



Government of the People's Republic of Bangladesh

Bangladesh Water Development Board  
Bangladesh Inland Water Transport Authority  
Insurance Development & Regulatory Authority



## Jamuna River Sustainable Management Project-1



## Environmental and Social Impact Assessment (Annexes)

January 2023

Prepared By

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Center for Environmental and Geographic Information Services

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## Annex 1.1: Team Composition

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<b>International Specialists</b>	
1.	Team Leader/Environmental Specialist
2.	Co-Team Leader/Social Development Specialist
<b>National Specialist</b>	
3.	Deputy Team Leader/ Health & Safety Specialist
4.	Terrestrial Ecologist
4.	Junior Ecologist
5.	Aquatic Ecologist/Fish Ecologist
6.	Water Resource Engineer/Civil Engineer (1)
7.	Land Tenure, and Resettlement Specialist
8.	Labor Laws Expert
10.	Gender and SEA/SH Expert
11.	Agriculturist/ Agronomist/Soil resource specialist
12.	Communication and Stakeholder Engagement Specialist
13.	Field Surveyor-1 (Ecologist)
14.	Field Surveyor-2 (Ecologist)
15.	Field Surveyor-3 (Water Resources Engineer)
16.	Field Surveyor-4 (Anthropologist)
17.	Field Surveyor-5 (Sociologist)
18.	Field Surveyor-6 (Water Resources Engineer)
19.	GIS Analyst
<b>Additional Resources (No Cost Addition)</b>	
20.	Water Resources Management Specialist
21.	Water Resources Engineer
22.	River Morphologist
23.	Morphologist
24.	River Morphologist
25.	Environmental Specialist (Occupational Health and Safety)
26.	Environmental Modeler (Air Quality and Noise)
27.	Jr Environmental Modeler (Air Quality and Noise)
28.	Fisheries Specialist/Aquatic Biodiversity Specialist
29.	Wildlife Biologist
30.	Junior Ecologist
30.	Agronomist
31.	Field Surveyor (Agronomist)
32.	Livelihood Specialist
33.	Anthropologist/Community Organizer
34.	Socio-economist
35.	Junior Wildlife Specialist

## Annex 2.1: National Acts and Regulations

Here is a detailed review of some pertinent national regulations and policies that are directly or indirectly relevant to this project's activities. Along with the International Conventions and Treaties, the World Bank's Environmental and Social Standards, procedures, and guidelines will also be outlined to create a rigid regulatory framework, particularly for the Jamuna River Sustainable Management Program (JRSMP).

### National Environmental Laws

#### *The Environment Court Act, 2010*

Bangladesh Environment Court Act, 2010 has been enacted to resolve the disputes and establish justice over environmental and social damage raised due to any development activities. This Act allows the government to take necessary legal action against any parties which create environmental hazards/ damage to environmentally sensitive areas and human society.

According to this Act, JRSMP implementing agency must consider precautions as government can take legal actions if any environmental problem occurs due to any interventions of any stage of this project.

#### *Environmental Conservation Act (1995) and all of its amendment*

The Bangladesh Environment Conservation Act of 1995 is the key legislation in relation to environmental protection in Bangladesh. This Act is promulgated for environment conservation, standards, development, pollution control, and abatement. It has repealed the Environment Pollution Control Ordinance of 1977. The Act was amended in 2000, 2002, 2007, and 2010. The main objectives of the Act are:

- Conservation and improvement of the environment; and
- Control and mitigation of pollution of the environment.

The main strategies of the Act can be summarized as:

- Providing appropriate organizational structure and regulatory powers to the
- Department of Environment to monitor environmental issues and enforce control measures where applicable;
- Declaration of ecologically critical areas and restriction on the operations and processes, which can or cannot be carried out / initiated within these;
- Promulgation of standards for quality of air, water, noise, and soil for various applications;
- Regulation of allowable vehicle emissions;
- Regulatory responsibility for the environmental clearance process for new and existing projects and developments;
- Regulation of discharge limits and discharge permits for industries and other developments;
- Promulgation of a standard limit for discharging and emitting waste; and
- Formulation and declaration of environmental guidelines for key issues.

The Department of Environment (DoE) executes the Act under the leadership of the Director-General (DG). As stipulated under the ECA, the Project proponent must obtain Environmental Clearance from the DG of DoE before any new project can be approved. An appeal procedure exists for those proponents who fail to get clearance. However, failure to comply with any part of this Act may result in punishment equivalent to a maximum of five years imprisonment or a maximum fine of Tk. 500,000, or both.

In accordance with this Act, the JRSMP will need to be cleared by DoE before commencing the Project following procedures given in the Environment Conservation Rules (ECR) 1997 (discussed below). Also, the Ecologically Critical Areas, defined by DoE under this Act, will have to be considered while planning and designing the JRSMP interventions.

*The Environmental Conservation Act (Amendment 2000)*

The Bangladesh Environment Conservation Act (Amendment 2000) focuses on ascertaining compensation for damage to ecosystems. It allows for increased provision of punitive measures both for fines and imprisonment and the authority for nominated officials to record the details of alleged offenses and prosecute the offenders.

*The Environmental Conservation Act (Amendment 2002)*

The 2002 Amendment of the ECA elaborates on the following parts of the Act:

- Restrictions on automobile emissions;
- Restrictions on the sale and production of environmentally harmful items like polythene bags;
- Assistance from law enforcement agencies for environmental actions; and
- Authority to try environmental cases in court (also supported by the Environmental Court Act, 2000)

*The Environmental Conservation Act (Amendment in 2010)*

The amendment of ECA" 95 was published on October 5, 2010, as Bangladesh Environmental Conservation Act, 2010. Some changes and inclusions have been made in different clauses, particularly in defining the Ecological Critical Area, farming specific rules and conditions in cutting and/or razing hills, handling the disposal of hazardous wastes, managing ship braking industries & wetlands, fixing responsibilities of environmental and safety management, obligations of obtaining and issuance of environmental clearance certificates and imposing penalties for violations including but not limited to filing cases for compensations, fixing fees and framing different rules under this Act. Moreover, affected persons were given provisions for putting objections or taking legal actions against the polluters or any entity creating nuisance to the affected person.

*Environmental Conservation Rules (ECR), 1997 and Amendments*

The ECR rules promulgated under the Environmental Conservation Act, which specifies environmental approvals processes for various project types and provides allowable limits for environmental disturbance or polluted discharge/emissions. The Environment Conservation Rules (1997) (ECR) defines industries and projects and identifies types of environmental assessments required against respective categories of industries or projects. The rules set:

- The National Environmental Quality Standards for ambient air, various types of water, industrial effluent, emission, noise, vehicular exhaust, etc.;
- The requirement for, and procedures to obtain, Environmental Clearance; and
- The requirement for IEE / EIAs according to categories of industrial and other development interventions.

The industries to obtain ECC have been classified into the following four categories based on their site and impact on the environment:

- Green
- Orange-A
- Orange-B

- Red

As per ECR '97, water resources development projects fall under the 'Red' category project, as do engineering works where the capital investment is more than 1 million Taka. Therefore, the JRSMP project falls into the 'Red' category project, requiring EIA & EMP for environmental clearance from DoE.

#### *Acquisition and Requisition of Immovable Property Act, 2017*

Land acquisition in Bangladesh is governed by a) the Acquisition and Requisition of Immovable Property Act, 2017 (henceforth, the 2017 Act), which repealed the Acquisition and Requisition of Immovable Property Ordinance 1982 (with subsequent amendments of the latter up to 1994) and b) the East Bengal State Acquisition and Tenancy Act (1950) revised in 1994. The 2017 Act provides certain safeguards for the owners and has provision for payment of "fair value" for the property acquired.

- The Deputy Commissioner (DC), in all cases, determines the "market value" of acquired assets on the date of notice of acquisition (notice under Section 9 of the 2017 Act). The assessment of this market value is done considering the average price of immovable properties of the same class, with similar facilities and within the vicinity of the "to be" permanently acquired land and assets. The DC then adds 200% and 300% premium of the assessed value for cash compensation under the law (CCL) of the land and assets, including a house for government and non-governmental acquisitions.
- For any other losses like ((b) loss of crops or trees; (c) loss of affected immovable property separated from existing immovable property; (d) loss of other immovable property or movable property or income; (e) transfer cost of affected residential and commercial properties) the DC adds 100% premium of the assessed value to pay as compensation.
- If land acquired has standing crops cultivated by tenant (bargadar) under a legally constituted written agreement, the law requires that part of the compensation money be paid in cash to the tenants as per the agreement. If there is a dispute regarding the amount of compensation, there is an option for arbitration, and the procedures for such are in place.
- The Alluvion and Diluvion Regulation, 1825 and the Alluvial Lands Act, 1920 – For the continuous reformation of land due to gained by alluvion, or by dereliction of a river, it was found difficult to determine the rights of litigant parties claiming ownership of char lands. In this context, the rules of usage were given statutory shape for the first time by promulgation of the Bengal Alluvion and Diluvion Regulation 1825 and later Alluvial Lands Act, 1920. These regulation and Act came in force for the prevention of disputes concerning the possession of certain lands in Bangladesh gained by alluvion, or by dereliction of a river or the sea.
- The East Bengal State Acquisition and Tenancy Act, 1950 – is an Act that has its roots in a 19th century law of the British colonial period, and was clearly not the result of the ratification of the convention by the Government of Bangladesh in 1972. Finally, present legal position regarding the right of ownership of the land reformed in situ, as settled by the amending Act XV of 1994, is that the owner of the land oncediluviated will get the land reformed in situ if it reappears within 30 years of diluvian and land reformed in situ after that period will be the property of the government.

#### *Water Act-2013*

It is an act to make provisions for the development, management, abstraction, distribution, use, protection, and conservation of national resources in an integrated approach. The Act is applicable for the surface water, groundwater, seawater, rainwater, and water in the atmosphere in the territory of Bangladesh. For

this Act, a small council called the "National Water Resource Council" presided by the Prime Minister has been constituted. Under this Act, several exchanges can be possible at the government level. Those are

- Exchange and assess any information of shared water resources;
- Joint research on international rivers;
- Prevention measures for chemical and organic pollution;
- Organization of educational and training programs on water resources
- Measures for the distribution of the water of international rivers

#### *Protection and Conservation of Fish Rules (1985)*

These Rules are in line with the overall objectives of the Fisheries Act and its amendments. Section 5 of the Rules states that "No person shall destroy or make any attempt to destroy any fish by explosives, gun, bow, and arrow in inland waters or within coastal waters." Section 6 states, "No person shall destroy or make any attempt to destroy any fish by poisoning of water or the depletion of fisheries by pollution, by trade effluents or otherwise in inland waters."

#### *Biodiversity Act- 2017*

The Act was passed in line with Bangladesh's constitutional mandate under Article 18A and international mandates under Convention on Biodiversity. This Act regulates the Biodiversity conservation and sustainable use of its resources. The Bangladesh Biodiversity act includes National Fisheries Policy, 1988, National Livestock Development policy, 2007, National Forest Policy, 1994, Bangladesh Wildlife (Protection and Safety) Act, 2012. It delegates the duties for granting permission to such access on the National Biodiversity Committee, who shall also determine the equitable sharing of benefits accrued from biodiversity, biological resources, and traditional knowledge

#### *Bangladesh Wildlife (Preservation) Order (1973) and Act (1974)*

The Bangladesh Wildlife Preservation (Amendment) Act 1974 regulates hunting, killing, capturing, trade, and exporting wildlife and wildlife products. It designates a list of protected species and game animals. It empowers the government to declare areas as game reserves, wildlife sanctuaries, and national parks to protect the country's wildlife and provides the following legal definitions:

- The game reserve is defined as an area declared by the government wherein the capture of wild animals is unlawful, to protect wildlife and increase the population of important species;
- The national park is defined as an area declared by the government comprising a comparatively large area of outstanding scenic and natural beauty with the primary objective of protection and preservation of scenery, flora, and fauna in their natural state, to which access for public recreation and education, and scientific research, maybe allowed; and
- The wildlife sanctuary is defined as an area declared by the government closed to hunting, shooting, or trapping wild animals as an undisturbed breeding ground, primarily to protect all-natural resources, including wildlife vegetation, soil, and water.

