries in the FRERMIP project area**

Adjacent River Reach	Sub-project Area	District	Upazila	Nr. of Fish Sanctuary	Remarks
Jamuna	JLB-1	Tangail	Delduar		
			Kalihati	11	3 operating
			Sadar	1	
	JLB-2	Manikgonj	Daulatpur		
			Ghior	1	
			Saturia		
JRB-1	Sirajgonj	Shibalaya			
		Belkuchi			
		Kamarkhanda			
		Shahjadpur			
		Chouhali	2		
JRB-2	Pabna	Bera	9	2 operating	
		Santhia	8	3 operating	
		Sujanagar			
Meghna	MLB 1&2	Chandpur	Uttar Motlab		
			Sadar	1	
	MRB-1	Shariatpur	Daksin Matlab		
			Bedargonj	2	
Padma	PLB-1	Manikgonj	Goshair Hat	4	1 operating
			Ghior	1	
			Sadar		
	PLB-2	Dhaka	Singair		
			Nawabgonj		
			Dohar	1	
	PLB-3	Munshigonj	Sreenagar		
			Serajdikhan		
			Lohajang		
			Sadar		
	PRB-1	Rajbari	Tongibari		
Goalanda					
Pangsha					
PRB-2	Faridpur	Sadar			
		Bhanga	3	1 Operating	
		Char hadrashan	1		
		Sadar	1		
			Sadarpur		

	PRB-3	Madaripur	Shib char	6	1 operating
			<b>Total</b>	<b>52</b>	

Source: Fish Sanctuaries of Bangladesh, DoF 2015

## Present status of fish sanctuaries in Bangladesh

A recent DoF report (2015, DoF) shows that there are 550 Fish Sanctuaries established in the floodplain and small rivers of the country besides the river areas declared as Fishing Ban Zones for conservation of breeding and early development of Hilsha (*Tenulosa ilisha*). Thus there are two basic types of aquatic sanctuaries in Bangladesh, i.e. (i) Floodplain Sanctuary mostly of 0.5-0.1 ha size with structural delimitations situated in the floodplain and small rivers, and (ii) River Sanctuary in the form of declared river area with a ban on fishing. Effort for establishment of such reserved areas in the rivers for Hilsha fishery started mostly in the 1990s when the Hilsha fishery declined significantly.

### BOX-1 Present Status of River Fishing Prohibited Areas

The strip between Shatnol and Char Alexander in Meghna River; Shahbazpur channel of Meghna River; Tentulia River adjacent to Bhola district; and Andharmanik River near the Bay of Bengal were declared fish sanctuaries in 2003-2004. The other major sanctuary is located in Shariatpur district, in the estuary of Padma and Meghna Rivers; this place was given the status in 2010-2011.

These are called sanctuaries because catching fish in these places is prohibited during the two breeding seasons. For the Andharmanik sanctuary, the breeding season is November-January. For the remaining four, the season spans March-April. At present, the five sanctuaries cover a total riverine area of 350 km<sup>2</sup>; the upcoming one is about 60 km<sup>2</sup> in size (Abu Naser, 2010)

Also, there are such declared areas in the Sunderbans and adjacent rivers, i.e. about 30 km<sup>2</sup> mainly for conservation of the Ganges River Dolphin including a ban on all sorts of fishing efforts in the area. Recent evaluation shows that fish production increased up to 140%, and fish diversity by about 10% due to establishment of these sanctuaries. Hilsha fishery has increased from 219,532 Ton in 2000 to 387,211 Ton in 2015, apparently due to the conservation measures taken. On the downside however, it appears that most floodplain fish sanctuaries are either non-existent, or non-operating, due to (i) poor establishment and (ii) ineffective management, while in the declared river fish ban area there is considerable indiscriminate fishing of Jatka.

## D1-2 Importance of Fish Sanctuaries for FRERMIP

It is foreseen that FRERMIP interventions for river stabilization will have a substantial impact on fish habitats and production, and to mitigate this, various structural and non-structural mitigation measures are proposed, such as the establishment of Fish Sanctuaries in the river and in the floodplain of the project influence area. In the backdrop of foreseeable significant reduction and changes in the river fish habitat, loss of scope for fish migration to the floodplain due to limitation of river-floodplain connectivity and reduction of flooding of the floodplain, are all expected to result in the decrease of fish biodiversity and production. Establishment of fish sanctuaries will be a major management measure for mitigation of the fisheries impacts.

## D1-3 Strategic plan for FRERMIP Fish Sanctuaries

### River Fish Sanctuary



Establishment of Fish Sanctuaries in the major river area with some physical delimitation will be an innovative effort in Bangladesh. It is planned to install sturdy Navigation Buoys in the river, 1 km apart, 300 m away from the bank along the whole bank line indicating the navigation route. The as such demarcated area is expected to be relatively free from river transport and (drift net) fishing. This effort will be challenging but not impossible because (i) there is already an established practice of putting Navigation Buoys in rivers along navigation routes, and (ii) river fisheries management practices by imposing restriction on fishing in certain areas is already known to river fishers. Besides, awareness development training, community-based management of the Sanctuary and regulatory measures through the concerned government departments (DoF & DoE) will be arranged to ensure effective management of the river fish sanctuary. It is planned that around the water regulators with fish passes that will be constructed as part of the FRERMIP interventions, there will be arrangements for fish shelters and breeding hubs to ensure safe habitation and breeding of river fish.

### Floodplain Fish Sanctuary

There is an established practice of making fish sanctuaries in the floodplain. And there are lessons learned from the practice. Floodplain sanctuaries are mostly established under certain projects of 3-5 years' term and the sanctuaries mostly collapsed after the expiry of the concerned project for want of needful maintenance and management measures. Secondly, because of the poor structural make up, framed by bamboo poles, the fish sanctuary infrastructure collapses in about 3 years. These issues regarding the establishment and management of the Fish Sanctuary were pointed out by DoF officials who suggested that fish sanctuaries will be durable and effective if these problem areas could be addressed befittingly. Hence it is planned to use more durable methods such as concrete poles instead of Bamboo, and community-based management will be arranged with the necessary training for awareness development and improvement of management skills of the local stakeholders.

Recent field surveys reveal that floodplain Fish Sanctuaries could be established in every project upazila. However, it would not be advisable to establish all possible fish sanctuaries in the area under this project. The preferred strategic approach will be to establish one Model Fish Sanctuary (MFS) in each upazila (TableD1-2, Figure-1) with durable infrastructure and perpetuating arrangement for community-based management of the MFS.

**Table D1-2. Proposed Fish Sanctuaries in the Project-2 Area**

Source: Fish Sanctuaries of Bangladesh, DoF 2015

### Present status of fish sanctuaries in Bangladesh

No	Name of the Sanctuary	Location				Size(ha) Max/Min (ha)	Ownership Public/Private	Connectivity (Name) Canal, Dis/Tributary, River
		Water Body	Project Sub-reach	Adm.District Upazila /Union	Coordinates			
1	Chandahar Beel	Beel	PLB-1	Dis:Manikgonj Upa:Singair U:Chandahar	E=521289 N=627509	72/20	Public	Kaliganga and Dholeshwari river
2	Gopinathpur Beel	Beel	PLB-1	Dis:Manikgonj Upa:Horirumpur U:Gopinathpur	E=491548 N=625916	700/.50	Private 70% Public 30%	Bahadurpur khal/ Padma
3	Patal Beel	Beel	PLB-1	Dis:Manikgonj Upa: Sadar Pourosova	E=502187 N=637840	20/5	Public	Bhanumati/ kaliganga River /Padma
4	Nimaikhali Beel	Beel	JLB-2	Dis:Manikgonj Upa:Doulatpur U:ChakMirpur	E=486146 N=648775	15/5	Public	Kaliganga/ Jamuna
5	Char Ghior Mallar Beel	Beel	JLB-2	Dis:Manikgonj Upa:Ghior	E=489003 N=643027	40/10	Public	Kaliganga/Jamuna

				U:Ghior				
6	Dholeswari Gopalpur Ghat	River	JLB-2	Dis:Manikgonj Upa:Saturia U:Boraid	E=496158 N=650665	12km	Public	Gazikhali River +Dholeswari/ Jamuna
7	Ichamati kol-Jagannath	Tributary	JLB-2	Dis:Manikgonj Upa:Shibalay U: Uthuli	E=482200 N=638636	8km/3km	Public	Ghoshbarir khal+Baradia/Ichamati Kol/Jamuna
8	Kodalía river	Tributary	JLB-2	Dis:Sirajgonj Upa:Chowhali U:Khaspukuria	E=481023 N=665413	60/20ha	Public	Dholeswari /Jamuna
9	Bonogram Beel	Beel	JLB-2	Dis:Tangail Upa:Nagarpur U:Goyahata	E=482718 N=663713	50/10ha	Public	Jamuna
10	Gomorki Beel	Beel	JRB-1	Dis:Sirajgonj V: Gomrekhi U:Daulatpur	E=469603 N=681808	65/25ha	Public	Jamuna (there is a sluice gate)
11	Kutir Char Ichamati Dead River	Tributary	JRB-1	Dis:Sirajgonj Upa:kamarkhand U:BhodraGhat	E=459293 N=694441		Public	Jamuna
12	Kadai Badla Beel	Beel	JRB-1	Dis:Sirajgonj Upa;Shahjadpur U: Beltola	E=462999 N=674980	40/15ha	Public	Korotoya River/Jmauna

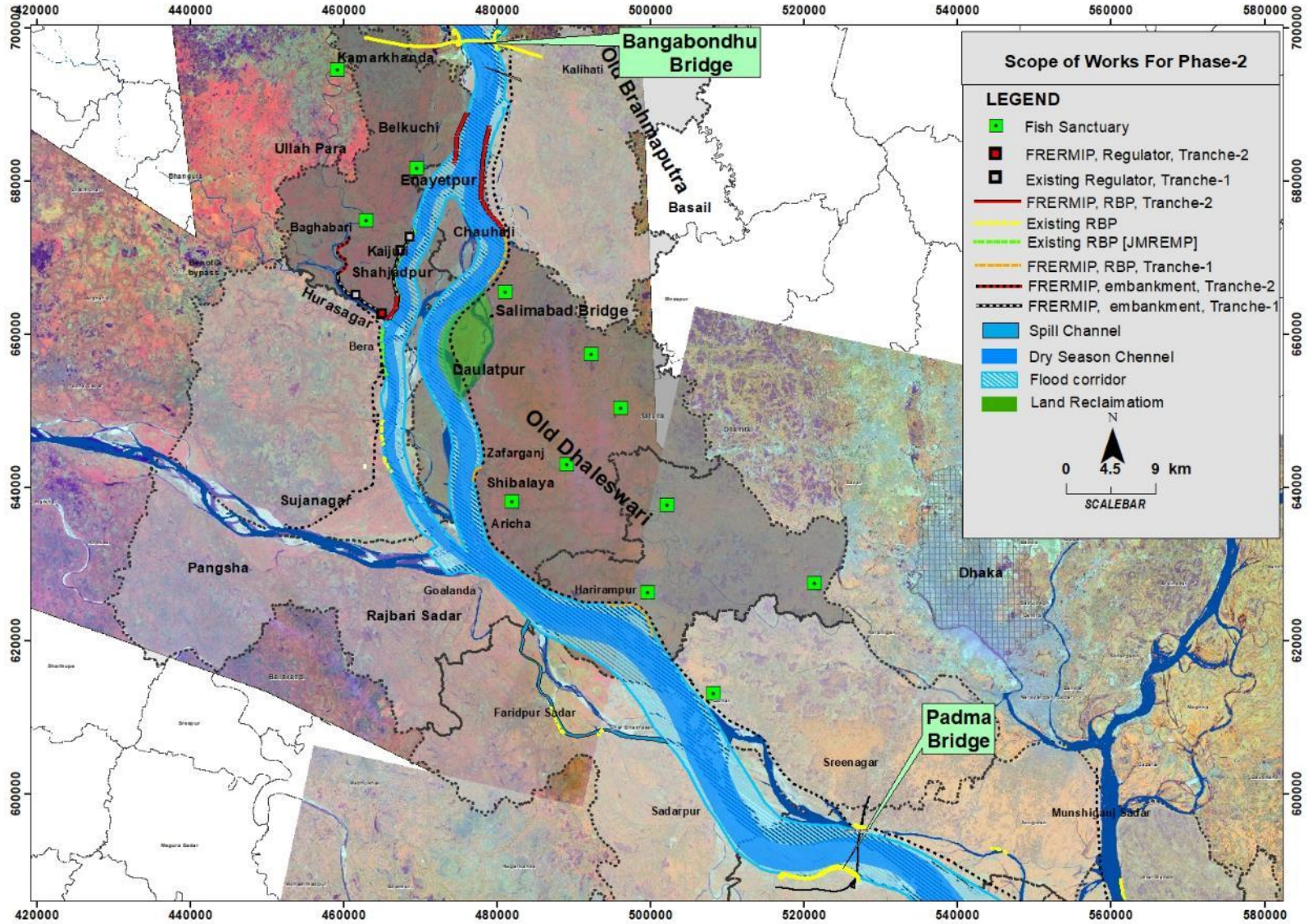


Figure D1-1. Location of the proposed Project-2 Model Sanctuary Sites

#### **D1-4 Management of Fish Sanctuaries**

Good management of the fish sanctuary is key to derive expected results. It is ascertained that the sanctuary established in the initial phases by the DoF ended in failure mainly due to lack of good management. Subsequently, community-based management measures were adopted with good results. So it is planned that community-based management will be ensured for the sanctuary with effective monitoring under joint supervision of BWDB and DoF. FRERMIP has a positive situation in this respect because the FRERMIP MFF is expected to be continued till 2023 with possibility of extension. So the project team will continue to monitor the management of the fish sanctuaries. It is believed that the community will be meanwhile adapted to good fish sanctuary management practices.

#### **D1-5 Conclusion and Recommendations**

It is foreseen that there will be potential impacts of the FRERMIP interventions on the fisheries sector and establishment of fish sanctuaries will be an effective mitigation measure for the impact. In the river area, potential fish habitats in the braided system and along the bankline will be lost and will be partially replenished by the proposed river sanctuaries which will also reduce possibilities for indiscriminate fishing. In the floodplain, anticipated fisheries loss due to the loss of connectivity by riverbank embankments impacting floodplain flooding and fish migration to and from the floodplain, will be partially covered by the added production expected due to the establishment of fish sanctuaries. Establishment of fish sanctuaries will be implemented by DoF as a works, with the financial assistance of BWDB/ADB.

#### **D1-6 Selected Project-2 sites for Fish Sanctuaries**

**River Sanctuary:** 100 km along the 100 km of left riverbank of Project-2 river area

- Navigation Buoys (NB): 100 for 100 km Tranche area @ 1 per km; @ USD 13,000 per NB = USD 1,300,000
- River fish Breeding Hub along the Regulator/Fish Pass: 9 locations near the regulators: 9 x \$ 13,000 = \$ 117,000

**Floodplain Sanctuaries:** 12 in 12 Upazilas

- Establishment of Floodplain Fish Sanctuaries: 12 sites in 12 upazilas @ USD 13,000/site= USD 156,000
- Re-excavation of canals: 12 x 5 km = 60 km @ \$ 2/m<sup>3</sup>: \$ 42,000/km, total \$ 2,500,000
- Beel nurseries in 12 fish sanctuaries: \$ 15,000
- Beel restocking in 12 fish sanctuaries: \$ 15,000

Regulators with Fish Passes: 2 in JLB-1; 1 in other location tbd. Cost: \$ 1 million/regulator, 35% of costs is for fish pass: \$ 2 million x 0.35 = \$ 700,000

#### **Training in fish sanctuary management and sustainable production**

Topics include awareness development; orientation; operation & maintenance; fisheries management; fish culture technology: 300 trainings in 3 years @ BDT 100,000/training = BDT 3 million = \$ 375,000

**Total cost = \$ 7,628,000**

## APPENDIX E - PUBLIC CONSULTATION MEETING, FIRST ROUND

### Overview of Meetings

Four first-round meetings were conducted at Chowhali, Harirampur, and Shahjadpur and Shibalaya, attended by 247 participants. Locations, dates, numbers and types of participants, and meeting photos are provided in the EIA of 16 May 2014.

To limit file size of this report, all participant signature forms and photos regarding Round 1 enclosed in the original EIA for Tranche -1 (2014) have been omitted.

### Stakeholder Concerns and Meeting Documentation

Summaries of stakeholder concerns expressed in each meeting are provided in the following tables.

**Table E1-1**

District	Upazila	Union	Meeting venue	Meeting date	Time
Sirajganj	Chauhali	Sadar	UP conference room	12/03/2013	11 am
Sirajganj	Harirampur	Sadar	UP conference room	26/02/2013	10 am
Manikganj	Shahjadpur	Sadar	UP conference room	27/02/2013	10:30 am
Sirajganj	Shibalaya	Sadar	UP conference room	17/04/2013	02:00 pm

**Table E1-2. Public Consultation Meeting Participant Details**

Meeting venue	Type of Participants	No. of participants
Chauhali Upazila conference room	Primary and secondary stakeholders	30
Harirampur Upazila conference room	Primary stakeholders	57
Shahjadpur Upazila conference room	"	26
Shibalaya Upazila conference room	"	44

**Table E1-3. First-Round Meeting Summary, Chouhali Upazila Complex, Sirajgonj**

Project/Subproject: Integrated Flood and Riverbank Erosion Management Investment Program
Meeting date: 12.03.2013
Place: Chouhali Upazila Complex, Sirajgonj
Attending: <u>Proponents:</u> BWDB, NHC, ADB <u>Stakeholders:</u> <i>Primary:</i> farmers, fishermen, local business community as well as the households to be displaced, women groups, and caretakers of community properties. <i>Secondary:</i> those who may not be directly affected but have interests that could contribute to the study, play a role in implementation at some stage, or affect decision making on Project aspects. In this Project NGOs, concerned government departments, and line agencies are considered.
<u>Reported by:</u> Manju Ara, Jr. Professional, CEGIS
Issues, questions, responses, comments - People's perception, opinion and attitude
Main problems due to erosion and flooding: Flooding and eroding of homesteads Accommodation problems for livestock Land erosion in river side areas

Spreading of water-borne diseases and resulting health hazards  
 Problems in crop cultivation  
 Students cannot go to the educational institutions  
 Siltation Problem in the Jamuna River  
 Communication and transportation problems  
 Problems in various rural infrastructures (educational institutions, religious institutions etc.)  
 Reduce employment opportunities for river erosion  
 Peoples' responses to the FRERMIP project:  
 People are very much positive to the implementation of this project. Additionally, they added the following suggestions:  
 Ensure the use of Geo-bag and CC-Block in protective work  
 Requirements of embankment  
 Construction of new embankment along the riverbank  
 Impacts of the project  
 People opined that this project must bring immense socio-economic benefits for them  
 Save Chowhali upazila complex and different govt. office  
 Prevent River erosion and protect household, livestock etc.  
 Impacts on Charlands  
 Increase density in Muradpur Char for relocation  
 Erosion of Charlands if construction cross dam or river

**Resettlement/ Relocation issues**

Impact of land acquisition on different group of people  
 Loss of homesteads  
 Damages of agricultural land  
 Increases the number of landless of people  
 loss of market facilities  
 Some of peoples have no land or not able to purchase land and they take shelter others home stated  
 Relocation of houses and other establishments  
 Landless people will be rehabilitated  
 People will be economically benefited  
 Price of adjacent land might be increased  
 Relocation should be ensured through the consultation with local allied persons  
 Choice of relocation site, availability of land and its current price  
 There is availability of land for relocation. The current price of land 1000 0BDT for cultivable land and 30,000 BDT for homesteads land.  
 People suggested that in compensation process, prices should be fixed by the consultation with the local people rather than the average price of sub-registered office.  
 Present community social services the affected areas and relocated areas  
 Presently, there is inadequacy of social services both in the affected and relocated area  
 Will this situation be improved or deteriorated after relocation?  
 The present situation must be improved if the concerned authority manages it effectively and relocate them in desired locations  
 Present level of access to market centers and towns/future level of access to market centers and towns after relocation  
 At present, access level of local people to markets and towns is low. But, it will be improved if the project is implemented.  
 What are the patterns of transport and communication in the affected area/relocated area?  
 Rickshaw, Nosiman, tempo, boat, CNG, Horse cab, and bicycle are the main transportation in the affected and relocated area. But overall transportation and communication facilities are not good.  
 What are the patterns for utilizing cultural and religious facilities? Will it generate conflicts in the host community?  
 There exists homogeneous religious and cultural scenario both in the affected and relocated area. So, there is no possibility any sort of social conflict.

What types of conflicts may arise due to relocation/resettlement?  
There is no possibility of social conflict. In spite of this, local allied persons should be involved in the process of relocation the affected people.

#### Compensation issues

ADB and GoB policies on involuntary resettlement  
Local people do not know the policies on involuntary resettlement of ADB and GoB  
Discussion on entitlements, compensation rates, income restoration, and grievance redress mechanism  
Compensation should be given on the basis current price land rather than traditional policy  
Ensuring compensated money to the actually affected people  
People's preference on mode of compensation payment and their previous experience  
In case of compensation they prefer money rather land as they feel freedom of choice  
Cut-off date for listing affected properties

#### Income restoration and generation

What are the current income generating activities of APs?  
Agriculture  
Fish culture  
Livestock rearing  
Small entrepreneurship  
Employed  
Business Etc.  
Are there possibilities for continuing employment in the project area? Which type of occupation?  
It is possible to continue the current occupation in the project area  
What types of income-generating activities are available at relocation sites? and to be generated?  
Agriculture  
Fish culture/capture  
Livestock rearing  
Small entrepreneurship  
Employed  
Business Etc.  
How does relocation of households affect the current market situation (job opportunities, competition, land price and market price situation)  
Labour availability will be increased. There is a chance to be more labour than less work  
Land price will be increased  
Social neighborhood will increased  
How many people can be absorbed?  
About 75 to 80 percent people can be absorbed  
Does this require training for skill development and IGA?  
Livestock rearing training  
Swinging training  
Health training  
Fish culture training  
Agricultural training  
Skill development training is highly needed for the local people. In addition, training should be given on disaster risk reduction  
How many people need to be trained and for what occupation?  
About 70% people need to be trained up. *Training sectors:*  
Fish culture  
Farming  
Livestock and poultry

#### Social Development Support

<p>Name of NGOs prevailing in the relocation site  Proshika, BRAC, ASA, Manob Mukti Sangstha, BDPC Etc.  Willingness of NGOs to support the APs for savings and income generation programs, providing capital support for income restoration and poverty reduction.  Various NGOs show greater interest to support the affected people through poverty reduction activities  Social safeguard and safety nets  At present the coverage of social safety net is quite good</p>
<p><b>Outcome (s)</b></p>
<p>All livelihood sectors are affected by erosion and flood  They demanded immediate bank protection  They show willingness to be relocated in purpose of protective work  There is no social conflict regarding relocation  Prior consultation with local allied persons is highly required before starting work  Income and employment will be generated  Compensation should be given in money considering the current market price  Lifestyle of the local people will be improved</p>
<p><b>Special Attention</b></p>
<p>Requirements of new embankment and protect work</p>
<p>Table A3-4. First-Round Meeting Summary, Harirampur Upazila Complex, Manikganj</p>
<p>Project/Subproject: Integrated Flood and Riverbank Erosion Management Investment Program</p>
<p>Meeting date: 26 /02/ 2013</p>
<p>Place: Harirampur Upazila Complex, Manikganj</p>
<p>Attending:  <u>Proponents:</u>  BWDB, NHC, ADB  <u>Stakeholders:</u>  <i>Primary:</i> Farmers, fishers, local business community as well as the households to be displaced, women groups, and caretakers of community properties.  <i>Secondary:</i> Those who may not be directly affected but have interests that could contribute to the study, play a role in implementation at some stage, or affect decision making on Project aspects. In this Project NGOs, concerned government departments, and line agencies are considered.  Reported by: Muhammad Shifuddin Mahmud, Professional, CEGIS</p>
<p>Issues, questions, responses, comments</p>
<p><b>People's perception, opinion and attitude</b></p>
<p>Main problems due to erosion and flooding:  Flooding and eroding of homesteads  Accommodation problems for livestock  Scarcity of safe drinking water  Sanitation problems  Spreading of water-borne diseases and resulting health hazards  Problems in crop cultivation  Students cannot go to the educational institutions  Problems in movements for population and livestock  Destruction in fishery sector  Communication and transportation problems  Problems in various rural infrastructures (educational institutions, religious institutions etc.)  Peoples' responses to the FRERMIP project:  People are very much positive to the implementation of this project. Additionally, they added the following suggestions:  Ensure the use of Geo-bag in protective work  Repairing of sluice gate at Kantapara</p>



<p>Construction of new embankment at Dhulshura, Boyra and Lesraganj UP</p> <p>Impacts of the project</p> <p>People opined that this project would bring immense socio-economic benefits for them</p>
<p><b>Resettlement/ Relocation issues</b></p> <p>Impact of land acquisition on different group of people</p> <p>Loss of homesteads</p> <p>Damages of agricultural land</p> <p>Increases the number of landless of people</p> <p>Relocation of houses and other establishments</p> <p>Landless people will be rehabilitated</p> <p>People will be economically benefited</p> <p>Price of adjacent land might be increased</p> <p>Relocation should be ensured through the consultation with local allied persons</p> <p>Choice of relocation site, availability of land and its current price</p> <p>There is availability of land for relocation. The current price of land is 10,000 BDT for cultivable land and 30,000 BDT for homesteads land.</p> <p>People suggested that in compensation process, prices should be fixed in consultation with the local people instead of considering the average price of sub-registered office.</p> <p>Present community social services the affected areas and relocated areas</p> <p>Presently, there is inadequacy of social services both in the affected and relocated area</p> <p>Will this situation be improved or deteriorated after relocation?</p> <p>The present situation would improve if the concerned authority manages it effectively and relocate them in desired locations</p> <p>Present level of access to market centers and towns/future level of access to market centers and towns after relocation</p> <p>At present, access level of local people to markets and towns is low. It will be improved if the project is implemented.</p> <p>What are the patterns of transport and communication in the affected area/relocated area?</p> <p>Rickshaw, Nosiman, tempo are the main transportation in the affected and relocated area. But overall transportation and communication facilities are not good.</p> <p>What are the patterns for utilizing cultural and religious facilities? Will it generate conflicts in the host community?</p> <p>There exists homogeneous religious and cultural scenario both in the affected and relocated area. So, there is no possibility of any sort of social conflict.</p> <p>What types of conflicts may arise due to relocation/resettlement?</p> <p>There is no possibility of social conflict. However, local allied persons should be involved in the process of relocation the affected people.</p>
<p><b>Compensation issues</b></p> <p>ADB and GoB policies on involuntary resettlement</p> <p>Local people do not know the policies on involuntary resettlement of ADB and GoB</p> <p>Discussion on entitlements, compensation rates, income restoration, and grievance redress mechanism</p> <p>Compensation should be given on the basis current price land rather than traditional policy</p> <p>Ensuring compensated money to the actually affected people</p> <p>People's preference on mode of compensation payment and their previous experience</p> <p>In case of compensation they prefer money rather than land as they feel freedom of choice</p> <p>Cut-off date for listing affected properties</p>
<p><b>Income restoration and generation</b></p> <p>What are the current income generating activities of APs?</p> <p>Agriculture</p> <p>Fish culture/capture</p> <p>Livestock rearing</p> <p>Small entrepreneurship</p> <p>Employed</p>

<p>Business Etc. Are there possibilities for continuing employment in the project area? Which type of occupation? It is possible to continue the current occupation in the project area What types of income-generating activities are available at relocation sites? and to be generated? Agriculture Fish culture/capture Livestock rearing Small entrepreneurship Employed Business Etc. How does relocation of households affect the current market situation (job opportunities, competition, land price and market price situation) Labour availability will be increased. There is a chance to be more labour than less work Land price will increase Social neighbourhood will increase How many people can be absorbed? About 70 to 75 percent people can be absorbed Does this require training for skill development and IGA? Skill development training is highly needed for the local people. In addition, training should be given on disaster risk reduction How many people need to be trained and for what occupation? About 70% people need to be trained up <i>Training sectors:</i> Fish culture Farming Livestock and poultry</p>
<b>Social Development Support</b>
<p>Name of NGOs prevailing in the relocation site Proshika, BRAC, Grammeen Bank, GKT, BARSIC, Bangladesh Red Crescent Society Willingness of NGOs to support the APs for savings and income generation programs, providing capital support for income restoration and poverty reduction. Various NGOs showed greater interest to support the affected people through poverty reduction activities Social safeguard and safety nets At present the coverage of social safety net is quite good</p>
<b>Outcome (s)</b>
<p>All livelihood sectors are affected by erosion and flood They demanded immediate bank protection They showed willingness to be relocated in purpose of protective work There is no social conflict regarding relocation Prior consultation with local allied persons is highly required before starting work Income and employment will be generated Compensation should be given in money considering the current market price Lifestyle of the local people will be improved</p>
<b>Special Attention</b>
<p>In Dhulshura union 5 schools, 4 mosques, one orphanage, 2 Madrashes and Dhulshura bazaar as well as crop land, homesteads and roadways may be eroded during the next April-May (Boisakh, Bangla month), if the government do not take effective initiative immediately to protect these resources.</p>

**Table E1-5. First-Round Meeting Summary, Shibalaya Upazila Complex, Manikgonj**

Project/Subproject: Integrated Flood and Riverbank Erosion Management Investment Program
Meeting date: 17/04/2013
Place: Shibalaya Upazila Complex, Manikgonj
<p>Attending:  <u>Proponents:</u>            BWDB, NHC, ADB  <u>Stakeholders:</u>  <i>Primary:</i> farmers, fishermen, local business community as well as the households to be displaced, women groups, and caretakers of community properties.  <i>Secondary:</i> those who may not be directly affected but have interests that could contribute to the study, play a role in implementation at some stage, or affect decision making on Project aspects. In this Project NGOs, Member of Parliamentarian (MP), concerned government departments, and line agencies are considered.  <u>Reported by:</u> Manju Ara, Jr. Professional, CEGIS</p>
Issues, questions, responses, comments
<p>People's perception, opinion and attitude</p> <p>Main problems due to erosion and flooding:            River erosion is main problem of Shibalaya Upazila.            Flooding and eroding of homesteads, cultivable land, homestead, various institutions such as educational institutions, social and religious institutions as well as all immovable and material resources are evanescent to Jumana and PadmaRiver.            Due to river erosion, communication system based on embankment has broken down. People cannot carry their goods as a result carrying cost and sufferings become no bounds. It keeps a negative impact on their economy.            Land erosion in river side areas            Accommodation problems for livestock            Spreading of water-borne diseases and resulting health hazards            Problems in crop cultivation            Students cannot go to the educational institutions            Communication and transportation problems            Problems in various rural infrastructures (educational institutions, religious institutions etc.)            Losing cultivable land and all resources, they have become unemployed            Reduce employment opportunities for river erosion            Peoples' responses to the FRERMIP project:            People are very much positive to the implementation of this project. Additionally, they added the following suggestions:            Ensure the use of Geo-bag and CC-Block in protective work            Construction of new embankment along the riverbank            Impacts of the project            Both positive and negative impact will be occurring after implementation of the FRERMIP project intervention.            Positive impact like- agricultural land, crops, homes, hat-bazaar, school, social institutions will be protected from riverbank erosion.            Negative impact- Agricultural land will reduce due to land acquisition. On the other hands, houses will be needed to shift or migrate.            Impacts on char lands            The char area will be protected from river erosion by implementation of the intervention and positive impact will occur in char area. Char area will sustain, as well as more crops will produce.</p>
Resettlement/ Relocation Issues
<p>Impact of land acquisition on different group of people            Impact will be occurring after Impact of land acquisition of the FRERMIP</p>

Agricultural land will reduce due to land acquisition.  
 On the other hands, houses will be needed to shift or migrate.  
 Increases the number of landless of people  
 loss of market facilities  
 Some of peoples have no land or not able to purchase land and they take shelter others home stated  
 Relocation of houses and other establishments  
 There are severe economical effects on different professional due to migration of homes, school, and various social institution of this area  
 Landless people will be rehabilitated  
 People will be economically benefited  
 Price of adjacent land might be increased  
 Relocation should be ensured through the consultation with local allied persons  
 Choice of relocation site, availability of land and its current price  
 There is availability of land for relocation. The local people prefer both side of Utholy-Aricha highway's space as rehabilitation. The price of land is almost BDT 50,000. Per decimal for homesteads land.  
 People suggested that in compensation process, prices should be fixed by the consultation with the local people rather than the average price of sub-registered office.  
 Present community social services the affected areas and relocated areas  
 There is no opportunity in river erosion area of Hat- Bazar as well as health and education services where relocation area has better facilities.  
 Presently, there is inadequacy of social services both in the affected and relocated area.  
 Will this situation be improved or deteriorated after relocation?  
 The present situation must be improved if the concerned authority manages it effectively and relocate them in desired locations  
 Present level of access to market centers and towns/future level of access to market centers and towns after relocation  
 At present, access level of local people to markets and towns is low. But, it will be improved if the project is implemented.  
 What are the patterns of transport and communication in the affected area/relocated area?  
 The dwellers normally use rickshaw, van, Auto van etc to go to nearest place such as hat, bazaar in village. On the other hand, in upzilla people use CNG, Auto van, Motorcycle etc. same kind of vehicles will be used. There are street facilities for communication. Overall transportation and communication facilities are not good.  
 What are the patterns for utilizing cultural and religious facilities? Will it generate conflicts in the host community?  
 Simply socio-religious and cultural facilities are equally enjoyed by the local people and there is no major conflict about it. If it is needed due to project implementation, conflict might not be happened.  
 What types of conflicts may arise due to relocation/ resettlement?  
 There is no possibility of social conflict. In spite of this, local allied persons should be involved in the process of relocation the affected people.

#### Compensation issues

ADB and GoB policies on involuntary resettlement  
 Local people do not know the policies on involuntary resettlement of ADB and GoB  
 Discussion on entitlements, compensation rates, income restoration, and grievance redress mechanism  
 The local people have preferred to have compensation by Union Parishad or Bank. Some people believe that hard cash might create predicament. Sometimes landowner does get money. In that case, land can be provided as replace of land.  
 Compensation should be given on the basis current price land rather than traditional policy  
 Ensuring compensated money to the actually affected people  
 People's preference on mode of compensation payment and their previous experience  
 In case of compensation they prefer money rather land as they feel freedom of choice

Cut-off date for listing affected properties
<b>Income restoration and generation</b>
<p>What are the current income generating activities of APs?  The main sources of income of this area are agriculture and handloom. But there are also have a little range of fisher men, businessmen, job holder and other professionals.</p> <p>Are there possibilities for continuing employment in the project area? Which type of occupation?  Many of them will bound to change their occupation due to changed environment and situation. However, being migrated if population, present income generating source could be sustained.</p> <p>What types of income-generating activities are available at relocation sites? and to be generated?  There are almost same in income generating source between affected area and project relocated area. Nevertheless, in project relocated area has predominance of handloom occupation.</p> <p>How does relocation of households affect the current market situation (job opportunities, competition, land price and market price situation)  Due to migration process, Abundance of labour force might be seen in newly relocated area, which might influence on local labour market. As a result, labour competition might increase and might lessen wage.</p> <p>Labour availability will be increased. There is a chance to be more labour than less work  Land price will be increased  Social neighborhood will be increased  How many people can be absorbed?  Almost affected people could be people can be absorbed.</p> <p>Does this require training for skill development and IGA?  Livestock rearing training  Swinging training  Health training  Fish culture training  Agricultural training etc  Skill development training is highly needed for the local people. In addition, training should be given on disaster risk reduction  How many people need to be trained and for what occupation?  By proper providing proper training, a great development of handloom will be brought and will create more employment opportunities. Related with handloom should provide proper training and better opportunities by govt. and NGOs. Almost half of total people should be trained up.</p>
<b>Social Development Support</b>
<p>Name of NGOs prevailing in the relocation site  BRAC, CEDIA, Grameen Bank, ASA, Paribar Unnoyn Samajik Sangasta, Pard, ASEA  CODAC and many other NGOs are working in this area.</p> <p>Willingness of NGOs to support the APs for savings and income generation programs, providing capital support for income restoration and poverty reduction.  NGOs worker are working in Savings, Income generating activities, financial assistance in re-settlement of income and in eradicating poverty. NGOs could expand their activities if they get financial assistance.</p> <p>Social safeguard and safety nets  The opportunities of social safety net are moderate. They need adequate financial assistance is needed. They also need training related to awareness. Employment generating activities should be increased.</p>
<b>Outcome (s)</b>
<p>All livelihood sectors are affected by erosion and flood  They demanded immediate bank protection</p>

They show willingness to be relocated in purpose of protective work There is no major social conflict regarding relocation Prior consultation with local allied persons is highly required before starting work Income and employment will be generated Compensation should be given in money considering the current market price Lifestyle of the local people will be improved
<b>Special Attention</b>
Requirements of new embankment and protect work

Table E5-6. First-Round Meeting Summary, Shibalaya Upazila Complex, Manikgonj

Project/Subproject: Integrated Flood and Riverbank Erosion Management Investment Program
Meeting date: 27.02.2013
Place: Shahzadpur Upazila Complex, Sirajganj
Attending: <u>Proponents:</u> BWDB, NHC, ADB <u>Stakeholders:</u> <i>Primary:</i> Farmers, fishermen, local business community as well as the households to be displaced, women groups, and caretakers of community properties. <i>Secondary:</i> Those who may not be directly affected but have interests that could contribute to the study, play a role in implementation at some stage, or affect decision making on Project aspects. In this Project NGOs, concerned government departments, and line agencies are considered. <u>Reported by:</u> Mobasher Bin Ansari, Professional, CEGIS
<b>Issues, questions, responses, comments:</b>
People's perception, opinion and attitude Major problems relating to flood and riverbank erosion, Attitude of the people towards the project (FRERMIP) and its proper completion, Impact (positive and negative) of the project and mitigation measures against negative impact, Unanticipated Impacts on Charlands Resettlement/ Relocation issues Impact of land acquisition on different group of people (farmer, fisherman, vulnerable people, and others), Relocation of houses and other establishments, Choice of relocation site, availability of land (agricultural, homestead, etc.) and its current price, Present community social services (eg health care, education) in the affected areas and relocated areas, Will this situation be improved or deteriorated after relocation? Present level of access to market centers and towns/future level of access to market centers and towns after relocation, What are the patterns of transport and communication in the affected area/relocated area? What are the patterns for utilizing cultural and religious facilities? Will it generate conflicts in the host community? What types of conflicts may arise due to relocation/resettlement? Compensation issues ADB and GoB policies on involuntary resettlement, Discussion on entitlements, compensation rates, income restoration, and grievance redress mechanism, People's preference on mode of compensation payment and their previous experience, Cut-off date for listing affected properties Income restoration and generation

<p>What are the current income generating activities of APs?  Are there possibilities for continuing employment in the project area? Which type of occupation?  What types of income-generating activities are available at relocation sites? and to be generated?  How does relocation of households affect the current market situation (job opportunities, competition, land price and market price situation)?  How many people can be absorbed?  Does this require training for skill development and IGA?  How many people need to be trained and for what occupation?  Social Development Support  Name of NGOs prevailing in the relocation site,  Willingness of NGOs to support the APs for savings and income generation programs, providing capital support for income restoration and poverty reduction.  Social safeguard and safety nets</p>
Outcomes (s)
People's perception, opinion and attitude
<p>Main problems due to erosion and flooding:  Flooding  riverbank erosion  Damage of households and assets  Damage of bridge, culvert and livestock etc.  Peoples' responses to the FRERMIP project:  Participants expressed positive attitude to the project implementation and demanded its early implementation adjacent villages of Padma Riverbank;  Impacts of the project  People opined that this project must bring immense socio-economic benefits for them</p>
Resettlement/ Relocation issues
<p>Negative impact of land acquisition on different group of people  Bank erosion will increase due to unplanned river management program  Lack of permanent protection work will not be enough to save households and agricultural and in project area.</p>
<p>Positive impact of land acquisition on different group of people:  To save agricultural land, households, bridges and culvert from riverbank erosion and flood.  Increase agricultural production  The stone base construction work from gravel layer will ensure its longevity.  Unanticipated Impacts on Charlands  No unanticipated impacts will observe on Charlands people rather these activities will ensure more food production and safety for them.  Impact of land acquisition on different group of people (farmer, fisherman, vulnerable people, and others),  The farmers and local people will lose their agricultural and homestead land due to land acquisition;  They demanded adequate compensation and other benefits for the loss of their assets and livelihood, as well as alternative place for relocation of their houses and business.  Relocation of houses and other establishments,  Relocation of houses and other establishments will possible in new Charlands,  Choice of relocation site, availability of land (agricultural, homestead, etc.) and its current price,  Government can decide best for relocation of site  There are available land for relocation  Current land price is now:  Agricultural land is 20,000BDT for each decimal.  Homestead land is 30,000BDT for each decimal.</p>

Present community social services (eg health care, education) in the affected areas and relocated areas,  
 The present health and education services in project area not satisfactory  
 Lack of health centres and schools in both project and relocated areas  
 Will this situation be improved or deteriorated after relocation?  
 After relocation this situation may not improve as high but definitely improve after few years  
 Present level of access to market centers and towns/future level of access to market centers and towns after relocation,  
 At present access to market is not satisfactory.  
 What are the patterns of transport and communication in the affected area/relocated area?  
 Modes of transportations in the project area are Rickshaw and van. Most of the people communicate through foot.  
 What are the patterns for utilizing cultural and religious facilities? Will it generate conflicts in the host community?  
 People of these areas are practicing homogenous cultural practices for 100 of years. No social conflicts exist in the project area  
 What types of conflicts may arise due to relocation/resettlement?  
 According to local people, no conflicts will happen due to relocation/resettlement. If any will rise, local power holder can solve this problem easily.

**Compensation issues, income restoration and generation**

ADB and GoB policies on involuntary resettlement  
 Local people are totally unknown about ADB and GoB policies on involuntary resettlement issues.  
 Discussion on entitlements, compensation rates, income restoration, and grievance redress mechanism,  
 Compensation should be paid to actual people who are affected by land acquisition.  
 Land compensation should be given on the basis of present land price.  
 People's preference and previous experience on mode of compensation payment  
 People's preferences on mode of compensation payment only through money.  
 Cut-off date for listing affected properties: N/A

What are the current income generating activities of APs?  
 Agricultural farming  
 Fishing (culture/capture)  
 Livestock rearing  
 Small cottage/Handicraft  
 Employed/service  
 Small business  
 Are there possibilities for continuing employment in the project area? Which type of occupation?  
 The mentions above occupations are possible for continuing in the project area.  
 What types of income-generating activities are available at relocation sites? And to be generated?  
 Agricultural farming  
 Fishing (culture/capture)  
 Livestock rearing  
 Small cottage/Handicraft  
 Employed/service  
 Small business  
 How does relocation of households affect the current market situation (job opportunities, competition, land price and market price situation)?  
 Land price will be increased  
 Development of agriculture  
 Development of communication system  
 Improvement of livestock rearing practice etc.



How many people can be absorbed?  
 About 50 percent people can be absorbed  
 Does this require training for skill development and IGA?  
 It is highly needed training programs on agriculture farming, livestock rearing and small cottage for the betterment of local people.  
 How many people need to be trained and for what occupation?  
 People identified at least 80% of local are needed to be trained up on these particular occupation as:  
 Improve agricultural farming  
 Fishing (culture/capture)  
 Small cottage/handicraft etc.

**Social Development Support**

Name of NGOs prevailing in the relocation site  
 BRAC, Grameen Bank, PPD, Manab Mukti, UNDP, ASA  
 Willingness of NGOs to support the APs for savings and income generation programs, providing capital support for income restoration and poverty reduction.  
 These NGOs are interested to support the APS for savings and income generation programs, providing capital for income restoration and poverty reduction.  
 Social safeguard and safety nets  
 At present, the social safeguard and safety nets activities in the project area are not good. Local people argued more initiatives should have taken by government in this regard such as:  
 Old allowances  
 Maternity allowances  
 Widow allowances etc

**Overall Findings**

Overall:  
 The local people desired for quick implementation of this project as they believe that the communication infrastructure and other facilities of the study area will be improved as well in the aftermath.  
 The landowners stated that they want higher prices of land than anticipated but still they agreed that the project would change the socio-economical condition of the area as well as of the country.  
 People demanded that the village crossroad which run beside the riverbank should be made as metalled road for the convenience of local people, contractor and the BWDB.  
 Specific:  
 Participants expressed positive attitude to the project implementation and demanded its early implementation.  
 Local people expect employment opportunities during and after project implementation;  
 People suggested for the development of road communication network which in a sense would create income generating sources for the villagers;  
 The compensation should be fixed in conformity with the market value of the land; and  
 People strongly demanded a plan which will not affect the local development with an excuse of national development.

## APPENDIX F - PUBLIC CONSULTATION MEETING, SECOND ROUND

### OVERVIEW OF MEETINGS

Four second-round meetings were conducted at Chowhali, Harirampur, and Shahjadpur and Shibalaya, attended by 157 participants. Locations, dates, numbers and types of participants are provided below.

To limit file size of this report, all participant signature forms and photos regarding Round 2 enclosed in the original EIA for Tranche -1 (2014) have been omitted.

### STAKEHOLDER CONCERNS AND MEETING DOCUMENTATION

**Table F1-1: Meeting Venues, Second Round Public Consultation Meetings**

District	Upazila	Union	Meeting venue	Meeting date	Time
Manikganj	Shibalaya	Sadar	UZ conference room	02/07/2013	11:00 am
Sirajganj	Shahjadpur	Sadar	UZ conference room	04/07/2013	11:30 am
Sirajganj	Chouhali	Sadar	UZ conference room	07/07/2013	11:00 am
Manikganj	Harirampur	Sadar	UZ conference room	09/07/2013	11:00 am

**Table F1-2: Public Consultation Meeting Participant Details**

Meeting venue	Type of Participants	No. participants
Shibalaya (JLB-2)	BWDB staff, ADB consultants, Upazila Nirbahi Officer, teachers, UP Chairman, UP members (Male/Female), farmer, Fishermen, local notable persons, healthcare assistants, businessmen, traders, and NGO staff	69
Shahjadpur (JRB-1)	BWDB staff, PPTA consultants, UP Nirbahi Officer, teachers, UP Chairperson, UP members (male and female), farmer, fishermen, local notable persons, healthcare assistants, businessmen, traders, and NGO staff	37
Chouhali (JLB-2)	BWDB representatives, ADB consultants, Upazila Nirbahi Officer, teachers, UP Chairman, UP members (Male/Female), farmer, Fishermen, local notable persons, healthcare assistants, businessmen, traders, and NGO staff	56
Harirampur (PLB-1)	BWDB representatives, ADB consultants, Upazila Nirbahi Officer, teachers, UP Chairman, UP members (Male/Female), farmer, Fishermen, local notable persons, healthcare assistants, businessmen, traders, and NGO staff	85

### SUMMARY OF CONCERNS, ALL MEETINGS

**Erosion.** Stakeholders were informed of average annual rates of land, homestead, and infrastructure loss to erosion in each subproject area, and that the proposed bank protection is expected to reduce these losses. Participants emphasized the need to ensure that construction work is of high quality.

**Flooding.** Stakeholders were informed that the proposed embankment will help to protect from flooding. Stakeholders stated that the embankment will not control flood without river dredging, and therefore dredging should be incorporated in the project.

**Land use.** Stakeholders were advised that the project would induce significant changes in land type, land use, and increased food production.

**Fish habitat.** Stakeholders were informed that the project is expected to have negative impacts on fish and other aquatic fauna due to reduction of wetland by the proposed interventions. Local participants suggested restoring fisheries habitat through pilot dredging of channels in the Tranche-1 area.

**Pollution.** Stakeholders were advised that the construction phase would cause temporary air pollution and noise. Almost all stakeholders present consented to accept these impacts during construction.

**Resettlement.** Participants were informed that, at the time of the meetings, 1726 households in Horirampur of Manikgonj and Chouhali of Sirajgonj district would require relocation to suitable alternate sites before the beginning of construction, per Tranche-1 resettlement plans.

**Improved road transportation.** Participants were informed that flood embankments would be provided with appropriate road facilities.

**Employment.** Participants were informed that the subproject's reduction of the areas' vulnerability will improve conditions for trade and commerce. Project construction will provide temporary employment opportunities to local people.

**Contingency funding to begin revetment construction this year (2013).** Almost all participants mentioned locations threatened by erosion, and that if the construction does not start for one year, erosion will proceed in these areas and the subproject designs will have to be changed. They requested contingency funds to be arranged now so that protection work can begin in 2013.

**Addition of dredging to subproject designs.** River dredging has not been included in subproject designs. Participants strongly recommended that it be added, as they believe flood and erosion control cannot be achieved in these areas without it. Some participants suggested capital dredging from Jamuna Bridge to Brahmankanda of Horirampur upazila under Manikgonj district.

**Successful implementation.** Participants are concerned that development projects initiated by the ruling party will lose priority if/when the opposition party is in power. Participants strongly urge a 2013 construction start to avoid future problems.

**Flood protection plans.** Participants expressed concern about the effectiveness of the subprojects in controlling flooding. They stated that flood protection plans should be developed based on an assessment of water levels. Proposed interventions should be designed to provide protection from the highest monsoon water levels.

## NOTES OF SPECIFIC MEETINGS

### Shibalay, Manikganj (JLB-2 area)

The upazila areas most affected by erosion are Zafarganj and Bachamara. Local MP Mr. A.B.M Anwerul Haq stated that over last five years, more than 9000 affluent households of Zafarganj area were forced by erosion to leave the area and now live in difficult circumstances in Dhaka city.

Participants recommend that construction should start from November in the dry season.

The northern part of Zafargonj Bazar is very much threatened by erosion this year. To protect this area, participants suggested seeking preparatory funds from Asian Development Bank (ADB) and Water Development Board. The subproject area needs access to contingency funds for emergency work.

Participants believe permanent protection works are required in the Padma and Jamuna Rivers as temporary erosion protection works are not viable there.

River dredging is essential to the success of the subproject and should be started in order to prevent erosion and flooding.

Riverbank protections from Kojuri to Baghabari are essential this year as these areas are vulnerable.

During construction, transparency should be ensured through BWDB monitoring of work quality.

A reservoir to hold water for rice cultivation and fish culture should be added to the subproject.

### **Shahjadpur, Sirajganj**

Co-ordination among involved departments should be ensured during subproject implementation.

Eroding locations should be properly identified and protection works provided there.

Participants requested adding construction of a water reservoir to the project, to hold water for rice cultivation and aquaculture and immediate repair of the existing upazila embankment and revetment.

Participants stated that a flood action plan was needed to improve flood proofing and response given the high flood levels in the subproject area.

Participants favor pilot dredging in area channels to increase fish production and maintain fish habitat.

### **Chouhali, Sirajganj**

The area of Chouhali upazila most vulnerable to erosion is the upazila sadar, where 40 to 50 per cent of the area has already eroded away. BWDB has been using sandbags in attempt to control the erosion, but these have been ineffective given the intensity of the erosive attack. Participants stated that sandbag revetments are ineffective in the Jamuna due to its erosion intensity.

Participants urged BWDB to appeal to ADB to allocate preparatory funds for emergency work. Construction of riverbank protection works should commence in the dry season, otherwise adequate work quality will not be achieved. Most participants stated that capital dredging should be undertaken from the Jamuna Bridge to Aricha. River dredging is required to ensure the survival of any future embankment works. An embankment built in this upazila at a cost of BDT 38 crore was already destroyed by erosion.

A flow divider should be incorporated in the project design.

Participants expressed frustration that the subproject design does not reflect the concerns and suggestions of local people, even though these have been expressed repeatedly in meetings with the Project Implementation Officer (PIO).

### **Harirampur, Manikganj**

The 5-km riverbank protection proposed in this upazila should be extended an additional 2 km up to Dhulsura. Bahadurpur union should be included with the project.

Participants were concerned about the successful implementation of the project. They think that projects initiated by the ruling party will have lower priority if and when the opposition is in power. Participants hope the subproject will be implemented in 2013 and agreed to make whatever sacrifices would be required to expedite this.

Participants stated that the priority should be to protect Harirampur before providing protection to Manikgonj town. Priority work should start as soon as possible.

A quality control committee should be struck to ensure quality construction work.

Local stakeholders should be involved in regular embankment maintenance.

## APPENDIX G - PUBLIC CONSULTATION MEETING, THIRD ROUND

### OVERVIEW OF MEETINGS

Six third-round public meetings were conducted at Harirampur, Shahjadpur & Chauhali and four FDG attended by 336 participants. Locations, dates, numbers and types of participants, and meeting photos are provided below.

### STAKEHOLDER CONCERNS AND MEETING DOCUMENTATION

Summaries of stakeholder concerns expressed in the meetings are provided in Sections A5-0 and A5-0. Copies of the meeting sign-in sheets are shown in Photos E1-8 to E1-16.

**Table G1-1: Meeting Venues, third Round Public Consultation & FDG Meetings**

District	Upazila	Union	Meeting venue	Meeting date	Time
Manikganj	Harirampur	Bahadurpur	Office room of Gopinathpurbeel water Management committee	17/10/2016	11:00 am
Sirajgonj	Shahjadpur	Ratankandi	Ratankandi Ideal High School	22/02/2017	2:00 pm
Sirajgonj	Chauhali	Chauhali	Chauhali Degree College	15/03/2017	3:00 pm
Manikgonj	Harirampur	Boyra	Boyra Union Parishad	27/09/2017	11:00 am
Sirajgonj	Chauhali	Solimabad	Union parishad building	09/10/2017	11:00 am
Sirajgonj	Chauhali	Khaspukuria	Khaspukuria union Parishad	09/10/2017	2:00 pm
Pabna	Bera	Bera Sadar	Bera Fisheries Office	27/12/2016	11:00 am
Pabna	Bera	Koitala	Courtyard of Mr. Akash kalidas house	27/12/2016	3:00 pm
Pabna	Pabna Sadar	Pabna Sadar	District Fisheries Office	27/12/2016	7:30 pm
Sirajganj	Shahjadpur	Verakhola	Verakhola old regulator site	28/12/2016	9:30 am

**Table G1-2: Public Consultation and FGD Meeting Participants Details**

Meeting venue	Type of Participants	No. participants
Harirampur (PLB-1) Public Meeting	BWDB staff, ADB consultants, Former UP Chairman, farmer, Fishermen, local notable persons, local social worker, healthcare assistants, businessmen, traders, and NGO staff	28
Shahjadpur (JRB-1) Public meeting Ratankandi	BWDB staff, UP Chairman, Public representatives, farmer, fishermen, local notable persons, local social worker, healthcare assistants, businessmen, traders, student and NGO staff	121
Chauhali (JLB-2) Public Meeting	BWDB staff, Public representatives, farmer, fishermen, local notable persons, freedom fighter, village doctor, local social worker, healthcare assistants, businessmen, traders and NGO staff	87
Harirampur (PLB-1) Public meeting Boyra	BWDB staff, UP Chairman, Public representatives, farmer, fishermen, local notable persons, local social worker, businessmen, traders and NGO staff	26
Chauhali (JLB-2)	BWDB staff, Upazila Chairman, Public representatives, farmer, fishermen,	21

Meeting venue	Type of Participants	No. participants
Public Meeting Char Solimabad	local notable persons, local social worker, businessmen, teacher, Imam, traders	
Chauhali (JLB-2) Public Meeting Khaspukuria	BWDB staff, Upazila Chairman, UP Chairman, Public representatives, farmer, fishermen, local notable persons, local social worker, student, businessmen, teacher, Imam, traders	25
Bera (JRB-1) FGD	BWDB staff, consultants, Former UP Chairperson, farmer, fisheries office, NGO staff	7
Bera (JRB-1) FDG	BWDB representatives, consultants, ex. UP members, farmer, owner of bird satctuary, local resident	6
Pubna (JRB-1) FDG	ISPMC consultant, Dirstrict Fisheries officer	3
Shahjadpur (JRB-1) FDG	BWDB staff, ISPMC consultants, Former UP Chairperson, farmer, fishermen, boatman, businessmen,	12

### SUMMARY OF CONCERNS, ALL MEETINGS

**Erosion** - Stakeholders and local people were informed about the project intervention of bank protection in order to establish river stabilisation. They were fully agreed in favour of bank protection but emphasized the need to ensure that construction work is of high quality. They also demanded to get compensation of their land used for the Project in a short period.

**Flooding**- Stakeholders were informed that the proposed embankment will help to protect from flooding. Stakeholders stated that the embankment will not control flood without river dredging and therefore dredging should be incorporated in the project.

**Land use** - Stakeholders were advised that the project would induce significant changes in land type, land use, and increased food production. They agreed the out come of the project implementation though they have limited idea about the project benefits other than erosion and flood control.

**Fish habitat** - Stakeholders were informed that the project is expected to have negative impacts on fish and other aquatic fauna due to reduction of river width by the proposed interventions. Local participants suggested restoring fisheries habitat through pilot dredging of channels and provide adequate number of fish pass regulators for connectivity with the flood plain and river.

**Pollution** - Stakeholders were advised that the construction phase would cause temporary air pollution and noise. Almost all stakeholders present consented to accept these impacts during construction.

**Resettlement** - Participants were informed that, at the time of the meetings, households in Horirampur of Manikgonj and Chouhali of Sirajgonj district would require relocation to suitable alternate sites before the beginning of construction, per Project-2 resettlement plans.

**Improved road transportation** - Participants were informed that flood embanbkments would be provided with appropriate road facilities.

**Employment** - Participants were informed that the subproject's reduction of the areas' vulnerability will improve conditions for trade and commerce. Project construction will provide temporary employment opportunities to local people.

**Addition of dredging to subproject designs** - River dredging has not been included in subproject designs. Participants strongly recommended that it be added, as they believe flood and erosion control cannot be achieved in these areas without it. Some participants suggested capital dredging from Jamuna Bridge to Brahmarkanda of Horirampur upazia under Manikgonj district.

**Successful implementation** - Participants are concerned that development projects initiated by the ruling party will lose priority if/when the opposition party is in power. Participants strongly urge early construction start.

**Flood protection plans** - Participants expressed concern about the effectiveness of the subprojects in controlling flooding. They stated that flood protection plans should be developed based on an assessment of water levels. Proposed interventions should be designed to provide protection from the highest monsoon water levels.

## NOTES OF SPECIFIC MEETINGS

### Harirampur, Manikganj (PLB-1 area)

The participants in the public meeting at Gopinathpur are strongly in favour of constructing the flood embankment from Paturia to Dohar (32 Km.) but they argued to add more ventage of the regulator and provide fish pass which is being constructed by LGED. They also requested to provide adequate number of regulators with fishpass provision in different proper locations of the embankments.

They demanded to take program for bank protection work at the upstream of bank protection work done in 2015-16 dry season as there is still erosion there. They also requested to construct atleast one boat pass facilities in this area to make it convenient for transporting their commodity to the local bazar.

They informed that the Embankment constructed by LGED is dwarf and weak in section as such they had to face a lot of trouble during rainy season as some portion of the embankment breached or tend to breach. They urged to strengthen the Embankment around the Gopinathpur beel area

In connection of the land acquisition issues, they are willing to give land which is required for Project implementations but they emphasized for getting compensation in time.

### Shahjadpur, Sirajganj (JRB-1 area), FGD

The participants in the FGD meeting opined to extent the Embankment up to Baghabari from where the Project-1 embankment ends. They strongly recommended that the riverside slope of the embankment should be protected for wave action as there occur high wave during monsoon.

They demanded to provide regulator with adequate number of ventage and also rehabilitate the existing regulator which was constructed in the previous project. They also requested to lower down the sill level of the regulators for fish migration.

### Bera, Sirajganj (JRB-1 area), FGD

A FGD meeting was conducted at the courtyard of Mr. Akash Kalidas who established a bird sanctuary in his residence containing 165 decimal of land. He informed a considerable number of migratory birds come every year during winter season. But this number is decreasing as some people of the locality hunt birds unlawfully when the birds used to collect food from beels and fields at night. The owner of the sanctuary and local people demanded to take administrative legal action against the bird hunters.

### Shahjadpur, Sirajganj (JRB-1)

A public meeting was held at Ratankandi Ideal High School where the participants demanded to construct flood embankment from Verakhola to Shahjadpur-koijuri road. They informed that there was embankment along this alignment but it was eroded by the river



erosion. So there was land acquisition by BWDB which may be followed to save the cost of land acquisition. They urged to provide regulators with fish pass where necessary.

### **Chauhali, Seraigonj (JLB-2)**

The participants in a public meeting at Chauhali Degree Collage informed the protective work done in 2015-16 dry season have been eroded in some places. They demanded to repair these damaged portions on emergent basis. They also informed during the flood season crops damaged due to innandation of field. While disclosing that proect has a plan to stabilize the Jamuna River and construct flood embankment along both banks of the Jumuna, they strongly supported the project plan and expressed their full cooperation in implementing the project plan.

Another two public meetings were conduced in this sub-reach, one at Char Solimabad another at Kaskaulia of Chauhali Upazila to receive the local public opinion for the proposed closure dam on the newly developed channel from Jamuna. The local people informed the newly developed channel eroded their homestead and other assets and it is aggravated day by day. They demanded to control this erosion. While informing the participants of the meeting that project has freamed a plan to construct a closure dam over this newly developed channel for depositing silt and therby the erosion will be checked, they strongly supported the plan and demanded to implement the work with emergent basis. They expressed their full cooperation in implementing the work.

### **Public Consultation Matrix- Comments/Opinion of the Participants and address by the Project**

Sl. No.	Comments/Opinion of the participants during consultation	Addressed in the Project
<b>General Comment</b>		
1.	While informing stakeholders and local people about the project interventions they are fully agreed in favour of bank protection and demanded to extend the protection work. They emphasized the need to ensure that construction work is of high quality	The bank protection work will be done as per technical need of the specific location. Quality of bank protection work will be ensured by Consultants, field staff of PMO and regular task force team of BWDB
2.	The participants raised their voice to get compensation of the land used for Project interventions in short time	The PMO staff and engaged NGO will pursue on regular basis to the concerned Deputy commissioner's office so that the compensations could be paid with in shortest possible time
3.	Stakeholder were informed that the proposed embankment to protect flooding. They expressed that only the embankment construction will not control flood. They are in favour of river dredging and demanded for incorporation of dredging in the project.	The issue was discussed with river stabilization technical team. They will provide dredging if it is feasible in context of river stabilization.
4.	Participants suggested restoring fisheries habitat through pilot dredging of channels and provide adequate number of fish pass regulators for connectivity with the flood plain and river	The EIA team shared these stakeholder opinions with BWDB officials and ISPMC's team members for technical solution. The suggestion is well taken. The design team is providing fish-pass regulators to

Sl. No.	Comments/Opinion of the participants during consultation	Addressed in the Project
		restore connectivity with the flood plain and river at feasible locations
5.	While informing the stakeholders that during construction temporary air pollution and noise may cause, which they consented to accept these impacts during construction	Noted and included in the EIA
6.	Probable project affected people expressed their views to relocate to suit able alternative sites before the start of construction	These issues will be addressed in the Resettlement program of the Project.
7.	Participants demanded for providing appropriate road facilities.	Project have a plan to provide road facilities over the flood embankment
8.	Participants enquired about the employment opportunities of the local people in the project work	Project construction will provide temporary employment opportunities to local people
9.	Participants recommended to include dredging as they believe flood and erosion control could not be achieved without dredging.	The scope River dredging to control erosion will be thoroughly investigate by the project design team. Necessary arrangement will be provided after feasibility study of the Project.
10.	Participants were concerned about development projects initiated by the ruling party will lose priority if/when the opposition party is in power. So, they strongly urged early implementation of the Project.	Noted and included in the EIA
11.	Participants expressed concerned about the effectiveness of the subproject in controlling flooding. Proposed interventions should be designed to provide protection from the highest monsoon water level.	Renowned international and national experts are taking care of it
<b>Public Consultation of the Specific Meetings</b>		
12.	At Gopinathpur public meeting the participants were in favour of constructing flood embankment from Paturia to Dohar. They urged to add more ventage of the regulator and provide fish pass which is being constructed by LGED. They also requested to provide adequate number of regulators with fish pass provision in suitable location of the embankments	Renowned international and national experts are taking care of it
13.	The participants in the FGD meeting at Shahjadpur, Sirajgonj (JRB-1) opined to extent the Embankment up to Baghabari from where the Project -1 embankment ends. They recommended that the riverside slope of the embankment should be protected from wave action as there occur high wave during monsoon. They demanded	The proposal for constructing embankment has been included in the Project-2 work. The experts of the team is working for fish pass regulators along with the sill level as requested.

Sl. No.	Comments/Opinion of the participants during consultation	Addressed in the Project
	to provide regulator with adequate numbers of ventage and also rehabilitate the existing regulator. They also requested to lower down the sill level of the regulators for fish migration	
14.	The participants of the FGD meeting at Bera Sirajgonj (JRB-1) informed that a considerable number of migratory birds come every year during winter season, but this number is decreasing as some people of the locality hunt the birds unlawfully when birds used to collect food from beels and fields at night. The local people asked to take administrative legal action against poacher	Noted and included in EIA. The opinion has been sheared with BWDB official for taking necessary action.
15.	The participants in a public meeting at Ratankandi Ideal High School demanded to construct flood embankment from Verakhola to Shahjadpur-Koijuri road. They informed there was land acquisition by BWDB in the previous embankment which may be followed to save the cost of land acquisition for new embankment.	The requested embankment reach has been included in the Project-2 interventions. The Pervious land acquisition by BWDB has been followed as per as feasible.
16.	The Public meeting at Chauhali Degree Collage, the participants demanded to repair the damaged portion of the protective work done in 2015-16 on emergent basis. They also urged to save their crops from monsoon flood.	The Project has taken up to repair the damage portion of the protective worked done in 2015-16. The participants were informed that Project has a plan to construct flood embankment along the bank of the Jamuna as a part of River stabilization plan.
17.	The participants in public meeting at Char Solimabad and Kaskaulia (JLB-2) demanded to control the erosion of the newly developed channel which eroding their homestead and other assets.	The Project has a program to construct a closure dam at the mouth of the newly developed channel in 2017-18 dry season. This will ensure the erosion control and about 5000 ha of land will be reclaimed by silt deposition.

**Some example photos of public consultation meetings (PCM) at various locations**



PCM at Bhadurpur, Harirampur



PCM at Ratankandi, Shahjadpur



PCM at Chauhali



PCM at Boyra, Harirampur



PCM at Char solimabad, Chauhali

**First Round Meeting Sign-in sheet, Gopinathpur, Harirampur, Manikgonj**

গোপীনাথপুর বিল এলাকায় মৎস্য অভয়াশ্রম প্রকল্প বাস্তবায়নের জন্য উপস্থিতির তালিকা

স্থান: বাহাদুরপুর, ঝাড়া, গোপীনাথপুর, টিলা (দারসাম) নি: ৩০, আদি২৮

তারিখ: ১৭.১০.২০১৬ খ্রিঃ

ক্রমিক নং	নাম	পেশা/পদবী	মোবাইল নং	স্বাক্ষর
০১	সুজাতা দেবী	সহকারী (সে:সি:সি) (দারসাম)	০১৭৩১-৩৩৭৭৫৫	সুজাতা দেবী
০২	মোঃ মোস্তাফিজুর রহমান	সহকারী (সে:সি:সি) (দারসাম)	০১৭২৪-৭৩৩৩৩৪	মোঃ মোস্তাফিজুর রহমান
০৩	মোঃ মাহমুদুল ইসলাম	সহকারী (সে:সি:সি) (দারসাম)	-	-
০৪	মোঃ মোস্তাফিজুর রহমান	সহকারী (সে:সি:সি) (দারসাম)	-	মোঃ মোস্তাফিজুর রহমান
০৫	মোঃ মোস্তাফিজুর রহমান	সহকারী (সে:সি:সি) (দারসাম)	০১৭১১০৩২৭৬	মোঃ মোস্তাফিজুর রহমান
০৬	মোঃ মোস্তাফিজুর রহমান	সহকারী (সে:সি:সি) (দারসাম)	০১৭১৫-১৩৬৩৪০	মোঃ মোস্তাফিজুর রহমান
০৭	মোঃ মোস্তাফিজুর রহমান	সহকারী (সে:সি:সি) (দারসাম)	০১৭৩১-৪০৩৩৬১	মোঃ মোস্তাফিজুর রহমান
০৮	মোঃ কুদ্দুস মিয়া	সহকারী (সে:সি:সি) (দারসাম)	০১৭২৩-৭৬৭৪৬৬	মোঃ কুদ্দুস মিয়া
০৯	মোঃ মাহমুদুল ইসলাম	সহকারী (সে:সি:সি) (দারসাম)	০১৭৩৪-০০২২৫৯	মোঃ মাহমুদুল ইসলাম
১০	মোঃ মোস্তাফিজুর রহমান	সহকারী (সে:সি:সি) (দারসাম)	-	মোঃ মোস্তাফিজুর রহমান
১১	মোঃ মোস্তাফিজুর রহমান	সহকারী (সে:সি:সি) (দারসাম)	-	মোঃ মোস্তাফিজুর রহমান
১২	মোঃ মোস্তাফিজুর রহমান	সহকারী (সে:সি:সি) (দারসাম)	-	মোঃ মোস্তাফিজুর রহমান
১৩	মোঃ মোস্তাফিজুর রহমান	সহকারী (সে:সি:সি) (দারসাম)	০১৭৩৪-২৫০৬০২	মোঃ মোস্তাফিজুর রহমান
১৪	মোঃ মোস্তাফিজুর রহমান	সহকারী (সে:সি:সি) (দারসাম)	-	মোঃ মোস্তাফিজুর রহমান
১৫	মোঃ মোস্তাফিজুর রহমান	সহকারী (সে:সি:সি) (দারসাম)	০১৭১১২৫৭৬৭৬	মোঃ মোস্তাফিজুর রহমান
১৬	মোঃ মোস্তাফিজুর রহমান	সহকারী (সে:সি:সি) (দারসাম)	০১৭৩৪০৭২০৬৭	মোঃ মোস্তাফিজুর রহমান
১৭	মোঃ মোস্তাফিজুর রহমান	সহকারী (সে:সি:সি) (দারসাম)	-	মোঃ মোস্তাফিজুর রহমান
১৮	মোঃ মোস্তাফিজুর রহমান	সহকারী (সে:সি:সি) (দারসাম)	-	মোঃ মোস্তাফিজুর রহমান
১৯	মোঃ মোস্তাফিজুর রহমান	সহকারী (সে:সি:সি) (দারসাম)	-	মোঃ মোস্তাফিজুর রহমান

**Thir Round Meeting Sign-in sheet, Gopinathpur, Harirampur, Manikgonj**

গোপীনাথপুর বিল এলাকায় মৎস্য অভয়াশ্রম প্রকল্প বাস্তবায়নের জন্য উপস্থিতির তালিকা

স্থান: *বাস্তবায়ন প্রকল্প (গোপীনাথপুর) বিল (নোয়াখালী) সি: বও, জেলা: নোয়াখালী*

তারিখ: *১৭.১০.২০২১*

ক্রমিক নং	নাম	পেশা/পদবী	মোবাইল নং	স্বাক্ষর
২০।	<i>শ্রী: মোঃ হাইদারুল ইসলাম</i>	<i>স্বাক্ষরকারী</i>	<i>০১৬৮৫৫৭৭০৪০</i>	<i>(সি: বও, জেলা: নোয়াখালী)</i>
২১।	<i>শ্রী: মোঃ মাসুদ হোসেন</i>	<i>শ্রী: ৭</i>	<i>০১৭৩৭-০০২২৬১</i>	<i>১৭/১০/২১</i>
২২।	<i>শ্রী: মোঃ মাসুদ হোসেন</i>	<i>শ্রী: ৭</i>	<i>০১৭৩৭ ৩৭ ৩৬৭০</i>	<i>শ্রী: মাসুদ হোসেন</i>
২৩।	<i>শ্রী: মোঃ মাসুদ হোসেন</i>	<i>শ্রী: ৭</i>		<i>শ্রী: মাসুদ হোসেন</i>
২৪।	<i>শ্রী: মোঃ মাসুদ হোসেন</i>	<i>Env. Specialist</i>	<i>০১৭১৫-৩১৫২২৭</i>	<i>শ্রী: মোঃ মাসুদ হোসেন</i>
২৫।	<i>শ্রী: মোঃ মাসুদ হোসেন</i>	<i>ISPMC, Jr. Water Resources</i>	<i>০১৬৭৬৯১৫৩৬০</i>	<i>শ্রী: মোঃ মাসুদ হোসেন</i>
২৬।	<i>শ্রী: মোঃ মাসুদ হোসেন</i>	<i>Engg. Construction</i>	<i>০১৭১১০৩১১৭০</i>	<i>শ্রী: মোঃ মাসুদ হোসেন</i>
২৭।	<i>শ্রী: মোঃ মাসুদ হোসেন</i>	<i>Engineer</i>	<i>০১৮১৮৭৯৪৪০১</i>	<i>শ্রী: মোঃ মাসুদ হোসেন</i>
২৮।	<i>শ্রী: মোঃ মাসুদ হোসেন</i>	<i>Site-Engineer</i>	<i>০১৭১৫০২২২১২</i>	<i>শ্রী: মোঃ মাসুদ হোসেন</i>

**Third Round Meeting Sign-in Sheet, Ratankandi, Shahjadpur**



Flood and Riverbank  
Erosion Risk Management  
Investment Program

আহমেদপুর থেকে বাদলবাড়ি পর্যন্ত ৬.৫০ কি:মি: প্রস্তাবিত বন্যা নিয়ন্ত্রন বাঁধ  
নির্মাণ সম্পর্কিত মত বিনিময় সভার অংশগ্রহণকারীগণের নাম ও সাফর

স্থান: রতনকান্দি আদর্শ হাই স্কুল  
হাবিবুল্লাহ নগর ইউনিয়ন পরিষদ, শাহজাদপুর, সিরাজগঞ্জ

সময়: দুপুর ২ টা তারিখ: ২২/০২/২০১৭

ক্রমিক নম্বর	নাম	পেশা / পদবি	সাফর
১	শাহজাদপুর-১১-১৩৩	ডেপুটি কমিশনার শাহজাদপুর	[Signature]
২	মো: বাবুল আলম	সহকারী কমিশনার শাহজাদপুর	[Signature]
৩	মো: মাহবুবুল আলম	সহকারী কমিশনার শাহজাদপুর	[Signature]
৪	মো: মাহবুবুল আলম	সহকারী কমিশনার শাহজাদপুর	[Signature]
৫	মো: মাহবুবুল আলম	সহকারী কমিশনার শাহজাদপুর	[Signature]
৬	মো: মাহবুবুল আলম	সহকারী কমিশনার শাহজাদপুর	[Signature]
৭	মো: মাহবুবুল আলম	সহকারী কমিশনার শাহজাদপুর	[Signature]
৮	মো: মাহবুবুল আলম	সহকারী কমিশনার শাহজাদপুর	[Signature]
৯	মো: মাহবুবুল আলম	সহকারী কমিশনার শাহজাদপুর	[Signature]
১০	মো: মাহবুবুল আলম	সহকারী কমিশনার শাহজাদপুর	[Signature]
১১	মো: মাহবুবুল আলম	সহকারী কমিশনার শাহজাদপুর	[Signature]
১২	মো: মাহবুবুল আলম	সহকারী কমিশনার শাহজাদপুর	[Signature]
১৩	মো: মাহবুবুল আলম	সহকারী কমিশনার শাহজাদপুর	[Signature]
১৪	মো: মাহবুবুল আলম	সহকারী কমিশনার শাহজাদপুর	[Signature]
১৫	মো: মাহবুবুল আলম	সহকারী কমিশনার শাহজাদপুর	[Signature]
১৬	মো: মাহবুবুল আলম	সহকারী কমিশনার শাহজাদপুর	[Signature]
১৭	মো: মাহবুবুল আলম	সহকারী কমিশনার শাহজাদপুর	[Signature]
১৮	মো: মাহবুবুল আলম	সহকারী কমিশনার শাহজাদপুর	[Signature]
১৯	মো: মাহবুবুল আলম	সহকারী কমিশনার শাহজাদপুর	[Signature]
২০	মো: মাহবুবুল আলম	সহকারী কমিশনার শাহজাদপুর	[Signature]
২১	মো: মাহবুবুল আলম	সহকারী কমিশনার শাহজাদপুর	[Signature]
২২	মো: মাহবুবুল আলম	সহকারী কমিশনার শাহজাদপুর	[Signature]

ISPMC  
Institutional strengthening and  
project management consultant

Joint Venture:  
**nhc** north west hydraulic consultants  
**Mott MacDonald**

Project Office:  
House 45 (2<sup>nd</sup> Floor)  
Road 27, Banani  
Dhaka 1213, Bangladesh

আহমেদপুর থেকে বাদলবাড়ি পর্যন্ত ৬.৫০ কিঃমিঃ প্রস্তাবিত বন্যা নিয়ন্ত্রন বাঁধ  
নির্মাণ সম্পর্কিত মত বিনিময় সভার অংশগ্রহণকারীগণের নাম ও সাফর

স্থান: রতনকান্দি আদর্শ হাই স্কুল  
হাবিবুল্লাহ নগর ইউনিয়ন পরিষদ, শাহজাদপুর, সিরাজগঞ্জ

সময়: দুপুর ২ টা

তারিখ: ২২/০২/২০১৭

ক্রমিক নম্বর	নাম	পেশা / পদবি	সাফর
২৩	শ্রীমতী মোঃ নূরুজ্জামান	শ্রীমতী	
২৪	শ্রীমতী মোঃ গাজল হক	শ্রীমতী	
২৫	শ্রীঃ রফিকুল ইসলাম	শ্রীঃ	
২৬	শ্রীঃ মোঃ মাসুদ হোসেন	শ্রীঃ	
২৭	" চাঁদ মোকাম্মিল	শ্রীঃ	
২৮	" শহিদুল ইসলাম (শ্রীঃ)	শ্রীঃ	
২৯	শ্রীঃ নিসার কান্ত জামান		
২০	শ্রীঃ মোঃ বাবুল হোসেন	শ্রীঃ	
২১	শ্রীঃ মোঃ মাসুদ হোসেন	শ্রীঃ	
২২	শ্রীঃ মোঃ মাসুদ হোসেন	শ্রীঃ	
২৩	শ্রীঃ মোঃ মাসুদ হোসেন		
২৪	শ্রীঃ মোঃ মাসুদ হোসেন		



আহমেদপুর থেকে বাদলবাড়ি পর্যন্ত ৬.৫০ কিঃমিঃ প্রস্তাবিত বন্যা নিয়ন্ত্রন বাঁধ  
নির্মাণ সম্পর্কিত মত বিনিময় সভার অংশগ্রহণকারীগণের নাম ও সাফর

স্থান: রতনকান্দি আদর্শ হাই স্কুল  
হাবিবুল্লাহ নগর ইউনিয়ন পরিষদ, শাহজাদপুর, সিরাজগঞ্জ

সময়: দুপুর ২ টা

তারিখ: ২২/০২/২০১৭

ক্রমিক নম্বর	নাম	পেশা / পদবি	সাফর
২৫	মো: হান্না বাবুল		মো: হান্না বাবুল
২৬	মো: কামরুল হক		মো: কামরুল হক
২৭	বাবুল		বাবুল
২৮	মো: হুমায়ুন কবীর		মো: হুমায়ুন কবীর
২৯	মুন্সের		মুন্সের
৩০	মো: তরু ডালিম		মো: তরু ডালিম
৩১	মো: রুহুল ক্বারী		মো: রুহুল ক্বারী
৩২	মো: জাহাঙ্গীর আলী		মো: জাহাঙ্গীর আলী
৩৩	হারুন		হারুন
৩৪	মো: রুহুল ক্বারী		মো: রুহুল ক্বারী
৩৫	মো: মোস্তাফিজুর রহমান		মো: মোস্তাফিজুর রহমান
৩৬	মো: কামরুল হক		মো: কামরুল হক



আহমেদপুর থেকে বাদলবাড়ি পর্যন্ত ৬.৫০ কিঃমিঃ প্রস্তাবিত বন্যা নিয়ন্ত্রন বাঁধ  
নির্মাণ সম্পর্কিত মত বিনিময় সভার অংশগ্রহণকারীগণের নাম ও সাক্ষর

স্থানঃ রতনকান্দি আদর্শ হাই স্কুল  
হাবিবুল্লাহ নগর ইউনিয়ন পরিষদ, শাহজাদপুর, সিরাজগঞ্জ

সময়ঃ দুপুর ২ টা

তারিখঃ ২২/০২/২০১৭

ক্রমিক নম্বর	নাম	পেশা / পদবি	সাক্ষর
৪৯	মুহু	মুহু	মুহু
৫০	ফারুক হোসেন	ফারুক হোসেন	
৫১	রাফি আহমদ -	রাফি আহমদ	রাফি
৫২	জয়নাম	জয়নাম	
৫৩	রুবেল	রুবেল	রুবেল
৫৪	হাদিজ	হাদিজ -	হাদিজ
৫৫	জামিল	জামিল	জামিল
৫৬	মোঃ মুর্তাযা আলী	মুর্তাযা আলী	মুর্তাযা
৫৭	মোঃ ইয়াছিন আলী -	ইয়াছিন	ইয়াছিন
৫৮	মোঃ ফকির আলী	ফকির আলী	ফকির
৫৯	রাজন হোসেন	রাজন হোসেন	রাজন
৬০	মোঃ কবির হোসেন	কবির হোসেন	
	মোঃ জাহাঙ্গীর হোসেন	জাহাঙ্গীর	জাহাঙ্গীর





Flood and Riverbank  
Erosion Risk Management  
Investment Program

আহমেদপুর থেকে বাদলবাড়ি পর্যন্ত ৬.৫০ কিঃমিঃ প্রস্তাবিত বন্যা নিয়ন্ত্রন বাঁধ  
নির্মাণ সম্পর্কিত মত বিনিময় সভার অংশগ্রহণকারীগণের নাম ও সাফর

স্থান: রতনকান্দি আদর্শ হাই স্কুল  
হাবিবুল্লাহ নগর ইউনিয়ন পরিষদ, শাহজাদপুর, সিরাজগঞ্জ

সময়: দুপুর ২ টা

তারিখ: ২২/০২/২০১৭

ক্রমিক নম্বর	নাম	পেশা / পদবি	সাফর
৭৪	শ্রীমতী মোস্তাফিজা হোসেন		
৭৫	শ্রীমতী সুলতানা হায়াত		
৭৬	শ্রীমতী মতিয়া		
৭৭	ছানাত		
৭৮	শ্রীমতী মোস্তাফিজা হোসেন	শিক্ষক	স্বাক্ষর
৭৯	শ্রীমতী মোস্তাফিজা হোসেন		স্বাক্ষর
৮০	শ্রীমতী মোস্তাফিজা হোসেন	কর্মসূচী	স্বাক্ষর
৮১	শ্রীমতী মোস্তাফিজা হোসেন	কর্মসূচী	স্বাক্ষর
৮২	শ্রীমতী মোস্তাফিজা হোসেন		স্বাক্ষর
৮৩	শ্রীমতী মোস্তাফিজা হোসেন		স্বাক্ষর
৮৪	শ্রীমতী মোস্তাফিজা হোসেন		স্বাক্ষর
৮৫	শ্রীমতী মোস্তাফিজা হোসেন		

ISPMC  
Institutional strengthening and  
project management consultant

Joint Venture:  
**nhc**  
northwest hydraulic consultants  
**Mott MacDonald**

Project Office:  
House 45 (2<sup>nd</sup> Floor)  
Road 27, Banani  
Dhaka 1213, Bangladesh

আহমেদপুর থেকে বাদলবাড়ি পর্যন্ত ৬.৫০ কিঃমিঃ প্রস্তাবিত বন্যা নিয়ন্ত্রন বাঁধ  
নির্মাণ সম্পর্কিত মত বিনিময় সভার অংশগ্রহণকারীগণের নাম ও সাক্ষর

স্থানঃ রতনকান্দি আদর্শ হাই স্কুল  
হাবিবুল্লাহ নগর ইউনিয়ন পরিষদ, শাহজাদপুর, সিরাজগঞ্জ

সময়ঃ দুপুর ২ টা

তারিখঃ ২২/০২/২০১৭

ক্রমিক নম্বর	নাম	পেশা / পদবি	সাক্ষর
৫৬	মোঃ আমনুল আলী	ছাত্র	আমনুল আলী
৫৭	মোঃ আব্দুল হারদার	দাতি	আব্দুল হারদার
৫৮	মোঃ আলফাজ কাম্বু	ছাত্র	আলফাজ
৫৯	মোঃ হিদায়েত মল্লিক	ছাত্র	হিদায়েত
৬০	মোঃ আফাজুল হক	ছাত্র	আফাজুল হক
৬১	মিঃ হুসেন আলী	ছাত্র	হুসেন
৬২	মোঃ মোস্তাফিজুল হক	ছাত্র	মোস্তাফিজুল হক
৬৩	মোঃ বাহুবাহু	ছাত্র	বাহুবাহু
৬৪	মোঃ মিরাজুল হক	ছাত্র	মিরাজুল হক
৬৫	মোঃ রফিকুল হক	ছাত্র	রফিকুল হক
৬৬	মোঃ রহিম	ছাত্র	রহিম
৬৭	মোঃ মাসুদ	ছাত্র	মাসুদ



আহমেদপুর থেকে বাদলবাড়ি পর্যন্ত ৬.৫০ কিঃমিঃ প্রস্তুতকৃত বন্যা নিয়ন্ত্রন বাঁধ  
নির্মাণ সম্পর্কিত মত বিনিময় সভার অংশগ্রহণকারীগণের নাম ও সাক্ষর

স্থান: রতনকান্দি আদর্শ হাই স্কুল  
হাবিবুল্লাহ নগর ইউনিয়ন পরিষদ, শাহজাদপুর, সিরাজগঞ্জ

সময়: দুপুর ২ টা

তারিখ: ২২/০২/২০১৭

ক্রমিক নম্বর	নাম	পেশা / পদবি	সাক্ষর
১৮	শ্রীঃ রাসুল		শ্রীঃ নেত্রজ
১৯	শ্রীঃ গুরু কান্ত		
২০০	শ্রীঃ আব্দুল হক		শ্রীঃ সত্যজিৎ
২০২	শ্রীঃ আব্দুল হক		শ্রীঃ সত্যজিৎ
২০২	এ।এ.এ.		এ।এ.এ.
২০৬	শ্রীঃ আব্দুল হক		শ্রীঃ সত্যজিৎ
২০৮	শ্রীঃ আব্দুল হক		
২০৫	শ্রীঃ আব্দুল হক		শ্রীঃ সত্যজিৎ
২০৫	শ্রীঃ আব্দুল হক		শ্রীঃ সত্যজিৎ
২০৭	শ্রীঃ আব্দুল হক		
২০৮	শ্রীঃ আব্দুল হক	শ্রীঃ সত্যজিৎ	
২০৯	শ্রীঃ আব্দুল হক	শ্রীঃ সত্যজিৎ	

আহমেদপুর থেকে বাদলবাড়ি পর্যন্ত ৬.৫০ কিঃমিঃ প্রস্তাবিত বন্যা নিয়ন্ত্রন বাঁধ  
নির্মাণ সম্পর্কিত মত বিনিময় সভার অংশগ্রহণকারীগণের নাম ও সাফর

স্থান: রতনকান্দি আদর্শ হাই স্কুল  
হাবিবুল্লাহ নগর ইউনিয়ন পরিষদ, শাহজাদপুর, সিরাজগঞ্জ

সময়: দুপুর ২ টা

তারিখ: ২২/০২/২০১৭

ক্রমিক নম্বর	নাম	পেশা / পদবি	সাফর
২১০	সংগীতিকা	কৃষি	সংগীতিকা
২২২	ছালা	ভাড়া	
২২২	শ্রী: আফতায় হোসেন		
২২৬	শ্রী: মোহাম্মদ কবীর	ইঞ্জিনিয়ার	
২২৪	শ্রী: মোঃ হাইদারুল	কৃষি	
২২৫	শ্রী: মোঃ হাদ্দু		
২২৬	শ্রী: মোঃ কবীর		
২২৭	শ্রী: মোঃ মজিবুল হক		
২২৮	শ্রী: মোঃ হাবিবুল হক		
২২৯	শ্রী: মোঃ হাবিবুল হক	কৃষি	
২২০	শ্রী: মোঃ হাবিবুল হক	কৃষি	
২২২	শ্রী: মোঃ হাবিবুল হক	ছালা	ছালা





Flood and Riverbank  
Erosion Risk Management  
Investment Program

এফ. আর. ই. আর. এম. আই. পি এর আওতাধীন (২য় পর্যায়) চৌহালীর উজান  
ও ভাটিতে (Sub reach JLB-2) প্রস্তাবিত কাজ সমূহের উপর মত বিনিময় সভার  
অংশগ্রহণকারীগণের নাম ও সাক্ষর

স্থান: চৌহালী ডিগ্রী কলেজ  
চৌহালী, সিরাজগঞ্জ

সময়: দুপুর ৩ টা

তারিখ: ১৫/০৩/২০১৭

ক্রমিক নম্বর	নাম	পেশা / পদবি	সাক্ষর
১	আবদুল হক মাসুদ আলী	কৃষক	আবদুল হক মাসুদ আলী
২	হুমায়ুন মোঃ আব্দুল হালিম	চাকুরী	হুমায়ুন
৩	মোঃ জে. এ. কামাল হোসেন	চাকুরী	মোঃ জে. এ. কামাল হোসেন
৪	শ্রী, মাসুদ	ডাঃ মোঃ জে. এ. কামাল হোসেন কাজে, ৭/১২/১৬	শ্রী, মাসুদ
৫	মোঃ মদ কামাল হোসেন	চাকুরী	মোঃ মদ
৬	মো. জে. মাসুদ	কৃষক	মাসুদ
৭	আব্দুল হক মাসুদ	কৃষক	
৮	মো. আব্দুল হক	কৃষক	
৯	কামাল হোসেন	কৃষক	
১০	মো. আব্দুল হক	কৃষক	
১১	মোঃ আব্দুল হক	কৃষক	
১২	মোঃ আব্দুল হক	কৃষক	

ISPMC  
Institutional strengthening and  
project management consultant

Joint Venture:



Project Office:  
House 45 (2<sup>nd</sup> Floor)  
Road 27, Banani  
Dhaka 1213, Bangladesh



Flood and Riverbank  
Erosion Risk Management  
Investment Program

এফ. আর. ই. আর. এম. আই. পি এর আওতায় (২য় পর্যায়) চৌহালীর উজান  
ও ভাটিতে (Sub reach JLB-2) প্রস্তাবিত কাজ সমূহের উপর মত বিনিময় সভার  
অংশগ্রহণকারীগণের নাম ও সাফর

স্থান: চৌহালী ডিগ্রী কলেজ  
চৌহালী, সিরাজগঞ্জ

সময়: দুপুর ৩ টা

তারিখ: ১৫/০৩/২০১৭

ক্রমিক নম্বর	নাম	পেশা / পদবি	সাফর
১৩	বাকশা	প্রকৌশলী	
১৪	ভূগোলা	প্রকৌশলী	
১৫	ভূগোলা	প্রকৌশলী	
১৬	ডায়ালগ	কর্মী	
১৭	ভূগোলা	প্রকৌশলী	
১৮	রাউন্ড	প্রকৌশলী	
১৯	রাউন্ড	প্রকৌশলী	
২০	আল হাভা	প্রকৌশলী	
২১	মোঃ মোস্তাফিজুর রহমান		
২২	মোঃ মোস্তাফিজুর রহমান	অধিকারী (প্রকৌশলী)	
২৩	মোঃ কামরুজ্জামান		
২৪	মোঃ মোস্তাফিজুর রহমান		

ISPMC  
Institutional strengthening and  
project management consultant

Joint Venture:  
**nhc**  
northwest hydraulic consultants  
**m**  
Mott MacDonald

Project Office:  
House 45 (2<sup>nd</sup> Floor)  
Road 27, Banani  
Dhaka 1213, Bangladesh



Flood and Riverbank  
Erosion Risk Management  
Investment Program

এফ. আর. ই. আর. এম. আই. পি এর আওতায় (২য় পর্যায়) চৌহালীর উজান ও ভার্টিতে (Sub reach JLB-2) প্রস্তাবিত কাজ সমূহের উপর মত বিনিময় সভার অংশগ্রহণকারীগণের নাম ও সাফর

স্থান: চৌহালী ডিগ্রী কলেজ  
চৌহালী, গিরাজগঞ্জ

সময়: দুপুর ৩ টা

তারিখ: ১৫/০৩/২০১৭

ক্রমিক নম্বর	নাম	পেশা / পদবি	সাফর
২৩৭	শ্রী: ইমদাদুল হক	কৃষক	
২৩৮	শ্রী: চান্দুজ্জলিল	কৃষক	
২৩৯	শ্রী: মোহাম্মদ হোসেন	শ্রমিক	
২৪০	শ্রী: মোহাম্মদ		
২৪১	শ্রী: মোহাম্মদ হোসেন	কৃষক	
৩০০	শ্রী: মোহাম্মদ হোসেন	কৃষক	
৩০১	শ্রী: আবু হুসেইন		শ্রী: আবু হুসেইন
৩০২	শ্রী: মোহাম্মদ হোসেন	কৃষক	শ্রী: মোহাম্মদ হোসেন
৩০৩	শ্রী: মোহাম্মদ হোসেন	কৃষক	শ্রী: মোহাম্মদ হোসেন
৩০৪	শ্রী: মোহাম্মদ হোসেন	কৃষক	শ্রী: মোহাম্মদ হোসেন
৩০৫	শ্রী: মোহাম্মদ হোসেন	কৃষক	শ্রী: মোহাম্মদ হোসেন
৩০৬	শ্রী: মোহাম্মদ হোসেন	কৃষক	শ্রী: মোহাম্মদ হোসেন

ISPMC  
Institutional strengthening and  
project management consultant

Joint Venture:  
nhc  
northwest hydraulic consultants  
Mott MacDonald

Project Office:  
House 45 (2<sup>nd</sup> Floor)  
Road 27, Banani  
Dhaka 1213, Bangladesh



Flood and Riverbank  
Erosion Risk Management  
Investment Program

এফ. আর. ই. আর. এম. আই. পি এর আওতায় (২য় পর্যায়) চৌহালীর উজান  
ও ভাটিতে (Sub reach JLB-2) প্রস্তাবিত কাজ সমূহের উপর মত বিনিময় সভার  
অংশগ্রহণকারীগণের নাম ও সাফর

স্থান: চৌহালী ডিগ্রী কলেজ  
চৌহালী, সিরাজগঞ্জ

সময়: দুপুর ৩ টা

তারিখ: ১৫/০৩/২০১৭

ক্রমিক নম্বর	নাম	পেশা / পদবি	সাফর
৩৭	গাজুল আলী	ইন্সপেক্টর	
৩৮	ইমান আলী	স্বাক্ষর	
৩৯	মো: মো: বাবুল	ইন্সপেক্টর	স্বাক্ষর
৪০	মো: হুমায়ুন	ইন্সপেক্টর	
৪১	মুন্সিফুল	ইন্সপেক্টর	
৪২	মো: হুমায়ুন	ইন্সপেক্টর	স্বাক্ষর
৪৩	মো: হুমায়ুন	ইন্সপেক্টর	স্বাক্ষর
৪৪	মো: হুমায়ুন	ইন্সপেক্টর	স্বাক্ষর
৪৫	মো: হুমায়ুন	ইন্সপেক্টর	স্বাক্ষর
৪৬	মো: হুমায়ুন	ইন্সপেক্টর	স্বাক্ষর
৪৭	মো: হুমায়ুন	ইন্সপেক্টর	স্বাক্ষর
৪৮	মো: হুমায়ুন	ইন্সপেক্টর	স্বাক্ষর

ISPMC  
Institutional strengthening and  
project management consultant

Joint Venture:  
nhc  
northwest hydraulic consultants  
Mott MacDonald

Project Office:  
House 45 (2<sup>nd</sup> Floor)  
Road 77, Banani  
Dhaka 1213, Bangladesh



Flood and Riverbank  
Erosion Risk Management  
Investment Program

এফ. আর. ই. আর. এম. আই. পি এর আওতায় (২য় পর্যায়) চৌহালীর উজান ও ভাটিতে (Sub reach JLB-2) প্রস্তাবিত কাজ সমূহের উপর মত বিনিময় সভার অংশগ্রহণকারীগণের নাম ও সাক্ষর

স্থান: চৌহালী ডিগ্রী কলেজ  
চৌহালী, সিরাজগঞ্জ

সময়: দুপুর ৩ টা

তারিখ: ১৫/০৩/২০১৭

ক্রমিক নম্বর	নাম	পেশা / পদবি	সাক্ষর
১৯১	কাজী আব্দুল কাদের	কৃষি	বাহুবল
১৯২	মোঃ হোসেন হারুন	কৃষি	হোসেন
১৯৩	মোঃ হোসেন আলী	কৃষি	হোসেন
১৯৪	সিদ্দিক	কৃষি	সিদ্দিক
১৯৫	মোঃ মজিবুল ইসলাম	কৃষি	মজিবুল
১৯৬	মোঃ জাহিদুল ইসলাম	কৃষি	জাহিদুল
১৯৭	মোঃ আব্দুল হক	কৃষি	আব্দুল হক
১৯৮	মোঃ আব্দুল হক	কৃষি	আব্দুল হক
১৯৯	মোঃ আব্দুল হক	কৃষি	আব্দুল হক
২০০	মোঃ আব্দুল হক	কৃষি	আব্দুল হক
২০১	মোঃ আব্দুল হক	কৃষি	আব্দুল হক
২০২	মোঃ আব্দুল হক	কৃষি	আব্দুল হক
২০৩	মোঃ আব্দুল হক	কৃষি	আব্দুল হক
২০৪	মোঃ আব্দুল হক	কৃষি	আব্দুল হক
২০৫	মোঃ আব্দুল হক	কৃষি	আব্দুল হক
২০৬	মোঃ আব্দুল হক	কৃষি	আব্দুল হক
২০৭	মোঃ আব্দুল হক	কৃষি	আব্দুল হক
২০৮	মোঃ আব্দুল হক	কৃষি	আব্দুল হক
২০৯	মোঃ আব্দুল হক	কৃষি	আব্দুল হক
২১০	মোঃ আব্দুল হক	কৃষি	আব্দুল হক

ISPMC  
Institutional strengthening and  
project management consultant

Joint Venture:  
**nhc**  
northwest hydraulic consultants  
**Mott MacDonald**

Project Office:  
House 45 (2<sup>nd</sup> floor)  
Road 27, Banan  
Dhaka 1213, Bangladesh



Flood and Riverbank  
Erosion Risk Management  
Investment Program

এফ. আর. ই. আর. এম. আই. পি এর আওতায় (২য় পর্যায়) চৌহালীর উজান ও ভাটিতে (Sub reach JLB-2) প্রস্তাবিত কাজ সমূহের উপর মত বিনিময় সভার অংশগ্রহণকারীগণের নাম ও সাফর

স্থান: চৌহালী ডিগ্রী কলেজ  
চৌহালী, সিরাজগঞ্জ

সময়: দুপুর ৩ টা

তারিখ: ১৫/০৩/২০১৭

ক্রমিক নম্বর	নাম	পেশা / পদবি	সাফর
৩১)	শ্রী: কজলুল হুদ	কৃষি	
৩২)	শ্রী: রুপকান্ত	কৃষি	অধ্যক্ষ
৩৩)	শ্রী: এম. হুমায়ুন	কৃষি	হুমায়ুন
৩৪)	শ্রী: তাহির মন্ডল	কৃষি	তাহির
৩৫)	শ্রী: মনিরুল হুমায়ুন	কৃষি	মনিরুল
৩৬)	শ্রী: মনিরুল হুমায়ুন	কৃষি	মনিরুল
৩৭)	শ্রী: মনিরুল হুমায়ুন	কৃষি	মনিরুল
৩৮)	শ্রী: মনিরুল হুমায়ুন	কৃষি	মনিরুল
৩৯)	শ্রী: মনিরুল হুমায়ুন	কৃষি	মনিরুল
৪০)	শ্রী: মনিরুল হুমায়ুন	কৃষি	মনিরুল
৪১)	শ্রী: মনিরুল হুমায়ুন	কৃষি	মনিরুল
৪২)	শ্রী: মনিরুল হুমায়ুন	কৃষি	মনিরুল

ISPMC  
Institutional strengthening and  
project management consultant

Joint Venture:  
**nhc**  
northwest hydraulic consultants  
**Mott MacDonald**

Project Office:  
House 45 (2<sup>nd</sup> Floor)  
Road 27, Banani  
Dhaka 1213, Bangladesh



Flood and Riverbank  
Erosion Risk Management  
Investment Program

এফ. আর. ই. আর. এম. আই. পি এর আওতায় (২য় পর্যায়) চৌহালীর উজান  
ও ভার্টিভে (Sub reach JLB-2) প্রস্তাবিত কাজ সমূহের উপর মত বিলিময় সভার  
অংশগ্রহণকারীগণের নাম ও মাধুর

স্থান: চৌহালী ডিগ্রী কলেজ  
চৌহালী, সিরাজগঞ্জ

সময়: দুপুর ৩ টা

তারিখ: ১৫/০৩/২০১৭

ক্রমিক নম্বর	নাম	পেশা / পদবি	মাধুর
০১	শ্রীঃ অঃ মাসুদ	মুনিম লেভেল	মাসুদ
০২	শ্রীঃ মোহাম্মদুল হক	ফিল্ড	মোহাম্মদুল হক
০৩	শ্রীঃ মোঃ হাদিস	ইঞ্জিনিয়ার	হাদিস
০৪	শ্রীঃ হাদিস	ইঞ্জিনিয়ার	হাদিস
০৫	শ্রীঃ হাদিস	ইঞ্জিনিয়ার	হাদিস
০৬	শ্রীঃ হাদিস	ইঞ্জিনিয়ার	হাদিস
০৭	শ্রীঃ হাদিস	ইঞ্জিনিয়ার	হাদিস
০৮	শ্রীঃ হাদিস	ইঞ্জিনিয়ার	হাদিস
০৯	শ্রীঃ হাদিস	ইঞ্জিনিয়ার	হাদিস
১০	শ্রীঃ হাদিস	ইঞ্জিনিয়ার	হাদিস
১১	শ্রীঃ হাদিস	ইঞ্জিনিয়ার	হাদিস
১২	শ্রীঃ হাদিস	ইঞ্জিনিয়ার	হাদিস
১৩	শ্রীঃ হাদিস	ইঞ্জিনিয়ার	হাদিস
১৪	শ্রীঃ হাদিস	ইঞ্জিনিয়ার	হাদিস
১৫	শ্রীঃ হাদিস	ইঞ্জিনিয়ার	হাদিস
১৬	শ্রীঃ হাদিস	ইঞ্জিনিয়ার	হাদিস
১৭	শ্রীঃ হাদিস	ইঞ্জিনিয়ার	হাদিস
১৮	শ্রীঃ হাদিস	ইঞ্জিনিয়ার	হাদিস
১৯	শ্রীঃ হাদিস	ইঞ্জিনিয়ার	হাদিস
২০	শ্রীঃ হাদিস	ইঞ্জিনিয়ার	হাদিস

ISPMC  
Institutional strengthening and  
project management consultant

Joint Venture:  
nhc  
northwest hydraulic consultants  
Mott MacDonald

Project Office:  
House 45 (2<sup>nd</sup> floor)  
Road 27, Banani  
Dhaka 1213, Bangladesh

এফ. আর. ই. আর. এম. আই. পি এর আওতায় (২য় পর্যায়) চৌহালীর উজান  
ও ভাটিতে (Sub reach JLB-2) প্রস্তাবিত কাজ সমূহের উপর মত বিনিময় সভার  
অংশগ্রহণকারীগণের নাম ও সাফর

স্থান: চৌহালী ডিগ্রী কলেজ  
চৌহালী, সিরাজগঞ্জ

সময়: দুপুর ৩ টা

তারিখ: ১৫/০৩/২০১৭

ক্রমিক নম্বর	নাম	পেশা / পদবি	সাফর
৭১	মোঃ মাহবুব হোসেন	কিঃসঃ (৫/৪)	মোঃ মাহবুব হোসেন
১০১	মোঃ শাহজাহান সিদ্দিক	নির্বাহী প্রকৌশলী বা.প.ভ.বা. টাঙ্গাইল	মোঃ শাহজাহান সিদ্দিক
১০২	মোঃ মোস্তফিজ হোসেন	অতিরিক্ত বিজ্ঞানসভা সদস্য/সিনিয়র প্রকৌশলী	মোঃ মোস্তফিজ হোসেন
১০২	মুহম্মদ হুসে	ডিপ্লোমা ইন সিস্টেম ডিভিশন ডিভিশন	Manjurul Haq
১০৩	মোঃ আব্দুল বাজাত	অধ্যক্ষ-পরিচালক এম.আই.পি.সি.সি.	মোঃ আব্দুল বাজাত
১০৪	মোঃ জাহাঙ্গীর হোসেন	ডিপ্লোমা ইন সিস্টেম (সি.আই.সি.) FRERMIP	মোঃ জাহাঙ্গীর হোসেন
১০৫		চাকরী- VRDS	
১০৬	মোঃ সালেম হোসেন	চাকরী- VRDS	মোঃ সালেম হোসেন
১০৭	মোঃ জাহাঙ্গীর হোসেন	চাকরী- VRDS	মোঃ জাহাঙ্গীর হোসেন



এফ. আর. ই. আর. এম. আই. পি. এর আওতায় (২য় পর্যায়) হরিরামপুরে প্রস্তাবিত বাঁধ ও স্লইছ গেট  
নির্মাণের উপর মত বিনিময় সভার অংশগ্রহণকারীগণের নামের তালিকা

স্থান : গাবুরাইল, বগুড়া জেলা  
সময় : ১১:০০

তারিখ : ০১/২৭/০৯/২০১৭

ক্রমিক নম্বর	নাম	পেশা/পদবি	সাক্ষর
০১	আব্দুল হক	ডেপুটি ইঞ্জিনিয়ার	হক
০২	মোঃ জাহিদ	ই.এস.ও	জাহিদ
০৩	মোঃ জাহিদ	ই.এস.ও	জাহিদ
০৪	মোঃ জাহিদ	ই.এস.ও	জাহিদ
০৫	মোঃ জাহিদ	ই.এস.ও	জাহিদ
০৬	মোঃ জাহিদ	ই.এস.ও	জাহিদ
০৭	মোঃ জাহিদ	ই.এস.ও	জাহিদ
০৮	মোঃ জাহিদ	ই.এস.ও	জাহিদ
০৯	মোঃ জাহিদ	ই.এস.ও	জাহিদ
১০	মোঃ জাহিদ	ই.এস.ও	জাহিদ
১১	মোঃ জাহিদ	ই.এস.ও	জাহিদ
১২	মোঃ জাহিদ	ই.এস.ও	জাহিদ
১৩	মোঃ জাহিদ	ই.এস.ও	জাহিদ
১৪	মোঃ জাহিদ	ই.এস.ও	জাহিদ

এফ. আর. ই. আর. এম. আই. পি. এর আওতায় (২য় পর্যায়) হরিরামপুরে প্রস্তাবিত বাঁধ ও ফ্লাইছ গেট  
নির্মাণের উপর মত বিনিময় সভার অংশগ্রহণকারীগণের নামের তালিকা

স্থান ০৫  
সময় ০৫

তারিখ ০৫ ২৭/০৯/২০১৭

ক্রমিক নম্বর	নাম	পেশা/পদবি	সাক্ষর
১৫	বেজিয়া	স্বাহিনী	বিজিয়া
১৬	আনকর	স্বাহিনী	
১৭	ইস্লাম	স্বাহিনী	ইস্লাম
১৮	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
১৯	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
২০	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
২১	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
২২	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
২৩	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
২৪	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
২৫	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
২৬	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
২৭	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
২৮	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
২৯	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
৩০	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
৩১	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
৩২	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
৩৩	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
৩৪	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
৩৫	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
৩৬	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
৩৭	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
৩৮	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
৩৯	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
৪০	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
৪১	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
৪২	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
৪৩	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
৪৪	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
৪৫	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
৪৬	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
৪৭	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
৪৮	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
৪৯	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ
৫০	আব্দুল হামিদ	স্বাহিনী	আব্দুল হামিদ



Flood and Riverbank  
Erosion Risk Management  
Investment Program

এফ. আর. ই. আর. এম. আই. পি. এর আওতায় (২য় পর্যায়) চৌহালীর ভাটিতে প্রস্তাবিত ফ্লোজার ডাম  
(ক্রস বাঁধ) নির্মাণের উপর মত বিনিময় সভার অংশগ্রহণকারীগণের নামের তালিকা

স্থান : চর আলিয়ারাবাদ  
সময় : ১১:০০

তারিখ : ১১/০৪/২০১৭

ক্রমিক নম্বর	নাম	পেশা/পদবি	সাক্ষর
১	আব্দুল্লাহ আল মামুন	জ্যেষ্ঠ সিনিয়র সিভিল ইঞ্জিনিয়ার	[Signature]
২	শ্রীমতি মোঃ মাহাবুব হোসেন	প: পিসি: (সিবি)	[Signature]
৩	ডাঃ আব্দুল মোমেন	সহকারী প্রকৌশলী	[Signature]
৪	মোঃ মোঃ মোঃ মোঃ মোঃ	সহকারী প্রকৌশলী	[Signature]
৫	মোঃ মোঃ মোঃ মোঃ	সহকারী প্রকৌশলী	[Signature]
৬	মোঃ মোঃ মোঃ মোঃ	সহকারী প্রকৌশলী	[Signature]
৭	শ্রী কামরুজ্জামান ইসলাম	সিনিয়র কম্পাউন্ড এন্ড সিস্টেম ইঞ্জিনিয়ার	[Signature]
৮	মোঃ আব্দুল হান্নান ইসলাম	সহকারী প্রকৌশলী	[Signature]
৯	মোঃ মোঃ মোঃ মোঃ	সহকারী প্রকৌশলী	[Signature]
১০	মোঃ মোঃ মোঃ মোঃ	সহকারী প্রকৌশলী	[Signature]
১১	মোঃ মোঃ মোঃ মোঃ	সহকারী প্রকৌশলী	[Signature]
১২	মোঃ আব্দুল কলাম মোস্তাফিজ	প্রকৌশলী	[Signature]
১৩	মোঃ মোঃ মোঃ মোঃ	সহকারী প্রকৌশলী	[Signature]
১৪	মোঃ মোঃ মোঃ মোঃ	সহকারী প্রকৌশলী	[Signature]

ISPMC  
Institutional strengthening and  
project management consultant

Joint Venture:  
**nhc** northest hydraulic consultants  
**Mott MacDonald**

Project Office:  
House 45 (2<sup>nd</sup> Floor)  
Road 27, Banani  
Dhaka 1213, Bangladesh  
Phone: 0088 (0) 2 986 1194

এফ. আর. ই. আর. এম. আই. পি. এর আওতায় (২য় পর্যায়) চৌহালীর ভাটিতে প্রস্তাবিত ক্রোজার ড্যাম  
(ক্রস বাঁধ) নির্মাণের উপর মত বিনিময় সভার অংশগ্রহণকারীগণের নামের তালিকা

স্থান :  
সময় :

তারিখ : ১০/০৯/২০১৭

ক্রমিক নম্বর	নাম	পেশা/পদবি	সাক্ষর
১৪	মুহাম্মদ হুসেইন	ইন্সপেক্টর	মুহাম্মদ হুসেইন
১৫	মুহাম্মদ হুসেইন	চাকুরী	মুহাম্মদ হুসেইন
১৬	মুহাম্মদ হুসেইন	সিএসসি	মুহাম্মদ হুসেইন
১৭	মুহাম্মদ হুসেইন	কম্পিউটার অপারেটর	মুহাম্মদ হুসেইন
১৮	মুহাম্মদ হুসেইন	কম্পিউটার অপারেটর	মুহাম্মদ হুসেইন
১৯	মুহাম্মদ হুসেইন	কম্পিউটার অপারেটর	মুহাম্মদ হুসেইন
২০	মুহাম্মদ হুসেইন	কম্পিউটার অপারেটর	মুহাম্মদ হুসেইন
২১	মুহাম্মদ হুসেইন	কম্পিউটার অপারেটর	মুহাম্মদ হুসেইন
২২	মুহাম্মদ হুসেইন	কম্পিউটার অপারেটর	মুহাম্মদ হুসেইন
২৩	মুহাম্মদ হুসেইন	কম্পিউটার অপারেটর	মুহাম্মদ হুসেইন
২৪	মুহাম্মদ হুসেইন	কম্পিউটার অপারেটর	মুহাম্মদ হুসেইন
২৫	মুহাম্মদ হুসেইন	কম্পিউটার অপারেটর	মুহাম্মদ হুসেইন
২৬	মুহাম্মদ হুসেইন	কম্পিউটার অপারেটর	মুহাম্মদ হুসেইন
২৭	মুহাম্মদ হুসেইন	কম্পিউটার অপারেটর	মুহাম্মদ হুসেইন
২৮	মুহাম্মদ হুসেইন	কম্পিউটার অপারেটর	মুহাম্মদ হুসেইন
২৯	মুহাম্মদ হুসেইন	কম্পিউটার অপারেটর	মুহাম্মদ হুসেইন
৩০	মুহাম্মদ হুসেইন	কম্পিউটার অপারেটর	মুহাম্মদ হুসেইন

8/



Flood and Riverbank  
Erosion Risk Management  
Investment Program

এফ. আর. ই. আর. এম. আই. পি. এর আওতায় (২য় পর্যায়) চৌহালীর ভাটিতে প্রস্তাবিত ক্রোজার ড্যাম  
(ক্রস বাঁধ) নির্মাণের উপর মত বিনিময় সভার অংশগ্রহণকারীগণের নামের তালিকা

স্থান : খাসম-পুকুরিয়া  
সময় : ৯:৩০ মি:

তারিখ : ১১/০৫/২০১৭

ক্রমিক নম্বর	নাম	পেশা/পদবি	সাক্ষর
১	শ্রীযুক্ত আম-হাসিন	ডেপুটি চৌহালী ক্রোজার	
২	মো: জন: সফিদুল হক	ডেপুটি খাসম-পুকুরিয়া	
৬	মো: আব্দুল রব্বি সিদ্দিকী	সহকারী খাসম-পুকুরিয়া	
৪	মো: মোস্তাফিজুল হক	ডেপুটি	
৫	মো: আব্দুল দারিদ হাফিজ	ডেপুটি	
৬	মো: মোস্তাফিজুল হক	সহকারী	
৭	মো: মোস্তাফিজুল হক	সহকারী	
৮	মো: মোস্তাফিজুল হক	সহকারী	
৯	মো: মোস্তাফিজুল হক	সহকারী	
১০	মো: মোস্তাফিজুল হক	সহকারী	
১১	মো: মোস্তাফিজুল হক	সহকারী	
১২	মো: মোস্তাফিজুল হক	সহকারী	
১৩	মো: মোস্তাফিজুল হক	সহকারী	
১৪	মো: মোস্তাফিজুল হক	সহকারী	
১৫	মো: মোস্তাফিজুল হক	সহকারী	
১৬	মো: মোস্তাফিজুল হক	সহকারী	
১৭	মো: মোস্তাফিজুল হক	সহকারী	

ISPMC  
Institutional strengthening and  
project management consultant

Joint Venture:  
**nhc**  
northwest hydraulic consultants  
**m**  
Mott MacDonald

Project Office:  
House 45 (2<sup>nd</sup> floor)  
Road 27, Banani  
Dhaka 1213, Bangladesh  
Phone: 0088 (0) 2 986 1194

এফ. আর. ই. আর. এম. আই. পি. এর আওতায় (২য় পর্যায়) চৌহালীর ভাটিতে প্রস্তাবিত ক্রোজার ড্যাম  
(ক্রস বাঁধ) নির্মাণের উপর মত বিনিময় সভার অংশগ্রহণকারীগণের নামের তালিকা

স্থান :  
সময় :

তারিখ : ১৯/০৩/২০১৭

ক্রমিক নম্বর	নাম	পেশা/পদবি	সাক্ষর
১৫৭	মেম: কামাল হোসেন	—	ক/ন/৮/৭
১৬০	৷ মঞ্জুর হোসেন	—	বকুল
১৬১	৷ কামাল হোসেন	—	চন্দ্রনাথ
১৬২	৷ মঞ্জুর হোসেন	১৬৩৬২২২২	মঞ্জুর হোসেন
১৬৩	৷ মেম: কামাল হোসেন	১৬৩৬২২২২	মেম: কামাল
২০১	৷ কামাল হোসেন	১৬৩৬	মেম: কামাল
২০২	৷ কামাল হোসেন	কামাল	মেম: কামাল
২২১	৷ কামাল হোসেন	১৬৩৬	১৬৩৬
২২২	৷ কামাল হোসেন	১৬৩৬	১৬৩৬
২২৩	৷ কামাল হোসেন	—	মেম: কামাল
২২৪	৷ কামাল হোসেন	—	মেম: কামাল
২২৫	মেম: কামাল হোসেন	নি: অ/কামাল হোসেন	মেম: কামাল



Flood and Erosion Risk  
Erosion Risk Management  
Investment Program

Focus Group Discussion

List of Participants

Location: ফেরা অফিস, সাতক্ষীরা জেলা Date: ২৪/০২/১৬  
 Venue: ফেরা অফিস (২য় তলা, ৪১৩) Time: ৯:৩০ AM

Sl NO	Name	Occupation	Mobile No	Signature
১	শ্রী. (মহাশয়) সত্যজিৎ	সহকারী (চাফালা) সত্যজিৎ	০১৭১১-৩৭৭৬৭৭	[Signature]
২	শ্রী. সত্যজিৎ	সহকারী (চাফালা)		[Signature]
৩	শ্রী. সত্যজিৎ	সহকারী (চাফালা)		[Signature]
৪	শ্রী. সত্যজিৎ	সহকারী (চাফালা)		[Signature]
৫	শ্রী. সত্যজিৎ	সহকারী (চাফালা)		[Signature]
৬	শ্রী. সত্যজিৎ	সহকারী (চাফালা)		[Signature]
৭	শ্রী. সত্যজিৎ	সহকারী (চাফালা)		[Signature]
৮	শ্রী. সত্যজিৎ	সহকারী (চাফালা)		[Signature]
৯	শ্রী. সত্যজিৎ	সহকারী (চাফালা)		[Signature]
১০	শ্রী. সত্যজিৎ	সহকারী (চাফালা)		[Signature]
১১	শ্রী. সত্যজিৎ	সহকারী (চাফালা)		[Signature]
১২	শ্রী. সত্যজিৎ	সহকারী (চাফালা)		[Signature]
১৩	শ্রী. সত্যজিৎ	সহকারী (চাফালা)		[Signature]
১৪	শ্রী. সত্যজিৎ	সহকারী (চাফালা)		[Signature]
১৫	শ্রী. সত্যজিৎ	সহকারী (চাফালা)		[Signature]
১৬	শ্রী. সত্যজিৎ	সহকারী (চাফালা)		[Signature]
১৭	শ্রী. সত্যজিৎ	সহকারী (চাফালা)		[Signature]
১৮	শ্রী. সত্যজিৎ	সহকারী (চাফালা)		[Signature]
১৯	শ্রী. সত্যজিৎ	সহকারী (চাফালা)		[Signature]
২০	শ্রী. সত্যজিৎ	সহকারী (চাফালা)		[Signature]
২১	শ্রী. সত্যজিৎ	সহকারী (চাফালা)		[Signature]
২২	শ্রী. সত্যজিৎ	সহকারী (চাফালা)		[Signature]

ISP/MC Institutional strengthening and project management consultants  
 Joint Venture: nhc millwest research consultants Mccormick & Macdonald  
 Project Office: House 45 (2<sup>nd</sup> Floor) Road 27, Barisal Dhaka 1213, Bangladesh

Third Round FGD meeting Sign-in Sheet, Fisheries Office, Bera



### Focus Group Discussion

#### List of Participants

Location: Upazila Fishery Office, Bera.