The Act allows the government to relax any specified prohibitions for scientific purposes, aesthetic enjoyment, or the betterment of scenery.

During the construction phase of JRSMP, it is anticipated to damage some flora and fauna, and also, the breeding ground of some aquatic species might be hampered. This ESIA will determine the magnitude of the impact and will recommend mitigation measures.

#### *Bangladesh Wildlife (Protection and Safety) Act 2012*

The Act is to provide for the conservation and safety of biodiversity, forest, and wildlife of Bangladesh by repealing the existing law relating to the country's conservation and management of wildlife; This Act:

- Protects 1,307 species of plants and animals, including 32 species of amphibian, 154 species of reptile, 113 species of mammal, 52 species of fish, 32 species of coral, 137 species of mollusk, 22 species of crustacean, 24 species of insect, 41 species of plant and 13 species of orchid. Of these, 8 amphibian-, 58 reptile-, 41 bird-, and 40 mammal species are listed as endangered in the Bangladesh IUCN Red Data Book (2000).
- Mandates one to three years imprisonment, a fine of BDT50,000 to200,000, or both, for wildlife poaching, capturing, trapping, trading, and for the purchase of wild animals, parts of wild animals, trophies, meat, or other products without a license.
- Mandates two to seven years imprisonment and BDT 100,000 to 1 million fine or both for killing an elephant or tiger; and 12 years plus BDT 1.5 million for repeat offenders.
- Mandates five years imprisonment and BDT 200,000 fine for killing a cheetah, clouded cheetah, gibbon, sambar deer, crocodile, gavia, whale, and dolphin.
- Mandates two years imprisonment and BDT 200,000 fine for killing a wild or migratory bird.
- It empowers the government to create an eco-park, safari park, botanical garden, or breeding ground on any state-owned forest land, land, or water body.
- Mandates two years imprisonment for farming, woodcutting, burning, and construction on such reserves.

#### *Bangladesh Water Rules 2018*

Bangladesh Water Rule 2018' got approved through a Government Gazette Notification has been published on August 18, 2018, for the same. Bangladesh Water Rules 2018 was prepared and finalized following Bangladesh Water Act, 2013. Water Resources Planning Organization (WARPO) of the Ministry of Water Resources has taken the lead coordination role make it happened and organized several consultations with relevant sector actors

#### *The Embankment and Drainage Act 1952*

An Act to consolidate the laws relating to embankment and drainage and make better provisions for the construction, maintenance, management, removal and control of embankments and water courses for better drainage of lands and their protection from floods and erosion other damage by water.

- Section 15 allows the engineers to construct new embankments or enlarge, lengthen or repair existing embankments.
- The other sections of the Act give powers and access to the Government or Authority or Engineers to commence necessary Project activities for land acquisition (through the Deputy Commissioner) and site clearing activities, including removal of trees or houses (if required).

#### *Inland Water Transport Authority Ordinance (1958)*

This ordinance sets up an authority for developing, maintaining, and controlling inland water transport and certain inland navigable waterways. The authority is mandated to carry out river conservancy work, river training for navigation purposes and aiding navigation, drawing up dredging program requirements and priorities for efficient navigable waterway maintenance, reviving dead or dying rivers, channels, and canals, and developing new navigation waterway.

The objectives of this ordinance will be fulfilled mainly by JRSMP.

### **National Policies, Strategies, and Plans**

#### *National Environment Policy, 1992*

The National Environment Policy of 1992 sets out the basic framework for environmental action and broad sector action guidelines. The policy provides a more comprehensive framework of sustainable development in the country. It also stated that all major undertakings, which will have a bearing on the environment, must undertake an IEE and EIA before initiation of the project. Key elements of the policy are:

- Maintaining ecological balance and ensuring sustainable development of the country through protection and conservation of the environment
- Protecting the country from natural disasters
- Identifying and regulating all activities that pollute and destroy the environment
- Ensuring environment-friendly development in all sectors
- Providing sustainable and environmentally sound management of the natural resources maintaining active association, as far as possible, with all international initiatives related to the environment.

Regarding the water sector, The Policy is applicable to the JRSMP Project, and the proposed interventions are required to comply with all the policy directives, particularly on reducing adverse environmental impacts. The ESIA studies of the proposed JRSMP Project are needed to address the potential impacts and propose mitigation measures against all kinds of environmental hazards.

#### *National Environment Management Plan 1995*

The National Environment Management Action Plan (NEMAP, 1995) identifies the leading national environmental issues related to the water sector. The main water-related national concerns include flood damage, riverbank erosion, environmental degradation of water bodies, increased water pollution, shortage of irrigation water, and drainage congestion.

NEMAP was developed to address the issues and management requirements for a period between 1995 and 2005 and set out the framework within which the National Conservation Strategy (NCS) recommendations are to be implemented. NEMAP has the following broad objectives:

- Identification of key environmental issues affecting Bangladesh;
- Identification of actions necessary to halt or reduce the rate of environmental degradation;
- Improvement of the natural and built environment
- Conservation of habitats and biodiversity;
- Promotion of sustainable development;
- Progress in the quality of life of the people

#### *National Water Policy (1999)*

Endorsed by the GoB in 1999, the National Water Policy (NWP) aims to guide the major water sector players to ensure optimal development and management of water. According to the policy, all agencies and departments entrusted with water resource management responsibilities (regulation, planning, construction, operation, and maintenance) must enhance environmental amenities and ensure that environmental resources are protected and restored in executing their tasks.

This Act has demonstrated the guidelines for the implementing agency to protect the water body and its resources from any development interventions (Hence the JRSMP) in terms of construction, operation, and maintenance.

#### *National Water Management Plan, 2001 (Approved in 2004)*

The objectives of the plan are listed below:



- Operational directives are given in National Water Policy and to do following the government-approved Development Strategy.
- To address issues related to harnessing and developing all forms of surface and groundwater and management of these resources in an efficient and equitable manner
- Consultation on and participation with the direct beneficiaries in the handover and development of water schemes.

*National Fisheries Policy, 1996*

The National Fisheries Policy (NFP), 1996 recognizes that fish production has declined due to environmental imbalances, adverse environmental impact, and improper implementation of fish culture and management programs. The policy mainly focuses on aquaculture and marine fisheries development. The policy suggests the following actions:

- Biodiversity will be maintained in all-natural water bodies and the marine environment
- Chemicals harmful to the environment will not be used in fish shrimp farms
- Environment-friendly fish shrimp culture technology will be used
- Expand fisheries areas and integrate rice, fish, and shrimp cultivation
- Control measures will be taken against activities that harm fisheries resources and vice-versa
- Laws will be formulated to ban the disposal of any untreated industrial effluents into the water bodies

Follow this policy during the implementation of JRSMP is mandatory. As Jamuna river is one of the country's most important natural breeding grounds of large and commercially valuable carp and catfishes, the project team should be cautious so that those species will not be disturbed or damaged by any intervention during the operation phase. Also, we need to look after the deep scour holes that support the large river fishes to survive.

*National Fisheries Policy (1998)*

The National Fisheries Policy, formulated by the Ministry of Fisheries and Livestock (MoFL), intends to enhance fish production from inland marine sources and increase foreign currency earnings from the sector for economic growth while maintaining ecological balance and biodiversity conservation. Different threats to fisheries, such as population pressure, construction of infrastructure in the floodplains, pollution from fertilizers, insecticides, and pesticides, are identified in the policy.

*National Agriculture Policy, 1999*

The overall objective of the National Agriculture Policy is to make the nation self-sufficient in food through increasing production of all crops, including cereals, and ensure a dependable food security system for all. The policy particularly stresses research on improved varieties and technologies for cultivation in water-logged and salinity-affected areas. The policy also recognizes that adequate measures should be taken to reduce waterlogging, salinity and provide irrigation facilities for crop production.

*National Agricultural Extension Policy 2013*

A revised National Agricultural Extension Policy (NAEP) sets extension policy direction for transferring technologies to crop, fisheries, and livestock sector development. Here, key elements of the lesson learned from existing policy, macroeconomic scenario, agroecology /bio-ecological zones, and current issues in agriculture such as natural disaster, production stagnation, land ownership and tenancy, poor soil health status, decreasing agricultural land, irrigation water scarcity, lack of good farming practices, high demand of quality seeds/planting materials, etc., livestock and fishery issues including emerging challenges and perspectives have been pointed out for solid consideration. In light of these elements, this policy document has been formulated.

Various river islands of Jamuna River are currently inhabited and/or have agricultural croplands. The mighty river is most devastating during monsoon, often leading to bank erosion and flooding that causes irreparable damage to nearby communities. During the dry season, vast tracts of fertile lands emerge to produce various crops. The proposed JRSMP is expected to contribute to achieving the objectives of the agriculture policy by saving the local community from bank erosion and flooding and saving the agricultural land from inundation.

*National Biodiversity Strategy and Action Plan of Bangladesh 2016-2021*

Applicable- As this strategy has national targets for the biodiversity and presents guiding framework for biodiversity conservation, ensuring sustainable use of its components along with fair and equitable sharing of benefits arising out of utilization of genetic resources. National Biodiversity Strategy and Action Plan is the basic instrument for implementing the Convention on Biological Diversity at the national level. NBSAP has the following broad objectives:

- Strengthen the governance of biodiversity conservation in national development strategies;
- Infuse biodiversity conservation in schools, universities curricula and develop outreach programs addressed to the general public;
- Bridge the gaps between scientists, citizens and decision-makers by fostering innovation and research;
- Strengthen existing ecological functioning systems and improve resilience of all ecosystems; and
- Foster international and regional cooperation.

*Bangladesh Climate Change Strategy and Action Plan (BCCSAP) 2009*

The Government of Bangladesh has prepared the Bangladesh Climate Change Strategy and Action Plan (BCCSAP), 2009. The BCCSAP is built on six pillars:

1. Food security, social protection, and health to ensure that the poorest and most vulnerable in society, including women and children, are protected from climate change and that all programs focus on the needs of this group for food security, safe housing, employment, and access to essential services, including health.
2. Comprehensive disaster management further strengthens the country's already proven disaster management systems to deal with increasingly frequent and severe natural calamities.
3. Infrastructure ensures that existing assets (e.g., coastal and river embankments) are well maintained and fit for purpose. That urgently needed infrastructure (cyclone shelters and urban drainage) is put in place to deal with the likely impacts of climate change.
4. Research and Knowledge management predict that climate change's likely to scale and timing impacts the different economies and socioeconomic groups; to underpin future investment strategies and ensure that Bangladesh is networked into the latest global thinking on climate change.
5. Mitigation and low carbon development to evolve low carbon development options and implement these as the country's economy grows over the coming decades.
6. Capacity building and Institutional strengthening enhance the capacity of government ministries, civil society, and the private sector to meet the challenge of climate change.

JRSMP will contribute towards achieving the objective of pillars such as (i), (ii), (iii), (iv), and (vi).

*National Land Use Policy (MoL 2001)*

The National Land Use Policy (NLUP), enacted in 2001, aims at managing land use effectively to support trends in accelerated urbanization, industrialization, and diversification of development activities. The NLUP urges that increasing the country's land area maybe not be possible through the artificial land reclamation process, which is cost-effective only in the long run. Therefore, land use planning should be based on the existing and available land resources. The policy suggests establishing land data banks where, among others, information on accreted riverine and coastal chars will be maintained.