Date: 27/12/16.

SL NO	Name	Occupation	Mobile No	Signature
01.	Md. Golam Yeasin	Service Asst Fishery Officer.	01712 197339	
02	Md. Abdul Rahim	CF ENRS-WRAP	01729 434677	
03	Md. Lokman Hossain	Service - CF ENRS - WRAP-PP	01724 593985	
04	Md. Alamgir Hossain	Service S.C.T	01716 899070	
05	Md Obaydul Islam	S.C.T/ICA	01730 933009	
06	Md. Mahubul Islam	Service	01745048000	
07.	Md. Amin Faizal.	Env. Specialist FRERMIP.	01715 315227	

### Third Round FGD meeting Sign-in Sheet, Koitola, Bera



6



Flood and Riverbank  
Erosion Risk Management  
Investment Program

**Focus Group Discussion**

List of Participants

Location: *Bireal Sanctuary Sanctuary, Kaitola, Bara.* Date: *27/12/16*  
Time: *3:00 PM*

SL NO	Name	Occupation	Mobile No	Signature
1	<i>Sree Akash Kalidas Kaitola up.</i>	<i>Bireal Sanctuary owners</i>		<i>[Signature]</i>
2	<i>Sree Fominolirathk Shy</i>	<i>Local people</i>		<i>Fame</i>
3	<i>Sree Baisudev Shy</i>	<i>Farmer</i>	<i>01713745302</i>	<i>bksu</i>
4	<i>Sree Banesh Chandra son</i>	<i>Land owners</i>	<i>01741061673</i>	<i>[Signature]</i>
5	<i>Md Mizanur Rahman</i>	<i>Ex. U.P member</i>	<i>01678668391</i>	<i>[Signature]</i>
6	<i>Md. Amin Faisal</i>	<i>Environment specialist</i>	<i>01715315227</i>	<i>[Signature]</i>

ISPMC  
Institutional strengthening and  
project management consultant

Joint Venture:  
**nhc**  
northwest hydraulic consultants  
**Mott MacDonald**

Project Office:  
House 45 (2<sup>nd</sup> Floor)  
Road 27, Banani  
Dhaka 1213, Bangladesh



## **APPENDIX H - STANDARD CONSTRUCTION CONTACT ENVIRONMENTAL SAFEGUARD CLAUSES**

### **H1 Environmental Protection and Control of Pollution**

#### **H1-1 General**

The Contractor shall observe and comply with all National Laws and Government Regulations pertaining to environmental protection, pollution control, waste management, and biodiversity protection.

In conducting his construction activities, the Contractor shall take all necessary precautions to minimise environmental disturbance to the project area and surroundings and to prevent the escape of polluting substances into streams, water courses, and ground water. The Contractor shall also utilise all necessary practicable methods and devices as are available to prevent and otherwise minimize atmospheric emissions or discharges of air contaminants.

Except where otherwise agreed or provided for by the Employer or expressly stipulated in Particular Specifications or Technical Specifications forming part of the Contract Documents, no separate payment will be made for complying with the provisions of this Clause and attendant sub-clauses; and all costs shall be deemed to be included in the prices for the Contractor's mobilisation for construction, and the various rates and lump sum items for the works included in the priced Bill of Quantities.

#### **H1-2 Pollution of Water Courses and Streams**

The emission of polluting liquids or other waste into drains, water courses or ground water shall not be permitted.

No concrete or cement washings from the works or drainage from the Contractor's concrete batching and mixing areas, plants or other manufacturing or production facilities shall be allowed to discharge into streams or drains without passing through an adequate system of settling ponds.

Storage of fuels, fuelling and maintenance of plant and vehicles, etc. shall take place only on sites and under conditions that do not allow spilt fuels to be discharged to water bodies. Fuel storage and fuelling areas shall be equipped with adequate protective measures to confine and retain accidental spillages. No drainage from fuel store and plant maintenance depots shall be allowed to be discharged without passing through an adequate arrangement of oil traps and separators.

Washing of vehicles shall not be permitted in streams but only in specially designated and equipped areas.

Operations in quarries and borrow areas shall be carried out in such a way as to minimize any possible pollution from particulate matter entering the streams.

Adequate sanitary waste control facilities shall be provided in site offices and workers camps, and sewage waste shall be collected regularly and disposed in accordance with relevant environmental legislation.

The Contractor shall accordingly be responsible for the installation, operation and maintenance of a comprehensive drainage system to all areas of the Works. The system shall be constructed such that no discharges of oil, cement, silt or other liquid or solid waste

matter can enter the streams and water courses at the site; and it shall have all necessary solid waste and sediment traps, settling ponds, oil separators, etc. required to ensure that pollution of streams watercourses and natural bodies of water does not occur. The Contractor shall be responsible for maintaining the system to the satisfaction of the Employer's Construction Supervisor and all costs of providing the system shall be deemed to be included in the various rates and lump sum items for the works included in the priced Bill of Quantities.

### **H1-3 Air Pollution**

The Contractor shall take all necessary steps to minimize air pollution resulting from his operations.

Except where stipulated in these Specifications for the disposal of natural vegetation and organic materials from clearing operations, the burning of waste materials for disposal, particularly oil and petroleum wastes, rubber, plastics and similar materials will not be permitted.

During the performance of the work required under the Contract or of any operations appurtenant thereto, whether on the Project Site or elsewhere, the Contractor shall take all steps necessary, and shall furnish all labour, equipment, materials and means, required to reduce dust nuisance from the Works, and to prevent dust originating from his operations from damaging crops, orchards, cultivated fields, and dwellings; or causing a nuisance to persons. The Contractor shall be held liable for any damage resulting from dust originating from his operations including on Government roads, rights-of-way or elsewhere.

The emission of dust into the atmosphere shall not be permitted during the manufacture, handling and storage and handling of cement and of concrete aggregates and the Contractor shall use such methods and equipment as are necessary for the prevention, or the collection and disposal, of dust during such operations. All truckloads of loose materials shall be covered during transportation

Concrete batching and mixing areas, asphalt (hot mix) plants, or other manufacturing or production facilities shall be sited at least 500m from the nearest habitation. Emission outlets shall be fitted with pollution control devices in compliance with relevant current Government of Bangladesh emission control legislation.

The cost of spraying water on haul roads, access roads, government roads, aggregate stockpiles, etc.; or of any other methods of reducing the formation of dust; and the cost of furnishing and applying materials to maintain the works areas, adjacent areas, and roads, in a dustless condition, shall be deemed to be included in the various rates and lump sum items for the works included in the priced Bill of Quantities.

### **H1-4 Noise Pollution**

The Contractor shall take all necessary precautions to minimize the amount of noise and vibrations coming from construction activities.

The Contractor shall ensure that all plant and equipment is properly maintained in good operating condition, and that noisy construction activities shall be effectively sound reduced by means of silencers, mufflers, acoustic linings or shields, acoustic sheds or screens or other means, to avoid disturbance to any nearby noise sensitive receivers. All plant and equipment shall comply with relevant Government of Bangladesh legislation covering sound emissions.

Quarry operations and blasting shall be undertaken so as to minimize blasting and disturbance during the night and, insofar as possible, noise, vibration and dust. Operation of trucks and heavy vehicles and machinery shall be restricted to the hours of 06:30 to 19:00.

All necessary measures shall be undertaken to protect schools, hospitals and other adjacent noise sensitive receptors, including the use of noise barriers. The budget for this purpose in the contract package should be arranged.

### **H1-5 Damage to Property, Crops, and Vegetation**

The Contractor shall limit the movement of his employees and equipment within the project area and on adjacent land, including access routes approved by the Employer's Construction Supervisor, so as to minimize damage to natural vegetation, crops and property, and shall endeavor to avoid any damage to land.

The Contractor shall strictly ensure employees and equipment do not enter any sensitive environmental areas that are demarcated as "no-entry" zones.

The Contractor shall preserve existing trees, plants and other vegetation that are to remain within or adjacent to the Works and shall use every precaution necessary to prevent damage or injury thereto. Trees or shrubs shall only be felled or removed where such impinge directly on the permanent works or necessary temporary works areas; and where such is approved by the Employer's Construction Supervisor.

On completion of the Works all areas disturbed by the Contractor's construction activities shall be restored by the Contractor to their original condition, or as may be acceptable to the Employer.

For any damage to the standing crops due to intervention of the project activities, the compensation will be paid to the affected person (AP) on receiving his/her claim to GRC.

### **H2 Sanitation Facilities and Arsenic Safe Water Supplies**

At each construction area, (i) an appropriate number of tubewells will be installed to supply water for construction and safe drinking water to labourers and the construction camps, and (ii) latrines with septic tanks will be provided. Tubewells will be tested for arsenic and marked accordingly (green/red for safe/unsafe).

### **H3 Reporting**

The Contractor shall maintain a record of all emissions and spills of liquid, solid and gaseous matter which occur at the site, whether into water courses, streams, on land, or into the air. This record shall be compiled daily and shall include details of date, time and nature of the event, along with details of the remedial and clean-up measures carried out. Copies of these records shall be given to the Employer monthly.

The Contractor shall also maintain a record of any complaints made by any Governmental or Community Organization or by the public, regarding his operations. This record shall contain the date and time of receipt of the complaint, the name and address of the complainant and the action taken to remedy the situation. Copies of these records shall be given to the Employer monthly.

### **H4 Environmental Management Plan**

The requirements of this clause and attendant sub-clauses on Environmental Protection and Pollution Control notwithstanding; the Contractor shall observe and comply with all relevant environmental protection and mitigation, monitoring and reporting requirements in the Environmental Management Plan (EMP) as stipulated in the Particular Specification. In the event of any conflict between the foregoing sub-clauses and the environmental protection and mitigation measures and pollution control requirements of the EMP, the EMP shall take precedence.

The Contractor shall prepare and submit to the Employer's Construction Supervisor a Construction Environmental Management and Monitoring Plan (CEMP) demonstrating the manner in which the Contractor will comply with the requirements of the foregoing sub-clauses on Environmental Protection and Pollution Control, the EMP, and any particular environmental mitigation measures as stipulated in the Particular Specifications or Technical Specifications forming part of the Contract Documents.

The CEMP shall be submitted within 15 working days of the Contractor receiving the Notice to Proceed with the Works, and shall include a waste management plan detailing procedures for waste management for the site covering all solid, liquid and gaseous waste materials and emissions. The waste management plan shall include procedures for the collection and disposal of all waste materials in such a way as to ensure that no damage is caused to the environment. Training shall be provided to workers about the appropriate implementation of the CEMP and waste management plan measures.

Where stipulated in the Particular Specifications or Technical Specifications forming part of the Contract Documents, and provision has been made in the Bill of Quantities; payment for the implementation of the CEMP will be made in accordance with the Unit Rates, Lump Sum or Provisional Sum Items included in the Priced Bill of Quantities.

## APPENDIX I - PROJECT IMPLEMENTATION ARRANGEMENTS

### I-1 Steering and Guidance of Executing and Implementing Agencies

The program is suggested to be implemented under the lead of BWDB (executing agency) with close relationships to DDM (implementing agency). Other associated organizations are WARPO, LGED, DoF, DAE, DoFo and BIWTA. The participating organizations require clearly defined procedures of when, where, and how to coordinate their activities. To this end BWDB has a number of Memoranda of Understanding (MoU) in place, which will be suitably updated for the purpose of the program during the first year of the program.

In line with government principles program activities are regularly reviewed and discussed through annual inter-ministerial steering committee meetings. Given the complexities of the program, a Panel of Experts is expected to provide guidance related to key questions:

- (i) River morphology, engineering, and stabilization
- (ii) Flood Risk Management at regional and community level
- (iii) Institutional and capacity development at regional and community level

### I-2 Integrated Program Management Office (PMO)

The PMO will be integrated into the administrative setup of BWDB and placed at a high level given the importance and relevance of the program. The key features are:

- (i) Headed by a Chief Engineer/Additional Chief Engineer/Superintending Engineer and supported by two Superintending Engineers and four Executive Engineers.
- (ii) Initially identical and later closely associated with the CE River Management, once the post gets approved. This is a vital element to activate the new river management wing and to institutionalize the broad river stabilization approach.
- (iii) Supported by an individual design office, exclusively dealing with river stabilization measures.
- (iv) Conducting river management activities of larger national importance, such as procuring materials for works and strategic stockpiling for emergencies, and guiding char reclamation activities
- (v) Implementing work through existing zonal division. These divisions already build embankments and riverbank protection, and will be strengthened in terms of staff during the implementation of the works.
- (vi) A environmental monitoring section headed by an Executive Engineer in PMO to monitor the EMP compliance and other environmental issues of the Project supported by SMOs, an International Environmental Specialist and a national Environmental Specialist from the ISPMC team.

Figure A1-1 depicts the ~~program~~ project management organogram for BWDB/FRERMIP management, as provided by the PMO in ~~February 2018~~ June 2020.

### I-3 Advisory Support

The program will be supported by consultants and NGOs at different level. This addresses the program management requirements of ADB and supports BWDB during the current period of staff shortage, specifically of junior staff. An Institutional Strengthening and Project Management Consultant (ISPMC) will provide the main support in a number of different areas. The advisory support scope of work includes the services of a specialist organization to conduct environmental assessment and planning. Additional details regarding the

financing and potential scope of work of the advisory support are provided in Section 15 of the Final Report, Main Volume.

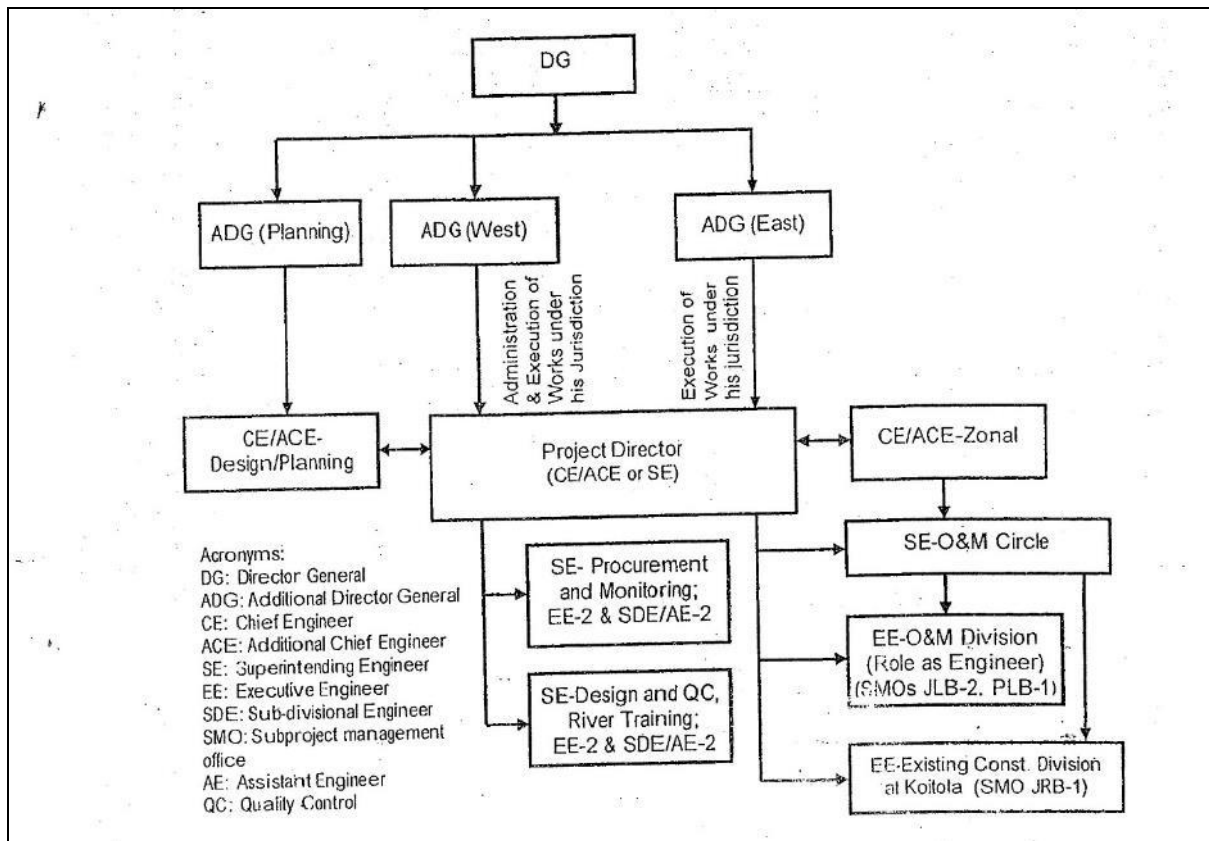
### I-4 Management Information and Reporting

The program requires data management at different levels for different purposes:

- (i) Baseline data for benefit assessment
- (ii) Project management data for progress documentation
- (iii) Asset information for BWDB operation, namely maintenance

A suitable MIS system for above three elements was outlined for FRERMIP (Individual Consultants, 2012). Component (iii) has been developed further for BWDB and forms part of the institutional report. The reporting requirements form also part of ADB's project implementation memorandum.

**Figure I1-1 Organization chart for BWDB/FRERMIP program management (February 2018)**





# APPENDIX J - BIODIVERSITY BASELINE AND FISHERIES DEVELOPMENT STUDY

## Terms of Reference for Consultancy Services for Updating the Biodiversity Baseline and Monitoring Plan; Preparation of a Fisheries Development Plan

### J-1 Background

1. The ADB-funded *Flood and Riverbank Erosion Risk Management Investment Program* (FRERMIP), aims to sustain incomes and livelihoods of people living along selected reaches of the Jamuna and Padma Rivers by enhancing resilience to flooding and to riverbank erosion through a mix of structural and non-structural measures. FRERMIP will be implemented under a Multi-tranche Financing Facility (MFF) in three phases or tranches of three- to four-year duration each with one year overlap from 2015 until 2023. Tranche-1 of the MFF consisting of three sub-projects: Jamuna Right Bank 1 (JRB-1), Jamuna Left Bank 2 (JLB-2), and Padma Left Bank 1 (PLB-1) – marked as 'FRERMIP recovery of lost floodplain' in Figure 1.

2. The Program includes structural measures, extensive non-structural activities, institutional strengthening, as well as preparing a long-term strategic river stabilization plan for the Jamuna, Padma and Lower Meghna rivers, i.e. between the Indian border and the estuary mouth (Figure 1).

3. A total of 50 km of riverbank protection, 53 km of embankment rehabilitation, and 36 km of embankment reconstruction or new construction are planned to be implemented through the Bangladesh Water Development Board (BWDB). In addition, more than one million people living in flood risk areas along the main rivers are expected to be supported by a community-based flood risk management program organized through the Department of Disaster Management (DDM). Institutional strengthening will largely focus on improving the knowledge base and planning tools for managing critical river reaches, particularly within the planned River Management Wing in BWDB.

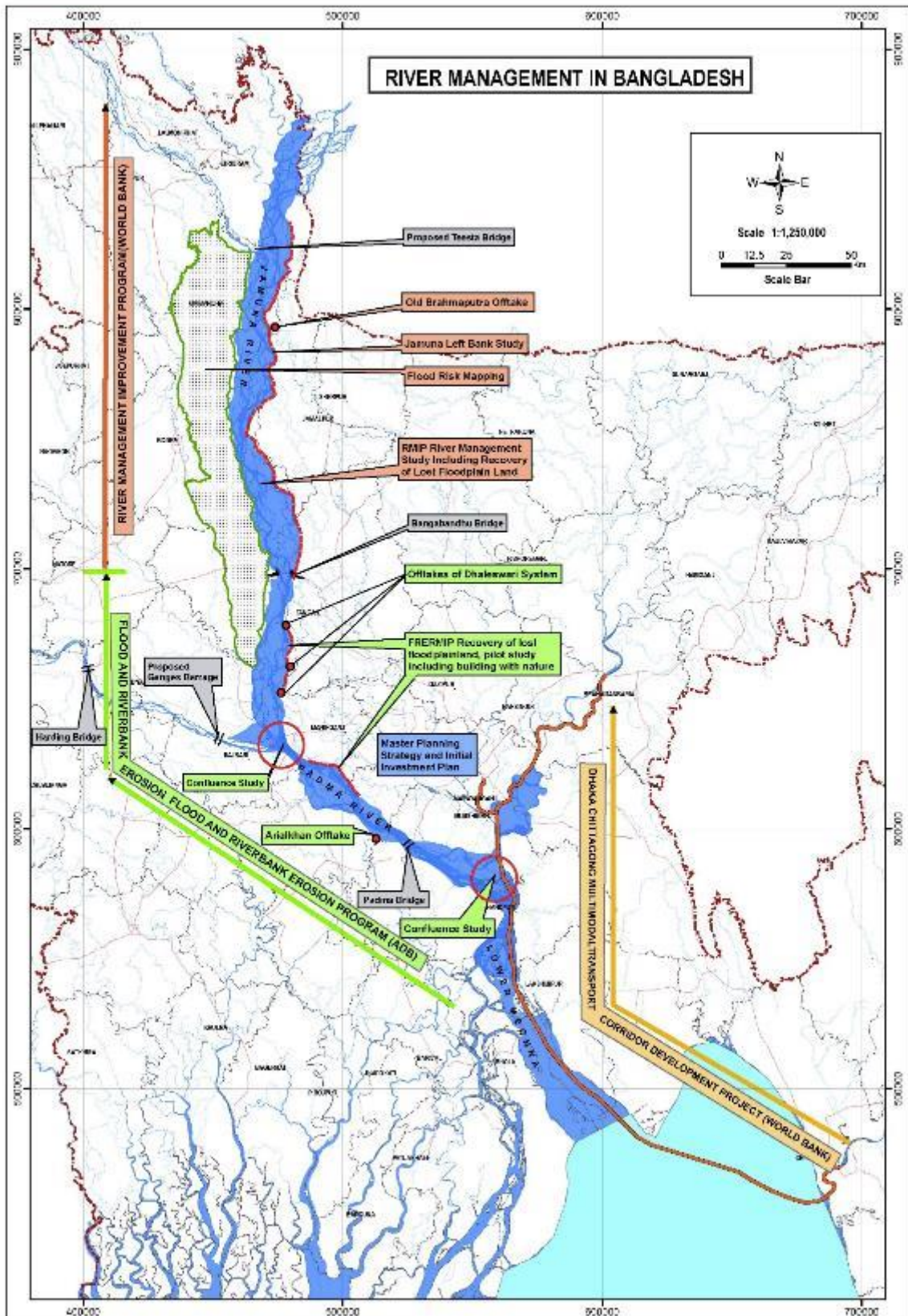
4. After initially protecting critically eroding riverbanks at priority areas under Tranche-1 (November 2015 to end-2018), and conducting the wider long-term strategic river stabilization study (November 2015 to mid-2016), the program plans to move to more systematic riverbank stabilization, potentially contributing towards future river-reach stabilization during later tranches. The stabilization approach will make use of the currently ongoing consolidation of the river morphology developing towards a more accentuated channel pattern similar to the one observed in the 1970s, before the dramatic widening (from the 1970s to 2000s) took place. In parallel existing, degraded or eroded embankment lines, such as the Brahmaputra Right Embankment (BRE) will be restored and extended to arrive at reliable flood protection for the large population living on the floodplain along the main rivers. The community-based flood risk management component aims to increase resilience and preparedness of the population for the residual risk, for example if existing embankments unexpectedly breach.

5. The riverbank protection approach builds on and extends technical principles established under the *Jamuna-Meghna River Erosion Mitigation Project* (JMREMP; 2004-2010). Embankment designs follow best international practice providing access along a land-side planform with the opportunity to raise embankments later in response to climate change requirements with limited means. Tranche-1 JLB-2 and PLB-1 physical works consist of riverbank-erosion protection works along critically eroding areas only. JRB-1 consists of limited riverbank-erosion protection works in support of existing works and the restoration of degraded and eroded flood embankments, specifically a section of the most downstream

part of the historic Brahmaputra Right Embankment. Flood embankments will also be rehabilitated behind the JLB-2 and PLB-1 erosion protection works, but not until Project-2.

6. The FRERMIP was prepared through Project Preparatory Technical Assistance (PPTA) 8054, called *Main River Flood and Bank Erosion Risk Management Program* (MRP) that delivered its (draft) final report in December 2013 – the final ADB version became available in May 2014. Among others this PPTA resulted in an Environmental Assessment and Review Framework (EARF, first version May 2014), its purpose being to guide the preparation of future tranches of the FRERMIP. It also produced a full EIA for the planned FRERMIP interventions for Tranche-1 (May 2014).

7. Specific guidance is required as the FRERMIP intends to move from localized riverbank protection towards stabilization of first river reaches of the main rivers in central Bangladesh. This approach includes the reclamation of lost floodplain land and expansion of existing flood risk mitigation infrastructure (flood embankments), leading to more reliable flood risk mitigation. To this end existing literature knowledge on issues pertaining to environmental safeguards, such as the river ecosystem, river floodplain interaction, and specifically fish, need to be expanded, in parallel to the study of the overall stabilization approach over the following tranches, alternative solutions, and their impacts. Future environmental assessment accounts for the dynamic river morphology that experienced dramatic changes over the last 40 years, which are still ongoing.



**Figure J-1 –FRERMIP’s physical intervention area, and study area for the Long-term Strategic River Stabilization Plan: Jamuna / Padma / Lower Meghna**

8. The historic river course, some 40-years ago, has exhibited planforms that are relevant for future planning. To this end the study of historic habitat characteristics will help to determine a suitable baseline for the rapidly changing river environment but also allow to draw analogies to future planned river courses, narrower than today's river.

9. The anticipated benefits of the planned works are considerable and include: (i) reduced loss of agricultural and other land with established infrastructure to prevent river erosion, (ii) reduced destruction of livelihood and impoverishment of families, (iii) gains in floodplain land from river stabilization, (iv) improved river navigation and trade, (v) reduced flood damage to agriculture, particularly Aus and Aman cropping, and (vi) increased agricultural and pond-fish production on less-flooded agricultural land.

10. While its anticipated benefits are considerable, the Program potentially negatively impacts both the floodplain and the river environment. Negative impacts may include the transformation of deeply flooded floodplain into less flooded areas leading to the degradation of floodplain aquatic (wetland) habitats, reduced hydrological connectivity, and physiochemical / water quality changes, which may adversely affect floodplain-dependent openwater fish species and wetland biodiversity. Increased agriculture may increase utilization of water resources for irrigation and increased fertilizer and pesticide use may impact water quality. Erosion protection of the Program may alter river morphology along reaches beyond the works, change river appearance (e.g. the number of channels and islands, water depths, and velocity), and as a consequence change the river habitat. This may in turn have an impact on the biodiversity locally, as well as for migrating or trans-boundary animal populations (e.g. fish, birds, dolphins).

11. The FRERMIP has a number of inbuilt mechanisms to reduce environmental impacts, and mitigation measures have been aggressively mainstreamed into program planning and engineering designs. The flexibility of a phased MFF approach supports minimization and mitigation of potential negative impacts in a gradual manner. Works started in Tranche-1 with protection of critically eroding riverbanks and the reconstruction of the destroyed BRE, while conducting extensive studies on future impacts of river stabilization and associated embankment works, including piloting new measures. Specialist studies have been conducted for Tranche-1 interventions on morphology, floodplain hydrology, and environmental aspects. They support that the Tranche-1 impacts are more limited in nature and can be mitigated. During Project-2 first measures for river stabilization along the priority work reaches are planned and will be designed based on the Tranche-1 study outcomes and supported by environmental monitoring and mitigation measures.

12. The FRERMIP includes several additional studies to develop a broader background understanding and develop an approach that optimizes different key drivers, ranging from morphological trends, future river use for navigation, safeguarding and enhancing the river ecosystem, and reducing social impacts.

13. Mitigation measures suggested for larger-scale river stabilization include:

- (i) Development of stabilization alternatives and assessing environmental impacts in the Jamuna-Padma-Meghna river system through a Long-term Strategic River Stabilization Study, i.e. from November 2015 to June 2016.
- (ii) Biodiversity baseline elaboration, both in river and floodplain, identification of locations for fish sanctuaries, and their establishment.
- (iii) Development of EIA studies for each subsequent tranche.
- (iv) Formulation of fisheries and aquatic biodiversity development plans to enhance fisheries production to compensate for adverse biodiversity and fisheries impacts.

14. Figure 2 depicts the system of studies and their interaction with environmental and social safeguards. In addition, “building-with-nature” measures will be piloted to assess ways closely mimicking or making use of natural processes to build attached charland faster into floodplain land.

## **J-2 Objectives**

15. Simultaneously with conducting the Long-term Strategic River Stabilization Study (Figure 2) environmental measures for potential larger-scale river stabilization (Figure 3 provides preliminary options) need to be investigated and suitable mitigation measures, such as aquatic sanctuary identified and detailed. This involves:

- (i) Identify historic developments and changes pertaining to the number of species and areas available to them within the river belt and adjacent floodplains from the 1960s to 2015.
- (ii) Identification of monitoring indicators for major flora and fauna components in the study area, i.e. the Jamuna-Padma-Lower Meghna (river and floodplain) between the Indian border and the estuary mouth, and during pre-construction, construction and operational stages. Once these indicators are carefully selected, they would be the monitoring indicators/parameters that will be followed throughout the project life. Hence, considerable research and thought must be given to this.
- (iii) Elaborating on the already existing biodiversity baseline for the study area's influence areas, i.e. building further (rather than duplicating) on baselines already established under FRERMIP and RMIP. The focus here is on identifying and mapping important habitats for fish, (migratory) birds, dolphins and other wildlife in river and floodplain of the study area, and assessing how these may be impacted (e.g. form/increase or reduce/disappear) by the river stabilization options proposed as part of the long-term strategic river stabilization plan.
- (iv) Considering the environmental and fisheries impacts, various strategic development options for river stabilization in the study area as proposed under the long-term strategic river stabilization plan.
- (v) Analysing the effectiveness of existing (fish) sanctuaries and other protected areas in the study area, and proposing improvement, including capture and pond culture fisheries to document past trends and needed improvements.
- (vi) Identifying, as necessary and if deemed feasible, suitable locations for sanctuaries or other protected areas, and developing detailed plans for establishment of such sanctuaries or protected areas, to compensate for project impacts and that contribute to a long term conservation of aquatic and terrestrial habitat.
- (vii) Assessing historic development of fisheries/aquaculture, their present status and prospect of contributions to the aquatic biodiversity and fisheries impacts.

## **J-3 Consulting Services**

16. Consulting services are solicited from one or more firm/NGO/research institute experienced in setting ecological baselines, biodiversity monitoring, defining conservation status of species and their conservation strategy and restoration, establishment and management of (fish) sanctuaries, and aquaculture practices with proven international and national experience to provide necessary technical services. The consulting team will include a mix of experts with experiences in biology of the various species and habitats. The interested party/ies should have experience in similar works and preferably have working experience in Bangladesh.

17. Sanctuary Establishment Plans should include a detailed Management & Monitoring Plan. The latter should identify the responsible persons/organizations and present a site-specific or/and species-specific management /monitoring plan for the required inputs.

#### **J-4 Scope of Services**

18. The consultants of the firm/NGO/research institute shall familiarize with the FRERMIP, RMIP and other relevant project documentation, as well as liaise with the team conducting the Long-term Strategic River Stabilization Study, and maintain close coordination with the Environment Unit of PMO. The scope of works is defined as follows.

##### **Task 1 – Existing environmental/biodiversity baselines**

- (i) Identify, collect and study relevant existing environmental/biodiversity baselines for the long-term river stabilization study area<sup>5</sup> and identify information gaps.
- (ii) Describe based on available information historic developments, changes and trends pertaining to the number of species and areas available to them within the river belt and adjacent floodplains from the 1960s to 2015.
- (iii) Oversight and summary of relevant existing biodiversity baselines for the study area.

##### **Task 2 – Biodiversity baseline for Project-2 area**

- (i) Biodiversity baseline for the Project-2 area (river and floodplain) through existing information and additional field data collection (including seeking local knowledge) as needed with a focus on (i) critically endangered and economically important species, including Hilsa and dolphin, resident and migratory birds, and other wildlife; (ii) frequency, abundance, distribution and migration patterns, dislocation of indicator species of wildlife in the study area; (iii) distribution and extent of key habitats (e.g. river, beel, channel, chars, mudflats, sandflats, reeds, agricultural fields, homesteads, etc.);
- (ii) Mapping important habitats for key biodiversity and economic species in the study area for the period 1960s to 2015 as per available data;
- (iii) Analysis of key environmental issues impacting on biodiversity;
- (iv) Identification of key monitoring indicators;
- (v) Biodiversity Monitoring Plan, including methodology, key monitoring indicators, responsible organisations, frequency, reporting, costs.

##### **Task 3 – River stabilization impacts for Project-2 area**

- (i) Identify FRERMIP impacts (positive and negative) on biodiversity and recommend remedial measures and visualization of results (tables, graphs, maps);
- (ii) Identify impacts (positive and negative) of planned river stabilization interventions options on the biodiversity and key habitats (distribution, extent), propose alternatives and mitigation measures and visualization of results (tables, graphs, maps);
- (iii) Stakeholder consultations will be conducted as needed and may include public representatives, Department of Environment, Department of Fisheries, Department for Wildlife Conservation, NGOs, representative of major professional groups (fishermen, agriculture farmers, etc. – men and women) and charland dwellers at the sites.

---

<sup>5</sup> Currently the Jamuna/Padma/Lower Megna between the Indian border and the Bay of Bengal. The Study Area will be delineated in January 2016.

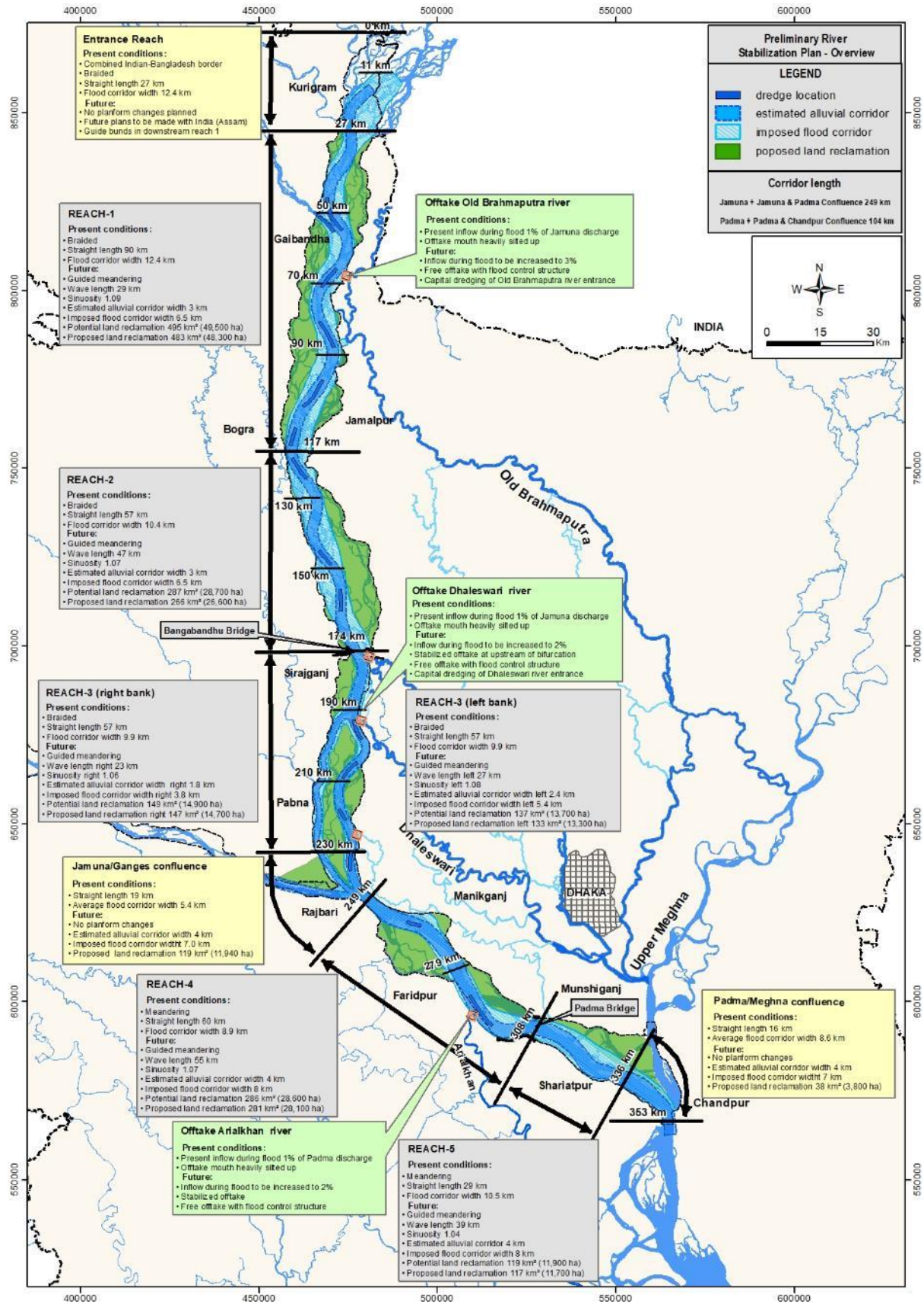


Figure J1-3 – Reference project option for long-term river stabilization from River Stabilisation Plan (2020)

#### **Task 4 – Aquatic sanctuary and fisheries development in Tranche-1 and Project-2 areas**

- (i) Identify the location of existing (fish) sanctuaries and assess for these their functioning (success / failures), analyse constraints, including capture and pond fisheries to document past trends, and determine requirements for effective sanctuary operation and management; if such areas do not exist within Tranche-1 and -2 areas, a number of representative sanctuaries will be studied elsewhere (e.g. north of Jamuna bridge – see RMIP report, July 2015)
- (ii) Identification of and recommend suitable locations, with justification, where one or more sanctuaries may be established in the Tranche-1 and -2 areas, including guaranteeing sustained connectivity to the river ecosystem;
- (iii) Public consultations with charland dwellers, local leaders, representatives of local fisheries, forestry, environment, wildlife conservation departments or units, relevant NGOs, representative of major professional groups (fishermen, agriculture farmers, etc. – men and women) at the sites and consider outcomes in identifying suitable locations.

19. The following criteria should be considered for the sanctuaries:

- (i) Located in the lower Jamuna downstream of Jamuna Bridge;
- (ii) Location be relatively insensitive to river erosion;
- (iii) Chars with reedlands with submerged areas are generally suitable due as these provide aquatic and bird habitat as well terrestrial habitats;
- (iv) Consider existing erosion and accretion processes on site and the impact of short- and medium-term (FRERMIP) and impacts from long-term river stabilization interventions;
- (v) Proposed locations may need to be located or raised to a height of 1-3 m above the monsoon water level and should contain a number of water bodies or channels and have least seasonal connection to the main river system;
- (vi) Consultations with local community and government organizations is needed to agree on the project location;
- (vii) Potential location sites will be mapped and zoned on the existing revenue maps to enable BBA to identify land for acquisition purposes.

#### **Task 5 – Biodiversity Sanctuary/ Protected area planning**

Two basic types of sanctuaries/ protected area should be planned

- (i) River Charlands Sanctuary/Wildlife protected area specially for aquatic birds/mammals
- (ii) Floodplain Sanctuary specially for biodiversity/Fisheries development

20. Sanctuary Establishment Plans should be prepared for at least two sites for River Sanctuary and for a number of locations to be identified for Floodplain Sanctuary, including:

- (i) Detailed design including demarcation of core and buffer zones, as well as connections with open (river) water;
- (ii) Site location reflected on the mouza maps for land acquisition purposes;
- (iii) Existing and required infrastructure such sluice, bridge, road, fish pass, etc., as well as needed repair and maintenance works;
- (iv) Core zone to include charland and river: a critical part of the design process will focus on the establishment of nursing and feeding areas for fish, crustaceans, turtles, dolphins, etc.;
- (v) Access paths and hides for observation for eco-tourism;



- (vi) Experience from fish sanctuaries developed in Hakaluki in 2008 by the DoE under the 'Coastal and Wetland Biodiversity Management Project' in Brahmaputra River by Bangladesh Agriculture University and Wetland (Floodplain) Sanctuary established under the Wetland Biodiversity Rehabilitation Project of giz-DoF and Fish Sanctuary established under the Community based Fisheries Development Project of DoF and LGED will be considered in the design;
- (vii) Stakeholder consultations will be conducted, and outcomes considered in planning the establishment of Sanctuary.

Note: morphological statistical information on river, char and floodplain dynamics (including water depth, cross-sections, charland extent and movement, erosion/accretion rates) in the study area will be made available by FRERMIPs morphologists.

### **Task 6 – Fisheries development**

- (i) Assessment of adverse impacts of the project interventions on the river and floodplain capture and culture fisheries including aquatic biodiversity;
- (ii) Identification of the impacted fisheries community in the river and Floodplain capture and culture fisheries sector;
- (iii) Assessment of status of the technology and methods of exploitation of the river and floodplain capture and culture fisheries of the subproject area;
- (iv) Assessment of potential of and outline methods for development of the fisheries sector to compensate for adverse impacts of the project intervention;
- (v) Detailed description of the plan for and functional details of the fisheries development program including aquatic biodiversity, fish, fisheries and fisheries community.

### **J-5 Time Frame**

21. The expected to start in 2020 and will be conducted in a period of 14 months (12 months of field study and 2 months of assessment and reporting), including revisions based on comments by BWD~~B~~, other agencies and ADB.

### **J-6 Reporting Requirements/Deliverables**

22. The firm/NGO/research institute will prepare and submit the following reports and deliverables during the Services:

- Inception Report (Month 1) – including outlining the methodology for data collection and analysis, data sources to be used, detailed work and outcome planning.
- Report on existing baselines and information gaps (Month 2)
- Draft Biodiversity Baseline and Monitoring Plan & Impacts of Planned Developments (Month 6) – including an updated biodiversity baseline, and impacts of river stabilization options visualized in tables / graphs / maps.
- Final Biodiversity Baseline and Monitoring Plan & Impacts of planned Developments (Month 8)–addressing comments received from various parties.
- Draft Sanctuary Analysis & Establishment Plan and Fisheries Development Plan (Month 12).
- Final Sanctuary Analysis & Establishment Plan and Fisheries development Plan (Month 14) – addressing comments received from various parties.
- Monthly progress notes as per agreed template.

In addition, the firm/NGO/research institute will conduct the following meetings/workshops:

- Presentation of the inception report
- Presentation of the draft Biodiversity Baseline, Monitoring Plan and Development Impact report;
- Presentation of the draft Sanctuary Analysis and Establishment Plan(s);
- Meetings with stakeholders and public consultation as needed.

### J-7 Staffing and Inputs

	Position	No	Person month	Minimum qualification	Field and minimum experience
	A. Professional Staff				
	International				
1	Environmentalist / Team Leader	1	10	MSc in environmental/aquatic or allied science	15 years' experience in planning and management of aquatic environmental management project
	National				
2	Ecologist /Fisheries Specialist, Deputy Team Leader	1	10	MSc in environmental/aquatic or allied science	8 years' experience of working in aquatic environmental project
3	Botanist/Forestry Specialist	1	5	MSc in botany/forestry/bio sciences	5 years' experience in relevant fields
4	Fisheries Specialist	1	10	MSc in fisheries/aquatic or allied science	8 years' experience working in fisheries
5	Aquaculture Specialist	1	6	MSc in aquaculture/aquatic of allied bio sciences	5 years' experience in relevant field
6	Civil Engineer	1	4	BSc in civil, construction engineering	10 years of experience in design and construction of river protection works and hydraulic structures
7	RS/GIS Specialist	1	4	BSc in GIS/RS urban/rural planning / geography	10 years' experience in mapping and zonal planning.
	Field Staff				
8	Field Surveyor/Data collector	3	12*	BSc in any field of bio Sciences	3 years' experience in relevant field work
	Office staff				

	Position	No	Person month	Minimum qualification	Field and minimum experience
9	Office manager	1	12*	Graduate	5 years' experience in office maintenance/support staff
10	Office boy /Messenger	1	12*	SSC	years' experience

Considering proposed extended period of consultancy service

## APPENDIX K - NCEA COMMENTS ON 2014-EIA & ISPMC RESPONSE

The consultant that conducted the PPTA for FRERMIP issued its draft EIA report, version R7, for the project on 28 February 2014. The Netherlands Embassy in Dhaka then contracted the Netherlands Commission for Environmental Management (NCEA) to review the report. Subsequently the NCEA conducted the review in two phases: Phase 1 focused, among others, on the February version on the EIA report in which the NCEA noted some shortcomings, after which the ADB decided to adjust the EIA report, which resulted in a next version of the report, i.e. of 16 May 2014 (<https://www.adb.org/sites/default/files/project-document/80829/44167-013-eia-02-0.pdf>).

Then, during Phase 2 the NCEA reviewed this revised version of the report and came up with recommendations. NCEA's findings were presented in its advisory review report, dated 26 June 2014, downloadable from: [http://api.commissiomer.nl/docs/os/i00/i0098/27-06-2014 final advice bangladesh.pdf](http://api.commissiomer.nl/docs/os/i00/i0098/27-06-2014%20final%20advice%20bangladesh.pdf).

The following matrix indicates how the (summarized) comments of the NCEA have been or are being addressed.

Nr	<i>Summary of NCEA's comments on the EIA of 16 May 2014</i>	Response of ISPMC
1.	<i>Justification and comparison of alternatives – This has not been studied in the EIA nor in the feasibility study, for example the Capital Dredging Study and FRERMIP's comprehensive stabilization plan to identify potential river stabilization solutions to be implemented in an adaptive manner with minimal impact on river and char development. Include the findings of the feasibility studies in the development of the planned SEA study.</i>	Alternatives are being considered in FRERMIP's long-term River Stabilization Plan for the active Jamuna/Padma and Lower Meghna River channel, as well as in its long-term River Management Master Plan. As part of these plans a Strategic Environmental and Social Assessment (SESA) has been prepared, addressing among others downstream and cumulative impacts of proposed interventions in the JPM river system. Capital dredging is considered by the FRERMIP consultant as an unfeasible solution to sustained long-term river management.
2.	<i>Downstream impacts of the Brahmaputra Right Embankment project under JRB-1 are not presented in the report. These should be studied in the long-term morphological / stabilization study that will be carried out during Tranche-1 and the findings could be presented in the SEA.</i>	There could be two levels of impacts: associated with the riverbank protection stabilization works to secure the embankment and associated with the impact of the embankment works on flood levels.  Potential downstream river instability is mitigated through a 7 km long riverbank protection work from the Hurasagar to Kaitola, which was completed under JMREMP in 2008. This protection work is

Nr	<i>Summary of NCEA's comments on the EIA of 16 May 2014</i>	Response of ISPMC
		<p>in good condition. In conjunction with the upstream 10 km long protection between Kaijuri and Verakhola, an about 30 km long river reach has been stabilized morphologically as demonstrated by successive dry season imagery.</p> <p>The impact on flood levels is not measurable as the embankment gap did not withdraw large amounts of flood waters. In addition, the BRE was closed from the mid-1980s until the mid-1990s before it eroded and the work only relates to the closure of an embankment gap as opposed to new construction.</p> <p>In summary, the reach has become stable with no discernible downstream embankment of the reconstructed BRE the JLB-1 sub-project. This has been included in this EIA.</p>
3.	<p><i>Livestock – Given the fact that grazing on chars and floodplains provides food to livestock, the present use of the floodplains by livestock and the economic importance for people owning livestock, as well as the influence of the proposed interventions on the availability and quality of grazing land is insufficiently described in the EIA report.</i></p>	<p>The ultimate goal of the FRERMIP is to stabilize the main rivers with two main purposes (i) a stable delineation between floodplain and river, and (ii) reclamation of lost floodplain land, converting infertile sand bars into fertile floodplains. The latter will lead to increased opportunity for using the land for agriculture but also intensive livestock, horticulture, etc. The overall larger floodplain area available after river stabilization will provide the opportunity for even increased grazing areas. Therefore, it is expected that grazing will continue within the stabilized river corridor, as well as on agricultural lands of the former and floodplains when there are no crops.</p>
4.	<p><i>Fisheries – Although indications are provided on commercial and subsistence fishermen in some areas, part-time fishers have not been mentioned. This is important as the majority of landless households are involved in fishing during part of the year. The proposed remedy to mitigate lost fish potential with development of</i></p>	<p>In recent years, fishing is becoming challenging while more rewarding jobs are becoming available, even in rural areas. While professional fishers somehow survive, occasional fishers change their profession. In certain areas, part-time fishers do not exist anymore. Aquaculture is thriving in the country, requiring substantial numbers of labourers. As</p>

Nr	Summary of NCEA's comments on the EIA of 16 May 2014	Response of ISPMC
	<i>aquaculture is not realistic as particularly poor people do not possess land and means to develop aquaculture.</i>	salaries offered in the aquaculture sector are significantly higher than other sources of income in the rural setting, this can compensate for production loss due to river mangement interventions. For those that still continue with part-time fishing, fish will be benefitted in two ways: (i) the stabilized river will attain a maximum depth similar to the one observed in the 1960s before the sediment wave changed its character, and (ii) through regularly spaced fish passes in the embankment lines to reconnect floodplain and river from pre- to post-monsoon. In addition, fish sanctuaries will be established in the main river channels to provide sheltered habitats for fish to recover. These measures are expected to enhance fish stocks, provided that fish sanctuaries and fish passes are effectively managed, i.e. by communities themselves. The SESA details various mitigation measures.
5.	<i>Brick industry – The EIA does not address the brick making industry in the floodplains. The brick manufacturing sector contributes significantly to Bangladesh' carbon emissions. As considerable quantities of concrete will be used for FRERMIP made from brick chips, the impact on floodplain and carbon emissions needs to be addressed.</i>	The BWDB has not used brick chips for cc blocks for riverbank protection works since 2001, among others because cc blocks made with brick chips are too light to effectively protect banks from erosion. Instead shingles/crushed stone is used in manufacturing cc blocks for riverbank protection works. These chips are collected in and transported from Madhyapara, Dinajpur, Northern Bangladesh. To further reduce transportation cost, and carbon emissions, the use of grout-filled mattresses will be considered, only requiring sand and cement as ingredients.
6.	<i>People affected – Negative impacts of the project interventions on people that will be affected have insufficiently been described. Apart from losing grazing land this may include sharecroppers or other farmers without official land titles who may lose access to land due to more influential people claiming land</i>	The outcome of river stabilization will be increased land available for farming, industry, settlements etc. This notwithstanding, a land redistribution process will take place in areas formerly eroded. Large-scale land reclamation therefore depends on a suitable land law regularizing the process of land acquisition and compensation of existing char land,

Nr	<i>Summary of NCEA's comments on the EIA of 16 May 2014</i>	Response of ISPMC
	<i>due to its higher production potential.</i>	stabilizing the river in that area, and land-use zoning and land development. The existing owners can be identified from mouza maps superimposed with banklines from the last 30 years.
7.	<i>Gender aspects – The Gender Action Plan is incomplete, lacks clear implementation arrangements and in its present form does not guarantee that the objective of the program of effective gender mainstreaming will be achieved.</i>	Noted, however the GAP is not applicable to the EIA.
8.	<i>Biodiversity aspects – The report does not provide insight in the impact of the program on protected areas; for some species the baseline does not provide sufficient insight in crucial habitats for the survival of all protected species of global and national significance, and the extent to which these species and habitats might be influenced by the program.</i>	A Terms of Reference for updating the biodiversity baseline and preparation of a fisheries development plan, included as Annex 13 in the May 2014-EIA has been revised based on the currently available information and needs, and this will be tendered in 2017. The updated ToR is enclosed in an Annex of the present EIA.
9.	<i>Anti-erosive measure – The proposed planting of trees on (slope) embankments is not appropriate to reduce erosion. Protection with shrubs and low vegetation is generally more effective for rain and wind erosion on such places.</i>	This is correct and the trees do not fulfill the function of erosion protection. They are rather placed as compensation for trees cut during embankment construction and to improve driveability. This was already incorporated in the May 2014 version of the EIA report.

## APPENDIX L - ADB COMMENTS ON DRAFT EIA & ISPMC RESPONSE

ADB submitted its comments on the draft EIA for Project-2 of 12 December 2017 on 8 February 2018, with further comments on particularly the annexes of the report on 13 February 2018. In the table below these ADB comments are listed and the ISPMC's response indicates how the comments have been addressed in the current final version of the report.

Page	Item/section	ADB comments	ISPMC Response
2	Figure 1-1.	<i>Replace with clearer map</i>	Figure replaced.
26	Figure 4-3.	<i>Replace with clearer map</i>	Figure deleted – see Figure 1-1.
28	Figure 4-4.	<i>Replace with clearer map</i>	Figure replaced.
36	Figure 5-1 & Figure 5-2	<i>Update with more recent data of monthly rainfall and temperatures</i>	Data was requested from BWDB, but not provided.
36	Table 12 1. Reaches along Padma left bank.	<i>Please check the coordinates (start x/y and end x/y) for the Reaches 1a, 1b, 2a, 2b and 3 if they fall along the Padma left bank.</i>	Checked but OK; all are along the Padma left bank. Coordinates were determined with the BTM (Bangladesh Transverse Mercator) projection which is commonly used by BWDB and SoB.
38	Table 12 2. Location and purpose of regulators for the whole embankment length from Paturia to Dohar	<i>Please check the coordinates (easting and northing) for the Regulators 1-6 if they fall along whole embankment length. They seem not in the location of the project area.</i>	Checked but OK. Initially there were 34 km of embankment and 6 regulators, but reduced to 17 and 4 respectively, due to economic feasibility. All structures are in the project area. Table 4-9 and Figure 4-10 revised.
41	Paragraph 148	<i>Presence of “()”. Please revise accordingly</i>	Revised.