## **Labour & Occupational Health and Safety Related Laws**

### *Bangladesh Labour Act (BLA), 2006*

The Bangladesh Labour Act, 2006 guides the employer's extent of responsibility and the worker's right to get compensation in case of occupational accident and related injury (and death) while working. Some of the relevant sections are:

#### Section 151. Amount of compensation:

- a) Subject to the provisions of this chapter, the amount of compensation shall be as follows, namely:
  - (i) Where death results from the injury, a worker in receipt of monthly wages falling within limits shown in the third column of the Fifth Schedule the amount shown against such limit thereof;
  - (ii) where permanent total disablement results from the injury-
    - in the case of an adult limit shown in Fifth Schedule, the amount shown against such limitations in the third column thereof; and
    - in the case of a minor- taka ten thousand;
  - (iii) Where permanent partial disablement results from the injury-
    - in the case of an injury specified in the first schedule, such percentage of the compensation which would have been payable in the case of permanent total disablement's as is specified therein as being the percentage of the loss of earning capacity caused by that injury;
    - in the case of an injury not specified in the first schedule, such percentage of the compensation payable in the case of permanent total disablement as is proportionate to the loss of earning capacity permanently caused by the injury; and
  - (iv) where temporary disablement, whether total or partial, results from the injury, a monthly payment payable on the first day of the month following the month in which it is due after the expiry of a waiting period of four days disablement or during a period as specified in the last column of the fifth schedule; whichever period is shorter.
- b) Where more injuries than one are caused by the same accident, the amount of compensation payable under sub-section (1), (c) shall be aggregated but not so in any case as to exceed the amount which would have been payable if permanent total disablement had resulted from the injuries.
- c) On the ceasing of the disablement before the date on which any monthly payment falls due, there shall be payable in respect of that month a sum proportionates to the duration of the disablement in that month.

As there will be plenty of workers from the local community and other areas, this law will ensure their health & safety and associated compensation if any maximum injury happens.

### *Bangladesh Labour Rules 2015*

The Bangladesh government introduced the Bangladesh Labour Rules 2015 on September 15, 2015, through an official gazette.

Here are some key points of the Labour Rules 2015:

- **Employment Policy/Service Rules:** If any establishment wants to have its own Employment Policy/Service Rules, it must obtain approval from the government (through the Inspector General, Department of Inspection for Factories and Establishment- DIFE).  
Registration of Manpower supply agency (Contractor): The Rules prescribed the process and forms for registering manpower supply agencies under the Labour Act. Some new conditions are also imposed on the manpower supply agencies.
- **Establishment Organogram:** Every owner of an establishment must prepare an organogram for the establishment and must obtain approval from the Inspector General of the DIFE or his designated official (depending on the administrative location of the establishment concerned).
- **Appointment Letter:** Under the Labour Act, an appointment letter must be issued for hiring any worker (Labour). The Labour Rules make it mandatory that the appointment letter contains specific salary, other financial benefits, applicable rules, etc.
- **Various Register:** The Labour Rules prescribe certain forms for different registers such as service book, worker register, leave record, etc.
- **Misconduct and punishment:** The Rules prescribe the process for investigation of misconduct.
- **Two festival bonuses:** The Rules make it mandatory that a worker, who has completed the continuous service of at least a year, shall be entitled to two festival bonuses every year. Each bonus shall not be more than the designated basic salary.
- **Provident fund elaborated:** The Rules provide detailed guidelines regarding the provident fund. New additions include provisions related to selecting a nominee, managing the fund and activities of the trust for managing the provident fund.
- **Holiday:** The Rules detailed the provisions related to holidays. It also clarifies the provisions related to the compensatory weekly holiday.
- **Health and fire safely:** The Rules provide a detailed guideline on health and fire safety.
- **Wages:** The Rules details the provisions related to wages. Clarification is provided for the mechanism of calculating wages for a fraction of a month and deduction from wages.

*The Fatal Accidents Act, 1855*

Whenever the death of a person shall be caused by wrongful act, neglect or default, and the Act, neglect or default is such as would (if death had not ensued) have entitled the party injured to maintain an action and recover damages in respect thereof, the party who would have been liable if death had not occurred shall be responsible to an activity or suit for damages, notwithstanding the death of the person injured, and although the death shall have been caused under such circumstances as the amount in law to a felony or other crime.

The proposed project has possibilities of an unplanned accidental event during the project life cycle; hence this law is applicable.

## **Annex 5.1 Environmental Baseline**

## 5. Environmental Baseline

### Study Area

The study area for the Environmental Baseline Area of Analysis EBAA (Figure 2.1) has been derived considering areas that are likely to have direct and indirect impact on its ambient environment by construction and operation activities of both Pilot Site 1 and 2 of JRSMP. It is assumed that the environmental impact will not only be limited within the project footprint area but it would have impacts on the nearby floodplain areas, hydro-morphological and road networks and other part of the proposed sites.

The following criteria were considered while delineating the EBAA:

- Project Footprint and Project Area of Influence (AOI)<sup>1</sup>.
- Direct and indirect impact area
- Impact of Noise from the Piling (piling will be the major activities)
- Air pollution including dust generation and water pollution might spread out up to the left bank of the project footprint.
- River area covering alluvial corridor, floodplain, and Chars between the banks etc.
- Possible hydro-morphological Impacts of the intervention due to the short distance of Jamuna Bridge from both sites.
- Impact on Significant Environmental Receptor of the nearby Chars and floodplain.
- Control area (upstream area, downstream area and the habitats along the opposite bank of the river which are beyond the limit of project AOI)

Fulchari Project AOI is extended to 4.65km upstream, 5.5km downstream, 4km towards opposite river bank (Covering Chars). The Kalihati Project AOI is extended to 1km upstream and around 3km downstream and around 4.5km towards opposite bank. The Kaoakola project AOI covered entire Kaoakola and Mechra Chars and river area up to the mainland of Sirajganj. Finally, the EBAA was delineated in two parts, one covered Kalihati and Kaoakola AOIs and the second one was further extension of Fulchari AOI considering the above criteria.

In addition to the EBAA where a detailed baseline analysis was done, a brief baseline assessment was also conducted for the Program AOI<sup>2</sup> since the activities of Component 2 will take place in the entire Program

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<sup>1</sup>The Project AOI (Fulchari, Kalihati and Kaoakola) has been defined on the basis of the hydrological Impact of the proposed intervention and noise impact of the construction work. The extend of the hydrological impacts is very wide bounded by natural boundaries like floodplain, river bankline, and existing water management infrastructures.

Section of the Jamuna River. Component 2 of stage-1 of this phase is primarily comprised of installation of navigational aids, Very High Frequency (VHF) Radar, Hydrography and Inland Electronic Navigational Chart (IENC) preparation and updating. As the precise locations for these activities has yet to be selected, the AOI of the overall program, 5km buffer area of the 200km program stretch (within Bangladesh) has considered. The 5km buffer for the Program is selected to cover all the possible impacts from Component 2 of the entire river width and the floodplains.

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<sup>2</sup> A 5km buffer area of the Program Section of the Jamuna river.

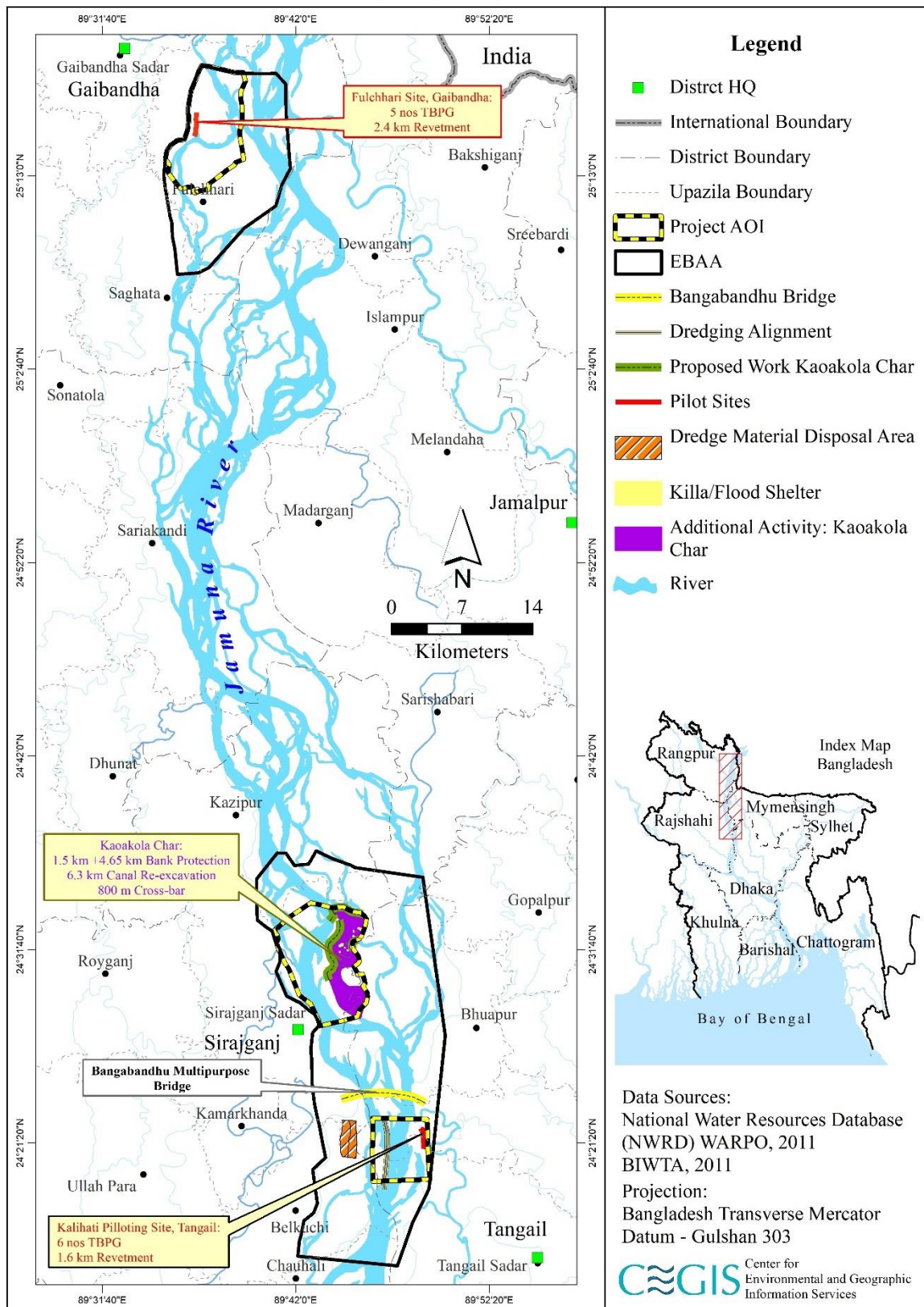


Figure 2.1: Map of the Environmental Baseline Area of Analysis

**Topography and Landform**

The Higher Himalayas, from which major tributaries of the Brahmaputra originate, are snow-capped most of the year and have rugged topography. The gradient of its tributaries in the eastern and central parts of



the Eastern Himalayas are very high, with elevations, from as high as 5000 m (MSL) to as low as 1000 m (MSL). In the Bengal Basin, the gradient of the Jamuna River is very low (i.e., 0.10–0.06 m/km). However, the Brahmaputra-Jamuna enters Bangladesh through Kurigram, decreases its gradient drastically and has become a classic example of a braided river. The lower gradient has made this river highly susceptible to channel migration and avulsion. Along the Brahmaputra-Jamuna, there are many diaras and Chars.<sup>3</sup> The soil and topography of Chars and diaras<sup>4</sup> vary considerably. The elevation between the lowest and highest points of these Chars and diaras may be as much as 5m. In general, the Project AOI is mostly flat and holds a lower topographic variation. From the digital elevation map of Bangladesh, it is found that the elevation varies from 9.47 to 28.88 mPWD.

### Geology

The bed load of the Jamuna River consists of fine sand and silt and is largely governed by the Himalayan erosional activities. The exposed geology of the study area is alluvial sand, alluvial silt, alluvial silt and clay and young gravelly sand (Figure: 2.2). These sediments are characterized by high water content and are loosely compacted. The characteristics of the sediments and the high volume of materials imposed on the channels by the flow system cause the rivers to turn continuously, adjusting their bed configurations to differing flow regimes. In this regard, sediments in the Jamuna are not only deposited in millions of tons but are also highly susceptible to erosion when flow conditions alter. The Jamuna and its adjoining area hold the sedimentary material from the Cenozoic to the present time. The overall sedimentary thickness in the program area may be 15km.