Page	Item/section	ADB comments	ISPMC Response
41-45	Table 5-1, Table 5-3, Table 5-10	<i>Update with more recent data on discharges of Jamuna – Padma, water levels, and ground water levels.</i>	Data was requested from BWDB, but not provided.
52	Table 12 3. Surface water quality of Jamuna and Padma	<i>Where are the surface water quality of Jamuna and Padma River for the months of July to December? Please include surface water quality of Jamuna and Padma for the months of July to December. This will serve as part baseline information of the river system.</i>	Table expanded.
62	Paragraph 209 and Table 12 4. Land use	<i>The paragraph and Table 12 5 do not match. Please revise accordingly</i>	Paragraph and Table corrected.
67- 68	Items 5.5.1 Health and Disease and 5.5.2 Rearing Constraints	<i>These are not related to the project scope. Please remove these items</i>	Sections deleted.
68	Paragraph 234	<i>Please provide a map for the locations of the seasonal and perennial khals (canals), beels (floodplain depressions) and the associated flood lands</i>	Map added.
68	Paragraph 235	<i>Please include in the sentence the source of the information. “Fish biodiversity is also rich in the area but is declining due to indiscriminate fishing, obstruction of migration routes (especially in the dry season), discharge of industrial wastes, poor fisheries management, siltation, oil spills, insecticide contamination, and loss of critical habitats to siltation and bank erosion.”</i>	Done.
69	Figure 5-15. Open water (I) and bankline fish habitat	<i>Include the location of the photograph where they are taken</i>	These pictures were taken from the FRERMIP Tranche-1 EIA (2014) that did not mention the location. Two new pictures included with known location.
72	Paragraph 250	<i>Please include in the sentence the source of the information. “Three types of fishers are found in the study area, i.e. (i) commercial or fulltime fishers; (ii) occasional or part time fishers; and (iii) subsistence fishers. Commercial or fulltime fishers are professional</i>	Done.

Page	Item/section	ADB comments	ISPMC Response
		<i>fishers.”</i>	
73	Figure 5-17. Seasonality of fishing and types	<i>Please include in the sentence the source of the information for the table</i>	Source added.
77	Table 12 6. Locations of Beels and their connectivity (Project-2 area)	<i>Provide map for the table</i>	This requires major further inputs that will be conducted as part of the various baseline studies planned.
80	For the items under 5.7.1 Bioecological Zones - Introductions	<i>Provide a map showing the Teesta Floodplain, Major Rivers, Brahmaputra–Jamuna Floodplain, Chalan Beel, and Ganges Floodplain.</i>	Map provided.
83	Terrestrial Fauna	<i>Revisit the IUCN category of each species mentioned in the EIA. Indicate the appropriate IUCN category for each species in the area. As an example, Varanus flavescens has a status of Lower Risk/least concern to the IUCN website, however, Varanus flavescens in the EIA (paragraph 305) is endangered. This creates confusion on the status of the species. Also, spell the scientific names correctly.</i>	Species list in annexes checked with IUCN Red List (2015) and main text adjusted.
86	Paragraph 322	<i>Please indicate the source of information stated in the Climate Change in Bangladesh.</i>	Indicated.
99	5.8.10 (b) Waterways	<i>Provide map for the waterways that will show the navigation routes of the area mentioned in paragraph 348. Please delete paragraph 349</i>	Waterways map added, paragraph 348 rewritten.  Paragraph 349 deleted.
102	5.8.16 Historical, Cultural and Archaeological Sites	<i>Provide map for the Historical, Cultural and Archaeological Sites</i>	Map added.
112	7.2.1 Erosion and Accretion	<i>Please provide a baseline information for the paragraph 412. There are no baseline information of the sediment loading or amount of total suspended solids (TSS) in the Chapter 5. Environmental and Social Baseline of the EIA Report.</i>	Baseline on erosion/accretion added as Section 5.2.2.

Page	Item/section	ADB comments	ISPMC Response
110	Grievance Redress Mechanism	<i>Make a separate chapter for this section. Add a flow diagram that will show the components and time frame of the mechanism</i>	Chapter (9) on GRM added.
134	EMP 10.1.1 Noise, Mitigation / Enhancement / Compensation / Contingency	<i>Please add the concept of "hours of operation are observed"</i>	Usually at site work starts at 8 AM and ends at 5 PM. Vehicle movement for mobilization of construction materials and operation of construction equipment should be limited within this period of the day.
135	EMP 10.1.1 Public Health, Mitigation / Enhancement / Compensation / Contingency	<i>What are the provisions to waste disposals?</i>	Rural toilets in Bangladesh are usually water- and smell-proof pits equipped with concrete circular slabs with a filtering arrangement at the bottom. Liquid passes while solids develop through anaerobic decomposition. After 5-6 months of working period in dry season the toilet is dismantled and the pit is covered with earth.
135	EMP 10.1.1	<i>What are the provisions to maintain the conditions of the immediate surface water and ground water to the site office, labour sheds, stock yards, etc.?</i>	Solid waste from labourer sheds is collected in bins and dumped into a ditch which is covered with earth at site closure. BoQs include solid waste management and provision of tube wells for drinking and cooking purposes. Sanitary

Page	Item/section	ADB comments	ISPMC Response
			toilets for labourers are located at a safe distance from site office and sheds. Working season takes place in dry season when groundwater level is low, limiting risk of overflow.
136	EMP 10.1.2 Bank Protection, Mitigation / Enhancement / Compensation / Contingency	<i>Please add the concept of "hours of operation are observed"</i>	Minor quantity of dust may be generated during working season which may be suppressed by sprinkled with water. This operation may be conducted from 9 AM to 4 PM (three times a day). Re noise: operation should be limited to between 8 AM to 5 PM.
136	EMP 10.1.2 Surface water quality, Mitigation / Enhancement / Compensation / Contingency	<i>Add the usage of sediment traps that would capture eroded materials along the immediate downstream of the bank protection activities</i>	No such arrangements for sediment traps to capture eroded materials is used/exists in bank protection work.
139	EMP 10.1.3 Surface water quality, Mitigation / Enhancement / Compensation / Contingency	<i>Add the usage of sediment traps that would capture eroded materials along the immediate downstream during the embankment construction and rehabilitation</i>	As above.
Annex 1	Table A1-1, A1-2, A1-3, A1-4 and A1-8	<i>Indicate each of the species' IUCN status</i>	IUCN Bangladesh does not assess conservation status of biota under Table A1-1 (terrestrial flora), A1-2 (cropfield vegetation) and A1-3 (wetland

Page	Item/section	ADB comments	ISPMC Response
			vegetation). Tables A1-4 to A1-8 checked and corrected.
Annex 4	Table -2. Proposed Fish Sanctuaries in the Project-2 Area	<i>Are the coordinates in the table correct? They do not seem fall into the area of Project-2.</i>	Coordinates are being checked – see response on comment 36 and 38, above.
Annex 1	Table A1-1, A1-2, A1-3, A1-4 and A1-8	<i>For information and consistency for all the tables, indicate each of the species' IUCN status.</i>	Achieved to the extent possible at this stage.
Annex 1	Table A1-9	<i>This can be a part of Annex 2 because the information in the matrix pertains to the potential impacts to river dolphins wherein Annex 2 contains the threats to river dolphins.</i>	Removed from A1 and included in A2.
Annex 1	Table A1-10	<i>The information in the table seems irrelevant for this annex. Consider removing this matrix from the annex and incorporating it into the groundwater baseline section of the main report instead.</i>	Removed from A1 and included in Main Report under Section 5.2.3 (groundwater).
Annex 9	Project Implementation Arrangements	<i>Based on the organizational chart for BWDB program management, the set up was made in 2013. Are there any changes in the management set-up? If there are any updates, please include any revisions or updates on the program management in this annex.</i>	Chart replaced for latest version (Feb 2018).

## APPENDIX M

### LIST OF ADMINISTRATIVE UNITS

**Table A1-1: Administrative Unit under MFF with Population Data**

Administrative Unit			
Sub-project	District	Upzilla	Population Data
Jamuna Right Bank 1 (JRB-1)	Sirajganj	Belkucchi	352835
		Kamarkhandi	138645
		Shahjadpur	561076
Jamuna Right Bank 2 (JRB-2)	Pabna	Bera	256793
		Santhia	380301
		Sujanagar	278096
Jamuna Left Bank 1 (JLB-1)	Tangail	Kalihati	410293
		Tangail Sadar	521104
		Delduar	207278
Jamuna Left Bank 1 (JLB-1)	Sirajganj	Chauhali	160063
	Tangail	Nagrapur	288092
	Manikganj	Daulatpur	112442
		Saturia	171494
		Ghior	146292
		Shibalaya	171873
Padma Left Bank 1 (PLB-1)	Manikganj	Harirampur	139318
		Manikganj Sadar	309413
		Singair	287451
Padma Left Bank 2 (PLB-2)	Dhaka	Nawabganj	318811
		Dohar	226439
	Munshiganj	Serajdikhan	288107
		Sreenagar	259887
Padma Left Bank 3 (PLB-3)	Munshiganj	Lohajang	159242
		Tongibari	197173
		Munshiganj Sadar	383263
Padma Right Bank 1 (PRB-1)	Rajbari	Pangsha	243285

<b>Administrative Unit</b>			
<b>Sub-project</b>	<b>District</b>	<b>Upzilla</b>	<b>Population Data</b>
		Rajbari Sadar	331631
		Goalanda	112732
Padma Right Bank 2 (PRB-2)	Faridpur	Faridpur Sadar	469410
		Char Bhadarasan	63477
		Sadarpur	186254
Padma Right Bank 3 (PRB-3)	Madaripur	Shib Char	318220
	Shariatpur	Zanjira	194019
		Naria	231644
Megna Left Bank 1 (MLB-1)	Chandpur	Uttar Matlab	292057
Megna Left Bank 2 (MLB-2)	Chandpur	Chadpur Sadar	465919
		Matlab Dakshin	210050
Megna Right Bank 1 (MRB-1)	Shariatpur	Bhedarganj	253234
		Gosairhat	157665

## APPENDIX N - PMO COMMENTS ON DRAFT EIA & ISPMC RESPONSE

PMO submitted its comments on the draft EIA (November 05, 2019). In the table below these PMO comments are listed and the ISPMC's response indicates how the comments have been addressed in the current final version of the report.

Sl. No.	PMO Comment	ISPMC Notes / Response to Project Management Office (PMO)	Location (Section/sub section/para/page no.)
A.	<b><u>General Observations</u></b>		
A1.	PMO has sent to you the ToR/Report Structure of the EIA via the Memo No. : PMOFRERMIP/E-4/871; Date: 17 October 2016 which was approved by the Department of Environment (DOE). Our development partner Asian Development Bank (ADB) has given their consent for following the GOB style through the email (attached as enclosure-I) and requested to ensure including all necessary items in the report to meet ADB's requirement. You are hereby requested to recast the EIA report by strictly following the approved ToR.	Although the report does not follow the exact order of the structure mentioned in the ToR of DoE and ADB in the memo, the contents cover all aspects as required by ADB and DoE. Note that it also follows the same structure as the already approved EIA for Tranche-1.	
A2.	The Report should be recast following the approved FSR (T-2). It is mentionable that in the FSR (T-2) report, no physical intervention is proposed under MLB-2 area. The FRERMIP financing plan needs to be updated as per actual	While the work locations and design of interventions have changed, the fundamental nature of works remains the same so that it can be expected that the environmental impacts are similar. The report has been updated to the T-2 design on 31 March 2020	
A3.	In the Executive Summary, there should be a table showing the sub-project area name, district name, upazila and union name (for proposed interventions) of T-2 project and in the main body of the report, there should be another table including the previous showing all the FRERMIP	This table has been included in an appendix that lists Administrative units.	Appendix M



Sl. No.	PMO Comment	ISPMC Notes / Response to Project Management Office (PMO)	Location (Section/sub section/para/page no.)
	(T1 , 2 & 3) sub-project areas' districts and upazilas name.		
A4.	In the Executive Summary of the report, there should be an A3 size clear colour satellite real image showing only T-2 proposed interventions and locations. In the main body, there should be two A3 size clear colour satellite real image (one showing only T-2 proposed interventions and another showing implemented T-1 interventions, proposed T-2 interventions and planned T-3 interventions as per approved FSR).	Maps are provided as appropriate. An A3 Map with satellite imagery has been provided in Appendix I	<u>Various locations throughout (e.g. 4-1)</u>
A5.	All the information and data provided in the submitted EIA report should be updated till the date (October 2019). So there need more data collection and updating. Hence, the report will be more acceptable.	Where data could be collected this was updated. Note that the purpose of the EIA is to provide an assessment of the long-term impacts of a project on the environment, which depend on long-term data series and trends. As the nature of the planned interventions was not altered fundamentally, significant changes to the EIA are not anticipated and therefore a repetition of the study is not required.	Paragraphs and data in 5.1.1 are updated.
A6.	To make the report more presentable, the whole report (including all appendices) should be in same Font, Font size, Letter spacing and more colourful with clear A3 maps (if suggested).	The report has been thoroughly edited to make it presentable	Throughout the whole report
A7.	The version name of the report should be updated at the bottom of each page of the report. The present header of the main body of the report	These have been done	In the whole report

Sl. No.	PMO Comment	ISPMC Notes / Response to Project Management Office (PMO)	Location (Section/sub section/para/page no.)
	should be deleted.		
A8.	It will be convenient to go through the whole report easily if all the para written here along with serial numbers	Although done in the first EIA, this has not been re-applied in the latest versions of the ESIA, as not all parties found it useful.	<u>N.a.</u>
B			
B1.	Cover Page: Please mention that the report prepared by Bangladesh Water Development Board (BWDB) with the financial assistance from ADB and technical assistance from ISPMC (NHC-EMM JV). Please also mention that the report is prepared for the proposed project of "Flood and Riverbank Erosion Risk Management Investment Program (FRERMIP)- Project-2" which may be implemented under the proposed ADB Loan 44167-015-BAN: Flood and Riverbank Erosion Risk Management Investment Program - Project-2.	These have been done however the ADB loan number has not yet been confirmed for Project-2 and this has been indicated	Cover page and page iii
B2	Page ii: proposed project name and loan number should be corrected for T-2. The revision date and the contributing team members' names should be updated.	Corrected and updated	Page-ii
B3	Page iii: proposed project name and loan number should be corrected for T-2. "ENVIRONMENT AND CLIMATE CHANGE and Main Report" may be deleted as the page is showing only the key data. Project start/end time may be updated as per approved FSR (T-2).	Corrected and updated	Page-iii
B4	Page iv: In 1 <sup>st</sup> para Tranche-I, 2 & 3 duration should be updated as per	Durations have been updated. The	Page-v, 1 <sup>st</sup> para

Sl. No.	PMO Comment	ISPMC Notes / Response to Project Management Office (PMO)	Location (Section/sub section/para/page no.)
	approved FSR (T-2). In 2 <sup>nd</sup> para financing plan should be updated as per 2 <sup>nd</sup> revised T-1 DPP and approved FSR (T-2). Please provide another detailed financing plan for T-2	financing amount and detailed financing plan are part of the FSR and can be found there. These are subject to changes during negotiations between GoB and ADB	
B5	Page v: In 4 <sup>th</sup> para, provide the zila, upazila & union against each sub-project area. Please delete related description for MLB-2 as there is no work proposed for MLB-2 are in FSR (T-2).	List of administrative units is included in Appendix M. Corrected for MLB-2.  The MFF covers four sub-projects. While currently no works are planned in MLB-2, it remains part of the MFF area and may be covered in Tranche 3.	Page-vi,  1 <sup>st</sup> para of the Assessed Project, Executive summary  included in Appendix M
B6	Page vi: In 1 <sup>st</sup> para, Total estimated cost for T-2 is 361.30 million US\$ (as per FSR: T-2) instead of \$ 143 million	Included. As per updated FSR for T-2 estimated total cost is 262 million USD	Page-vi,  2 <sup>nd</sup> para of the Assessed Project sub head, Executive Summary
B7	Page viii: In 4 <sup>th</sup> para, correct '20113' with '201 3' and in 3 no. reference correct 'Geob-Bags' with 'Geo-bags'	Corrected	Page-ix  3 <sup>rd</sup> para, Sub head- Riverbank protection intervention impacts-General

Sl. No.	PMO Comment	ISPMC Notes / Response to Project Management Office (PMO)	Location (Section/sub section/para/page no.)
			Reference-5
B8	Page ix: please make one para instead of 1 <sup>st</sup> & 2 <sup>nd</sup> para. In 3 <sup>rd</sup> para, provide Dolphin habitats reknowned area list which are related with FRERMIP area. The line "and India cannot be ruled out" should be deleted, In 4 <sup>th</sup> para repetition of "than" should be omitted.	The sentence has been refreshed deleting India. Repetition removed.	Page-x 2 <sup>nd</sup> para, Sub head- Riverbank protection intervention impacts-General
B9	Page x: In 2 <sup>nd</sup> para, 1 <sup>st</sup> point, the line "Along all protected riverbanks navigation buoys will be placed with kilometer spacing" may be replaced with "BWDB/MoWR will request BIWTNMoS to place navigation buoys along all protected riverbanks with kilometer spacing. In these regard, BWDB will provide the data of riverbank protection works. dredging works and other related works". In 3 <sup>rd</sup> point, the line "Vetiver, Katkin and Dhoincha are specially suggested here" may be added at the end. In 4 <sup>th</sup> point, regulator nos. is 'nine' instead of 'two' as per FSR (T-2). Please recast 4 <sup>th</sup> and 6 <sup>th</sup> para as in the FSR (T-2), there is no proposal for any physical work at any charland area. In 6 <sup>th</sup> para, the line "char shall be covered with katkin or vetiver plantation." may be replaced with "char shall be covered with dhoincha, katkin, vetiver or any other helpful plant for land reclamation to.."	1 <sup>st</sup> , 3 <sup>rd</sup> , and 4 <sup>th</sup> point have been refreshed. 4 <sup>th</sup> and 6 <sup>th</sup> paragraph: this refers to the embankment planned to run over the Solimabad char which is to be built in Tranche-3 after successful closure of the Solimabad channel through intelligent dredging and material placement.	Page-x & xi, 8.6.1 and Appendix D 8.6.2, P. 138
B10	Page xi: in 1 <sup>st</sup> para: requirement of land (27 ha) for RBP need justification and should be as per FSR (T-2). The sub-heading "Specific MLB-2 Interventions and Impact" should be deleted as it is a repeated sub-	This sub heading has been refreshed The justification for land acquisition is found in the resettlement framework and	Page-xi

Sl. No.	PMO Comment	ISPMC Notes / Response to Project Management Office (PMO)	Location (Section/sub section/para/page no.)
	heading.	resettlement plans	
B11	Page xii: in 2 <sup>nd</sup> para, the line "whole Brahmaputra System from the upstream areas at Kurigram in Bangladesh to the Bay of Bengal." should be recast with more specific location information considering the FRERMIP study area (downstream of Bangabandhu Bridge).	This paragraph refers to the river stabilization plan prepared under FRERMIP Tranche-1, which covers the entire length of the Jamuna and Padma rivers, including areas outside of FRERMIP T-1 project area	Page-xii
B12	<p>Page xiii: 2<sup>nd</sup> &amp; 4<sup>th</sup> para should be recast with accurate estimated cost as per FSR (T-2). Please keep in mind that placing of buoys is not the mandate of BWDB. It is the mandate of BIWTA/MoShipping. BWDB can help BIWTA only by providing related necessary data.</p> <p>GRM: The paragraph may be replaced as: "During implementation of Tranche-I project, there were formed 3 local Grievance Redress Committee (GRC) for each sub-project area/site. These may continue for Project-2 project implementation. However, as per development partner ADB's guideline, Grievance Redress Mechanism (GRM) will be effective for Land Acquisition, Resettlement, Environment, Gender and related any other issues during project and intervention implementation. It's proposed to assign national GRM specialist (male or female or both) to boost grievance mechanism and facilitate GRCs. The GRCs formed during Tranche-I may need reform as per revised resettlement framework or other related ADB guideline if required, A Joint Verification Team (JVT) consists of 3 members (representative from BWDB, DC, INGO) will visit the site before planning and construction for investigation of land and resettlements or other related assets. Then a Property Valuation Advisory Team (PVAT) consist of 4 members (Representative form BWDB,</p>	<p>The para has been refreshed</p> <p>Text has been refreshed as per advice mentioned in the comment</p>	<p>Page-xiii, 2<sup>nd</sup> para</p> <p>Page-xiii &amp; xiv</p>

Sl. No.	PMO Comment	ISPMC Notes / Response to Project Management Office (PMO)	Location (Section/sub section/para/page no.)
	<p>DC, INGO) will assess the costing of the identified assets in the alignment of the intervention. The concern office will pay the Affected Person (AP)s CCL and Resettlement Grants as per PVAT's decision. If any AP has any complain against any decision, then he can submit his complain to the GRC. Each GRC consists of 5 members (representative from BWDB, UP, AP, INGO). Aggrieved persons are free to access the country's legal system regardless of GRC involvement."</p>		
B13	<p>Page xiv: 1<sup>st</sup> para may be replaced with "As per development partner ADB's requirement, Quarterly Progress Report (QPR) will generate and will send to the concern offices. In addition to that semi-annual Environmental Monitoring Report, Work Completion Report, Training Report, IMED Report, Project Completion Report and any other report required for BWDB, MoWR, ERD, PC and ADB or other GOB part will be formulated and circulated among the concerns. The reports will be disclosed on ADB, BWDB and project's website. Environmental Monitoring Report will be prepared by PMO with close consultation with the Environmental Focal Point (EFP), Gender Progress Report will be prepared by PMO with close consultation with the Gender Focal Point (GFP) and Resettlement Plan Implementation Progress Report will be prepared by PMO with close consultation with the Chief Resettlement Officer (CRO) and</p> <p>In last line, ", and the implementation consultant" may be deleted.</p>	<p>1st para of Reporting and Monitoring has been refreshed as per advice mentioned in the comment</p> <p>Last line deleted</p>	Page-xiv

Sl. No.	PMO Comment	ISPMC Notes / Response to Project Management Office (PMO)	Location (Section/sub section/para/page no.)
B14	Page xxii: Enrich the ACRONYMS with the terms used in the report	Acronym list has been expanded	Page-xxiii & xxiv
B15	Page xxvi: Figure 1 may be replaced with more clearly, colourful and A3 sized map.	A clear new map is included	page-xxvi
B16	Page 1: 1 <sup>st</sup> para: May need to recast the paragraph following your Table 5-27. 2 <sup>nd</sup> para: Total project cost may be corrected as per 2 <sup>nd</sup> revised T-1 cost and FSR (T-2) cost. 6 <sup>th</sup> para: last line may be replaced with "The EIA Report for proposed Project-2 project is formulated in connection with the approved EIA report for Tranche-I project,"	1 <sup>st</sup> & 2 <sup>nd</sup> para have been updated  6 <sup>th</sup> para: Last line has been refreshed as suggested	Page-1, 1 <sup>st</sup> para  5 <sup>th</sup> para
B17	Page 2: 1 <sup>st</sup> para: the clause "and the World Bank supported Riverbank Improvement Project (RBIP)" may be deleted. The population data provided here should be in tabular form showing each Upazila wise population data. Figure 1-1: may be replaced with clearer one.	Development of the Jamuna river upstream of the Jamuna bridge is supported by World Bank.  Upazila wise population data provided in Appendix  New figure is provided	Information is included in appendix M  Page-2
B18	Page 3: 1.5 Report Format: Please follow the General Observation (a).	Corrected	Page-3
B19	Page 9: Figure 2-1 may not be suitable in this para. This figure may be shifted to a new para.	The figure has been shifted under Environmental clearance procedure for red category project	Page-8

Sl. No.	PMO Comment	ISPMC Notes / Response to Project Management Office (PMO)	Location (Section/sub section/para/page no.)
B20	Page 13: 'National Environment Policy', 'Biodiversity Act', 'Balu Mahal Nitimala', 'Jol Mahal Nitimala' and related may need to be added here	The policy and act have been included as suggested	Page-13 & 14
B21	Page 14: Is there any update available for Schedule 2, 4 & 8 of Environmental Conservation Rules 1997, if yes, then please provide the update.	There is no update available for schedule 2, 4 & 8 of Environmental Conservation Rules 1997	Page-15
B22	Page 24: The T-2 map may be A4/A3 in size. Table 4-1: Please provide the interventions' tentative location (chainage, length, union, upazila and zila).	The T-2 map is enlarged and is provided in A3 in Appendix I	page-27 Appendix I
B23	Page 25: Table 4-2: Please add regulator cum fishpass/boatpass number, land reclamation (if any), dredging and slope protection piloting works (if any).  4.2 Technologies Used: Please provide intervention wise individual technology, which will be used during physical work implementation. Please give emphasis on dredging component, as it is related with DOE, BIWTA, MOL and local Administration. So that achieving clearance/no objection certificate from concern agency will be easier and timely.	No, of regulators with fishspasses (2 no.) is mentioned in the text below Table 4-2  This information can be found in Table 4-3	Page 26  Page-29



<b>Sl. No.</b>	<b>PMO Comment</b>	<b>ISPMC Notes / Response to Project Management Office (PMO)</b>	<b>Location (Section/sub section/para/page no.)</b>
B24	Page 27: 1 <sup>st</sup> Para: "Project-2 will build more than 25 km of flood embankments.." may be replaced with "Project-2 will build 25.30 Km of flood embankments.." The line "A number of regulators..." may be replaced with "8 regulator cum fishpasses and 1 regulator cum fish/boatpass.". 2 <sup>nd</sup> para: the line "with compacted dredge-fill" may be replaced with "with compacted dredged matetrials".	No boat pass is planned under Project-2 and 2 no regulators with fish passes are planned following the removal of Harirampur embankment  Replaced as suggested	Page-32
B25	Page 28: (ii) the line "with compacted dredge-fill" may be replaced with "with compacted dredged matetrials".	Replaced as suggested	Page-32
B26	Page 31; Last para: please provide only the Project-2 area information (sub-project/ district wise) in the line "Mean Rainfall in the project area is approximately 1800 mm/year".	There are two BWDB rainfall station which falls under T-2 area i.e. Faridpur & Tangail. Taking rainfall data of these two stations up to 2019 and mean of these will give approximate mean annual rainfall in the project area. This data was requested in November 2019 and was not received and therefore could not be updated	n/a
B27	Page 32, 33: Figure 5-1, 5-2, 5-3, 5-4 & 5-5 should be elaborated (please mention the area, avg. or specific, station location etc.). Please update the data till date (October 2019).	Figure 5-2. 5-3, 5-4. 5-5 & 5-6 have been updated up to 2018	Page-34, 35 & 36
B28	Page 35: Figure 5-7: Please omit the 'CEGIS logo'.	As CEGIS is the originator of the figure, the logo cannot be omitted, but then the caption has to state the source	Page-37
B29	Page 36: Figure 5-8: Please omit the 'CE-GIS logo'	Same response to comment B28	Page-38

Sl. No.	PMO Comment	ISPMC Notes / Response to Project Management Office (PMO)	Location (Section/sub section/para/page no.)
B30	Page 37: Table 5-1 & 5-2: Please update the data till date (October 2019)	This data was requested in November 2019 but was not received. So, Table 5-1 & 5-2 could not be updated	
B31	Page 39: Table 5-3 & 5-4: Please update the data till date (October 2019) Table 5-5: Please add a column showing the values you described in the para 'water quality'.	This data was requested in November 2019 but was not received. Table 5-3 & 5-4 could not be updated.  Table 5-5 has been modified	Page-41 & 42
B32	Page 40: Table 5-6: The data may be updated till date (October 2019).	Table 5-6 contains reference values rather than measured values and therefore has not been changed.	Page-43
B33	Page 41: 1 <sup>st</sup> para: There may be a para heading named 'Ground Water Salinity'	The salinity in Jamuna and Padma River is considered as 0 ppt. So, ground water salinity may be considered as zero, certainly in the Reaches under consideration.	Page-43, 2 <sup>nd</sup> para
B34	Page 46: 2 <sup>nd</sup> & 3 <sup>rd</sup> para: These two para should be updated till date (October 2019) and the data provided here should be 'source' supported.  Char Formation: In this discussion, there should be periodical satellite images showing the morphology during char accretion/erosion	2 <sup>nd</sup> & 3 <sup>rd</sup> para have been updated up to 2018 and source has been mentioned  A detailed analysis of the complex morphological processes in the Jamuna and Padma river would exceed the scope of this report. The relevant information can be obtained elsewhere (River stabilization plan, FAP reports, etc)	Page-48

<b>Sl. No.</b>	<b>PMO Comment</b>	<b>ISPMC Notes / Response to Project Management Office (PMO)</b>	<b>Location (Section/sub section/para/page no.)</b>
B35	<p>Page 47: 3<sup>rd</sup> para: please correct the numbering. 4<sup>th</sup> para: The line "Characteristics of the study area's agro.." should be replaced with "The study area's agro.." as the Table 5-11 is showing only the area.</p> <p>Table 5-12 &amp; 5-13: Please provide the decimal value for the range showing here.</p> <p>Page 49: Figure 5-13: Please omit 'CEGIS logo'. The map should be shown under district/upazila boundary.</p>	<p>Numbering of 3<sup>rd</sup> para is corrected and line in 4<sup>th</sup> para has been changed as suggested</p> <p>This data is from BRAC fertiliser guide as per the source and so numerical data is not available</p> <p>Pl. response to the comment B28</p>	<p>Page-49</p> <p>Page-50</p> <p>Page-51</p>
B36	<p>Page 50: Table 5-14, 5-15 &amp; 5-16: Please provide the decimal value for the range showing here.</p> <p>2<sup>nd</sup> para: the line "become moderately deeply or deeply.." should be replaced with "become moderately deep or deeply..".</p>	<p>This data is from BRAC fertiliser guide as per the source and so numerical data is not available</p> <p>The line has been changed as suggested</p>	<p>Page-52 &amp; 53</p> <p>Page-53, 2<sup>nd</sup> para</p>
B37	<p>Page 51: Last para: The line "are about 21, 8, 22 and 14 respectively.." should be in compliance with Table 5-18</p>	<p>The line has been corrected as per Table 5-20</p>	<p>Page-54, 2<sup>nd</sup> para</p>
B38	<p>Page 53: 2<sup>nd</sup> para: the line "Most of the area (82%)... The rest (18%)..." should be replaces with " Most of the area (83%)... The rest (17%)</p>	<p>The line has been corrected as per Table 5-23</p>	<p>Page-55, 3<sup>rd</sup> para</p>
B39	<p>Page 63: Figure 5-17: The 'CEGIS logo' may be omitted and the map should be more clear showing districts boundary</p>	<p>Pl. see response to comment B28</p> <p>A clear map has been provided</p>	<p>Page-66</p>

<b>Sl. No.</b>	<b>PMO Comment</b>	<b>ISPMC Notes / Response to Project Management Office (PMO)</b>	<b>Location (Section/sub section/para/page no.)</b>
B40	Page 65: 3 <sup>rd</sup> para: The line "The study area consists of 8 Upazila's of 4 districts ( should be recast as per approved FSR (T-2). Please show the T-2 project area in tabular format. The line "of some 93,000 ha." may be replaced with "of some 93,975 ha..".	The study area is independent of the approved feasibility study, which is a result of the study.  The line has been corrected as suggested	Page-68, 3 <sup>rd</sup> para
B41	Page 66: Table 5-29: The table may recast for only T-2 area	The impact of the FRERMIP T-2 works will have impact on the total project area. Therefore, data for the entire area is provided	Page-69. Table 5-31
B42	Page 70: Table 5-30: The table may recast for only T-2 area	Pl. see response to comment B41	Page-73, Table 5-32
B43	Page 75: 1 <sup>st</sup> para: The line "lists are given in Annex 1" may be replace with "lists are given in Appendix A".	The line has been corrected	Page-77
B44	Page 76: TEESTA FLOODPLAIN: This para may be not suitable here as the area may not be under T-2 area	The para has been deleted	Page-79
B45	Page 77: Figure 5-21 : The map should be more clear showing the district boundary. Last para: The line "this zone was heavily forested,...: should be checked again	Clear map with district map provided  The paragraph has been deleted	Page-80
B46	Page 80: 1 <sup>st</sup> para: Please check whether there is any natural forest or not.  Last para: please correct the serial number.	There is no natural forest in these regions  Serial number has been corrected	Page-83
B47	Page 82: AQUATIC FAUNA: Please recast the whole discussion with the	Updated study/information up to October 2019 is not available. This type of	Page-85 & 86

<b>Sl. No.</b>	<b>PMO Comment</b>	<b>ISPMC Notes / Response to Project Management Office (PMO)</b>	<b>Location (Section/sub section/para/page no.)</b>
	updated data (October 2019).	study/survey is not conducted frequently. The available discussion with aquatic fauna is consider sufficient for baseline of the report. Detail discussion on threat of Dolphin is also provided in Appendix-B	
B48	Page 86: Table 5-37: Please provide the source of data.	Source provided	Page- 89 , Table 5-39
B49	Page 87: The table 5-38 should be recast as per approved FSR (T-2) area, Table 5-39: The data provided here should be unit base.	Table 5-38 has been revised as table 5-40. The unit has been provided in text	Page- 90, Table 4-40, 2 <sup>nd</sup> para
B50	Page 88: Table 5-41 may be recast for Upazila targeted for T-2 project area (FSR_T-2). Please mention the source of data	Pl. see response to comment B41  Source mentioned	Page- 92. Table 5-43
B51	Page 89: Table 5-41 may be recast for Upazila targeted for T-2 project area (FSR_T-2)	Pl. see response to comment B41	Page- 92. Table 5-43
B52	Page 92: Table 5-43 may be recast for Upazila targeted for T-2 project area (FSR_T-2)	Pl. see response to comment B41	Page-96. Table 5-45
B53	Page 95: Please mention the Expenditure and Income Unit in the Table 5-45	Table 5-45 has been revised as Table 5-47	Page-99, Table-5-47
B54	Page 96: Table 5-49 may be recast for Upazila targeted for T-2 project area (FSR_T-2).	Pl. see response to comment B41	Page-100, Table 5-51
B55	Page 97: Table 5-50 & 5-51 may be recast for Upazila targeted for T-2 project area (FSR_T-2)	Pl. see response to comment B41	Page-101, table-5-52 & 5-53

<b>Sl. No.</b>	<b>PMO Comment</b>	<b>ISPMC Notes / Response to Project Management Office (PMO)</b>	<b>Location (Section/sub section/para/page no.)</b>
B56	Page 98: Table 5-52 may be recast for Upazila targeted for T-2 project area (FSR_T-2)	Pl. see response to comment B41	Page-102, Table 5-54
B57	Page 99: 2 <sup>nd</sup> para: please mention the study area (district & upazila).	This refers to the FRERMIP study area	Page-103, 2 <sup>nd</sup> para
B58	Page 101: Figure 5-34: the map may be replaced with the map showing only the district boundary and historic, archeological site. Map showing road connectivity is not preferable here	Figure 5-34 has been revised showing district boundary	Page-105
B59	Page 103: 3 <sup>rd</sup> para: the line "this study in early-2013..." may be replaced with the actual date. 6 <sup>th</sup> para: 'Annex 5' may be replaced with 'Appendix E'.	Actual date provided  Annex 5 has been replaced by Appendix E	Page-107. 3 <sup>rd</sup> para  6 <sup>th</sup> para
B60	Page 104: Figure 6-1: The 'CEGIS logo' may be omitted. The map may be replaced with the map showing districts boundary only. Road connectivity is seeming irrelevant here	For CEGIS logo pl. see response to comment B28.  The quality of this map has been improved so that it is clearer, as it is a CEGIS map the roads could not be removed.	Page-109
B61	Page 105: The 3 <sup>rd</sup> para should be recast as the consultation should be under T-2 project only. 5 <sup>th</sup> para: 'Annex 7' may be replaced with 'Appendix G'. 6 <sup>th</sup> para: Omit the duplication of 'and'.	3 <sup>rd</sup> para: this refers to the consultations held in preparation of Tranche 1. As this EIA is connected to Tranche-1 and the consultations are an ongoing project, this should be mentioned here  5 <sup>th</sup> para and 6 <sup>th</sup> para has been replaced as suggested	Page-109, 4 <sup>th</sup> para  Page-110

Sl. No.	PMO Comment	ISPMC Notes / Response to Project Management Office (PMO)	Location (Section/sub section/para/page no.)
B62	Page 106: The Third Round Consultation may not cover all the T-2 Upazilas/districts. There may need recast of this 6.53 paragraph	The Third Round Consultations cover all relevant upazilas	Page-109 & 110
B63	<p>Page 107: 1<sup>st</sup> para: the two lines "is threatened by erosion this year." &amp; "Baghabari is also essential this year.." should be replaced with the specific year/period of threatening.</p> <p>3<sup>rd</sup> para: the line "where 40-50% of the area has already eroded away," Should be recast with the accurate statistics of erosion &amp; accretion for that Upazila. The line "BWDB has been using sandbags to control the erosion, but these have been ineffective given the intensity of the erosive attack. Participants stated that sandbag revetments are ineffective in the Jamuna due to its erosion intensity" may be replaced with "BWDB has been using sandbags as temporary measure to protect the riverbank from sudden severe erosion, but these temporary measures are found not effective as sustainable solution. Many participants stated that these sandbag revetments are presently not suitable for the mighty Jamuna river due to its severe erosion intensity."</p> <p>The line "An embankment built in this Upazila at a cost of BDT 38 crore was destroyed by erosion" may be recast with the line "An embankment of Km. built in this Upazila along the right bank of Jamuna river during the year at a cost of BDT ... ..crore was eroded due to severe flood and intensive erosion of mighty Jamuna river," Is there any meetings for other Upazilas?</p>	<p>1<sup>st</sup> para: has been refreshed as suggested</p> <p>3<sup>rd</sup> para: has been refreshed as suggested</p>	<p>Page-111, 3<sup>rd</sup> para</p> <p>Page-111, 5<sup>th</sup> para</p>
B64	Page 108: 2 <sup>nd</sup> para: The line "Stakeholder engagement will continue during implementation facilitated by an NGO engaged for this purpose" may be replaced with "Stakeholder engagement was continued during	This refers to the stakeholder engagement during implementation of Project-2	Page-112, 2 <sup>nd</sup> para

Sl. No.	PMO Comment	ISPMC Notes / Response to Project Management Office (PMO)	Location (Section/sub section/para/page no.)
	planning process of the project. During implementation, GRM will be effective for any claim regarding environment issue for the affected persons and will be facilitated by an INGO engaged for this purpose." Footnote 15: 'Annex JI' may be deleted.	The resettlement framework from 2013 is the original document covering the MFF.	
B65	Page 109: 2 <sup>nd</sup> para: the line "into the December and July version of..." may be replaced with "into the January and July version of..."  The components described in Chapter 7 may be short version duplication of the components of Chapter 5. Please follow DOE approved ToR, where special emphasis given on "Environmental and Social Impacts (Positive and Negative both)". Chapter 7 need to recast accordingly.	Corrected as per suggestion  This chapter is intended to select environmental and social component that may likely be impacted the items whose information given in chapter 5 in connection with the planned works. The mentioned detailed impact assessment is presented in chapter 8.	Page-113, 2 <sup>nd</sup> para  Page-114, Chapter-7
B66	Page 110: 6 <sup>th</sup> para: The line "proposed interventions are likely to impact the.]' may be replaced with the line "proposed interventions may impact the..."	Changed as suggested.	Page-115, 3 <sup>rd</sup> para
B67	Page 115: 3 <sup>rd</sup> para: the line "...during the period (RMIP 2015)" may be replaced with only the period but no the project name.  4 <sup>th</sup> para: the estimate "USD 110 million per year," need justification here, or provide the source	This is a reference to a report prepared under the RMIP study. Hence the project name cannot be removed  4 <sup>th</sup> para: has been refreshed	Page-122, last para  Page-123, 1 <sup>st</sup> para
B68	Page 116: 2 <sup>nd</sup> para: the estimate "USD 75 million per year," need justification here, or provide the source.	The para has been refreshed	Page-123, 3 <sup>rd</sup> para
B69	Page 118: 2 <sup>nd</sup> para: the estimate "5000 ha of land will be reclaimed" need	The para has been revised. Source of	Page-125, 4 <sup>th</sup> para



Sl. No.	PMO Comment	ISPMC Notes / Response to Project Management Office (PMO)	Location (Section/sub section/para/page no.)
	justification here, or provide the source	estimate is FSR for T-2.	
B70	Page 121: 2 <sup>nd</sup> & 5 <sup>th</sup> para: the study was done for 'Choirā' area, which is not our FRERMIP (T-2) area. So the study area need to be reset according to the proposed T-2 area. However, Land Reclamation is not a major component under T-2 project.	This relates to the people living on chars within the project area, including the Solimabad char, which is subject to be stabilized through Project-2. Irrespectively of interventions directly on the char, the population is impacted by interventions along the river and a holistic study without consideration of chars and char population is not possible	Page-128, 6 <sup>th</sup> para
B71	Page 122: 2 <sup>nd</sup> para: the whole 2 <sup>nd</sup> para need to be deleted as the para is not suitable for EIA Study Report	Land tenure is an essential parameter for the implementation of any intervention, including environmental management measures.	Page-129, 6 <sup>th</sup> para
B72	Page 124: 4 <sup>th</sup> para: No. IV) : The word 'IL' may be replaced with 'RL' and the Land Types (F2F4) shown here need to be elaborated here or as footnote.  6 <sup>th</sup> para: The word 'HYV Taman' may be replaced with 'HYV Aman'	4 <sup>th</sup> para: IL stands for invert level;  Explanation has been provided in footnote  Changed as per suggestion	Page132, 1 <sup>st</sup> para  Footnote 21  3 <sup>rd</sup> para
B73	Page 126: 2 <sup>nd</sup> para: (Annex3) may be replaced with '(Appendix C)'.  3 <sup>rd</sup> para: The line "Here people from the surrounding areas complain about a bad smell and unhealthy conditions that negatively affect their living conditions" may be deleted. 5 <sup>th</sup> para: the line "but thus far this isn't	Corrected as mentioned  3 <sup>rd</sup> para: this is a finding from consultations and an impact from the project, which has to be addressed. Explanation of measures	Page-133, 8 <sup>th</sup> para  Page-134. 1 <sup>st</sup> para

Sl. No.	PMO Comment	ISPMC Notes / Response to Project Management Office (PMO)	Location (Section/sub section/para/page no.)
	operational anywhere" may be deleted	taken will be included  The sentence has been refreshed	Page-134, 3 <sup>rd</sup> para
B74	Page 127: last para: duplication of 'that' word may be omitted	corrected	Page-137, 4 <sup>th</sup> para
B75	<p>Page 128: 3<sup>r</sup> para: No.(I) : The line 'Along all protected riverbanks navigation buoys will be placed with kilometer spacing to protect fish habitats from systematic overfishing with floating nets} May be replaced with 'Along all protected riverbanks navigation buoys will be suggested to Department of Fisheries to place with kilometer spacing to protect fish habitats from systematic overfishing with floating nets. BWDB will provide necessary data to DOF &amp; BIWTA for the purpose."</p> <p>No (II) : The line "The countryside slopes of the embankment shall be used for tree plantation of local resilient varieties to help re-establishing a diverse vegetation covered' may be replaced with the line "The countryside &amp; riverside both slopes of the embankment may be covered with Vetiver, Katkin &amp; Dhoincha plantation for slope protection as well as to help re-establishing a diverse vegetation cover."</p> <p>5<sup>th</sup> para: The line "Typically, the land used alongside the protection char banks would be in order of 250m wide, and contain the slope protection above low water level, a berm and the embankment" may be recast following the design and drawing of T-2 RBP works. It is mentionable that under T-2, there is no char bank protection work.</p>	<p>Changed as suggested</p> <p>Changed as suggested</p> <p>5<sup>th</sup> para: see answer to comment B70</p>	<p>Page-138. No.(I)</p> <p>Page-138. No (II)</p> <p>Page-138. 3<sup>rd</sup> para</p>
B76	Page 129: 2 <sup>nd</sup> & 3 <sup>rd</sup> para: the required land of 27ha & 90ha need justification or source of data. The line "About 7km of the alignment	Some of these comments longer relevant as no embankment at PLB-1 is proposed	Page137 & 138

Sl. No.	PMO Comment	ISPMC Notes / Response to Project Management Office (PMO)	Location (Section/sub section/para/page no.)
	<p>(40%) will be placed on newly reclaimed charland" need to be recast as per approved FSR (T-2).</p> <p>4<sup>th</sup> para: the line "In total 5 regulators... need to be checked.</p> <p>6<sup>th</sup> para: The line "The embankment planned for Tranche-I is yet to start due to unavoidable delay in tendering process" need to be recast as per actual field condition.</p> <p>9.1 Tranche-I Experience: 1<sup>st</sup> &amp; 2<sup>nd</sup> para: need to recast as per last update (please follow QPR16 or latest draft 17)</p>	<p>under the updated design as per client preference</p> <p>6<sup>th</sup> para: has been refreshed</p> <p>9.1: The para has been refreshed</p>	<p>Page-138 &amp; 139</p> <p>Page-140</p>
B77	<p>Page 131: 4<sup>th</sup> para: The line "For implementation of GRM it is proposed to assign two..." may be replaced with the line 'For implementation of GRM, there may be two..."</p>	<p>This change would not make it clear that these are additional positions</p>	<p>Page-142, 3<sup>rd</sup> para</p>
B78	<p>Page 132: 1<sup>st</sup> para: No (IV): the line " in a format agreed with the ISPMC Team Leded' may be replaced with ...in a format agreed with the BWDB and the development partner ADB". 3<sup>rd</sup> para: The line "the FRERMIP project area was.." may be replaced with "the FRERMIP program area was....</p>	<p>1<sup>st</sup> para: changed as suggested</p> <p>3<sup>rd</sup> para: Changed as suggested</p>	<p>Page-142, 3<sup>rd</sup> para (IV)</p> <p>Page-143, 1<sup>st</sup> para</p>
B79	<p>Page 133: last para: the line "specialist firm/NGO will be retained.." may be replaced with "specialist firm/NGO may be retained.."</p> <p>Provide the Impact Magnitude Scale here in a tabular format</p>	<p>Changed as suggested</p> <p>Impact Magnitude scale have been provided against each intervention in EMP table</p>	<p>Page-144, 4<sup>th</sup> para</p> <p>EMP table</p>
B80	<p>Page 136: 11.1.2 'Bank Protection' may be replaced with 'Riverbank</p>	<p>Changed as suggested</p>	<p>Page-147, 11.1.2</p>

<b>Sl. No.</b>	<b>PMO Comment</b>	<b>ISPMC Notes / Response to Project Management Office (PMO)</b>	<b>Location (Section/sub section/para/page no.)</b>
	Protection'.  Noise: Mitigation: may be 'Working hours to be restricted to 8:00 AM to 5:00 PM. only'	Changed as suggested	
B81	Page 137: Surface Water Quality: Mag. of Impact may be -3 & EMP Cost may be 2.00	The impact magnitudes are determined by national and international environmental experts. This test will be conducted at different locations	Page-148
B82	Page 139: Terrestrial and Aquatic Ecosystem Diversity: Mag. of Impact may be -1 & Mag with EMP may be -1	The impact magnitudes are determined by national and international environmental experts.	Page-150
B83	Page 140: Health and Safety: Mag. of Impact may be -3	Same response to comment B 82	Page-151
B84	Page 141: Employment: Mag. of Impact may be +3. Community Organizations: EMP Cost: Check FSR (T-2) for accurate costing	Same response to comment B 82	Page-152
B85	Page 142: 11.113: 'Embankment Construction and Rehabilitation' may be replaced as 'Embankment Construction/Reconstruction'.  Air Quality: Mag with EMP may be -1.  Page 143: Noise: Mitigation: may be 'Working hours to be restricted to 8:00 AM to 5:00 PM	Changed as suggested  Same response to comment B 82  Changed as suggested	Page- 152 & 153
B86	Page 144: Drainage Congestion: Mitigation: may be 'Constructing Regulators cum Fish/Boat pass at appropriate locations'.	Changed as suggested  Cost may be incurred from anywhere from	Page-154

Sl. No.	PMO Comment	ISPMC Notes / Response to Project Management Office (PMO)	Location (Section/sub section/para/page no.)
	Land Loss: Mag with EMP may be 0 and for EMP Cost, please check present ongoing works' BOQ of the Contract Agreement	project, but it will be reckoned as EMP cost and magnitude is consider with EMP	
B87	Page 146: Crop Production Loss: Mag with EMP may be +1 & the list of Responsible Agency may need recast	Same response to comment B 82	Page-156
B88	Page 148: Fish Habitat: Mag of Impact may be -3 & Mag with EMP may be -1. Mitigation: please mention all 9 regulators which are proposed in FSR (T-2)	Same response to comment B 82. 7 no of these regulators are no longer proposed as PLB1 embankment has been removed from the design as per Client preference. 2 no fish regulators have been mentioned as mitigation	Page-157
B89	Page 149: Terrestrial and Aquatic Ecosystem Diversity: Mag. of Impact may be -3 & Mag with EMP may be -1. In Impacts: the line '..and fauna will be destroyed' may be replaced with '..and fauna may be destroyed'	Same response to comment B 82 Impact column changed as suggested	Page-158
B90	Page 151: Health and Safety: Mag of Impact may be -3	Same response to comment B 82	Page-159
B91	Page 152: Employment: Mag of Impact may be +2. Community Organizations: EMP Cost: Please mention the decimal figure	Same response to comment B 82 Sub section corrected	Page-160
B92	Page 153: 11.14 'Drainage Structure/Sluice/Fishpass' may be replaced with 'Drainage Structure/Rgulators cum Boat/Fishpass' Page 154: Noise: Mitigation: may be 'Working hours to be restricted to 8:00 AM to 5:00 PM.' Drainage Congestion: the word 'sluices' may be replaced with 'regulators	_Changed to "regulators cum fish passes" Working hours restriction mention as suggested	Page-161

<b>Sl. No.</b>	<b>PMO Comment</b>	<b>ISPMC Notes / Response to Project Management Office (PMO)</b>	<b>Location (Section/sub section/para/page no.)</b>
	cum boat/fish pass'. EMP cost: mention the decimal figure	Changed to "regulators cum fish passes"	
B93	Page 155: Health and Safety: Mag of Impact: may be -2. Employment: Mag of Impact: may be +2. Community Organizations: EMP Cost: mention the decimal figure	Same response to comment B 82 Same response to comment B 82 Figure included	Page-160
B94	Page 158: Waste and Disposal: Mag of Impact may be -2. Public Health: Mag of Impact may be -3 & Mag with EMP may be -1	Same response to comment B 82 Same response to comment B 82	Page166
B95	Page 159: Erosion: Mitigation: check the figure of .6,700ha'. Drainage Congestion: Mitigation: the word 'sluices' may be replaced with 'regulators cum boat/fishpass'	Pl. check the figure 6700 ha Changed to "regulators cum fish passes"	Page-176
B96	Page 162: Sand Carpeting: EMP Cost: Mention the decimal figure	At this stage figure cannot be provided. It will be quantified after assessing field condition	Page-170
B97	Page 164: Improved Irrigation Facilities: EMP Cost: Mention the decimal figure	Cost will be finalised after observing field condition	Page-172
B98	Page 165: Fish Habitat: Impacts: The line 'Estimated net loss of 6,700 ha of fish habitat due to land reclamation + habitat altered due to the revetment 1,300 ha' need to be check following the FSR (T-2). Fish Migration: Mitigation: the word 'sluices' may be replaced with 'regulators cum boat/fishpass'. Mag with EMP may be -2	This has not been mentioned in FSR T2  Changed as per suggestion	Page-174

Sl. No.	PMO Comment	ISPMC Notes / Response to Project Management Office (PMO)	Location (Section/sub section/para/page no.)
B99	Page 166: Fish Biodiversity & production enhancement: Mitigation (1, 3 & 7): placing buoys is not the mandate of BWDB but the mandate of Department of Fisheries or BIWTA. BWDB can provide the RbP Works' data to the concern organizations. Hence 1, 3 & 7 no. mitigation need to be recast as per.	It is a mitigation measure provided by the expert which should be included in EMP. During implementation the responsibility/ mandate will be sort out	Page-175
B100	Page 169: Communication: Impacts: the line '...be provided with crest pavements..' may be replaced with ...be provided with 10m wide crest of the flood protection embankments..}  EMP Cost: Mention the decimal figure following the FSR (T-2).  Responsible Agency: should be BWDB	A crest alone will not improve road transport unless it is paved, as otherwise this is subject to encroachment  Project cost (Tbd)  Changed as suggested	Page-179
B101	Page 171: Monitoring Plan 10: 'No embankment and bank soil erosion' may be replaced with 'No embankment and riverbank soil erosion'	Changed as suggested	Page-180
B102	<u>Page 176: 3rd para: The line 'aquatic habitats including charlands and their...' may be recast as there are no works in charlands under FSR (T-2).</u>  <u>The recommended action I, II &amp; III should be more elaborate that which agency will implement those actions as BWDB is not mandated to do those. Different agencies can do those actions and BWDB can assist concern agencies providing related data for this purpose.</u>  <u>The line 'Finalization of the Tranche-I works (in 2018) can proceed without further environmental study' need to recast as per present situation.</u>	The sentence has been refreshed without including charlands  The action I, II & III has been refreshed  The para has been refreshed	Page-186

<b>Sl. No.</b>	<b>PMO Comment</b>	<b>ISPMC Notes / Response to Project Management Office (PMO)</b>	<b>Location (Section/sub section/para/page no.)</b>
B103	Page 186,187, 188, 189, 190: IUCN Status & Local Status: Please update the list as per latest 2019 status	The list was last updated in 2015 and it will be updated in 2025 again	Page- 196 to 200
B104	Page 193: 1 <sup>st</sup> para: The line 'Perhaps the most significant issue is the building more than 50 dams along many rivers,..' may need recast with more specific data (number of dams and relevant river names), like the relevant upstream river of Jamuna and Padma.  3 <sup>rd</sup> para: The line 'Dolphin oil is used by people in Bangladesh as a liniment,' should be replaced with the line 'Dolphin oil & organs are used by the people around the world,....'	This comment is related to the destruction habitat of dolphins across the sub-continent and so the names of the rivers or dams are not relevant and will not affect the statement's validity. A sentence in the main report can be added referring to the overall effect of dolphins.  This document relates to Bangladesh, however refreshed according to Client preferences	Page-205
B105	Page 197-203: The proposed Bird Sanctuary Site 1, 2, 3, 4, 5, 6, 7, 8 & 9 should be more specific by mentioning Union, Upazila and District name	The bird sanctuary sites are provided with maps and GPS coordinates instead, which is more specific than union & upazila name.	Page-209 to 215
B106	Page 206: 1 <sup>st</sup> para: Please provide the Fish Sanctuary DoFo data up to the date (October 2019) and provide the data only for T-2 area as per approved FSR Page 207: 1 <sup>st</sup> para: may recast the report as per latest DoFo report	No updated data/report regarding the no. of Fish Sanctuaries in the Tranche -2 in October 2019 is available with the DoF. However, field report of the ISPMC Team of August 2019 indicated that there are 5 Fish Sanctuaries, most of them non-functional, in the Tranche -2 area including the DoF and NGO supported ones.	Page-218 & 219



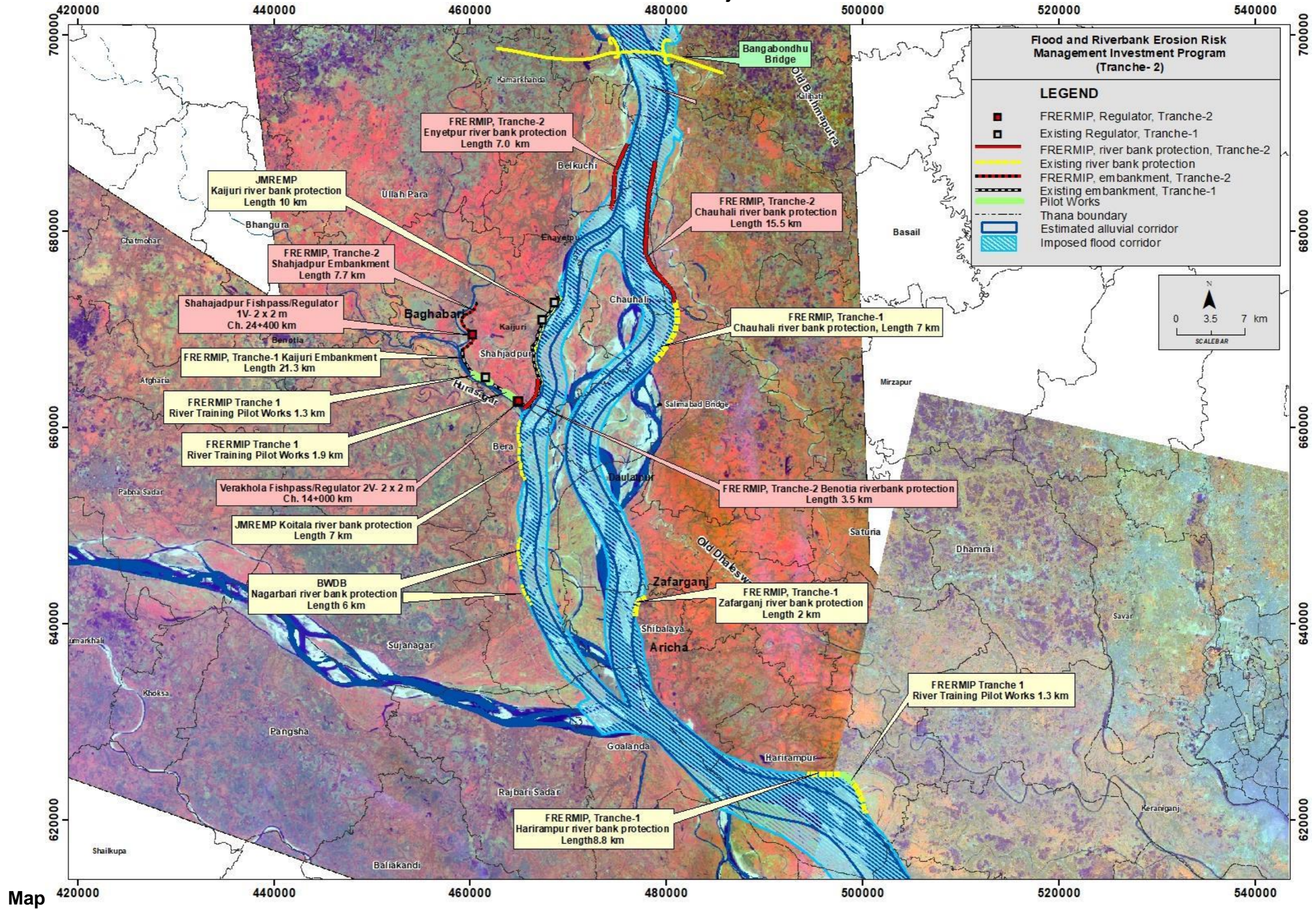
Sl. No.	PMO Comment	ISPMC Notes / Response to Project Management Office (PMO)	Location (Section/sub section/para/page no.)
B107	<p>Page 210: Figure DI-I: the map should be more clear and the figure title may be 'Proposed location of model sanctuary which is located under T-2 project site.</p> <p>1<sup>st</sup> para: the line because the project will continue till 2023 with...' may be replaced with the line .because the FRERMIP MFF program is expected to be continued till 2023 with...'</p>	<p>Clear map provided</p> <p>The sentence has been changed as suggested</p>	<p>Page-222</p> <p>Page-223, 1<sup>st</sup> para</p>
B108	<p>2<sup>nd</sup> para: The para may be recast as per the sense that BWDB is not mandated to implement fish sanctuaries in the project area. DoF is mandated to do that. BWDB may assist DoF by providing necessary data in purpose of Sanctuary establishment. ADB may finance DoFi in respect of establishment of fish sanctuary to mitigate the adverse effect of fish production &amp; habitat due to T-2 project implementation</p>	<p>2nd para has been refreshed. DOF initiated establishing Inland Fish Sanctuaries as extension measures in the 1980s, and now several NGOs and private efforts are there to establish and maintain Fish Sanctuaries. Project evaluation of sanctuaries found many to be deficient, and an improved approach is needed.</p>	<p>Page-223</p>
B109	<p>Page 213: Table EI-3: Please correct the project name and proponents may be BWDB, ISPMC &amp; ADB</p>	<p>At that time, no ISPMC was engaged, hence the proponent was NHC</p>	<p>Page-225</p>
B110	<p>Page 231: Table GI-I: is there any consultation meeting for Tangail? If so, then please mention the details.</p> <p>Table GI-2: name may be 'Public Consultation and FGD Meeting Participants Details'</p>	<p>There were no consultation meetings in Tangail.</p> <p>Type mistake has been corrected</p>	<p>Page-244</p>
B111	<p>Page 239 &amp; 240: Please check the meeting date for both and make confirm whether the meeting is for first round or third</p>	<p>The consultation meeting is for third round</p> <p>The meeting date is ok</p>	<p>Page-252</p>

Sl. No.	PMO Comment	ISPMC Notes / Response to Project Management Office (PMO)	Location (Section/sub section/para/page no.)
B112	Page 269: 5 <sup>th</sup> para: asphalt (hot mix) plants is not suitable here as there is no asphalt work under proposed T-2 project	Asphalt removed	Page-282
B113	Page 271: 4 <sup>th</sup> para: to implement the line 'including the use of noise barriers', there should kept budget provision in the Contract Agreement of work packages.  9 <sup>th</sup> para: deduction of contractor's bill for crop damage (if any) during the intervention construction may not feasible under the present GOB rules. The AP can submit his/her claim to the GRC for appropriate compensation for this case. Last para: tubewell testing: there should kept budget provision in the contract agreement/BoQ for water quality tests and the liability should be upon the contractors side	4 <sup>th</sup> para: Refreshed as suggested  9 <sup>th</sup> para: The para has been refreshed as suggested  Last para: testing of tube well should be kept under contractor's contract budget	Page-284, 4 <sup>th</sup> para  Page-284, 9 <sup>th</sup> para  Page-284, last para
B114	Page 272: 4 <sup>th</sup> para is a good initiative and should be included in the tender documents under T-2 project	noted	Page-285
B115	Page 273: 1 <sup>st</sup> para: other associated organizations may be DoF (Forests), DOE, DoF (Fisheries) 3 <sup>rd</sup> para: (i): The line may be 'Headed by an CE/ACE/SE and supported by two SE and 4 EEs	1 <sup>st</sup> para changed as suggested  3 <sup>rd</sup> para (i) refreshed as suggested	Page-286 1 <sup>st</sup> para  3 <sup>rd</sup> para (i)
B116	Page 274: 2 <sup>nd</sup> para: The serial number need to be refresh.  3 <sup>rd</sup> para: need to recast as per present T-1 & it's components' progress	<u>2<sup>nd</sup> para: serial number corrected</u>  This section refers to the implementation arrangements rather than the status of the project and so have not changed	<u>Page-287, 2<sup>nd</sup> para</u>  <u>Page-287, 3<sup>rd</sup> para</u>
B117	Page 275: The heading name should be 'Model terms of Reference.....'	This terms of reference is for engagement of a NGO to conduct a study under the	Page-288, heading name

Sl. No.	PMO Comment	ISPMC Notes / Response to Project Management Office (PMO)	Location (Section/sub section/para/page no.)
	<p>3<sup>rd</sup> para: The line 'A total of 50km .36 km of embankment..' need to be recast as per the data shown in the approved FSR (T-2)</p> <p>4<sup>th</sup> para: the line ....the dramatic widening (from 1970s to 2000s) took place.' Please provide the satellite image at 10 years interval for 1970 to 2019 in favour of this line.</p> <p>The line 'for example if the existing embankments unexpectedly breach' may be deleted.</p> <p>Last para: the line 'established under the successful Jamuna-Meghna. May be replaced with the line 'established under the Jamuna-Meghna...'</p>	<p>project. Some expertise opinion will be provided in the study report which may be implemented to mitigate/enhance the biodiversity lose due to project interventions. So the heading should not be changed</p> <p>3<sup>rd</sup> para: This has now been changed in line with the latest design</p> <p>4<sup>th</sup> para: these information are available in other reports as the FAP reports and would exceed the scope of this report. A references has been provided.</p> <p>The CbFRM is aimed to mitigate losses of property and life in case of embankment breaches and therefore this has to remain here as example</p> <p>Replaced as suggested</p>	<p>3<sup>rd</sup> para</p> <p>4<sup>th</sup> para</p> <p>4<sup>th</sup> para</p> <p>Last para</p>
B118	Page 276: Please reduce the gap between the 1 <sup>st</sup> & 2 <sup>nd</sup> para	Done as mentioned	Page- 289, 1 <sup>st</sup> & 2 <sup>nd</sup> para
B119	Page 277: Please provide more clear map	A more clear map provided	Page- 290
B120	Page 282: Please provide the map showing only FRERMIP area. RMIP map is not suitable here	This has been updated with a map from the river stabilization plan	Page- 296

Sl. No.	PMO Comment	ISPMC Notes / Response to Project Management Office (PMO)	Location (Section/sub section/para/page no.)
B121	Page 284: 4 <sup>th</sup> para: The line 'the expected to start in 2018... 'may be replaced with the expected to start in 2020...'	Changed as mentioned	Page-297, 4 <sup>th</sup> para

### APPENDIX I –A3 Project-2



## APPENDIX O - Environmental and Social Baseline

The environmental and social baseline condition in the study area has been characterized by using both primary and secondary data. Primary data were collected by the EIA field team during visits to the study area, through rapid rural appraisal (RRA), focus group discussions (FGD), key informant interviews (KII) and public consultations. Secondary data sources included:

- i. Bangladesh Bureau of Statistics (BBS)
- ii. Bangladesh Water Development Board (BWDB)
- iii. National Water Resources Database (NWRD)
- iv. Water Resources Planning Organization (WARPO)
- v. Soils Resources Development Institute (SRDI)
- vi. Bangladesh Meteorology Department (BMD)
- vii. Department of Agricultural Extension (DAE)
- viii. Department of Fisheries (DoF)
- ix. International Union for Conservation of Nature (IUCN).

### O1 Physical Environment

#### O1-1 Climate

##### Seasonality

The project influence area lies in the northwest part of Bangladesh where the climate is sub-tropical in nature with three seasons namely summer/pre-monsoon from March to May, monsoon from June to October, and winter season from November to February. Lower rainfall makes this area both atmospherically and pedologically drier than the rest of the country. The rainy season is hot and humid with about 88% of the annual rainfall in the area. The winter is predominately cool and dry. The summer is hot and dry interrupted by occasional heavy rainfall, whereas monsoon comes in the month of June and recedes in late October. Meteorological data such as rainfall, temperature, humidity and wind speed were collected from Bangladesh Meteorological Division (BMD) and analyzed for assessing local climate that are directly related to water resources of the study area.

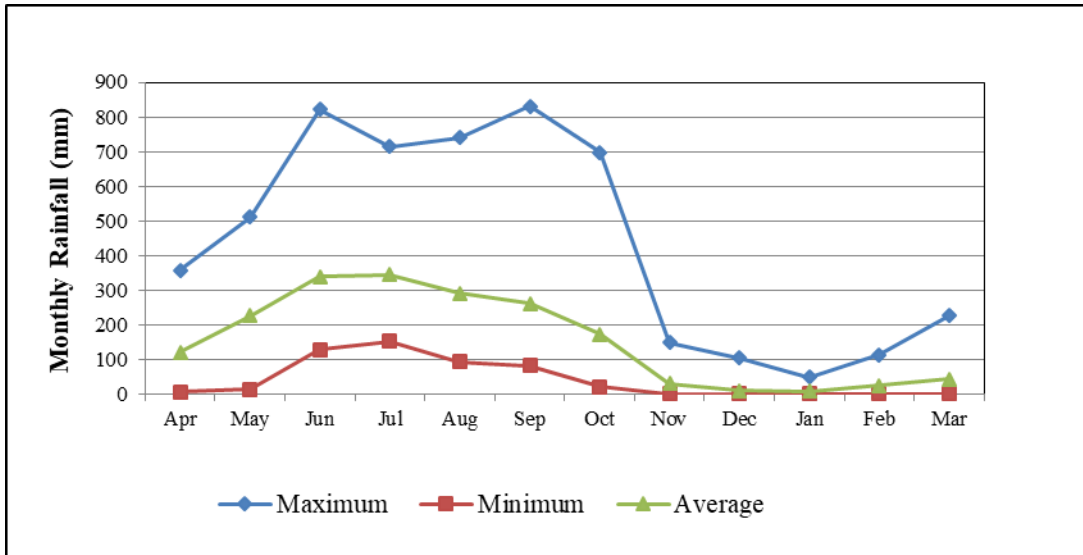
During the pre-monsoon, violent thunderstorms (referred to as “northwesters”) are common. During the rainy season, tropical depressions move inland from the Bay of Bengal. During the pre- and post-monsoon periods (March-May and October-December), cyclones can occur, sometimes generating very large storm surges that cause significant flood damage to the coastal area.

##### Meteorology Stations

Data used here is from two stations near the study area (Faridpur and Tangail) of Bangladesh Meteorological Division (BMD).

##### Rainfall

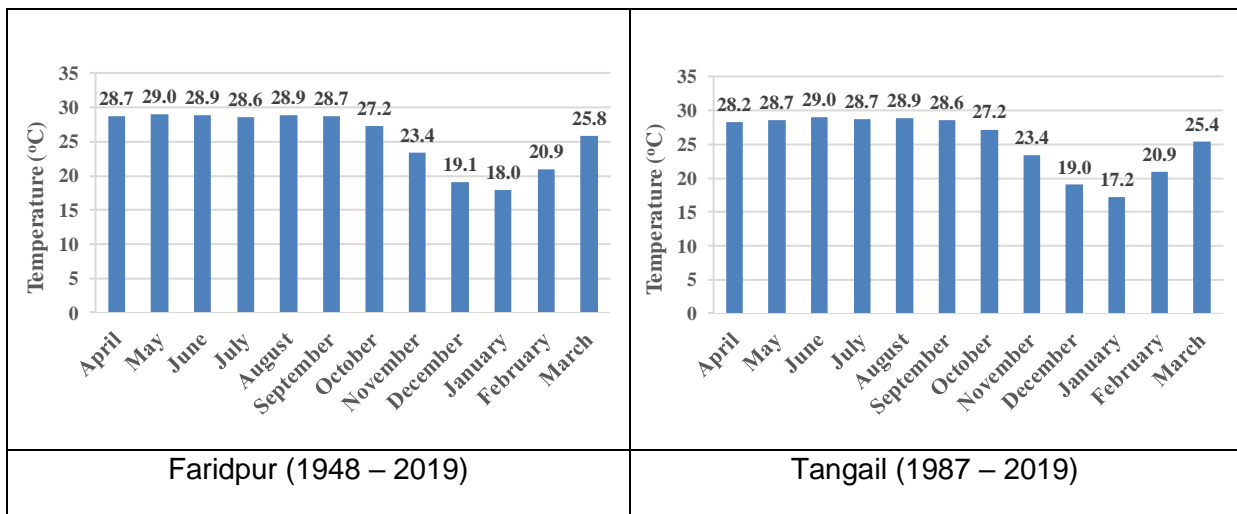
Mean annual rainfall in the project area is approximately 1800 mm/year (FAP-3, 1992). **Error! Reference source not found.** shows the 1959-2008 rainfall record from Faridpur station. Significant rainfall occurs from June to October, and little or no rainfall from November to February. The maximum recorded monthly rainfall was 831 mm in September 1986. No up to date rainfall data was available however as this is long time series data small fluctuations were deemed unlikely to significantly affect the analysis.



**Figure 12-1. Monthly rainfall**

Temperature

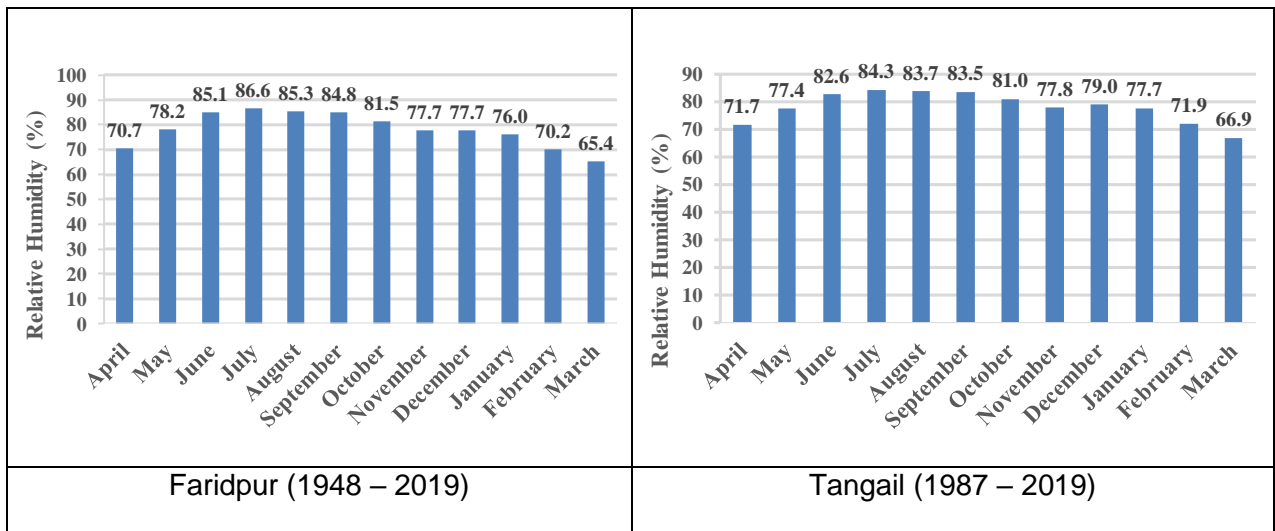
Figure 12-2 shows average monthly temperatures 1948-2019 at Faridpur and 1987-2019 at Tangail. These range from 18.0 to 29.0°C in Faridpur and 17.2°C to 29.0°C in Tangail, with higher values (>8°C) from April to October, and lower values from November to March.



**Figure 12-2. Monthly temperature**

Humidity

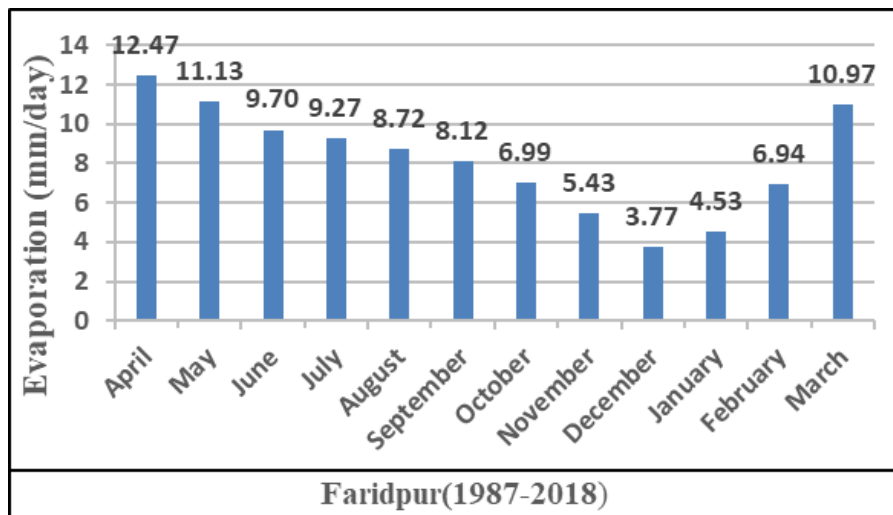
Figure 12-3 shows average monthly humidity 1948-2019 at Faridpur and 1987-2019 at Tangail. These range from 65 to 87% in Faridpur and 67 to 84% in Tangail, with lower values ( $\leq 80\%$ ) from November to May and higher values from June to October.



**Figure 12-3. Relative humidity**

Evaporation

Figure 12-4 shows average monthly evaporation 1987-2018 at Faridpur (no data for 2019 was available). Values range from 3.77 to 12.47 mm per day, with lower values ( $\leq 9.27$  mm per day) July through February, and higher values from March through June.



**Figure 12-4. Evaporation**

Windspeed

Figure 12-5 shows the average monthly wind speed 1948-2019 at Faridpur and 1987-2019 at Tangail. The highest value occurred in May (200 km/day in Faridpur) and the lowest in December (91 km/day in Tangail).



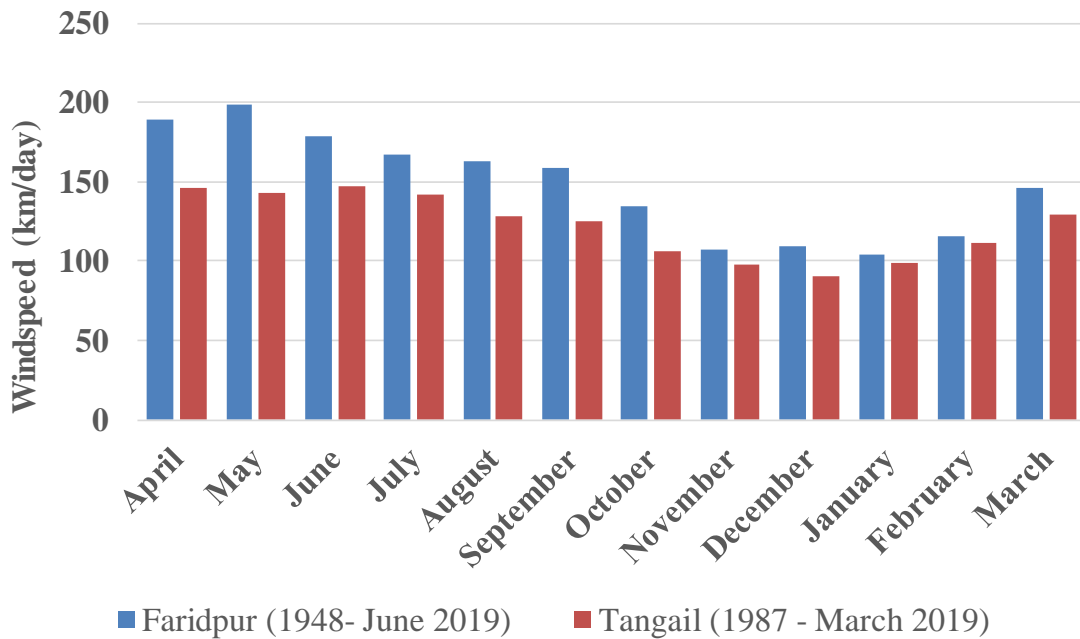


Figure 12-5. Windspeed

Sunshine Hours

Figure 12-6 shows the average monthly sunshine hour per day data 1985-2018 at Faridpur and 1987-2018 at Tangail (no data for 2019 was available). The highest value occurred in April (8.0 hours per day in Faridpur) and the minimum in July (4.0 hours per day in Tangail).

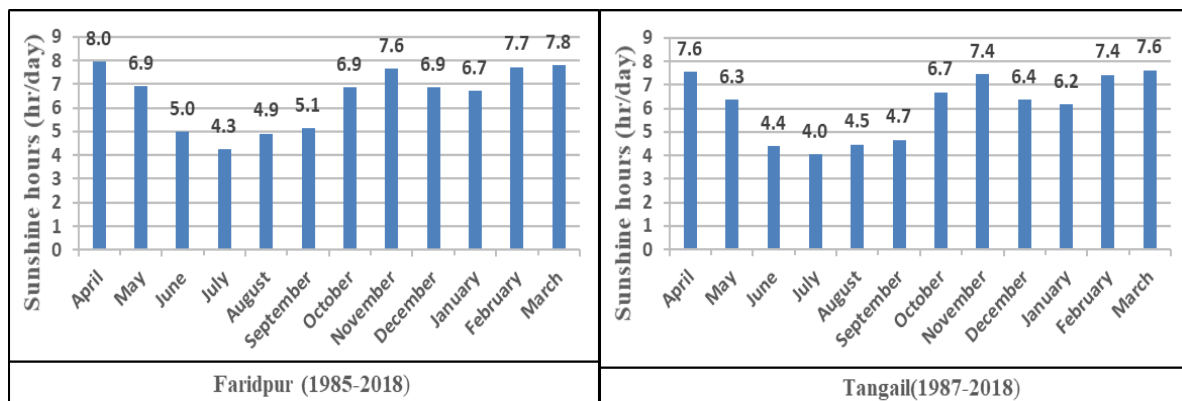


Figure 12-6. Sunshine hours per day

O1-2 Stratigraphy and Seismicity

Figure 12-7 shows the ten tectonic units of Bangladesh. The study area lies mostly in the Faridpur trough. A small part of the study area in the northwest lies in the Calcutta-Mymensingh hinge, and another small part in the southwestern Bansal Gravity High. The study area falls in a seismic zone that has a medium earthquake vulnerability.

O1-3 Topography

Error! Reference source not found. shows the study area topography as rendered by a digital elevation model. The topography of the study area is low and flat and affected by river flooding annually during the monsoon season. Land elevation varies from 0.39 to 1.39 m above mean sea level (AMSL). The average land level is 0.81 m AMSL. The area slopes gently downward from north to south. The higher northern portion (Khamarkhanda, Belkuchi, parts of Sirajganj, and so on) and the lower southern portion (JLB-2 areas near Singair and

Shibalaya in Manikganj district) have average land elevations of 1.15 m and 0.54 m AMSL respectively.

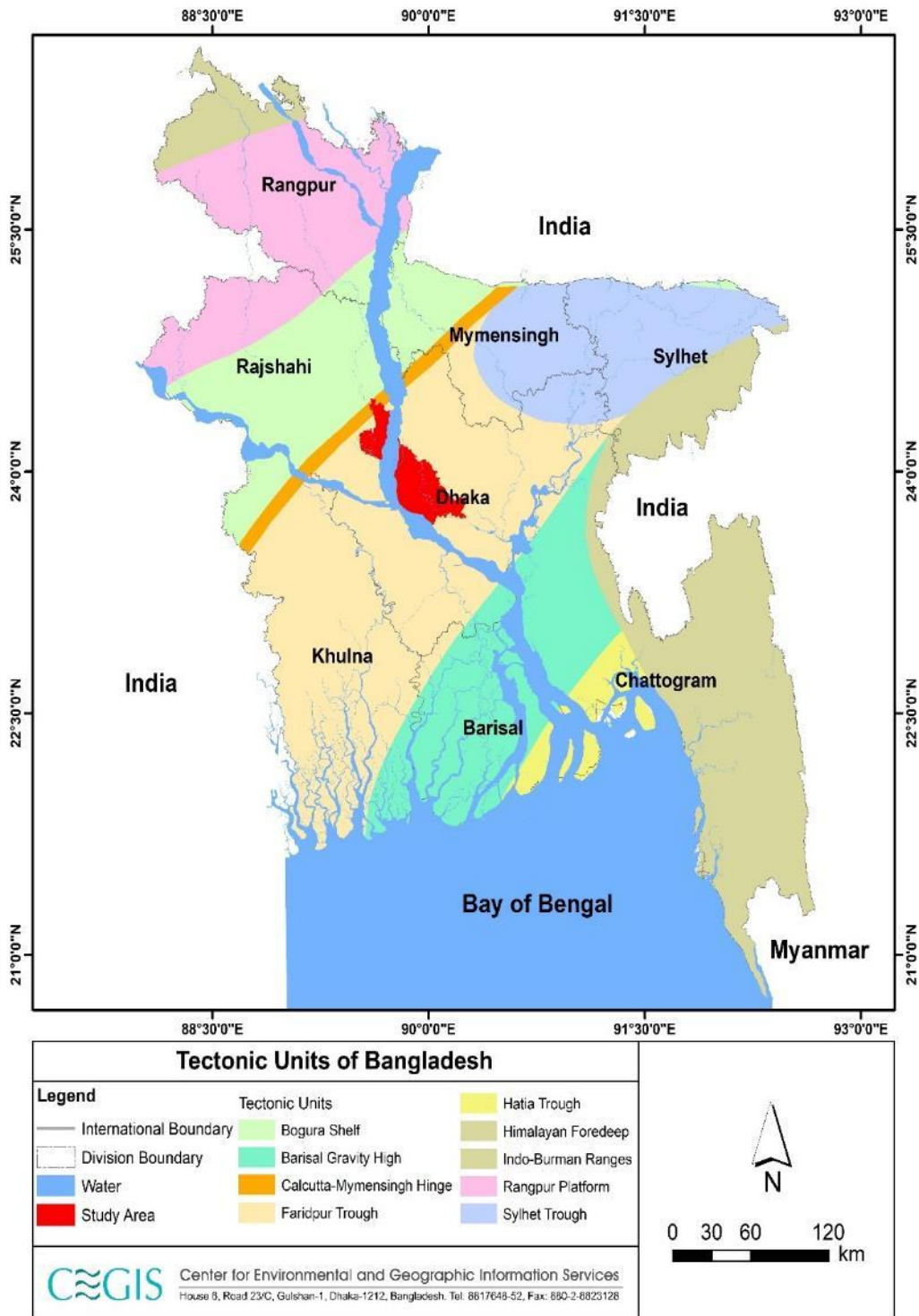
## **O1-4 Water Resources**

### **O1-4-1 River System**

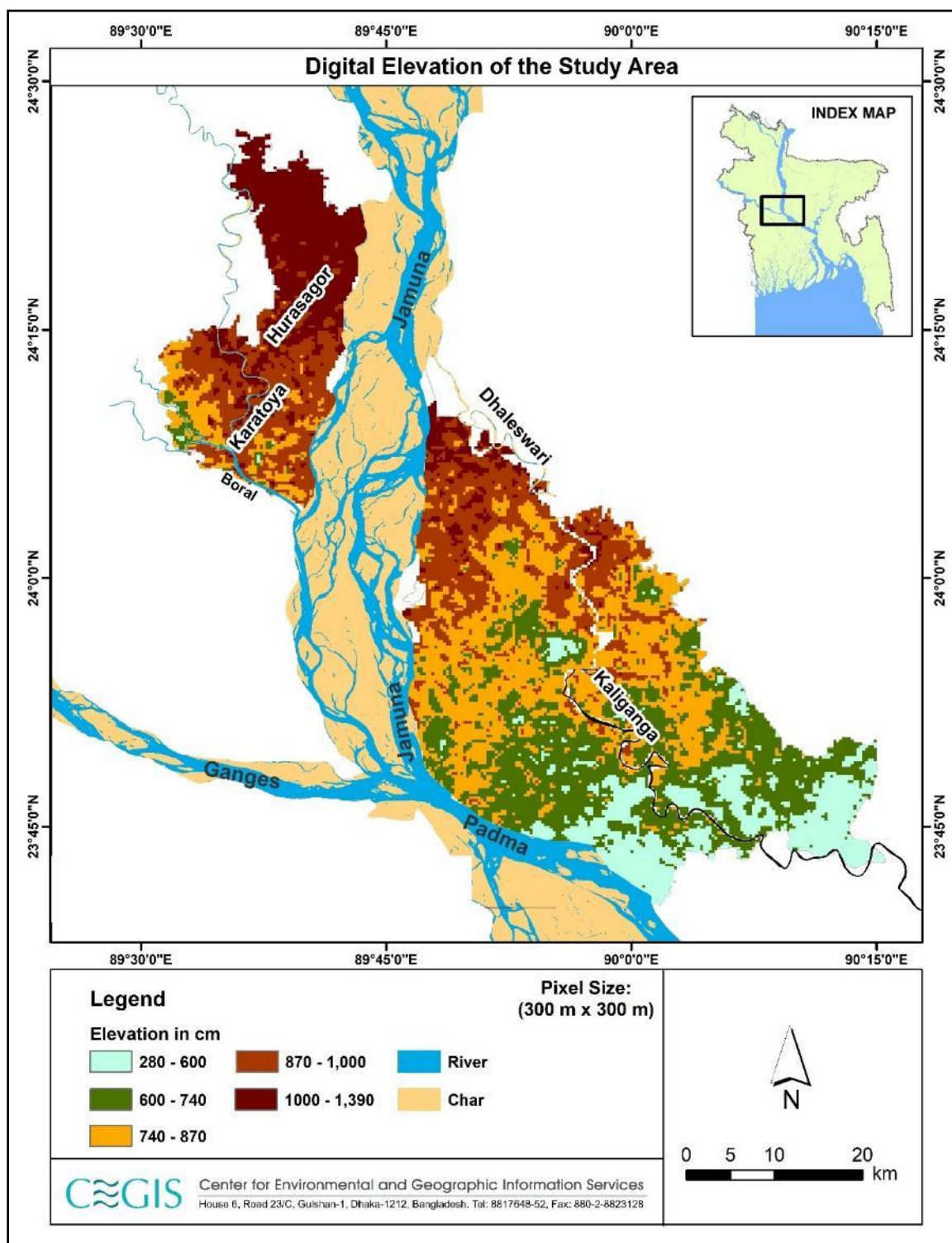
The study area, consisting of the two sub-reaches JRB-1 and JLB-2, comprises about 244,316 ha of which approximately 13% are occupied by rivers and a very minor percentage (approximately 0.6 per cent) is occupied by other water bodies. The hydrology of the area is dominated by the three major rivers: Jamuna, Ganges and Padma.

The Jamuna River is the 240 km-long lower reach of the Brahmaputra River from the India-Bangladesh border to the confluence with the Ganges. The Jamuna has an annual average discharge of around 20,000 m<sup>3</sup>/s at Bahadurabad Transit. The flow varies from a low of 8,000 m<sup>3</sup>/s to a maximum of 100,000 m<sup>3</sup>/s. Bankfull discharge is around 48,000 m<sup>3</sup>/s. The river typically peaks in July-August. The average width is 11.8 km, the average floodwater slope of the river is 7.5 cm/km and the average median size of bed material at Bahadurabad is 0.20 mm.

The Ganges/Padma (above its confluence with the Jamuna) has a long-term mean flow of about 12,000 m<sup>3</sup>/s or about 60% of the Jamuna. Flood discharges reach 80,000 m<sup>3</sup>/s. The Ganges/Padma typically peaks later than the Jamuna in August-September. The Ganges/Padma has the lowest water yield, particularly in the dry season, with flows dropping below 650 m<sup>3</sup>/s.



**Figure 12-7. Location of the study area in the tectonic units of Bangladesh**



**Figure 12-8. Topography of the study area**

The Padma (below its confluence with the Jamuna) drains the combined Ganges/Padma-Jamuna. It is approximately 120 km long. The reach-averaged width of the river is 10.3 km but varies from 2.5 km to 20 km. The average median size of the bed material at Mawa is 0.12 mm. It has an average discharge at Mawa of around 30,000 m<sup>3</sup>/s. Discharge varies from a minimum of 10,000 m<sup>3</sup>/s

up to 120,000 m<sup>3</sup>/s. Substantial overland flow occurs along the Padma to the southern coastal area, and as such, counters salinity intrusion, but this also leads to reduced in-

channel discharges downstream. The Padma is weakly tidal during the dry season. At the downstream end of the project area, the Padma joins the Meghna River near Chandpur.

**Error! Reference source not found.** and **Error! Reference source not found.** show the seasonal maximum and minimum and mean discharge values of the Jamuna and Padma rivers from 1981 to 2015 at two stations, Bahadurabad transit and Baruria transit (BWDB, 2015). The Jamuna maximum is about 100,000 m<sup>3</sup>/s (July) while the Padma maximum is about 140,000 m<sup>3</sup>/s (September-October).

**Table 12-1. Seasonal maximum & minimum discharge of Jamuna and Padma (1981-2015)**

Season	Jamuna River (Bahadurabad Transit)		Padma River (Baruria Transit)	
	Maximum	Minimum	Maximum	Minimum
Dry (December-February)	16232	3140	17384	3040
Pre-Monsoon (March-May)	43600	2702	40700	3196
Monsoon (June-September)	103129	10500	141935	9528
Post-Monsoon (October-November)	66100	6190	77800	9050

Source: BWDB

**Table 12-2. Mean discharge of Jamuna and Padma (1981- 2015)**

Season	Jamuna River (Bahadurabad Transit)	Padma River (Baruria Transit)
Dry (December-February)	5685	7829
Pre-Monsoon (March-May)	9869	10722
Monsoon (June-September)	40101	57712
Post-Monsoon (October-November)	18432	28809

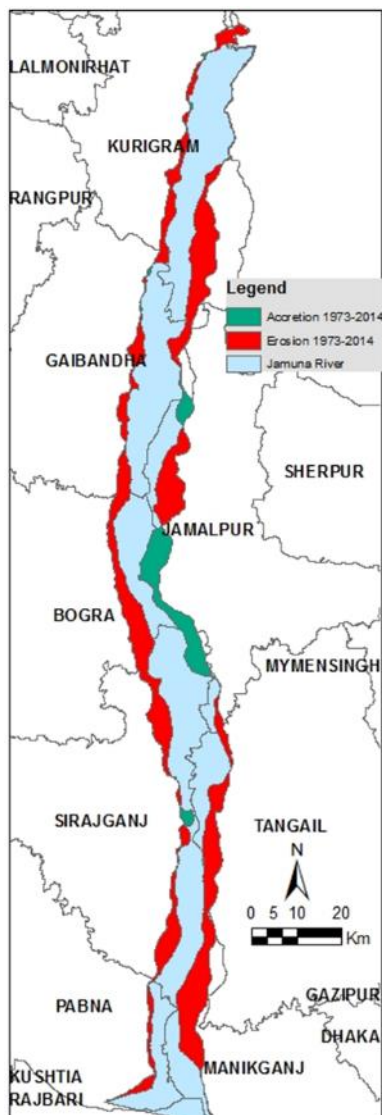
Main river water levels and discharges are not strongly related to local precipitation, since the majority of river runoff is generated outside the country. The most severe floods occur when the Jamuna and Ganges Rivers peak together such as occurred in 1988.

The tributaries of these major rivers inside the study area are Hurasagar, Dhaleswari, Kaliganga, Baral, Gohala, and Ichamati rivers. The Ichamati is the only Padma tributary passing through the study area; the other tributaries connect directly to the Jamuna. Some small water bodies (*Kadaibadla Beel, Pandaha Beel, Khalsir Beel, Nalai Beel, Bharua Beel, Gharilpur Beel* and so on) are found inside the study area. Most are connected to the tributary channels during monsoon.

#### **O1-4-2 Erosion and Accretion**

The width of Jamuna River has changed over the years and analysis shows a widening trend since 1900 which accelerated after the 1980s, causing an increase in bank erosion. The erosion rate was high before the 1990s, but since the start of this century it has decreased significantly due to natural causes and human interventions such as the construction of riverbank protection structures. However, the last 40 years has seen more erosion than accretion.

A westward migration of the Jamuna riverbed has been a prominent feature since the initiation of the avulsion of the Brahmaputra River from its old path into the Jamuna River. The Jamuna transported some 1 billion tons of sediment annually in the 1960s, but since then its sediment load has gradually dropped by 2.5 times during the 1980s. It is believed that a sediment slug generated by the great Assam earthquake of 1950 has attributed to this rapid decrease of sediment.



The Padma River carries the combined discharge of Brahmaputra and Ganges and has an annual average discharge of 30,000 m<sup>3</sup>/s, mainly due to southwest monsoon precipitation occurring in June-October while the remainder is generated from base flow and snow melt in the Himalayas. In terms of discharge it is the third largest river in the world.

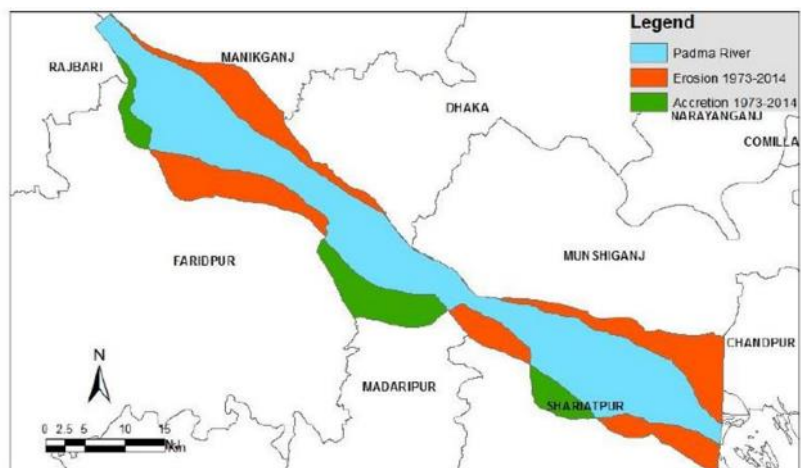


Figure 12-3. Erosion and accretion along Jamuna and Padma Rivers in 1973-2014 (CEGIS, 2014)

### O1-4-3 Surface Water Levels and Water Quality

Surface water data records for water level, water quality, and discharge of the two major rivers were collected from several BWDB stations covering various time intervals. The following sections provide a discussion of surface water characteristics in the study area.

Water levels. Secondary data on water levels were collected for the Jamuna and Padma rivers from the BWDB stations at Sirajganj and Aricha. The maximum and minimum water levels in different seasons (1981-2015) are shown below in **Error! Reference source not found.**. The table shows that in monsoon the average surface water levels of Jamuna and Padma rivers remain about 12.50 m PWD and 8.04 m PWD, respectively. In the dry season, the Padma River becomes extremely shallow, but the Jamuna River remains deep. **Error! Reference source not found.** shows the average values of water levels of the two major rivers in different seasons (1981 to 2015).

Table 12-3. Maximum and minimum water levels of Jamuna and Padma (1981-2015)

Season	Jamuna River (Sirajganj station)		Padma River (Aricha Station)	
	Maximum	Minimum	Maximum	Minimum
m+PWD				
Dry (December-February)	9.14	6.11	4.88	2.00
Pre-Monsoon (March-May)	12.38	6.03	7.30	1.94
Monsoon (June-September)	15.11	9.17	10.76	4.26

Post-Monsoon (October-November)	(October-November)	13.69	7.79	9.50	3.75
---------------------------------	--------------------	-------	------	------	------

Source: Bangladesh Water Development Board

**Table 12-4. Jamuna and Padma Rivers mean water levels (1981-2015)**

Season	Jamuna River (Sirajganj station) [m+PWD]	Padma River (Aricha Station) [m+PWD]
Dry (December-February)	7.41	3.22
Pre-Monsoon (March-May)	8.30	3.72
Monsoon (June-September)	12.50	8.04
Post-Monsoon (October-November)	10.24	6.20

Source: Bangladesh Water Development Board

**Water quality** –The standard values of seven surface water quality parameters and their suitability set by the DoE are shown in Table 12-6 and 5-6. On the whole, water quality seems reasonable to good in the Jamuna and Padma rivers, except dissolved oxygen (DO), which is low during the months July-November/December.

**Table 12-5. Surface water quality of Jamuna and Padma**

Station Name	River	Month	Temp (°C)	pH	DO (mg/l)	TDS (mg/l)	EC (µS/cm)	Fe (mg/l)	Cl (mg/l)
Bahadurabad Transit	Jamuna	Jan	29	7.8	8.29	22	66	0.02	11
		Feb	30	7.8	8.29	23	65	0	11
		Mar	32	7.8	8.29	21	66	0.02	10
		Apr	28	7.8	8.28	21	64	0.02	10
		May	28	7.7	8.26	21	65	0.01	11
		Jun	27	7.6	8.21	21	65	0	11
		Jul	28	6.7	0.52	54	164	0.51	17
		Aug	28	7.0	0.26	56	112	1.59	10
		Sep	28	6.9	1.15	54	107	1.45	11
		Oct	28	7.1	0.67	55	109	1.67	12
		Nov	25	7.0	0.48	80	160	1.27	18
		Dec	22	7.5	8.60	77	125	0.29	9
Aricha	Padma	Jan	28	7.3	8.16	24	69.2	0.2	12
		Feb	30	7.3	8.12	24	69.2	0.2	12
		Mar	30	7.3	8.16	25	69.2	0.2	10
		Apr	30	7.3	8.16	23	69.2	0.2	10
		May	27	7.3	8.1	22	69.2	0.2	10
		Jun	28	7.3	8.1	23	69.2	0.2	12
		Jul	29	6.8	3.05	50	100	1.89	10
		Aug	28	6.4	0.25	76	153	0.07	9
		Sep	26	6.5	0.35	91	181	1.85	18
		Oct	28	7.0	1.13	53	106	1.86	11
		Nov	25	7.0	0.63	59	118	1.19	12
		Dec	22	7.1	1.22	84	169	0.13	17

Source: Bangladesh Water Development Board

**Table 12-6. Bangladesh surface water quality standards**

Water quality parameters	Standard value	Suitable for
pH	7.0-8.5	Irrigation
	6.7-9.5	Fishing
DO (mg/l)	4.0-6.0	Fishing
	5	Irrigation
Nitrate (mg/l)	0.01-2.0	Irrigation
	2.5-10.0	Fishing
Phosphate (mg/l)	0.01-2.0	Irrigation
	1.5-10.0	Fishing
Chlorine (mg/l)	22	Irrigation
	22	Fishing
Temperature (°C)	20-30	Irrigation
	20-30	Fishing

Source: Bangladesh DoE

#### O1-4-4 Groundwater

Groundwater level data are analyzed using data of three BDWB observation wells in three districts (Sirajganj, Manikganj and Tangail) of the study area.

**Error! Reference source not found.** shows variations of mean groundwater levels. The Tangail average groundwater level is slightly lower than those of the other two districts. Manikganj and Tangail average ground water levels were similar during the observation periods, whereas at Sirajganj station, a decline in groundwater table (up to 6 meters) was observed in 1997 and 2001.

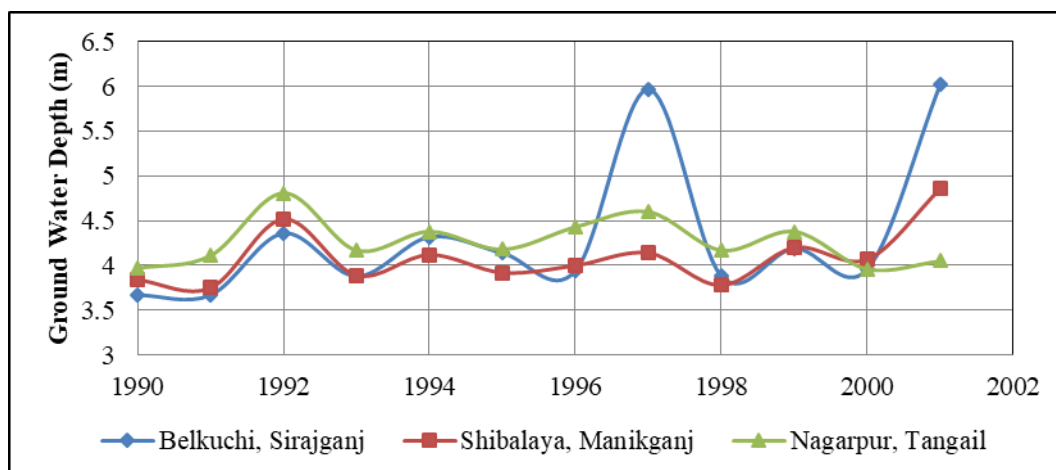


Figure 12-10. Mean groundwater levels in Sirajganj, Manikganj, and Tangail (1990-2001)

**Error! Reference source not found.** shows the groundwater table (GWT) at 10-year intervals at the three locations. Values are shown for both the dry (April) and wet (September) period. In the dry season, increased use of groundwater by local people lowers the GWT. During the monsoon, surface water recharges the groundwater and GWT rises upward. In 2000 compared to 1990, the dry season GWT had dropped whereas wet season GWT had risen.

Table 12-7. Groundwater depth at three locations at three 10-year intervals

Well ID	Location	Groundwater Depth (m)



		1980		1990		2000	
		April	September	April	September	April	September
8811001	Shrenagar village, Sirajganj, Belkuchithana,	6.78	2.83	4.51	1.70	5.84	1.42
5678012	Uthali village, Manikganj, Shibalayathana,	6.31	1.39	5.91	1.89	7.07	0.90
9376032	Bhalkutia village, Tangail, Nagarpurthana,	6.46	1.64	5.51	1.94	6.31	1.52

Ocean water has a salinity of 35 ppt whereas in the Bay of Bengal close to Bangladesh coast it is 30–32 ppt. This is due to discharge of fresh water by the three large rivers. The salinity in Jamuna and Padma River is considered as 0 ppt. The extreme lower part of Padma river near Chandpur has very low salinity which varies between 0-1 ppt.

#### **O1-4-5 Navigation**

The Jamuna River is categorized as Class II by the Bangladesh Inland Water Authority (BIWTA, 1991), which means the river remains navigable throughout the whole year and links major inland ports or places of economic importance to class-I route (**Figure 12-11**).

The available average draft in the Jamuna is 1.75 m across the river and recent surveys show the minimum available water depth in the river from Sirajganj to Bahadurabad is 1-1.3 m and from Bahadurabad to Chilmari is a 1.2-2.2 m (Mishra and Hussain, 2012). The river is also a part of the India-Bangladesh protocol route and the route is used by cargo vessels to carry goods to Pandu in India. At the local level, people from charlands use the river to access the mainland mainly for earning livelihood, education and health care purposes. Smaller mechanized boats are used mainly for carrying people and goods and for fishing activities.

#### **O1-4-6 Water Resources Functions**

The people of the study area not only depend on the existence of the surrounding water resources system, but also its adequate functioning. The assessment of the water resources functions is helpful to investigate the scenarios of different types of water use, as well as the consequences of natural flow phenomenon.

##### **Irrigation**

The net cultivable area (NCA) for Project-2 is approximately 184,200 ha, comprised of 51% clay and 49% loam soil. The water required to irrigate the entire NCA is approximately 2.8 billion m<sup>3</sup> for a single season of Boro rice planted in the Rabi winter season (generally November-February) and harvested in the Kharif monsoon season (generally March-October). Water to irrigate the NCA for Aus (rice planted and harvested in Kharif) and for Aman (rice planted in Kharif and harvested in Rabi) would be 0.55 billion m<sup>3</sup> each. Therefore around 3.9 billion m<sup>3</sup> water would be required for irrigating the entire 184,200 ha NCA. However, of this area, only 55% area is irrigable. **Table 12-8** shows the proportion of irrigable areas and water consumed by these areas annually (Minor Irrigation Project, 2010). Approximately 2.15 billion m<sup>3</sup> of water is annually available for irrigation from different surface and groundwater sources and around 1.75 billion m<sup>3</sup> of water would be further required to provide irrigation in the entire NCA.

**Table 12-8. Irrigable areas and water consumption**

<b>Irrigation methods used</b>	<b>Area (ha)</b>	<b>Percentage of NCA</b>	<b>Annual Water Requirements</b>
<i>Groundwater</i>			
STW	94,840	51.15	2.0
DTW	6120	3.3	0.1
<i>Surface water</i>			
LLP	1,020	0.55	0.05
Total Irrigated area	101,980	55	2.15 Bm <sup>3</sup> of water is available for irrigation and another 1.75 Bm <sup>3</sup> of water is required to bring the remaining 45% non-irrigated area into irrigation coverage
Total non-irrigated area	82,220	45	

Source: Minor Irrigation Project, 2010

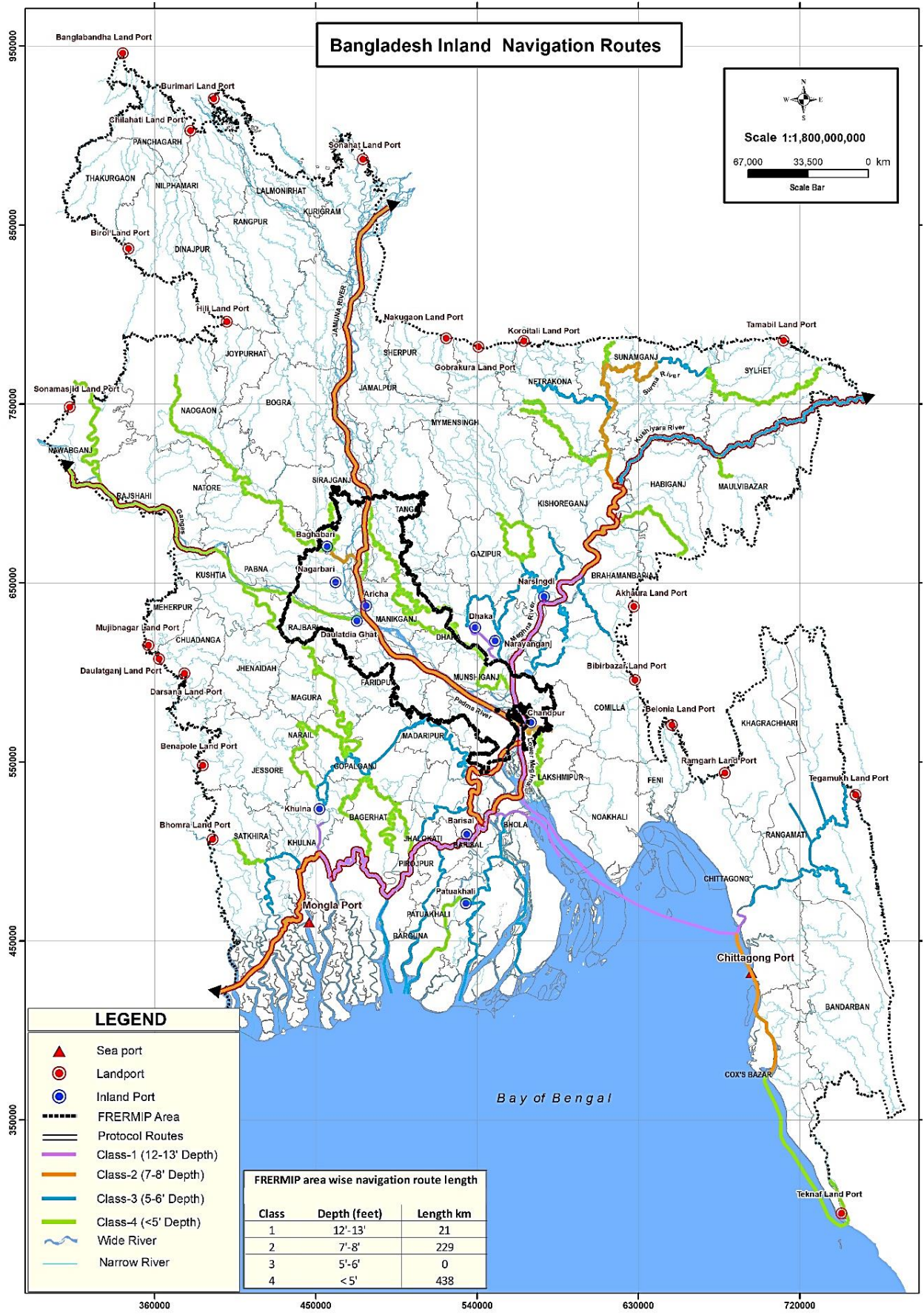
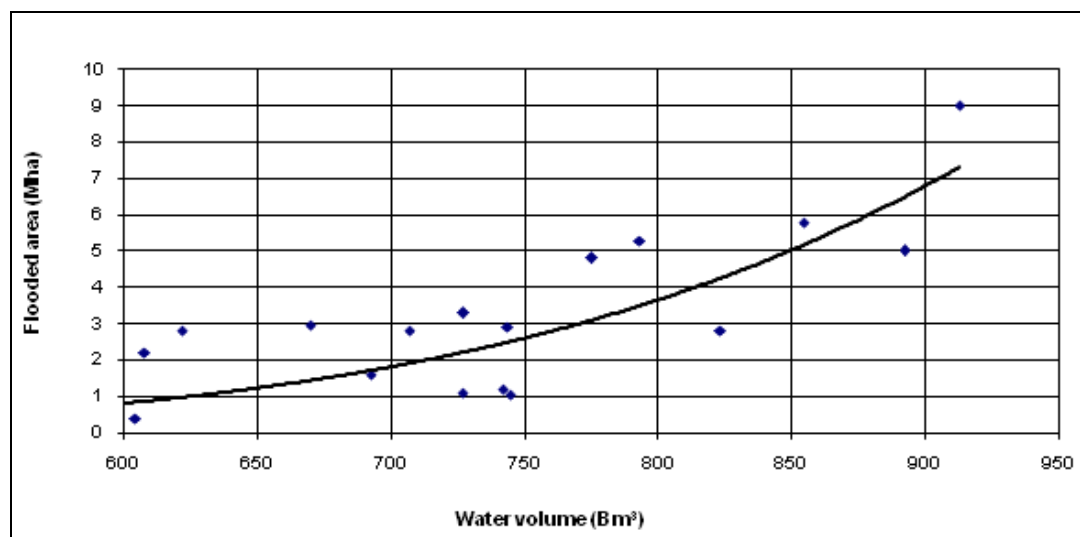


Figure 12-11. Main waterway navigation routes in Bangladesh

Due to the flat topography of Bangladesh, just a small increase in water level above the riverbank causes full-scale inundation. **Error! Reference source not found.** shows a relation between the flooded areas (Mha) and the total volume ( $Bm^3$ ) of river water. During monsoon the Jamuna and Padma rivers attain their peak discharges which consequently lead to higher flooding as well as drainage congestion during the period.



**Figure 12-12. Flooded area vs water volume (1972-1993)**

The occurrence of flood is indicated when the water level of the river exceeds its danger level. The danger level of the Padma at Mawa is 6.0 m PWD and the Jamuna at Bahadurabad is 19.5 m PWD. The probability of flood in a year for the Padma is about 60 % and for the Jamuna is about 75%. The average duration of flood is about 23 days in the Padma basin and about 14 days in the Jamuna basin. The duration of floods previously affecting the Padma/Jamuna basin is given in Table 12-9.

**Table 12-9. Flood duration, Padma and Brahmaputra/Jamuna Basins**

Padma Basin		Brahmaputra/Jamuna Basin	
Year	Flood duration (days)	Year	Flood duration (days)
1998	65	1998	63
1987	52	1974	44
2003	39	1970	26
1971	35	1984	24
1969	33	1977	22
1995	30	1973, 1980, 2007	21

Source: Flood Shelter Report, IWFM and BRAC

Table 12-10 and Table 12-11 show the frequency analyses of the annual maximum water levels of the Jamuna and Padma rivers (Flood Shelter Report, IWFM and BRAC). The tables explain the differences in water levels due to change in return periods. It is seen from the tables that the difference between the highest flood and the 20-year flood is about 23 cm at Bahadurabad and 38 cm at Mawa.

**Table 12-10. Flood level frequency analysis, Jamuna at Bahadurabad**

Probability distribution function	Water level for the specified return period (m PWD)					Highest observed floods, m+PWD (year)
	5 year	10 year	20 year	50 year	100 year	
Normal	20.11	20.29	20.44	20.6	20.72	20.61 (1988) 20.40 (2007) 20.37 (1998)
Log Normal	20.11	20.29	20.45	20.62	20.74	
Log Pearson Type III	20.11	20.26	20.38	20.5	20.58	
Gumbel	20.06	20.3	20.53	20.83	21.05	

Source: Flood Shelter Report, IWFM and BRAC

**Table 12-11. Flood level frequency analysis, Padma at Mawa**

Probability distribution function	Water level for the specified return period (m PWD)					Highest observed floods, m+PWD (year)
	5 year	10 year	20 year	50 year	100 year	
Normal	6.5	6.67	6.81	6.97	7.08	7.14 (1998) 7.07 (1988) 6.84 (2004)
Log Normal	6.49	6.67	6.82	7.0	7.12	
Log Pearson Type III	6.5	6.64	6.76	6.88	6.95	
Gumbel	6.45	6.68	6.9	7.18	7.39	

Source: IWFM and BRAC Flood Shelter Report

The severe land erosion along riverbanks and charlands of the study area cause continuous siltation in major tributary rivers (e.g. Karatowa, Baleswari, Baral, Hurasagar, Ichamati) of the Padma and the Jamuna. This eventually reduces the depths of these rivers and during the dry periods these rivers become extremely shallow. As a result, waterlogging problems arise during the dry periods at a few locations (Ghashpukuria, Ghashkauliya, Bagutia, etc villages under Chauhali and Daulatpur upazilas). The condition of drainage inside the area is poor. In the study area, drainage channels are not well developed. A significant portion of the entire study area suffers from drainage congestion problems during the wet period. As the major tributary channels are becoming shallow because of heavy siltation, such rivers and water bodies do not provide the effective drainage needed during monsoon. Due to the backwater effects of the two major rivers, drainage congestion problems occur. Some areas near JRB1 interventions at Belkuchi, Shahjadpur etc. undergo moderate drainage. Drainage of areas near the JLB2 intervention (Nagarpur, Satura, Shibalaya etc locations) is poor.