The project AOI mostly falls under Rangpur Platform and Bogura shelf (Figure: 2.3) which are two parts of Stable Pre-Cambrian Platform in Bangladesh under Bengal Basin. As Brahmaputra-Jamuna is one of the geologically youngest rivers in the world, the frequent tectonic activities between the Asian plate and Himalayan plate have made this river tectonically active, especially the southern end of the study area.

According to the National Water Resources Database (NWRD) and Bangladesh National Building Code (BNBC), 1993, Bangladesh is divided into three seismic zones (Figure-2.4). The Project AOI falls under zone-III. Therefore, all structural interventions in the study area must consider the seismic design.

### Physiography, Land-cover and Land-use

Physiographically, the eastern side of the program area is covered by the floodplain areas of the Active Brahmaputra-Jamuna Floodplain, Young Brahmaputra-Jamuna Floodplain and Old Brahmaputra Floodplain (Figure-2.5). Active Brahmaputra-Jamuna Floodplain is the current dynamic floodplains of Brahmaputra-Jamuna. Young Brahmaputra-Jamuna floodplain is the meander floodplains of Brahmaputra-Jamuna. Basically, this is a floodplain area and frequently affected by monsoon rain, seasonal floods, flash floods and riverbank erosion. On the other hand, physiographically, most of the areas of the western side of the study area are covered by the Teesta Meander Floodplain and Karatoya-Bangali Floodplain. Flooding is mainly shallow and generates considerable silt and clay deposits over the floodplain areas. Both pilot sites are located in the Active Brahmaputra-Jamuna Floodplain area.

The land use pattern in the area is of mixed type having agricultural, grassland, wetland and residential uses (Figure-2.6). The main land use patterns of the Program AOI and its surrounding area are agriculture (32.86%), settlements (3.47%), River and Khals (25.63%), and sandbars (35.16%). The land cover and land use of the piloting sites are further discussed in the later section.

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<sup>3</sup>Char is usually means, any accretion in a river course or estuary.

<sup>4</sup>Diara is the piece of land that has got created in the middle of the river Ganges as a result of deposition of sands over the decades

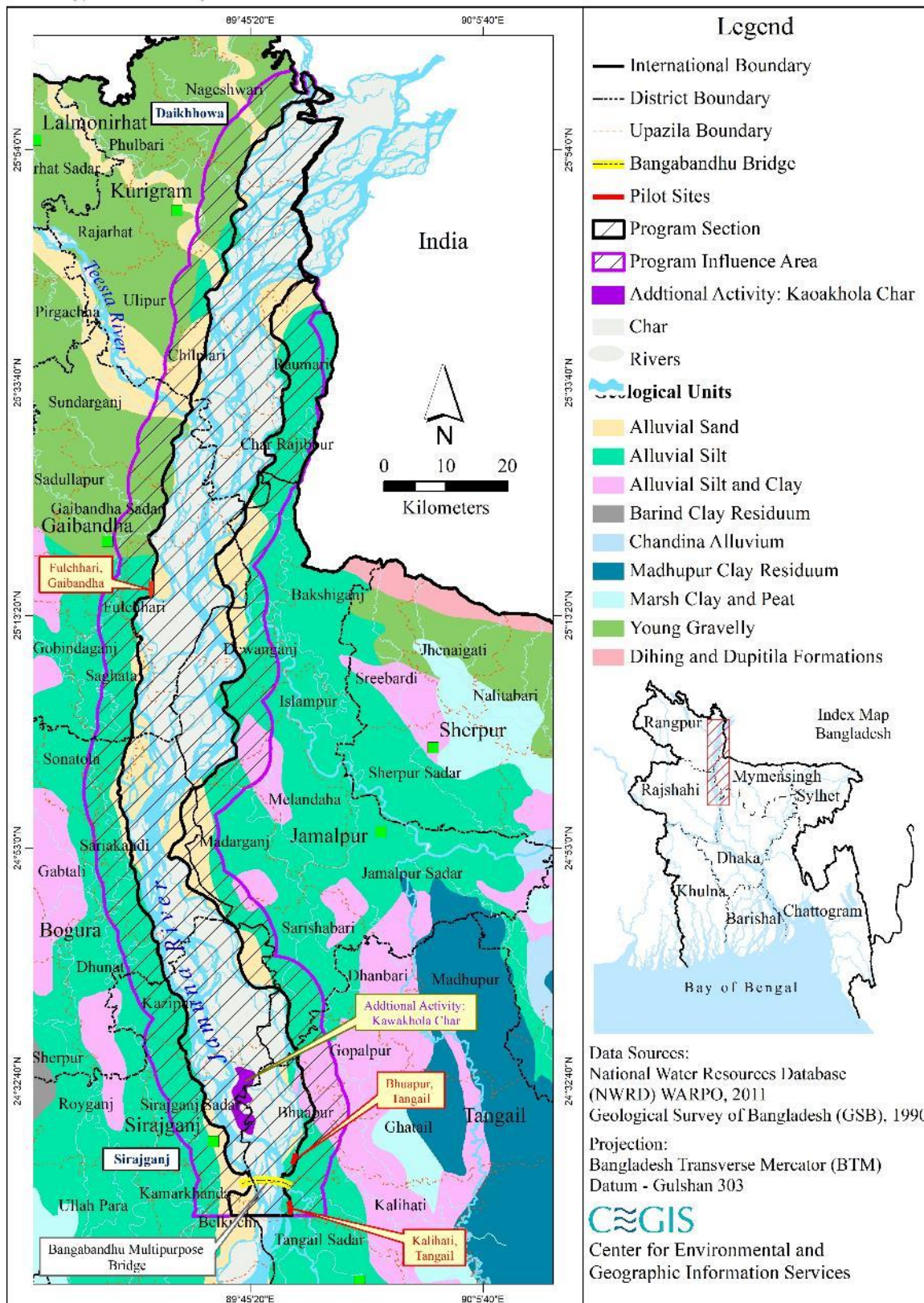


Figure 2.2: Surface Geological Features of the Program AOI and EBAA



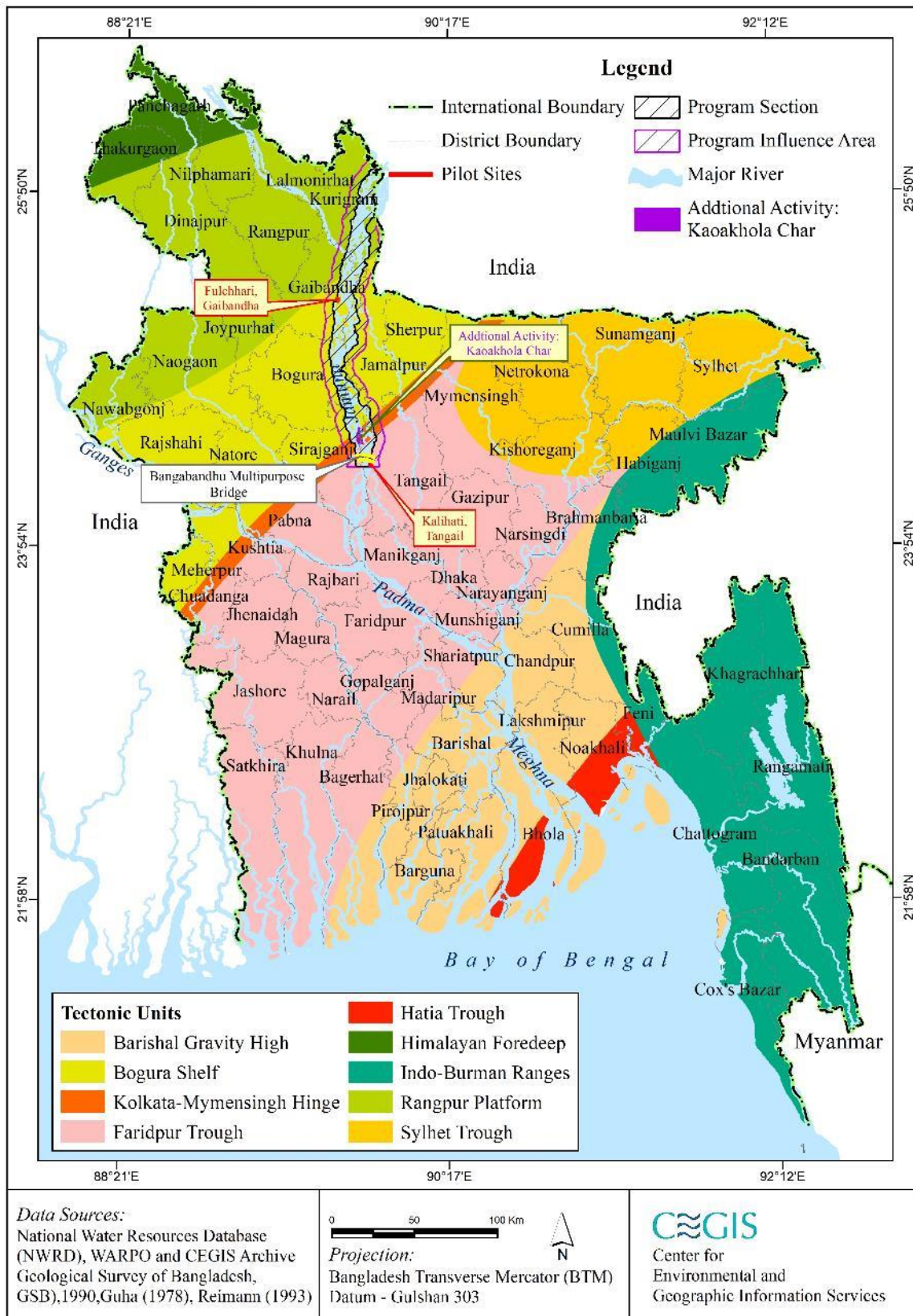


Figure 2.3: Tectonic Elements of Bangladesh and along the Program and EBAA

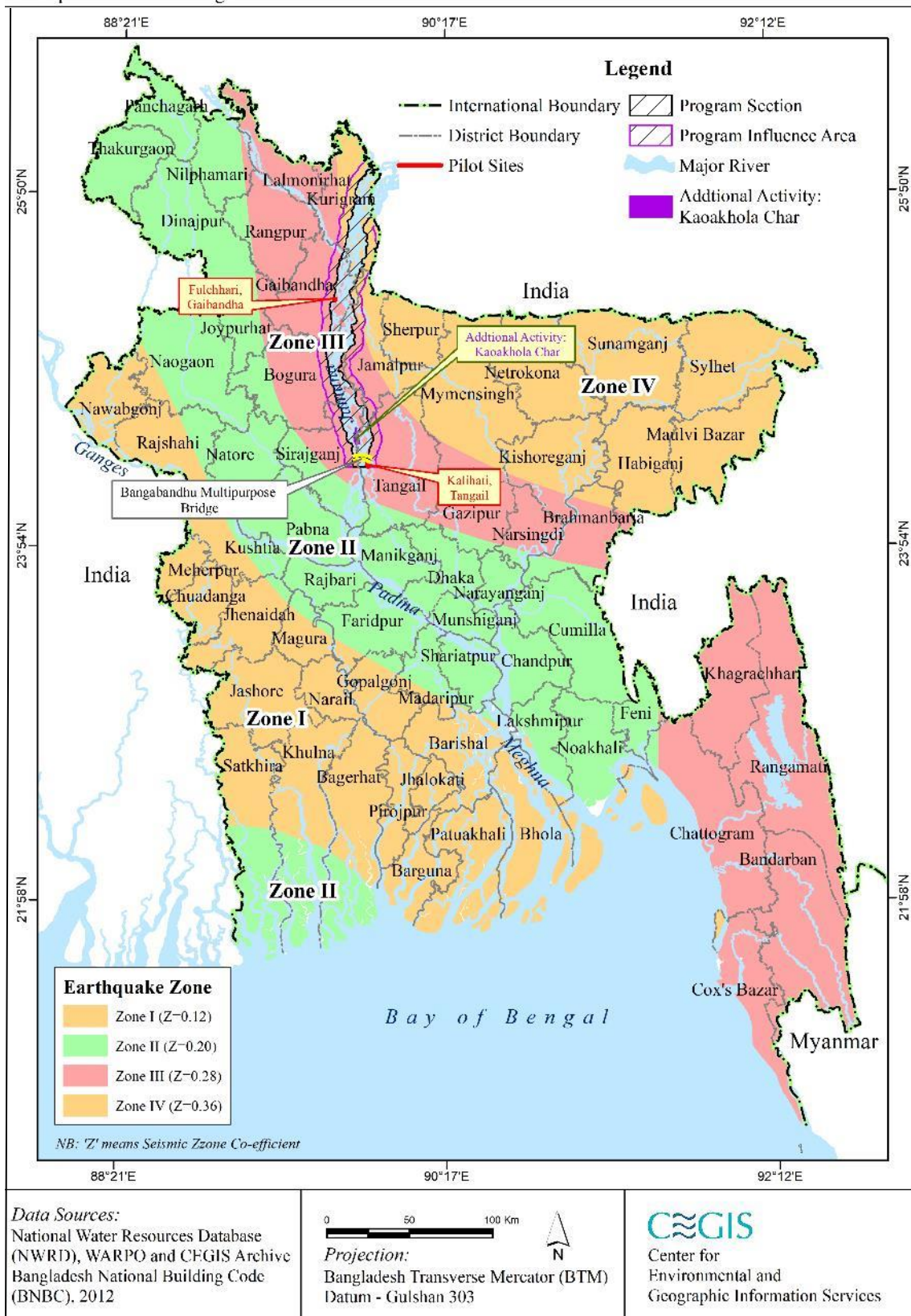


Figure 2.4: The Earthquake/Seismic Zones of Bangladesh and along the Program AOI and EBAA