### Morphology

The morphology of the two major rivers adjacent to the study area has enormous impacts on the lives and livelihood of the local people. During the last few decades the lower reach of the Jamuna River changed its plan form from a single threaded meandering river to a complicated braided river. The location of the confluence of the Hurasagar River shifted several kilometers upstream during the last 40 years and became fixed at the present position about two decades back. Channel development and abandonment, movement of bars, islands and bank lines is very common in this river. The Padma, on the other hand is a meandering river and less dynamic.

## Erosion

Riverbank erosion is the most important natural cause of landlessness and forced resettlement of people in the study area. During 1973 to 2018, erosion and accretion along the Jamuna and Padma rivers was 132,766 ha and 30,983 ha respectively (net erosion was 101,783 ha). In 2018, net erosion along the Jamuna and Padma was 2,168 ha of which 385 ha were settlements. The eroded lands also included about 63 m of district road, 1,645 m of upazila road and 1,967 m of rural road. The rate of widening of the Padma River was 160 m/year in the 1980s, which increased to 230 m/year in the 1990s. Recently, the rate of widening has reduced to 130 m/year.

**Table 12-12. Erosion & accretion from 1973-2018 (cumulative)**

River	Erosion, Ha	Accretion, Ha	Net Erosion, Ha
Jamuna	94,616	16,738	77,878
Ganges	37,412	27,071	10,341
Padma	38,150	14,245	36,725
<b>Total</b>	<b>170,178</b>	<b>58,054</b>	<b>124,944</b>

Source: CEGIS 2019, *Prediction of Riverbank Erosion April 2019*, p. 1-3

## Char Formation

Charlands refer to mid-channel islands that periodically emerge from the riverbed as a result of accretion (Elahi, Ahmed, and Mafizuddin 1991). The residents of chars and mainland adjacent to main rivers are extremely vulnerable to erosion and flooding as it can destroy their crops and homesteads, render land unproductive, and destroy livestock. In the Jamuna floodplains, about 50% of the people live in the island and attached chars whereas in the Padma char areas, this is about 27% (Bangladesh Flood Action Plan, 1993).

In the Jamuna River, about 85% reduction in flow takes place during dry period. The mean depth of Jamuna River recorded near the Sirajganj Sadar reduces by approximately 40%. About 87% reduction inflow takes place in the Padma River from monsoon to dry period. The average depth of the river reduces by approximately 60% (from 8.19 m during monsoon to 3.23 m in the dry season). This significant reduction of dry season flow eventually increases the char lands during the dry season.

Charlands are formed mainly because of the low flow in the rivers in the dry season. Erosion along the sides of the Jamuna and Padma rivers result in the siltation of inside the rivers, which results in the formation of charlands.

### O1-5 Land Resources

#### O1-5-1 Agro-Ecological Regions

Bangladesh has a wide range of environmental conditions. Environmental diversity occurs not only at national and regional levels, it also occurs at upazila and village levels. Besides considerable year to year variability in moisture, temperature and flood regimes create major problems for planning environmental and agricultural research, extension and development activities.

Thirty agro-ecological regions and 88 sub-regions have been identified by adding successive layers of information on the physical environment which are relevant for land use and assessing agricultural potential (**Figure 12-13**). These layers are: (i) physiography (land forms and parent materials); soils and their characteristics; (ii) depth and duration of seasonal flooding; (iii) length of the rain-fed kharif and rabi growing periods; length of the

pre-kharif period of unreliable rainfall; (iv) length of the cool winter period and frequency of occurrence of extremely low temperature (below 0.40°C); (v) winter temperature, and (vi) frequency of occurrence of extremely high (> 400°C) summer temperature.

The study area comprises of the following five agro-ecological regions:

- (I) Karatoya-Bangali Floodplain (AEZ-4);
- (II) Active Brahmaputra-Jamuna Flood plain (AEZ-7);
- (III) Young Brahmaputra and Jamuna Floodplain (AEZ 8);
- (IV) Active Ganges Floodplain (AEZ-10); and
- (V) Lower Ganges River Floodplain (AEZ-12).

The distribution of agro-ecological regions in the study area is presented in **Figure 12-13**.

The study area's agro-ecological regions are presented in Table 12-13.

**Table 12-13. Agro-ecological zones**

Agro-ecological Region	AEZ Area Within Study Area	
	(ha)	(%)
Active Brahmaputra-Jamuna	43,977	18
Active Ganges Floodplain	7,329	3
Karatoya-Bangali Floodplain	43,977	18
Lower Ganges River Floodplain	46,420	19
Young Brahmaputra and Jamuna	102,613	42
Total	244,316	100

#### Karatoya-Bangali Floodplain Region (AEZ-4)

The floodplain apparently comprises of a mixture of Tista and Brahmaputra sediments. Most areas have smooth, broad, floodplain ridges and almost level basins. The soils are grey silt loams and silty clay loams on ridges and grey or dark grey clays in basins. Five general soil types occur in the region of which, Non-calcareous Grey Floodplain and Non-calcareous Dark Floodplain soils predominate. They are moderately acidic throughout. Organic matter content is low in ridge soils and moderate in basins. General fertility is medium. Some physico-chemical properties of soils of Karatoya-Bangali Floodplain Region are presented in Table 12-14.

**Table 12-14. Soil characteristics in Karatoya-Bangali Floodplain Region**

Major land type	Soil pH	Soil OM	Nutrients status									
			N	P	K	S	Ca	Mg	Zn	B	Mo	
High land (23%)	4.7-7.8	L	VL-L	L-M	L	L-M	Opt	Opt	L-M	L-M	Opt	
Med highland (44%)	5.4-7.9	L	VL-L	L-M	L	L-M	Opt	Opt	L-M	L-M	Opt	
Med lowland (14%)	6.2-7.7	L	VL-L	L-M	L	L-M	Opt	Opt	L-M	L-M	Opt	

Source: BARC Fertilizer Recommendation Guide-2005.

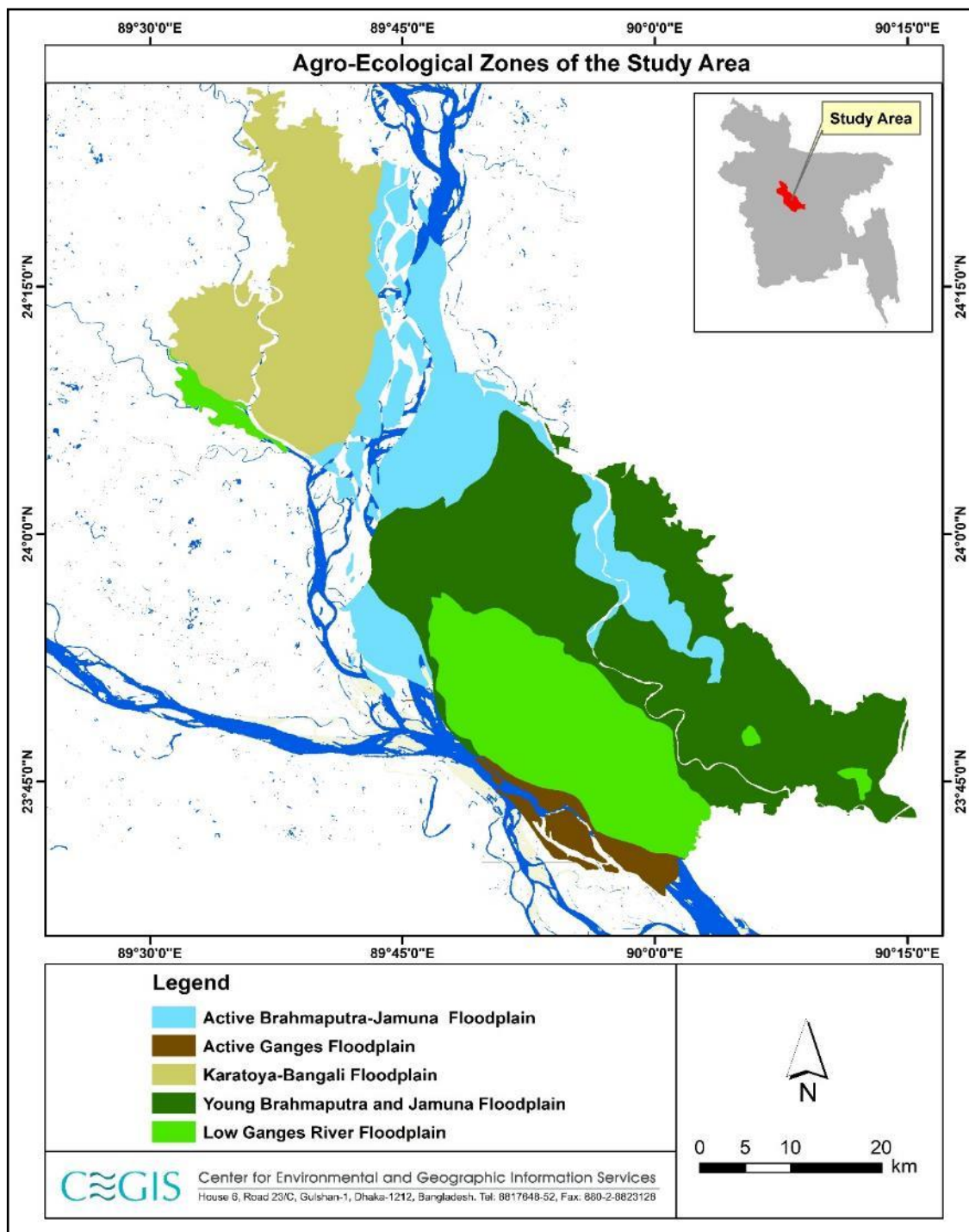
Notes: OM=Organic matter; VL=Very low; L=Low; M=Medium; Opt=Optimum; H=High; VH=Very high.

#### Active Brahmaputra-Jamuna Floodplain Region (AEZ-7)

This subunit, which underlies Agro-ecological Region 7, comprises young, stratified, alluvial land within and adjoining the shifting channels of the Brahmaputra and Jumna Rivers, the

Old Brahmaputra River and the Dhaleswari-Kaliganga River. The land formation (char) are liable to change shape each year as riverbanks are eroded, new alluvium is deposited within and alongside channels and older deposits are buried by layers of new alluvium.

The relief varies from smooth to irregular, with differences in elevation of 2-3 m or more between adjoining ridges and depressions. The depth of flooding varies from shallow to deep on different sites and the maximum depth may vary by a meter or more from year to year. The area is occupied by sandy and silty alluvium rich in minerals with slightly alkaline in reaction. The Brahmaputra sediments are greyer in color than the Ganges sediments. Six general soil types occupy the area of which only Non-calcareous Alluvium predominates. Organic matter content is low and fertility status low to medium. Some physico-chemical properties of soils of Active Brahmaputra-Jamuna Floodplain Region is presented in Table 12-15.





**Figure 12-13. Agro-ecological regions in the Study Area**

**Table 12-15. Soil characteristics, Active Brahmaputra-Jamuna Floodplain**

Major land type	Soil pH	Soil OM	Nutrients status									
			N	P	K	S	Ca	Mg	Zn	B	Mo	
Medium highland (37%)	5.7-8.2	L	L	L-M	L-M	L-M	L-M	L-M	L-M	L-M	L-M	M
Medium lowland (20%)	6.0-8.2	L	L	L-M	L-M	L-M	L-M	L-M	L-M	L-M	L-M	M

Source: BRAC Fertilizer Recommendation Guide-2005.

Notes: OM=Organic matter; VL=Very low; L=Low; M=Medium; Opt=Optimum; H=High; VH=Very high

#### Young Brahmaputra and Jamuna Floodplain Region (AEZ 8)

This region comprises the area of Brahmaputra sediments. It has a complex relief of broad and narrow ridges, inter-ridge depressions, partially in filled cut-off channels and basins. This area is occupied by permeable silt loam to silty clay loam soils on the ridges and impermeable clays in the basins; neutral to slightly acid in reaction. General soil types include predominantly Grey Floodplain soils. Organic matter content is low in ridges and moderate in basins. Soils are deficient in N, P and S but the status of K and Zn is medium. Some physiochemical properties of the soils of Young Brahmaputra and Jamuna Floodplain are presented in Table 12-16.

**Table 12-16. Soil characteristics, Young Brahmaputra and Jamuna Floodplain**

Major land type	Soil pH	Soil OM	Nutrients status								
			N	P	K	S	Ca	Mg	Zn	B	Mo
High land (18%)	5.6-7.5	VL-L	VL-L	L	M	L	M	M	L-M	L-M	M
Med highland (42%)	5.4-7.5	VL-L	VL-L	L	M	L	M	M	L-M	L-M	M
Med lowland (19%)	5.4-7.5	L	L	L	M	L	M	M	L-M	L-M	M

Source: BARC Fertilizer Recommendation Guide-2005.

Notes: OM=Organic matter; VL=Very low; L=Low; M=Medium; Opt=Optimum; H=High; VH=Very high

#### Active Ganges Floodplain Region (AEZ-10)

The agro-ecological region of Active Ganges Floodplain comprises of young, stratified, alluvium land within and adjoining the shifting channels of the Ganges River and its two main distributaries, the Gorai- Madhumati and Arial khan. The alluvial formations (chars) are liable to change shape each year as riverbank are eroded, new alluvium is deposited within and along channels and older deposits are buried by layers of new alluvium. The relief varies from smooth to irregular, with 2-3 m or more difference in elevation between the adjacent ridges and depressions. Seasonal flooding varies from shallow to deep on different sites and may vary in depth by more than a meter between years. The area has complex mixtures of calcareous sandy, silty and clayey alluvium. The general soil types predominately include Calcareous Alluvium and Calcareous Brown Floodplain soils, which are low in organic matter and mildly alkaline in reaction. The fertility status generally is medium. Physiochemical properties of soils of the Active Ganges Floodplain Region are presented in Table 12-17.

**Table 12-17. Soil characteristics, Active Ganges Floodplain Region**

Major land type	Soil pH	Soil OM	Nutrients status								
			N	P	K	S	Ca	Mg	Zn	B	Mo
High land (12%)	7.1-8.1	L	L	L-M	M	L-M	H	H	L	M	M
Med highland (33%)	7.1-8.1	L	L	L-M	M	L-M	H	H	L	M	M
Med lowland (18%)	7.1-8.1	L	L	L-M	M	L-M	H	H	L	M	M

Source: BARC Fertilizer Recommendation Guide-2005.

Notes: OM=Organic matter; VL=Very low; L=Low; M=Medium; Opt=Optimum; H=High; VH=Very high.

#### Lower Ganges River Floodplain (AEZ-12)

This region comprises of the north-eastern, eastern and south-eastern parts of the Ganges Meander Floodplain which are lower lying than the western part. The ridges are mainly shallowly flooded, but basins become moderately deep or deeply flooded in the rainy season.

The soils of the Lower Ganges River Floodplains are silt loams and silty clay loams on the ridges and silty clay loams to heavy clays on lower sites. In general soil types predominately include Calcareous Dark Grey, Grey and Calcareous Brown Floodplain soils. Organic matter content is low in ridges and moderate in the basins. Soils are calcareous in nature having neutral to slightly alkaline in reaction. General fertility level is medium. Some physiochemical properties of soils of Lower Ganges River Floodplain are presented in Table 12-18.

**Table 12-18. Soil characteristics, Lower Ganges River Floodplain**

Major land type	Soil pH	Soil OM	Nutrients status								
			N	P	K	S	Ca	Mg	Zn	B	Mo
High land (13%)	6.8-8.2	L	VL-L	VL-L	M-Opt	L-M	Opt-H	Opt-H	L-M	M-Opt	Opt
Medium highland (29%)	6.2-8.3	L-M	VL-M	VL-M	M-Opt	L-M	Opt-H	Opt-H	L-M	M-Opt	Opt
Medium lowland (31%)	6.0-8.3	L-M	L	L	M-Opt	L-M	Opt-H	Opt-H	L-M	M-Opt	Opt
Lowland (14%)	6.0-7.7	M	L	L	M-Opt	L-M	Opt-H	Opt-H	L-M	M-Opt	Opt

Source: Fertilizer Recommendation Guide-2005, BARC

Notes: OM=Organic matter; VL=Very low; L=Low; M=Medium; Opt=Optimum=High; VH=Very high

#### O1-5-2 Land Use

The total study area is about 244,316 ha of which about 184,200 ha is net cultivable area (NCA). Settlements and water bodies constitute about 11% and 13% respectively. Land use in the study area is presented in **Error! Reference source not found.**

**Table 12-19. Land use**

Land use	Area (ha)	% of total area

NCA	184,200	75
Settlements	27,764	11
Rivers & Water Bodies	32,352	13
<i>Total</i>	<i>244,316</i>	<i>100</i>

Sources: CEGIS estimation from SOLARIS

### O1-5-3 Land Type

Land type classifications are based on depth of inundation on agriculture land during monsoon season due to normal flooding. This land type classification is based on depth of inundation during the monsoon season due to normal flooding on agriculture land. There are five land types: High Land (HL, flooding: depth 0-30 cm); Medium Highland (MHL, flooding depth: 30-90 cm); Medium Lowland (MLL, flooding depth: 90-180 cm); Low Land (LL, flooding depth: 180-360 cm); and Very Lowland (VLL, flooding depth: above 360 cm) (MPO, 1986). The percentages of land type of high land, medium highland, medium lowland, lowland and very lowland are about 4, 37, 37, 21 and 1 respectively of the total area. The detailed land type is presented in Table 12-20.

**Table 12-20. Land types**

Land type	Area (ha)	% of NCA
Highland	8,153	4
Medium Highland	68,045	37
Medium Lowland	68,023	37
Lowland	39,376	21
Very Lowland	1795	1
<i>Total</i>	<i>184,200</i>	<i>100</i>

Sources: CEGIS estimation from SOLARIS

### O1-5-4 Soil Texture

Soil texture is the relative proportions of sand, silt and clay; important for agriculture crop production. The percentages of texture of surface soil of the study areas are about 7, 44, 39, 6 and 4% for clay, clay loam, loam, sand, sandy loam respectively of the NCA. Data on soil texture is presented in Table 12-21.

**Table 12-21. Soil texture, 0-15 cm depth**

Texture	Area(ha)	% of NCA
Clay	13,157	7
Clay Loam	80,193	44
Loam	72,511	39
Sand	11,389	6
Sandy Loam	6,950	4
<i>Total</i>	<i>184,200</i>	<i>100</i>

Sources: CEGIS estimation from SOLARIS

### O1-5-5 Available Soil Moisture

The available soil moisture is important for the cultivation of Rabi crops. The high (72.9%) and medium level (26.9%) of available soil moisture has been observed in the study area. The distribution of available soil moisture is presented in Table 12-22.

**Table 12-22. Soil moisture**

Soil Moisture	Area	% of NCA
High	134,373	72.9
Medium	49,485	26.9
Low	342	0.2
Total	184,200	100

Source: CEGIS estimation from SOLARIS

### O1-5-6 Drainage Characteristics

Drainage plays a vital role in the management of soil in the study area. As per the SRDI, the drainage characteristics have been divided into six classes from the agriculture point of view. Detailed drainage characteristics along with area of the project are presented in **Error! Reference source not found.**

Most of the area (83%) of the NCA is under imperfectly drained condition. The rest (17%) is under poorly drained condition. The dominance of imperfectly drained soil of the study area indicates that the removal of water in rainy/monsoon season is the main constraint for growing dry land crops in the study area.

**Table 12-23. Drainage characteristics**

Drainage classes	Drainage characteristics	Area (ha)	% of NCA
Imperfectly Drained	Water drained from soil badly or slowly. This soil often remains wet in rainy season due to rainfall. In normal situation, water does not stand on land more than 15 days at a stretch. In rainy season, groundwater stands within 1 m at least for some time.	31,314	17
Poorly Drained	The soil remains under water from 15 days to 7/8 months. Water is drained from the soil slowly. In most cases, the land remains wet/water-logged for a considerable period of time after the rainy season.	152,886	83
Total		184,200	100

Source: CEGIS estimation from SOLARIS (NWRD).

### O1-5-7 Land reclamation

About 150,000 ha of land is to be stabilized and reclaimed under the RSP programme, which is to consist of currently (unstable) char land and low-lying floodplain land. Figure 5-14 provides a map of the areas and locations to be reclaimed. It is anticipated that land stabilization will lead to reduced human suffering, greater investment and higher productivity, but also greater use of agrochemicals (and hence pollution), loss of floodplain habitats and competing land claims.

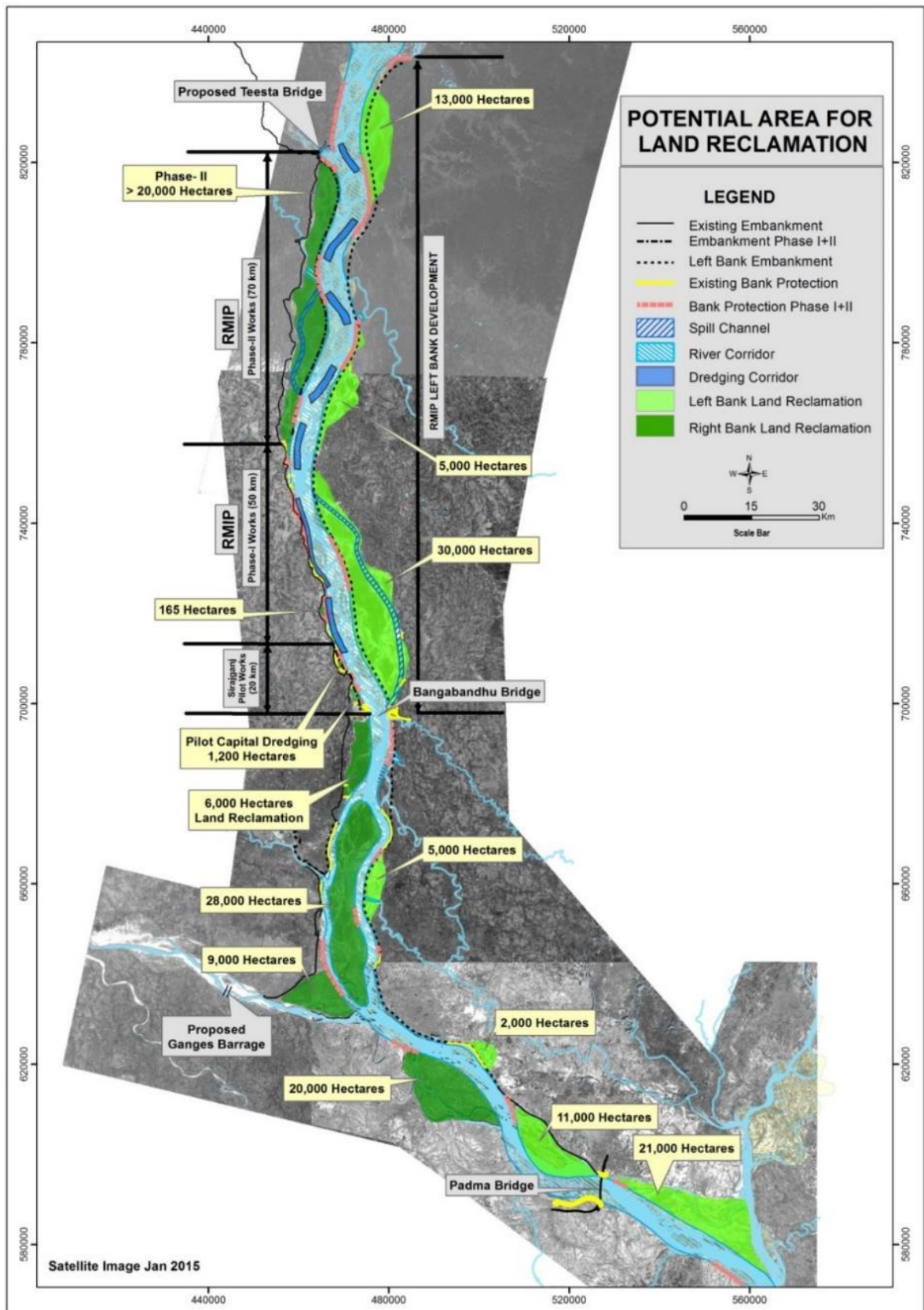


Figure 12-14. Reclaimed Land Resulting from FERMIP Interventions

## **O1-6 Agriculture Resources**

### **O1-6-1 Farming Practices**

Farming practices in the study area are largely controlled by physical, biological, climatological and socio-economic factors. Agricultural crops are grown by cropping seasons. There are two distinct cropping seasons in a year. They are Kharif and Rabi seasons. The Kharif season starts from March and ends in October while the Rabi season starts from November and ends in February. Based on crop adaptability and crop culture, the Kharif season has been further sub-divided into Kharif-1 (March-June) and Kharif-II (July-October) season.

Kharif-I is characterized by high temperature, low humidity, high evaporation, high solar radiation and uncertainty of rainfall of low alternating dry and wet spells. In this season, mainly Aus rice, Jute and Vegetables are grown. The Kharif-II season is characterized by high rainfalls, lower temperatures, high humidity, low solar radiation and high floods that recede towards the end of the season. Rice is the predominant crop grown during this season due to the submergence of soil. Excessive soil moisture also restricts other crops suitable for a high temperature regime. Local transplanted Aman (LT Aman) and High Yielding Varieties of Transplanted Aman (HYV Aman) rice are grown in Kharif-II season in the study area.

The Rabi season starts from November and ends in February. During this season, crops are favored with high solar radiation, low humidity and temperature, but inadequate soil moisture due to very low or no rainfall depresses crop yield throughout the season. Wide ranges of crops can be grown in this season. Major crops grown in this season in the study area are HYV Boro (Figure 12-15), pulses, spices, mustard (Figure 12-15), potato and vegetables. However, there are occasional overlaps such that Kharif-II season crops (Aman rice) are harvested in Rabi season and Rabi season crop (maize, potato and vegetables) are harvested in Kharif-I season and Jute is harvested in Kharif-II season.



**Figure 12-15. Boro seedbed (left) and mustard field (right)**

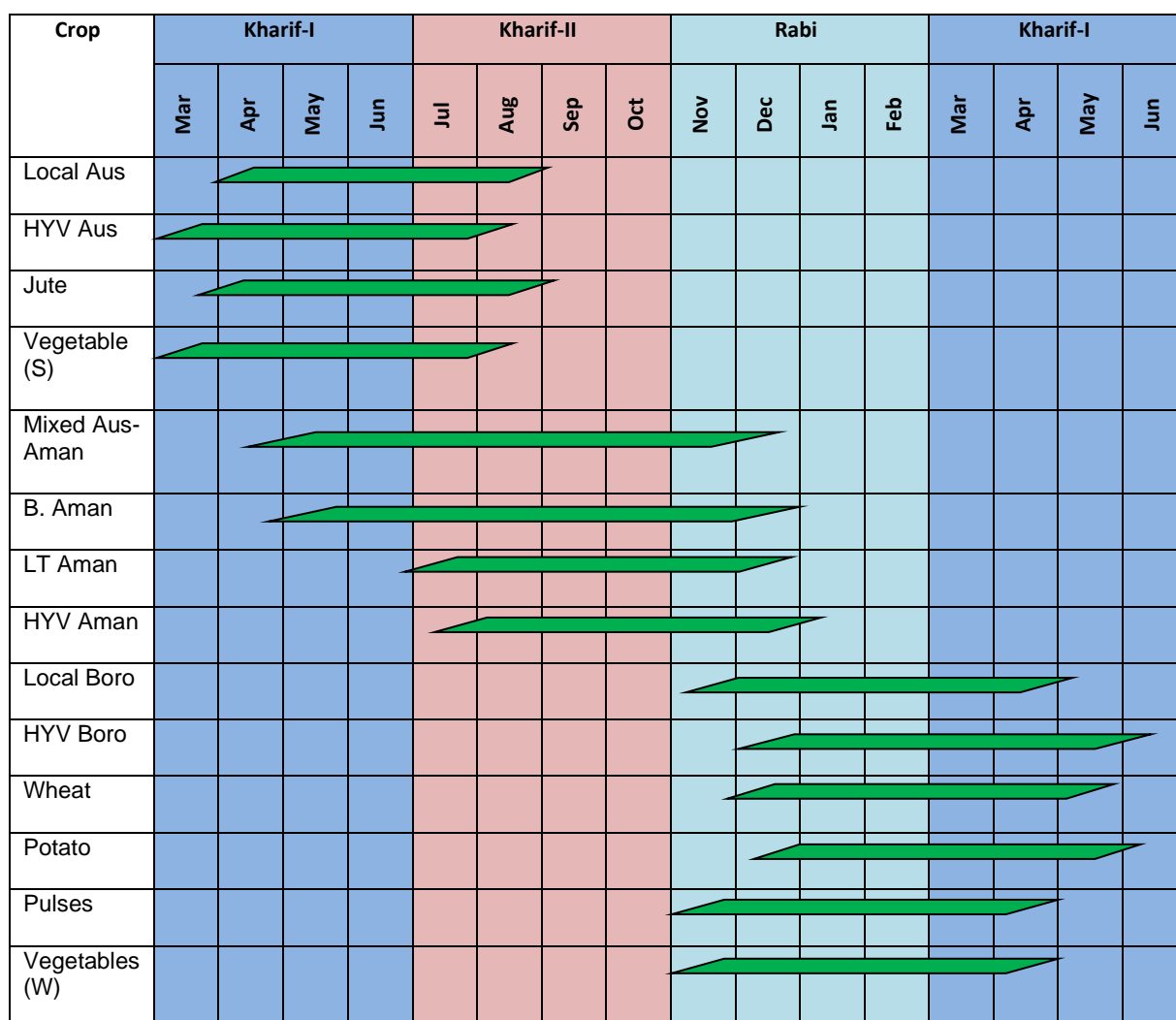
### **O1-6-2 Main Constraints of Crop Production**

The main constraints that are found in the study area are erosion of river, drainage congestion, siltation of different internal river and drainage khals, scarcity of irrigation water in Boro season etc. Siltation of different internal Khals caused drainage congestion which affected transplantation of HYV Aman crops. Jute, vegetables and Maskalai are also affected. Scarcity of irrigation water affect Boro cultivation and riverbank erosion cause loss of fertile agriculture lands.

### **O1-6-3 Cropping Pattern and Intensity**

**Figure 12-16** shows the cropping pattern. The cropping pattern is defined as the sequence of crops grown in Kharif-I, Kharif-II and Rabi crops in a plot of land in any one year, varies with flood timing, land type, and soil fertility.

Cropping patterns practiced on land types in the study area are presented in Table 12-24, which shows 24 major cropping patterns on five land types. Dominant high land cropping patterns are HYV Aus-Fallow-Mustard and Jute-Fallow-Lentil. Dominant medium high land cropping patterns in the include Fallow-HYV Aman-HYV Boro, HYV Aus-HYV Aman-Onion, Jute-HYV Aman-HYV Boro, Jute-Fallow-Mustard, Fallow-LT Aman-Wheat and local Aus-HYV Aman. Dominant medium low landcropping patterns are B. Aman-HYV Boro, LT Aman and Fallow-Fallow-HYV Boro. Dominant cropping on low land and very low land respectively are single-cropped HYV Boro and Local Boro.



**Figure 12-16. Crop calendar**

#### **O1-6-4 Cropped Area**

Details on crop production are shown in Table 5-23 which exhibits that the total cropped area is 335,099 ha of which 240,052 ha is under rice crop cultivation. Therefore, about 72% of the total cropped area in the study area is under rice crop and the rest (28%) is covered with non-rice crops. Pulses and jutes are the major among the non-rice crops which occupied about 26% and 17% of the total cropped area respectively. The other non-rice crops covered 57% of the total cropped area which include spices, oilseeds, wheat, potato and vegetables crops.



From Table 5-24 it is calculated that among the rice crops, Aus covers 11%, Aman covers 39% and Boro covers 50% of the cropped area. About 70% of the area is occupied by high yielding varieties and rest of the area is covered by local varieties of rice crop. Among the non-rice crop, pulses cover about 25,031 ha; jute 16,332 ha; mustard 14,415 and spices 12,563 ha. About 3,450 ha of the total cropped areas are used for both summer and winter vegetable cultivation.

**Table 12-24. Cropping pattern by land type**

Land type	Kharif-I (March-June)	Khartif-II (July-Oct)	Rabi (Nov-Feb)	Area (ha)	Per cent of NCA
High Land	Vegetables	Vegetables	Vegetables	1150	0.7
	Maize	Fallow	Potato	1,500	0.8
	HYV Aus	Fallow	Mustard	3,853	2.1
	Jute	Fallow	Lentil	1,650	0.9
	<i>Sub-total:</i>			8,153	4.43
Medium High Land	Fallow	HYV Aman	HYV Boro	13,625	7.4
	HYV Aus	HYV Aman	Onion	7,173	3.9
	Maize	HYV Aman	HYV Boro	1,608	0.9
	Fallow	HYV Aman	Ground nut	2,873	1.6
	Dhaincha	HYV Aman	HYV Boro	4,229	2.3
	Sesame	Fallow	Mustard	4,650	2.5
	Jute	HYV Aman	HYV Boro	8,770	4.8
	Jute	Fallow	Mustard	5,912	3.2
	Fallow	Local T Aman	Wheat	7,040	3.8
	Local Aus	HYV Aman	HYV Boro	8,080	4.4
	Maize	Fallow	HYV Boro	4,085	2.2
<i>Sub-total:</i>			68,044	36.9	
Medium Low Land	B. Aman	B. Aman	HYV Boro	15,000	8.1
	B. Aman	B. Aman	Black gram	8,341	4.5
	Mixed Aus+ B. Aman	B. Aman	Kheshari	8,540	4.6
	B. Aman	B. Aman	Kheshari	6,500	3.5
	Fallow	Local T. Aman	HYV Boro	11,321	6.1
	Fallow	Fallow	HYV Boro	12,931	7.0
	Fallow	Local T. Aman	Garlic	5,390	2.9

Land type	Kharif-I (March-June)	Khartif-II (July-Oct)	Rabi (Nov-Feb)	Area (ha)	Per cent of NCA
	Sub-total:			68,023	36.9
Low Land	Fallow	Fallow	HYV Boro	39,375	21.4
	Sub-total:			39,375	21.4
Very Low Land	Fallow	Fallow	Local Boro	605	0.3
	Sub-total:			605	0.3
Total:				184,200	100.00

Source: CEGIS field survey, 2013, plus secondary data from Upazila Agricultural Offices of the study area.

**Table 12-25. Crop production**

No.	Crop	Area (ha)	Damage-Free			Damaged			Total Production (tons)
			Area (Ha)	Yield (t/ha)	Production (Tons)	Area (Ha)	Yield (t/ha)	Production (Tons)	
1	Local Aus	8,080	6,060	1.4*	8,526	2,020	0.7*	1,353	9,880
2	HYV Aus	11,026	7,718	1.7*	10,860	3,308	1.2*	2,216	12,213
3	Jute	16,332	13,066	2.4	18,383	3,266	1.5*	2,188	19,737
4	Maize	7,193	7,193	6.5	10,121	-	-	-	11,474
5	Vegetables	3,450	2,588	14	3,641	863	8	578	4,994
6	Sesame	4,650	4,650	0.95	6,543	-	-	-	7,896
Kharif-1 Total:		50,731	41,274		58,073	9,457		6,336	59,426
7	Mixed Aus- Aman	8,540	8,540	0.80*	12,016	-	-	-	12,016
8	B. Aman	29,841	19,397	0.85*	27,291	10,444	0.7*	7,697	28,644
9	HYV Aman	39,185	23,511	2.1*	33,080	15,674	1.3*	11,552	34,433
10	Local Aman	23,751	17,813	1.3*	25,063	5,938	0.8*	4376	26,417
Kharif-2 Total:		101,317	69,261		97,450	32,056		23,625	98,803
11	HYV Boro	119,024	101,170	4.0*	142,347	17,854	2*	35,886	143,700
12	Local Boro	605	605	1.9*	851	-	-	-	851
13	Wheat	7,040	7,040	2.4	9,905	-	-	-	9,905
14	Potato	1,500	1,500	15	2,111	-	-	-	2,111
15	Mustard	14,415	14,415	0.96	20,282	-	-	-	20,282

No.	Crop	Area (ha)	Damage-Free			Damaged			Total Production (tons)
			Area (Ha)	Yield (t/ha)	Production (Tons)	Area (Ha)	Yield (t/ha)	Production (Tons)	
16	Pulses	25,031	25,031	1	35,219	-	-	-	35,219
17	Spices	12,563	12,563	4.6	17,676	-	-	-	17,676
18	Ground nut	2,873	2,873	1.5	4,042	-	-	-	4,042
Rabi Total:		183,051	165,197		232,433	17,845		35,886	233,786
Cropped Area		335,099	275,733			59,358			
NCA		184,200							
Cropping Intensity		182%							

Source: CEGIS field survey, 2013, plus secondary data from Upazila Agricultural Offices of the study area.

### O1-6-5 Crop Production

Crop production data, presented in Table 12-25, indicates that the major agricultural production of the study area comes from rice crops. The annual total rice production stands at about 268,154 metric tons. There is a production loss in rice production which is calculated as 63,080 MT. Among the rice crops, Boro is contributing about 54% (144,551 MT) followed by T. Aman 33% (89,494 MT), T Aus 8% (22,093 MT) and Mixed Aus-Aman 4% (12,016 MT) of the total rice production. Different types of non-rice crops are grown in about 95,047 ha land and production is about 133,336 MT. The non-rice crops are pulses (about 35,219 MT), spices (about 17,676 MT), jute (about 19,737 MT), mustard (about 20,282 MT), vegetables (about 4,994 MT) and potato (about 2,111 MT).

### O1-6-6 Crop Damage

Table 12-25 also articulates the crop damage area and damaged yield in the study area. During the field survey, it was found that major crop damaging factors are heavy rainfall, floods, river erosion, drainage congestion and hailstorm during monsoon period; irrigation water scarcity and drought during dry season and pest infestation throughout the year. Boro crop of the study area suffered due to non-availability of surface water and lowering of ground water table during the flowering stage. For this reason, about 15% of Boro crop area suffered damage annually and yield of this crop was reduced by about 24 to 26%. Aus crop was damaged due to heavy rainfall during the month of June and July at harvesting period of this crop. Jute also suffers during their sowing period when the distribution of rainfall is uneven. Farmers try to meet up the demand of water with the help of irrigation water. But their attempts fail due to non-availability of surface water due to siltation of the khals/rivers. About 35% area of Aman crop was affected by flood, river erosion and drainage congestion during the months of August and September. Early drought also delays transplanting and harvesting of crop which affect the growing of Rabi crops after Aman rice. This crop also faces maximum drought stress during panicle initiation to the maturity stage. Crop production loss has been calculated using the formula: Crop production loss = Total cropped area × normal yield - (damaged area × damaged yield + damage-free area × normal yield).

### O1-6-7 Agricultural Inputs

Fertilizers and pesticides are used for all crop cultivated in the study area (Table 12-26). However, the rate of use of fertilizer per hectare varies considerably from farmer to farmer depending on soil fertility, cropping pattern and financial ability. The major fertilizers used in

this area are Urea, TSP, MoP and Gypsum. Urea is widely used for potato (300-350 kg/ha), vegetables (200-300 kg/ha) HYV Boro (200-250 kg/ha) crop while less fertilizer is used in pulses (20-50 kg/ha), jute (60-100 kg/ha) and B. Aman (60-100 kg/ha). The use of pesticides depends on the degree of pest infestation. The major insects as reported by the farmers are stem borer, gal midge, leaf roller, rice bug, rice hispa, brown plant hopper and caterpillar for rice crop. Different types of fungus damage the Rabi crops. Local farmers reported that they are using different types of pesticides and fungicides to prevent pest infestation in croplands. Mainly pesticides are used in liquid form. Diazinon (Raison-60EC), Carbofuran (Brifer-5G), Sipermethrin (Siperin-10EC), Fipronil (Regent-3G), Melathion (Sifanon-57EC) are the main pesticides available in the study area. The most use of pesticide is for cultivating vegetables, farmers use 700ml/ha liquid pesticides in 2-3 times for the cultivated period, while less pesticides are used (0-1 times with 700ml/ha) for HYV Aus, local aman, wheat, pulse and jute. Details of fertilizer and pesticides application of the study area is presented in Table 12-26.

**Table 12-26. Fertilizer and pesticides**

Crop name	Fertilizer (Kg/ha)				Pesticides		
	Urea	TSP	MP	Gypsum	No. Appli.	Liq. ml/ha)	Gran. (Kg/ha)
Local Aus	100-140	-	-	-	-	-	-
HYV Aus	100-140	40-60	0-40	0-40	0-1	700	7-8
HYV Aman	120-180	60-80	20-40	0-40	1-2	700	7-8
Local Aman	100-140	40-60	20-40	0-40	0-1	700	7-8
B. Aman	60-100	0-40	-	-	-	-	-
HYV Boro	200-250	100-120	80-100	50-100	1-2	700	7-8
Wheat	180-220	60-80	40-50	40-60	0-1	700	7-8
Pulses	20-50	40-50	20-40	-	0-1	700	7-8
Oilseeds	100-180	40-60	30-40	30-40	0-1	700	7-8
Spices	200-250	120-160	100-150	60-100	0-2	700	7-8
Potato	300-350	100-150	150-200	20-40	1-2	700	8-10
Vegetables (W)	200-300	100-200	100-200	-	2-3	700	8-10
Vegetables (S)	200-300	100-200	100-200	-	2-3	700	8-10
Jute	60-100	30-40	30-40	0-50	0-1	700	7-8

Source: CEGIS field survey, 2013, plus Irrigation statistics secondary data from study area Upazila Agricultural Offices.

### O1-6-8 Minor Irrigation

Table 5-27 shows that in the study area about 55% of the cultivable areas are irrigated. Groundwater irrigation coverage is about 99% of total irrigation coverage in the dry season. Mainly shallow tube-wells (STW) are used for lifting ground water for irrigation. The remaining 1% is irrigated by low-lift pumps and traditional methods that lift surface water from rivers, canals, and beels (Figure 12-17).



**Figure 12-17. Surface water irrigated agricultural field**

**Table 12-27. Minor irrigation**

Mode of Irrigation Equipment	Number	Irrigated Area (ha)
Deep Tube Well	283	6,094
Shallow Tube Well	47,705	94,530
Low Lift Pumps	108	1360
<i>Total</i>	<i>48,096</i>	<i>101,984 (55.4%)</i>

Source: BADC Minor Irrigation Survey Report, 2009-10.

### O1-7 Livestock and Poultry

Livestock and poultry play a significant role in the agro-based economy of Bangladesh. Table 12-28 shows estimates livestock and poultry numbers in the study area. Livestock constitute an important part of the wealth in the study area, providing draft power, leather, meat, milk, and cow dung for fuel and fertilizer. Many individuals earn their livelihood through work associated with raising cattle and poultry. Draught power for tilling the land, the use of cow dung as manure and fuel, and animal power for transportation, a ready source of capital and meat, milk and eggs for human consumption make up the demand of the local area. In addition, hides and skins, bones, feathers, etc, help in earning money. Livestock resources also play an important role in the sustenance of landless people.

**Table 12-28. Livestock and poultry**

Livestock/Poultry	Number of Livestock/Poultry
Cattle/cow	974,817
Buffalo	1,563
Goat	290,967

Livestock/Poultry	Number of Livestock/Poultry
Sheep	89,843
Horse	2,438
Chicken	2,876,480
Duck	524,564
Pigeon	93,580

Source: Upazila Livestock Offices and Census of Agriculture.

## **O1-8 Fisheries**

### **O1-8-1 Introduction**

The study area is a major fish producing region of the country with diversified fresh water fisheries resource bases consisting of the Jamuna, Padma and Meghna rivers, their tributaries and distributaries, seasonal and perennial Khals (canals), Beels (floodplain depressions) and the associated flood lands (Figure 12-18). The tributaries/distributaries and the canals act as the major connecting links between the river and the floodplain and thus play a vital role in maintaining fisheries biodiversity and productivity.

Fish biodiversity is also rich in the area but is declining due to indiscriminate fishing, obstruction of migration routes (especially in the dry season), discharge of industrial wastes, poor fisheries management, siltation, oil spills, insecticide contamination, and loss of critical habitats to siltation and bank erosion (FRERMIP EIA Tranche-1, 2014). Indiscriminate fishing practices include capture of brood-fish especially during winter and use of current jal to catch juvenile fish, especially of hilsa, and dewatering of beels for irrigation or fishing. Aquaculture practices are also prevalent in the study area but relatively less developed due to the flood threat and lack of improved technology.

FRERMIP interventions for river stabilization involving the construction of riverbank embankment to contain flooding, revetment of the bankline to stop erosion, and selective dredging to induce channel diversion will result in a narrower, non-eroding and non-flooding channel which will reduce the expanse of fisheries habitat and river-floodplain connectivity. It will furthermore alter the bankline and braided system of huge fisheries potential resulting in the reduction of catch fishery both in the river and the floodplains. Befitting mitigation measures to cover the adverse impacts are planned under the project interventions.

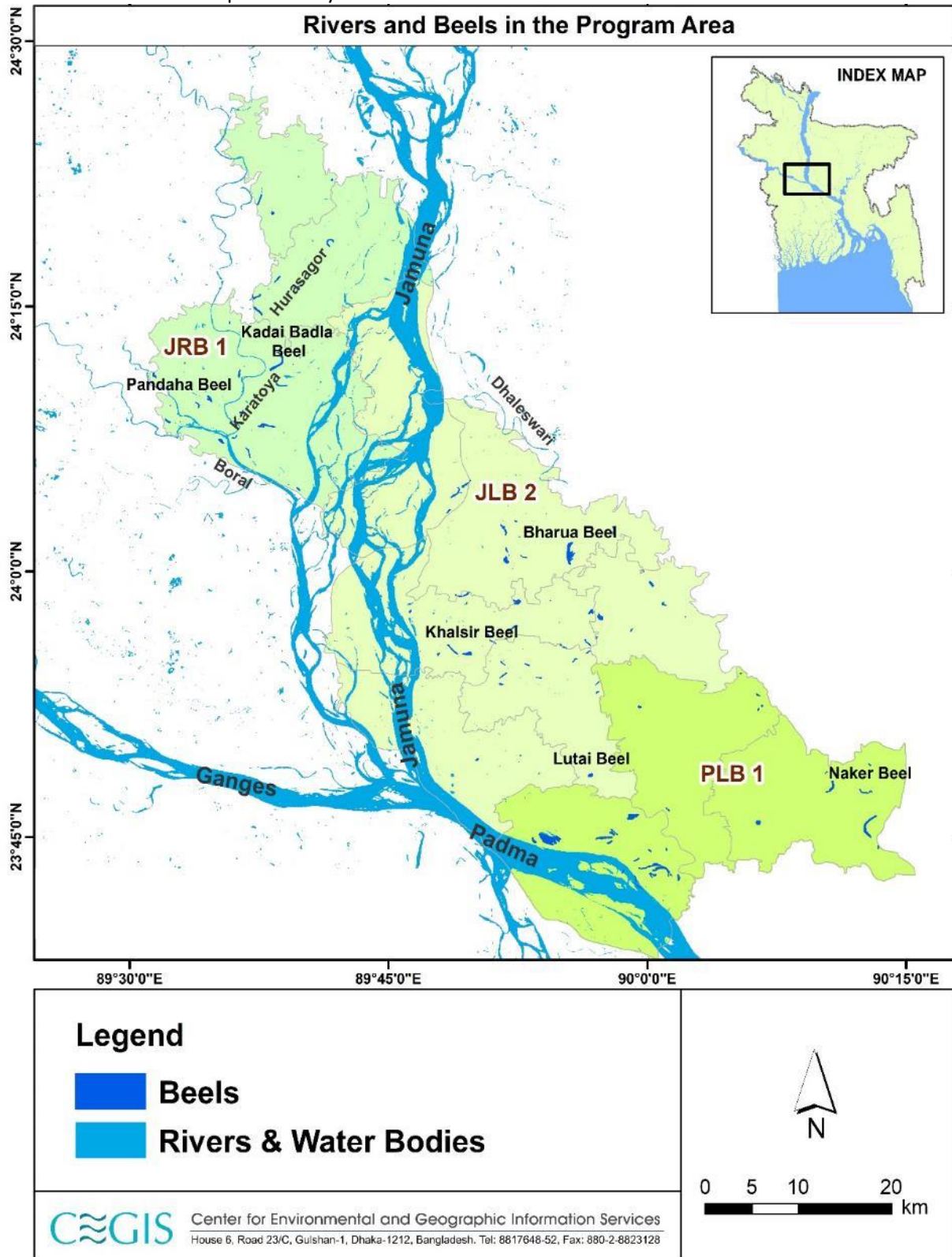
The area of intervention of the Project-2 works is mainly in the same sub-project area as the Tranche-1 works, i.e. JRB-1 and JLB-2, but with new dimensions: embankments, a closure dam and mid-river charland development with land reclamation in addition to revetments. Major target areas of interventions in the Chouhali reach form important aquatic ecosystems which will substantially be affected by the proposed interventions.

### **O1-8-2 Problems and Issues**

Major problems and issues identified during the baseline study are as follows:

- (I) Loss of connectivity from the main river to the beel specially in the dry season.
- (II) Decrease in capture fisheries production due to the loss of habitat and change of present aquatic ecological condition.
- (III) Reduction of and obstruction to fish migration mainly between the river and the floodplain.
- (IV) Fishing of brood fish especially in the overwintering period.

- (V) Breeding and feeding grounds are gradually being destroyed and decreasing due to dewatering, siltation and bank erosion.
- (VI) Decrease of fish production due to the use of current jal, mainly used to catch the fingerlings (i.e. young fish).
- (VII) Use of harmful insecticides in the crop fields, which along with the industrial pollutants affect the aquatic ecosystem.



**Figure 12-18. Rivers and beels as potential fish habitats in the program area**

### O1-8-3 Fish habitats

Fish habitats of the study area may be divided into basically two types: River Fish habitat and Floodplain Fish habitat. The former can be sub-divided into (i) Bankline habitat (Figure 12-19); (ii) Charland habitat and (iii) Main Channel habitat, each having distinctive bio-ecological features. Basic differences among these three sub-habitats are seasonality, depth and characteristic fishery. Main channels form the deepest parts and perennial areas making safe home for deep water fish, dolphin and shelter for overwintering river fish. The bankline ecosystem consists of the river corridor area beyond the main channel on two sides of the main channel. In the peak season, bankline habitat is flooded making good base for breeding and shelter of fishlings. In the lean season, the shallow bankline area dries out. Charlands are usually sandbars situated beyond the main channel. As it matures, it may be coalesced with the riverbank forming the river floodplain. Charlands may be vegetated or non-vegetated. Submerged vegetated charlands are also a safe eco-niche for breeding and early development of many fish.



**Figure 12-19. Bankline fish habitat in Harirampur (I) & open water near the Jamuna-Padma confluence**

Floodplain fish habitat consists of (i) distributaries and canals; (ii) beels and floodlands; and (iii) closed water bodies. Most distributaries are perennial though some are now heavily silted off takes. Canals are seasonal or perennial. Beels are also seasonal or perennial. Floodlands are seasonal by nature. Closed water bodies are mostly homestead ponds and impoundments which may be seasonal or perennial.

In the aquatic ecosystem (river and floodplain) of the study area a characteristic fisheries-related annual bio-ecological cycle takes place. As the water level rises in the river in March, bankline and charland vegetated areas are inundated creating breeding and shelter sites for early development of fishlings. At the same time, floodplains are inundated by river flow and thereby creating shallow waters with vegetation suitable for breeding and fishlings. With respect to breeding and early development there are four categories of fish: (i) river fish with breeding and early development in the river; (ii) river fish breeding in the river but early development in the floodplain; (iii) river fish breeding and early development in the floodplain; and (iv) floodplain fish breeding and early development in the floodplain.

Fish breeding starts in March and continues up to August (in the river). In shallow waters of the floodplain, fishlings grow through September. When the river water starts receding, grown-up fish sub-adults along with their migrating parents return from the floodplain to the river. Similarly, river-born sub-adults move from bankline and charland shallow waters to the deeper waters as the bankline and charland dry up. Synchronously, reed vegetation of the



bankline and charlands will end their annual lifecycle in September-October and dry up making room for newer seedlings which make next year's fish breeding ground. The braided river system provides a good niche for fish and fishery.

With respect of the ownership and user's right, rivers, distributaries, canals and most beels are public water bodies while some beels, ponds and impoundments are private property. Public water bodies like canals and beels are leased to fishermen groups but other public water bodies are common property and open to all for fishing, transportation and irrigation.

The study area consists of 8 Upazila's of 4 Districts (3 in Sirajganj, 2 in Manikganj, 2 in Dhaka and 1 in Chandpur district) under 2 sub-reaches (JRB-1, JLB-2). Field studies conducted in the three sub-reaches show that capture fisheries habitats with an area of some 93,975 ha include rivers, khals, perennial and seasonal beels and seasonal floodlands while culture ponds measure only 1,235 ha. **Error! Reference source not found.** shows the area of fish habitat categories.

In the dry season, average river water depth is 4 to 7 m which is adequate for fish habitation. In deep areas (kum), both large and small riverine fish take shelter when river water levels drop. Deep areas play a vital role in fish propagation. The major problems in these riverine fish habitats are siltation and erosion.

**Table 12-29. Fish habitats**

Sl. No.	Habitat Category	Habitat Type	Area (ha)
1	Capture	River	30,783
		Khal	312
		Beel	1,258
		Kol	605
		Floodplain	59,782
		<i>Sub total:</i>	<i>92,740</i>
2	Culture	Fishpond	1,235
		<i>Sub total:</i>	<i>1,235</i>
		<i>Total:</i>	<i>93,975</i>

Source: CEGIS field Survey, 2013

#### **O1-8-4 Fish Production and Effort**

Fish production sources are basically divided into two categories: capture/open water fishery and aquaculture/closed water fishery and these are of three types in the study area as in the whole country: (i) river capture fishery; (ii) floodplain capture fishery; and (iii) floodplain aquaculture. Capture fishery has more area but less production with less but natural productivity requiring nearly no production/management cost/effort, but aquaculture requires less area but more management/ production cost with higher productivity. In the project area, capture fishery, particularly the rivers, is the major source of production and aquaculture is less developed due to the flood threat and lack of improved technology. Table 12-30 shows the fish production per habitat type in the project area. As these illustrate, the major fish production (84%) comes from the capture fishery and culture fishery has lesser contribution (16%).

**Table 12-30. Fish production by habitat in JRB-1, JLB-2 and PLB-1 area**

Sl. No.	Habitat Category	Habitat Type	Total production (MT)	%
1	Capture	River	4,617	
		Khal	47	
		Beel	722	
		Kol (Semi closed water	871	

Sl. No.	Habitat Category	Habitat Type	Total production (MT)	%
		body)		
		Floodplain	11,956	
		Sub total:	18,213	84
2	Culture	Fishpond	3,446	
		Sub total:	3,446	16
		Total:	21,659	100

Source: Field observation, FRSS 2010-2011; note: PLB-1 is included in this assessment as it was originally part of Project-2

A comparative analysis of fish production of the project districts shows that overall average fisheries production and capture fisheries production is higher in the study area compared to the other districts. But culture production is relatively lower in the project districts (Table 12-31).

**Table 12-31. Comparative status of fish production in the project districts**

Project Districts	Fish Production 2014-2015 (MT)									
	Capture Fishery				Culture Fishery					Total
	River	Beel	Flood Plain	Sub-total	Pond	Seasonal Culture waters	Pen Culture	Cage Culture	Sub-total	
Dhaka	492	748	4672		7425	3306	2510	20		
Manikganj	1185	484	10188		7950	3241	23	00		
Tangail	437	2132	9911		32189	6015	245	00		
Sirajganj	2405	612	30665		14800	2923	5	20		
Chandpur	21746	280	22293		35599	1799	0	227		
Total (Project districts =PD)	27265	4256	77729	109250	98043	17248	2783	267	118341	227591
Average/ PD	5453	851	15545	21850	19609	3450	557	53	23668	45518
Total (Country)	174878	92678	730210	997766	1613240	201280	13070	1969	1829559	2827325
Average (Country)/ District	2732	1448	11409	15590	25207	3145	284	328	28587	44176

Source: FRSS, 2016. Fisheries Statistical Report of Bangladesh, DoF

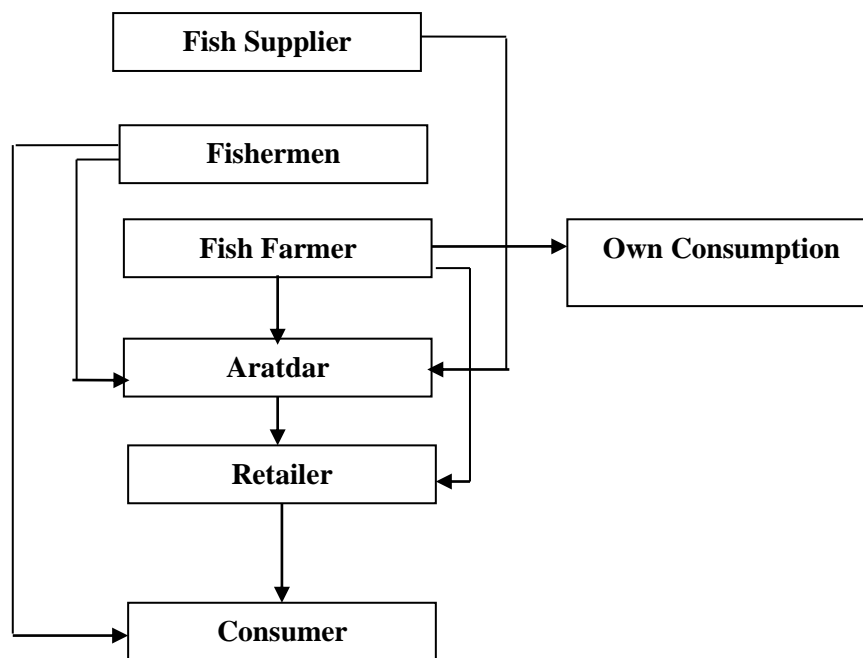
## Fish Marketing

Fish marketing has a different approach and pattern in river and floodplain areas. In the river area, overnight catches are brought to the wholesale market, usually near the riverbanks, early in the morning. From the wholesale markets, fish are taken to three destinations: (i) interior village markets; (ii) Aratdars (middlemen or fish stockists); and (iii) fish processing factories. Stockists usually send fish to distant markets like Dhaka and a part to the factories depending on the demand.

Floodplain fishers and aquaculture farmers sell their fish at the fishing spot, in local markets or to middlemen/Aratdars who send the fish to distant markets or processing factories. Fish processing factory agents sometimes collect fish from aquaculture farms and carry it in specialized refrigerated vans to factories. There are major fish markets at Baghabari, Rautara, Bantiar, Betil, etc. in Sirajganj District; Nagarpur, Dupuria, Vadra, Sabadpur in Tangail District; and Jhitka, Nayarhat, Andharmanik, Balra in Manikganj district. There are ice factories mainly located near wholesale markets. There are few fish landing centers in the study area but most of these with poor facilities. There is no storage capacity except in large landing centers like Chandpur. Transportation facility at root level is on foot, rickshaw and CNG auto rickshaw. The generalized fish marketing channel is shown in Figure 5-19.

## Fishers, Fishing Gear and Fishing Methods

Three types of fishers are found in the study area, i.e. (i) commercial or full-time fishers; (ii) occasional or part time fishers; and (iii) subsistence fishers. Commercial or fulltime fishers are professional fishers (ISPMC Team, 2017). The Department of Fisheries issues fishing licences to them and registers their names as bonafide fishers. Part time fishers are those who fish occasionally particularly when they find fishing is more rewarding than other work or if they cannot find other work. An example is seasonal hilsha fishing – large numbers of occasional fishers get to fishing during the peak hilsha season.



**Figure 12-20. Generalized fish marketing channels in the study area**

Subsistence fishers fish any time anywhere for their consumption. The number and proportion of fishers varies per area and season. In the river area, along the bankline, most fishers are subsistence fishers. In the main river channel and charlands, almost all are commercial fishers. In the floodplain area, the number of subsistence fishers has dropped in recent years because it is less rewarding, and many other better paying jobs are available now. In a study carried out in the district of Manikgong (floodplain area), only 11% of the fishers were found to be subsistence fishers. In an FGD along the riverside, about 80% of the households were found to have some fishing gear (mostly cast net or trap) for subsistence fishing. In September 2016 (high fishing season), 38% were found to be occasional fishers and 62% professional fishers. In December 2016, there were very few fishers along the bankline except anglers because bankline fishery has a seasonal decline. In the main river professional fishers were found only.

Average daily income of commercial fishers is BDT 300-350 during the monsoon (May to November). Income level of commercial fishers is decreasing day by day. Professional fishers are mostly continuing their efforts, but the occasional/part time fishers are increasingly decreasing in number and in certain areas they are all getting to other more profitable activities. The fishers are also vulnerable to 'musclemen' who convert open water fish habitats into culture fishery. Some of the fishers are involved with fish trading, fry trading and some are working as labourer in fish farms especially during the dry season. Fortunately, fish farming practices are increasing, and fish labourers are well paid in such farms. For example, in the Mymensingh area where farming is extensively practiced, fish farm labourers are hired from other areas and paid at least 50% higher salary compared to other identical employments. The thriving aquaculture sector has opened opportunities for part time fishers who often change their jobs depending on the pay level.

## Fishing Season

Fishing in floodplains, beels, rivers and khals starts in May and continues up to November except in the river. In the river, there is also clear seasonality in fishing area, pattern and catch. In the high season, June to September, fishing is done in all the three river sub-habitats – bankline shallow water, main channel and charland area with extensive fishing effort and varied catch. But in the lean season, major bankline fishery dwindles as the area dries out and grown up fish migrate to the deeper waters. Char fishery also diminishes during that season. The seasonality of major fishing is illustrated in Figure 12-21.

**Figure 12-21. Seasonality of fishing and types**

Seasonality of fishing types													
Fishing types	Seasonality												
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
	Boishakh	Jaishthya	Ashar	Sravon	Bhadra	Ashyin	Kartik	Agrahaya	Paush	Magh	Falgun	Chatra	
Gill net (Curent jal)													
Lift net (Vesal jal)													
Seine net (Ber jal)													
Push net (Thela jal)													
Trap gear (Var)													
Lining (Borshi)													
	High		Medium			Low		No occurrence					

Source: FRERMIP EIA Tranche-1, 2014

## Fishing Crafts and Location

Country fishing boats are widely used to catch fish in the study area. The fishers catch fish in Jamuna, Karotoa, Ichamati, Baral, Dhalai, Sonai, Hurasagar (old part of Jamuna river) and Dhaleshwary rivers round the year. However, fishing in seasonal beels and floodplains is done in the monsoon only. The subsistence fishers catch fish in the same water bodies both during the monsoon and dry season.

Eight types of fishing gear and methods are used for fishing in the study area. Fishing nets used comprise 9 types, as follows:

- (I) **Gill nets** (5 types) are: punti jal, bata jal, ilish jal/chandi jal, poa jal and fash jal. Names of the gillnets suggest the type of fish caught by the respective gill nets. Hilsa (*Tenualosa ilisha*), Poa (*Otolithoides pama*), Pangus (*Pangasius pangasius*), Poa (*Otolithoides pama*), Hilsa (*Tenualosa ilisha*), Bata (*Labeo bata*), Ayre (*Mystus aor*) and Bata (*Labeo bata*) are the main species caught.
- (II) **Siene nets** are encircling nets and local varieties are known as Shatting jal/Jagat ber jal and Gosi jal/Khoti jal. Gosi jal is a very large size seine net used in the river area mostly. Most of the nets, fixed purse net, cast net, dip net, lift net and drag/push net are used both in the river and floodplain area.
- (III) **Fish traps** are of all shapes and trapping arrangements; they are used extensively along the riverbankline and in the floodplain mostly for subsistence fishing.
- (IV) **Angling** is done along the riverbankline and in the floodplain mostly for subsistence and sport fishing.
- (V) **Wounding gears** are in shallow clear water fishing mostly in the floodplain area.
- (VI) **Katha fishing** is the process of creating artificial shelter for fish by putting tree-branches, sometimes with feeding arrangement to allure the fish. Then the katha is encircled with nets and fished.
- (VII) **Hand picking** is fishing with bare hands. This is a common subsistence fishing along the riverbanks and floodplain.
- (VIII) **Dewatering** process of fishing is adopted in the floodplain in the lean season for fishing in the KUA (shall ditch) in the floodplain and in aquaculture farm ponds.

(IX) **Fishing by poisoning** is an illegal process of fishing sometimes adopted in the floodplain area particularly for pouching fish.

### O1-8-5 Brackish Water and Pond Aquaculture

**Brackish Water** – There is no significant brackish water in the project area except that in certain seasons there is a slight increase in salinity (0.5-1.00 ppt) in the lower reaches of the Padma River.

**Aquaculture (project area)** – Aquaculture is relatively less developed in the project because of three reasons – flood threat, lack of knowledge about the technology and availability of open water fish. Field investigations show that every third year, coastal farmer's ponds are washed away by flood and so they are discouraged to head into the aquaculture venture though they are interested to get into the profitable fish farming. During public consultation meetings, when they were informed about the flood control works, they were seeking good fish farming technology and extension support to further their aquaculture practices.

With respect to aquaculture production the project districts are less productive (3.70 ton/ha) compared to the overall average productivity (4.33 ton/ha) of the country and much behind the best productivity (11.68 ton/ha) (Mymensingh district) of the country (Table 12-32).

There is scope of increasing aquaculture production in the project area 3 to 4-fold when flood threat is contained by FRERMIP interventions and technological support for improved aquaculture practices are provided under this project.

**Table 12-32. Comparative status of pond fish production and productivity in the project districts**

Project Districts	Pond Area (ha)	Production (ton)	Productivity (ton/ha)
Dhaka	1,911	7,425	3.89
Manikgonj	2,577	7,950	3.08
Tangail	8,276	32,189	3.89
Sirajgonj	4,364	14,800	3.39
Chandpur	9,350	35,599	3.81
Total (Project districts=PD)	26,478	98,043	3.70
Average/PD	5,296	19,609	3.70
Total (Country)	372,397	1,613,240	4.33
Average/district(country)	5,819	25,287	4.33
Mymensingh (with highest aquaculture production)	27,342	319,421	11.68

Source: FRSS, 2016. Fisheries Statistical Report of Bangladesh, DoF

### O1-8-6 Fish Migration

Thirty-six (17%) of 218 freshwater fish species in Bangladesh are considered migratory, but the overall fish migration in the study area is moderate to poor. The Jamuna and Padma rivers form the base for fish migration; tributaries/distributaries and canals are the migration routes connecting the floodplains. Major distributaries in the Project-2 area are Hurasagar on the right bank and the Pungli, Old Dhaleshwari and Gior Khal/Ichamoty which connects the project influence area. Moreover, during pre-monsoon and monsoon (availability of water in khal) Shameshpur Khal, Banigati Khal, Balorampur Khal for Sirajganj district, Shureshwary Khal, Baro Khal, East Dhadra Vikon Khal etc for Tangail district as well as Tutium Dhamshar

Khal, Kholshi-Kumuria Khal, Mandatta Khal for the Manikganj district maintain the major arteries for fish migration.

These khals carry waters from the above-mentioned rivers to both the perennial and seasonal beels. Fish migration usually occurs during pre-monsoon to some extent, but largely during peak monsoon. Reportedly, feeding and spawning migration of riverine and beel resident fish species occurs through open khals and channels between beels and rivers and over bank spill during the period of late May to August. During this period, fish species such as tengra, punti, chela, baim, gutum, taki, koi migrate through khals to beels and floodplain each year. Seasonal water bodies such as Kholshi beel, Kumuria beel, Shampur kum beel, etc. are used as feeding and nursing ground by most of the open water fishes. Many fish species migrate to these water bodies as part of their life cycle. Nevertheless, aggradations of external rivers and internal khals of the study area due to siltation and water regulatory structures on the khals cause the reduction of the length of successive migratory routes.

Certain categories of fish (i.e. the 36 species mentioned above) are dependent on migration to complete their lifecycle and when opportunity of migration fails particularly due to the loss of river-floodplain connectivity, their lifecycle cannot be completed which affects their propagation and contribution to fisheries. Some of the fishes throughout their life cycle have no dependence on the floodplain. But some of the fishes are found more dependent on the floodplain to complete their life cycle (Table 12-33).

**Table 12-33. Key (shell-)fish dependent on river-floodplain connectivity/Fish Pass**

Category of Fish (Representative Species)	Habitation	Breeding	Early Development	Dependence on River-Floodplain Connectivity
Hilsha ( <i>Tenualosa ilisha</i> )	Bay	River	River	No
Baspata ( <i>Ailia coila</i> )	River	River	River	No
Pangus ( <i>Pangasius pangasius</i> )	River	River	Estuary	No
Climbing Perch ( <i>Anabus testudineus</i> )	Floodplain	Floodplain	Floodplain	No
Wallago catfish ( <i>Wallago attu</i> )	River	Floodplain	Floodplain	Yes
Carp ( <i>Catla catla</i> )	River/Floodplain	River	Floodplain	Yes
Giant Prawn ( <i>Macrobrachium rosenbergii</i> )	River	Estuary	Floodplain	Yes

Fish migrations may be categorized as bi-directional, from river to floodplain and vice versa, and bi-dimensional, passive and active (Table 12-34). All fish migrations and some other live activities of the fish are influenced by the river flow and flooding. Fish-spawn/fingerlings of certain river breeders move passively with the river flow of the early monsoon flooding into the floodplain to be nursed there while some river fish enter the floodplain with the same flood pulse to breed in the floodplain.

All migrations from the floodplain to the river in the post monsoon are, however, active movements. These fish migrations between river and floodplain will be affected by the project interventions, particularly by the embankments. Some possible measures like designing fish friendly sluice gates with fish passes and other fish supporting structures and fish friendly operation of the sluice gates will minimize the adverse impacts on fish migration.

**Table 12-34. Some aspects of fish migration and river-floodplain connectivity in the project area**

Date/Period of migration	Life cycle stage	Migration activity	R-Fp connectivity needed for:	Type of Migration	Relationship with the R-F water flow
15 March – 15 May	Brood stock	Starts upward migration to upstream breeding ground, lateral migration to/from Floodplain	Lateral migration of Brood stock to and from Fp	Active	a. R-Fp migration along the water flow b. Fp-R migration against the water flow
15 April - 30 May	Egg/spawn	Lateral drifting migration to Floodplain	Lateral migration of Egg/spawn	Passive	Along the water flow
June-July	Fish fry	Lateral migration to the floodplain	Lateral migration of Fish fry	Mostly active	Along the water flow
15 Sept-15 Oct generalized	Young / adult fish	Back migration from Floodplain to river	Back migration to river	Active	Along the water flow

\*Adopted mostly from IUCN Report 2015; \*\* Recent study has revealed some variations.

**Table 12-35. Key migratory fish species**

No	Scientific Name	Local Name
1	<i>Labio rohita</i>	Rui
2	<i>Catla</i>	Catla
3	<i>Cirrhinus mrigala</i>	Mrigal /Mirka
4	<i>Cirrhinus reba</i>	Raik
5	<i>Labeo bata</i>	Bata
6	<i>Labeo boga</i>	Bhangan
7	<i>Labeo calbasu</i>	Kalbaus
8	<i>Labeo gonius</i>	Ghonia
9	<i>Aorichthyes aor</i>	Ayre
10	<i>Aoichthyes seenghala</i>	Guzzi ayre
11	<i>Mystus blekeeri</i>	Golsha Tengra
12	<i>Mystus cavasius</i>	Kabashi Tengra
13	<i>Chela laubuca</i>	Kash khaira
14	<i>Securicula gora</i>	Ghora chela
15	<i>Salmostoma bacaila</i>	Katari chela
16	<i>Salmostoma phulo</i>	Fulchela
17	<i>Gudusia chapra</i>	Chapila
18	<i>Eutropiichthyes vacha</i>	Bacha
19	<i>Pseudeutropius atherinoides</i>	Batasi
20	<i>Ompok bimaculatus</i>	Kani Pabda
21	<i>Ompok Pabo</i>	Pabda
22	<i>Ompok pabda</i>	Modhu pabda
23	<i>Wallagu attu</i>	Boal
24	<i>Notopterus chitila</i>	Chital

Source: FAP 17, Supporting Volume No. 10

**Table 12-36. Locations of Beels and their connectivity (Project-2 area)**

Name of District	Name of Upazila	Source of River	Connecting Khal	Connecting water bodies (Beel/River/Floodplain)
Manikgonj	Harirumpur	Padma	-	Shoilokuta Beel
			-	Boroichora Beel

Name of District	Name of Upazila	Source of River	Connecting Khal	Connecting water bodies (Beel/River/Floodplain)	
			-	Gopinathpur Beel	
			-	Alamdi Beel	
			-	Kanthopara Beel	
			-	Ramgopladi Beel	
			-	Dhumur Khola Beel	
		Ichamati	-	Diyar Beel	
	Kaliganga	-	Bhatsala Beel		
	Sadar	Kaliganga	Kaliganga Khal	Patal Beel	
		-	-	Gojaria	
		Dhaleshwary	-	Ratna Beel	
		Ichamati	-	Khabaishpur Beel	
	Singair	Kaliganga	Kaliganga khal	Dharar Beel	
			Charigram Khal	Atrai Beel	
			Nuraniganga Khal	Mograr Beel	
			Boldhara khal	Manikdaha Beel	
			-	Bolta Beel	
		Dhaleshwary	-	Nilambor Patti Beel	
			-	Senior Beel	
		Dhaleshwary Kaliganga	-	Chandahar Beel	
		Dhaleahwary Kaliganga Jamuna	Joymontop Khal	Joymontop Kol	
		Daulatpur	Jamuna Kaliganga	Gaighata Khal	Kalibari Kol
	Old Dholeshwary			-	Gazishail Kol
	Jamuna		-	Nimaikhali Beel	
			-	Bohora Beel	
			-	Dhola Pukur Beel	
			-	Panchuri Beel	
	Dholeahwary		-	Meer Ali gara Beel	
			-	Nilua Beel	
			-	Niraligala Beel	
			-	Pasthobi Beel	
			-	Ulail Beel	
			-	Shampur Kum Beel	
	Ghior		Old Dholeshwary	-	Choto Nilwaya Beel
				-	Char Ghior Mollar Beel
		Jamuna	-	Bajjuri	
			-	Char Bajjuri	
	Saturia	Gazikhali Dholeashwary	-	Hazi Bulbul Floodplain	
		Dholeshwary	-	Boro Poila Floodplain	
	Shibalay	Jamuna	-	Modhdhonagar Kol	
			-	Char Shibalay	
Dhaka	Dohar	Padma	-	Arial Beel	
	Nawabgonj	Ichamati/Padma	-	Bilchuri Beel	
		Padma	-	Arial Beel	
		Ichamati	-	Nayanchori	
Sirajgonj	Belkuchi	Hurasagor	-	Rupnai Shondha Beel 01	



Name of District	Name of Upazila	Source of River	Connecting Khal	Connecting water bodies (Beel/River/Floodplain)
		River		
		Hurasagor River	-	Rupnai Shondha Beel 02
		Jamuna	-	Jamuna Dead River
			-	Aguria Jamuna Dead River
			-	Someshpur Hura Sagor dead river
			-	Hura Sagor dead river
			-	Hura Sagor dead river
			-	Hura Sagor dead river
			-	Hura Sagor dead river
			-	Hura Sagor dead river
		Balorampur Khal	Chondi Beel	
	Hurasagor (Old part of Jamuna), Jamuna River	Banigati Khal	Kamarullahpara Beel	
		Khashnamoki Khal,		
		Kamarullahpara		
	Shahjadpur	Korotoya	Potazia Khal	Prannathpur Beel
		Boral		Kadiabadla Beel
		Bag-Jamuna Nageswary	Barabil Khal	Prandoho Beel
		Sonai	-	Charkai Beel
		Dholail	-	Shaildar Beel
	Kamarkhand	Hurasagor River (Old Part of Jamuna)	-	Nandina Madhu Beel
			-	Boronal Chongi Beel
			-	Konabari Beel
			-	Hura Sagor dead river
			Chaubari khal	Dashsika Beel
			Balorampur Khal	Pakuria Beel
	Chowhali	Boalkandi Channel	-	Moheshpur Beel
		Jamuna	-	Kotalia Beel
Tangail	Nagarpur	Jamuna	East Dhadra Vikon Khal	Baraposha Beel
		Jamuna		Kushtiya Beel
				Alokdiya Beel
		Jamuna	West dhadra vikon khal	Bongram Beel
		Dholeswary	Baro Khal	Mailjani & Uladaab
			Shureshwary Khal	Shunshi Beel
			Nardohi Khal	Autpara Beel
Dholeswari /Jam		Kodaila		

Source: Ref. FRERMIP Team Field Investigation, October 2017

### O1-8-7 Fish Biodiversity

- (a) The study area is rich in fish biodiversity: 120 fish species have been recorded. A fish species list of major commercial fishes is presented in the following table and other lists are given in Appendix A.

**Table 12-37. Fish species of major commercial importance**

Scientific Name	Local Name	Habitat		
		Beel and floodplain	River and khal	Pond
<i>Hilisha ilisha</i>	Ilish	A	P (River)	A
<i>Pangasius pangasius</i>	Pungus	A	P (River)	A
<i>Glossogobius giuris</i>	Baila	P	P	A
<i>Puntius sophore</i>	Jatputi	P	P	A
<i>Prawn sp.</i>	Chingri	P	P	A
<i>Macragnathus aral</i>	Tara baim	P	P	A
<i>Mastacembelus armatus</i>	Sal baim	P	P	A
<i>Anabas testudineus</i>	Koi	P	A	A
<i>Heteropneutes fossilis</i>	Shing	P	A	A
<i>Channa panchtatus</i>	Taki	P	A	A
<i>Nandus nandus</i>	Veda	P	A	A
<i>Mystus vitatus</i>	Tengra	P	P	P
<i>Notopterus notopteus</i>	Foli	P	A	A
<i>Hypophthalmichthys molitrix</i>	Silver Carp	A	A	P
<i>Aristichthys nobilis</i>	Bighead Carp	A	A	P
<i>Ctenopharyngodon Idella</i>	Grass Carp	A	A	P
<i>Catla catla</i>	Catla	P	P	P
<i>Labeo rohita</i>	Rui	P	P	P
<i>Labeo bata</i>	Bata	P	P	P
<i>Cirrhinus mrigela</i>	Mrigel	P	P	P
<i>Ciprinus carpio</i>	Carfu	A	A	P
<i>Labeo calbasu</i>	Kalibaus	P	P	P
<i>Oreochromis mossambicus</i>	Tilapia	A	A	P
<i>Oreochromis niloticus</i>	Nilotica	A	A	P
<i>Clarias batrachus</i>	Magur	P	A	A
<i>Channa striatus</i>	Shol	P	P	A
<i>Gudusia chapra</i>	Chapila	P	P	A
<i>Amblypharingodon mola</i>	Mola	P	P	A
<i>Wallago attu</i>	Boal	P	P	A
<i>Ompak pabda</i>	Pabda	P	P	A
<i>Mystus bleekri</i>	Gulsha Tengra	P	P	A
<i>Aorichthys aor</i>	Ayre	P	P	A
<i>Lepidosephalus guntia</i>	Gutum	P	P	A
<i>Macragnathus aculatus</i>	Guchi baim	P	P	A
<i>Rasbora daniconius</i>	Darkina	P	P	A
<i>Xenentodon cancila</i>	Kakhila	P	P	A
<i>Colisa fasciata</i>	Khalisa	P	P	A
<i>Corica soborna</i>	Kaski	P	P	A
<i>Puntius gonionotus</i>	Thai Sarpunti	A	A	P

Source: Upazila fisheries offices (P-present, A-absent)

Fish biodiversity and abundance is declining in recent years. Major causes are both natural and anthropogenic interventions. Natural causes are mainly siltation of the water bodies resulting in the shrinkage of spawning and feeding grounds affecting natural recruitment and production. Man made hazards are overfishing, negative impacts of water management interventions particularly affecting river-floodplain connectivity impeding flooding of the fish habitat and fish migration affecting fish propagation and production, agro-chemical and industrial pollutions causing deterioration of water quality of the aquatic ecosystems.

Efforts for conservation of fish and fisheries are limited except for the Hilsha fishery for which a program of the Department of Fisheries (DoE) is running resulting in substantial improvement in Hilsha catch in recent years. Overfishing is the major challenge which may be tackled by awareness development and making arrangement to discourage indiscriminate fishing. FRERMIP plans to initiate such work in the study area.

Fish species which are locally unavailable for last 10-15 years or have become rare as reported by the local fishers and concerned elderly people are given in Table 12-38.

**Table 12-38. Fish species of conservation significance**

Scientific name	Local name	Local Status	
		Rare	Unavailable
<i>Puntius sarana</i>	Deshi Sarputi	√	
<i>Ompak pabda</i>	Pabda		√
<i>Lepidosephalus guntia</i>	Gutum		√
<i>Notopterus chitala</i>	Chital	√	
<i>Mastacembelus armatus</i>	Sal baim	√	
<i>Labeo bata</i>	Bata	√	

Source: Upazila fisheries offices

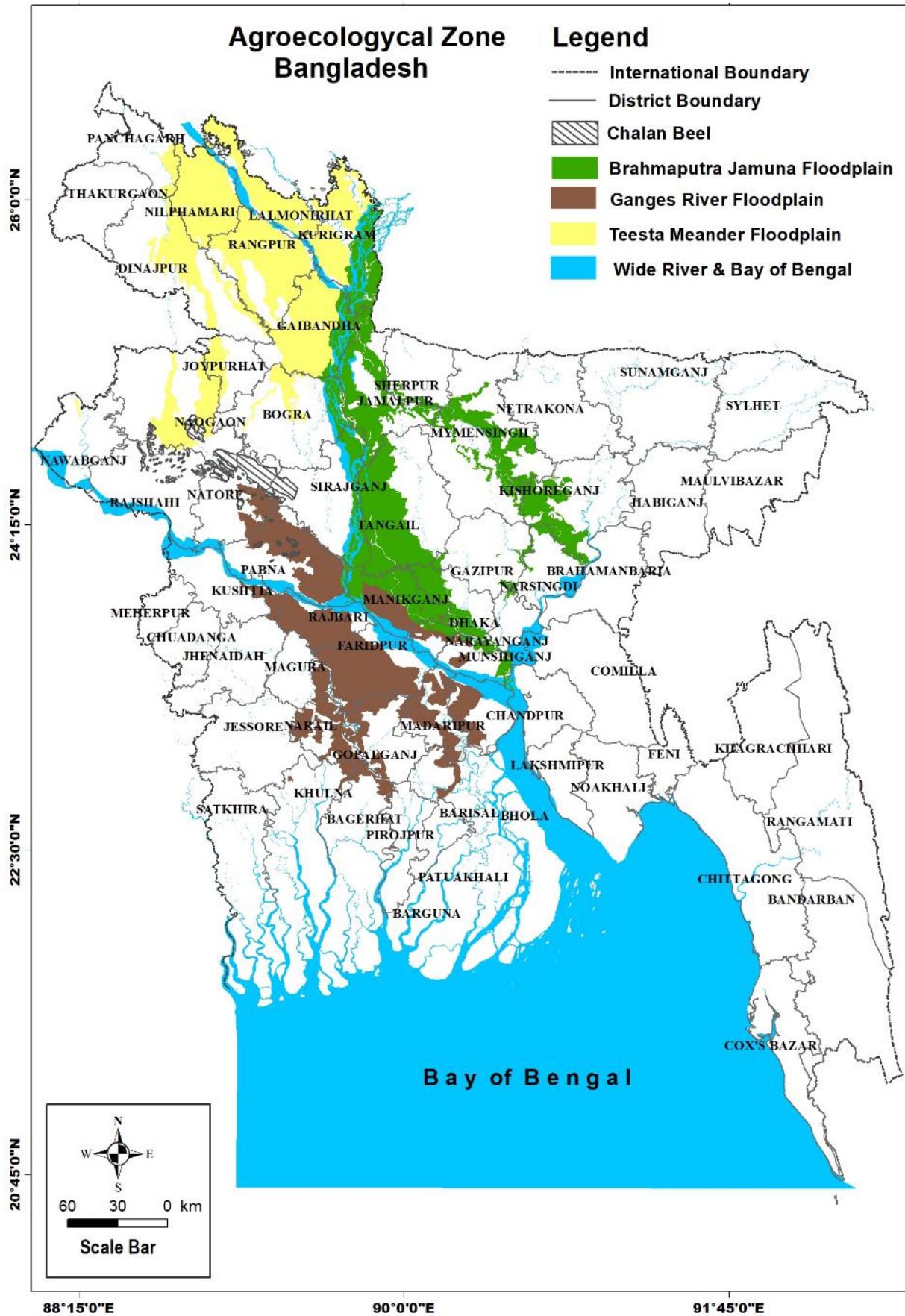
## O1-8-8 Fisheries Management

In the study area, there are three categories of fisheries management: (i) departmental management, (ii) community-based management and (iii) individual management. DoF basically administers the entire open water fisheries management but overall management measures are neither adequate nor effective particularly due to lack of adequate manpower and stakeholders' response to adhere to fisheries regulations. However, considerable success has been achieved in the management of Hilsha fishery in the country in recent years and as a result declining fishery has been rejuvenated. In the floodplains in recent year there have been several efforts for community-based fisheries management with considerable success. NGOs played a role along with DoF to achieve this. In the study area, fisher-based community associations have been established in Shahjadpur of Sirajganj, Nagarpur of Tangail and Daulatpur in Manikganj District in the study area. Fishing rights on existing fish habitats is limited. Upazila Fisheries offices conduct technical training on fish culture for fish farmers and some activities such as awareness meeting, nursery management, and linkage development among the fish traders in future. Status of enforcement of fisheries regulation is weak.

## O1-9 Ecological Resources

### O1-9-1 Bioecological Zones - Introduction

The study area comprises five different bioecological zones of the country (Nishat et al, 2002): (i) Teesta floodplain, (ii) Major rivers, (iii) Brahmaputra–Jamuna floodplain, (iv) Chalan Beel, and (v) Ganges floodplain (Figure 12-22).



**Figure 12-22. Major floodplains in Central Bangladesh**

## Major Rivers

Bangladesh consists mainly of riverine and deltaic deposits of three large and extremely dynamic rivers entering the country: the Brahmaputra, the Ganges and the Meghna rivers. Newly accreted land, if it does not erode quickly, is initially colonized by grass, particularly catkin grass (or wild cane *Saccharum spontaneum*, for example). Dense growth of catkin grass can accelerate silt deposition on chars. The Jamuna River yields the highest amount of char lands. Many of the species' natural distribution, migration and storage primarily continue via these rivers into other wetland ecosystems (GoB-IUCN, 1992). A diverse range of waterfowl are directly or ecologically dependent on these rivers and their associated ecosystems. However, river biodiversity is under severe pressure.

### Brahmaputra–Jamuna Floodplain

The Brahmaputra-Jamuna floodplain comprises the active channel of the Brahmaputra River and the adjoining areas of the young floodplain lands formed since about 1780, when the river shifted to its present course (ie the Jamuna River) to the south of Dewanganj in Jamalpur district. The main river course is strongly braided and consists of several interconnecting channels.

This floodplain possesses a unique variety of plants, medicinal herbs, fruit yielding trees, many jungle shrubs, creepers and climbers, flowering trees etc, many of which yield valuable products. Bushes of reeds and canes are also found here. The faunal diversity in this zone is also rich. The most common poisonous snake in this area is the Banded krait (*Bungarus fasciatus*), which is easily identified by its broad black and yellow bands. Various mammals such as bats, several species of monkeys and pangolins are found, along with various birds of prey.

### Chalan Beel

Chalan Beel, the center of which is located some 10 km north of the JRB-1 area astride the Dhaka-Rajshahi highway in Ullapara upazila, Rajshahi Division, is an extensive low land area at the lower Atrai basin. It consists of a series of beels connected to one another by various channels to form a continuous water body during the rainy season. The beel area expands into a vast water body. The Jamuna remains flooded during the monsoon with dense aquatic vegetation. However, it dries up in the winter leaving only patches of water holes in the central part of this zone.

Significant species diversity of Chalan Beel is as follows. At present amphibian fauna in the beel include seven species of frogs and one species of toad. A total of 34 species of reptiles are found in this zone of which ten are turtles and tortoise, nine are lizards and the remaining 15 include various snake species. Of the turtles and tortoise, the Asiatic Soft-shell Turtle and three-keeled land tortoise are globally threatened. A total of 195 bird species from 51 families are recorded in this zone of which 140 are resident and 55 are migratory. Similarly, a total of 27 species of mammals from 12 families are recorded in the beel, including the Smooth-coated Otter, IUCN Red Data listed as vulnerable in Bangladesh.

The common tree species in this area are Barun *Crataeva nurvala*, Aswatha *Ficus religiosa*, Aum *Mangifera indica*, and Hijol *Barringtonia acutangula*. The banks of the beels are vegetated with dense stands of Kash *Saccharum spontaneum*, Paddo *Nelumbo nucifera*, Nol *Arundo donax*, Dhol Kalmi *Ipomoea carnea* ssp. *fistulosa* (native to Central and South America), Shimul *Bombax ceiba* and Date palm *Phoenix sylvestris*.

The northern palm squirrel, smooth-coated otter, fishing cat, cotton-pigmy-goose, small buttonquail, purple swamp hen, three-stripe roof turtle, painted roofed turtle, common krait are common wildlife species in this zone.

### Ganges Floodplain

The Ganges floodplain basically consists of the active floodplains of the Ganges River and the adjoining meandering floodplains. It is mostly situated in the districts of Rajshahi, Pabna, Jessore, Kushtia, Faridpur, Shariatpur and Barisal. The adjoining meander floodplains mainly comprise a smooth landscape of ridges, basins and old channels. A noteworthy aspect here is that the Gangetic alluvium is readily distinguishable from the old Brahmaputra, Jamuna and Meghna sediments by its high lime content. Beside this the relief is locally irregular alongside the present and former river courses, especially in the west, comprising a rapidly alternating series of linear low ridges and depressions. The Ganges-Jamuna channel is constantly shifting within its active floodplain, eroding and depositing large areas of new charlands in each flooding season. But it is less braided than those of the Brahmaputra-Jamuna. Both plants and animals move and adapt with the pattern of flooding (Brammer, 1996).

Significant species diversity of the Ganges Floodplain is as follows. This floodplain is characterised by mixed vegetation. The presence of lot of stagnant water bodies and channels, rivers and tributaries in this zone support a habitat of rich biodiversity to some extent. In the beels and other water bodies, free-floating aquatic vegetation is prominent. The dominant floral types are Panimorich *Polygonum orientale*, Jhanji *Hydrilla verticillata*, Helencha *Alternanthera philoxeroides*, Topapana *Pistia stratiotes*, Chechra *Schoenoplectus articulatus*, Shada shapla *Nymphaea nouchali*, Keshordam *Ludwigia adscendens*, Kolmi *Ipomoea aquatica*, Dhol kolmi *I. carnea* ssp. *fistulosa*, Hijal *Barringtonia acutangula*, Tentul *Tamarindus indica* and Biash *Salix tetrasperma*. Moreover, grasses are abundant in the Ganges Floodplain and begin to grow as soon as the floodwater begins to recede. Hunuman Langur, Five-Striped Palm Squirrel, Smooth-Coated Otter, Refuse-Tailed Hare, Water Cock, Bank Myna, Asian Paradise Flycatcher, River Tern, Yellow Monitor, Common Vine Snake, Painted-Roofed Turtle, Balloon Frog, etc, occur in this zone.

Nearly all the major groups of oriental birds are represented in this zone by one or more species. In addition, migratory birds are found here during the winter. Besides, different species of freshwater tortoises and turtles are also found in the rivers and ponds, most of which are a popular delicacy among non-Muslims. The amphibian species found in this zone include a few species of toads, frogs and tree frog.

### O1-9-2 Terrestrial Habitats and Flora

Terrestrial habitats of the study area can be categorized under the following divisions: (i) settlement/ homestead vegetation (ii) cropland vegetation, (iii) river-bank vegetation, (iv) social forest, and (v) roadside vegetation. Species lists of terrestrial flora and cropland vegetation are provided in Appendix A (Table A1-1 and Table A1-2).

**Settlement / homestead vegetation** is a man-made plantation cultivated in the yard adjacent to the house. This type of vegetation has been practiced by community traditionally for financial and mundane needs. The Narikel *Cocos nucifera*, Aam *Mangifera* sp., Supari *Areca catechu*, Bansh *Bambusa* spp.), Akashmoni *Acacia auriculiformes*, and Bot *Ficus bengalensis* were observed frequently during the field survey. Chatim and Swarna Lata are present but less common.

**Cropland vegetation** is found on the periphery of cultivated lands as weeds that grow and expand through self-propagation. Dominant weed species are Shyama Ghash, Durba Ghash, Badali ghash, and Chawla ghas.

**Riverbank vegetation** consists primarily of small to large trees. The large species are Pitali *Trewia nudiflora*, Pakur *Ficus religiosa*, Neem *Azadirachta indica*, Shimul Tula *Bombax ceiba*, Kul etc. The small to medium-sized species are Bhat *Cleodendrum viscosum*, Chon, Dhol Kolmi, Dumur *Ficus hispida*, Bhadi *Lannea coromandelica* and Khejur *Phoenix sylvestris*. Among grasses, Durba and Chawla are common.

**Social forest** in the study area is found on small areas of fallow lands, cropland periphery, and near settlements and graveyards. Social forestry species are Akashmoni (*Acacia auriculiformes*, Bansh *Bambusa* spp., Mehogany *Swietenia mahogani*).

**Roadside vegetation** consists of a variety of floral species, some wild and some planted. Roadside vegetation is planted in some locations with the concept of public-private partnership to protect roads from erosion. The Ghora Neem *Melia azadirachta*, Pakor *Ficus religiosa*, Akashmoni *Acacia auriculiformes*, Sisu *Dalbergia sissoo*, Pitali *Trewia nudiflora*, Bamboo *Bambusa* spp., Khejur *Phoenix sylvestris*, Bon Begun *Solanum nigrum* are common. Less common floral species are Dumur *Ficus hispida*, Debdaru *Polyalthia longifolia* and Pakor *Ficus religiosa*.

**Urban Area** and built up areas have a low density of vegetations. Because of serious disturbance due to urbanization and dense road network with heavy traffic load, the wildlife population and floral condition and distribution are poor. But still some small mammals, reptiles, and birds were sighted during the field survey.

### O1-9-3 Seasonal and Perennial Wetland Habitats and Flora

(a) **Overview** – Wetland habitats of the study area include charland, swamp, and grassland. Appendix A: Table A1-3 provides a species list of wetland vegetation.

(b) **Charland** occupies significant part of the study area. The Jamuna and Padma Rivers are constantly shifting within their active floodplains, eroding and depositing large areas of new charlands each flood season. New charlands exhibit considerable plant succession such that the char vegetation depends on the time since char formation. At species level, Shon *Crotalaria retusa*, Nol *Phragmites karka* and Kaisa are the first colonizers, whereas Mutha *Cyperus* sp, Kolmi *Ipomoea* sp, Binna *Vetiveria zizanioides*, Durba *Cynodon* sp etc, are the second level successor. At the terminal succession, some bushy plant species such as Dholkolmi *Ipomoea carnea* ssp. *fistulosa* appear.

(c) **Swamps** – Chalan Beel area is favorable for a good growth of wetland trees like Hizal *Barringtonia acutangula* and Barun.

(d) **Grassland** species include Binna *Vetiveria zizanioides* and Durba *Gash Cynodon dactylon*.

### O1-9-4 Terrestrial Fauna

**Overview** – Among the terrestrial fauna, groups of animals present in the area include birds (Appendix A: Table A1-4), mammals (Appendix A: Table A1-5), amphibians (Appendix A: Table A1-6), and reptiles (Appendix A: Table A1-7).

**Terrestrial birds – residents and short-range migrants.** Common terrestrial birds in the study area include the Common Myna *Acridotheres tristis*, Red-Vented Bulbul *Pycnonotus cafer*, Spotted Dove *Streptopelia chinensis*, Black Drongo *Dicrurus macrocercus*, Pompadour Green Pigeon *Treron pompadora*, Blue Rock Pigeon *Columba livia*, Oriental Magpie Robin *Copsychus saularis*, Brahminy Kite *Haliastur indus*. Uncommon residents include the Barn Owl *Tyto alba*, Bank Myna *Acridotheris ginginiarius* and Bronze-winged Jacana *Metopidius indicus*. Uncommon winter visitors include the Bar-headed Goose *Anser indicus*, several sand piper and tern species. The area supports also small numbers of species that appear on the Bangladesh-IUCN's Red List (2015) such as the Lesser Adjutant

*Leptoptilos javanicus* is Vulnerable; River Lapwing *Vanellus ducaucelli* and River Tern *Sterna aurantia* are Near Threatened; Masked Finfoot *Heliopais personatus* is Endangered; and Indian Skimmer *Rynchops albocollis*, Eurasian Spoonbill *Platalea leucorodia* and Painted Stork *Mycteria leucocephala* are Critically Endangered.

**Terrestrial birds – long-range migratory species.** Bangladesh is on the Central Asian Flyway between the Palearctic and the Indian subcontinent. Migratory birds that move along the Central Asian Flyway utilize the Brahmaputra-Jamuna-Padma-Ganges char and other habitats potentially affected by Project-2 works.<sup>6</sup>

**Mammals** – The situation of mammals in Bangladesh is not good due to habitat shortage, food scarcity and hunting pressure. Several species have gone extinct since the 1970s. Mammal species still present include Little Indian Field Mouse *Mus booduga*, Golden Jackal *Canis aureus*, Small Indian Mongoose *Herpestes auropunctatus*, Indian Flying Fox *Pteropus giganteus* and Greater Short-Nosed Fruit Bat *Cynopterus sphinx*. Several species still occurring are on the Bangladesh IUCN Red List (2015) for example: Ganges River Dolphin *Platanista gangetica*, Bengal Fox *Vulpes bengalensis* as Vulnerable; Finless Porpoise *Neophocaena phocaenoides*, Irrawady Dolphin *Orcaella brevirostris*, Jungle Cat *Felis chaus*, Large Indian Civet *Viverra zibetha*, Small Indian Civet *Viverricula indica* and Common Tree Shrew *Tupaia glis* as Near Threatened; Eurasian Otter *Lutra lutra* and Smooth-coated Otter *Lutrogale perspicillata* as Critically Endangered.

**Amphibians** are found in terrestrial and aquatic environments. Common terrestrial species observed during the survey were Indian Common Toad *Duttaphrynus melanostictus* and Indian Bullfrog *Hoplobatrachus trigerinus*. The Common Tree Frog *Polypedates maculatus* occurs in association with human settlement and forest periphery and the Balloon Frog *Uperodon globulosus* (IUCN: Vulnerable) lives both in burrows and forest patches and agricultural land. The latter species is considered as rare in the study area.

**Reptiles** – The Yellow-bellied House Gecko *Hemidactylus flaviviridis*, Common Garden Lizard *Calotes versicolor*, Yellow Monitor *Varanus flavescens* (IUCN: Near Threatened) and Banded Krait *Bungarus fasciatus*, were observed during the field survey. King Cobra *Ophiophagus hannah* (IUCN: Vulnerable) and Indian Cobra *Naja naja* were reported by local people as present in the area.

For several of the species recorded to be present in the area (Tables A1-4 to A1-8 in Appendix A) it is doubtful whether they still occur in this densely populated and intensively used part of Bangladesh, such as the Gharial *Gavialis gangeticus* (which may be nationally extinct) or the shy Masked Finfoot *Heliopais personatus* (which is probably now confined in its distribution to the Sundarbans only). The Biodiversity Baseline study (Annex 10) is going to investigate and verify the occurrence of plant and animal species in the program area.

### **O1-9-5 Aquatic Ecosystems**

The hydrological cycle regulates ecosystem function by providing varying water levels and flows that create diverse aquatic habitats to be utilized by aquatic biota. In this area, aquatic ecosystems include a range of riverine, floodplain, and pond habitats that become maximally interconnected in the monsoon season.

Freshwater wetlands (rivers, khals, ponds, and beels) are classified as seasonal and perennial. Seasonal wetlands usually remain inundated for four to five months. Seasonal wetland occupies the lower croplands and provides refuge and shelter for many aquatic flora and fauna. In addition, wetlands serve as the grazing ground for fish and other aquatic fauna.

---

<sup>6</sup> Ministry of Environment and Forest. 2002. "Country Paper of Bangladesh." Seventh Meeting of the Conference of Parties of Convention on the Conservation of Migratory Species of Wild Animals. Bonn, Germany: Government of Bangladesh. [http://www.cms.int/bodies/COP/cop7/proceedings/pdf/national\\_reports/national\\_report\\_bangladesh.pdf](http://www.cms.int/bodies/COP/cop7/proceedings/pdf/national_reports/national_report_bangladesh.pdf)



Perennial wetlands hold water throughout the year.

#### Aquatic Flora

Aquatic flora is present in both seasonal and perennial water bodies. The submerged species are Fodder *Hydrilla verticillata*, *Vallisneria spiralis*, *Aponogeton Sp.* and Gechu. The free-floating species mentionable here are Kachuripana *Eichhornia crassipes* (waterhyacinth), Kutipana *Azolla Sp.*, and Khudipana *Lemna perpusilla*. Of the rooted floating species, Keshordam *Ludwigia adscendens* (syn. *Jussiaea repens*) and Shapla *Nymphae nouchali* (waterlily) are common especially in perennial and seasonal beel.

#### Aquatic Fauna: South Asian River (Gangetic) Dolphin

The South Asian River (Gangetic) Dolphin *Platanista gangetica* is native to the Ganges and Brahmaputra rivers in Bangladesh and India (Figure 12-23).

During January-September 2011, a Dolphin survey was carried out in the Padma, Jamuna, and Hurashagar-Baral Rivers of Pabna district.<sup>7</sup> Seventy-four transects (including upstream and downstream) were made over 79 km of river reach by mechanized boats to estimate abundance and habitat use. The dolphin population of the studied area was found to vary from 58 during early monsoon and to 103 during late monsoon. The mean dolphin population was about one dolphin per 1.72 km in the Padma and one per 0.69 km in the Jamuna. Adults accounted for 65% and juveniles for 35% of observed individuals. Dolphin concentrations were found in 22 river locations and found in every count in three scours (Bangla *kum*): Mohanganj *kum* of Jamuna- Hurashagar River, Nazirganj ferry ghat *kum* of Padma River, and Nagarbari *kum* of Jamuna River. Recent surveys in 2015-2016 recorded 206 River Dolphins in the Jamuna-Brahmaputra system (Aziz, 2019<sup>8</sup>).

Dolphins were slightly more abundant during the low water Jan-Apr period (one per 1 km) than in the monsoon high water Jun-Jul period (one per 1.06 km). The local community fishers were involved in river dolphin conservation.

Dolphins utilizing riverine habitats potentially affected by the project are part of a transboundary (Bangladesh-India) population that may include individuals who migrate internationally between Bangladesh and India. Most international movement of dolphins occurs within peri-border areas as short-range tributary-to-mainstream trips, but longer-range migrations of individuals between the project's influence area and India cannot be ruled out.

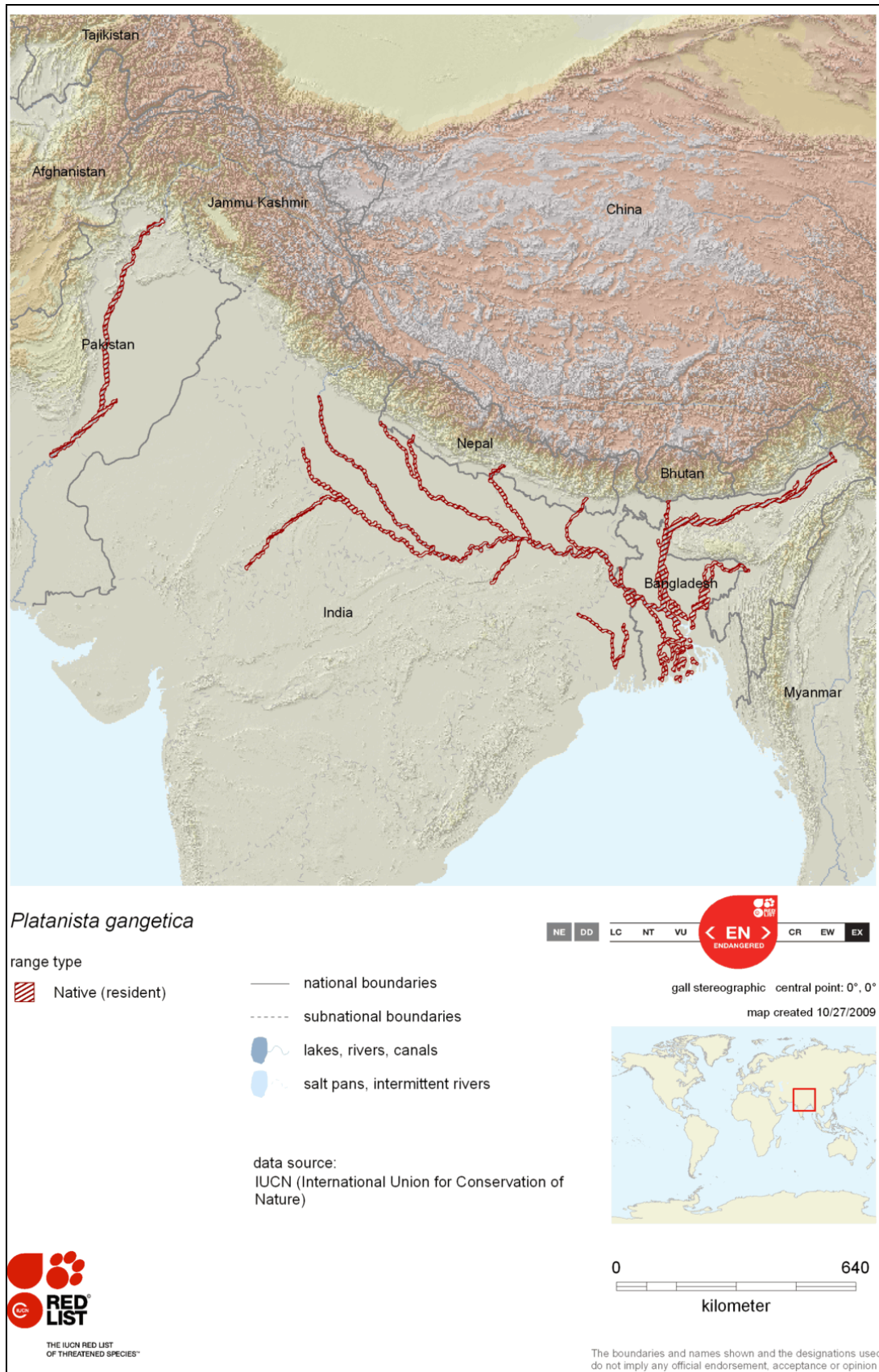
The Ganges River Dolphin is on the IUCN Red List as Vulnerable. It is listed in Appendices I and II of the Convention on the Conservation of Migratory Species of Wild Animals (CMS). CMS Appendix I listed species are deemed in danger of extinction throughout all or a significant proportion of their range and meriting from CMS Parties (Bangladesh is a signatory) strict protection, conservation or restoration of habitats, mitigation of migration obstacles, and control of other threats to survival. Appendix II listed species have an unfavourable conservation status or would benefit significantly from international co-operation organised by tailored agreements. It is also listed in Appendix I of the Convention

---

<sup>7</sup> Rashid, S.M.A., Abdul Wahab Akonda, and Bashir Ahmed. 2012. "Occurrences of South Asian River Dolphin (*Platanista Gangetica*) in the Padma and Jamuna Rivers, Pabna." In Book of Abstracts, 130. Dhaka: Bangladesh Fisheries Research Forum. <http://bfrf.org/bookofabstracts/BFRF%205th%20Fisheries%20Conference%20and%20Research%20Fair%202012%20-%20Book%20of%20Abstracts.pdf>.

<sup>8</sup> Aziz, M.A (2019) Final Report atlas on Ganges River Dolphin and Irrawaddy Dolphin of Bangladesh. Expanding the Protected Area System to Incorporate Important Aquatic Ecosystems Project. Bangladesh Forest Department, Ministry of Environment, Forests and Climate Change. 47 pp.

on International Trade in Endangered Species (CITES) as a species in which international trade is prohibited. Specific Threats to dolphins are summarized in Appendix-B.



**Figure 12-23. Range of the South Asian River (Gangetic) Dolphin**

### **O1-9-6 Aquatic Ecosystem Services**

The floodplain and wetland ecosystem of the study area play an important role in the purification of water quality of the area, fertilization of the agricultural land, recreation and fodder for livestock and food sources for community. The flood cycle and its associated ecosystem purify the water quality deteriorated by the discharge of effluents and waste, and use of agrochemicals.

### **O1-9-7 Threats to Aquatic Ecosystems**

In the study area, river erosion and siltation occur every year. Consequently, threats on surrounding aquatic ecosystem and its biodiversity are increasing. Some of the aquatic plant species being rare have become extinct due to erosion and siltation. Due to this process habitat quality is deteriorating day by day. The population of both flora and fauna is disrupted.

### **O1-10 Climate Change: Current and Predicted Conditions**

In 2007, the International Panel on Climate Change (IPCC) considered data from climate observations across the world and concluded that the evidence for warming of the global climate is 'unequivocal'. Current projections estimate that the increase in global temperature by the end of this century will range from 1.8 - 4.0 °C predominantly depending on the level of future greenhouse gas emissions. However, these figures demonstrate that dangerous climate change – conventionally understood as a global temperature rise of 2 °C or greater – is becoming increasingly likely. And even this picture is evolving rapidly: recent studies suggest that the impacts of climate change may be even more severe and more rapid than those reported by the IPCC at the start of 2007. In a country like Bangladesh, the vulnerabilities will be emphasised and increased due to the dependence of livelihoods on climate sensitive natural resources and their weak social protection structures. They will be impacted with physical resources, human resources, social resources, natural resources and financial resources. A publication named "Promoting adaptation to climate change in Bangladesh" from Journal of Practical Action, UK ([www.preventionweb.net/publications/views/20408](http://www.preventionweb.net/publications/views/20408)) states that the projected impacts of climate change on Bangladesh are:

- (I) Climate change is likely to bring particularly rapid temperature increases in Bangladesh – faster than the average global rate of warming.
- (II) Winter temperatures will increase more than summer temperatures. The level of winter rainfall is expected to decrease, whilst summer rainfall will increase.
- (III) Extreme weather events such as heatwaves and very high rainfall are likely to become more frequent. Tropical cyclone intensity is expected to rise by 10 - 20%.
- (IV) It is certain that sea level will rise. The lowest anticipated rise in sea level is 40cm by the end of the century.

Some level of uncertainty is inevitable in measuring and anticipating climate change. Attributing individual current events to climate change is impossible due to inherent climate variability. A lack of observations over a sufficiently long time frame or narrow geographical area can hamper the analysis of climate trends. However, the degree of certainty of overall aspects of climate change has increased in recent years, between the publication of the IPCC's reports in 2001 and 2007.

Climate Change Projections: The majority of climate change projections relevant to Bangladesh have been made using regional climate models. These indicate that warming across Asia will accelerate. The rate of warming in the South Asia is projected to be

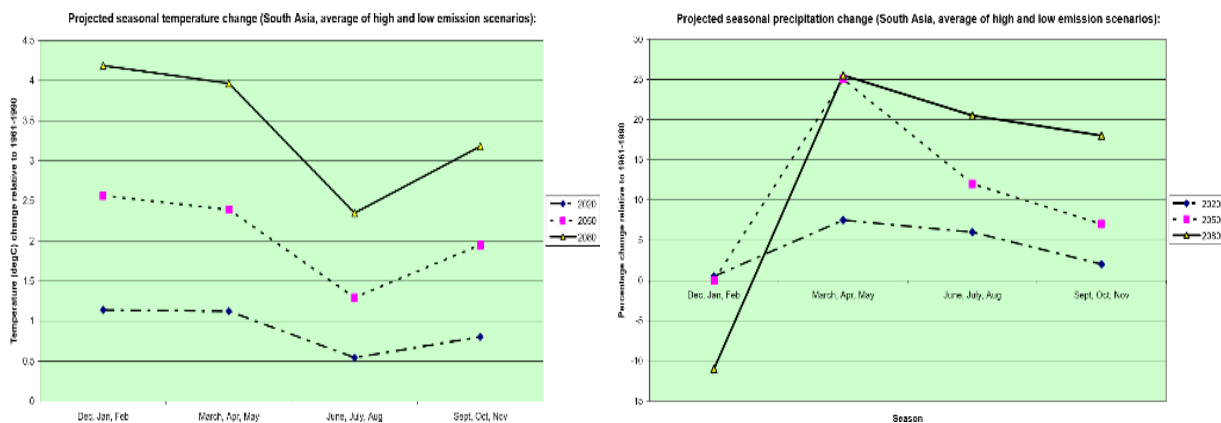
significantly faster than that seen in the 20<sup>th</sup> century, and more rapid than the global mean rate of warming:

- (I) During December, January and February warming is expected to be at its greatest and associated with a decrease in precipitation, whilst the consensus of regional models is that summer rainfall will increase.
- (II) Extreme weather events are projected to increase in frequency in South Asia, including heatwaves and high rainfall. Tropical cyclone intensity is also expected to rise by 10 - 20% as sea surface temperature rises by 2 – 4 °C.
- (III) Glacial and sea-ice melt and the expansion of the oceans due to increased temperature mean that a rise in sea level is certain. The minimum change, suggested by the most conservative climate change models, is for a 40 cm rise by the end of the century. The predicted seasonal changes for the south Asia are summarized in the following table and graphs.

**Table 12-39. South Asia seasonal temperature & precipitation projections (relative to 1961-1990 av.)**

	2010-2039				2040-2069				2070-2099			
	Temperature change °C		Precipitation change %		Temperature change °C		Precipitation change %		Temperature change °C		Precipitation change %	
	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
Dec - Feb	1.17	1.11	-3	4	3.16	1.97	0	0	5.44	2.93	-16	-6
Mar - May	1.18	1.07	7	8	2.97	1.81	26	24	5.22	2.71	31	20
Jun-Aug	0.54	0.55	5	7	1.71	0.88	13	11	3.14	1.56	26	15
Sep - Nov	0.78	0.83	1	3	2.41	1.49	8	6	4.19	2.17	26	10

Source: Practical Action UK (2008) Promoting adaptation to climate change in Bangladesh. 12 pp. <https://www.preventionweb.net/publications/view/20408>



**Figure 12-24. Projected seasonal temperature change**

## 01-11 Socio-economic Conditions

### 01-11-1 Area and Location

Socio-economic information is presented for the study area upazilas – twelve upazilas of Sirajganj, Tangail and Manikganj districts (**Error! Reference source not found.**).

**Table 12-40. Administrative units of Bangladesh**

River Reach	BWDB Zone	Sub-project	Districts	Upazilas
3	North West	JRB-1	Sirajganj	Belkuchi
				Kamarkhanda
				Shahjadpur
3	North Central	JLB-2	Manikganj	Daulatpur
				Ghior
				Saturia
				Shibalaya
			Sirajganj	Chauhali
			Tangail	Nagarpur

Source: Spatial GIS Analysis, CEGIS 2012

### 01-11-2 Demography

Table 12-41 presents key demographic data of the study area. The study area population is 2.89 million (BBS Census Report, 2011). This includes 1.42 million males and 1,47 million females in 661,000 households having an average household size of 4.37 persons. Population density is about 1,200 person /km<sup>2</sup>.

**Table 12-41. Demographic information**

Households	Population			Size of Household
	Total	Male	Female	
661,136	2,893,578	1,424,675	1,468,903	4.37
		49.2%	50.8%	

Source: BBS Population Census 2011

Table 12-42 shows age group composition of the area. About 34% of the population is under 15 years of age; 57% is between 15 and 59; and 9% is over 60 years of age, for an approximate dependency ratio of 75.