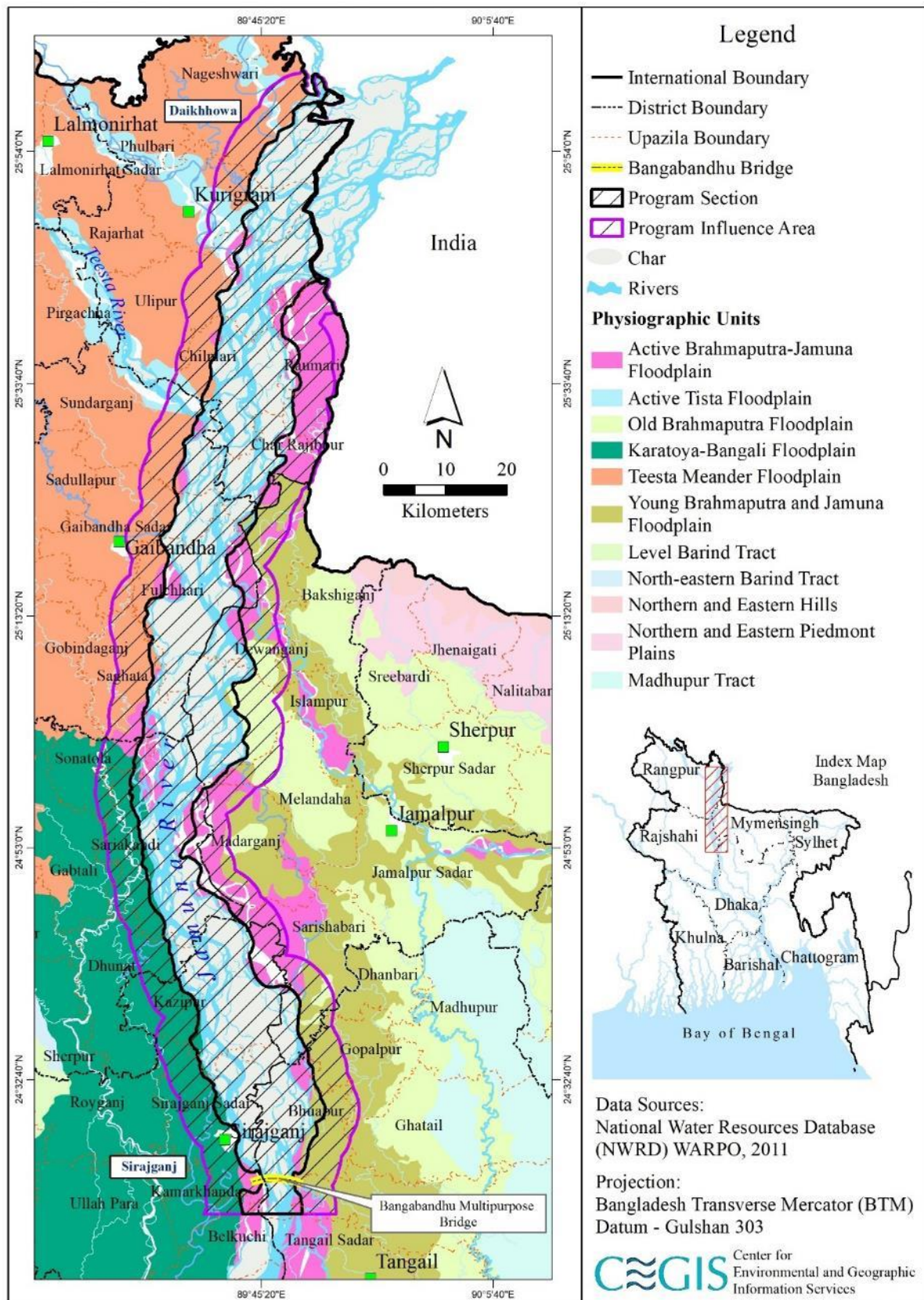


Figure 2.5: The Physiographic Units of the Program AOI and EBAA

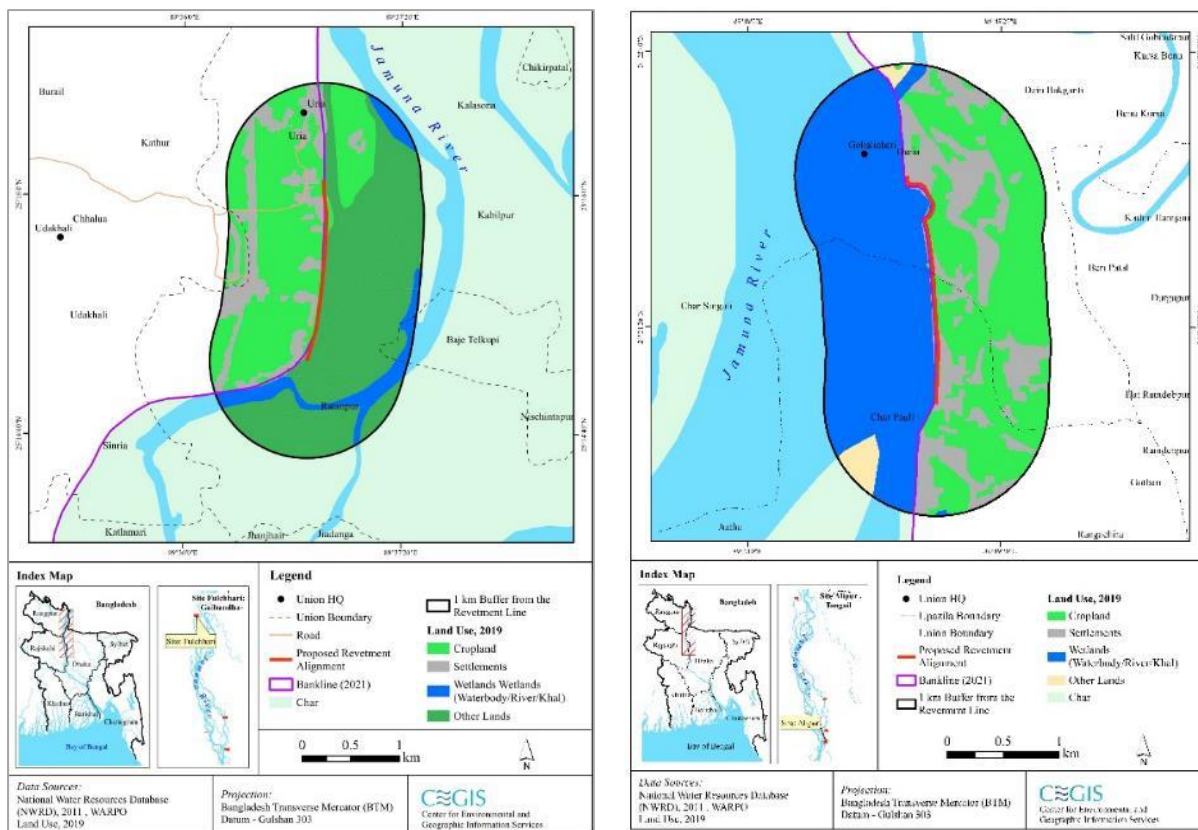


Figure 2.6: Landuse Patterns of the Project AOI of Two Sites

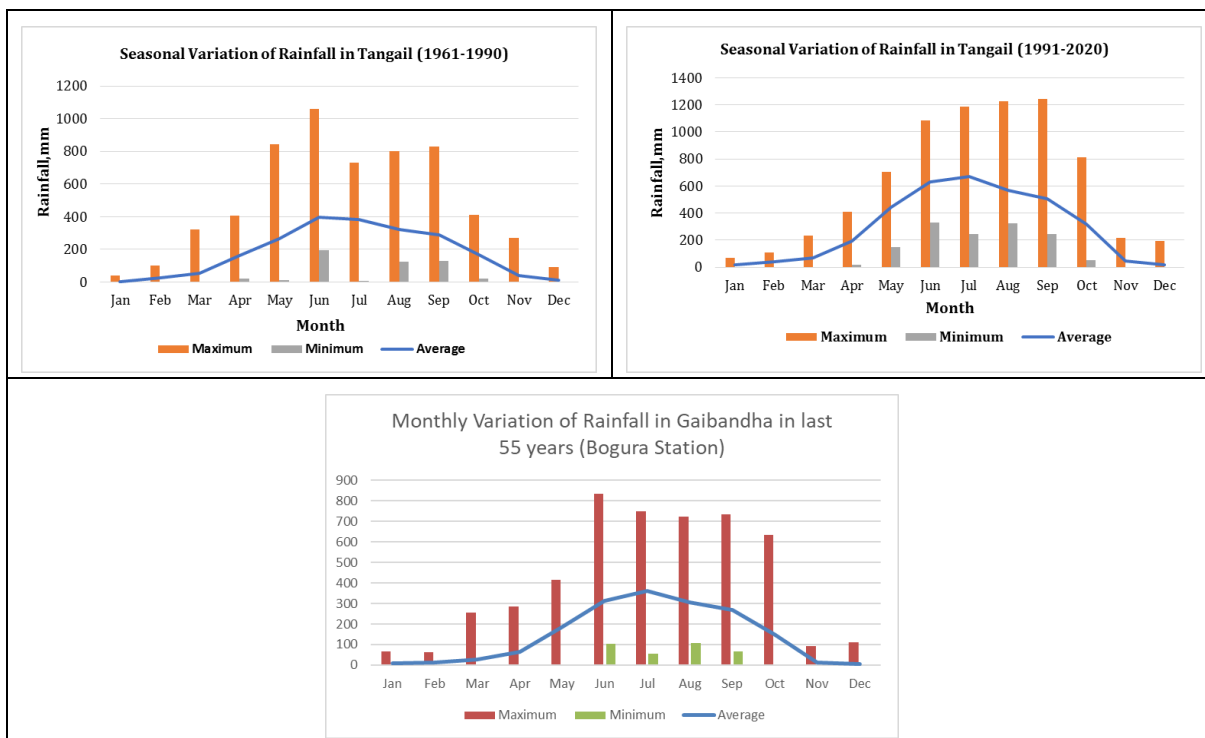
### Climate and Meteorology

While the Program AOI mostly falls under the northern part of the northern region, north-western region and south-central region, the Project AOI falls under the south-western region. meteorological station for the project influence area.

Generally, the climate is sub-tropical 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 pedagogically drier than the rest of the country. The rainy season is hot and humid with about 88 percent 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 June and recedes in late October. Relevant meteorological data such as temperature, rainfall, and wind speed were collected from Tangail and Bogura BMD station which are the nearest stations to the project AOIs.

### Rainfall

The monthly maximum, minimum and average rainfall data of Tangail station (during 1961-2020) and Bogra Station (1948-2013) were collected and analyzed, and is shown in Figure-2.7. During this period, the monthly maximum rainfall varied 10mm to 1200mm in Tangail and 63mm to 835mm in Bogura station (Figure 2.7). There is a significant change in rainfall distribution pattern observed in last 30 years. Over the past decade, the maximum rainfall occurs in August and September, whereas August used to be the rainiest month during 1961-1990 period (Figure 2.7). Over the past 59 years, the total annual rainfall varied from about 1000mm to nearly 5000mm in Tangail and 751mm to 2601mm in Bogura. In Tangail, which is the rainiest area between the two piloting sites, while the period 1961-1990 experienced increasing trend of rainfall, the 1991-2020 period has experienced a decreasing trend(Figure 2.8).



Source: Tangail BMD station

Figure 2.7: Monthly Maximum and Average Rainfall at Tangail BMD Station (1988-2017)

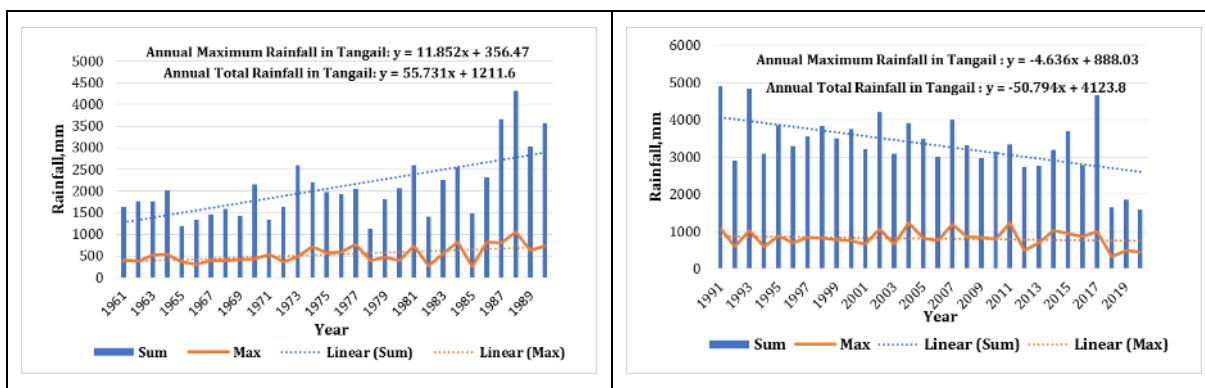


Figure 2.8: Annual Rainfall at Tangail BMD Station (1988-2017)

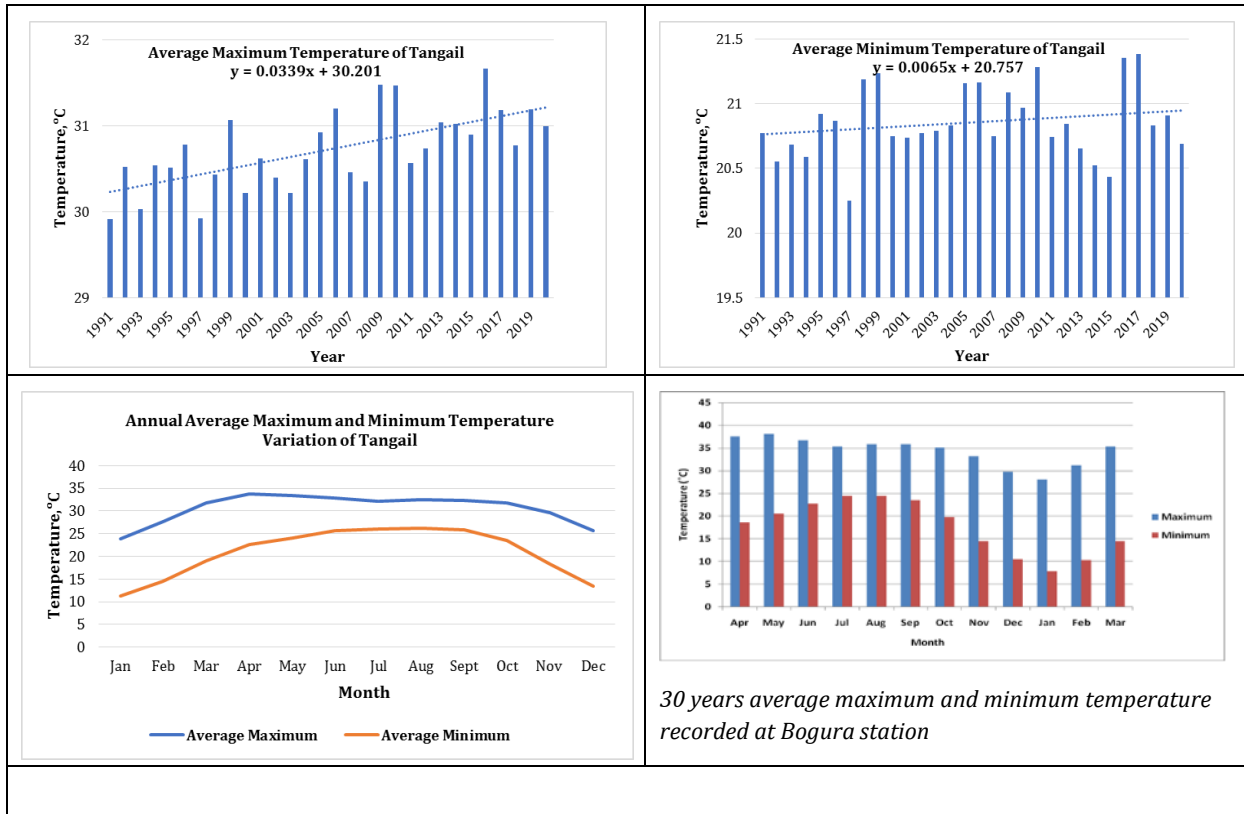
The extreme rainfall analysis shows that Tangail experienced more heavy and extreme rainfall than the other nearby BMD stations (i.e. Dhaka, Mymensingh, Faridpur and Cumilla). The record over the last 59 years shows that, at Tangail, there were 34 normal rainfall events with 100-200mm rain, 11 heavy rainfall events with 200-300mm rain and 7 extreme rainfall events with more than 300mm rain.

**Temperature**

The monthly average temperature data over the last 29 years (1991-2020) shows that the maximum temperature varies from 24.9°C to 34.9°C, with April being the warmest month, while the minimum temperature varies from 11°C to 25.1°C, with January being the coldest month. The monthly average of the maximum and minimum temperature of Tangail station are presented in Figure-2.9.

The data of Bogura station shows the maximum temperature varies from 28.05°C to 38.10°C and May is the warmest month while the minimum temperature varies from 7.82°C to 24.49°C and January is the coldest month.



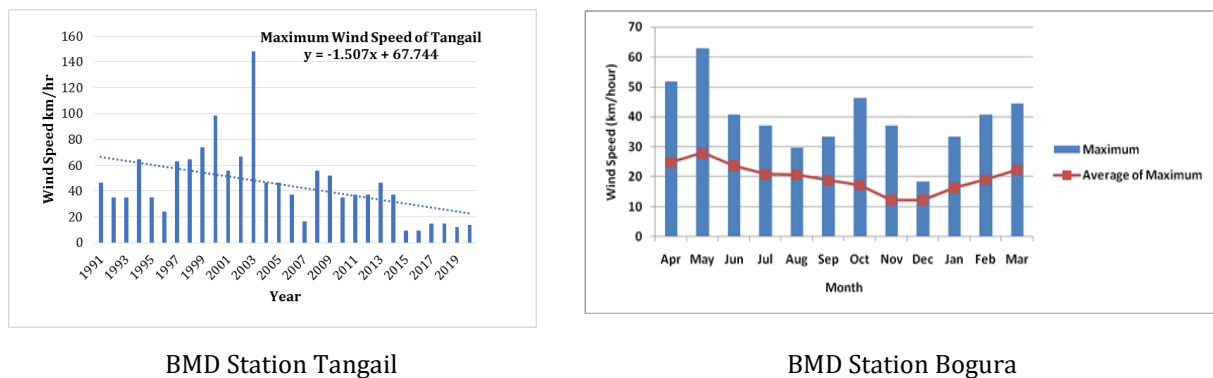


Source: Tangail BMD station (1991-2020)

**Figure 2.9: Monthly Temperature at Tangail BMD Station (1991-2020)**

**Wind Speed**

The data for maximum wind speed over the last 30 years (Figure 2.10 - 1991 to 2020) shows that in Tangail the monthly maximum wind speed of 144 km/hr occurred in 2003. In Bogura, the recorded maximum wind speed was 166.68 km/hr occurred in April 1970.



**Figure 2.10: Annual Maximum Wind Speed at Tangail BMD Station (1991-2020)**

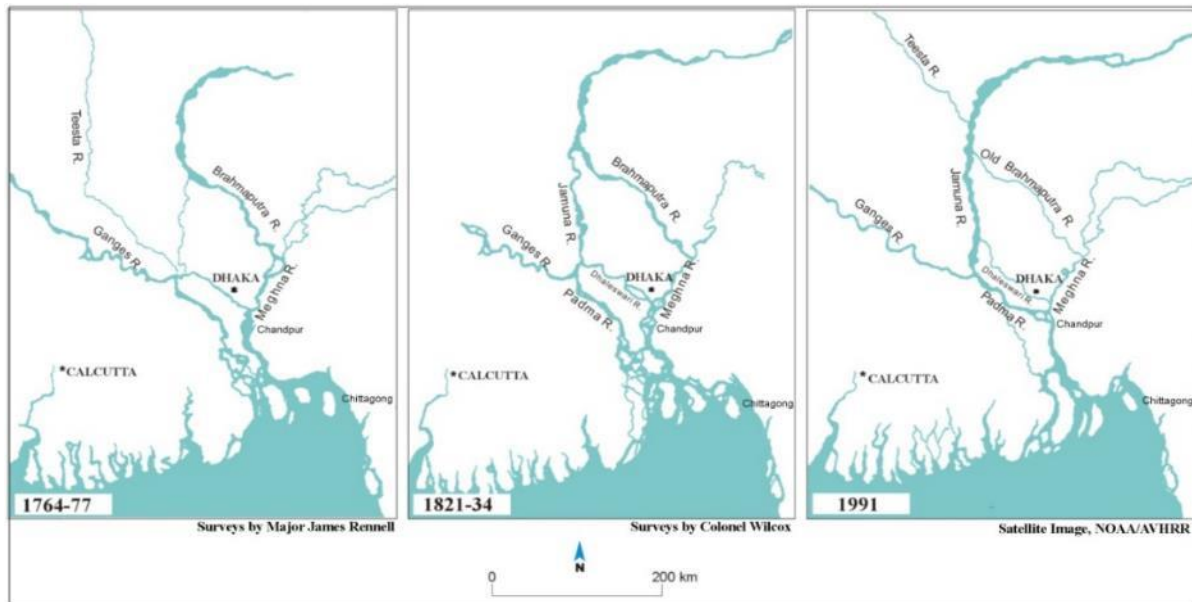
**Jamuna River Morphology**

**Historical Development of Jamuna River**

Historical development in the last 250 years indicates that the Brahmaputra River was flowing east of the Madhupur Tract along the present course of the Old Brahmaputra River as shown by Major Rennell in the eighteenth century. Subsequently, the main flow was diverted to the west of the Madhupur Tract, as surveyed by Colonel Wilcox in the nineteenth century as shown in **Figure 2.11**. The new course is named



as Jamuna River and presently it is following the same course. This avulsion of the river is due to the tectonic tilting of the Madhupur Tract and addition of the flow from the Teesta River by its sudden shifting from west to east (Source: Morgan and McIntire, 1959). However, this avulsion is not a unique event as stated by Goodbred and Kuehl in 2000, as the series of periodic movements of the river occurred in the Holocene period (10,000 years before).