**Table 12-42. Age distribution**

Age Range (Years)	0-4	5-9	10-14	15-19	20-24	25-29	30-49	50-59	60-64	65+
Percentage of Population	10	13	11	8	8	9	25	7	3	6

Source: BBS Population Census 2011

Most people live in dwellings owned by their household (Figure 12-25).<sup>9</sup> The exception is Manikganj Sadar Upazila which is more urbanized, where most dwellers live in dwellings owned by others.



Figure 12-25. Housing tenancy

### 01-11-3 Livelihood

#### Occupation

Agriculture is the main occupation of 76% of households. About 16% of the population works in the service sector; and the remaining 8% works in the industrial sector (**Error! Reference source not found.**).

Both male and female members of households are engaged in livelihood activities, but the participation of female members is small compared to male participation. In the study area only 2% female members are working whereas 98% male members are engaged in income generating activities.

Table 12-43. Primary occupation

Upazilas	Agriculture		Industry		Service	
	Male	Female	Male	Female	Male	Female
Kamarkhanda	55.98	0.59	18.40	3.68	19.47	1.88
Belkuchi	32.31	0.69	46.23	4.48	14.33	1.96
Chauhali	75.08	2.00	11.59	0.57	8.10	2.65
Shahjadpur	58.72	1.41	24.33	1.39	12.61	1.54
Ghior	78.42	1.67	5.58	0.80	11.78	1.75
Shibalaya	74.89	1.67	2.90	0.60	17.50	2.44

<sup>9</sup> BBS distinguishes tenancy status of dwelling units into three classes such as- i) Owner: Dwelling unit found occupied and used by household owning it; ii) Rented: Dwelling unit found occupied and used under arrangement of contractually rented; and iii) Rent free: Dwelling unit found occupied and used without rent.

Manikganj sadar	62.99	1.39	5.82	1.81	23.91	4.07
Singair	79.09	1.37	5.85	0.86	11.49	1.33
Saturia	75.60	1.66	6.73	1.43	12.47	2.10
Harirampur	81.00	2.55	3.24	0.21	11.03	1.97
Daulatpur	90.29	3.20	2.75	0.23	3.19	0.33
Nagarpur	79.82	1.46	5.67	0.47	11.17	1.40

Source: Bangladesh Bureau of Statistics

## Employment

Figure 12-26 shows the employment status of people in the study area. About 40% of the total population is employed, 47% is engaged in household work, only below than one per cent is looking for work and about 13% is not working (including children and physically challenged population).

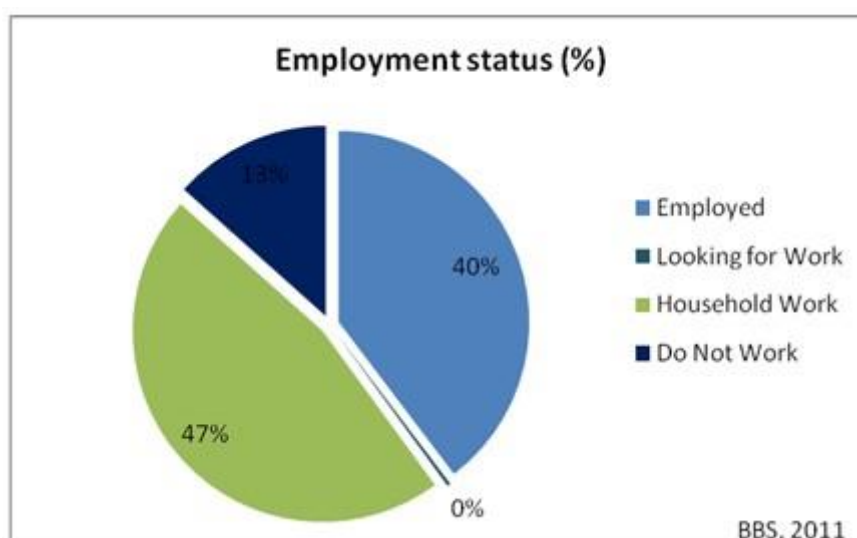


Figure 12-26. Employment status

Table 12-44 shows the distribution of employment status by male and female in the study area. It is found that only 4% female members are employed whereas 34% male members are employed in the study area.

Table 12-44. Employment

Upazilas	Employment (%)		Looking for work (%)		Household work (%)		Do not work (%)	
	Male	Female	Male	Female	Male	Female	Male	Female
Kamarkhanda	38.82	2.54	0.16	0.05	0.30	45.09	5.88	7.16
Belkuchi	38.67	2.97	0.14	0.08	0.29	41.16	7.77	8.93
Chauhali	39.27	2.16	0.34	0.10	0.35	47.59	5.16	5.01
Shahjadpur	39.58	1.80	0.20	0.10	0.45	43.30	6.55	8.02
Ghior	36.53	1.61	0.17	0.07	1.04	49.01	4.56	7.00
Shibalaya	37.50	1.85	0.23	0.06	0.52	47.26	5.33	7.25
Manikganj sadar	35.81	2.81	0.17	0.05	0.45	46.63	5.97	8.12

Singair	37.43	1.38	0.29	0.07	0.66	46.09	6.28	7.80
Saturia	37.65	2.06	0.21	0.10	0.39	49.42	4.04	6.13
Harirampur	36.81	1.83	0.17	0.11	0.78	46.93	5.73	7.66
Daulatpur	35.49	1.39	0.22	0.08	0.88	49.82	5.34	6.77
Nagarpur	35.84	1.24	0.25	0.08	0.54	49.59	5.54	6.92

Source: BBS Population Census 2011

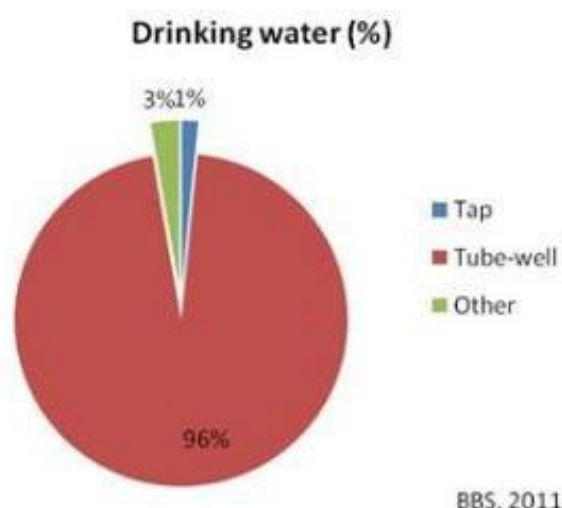
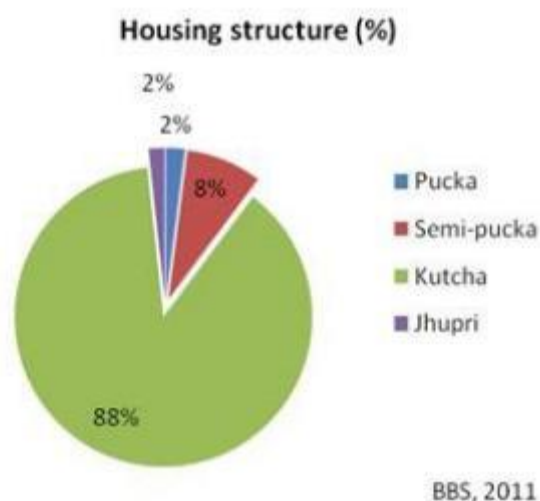
## 01-11-4 Quality of Life

### Housing

In the study area, overall housing condition is unsatisfactory. On an average, only 3% of the houses are pukka (made of bricks and mortar) whereas 88% are *kutcha* (made of wood/bamboo, and other local materials; Figure 12-27. Statistics show that *kutcha* households are dominant in whole of the study area. People in the study area are mainly in the extremely poor category of housing type.<sup>10</sup>

### Drinking Water

The overall status of drinking water in the area is satisfactory. Tube-well coverage is quite good in some upazilas e.g. Belikuchi, Ghior, Nagarpur, Shibalaya and Harirampur. But in other area, people collect water from biologically unsafe sources such as ponds (with or without pond sand filter) and rivers. Of all households, 96% use tube-well water and the rest other sources (Figure 12-28).



**Figure 12-27. Distribution of housing types; Figure 12-28. Drinking water sources**

<sup>10</sup> BBS distinguishes housing structures into four classes such as- i) Jhupri: House which consist mud walls of 1.5 to 3.0 ft thickness, which carry the roof load. Earthen floor, thatch or CI sheets are used as roofing materials. ii) Kutcha: Walls: Organic materials like jute stick, catkin grass, straw, and bamboo mats. Split are bamboo framing. In some areas wall are made by earth. Foundation: Earthen plinth with bamboo or timber posts. Roof: Thatch-rice or wheat or maize straw, and catkin grass, with split bamboo framing; iii) Semi-pukka: Walls: Bamboo mats, CI sheet, Timber or bamboo framing. In some areas wall are made by earth, sometimes part or full brick. Foundation: Earthen plinth; Brick perimeter wall with earth infill; Brick and concrete also use. Roof: CI sheet with timber or bamboo framing; and iv) Pukka: House which is made by fully concrete, cement, and iron.



Sanitation facilities are unsatisfactory in the study area. <sup>11</sup> Only 16% of study area households use hygienic (water-sealed) facilities; 47% use non-water-sealed facilities, 34% use non-sanitary facilities; and 1% lacks access to sanitation facilities.

#### Disease Incidence Ranking

According to local people's report, the diseases with highest incidence in the area ranked from highest to lowest are diarrhoea, influenza, heart disease, hypertension, gastric illness, asthma, skin disease, hepatitis, chicken pox, and arsenicosis (CEGIS fieldwork, 2012).

#### Health Services and Facilities

In the study area trained medical doctors are accessed by about 20% of households; paramedic/diploma practitioners by 30% and untrained ("quack") practitioners by 40%. All types of medical treatment are inaccessible to the remaining 10% due to impoverishment and communication problems (Figure 12-29). Local people's report that they are dissatisfied with the poor quality of available health services and facilities.



Jhuri house

Kutcha house

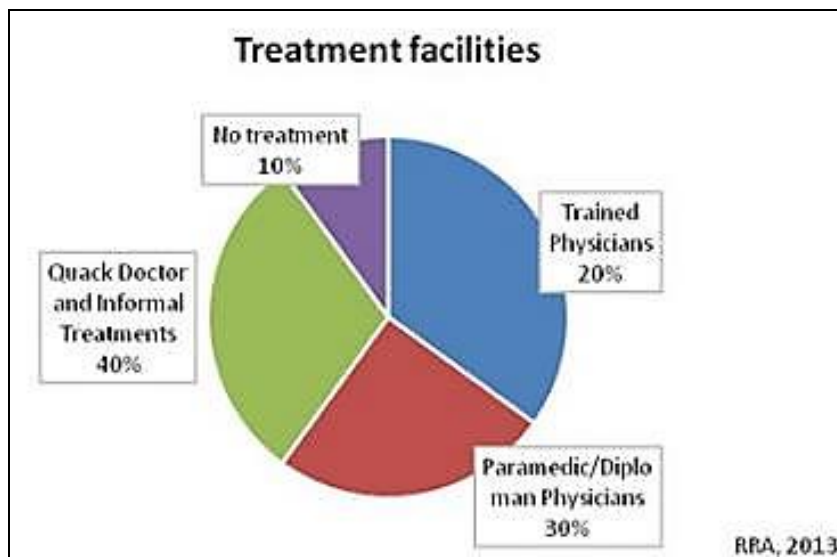
<sup>11</sup> BBS defined four types of sanitary facilities: (i) Sanitary water-sealed, pit latrine with a water barrier to prevent odors and insect, rodent, etc infestation; (ii) Sanitary not water-sealed, latrine with slab or other secure cover or polyethylene flap over the drop hole to prevent infestation; and (iii) non-sanitary (kutcha):latrine, a frame or platform extending over earth or water; an open pit latrine without squat platform or slab; and (iv) no facilities, defecation in bushes, fields, or other outdoor location.



Semi-Pukka house



Pukka house



**Figure 12-29. Medical treatment**

### 01-11-5 Education

In the study area literacy rate is quite satisfactory in terms of national average. Manikganj sadar has the highest literacy rate (56%) and is followed by Ghior (55%) upazilas (Table 12-45). However, the tendency to be educated is now growing among the local people, and people show their interest in education. They send their children to the institutions in due time and try to continue with their education.

**Table 12-45. Literacy rates**

Upazilas	Literacy Rate (per cent)		
	Total/Both	Male	Female
Kamarkhanda	46	49	44
Belkuchi	46	48	43
Chauhali	37	41	33
Shahjadpur	38	42	35
Ghior	55	58	51
Shibalaya	53	57	49
Manikganj sadar	56	59	53
Singair	46	48	44

Saturia	47	52	43
Harirampur	48	50	47
Daulatpur	35	40	30
Nagarpur	43	46	40

Source: BBS Population Census 2011.

### O1-11-6 Electricity

According to secondary census data, electrification in the study area is available to only 48 % of households (Figure 12-30). In contrast, the RRA found that local people reported about 80% coverage of national grid connection. In addition, some households receive electricity from solar and other sources. As a consequence, the use of modern technology and access to information and entertainment is relatively high.

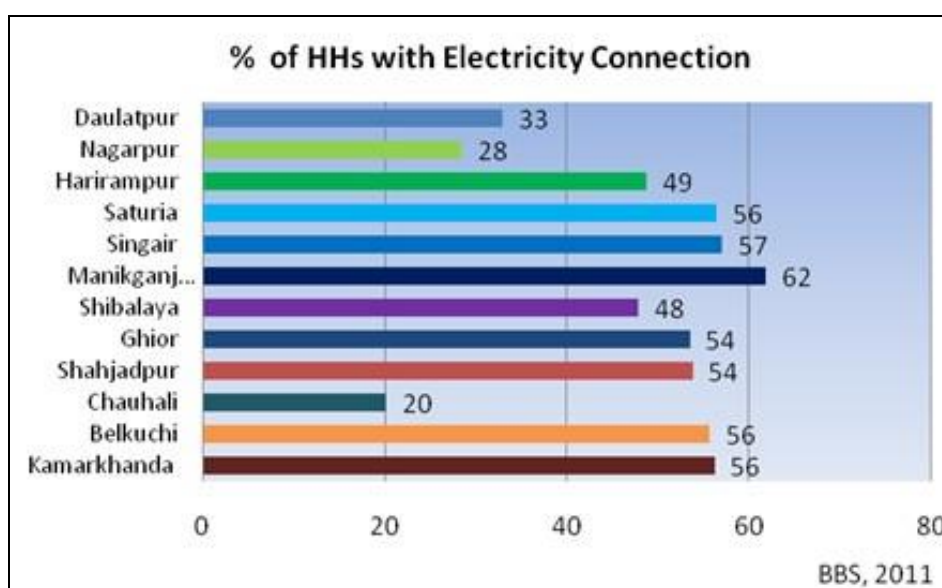


Figure 12-30. Household access to electricity

### O1-11-7 Poverty and Safety Nets

#### Landownership Pattern

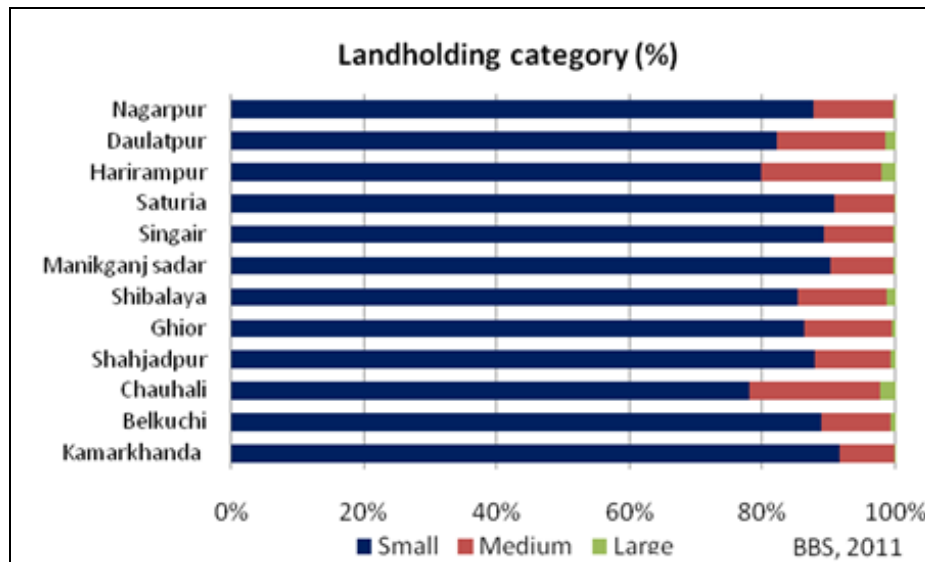
The land ownership pattern is correlated with poverty incidence in the area. The RRA found that about 30% of the households are absolute or landless and the remaining 70% have land for mainly agriculture use and also for settlement and commercial uses (**Error! Reference source not found.**).

Table 12-46. Landownership

Land Holding Categories	Distribution of Household (%)
Absolute Landless (0 decimal)	20
Functional Landless (up to 49 decimal)	10
Marginal (50-100 decimal)	40
Small (101-249 decimal)	20
Medium (250-749 decimal)	7
Large (more than 750 decimal)	3

Source: CEGIS fieldwork 2013

In the study area the Agricultural Census conducted by BBS in 2008 has found that most of the land is held in small holdings. BBS classifies land holdings into three broad categories: (i) small, 0.05 to 2.49 acre cultivated land; (ii) medium 2.50 to 7.49 acres; and (iii) large, 7.50 acres and above. In the upazilas of the project area, small holdings comprise between 78 and 93% of agricultural area, medium holdings comprise between 10 and 20%, whereas large holdings comprise far less, between 0.5 and 2% (Figure 12-31).

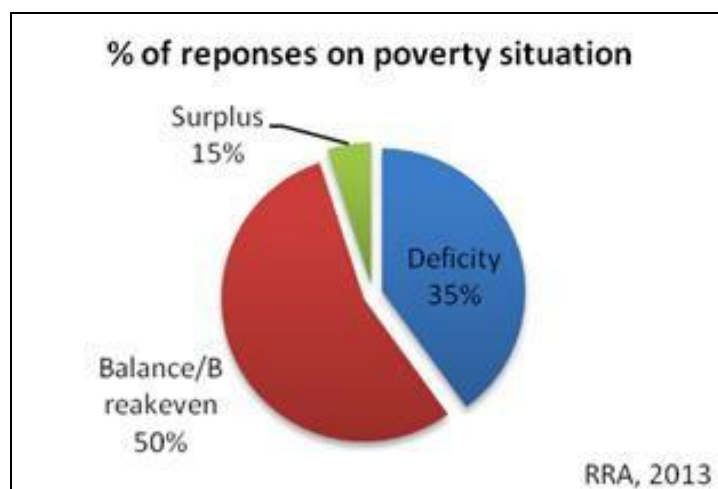


**Figure 12-31. Landholding**

### Income Poverty

Income poverty is measured through self-assessment in the study area. In this process, respondents were asked to assess the overall condition of people living in the study area. Their responses are assigned to three categories: deficit, balance or break-even and surplus.

Local people assessed that on an average about 50% of the local population are in a balance or break-even position, meaning that their economic activities are subsistence-oriented, 35% people are in deficit, meaning they must borrow all year long to finance consumption and 15%, mainly large land owners and businessmen, are in a surplus position (Figure 12-32). In the study area consumption is higher than income which perpetuates poverty intergenerationally.



**Figure 12-32. Self-assessed poverty status of people**

### Income and Expenditure

Household income and expenditure are key indicators of socio-economic status. In the study area, monthly household income and expenditure vary from BDT 5000 to 20,000. About 75% of households are engaged in agricultural labour. The wage rate varies between BDT 300 to 400 per day. A few in-migrating labourers stay in the area for a year, returning home at the end of the year with all their income. Women's participation in the agricultural sector is negligible (Table 12-47). Field findings show that most income comes from three sectors i.e. agriculture, small business and remittance, and that household consumption

**Table 12-47. Annual income and expenditure level**

Range (BDT/month)	Expenditure	Income
Less than 1,000	-	2%
1,000 - 2,000	5%	3%
2,000 – 5,000	35%	30%
5,000 - 9,000	42%	40%
9,000 - 20,000	15%	20%
More than 20,000	3%	5%

Source: CEGIS fieldwork 2013.

### 01-11-8 Natural Disasters

The local inhabitants of the study area have identified river erosion, drought, and floods as the major hazards in the area. Details about the disasters and their affects in the area are presented in **Error! Reference source not found..**

**Table 12-48. Effects of recent natural disasters**

Disaster	Frequency	Affected Area (%t)	Affected House Holds (%)	Crop Damaged (%)	Major Damaged Crop
River erosion	Every year	50	100	90	Rice
Drought	2007, 2009, 2011	50	40	30	Rice
Floods	1998, 2005, 2009	60	100	90	Rice

Source: CEGIS fieldwork 2012.

### 01-11-9 Social Safety Nets and Poverty Reduction Measures

The major social safety nets and poverty reduction programs initiated in the area include the Vulnerable Group Development, Food/Taka for Work (F/TFW), Food for Education/Cash for Education, Rural Maintenance Program (RMP), Old Age Allowance, Freedom Fighter Allowance and Integrated Poverty Reduction Program. These programs have created food security as well as social safety nets among the targeted poor households and vulnerable communities (Table 12-49).

**Table 12-49. Social Safety Net Programs**

Social Safety Net Programs	Households/Communities %
Vulnerable Group Development (VGD)	6
Food/Taka for Work (F/TFW) of PIO	4
Food for Education/Cash for Education	10
Rural Maintenance Programme (RMP)	6
Old Age Allowance	5
Freedom Fighter Allowance	3
Integrated Poverty Reduction Program of BRDB	6

Source: CEGIS fieldwork 2013.

Local, national and international NGOs work in the study area (Table 12-50). Their main activities are micro credit programs among the rural poor and landless women/men. The major NGOs working in the area include BRAC (Bangladesh Rural Advancement Centre), ASA (Association for Social Advancement), TMSS (Thengamara Mohila Sobuj Songho), Manob Mukti Sangstha (MMS), Proshika, Muslim Aid UK, CARE and Karitas. These NGOs are serving with microcredit while BRAC, ASA, and Uttaran are working for non-formal education, Health, human rights, water and sanitation, gender and children development programs. About 40% of households are found to benefit from NGO interventions.

**Table 12-50. NGOs Programs**

NGO	Type of Programs							
	Credit	Education	Water and Sanitation	Health	Human Rights	Gender	Children	Disaster
BRAC	✓	✓	✓	✓	✓	✓	✓	-
ASA	✓	✓	-	-	✓	✓	-	-
TMSS	✓	✓	✓	-	✓	-	✓	-
Manob Mukti	✓	-	-	-	-	-	-	-
CARE	✓	✓	✓	-	✓	✓	-	-
UK Muslim id	-	✓	✓	✓	✓	-	-	✓
Karitas	-	-	-	-	-	-	-	✓

Source: CEGIS fieldwork 2013.

## O1-11-10 Transportation

### Roads

Overall about 1,000 km of roads exist in the upazilas of the area, of which: 65 km roads are national: 200 km are FRA (connecting road from upazila to district); 253 km are FRB (connecting road from union to upazila); and 493 km are R1 (regional road within the districts). Table 12-51 presents data on the road network in the study area.

**Table 12-51. Road network**

Upazilas	N	FRA	FRB	R1
Daulatpur	-	6	22	33
Ghior	8	13	13	34
Harirampur	-	13	27	28
Manikganj Sadar	10	19	28	58
Saturia	3	12	8	52
Shibalaya	18	12	9	56
Singair	-	19	41	56
Belkuchi	-	25	9	43
Chauhali	-	2	23	2
Kamarkhanda	8	22	14	17
Shahjadpur	17	27	22	62
Nagarpur	-	30	37	53
Total	65	200	253	493

Source: NWRD database 2013.

### Waterways

Waterways are the most important means of transportation in the area. The navigation routes in the study area include: 21 km of routes 3.5 to 4.0 m depth; 229 km of routes 2.1 to 2.5 m depth and 438 km of routes less than 1.5 m depth. Figure 12-11 and Table 12-52 show the main navigation routes in the project area. The area has one ferry ghat, two inland river ports, and two pilot stations. Waterways are gradually decreasing in size due to siltation.

**Table 12-52. Navigation routes**

Upazilas	Below 25m	25m - 50m	50m - 100m	Above 100m
Daulatpur	30	9	15	6
Ghior	24	25	15	8
Harirampur	12	37	4	11
Manikganj Sadar	14	8	41	34
Saturia	7	23	11	16
Shibalaya	25	20	0	10
Singair	48	12	29	15
Belkuchi	7	17	0	7
Chauhali	32	5	0	13
Kamarkhanda	22	10	2	4
Shahjadpur	82	3	0	60
Nagarpur	86	1	8	24
Total	390	170	126	207

Source: NWRD database 2013.

### **O1-11-11 Educational Institutions**

The area has 914 primary and secondary schools, 48 colleges, and 92 *madrasas* (religious schools; Table 12-53). Some area students go to Rajshahi and Dhaka for secondary education. Educational institutions are mostly concentrated in larger settlements, although primary schools are distributed equally in all unions of the area.

**Table 12-53. Academic institutions**

Upazila	School	College	Madrasha
Kamarkhanda	125	7	15
Belkuchi	173	6	11
Chauhali	134	7	23
Shahjadpur	264	15	30
Ghior	102	5	3
Harirampur	98	3	2
Daulatpur	18	5	8

Source: CEGIS fieldwork 2013.

### **O1-11-12 Population Migration**

Seasonal labour migration is common throughout the study area. Permanent in- and out-migration is negligible.

Area residents tend to out-migrate to Dhaka, Tangail, Sylhet and Rajshahi, for better livelihood (60%). These out-migrants are both male and female and from both excluded/impoverished and privileged backgrounds.

A significant number of labourers living in the area (20%) are in-migrants who came seeking subsistence wages (Table 12-54). Most of these in-migrants are male, aged 15 to 47 and from socially excluded and economically impoverished backgrounds.

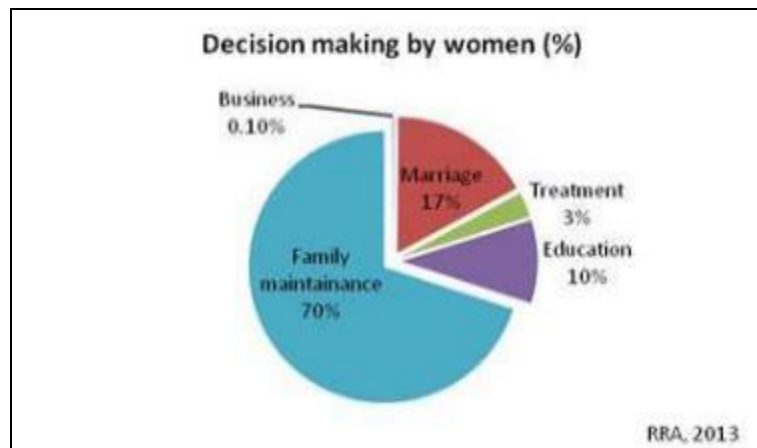
**Table 12-54. Labour migration**

Type of Migration	Out Migration		In Migration	
	Destination	Per cent of population	Origin	Per cent of population
Seasonal labour migration	Dhaka, Narayangong, Rajshahi, Manikgonj	Tangail, Sylhet, 60	Rajshahi, Pabna, Rangpur, Natore, Gaibandha, Bogra etc	20 (during harvesting period)

Source: RRA 2012

### 01-11-13 Gender and Women

Restrictions on women’s mobility, male-female discrepancies in wages, mortality, health, nutrition, and education are some of the key gender issues in the study area. Women have a minor role only in decision-making in the family and community. The RRA found that area women and girls face social and economic discrimination within the family and the community. Figure 12-33 shows the scope of decision-making by women in the study area.



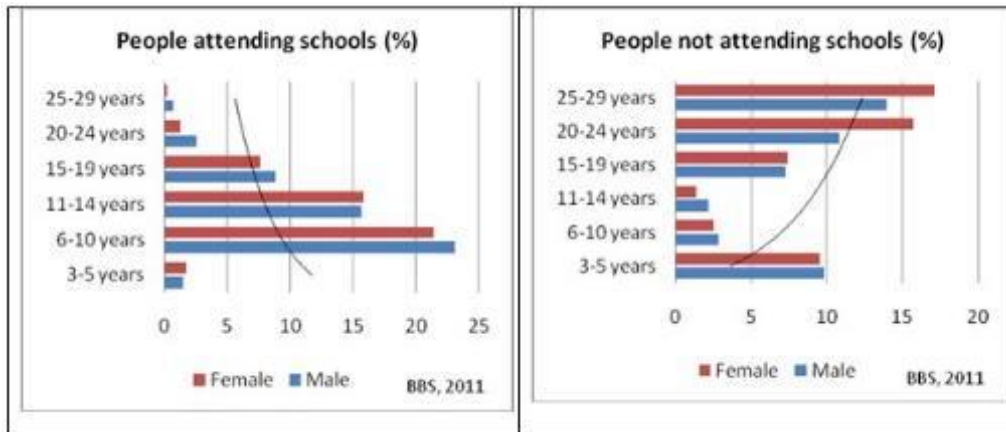
**Figure 12-33. Decision-making by women**

Women mobility in the area is mostly localized except for travel to obtain medical treatment, fetch water, engage in farming activities, and visit relatives.

Growing consciousness among local people, health services provided by the public and other health centers and NGO programs have each contributed to recent decreases in higher mortality rates for women. About 15% of the women are living with good health condition and the rest are suffering from various diseases such as low blood pressure and premature delivery. About 20% of the women are getting proper nutrition and about 10% have access to the health centers, which are around 15 km away on average from their residence.

As shown in Figure 12-34, women’s literacy in the study area has been increasing gradually, to 58%, while school attendance of males and females is now almost equal.





**Figure 12-34. School enrollment**

### **01-11-14 Vulnerable Communities**

In the study area, three types of people could be considered as vulnerable. These are (i) marginal farmers having less than BDT 5,000 monthly income; (ii) fishermen; and (iii) women-headed households. Even though most landowners cultivate their own land, sharecropping-in land is an important source of income for vulnerable households. Fishing in the open water bodies is another significant income source for these households.

### **01-11-15 Common Property Socio-Cultural Places and Resources**

The common property socio-cultural places and resources of the area include mosques, graveyards, temples, cremation grounds, playgrounds, eidgahs (places for offering Eid prayers) and the BWDB embankment. Local people frequently use these places for religious, social, and cultural gatherings.

### **01-11-16 Historical, Cultural and Archaeological Sites**

Significant historical, cultural and archaeological sites in the program area are indicated on the map of Figure 5-34. Sirajgonj district covers a large part of the study area. In 1762, a severe earthquake changed the flow of the Jamuna River and created a new river named Baral. On the west bank of this Baral River, a new bazaar (Ganj in Bengali) emerged and most of the land of this bazaar belonged to Zaminder Siraj Ali. After his name this bazaar got its recognition as Sirajgonj. Currently it is famous for its hand-loom cottage industries.

**Sirajgonj district** is rich in historical and cultural sites. Among these the followings are the prominent ones.

**Rabindro Kachari Bari**, Shahjadpur, Sirajganj-Shahjadpur is filled with the memory of the famous Nobel-laureate Rabindranath Tagore. This poet started to stay in Shahjadpur to oversee the administration of his father's zamindari or assets. He wrote many poems and novels when he used to stay here. The beauty of the village used to fascinate him much. Every year thousands of fans of the poet comes from all over the world to visit this historic spot.

**Hatikumrul Navaratna Temple** is located at the Navaratna village of Hatikumrul Union of Ullapara Upazila in Sirajganj district. It is believed to be a 300 years old temple having similar architecture to the Kantanagar Temple of Dinajpur by shape. This temple was built somewhere between 1704 - 1728, by a tahsildar named Ramnath Bhaduri. Some people believe that this is the largest Navaratna temple of Bangladesh.

**Manikgonj district** located in the central part of the study area and historical places are situated here. Some of these are as follows.

**Baliati Palace** is a massive palace complex comprising four major sections. The palace is under the Ministry of Archeology.

**Nava Ratna Mandir temple** was built around 1920s, owners of this palace tried to make the temple in European style rather using traditional Hindu mythological decor. The remarkable Navaratna adjoining the rajbari, built in honour of the family god and used during the 'Dol' festival, is among the tallest and most elegant ones of its kind.

**Teota Zaminder Palace** is located 3 km away from Aricha ghat. The 300-year old Teota Zamindar Palace at the village Teota under Shibalaya Upazila in Manikganj District still stands with pride and dignity becoming a living testimony to historical times.

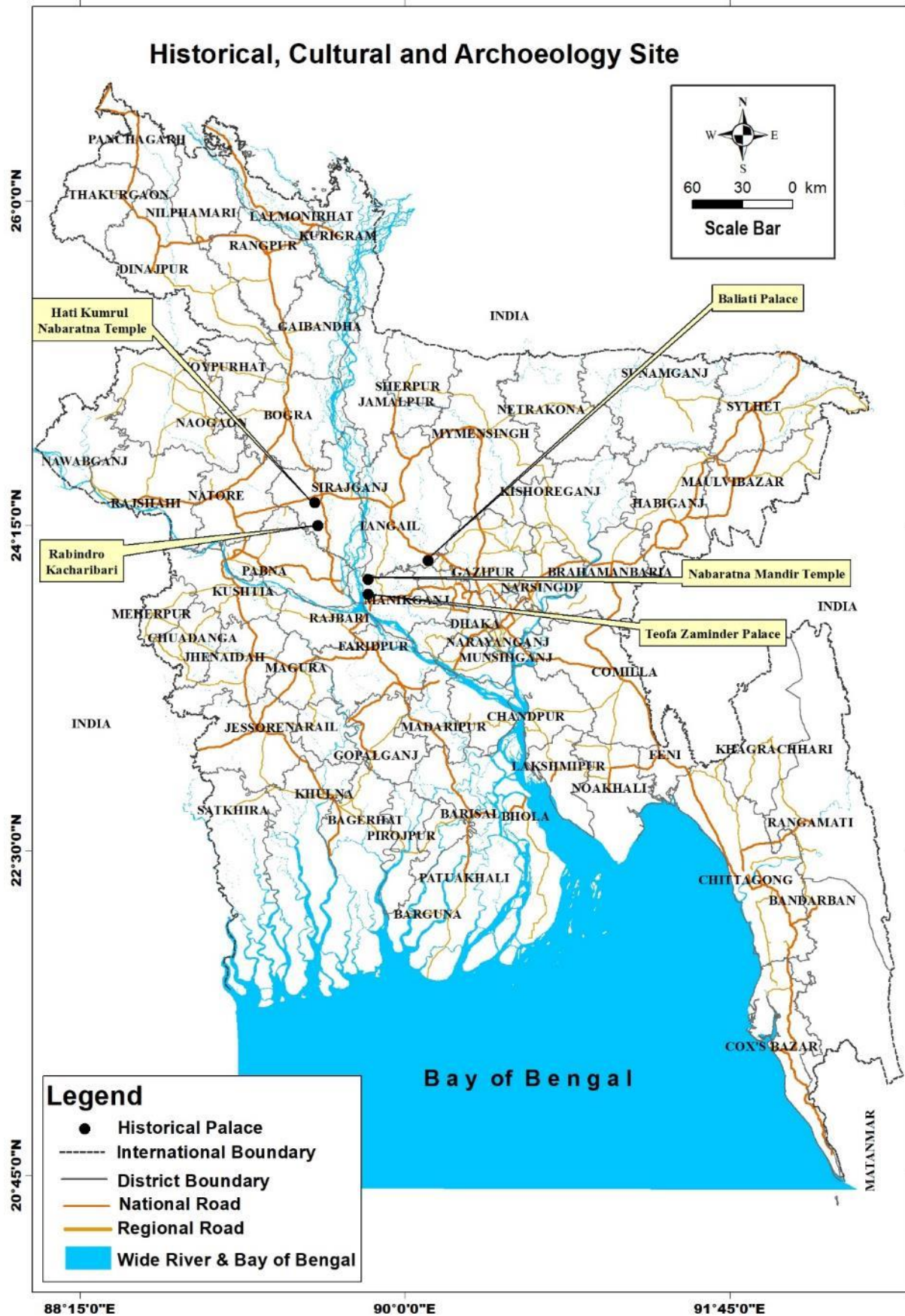


Figure 12-35. Significant historical, cultural and archaeological sites in the program area

## APPENDIX P - Preliminary Comment Matrix

Flood and Riverbank Erosion Risk Management Investment Program – Project 2  
Environmental Impact Assessment Report (Comments from May 2020)

No.	Issue	Suggested action	Response
1	<p><u>General issue:</u></p> <p>While the report is well prepared and comprehensive, however, it also tends to be exceedingly long.</p> <p>While the information (<u>Baseline</u>) is there, it is difficult to decipher which information is generic to the area and which is specific to the project site.</p>	<p>Please review the baseline section and use the most relevant information to impact analysis and discard other information that is affecting the flow of the report. Some of this information can probably be kept as an annex if necessary.</p> <p>Impacts depend on the type of intervention. The overall project area is relatively larger than some of the specific interventions such as the construction of embankment, which might have potentially more significant impact, some level of disaggregation will be helpful to get a clearer picture.</p> <p>Please disaggregate the information (baseline and impact) at the site level and by intervention type (flood protection, dam etc), as much as possible. For example, which are the Khals and Beels that are within the zone of influence of the project? Which are of the conservation importance? What are the potential impacts? The information provided on 3rd of May on Impact of FRERMIP Project-2 works on Beels and wetlands presents some level of</p>	<p>The 77 page social and environmental baseline has been moved to a new Annex O, so as to retain available information. To improve the flow of the report, a new 22-page summary Social and environmental baseline has been inserted.</p> <p>The summary baseline is more site specific than the original baseline and includes three location maps (of beels and land reclamation areas).</p>

		<p>disaggregation.</p> <p>It is understandable that the site specific information on biodiversity might not be available. Please provide linkages to site and justification when national level data is being used.</p>	
2	<p>Some description of the project activities is outdated</p> <p>It is not clear construction of the road on the embankment is included in the current project design or not?</p>	<p>Please revise the description of project activities to reflect the most recent design</p> <p>Please clarify if the construction of the road is still within the scope or not.</p>	<p>Latest description of Project-2 is now included.</p> <p>Road construction is no longer included, and an observation to this effect is included in 4.1.</p>
3	<p>Old maps and not necessarily relevant to Project-2</p>	<p>Please replace with the newly updated map, please include Project-2 specific details as much as possible.</p>	<p>Maps have been replaced.</p>
4	<p><u>Cumulative and induced impact.</u></p> <p>This section could be further elaborated in the context of the first tranche of the project, what will be the potential risk (e.g. downstream flood risk, inundation of adjacent floodplains, dike failure risk due to change in river morphology, raised riverbed, increase in water depth, and</p>	<p>Please further elaborate on this section. Please use report on Strategic Environmental and Social Assessment as a reference, wherever applicable.</p>	<p>The section has been added to re the points indicated, with some reference to the SESA.</p>

	increased velocity of water etc. )		
5	<p><u>Impact assessment.</u></p> <p>Impact assessment currently <i>focuses only on habitat and species</i>. It could be strengthened by taking a bit broader approach considering overall foregone ecosystem services, e.g. flushing of agriculture land (pollution), nutrient loading, drainage obstruction associated with hydrological regimes, if possible.</p> <p>More details on <i>reclaimed land</i> could be provided. This could include site-specific current characteristics, land-use, land-tenure. Future land-use plan. And, Impact, such as increase Agri-chemical use, pollution.</p> <p>Water quality impact of <i>dredging</i> should also be elaborated. While the impact of dredging is mentioned, it is not clear what is the current baseline, and what will be the additional change because of</p>	<p>Please elaborate this section to include ecosystem service, this might require including additional baseline information.</p> <p>Please provide a more detailed baseline and impact analysis on reclaimed land.</p> <p>Please elaborate baseline on water quality and impact of dredging.</p>	<p>The summary focuses on habitat and species as these are likely to be significantly affected. However, chapter 8 focuses on a broad range of social and environmental impacts, both positive (8.2) and negative (8.3), including aspects associated with pollution, nutrient loading and so on. As suggested, a section on (negative) impacts on ecosystem services (8.3.10) has been added.</p> <p>A map and paragraph on (to be) reclaimed land has been added to the baseline on land resources (5.3.7). Impacts of land reclamation are felt at various levels and concern dredging and excavation (8.3.4), reduced flooding (8.3.5), fisheries (8.3.7), natural habitats and wildlife (8.3.8) and of course on local (char dwelling) communities, which is dealt with in 8.3.6. Pollution &amp; agro-chemical used has been added to 8.3.6.</p> <p>The impact of dredging is not just mentioned, but 1.5 pages is devoted to this impact. In terms of impacts on aquatic environment, the EIA states: "Dredging will or may affect the aquatic environment in four possible ways: (i)</p>

	the project activities.		destabilizing the bottom ecology, (ii) channel deepening creates an altered ecosystem that may not be good for aquatic life, (iii) destroying potential fisheries habitat as the spoil deposition sites are targeted to be partly water bodies, and (iv) changing water quality (e.g. pollution, turbidity, suspended solids).” The latter has been elaborated further. These are the anticipated changes, and the EIA specifies (via the EMP) that water quality is monitored, which will also provide a pre-dredging baseline. Section 5.2.3 provides a baseline on water quality for the Jamuna and Padma, but for monitoring this needs to be time and location specific.
6	<p><u>Consultation.</u></p> <p>It seems that the last consultation was held in 2017.</p>	It might be useful to undertake a consultation based on the finalized project design and include it in the report.	Public consultations were conducted in three rounds, two in 2013 and the third from 2016-2017, so a renewed consultation would have been appropriate. However, given present restrictions due to COVID-19, the completion of the ISPMC contract in June 2020 and the limited ability to use alternative strategies for face-to-face meetings (e.g. teams or zoom) in these rural settings, renewed consultations are not feasible for the foreseeable future. Also, in principle, the types of interventions and impacts and hence the

			likely concerns of the stakeholders remain unchanged in the final design, so it is unlikely that new insights will emerge.
--	--	--	--



## APPENDIX Q - Detailed Comment Matrix:

### Flood and Riverbank Erosion Risk Management Investment Program – Project 2 Environmental Impact Assessment Report (Comments from June 2020)

No.	Issue	ADB comments – 26 June 2020	Response on 30 June 2020
1	<p><u>General issue:</u></p> <p>While the report is generally well written, there are several paragraphs, which are very long and convoluted and might benefit from editing. Some sentences in EMP tables are incomplete (marked x)</p> <p>The report refers to old EARF and EIA of the program.</p>	<p>Please edit the document / complete the information as required.</p> <p>Please update based on updated EARF of Project-2 thorough out the report.</p>	<p>The 'x's' in the EMP tables are intentional, as they refer to unknown amounts (e.g. ha impacted, or extra rice production in tons).</p> <p>This has been updated in the latest revision (30 June 2020).</p>
2	<p><u>Executive Summary:</u></p> <p><u>Introduction:</u></p> <p>First sentence refers to the EIA of the program. This report is for the EIA of Project 2.</p>	<p>Please update</p>	<p>The 'program' referred to is the title of FRERMIP and that remains unchanged. Where appropriate the document refers to Project 2.</p>

	<p>The Assessed Project:</p> <p>Does not mention PLB 1</p> <p>Environmental categorization: needs to be updated based on new EARF for Project 2.</p> <p>Impacts: understandably, the emphasis is on long term significant impacts such as habitat and species; however, it will be useful to add a summary of other impacts as well.</p> <p>Fourth Paragraph: "... Riverbank protection works at the two sub-project sites have the purpose of protecting the existing floodplain habitat from continuous and systematic erosion..." It should be three sub-projects.</p> <p>Fifth Paragraph. Difficult to understand.</p> <p>Sixth Paragraph. References to morphology studies are missing.</p>	<p>Please add PLB 1 or provide justification, and adjust throughout the report</p> <p>Please update</p> <p>Please update</p> <p>Please update</p>	<p>This has been added.</p> <p>Environmental categorization is correct and updated; the EARF does not specify the environmental category.</p> <p>Other impacts such as on livelihoods, protection against floods and erosion are already mentioned in the 2.5 pages summary on impacts.</p> <p>Reference to number of sub-project sites has been removed.</p> <p>This 5<sup>th</sup> paragraph has been rewritten/</p>
--	--	---	--

	<p>The last two sentences are not clear.</p> <p>Specific JRB-1 Interventions and Impacts: Does not say anything about the impacts</p> <p>Specific JLB-2 Interventions and Impacts: Does not say anything about the impacts</p> <p>Specific PLB-1 Interventions and Impacts: Does not say anything about the impacts</p> <p>Recommended Actions</p> <p>“... It will not result in all residual impacts being reduced to insignificance, but it will reduce them to levels considered acceptable under the circumstances...” is vague, acceptable by whom?</p> <p>“...emergency type riverbank protection...” not clear what does this mean</p> <p>Environmental Management Plan</p>	<p>Please rewrite the paragraph</p> <p>Please provide a reference to morphology studies.</p> <p>Please rewrite the last two sentences</p> <p>Please summarize the impacts of JRB-1</p> <p>Please summarize the impacts of JLB-2</p> <p>Please summarize the impacts of PLB-1</p> <p>Please be specific, a reference to standards</p>	<p>Reference provided.</p> <p>Unclear which two sentences are referred to.</p> <p>These have been added.</p> <p>Reference is made to JRB-1, above.</p> <p>Reference is made to JRB-1 and JLB-2 impacts.</p> <p>Redrafted this, as indeed vague.</p>
--	--	--	---

	<p>“...(i) include open water fisheries-related measures...” Not clear what are the measures</p>	<p>and best practices will help</p> <p>Please clarify</p> <p>Please specify measures or give examples</p>	<p>These target initial perceived risks. Has been reworded.</p> <p>These include fish-passes and buoys to curb use of nets (now added to text).</p>
	<p>Introduction:</p> <p>Overview: First sentence. Long and convoluted. Also, what is the remaining 85% of land use?</p> <p>Second Paragraph. Outdated</p> <p>Third paragraph. Reference to MFF</p>	<p>Please rewrite</p> <p>Please update based on the new EARF for Project-2</p> <p>Please update based on the updated EARF for Project-2</p>	<p>Reworded. 15% consists of water bodies, the rest consists of dryland area.</p> <p>This history of EARF and EIA has been updated.</p> <p>Reworded.</p>
	<p>Objective:</p> <p>Reference to Jamuna-Meghna River Erosion Mitigation Project (JMREMP). It suddenly appears here without providing any context or linkage to Project 2.</p> <p>“...It aims to sustain incomes and livelihoods of people...” The objective does not appear in line with Project 2 outcome and outputs</p>	<p>Please provide better context to JMREMP if necessary, otherwise, delete any reference to the JMREMP.</p> <p>Please clarify/ adjust, more along the line of flood and bank erosion risk management</p>	<p>Reference to JMREMP has been removed.</p> <p>The main aim is providing security, and sustaining incomes and livelihoods is a knock-on effect.</p>

<p>Project Area <i>versus</i> Study Area. This section needs to be updated for Project-2</p> <p>The first paragraph refers to the World Bank Project, however linkage to this project is not clear. If there is a link, this needs a discussion under the section on Cumulative Impact Assessment.</p> <p>"... The EIA study area has focused on two sub-reaches, i.e., JRB-1 and JLB-2..." PLB-2 is missing.</p>	<p>Please update</p> <p>Please clarify/ elaborate.</p> <p>Please add PLB-1 or justify not including it in the EIA</p>	<p>Reworded, and PLB-1 has been reinserted.</p> <p>Deleted, as PMO also questioned this previously.</p> <p>PLB-1 has been reinserted.</p>
<p>POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK.</p> <p>National Conservation Strategy (NCS, 1992). One sentence does not say much about this strategy. What is the objective of the strategy and its relevance/linkage to Project-2?</p> <p>National Environmental Management Action Plan (NEMAP, 1995). The period covering period 1995 to 2005 appears outdated, what is its relevance to Project-2?</p> <p>Bangladesh Climate Change Strategy and Action Plan (BCCSAP, 2009). What is the objective of the strategy and its relevance/ linkage to Project-2?</p> <p>Environmental Conservation Rules (ECR, 1997). Does Project-2 fall inside any 'ecologically critical area' (ECA)</p>	<p>Please elaborate</p> <p>Please update/ clarify</p> <p>Please add an introductory paragraph</p> <p>Please provide information</p> <p>Please add a sentence or two to clarify</p>	<p>This has been elaborated.</p> <p>As NEMAP was not updated after 2005, it still provides the framework for implementing the NCS.</p> <p>This has been added. The BCCSAP demonstrates the government's commitment to low carbon development and ensuring that infrastructure is climate proof, both of which are of direct relevance to Project 2 design and implementation.</p> <p>By 2015, 13 Ecologically Critical Areas had been declared in Bangladesh, none of which are in the project area.</p> <p>Any resettlement on Project 2 should bear in mind the issues related to arsenic in drinking</p>

	<p>The National Policy for Arsenic Mitigation (2004). Not clear what is the relevance to the Project-2.</p> <p>Bangladesh Wildlife (Protection and Safety) Act 2012. The introduction to this act is missing.</p> <p>Bangladesh Wildlife (Protection and Safety) Act 2012</p> <p>Last sentence. "... GOB commitment to biodiversity conservation..." also climate change and disaster risk management</p>	<p>relevance to Project-2</p> <p>Please introduce this act with a few sentences</p> <p>Please add climate change and disaster risk management</p>	<p>water.</p> <p>An introductory sentence has been added.</p> <p>Updated the last sentence of Section 2.2 to include this</p>
	<p>APPROACH AND METHODOLOGY</p> <p>Baseline Data Collection and Analysis: The collection of baseline on the existing infrastructure is missing. This is important because one of the major impacts is reduction of connectivity between river and floodplains, which is also affected by already built infrastructure such as embankments, roads, and settlements.</p>	<p>Please add a collection of baseline on existing infrastructure in approach and methodology. Also, add collection of baseline on other human activities such as navigation, existing use/land use (char) of braided river system.</p>	<p>This information was collected. Road network and waterways, including maps, are now included in Annex O, and have been moved here because a previous review by ADB found that the baseline (chapter 5) was way too long. Land use is included in 5.3 on Land Resources. A comment has been added to approach &amp; methodology.</p>
	<p>Project Description</p> <p>Assessment of dredging. This title is confusing. Probably it should be Description of dredging instead of assessment</p> <p>The last paragraph is the description of embankment construction. It should be under separate title.</p>	<p>Please consider/ change</p> <p>Please adjust</p>	<p>Reworded as description of proposed dredging.</p> <p>Please note that it is included under 'technologies used', and not under the heading 'dredging'.</p>
	<p>Environmental and Social Baseline</p>		

<p>Additional baseline discussed above under (approach and methodology) needs to be included</p> <p>Water Resources</p> <p>River System</p> <p>Last Paragraph. "...The tributaries of these major rivers inside the study area are Hurasagar, Dhaleswari, Kaliganga, Baral, Gohala, and Ichamati rivers.." it should be distributaries instead of tributaries?</p>	<p>Please include additional baseline information</p> <p>Please change</p>	<p>As explained above, this was moved to Annex O after being advised by ADB to reduce the length of chapter 5.</p> <p>This has been changed to distributaries.</p>
<p>Ecological Resources</p> <p>Bioecological Zones - Introduction</p> <p>References to Chalan Beel. Chalan Beel is not in the Project-2 area. Arial Beel is probably a significant Beel in the Area.</p>	<p>Please update</p>	<p>Chalan Beel is not directly in the project area, but adjacent and likely to be influenced, hence it is included in the study area.</p> <p>5.5.4 and table 5-10 lists the beels in the project area – this includes Arial beel but not Chalan beel.</p>
<p>Impact Assessment and Possible Mitigation Measures</p> <p>The methodology suggests that the impact assessment will be done based on trend analysis for with and without project scenarios. This section should be better structured/ articulated to reflect this approach.</p> <p>Environmental categorization. TBD once categorization is finalized</p>	<p>Restructure/ rearticulate.</p> <p>Needs to be determined once categorization is finalized</p>	<p>Analyses were conducted on the Important Environmental and Social Components (IESCs) analyzed in chapter 7, under a with/without project situation.</p> <p>Environmental categorization has already been determined in the REA, SESA and previous versions of the ESIA, and</p>

			determined to be Category A.
<p>Negative Impacts</p> <p>Reduced Flooding – Baseflow</p> <p>“This may particularly impact water levels in distributaries, notably the Old Brahmaputra, Dhaleswari, and Arial Khan.” Isn’t construction of offtake supposed to increase the flow?</p> <p>Reclaimed Land &amp; char dwellers</p> <p>It only discusses social impacts. Missing environmental impacts (habitat and species)</p> <p>“...Zaman (1996) notes that compliance with donor safeguards is hampered by an inadequate legal framework, the absence of an appropriate institutional framework, and often the lack of administrative and political will. CARE (2003) notes that while tenants’ rights are enshrined in legislation they are ‘almost invariably ignored in practice’ and goes on to document the costs of corruption in transferring or securing access to land...” References are a bit outdated. Has any reform/ improvement taken place since then?</p>	<p>Please clarify</p> <p>Please add</p> <p>Please update</p> <p>Please add quantification/ evidence/</p>	<p>There is an increase in baseflow, but a decrease in flooding along these distributaries. The former improves some important aspects, such as river habitats, water quality and navigation, but the reduced flooding means that associated wetlands receive less water.</p> <p>These are dealt with in detail elsewhere, as the first sentence explains: “Impacts of land reclamation are felt at various levels and concern dredging and excavation (8.3.4), reduced flooding (8.3.5), fisheries (8.3.7), natural habitats and wildlife (8.3.8) and of course on local (char dwelling) communities, which is dealt with here.”</p> <p>This has unfortunately not changed significantly since, and was recently (March 2020) raised by the NEMC on discussions about the SESA for FREMIP.</p> <p>Inland fisheries production from capture fisheries has declined in the past two</p>	



	Loss of catch through the loss of habitats: Current trend is not clear. Is quantification possible for with and without project scenarios?	examples.	decades (and perhaps longer), in spite of increased effort. Decline of habitat (area and quality) is the only possible explanation.  Freshwater fisheries production is boosted by aquaculture, but this often does not much benefit the poor.
	The section on Reduced biodiversity and migratory fish and Reduced fish migration should be combined. Is quantification possible?	Please add quantification/ evidence/ examples.	These have been combined. Few quantitative studies on impacts on fish migration have been carried out, but these are reportedly not very well designed.
	Increased capture at regulators  “...for example, some fishes may avoid long and narrow tunnels, where water flow may be too high...” What kind of tunnels? Tunnels are usually associated with the fish passes on big dams.	Please clarify	“Tunnels” was probably incorrect, has been replaced with passages.
	Climate Change & Emissions  Climate change  “...Furthermore, embankment designs follow best international practice providing road access along the top of the embankment and the opportunity to raise embankments later in response to climate change requirements within the typical construction width applied in Bangladesh....” If this is the case then road and its environmental impact will have to be discussed as a part of induced impact	Please clarify/ update the section on induced impact as applicable	Roads are not included in Project 2, but may be added later (by other gov. agencies). The reference to road access has been deleted from this sentence.
	Analysis of Alternatives  “...Considerations regarding the Without-Project		Without project scenarios have been added

	<p>scenario have already been addressed in Chapter 4. ..” Scenarios need to be elaborated here. Chapter 4 is on project description.</p>	<p>Please address</p>	<p>(these were taken out of an earlier version of the ESIA, as deemed too elaborate).</p>
	<p>Environmental Management Plan</p> <p>The table on Riverbank Protection:</p> <p>Row on Fish Biodiversity. Specify if the impact is temporary or permanent. Clarify what “shift” means.</p> <p>Fish Migration. Vegetation clearance should be done as low as possible. Not clear where, and how is this a mitigation measure.</p> <p>Community organizations. The nature of “Positive impacts” is not clear.</p> <p>The table on Embankment Construction/Reconstruction:</p> <p>Land loss. X ha of land. Missing information.</p> <p>Crop production loss. x metric ton. Missing information.</p> <p>The table on Drainage Structure / Regulators cum fish passes/off-take Old Dhaleswari</p> <p>Construction of off-take structure to divert 245 m<sup>3</sup>/s from Jamuna to Dhaleswari. Impact stated occurs Post-Construction Phase. Please move to the table on Post-Construction Phase. Please include any impact</p>	<p>Please update</p> <p>Please clarify/ adjust as needed</p> <p>Please elaborate on what are these positive impacts.</p> <p>Please complete</p> <p>Please complete</p> <p>Please complete</p>	<p>Permanent has been added after long-term; shift from has been replaced with ‘leave’</p> <p>‘Low’ has been replaced with as little as possible. Vegetation provides habitat.</p> <p>Positive impacts, due to awareness-raising and employment provided to members.</p> <p>200ha is anticipated in the resettlement plan, and now included here.</p> <p>Crop loss of x MT is now removed.</p> <p>Parts moved to Post-construction Phase; see next comment.</p> <p>Has been moved; other impacts during construction phase (such as air quality,</p>

	<p>that will occur during the construction phase</p> <p>Mitigation measures state construction. Proper site selection is probably a more fitting mitigation measure.</p> <p>The table on Agricultural Resources</p> <p>The impact of pollution from agriculture activities is missing.</p> <p>Improved irrigation facilities x ha. Missing information.</p> <p>Fish migration. Degraded fish migration. Obstructed probably is a better choice of word</p>	<p>Please update</p> <p>Please consider/ update</p> <p>Please add impact and mitigation measure</p> <p>Please complete</p> <p>Please complete</p> <p>Please consider</p>	<p>noise, surface water quality, drainage congestion, health and safety, employment, community organization) are already included.</p> <p>Construction removed as mitigation measure.</p> <p>Already includes impacts and mitigation measures, not sure what is meant here.</p> <p>This has been added.</p> <p>Number of ha has been removed, as this cannot be assessed at this point in time, depends on too many factors, including farmers' perceptions and willingness to invest.</p> <p>Indeed, this has been replaced as suggested.</p>
--	--	--	--