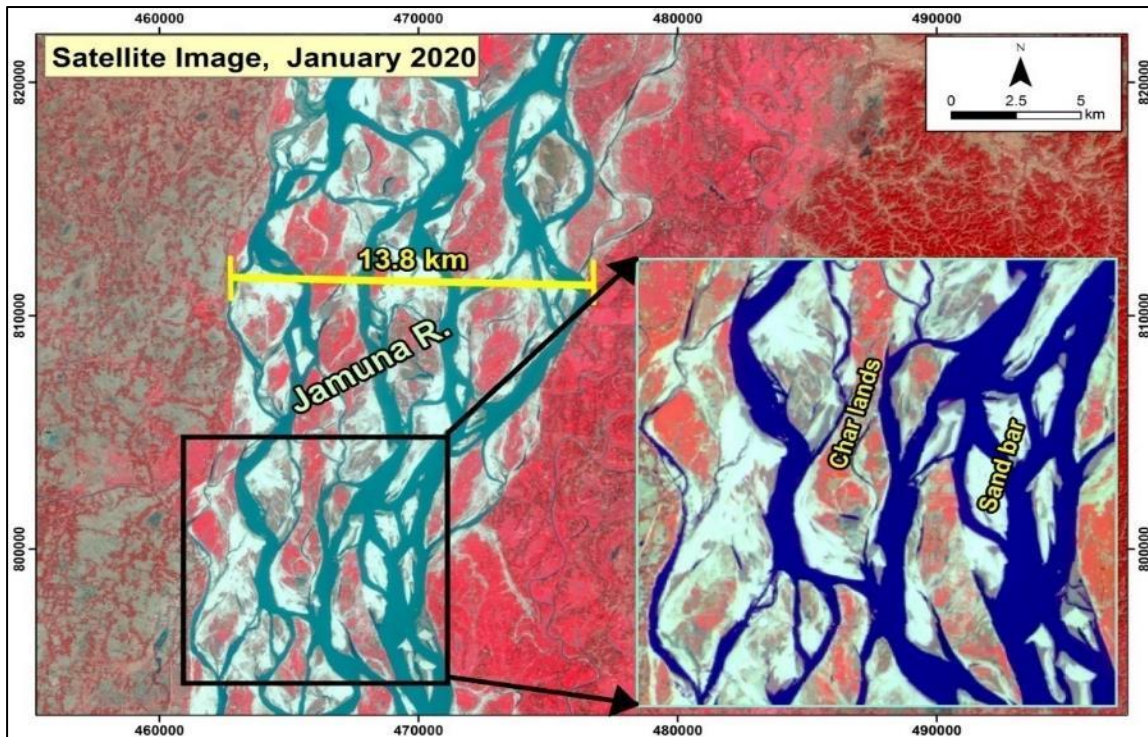


Source: Sarker, M. H., 2009

**Figure 2.11: Historical Development of the Brahmaputra-Jamuna River**

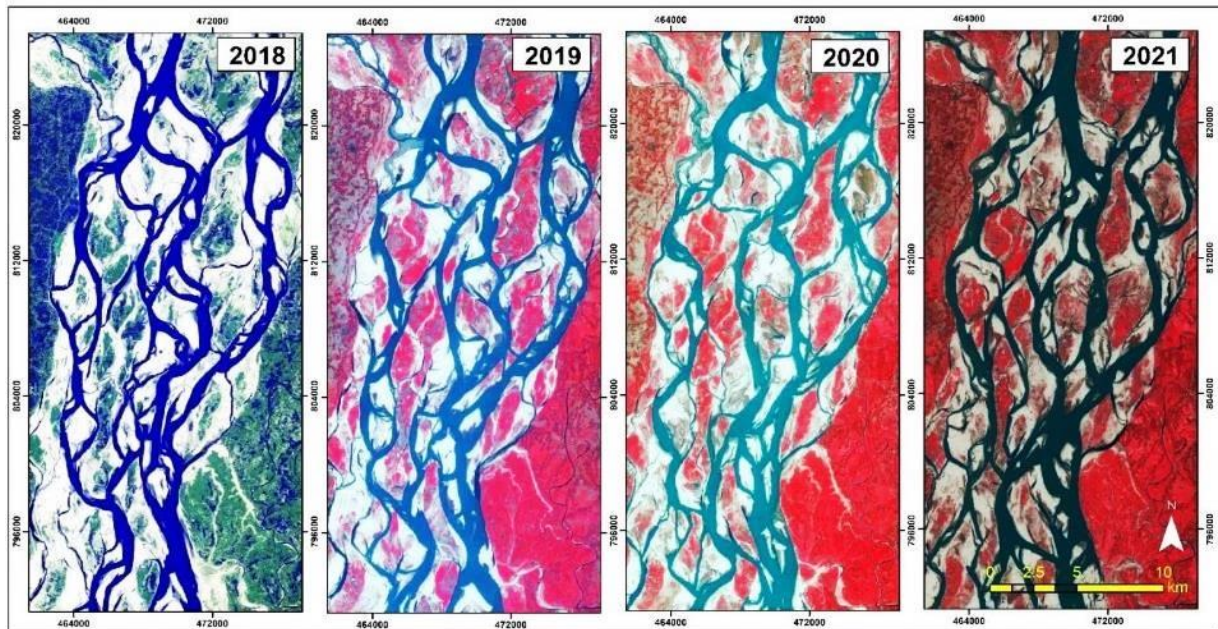
### ***River Planform Development***

The Jamuna River is one of the most dynamic rivers in Bangladesh. The Jamuna is a classic example of a braided river system. It has multiple channels separated by numerous small sand bars and Chars lands. **Figure 2.12** shows in plan view a portion of the Jamuna in the dry season satellite image of 2020. The widest portion is about 13.8 km. A small portion is enlarged in the index map, where numerous Char lands with vegetation and unstable sand bars can be seen.



**Figure 2.12: Planform of Jamuna River having Braided Characteristics**

The Jamuna is a very dynamic river where migration of channels and shifting of banklines occur frequently. It is so dynamic that visible changes can be found even within a year. **Figure 2.13** shows in planview of a portion of Jamuna for four consecutive years. All the wide and narrow channels show changes in their courses each year which makes the system very complex. Also, the shape of Char lands changes with the change of channels. This illustrates the dynamic nature of the Jamuna River and how a channel may decline or develop within one season.

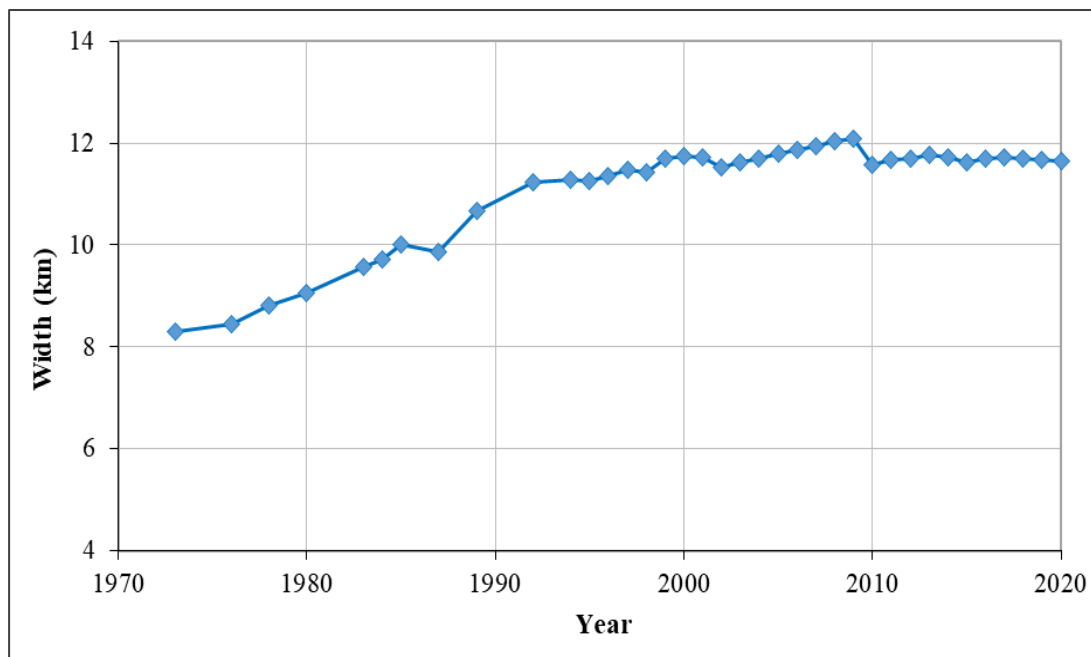


**Figure 2.13: Changes in Planform of Jamuna for the Last 4 Years**

**Width of the Jamuna River**

Widening of the river has been very significant over the last 46 years as the width has increased from 8.0 to 12.0 km on average (**Figure 2.14**). The 1950 Assam Earthquake had a massive impact in the planform changes of the Brahmaputra-Jamuna River as studied by Sarker and Thorne in 2006. Landslides due to the earthquake generated 50 billion m<sup>3</sup> of sediment which eventually added to changes in river planform of Jamuna and Meghna estuary. Mainly coarse sediment (sand portion) played a significant role to alter the morphology in the next 50 years from 1950 Assam earthquake which propagated gradually as a sand wave to the Bay of Bengal. This additional input of sediment made the river more dynamic and dissipated its energy by the process of the river widening.

Moreover, it has been observed that the river shows a trend of increased widening between 1970 and 2010. In the most recent decade, the average width of the river has remained stable.



**Figure 2.14: Average Width of the Brahmaputra-Jamuna River since 1970 Over Time**

### **Char Dynamics**

Char Dynamics in the Brahmaputra-Jamuna River is interrelated with the bank erosion processes, widening and narrowing of rivers. Development of Char within the riverbank affords land for settling of people and cultivation in the Char for maintaining their livelihoods. Widening of the river increases Char area. Char area has increased about 18% in 2016 compared to 1973 (about 76,000 ha) (**Figure 2.15**). Widening of the river caused increasing trend of the Char area. However, the widening process has slowed down recently. This does not mean the formation of Char will stop. Rather loss of Char in one area may compensate to other areas within the riverbank. Additionally, Char dynamics is directly related to livelihood and living standard of Char Dwellers in the Brahmaputra-Jamuna River. With the growing human population density in Bangladesh people have been forced to live in Char areas of the river. With the increase in Char areas since 1993 there has been an increase in the Charland population density in the recent time compared to early 1990's.



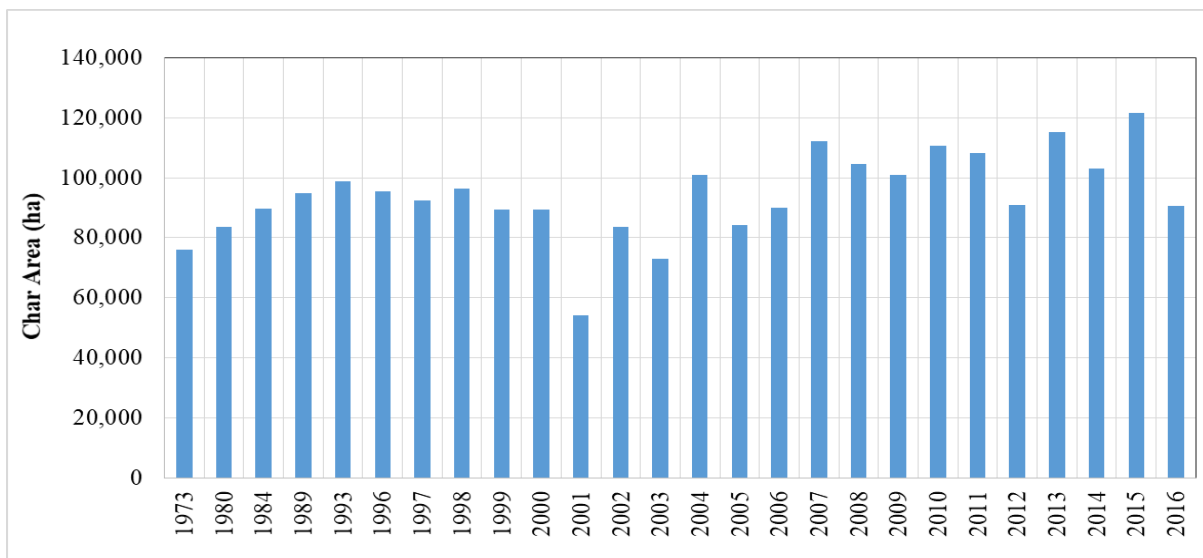
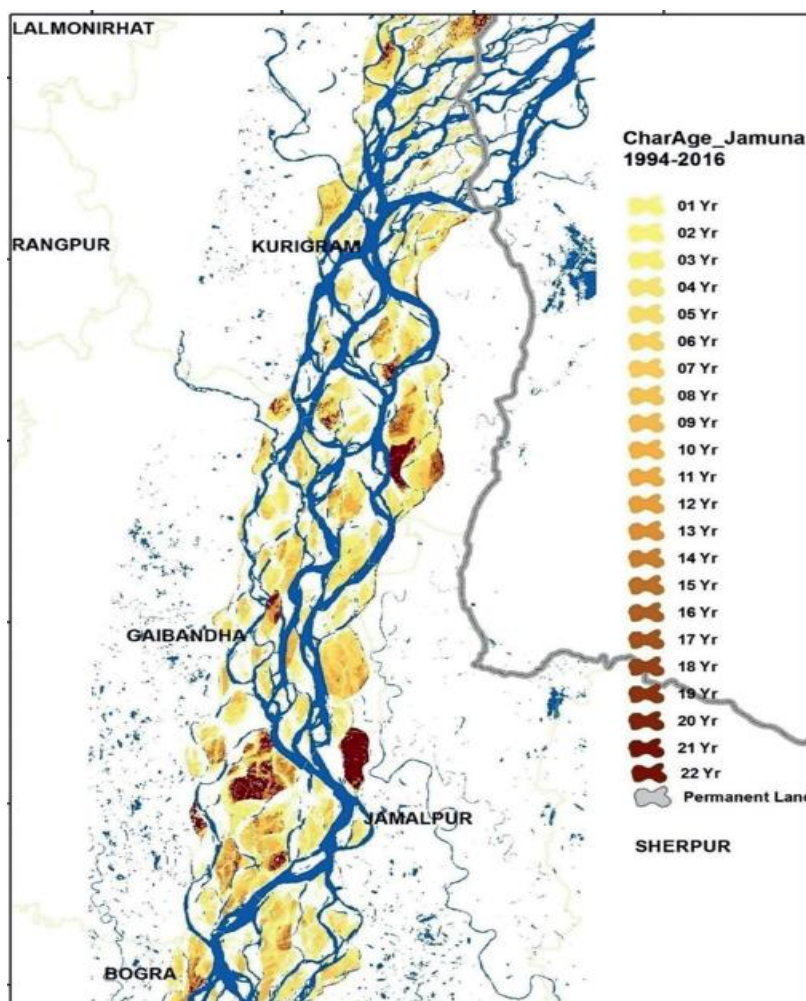


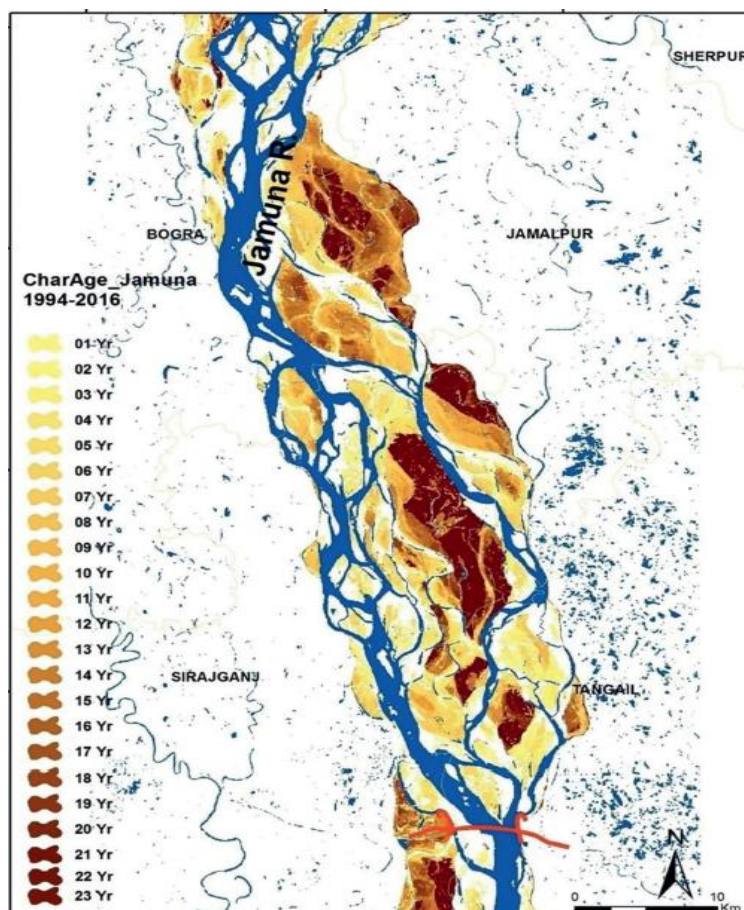
Figure 2.15: Char Area of the Brahmaputra-Jamuna River Over Time

The age of Chars of the JamunaRiver from its entry to Bangladesh to Bangabandhu Bridge was calculated by the FRERMIP study in 2019. Mainly Char age was calculated for the period 1994-2016 (Figure 2.16 and Figure 2.17).



Source: FRERMIP 2019

Figure 2.16: Char Age of the Jamuna River (Upstream)



Source: FRERMIP 2019

**Figure 2.17: Char Age of the Jamuna River (Downstream)**

### ***Erosion and Accretion Analysis***

Jamuna is a highly erosion-prone river. The average rate of bank erosion was assessed during the period from 1973 to 2020 at different time intervals for the study reach from the Bangladesh-India border to Sirajganj. This reach is about 160 km long. Both left and right banks are experiencing considerable erosion every year.

For the assessment of the erosion along both banks of the Jamuna River on a decadal basis, Landsat Satellite images of 1973, 1980, 1989, 2000, 2010 and 2020 were collected. After that, satellite images were geo-referenced. Afterward, images were co-registered with each other to avoid distortion from one image to another image.

Banklines were then delineated using satellite images from each year. Next, banklines were superimposed with each other to identify the locations of vulnerable areas along both banks of the river for different time periods from 1973 to 2020 (Figure-2.18). At the same time, erosion-accretion rates were calculated using Arc-GIS tool of Remote Sensing techniques. Table-2.1 and Table-2.2 show the amount of erosion and accretion for riverbanks on both sides of the river and the total rate of erosion and accretion for different time periods, respectively.

**Table 2.1: Erosion of the Jamuna (from Bangladesh-India border to Sirajganj) during 1973-2020**

Year	Erosion at Left Bank (ha)	Erosion at Right Bank (ha)	Total Erosion (ha)	Erosion rate (ha/year)
1973-1980	11,820	8,030	19,850	2,835
1980-1989	12,840	16,250	29,090	3,230

Year	Erosion at Left Bank (ha)	Erosion at Right Bank (ha)	Total Erosion (ha)	Erosion rate (ha/year)
1989-2000	11,460	10,430	21,890	1,990
2000-2010	6,340	4,660	11,000	1,100
2010-2020	5,380	4,310	9,690	970

**Table 2.2: Accretion of the Jamuna (from Bangladesh-India border to Sirajganj) during 1973-2020**

Year	Accretion at Left Bank (ha)	Accretion at Right Bank (ha)	Total Accretion (ha)	Accretion rate (ha/year)
1973-1980	3,110	5,500	8,610	1,230
1980-1989	7,020	7,30	7,750	860
1989-2000	7,840	1,240	9,080	825
2000-2010	9,990	3,010	1,3000	1,300
2010-2020	3,020	1,050	4,070	405

It was observed that the left bank eroded more than the right bank for the observed time periods in this study reach. the highest erosion rate of 3230 ha/year was observed during 1980-1989. Since then, erosion decreased along both banks and was only 970 ha/year in the recent decade. This illustrates that the erosion rate of the Jamuna River from its entrance (inside Bangladesh) to Sirajganj reach shows a decreasing trend (Figure 2.19).

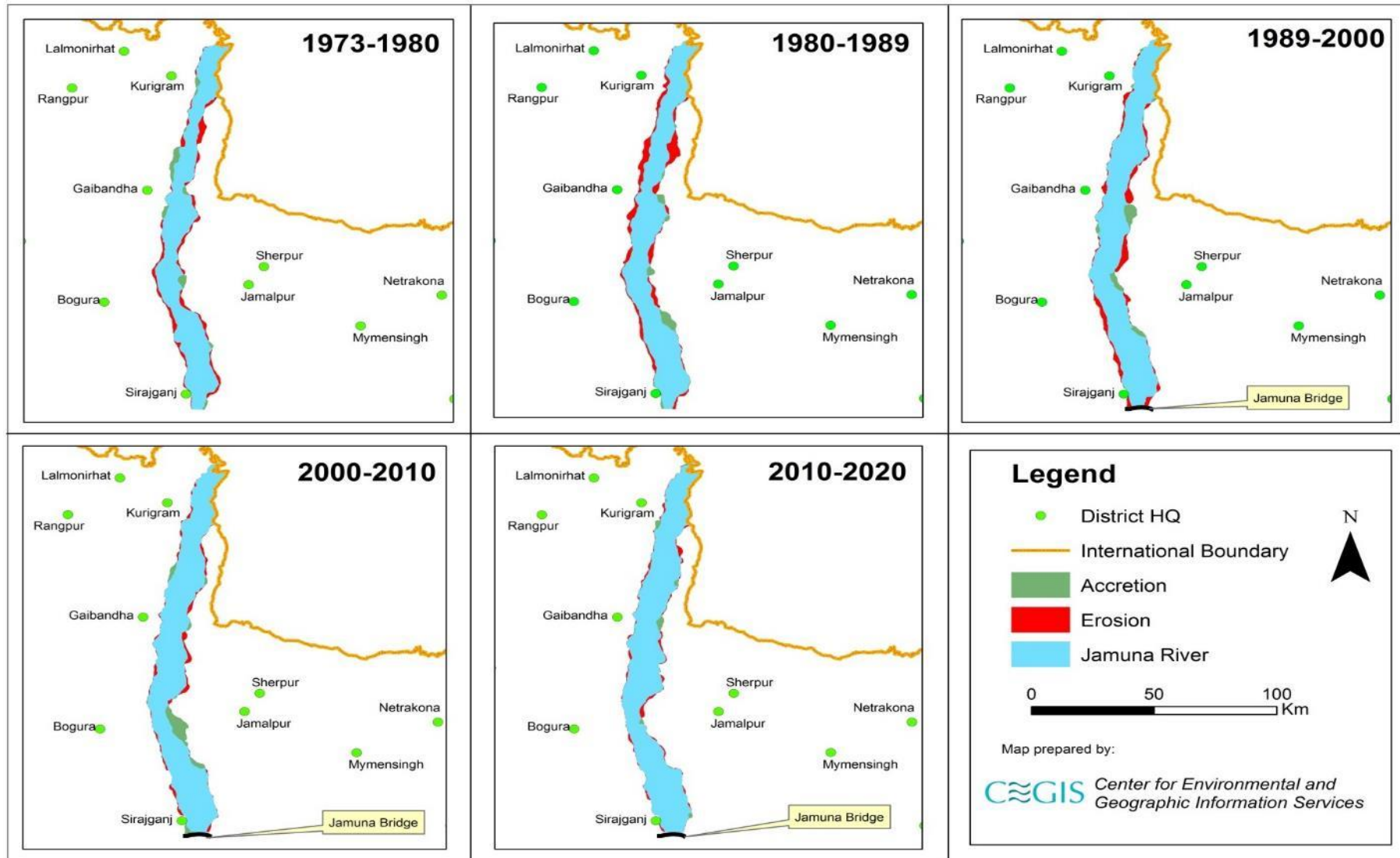
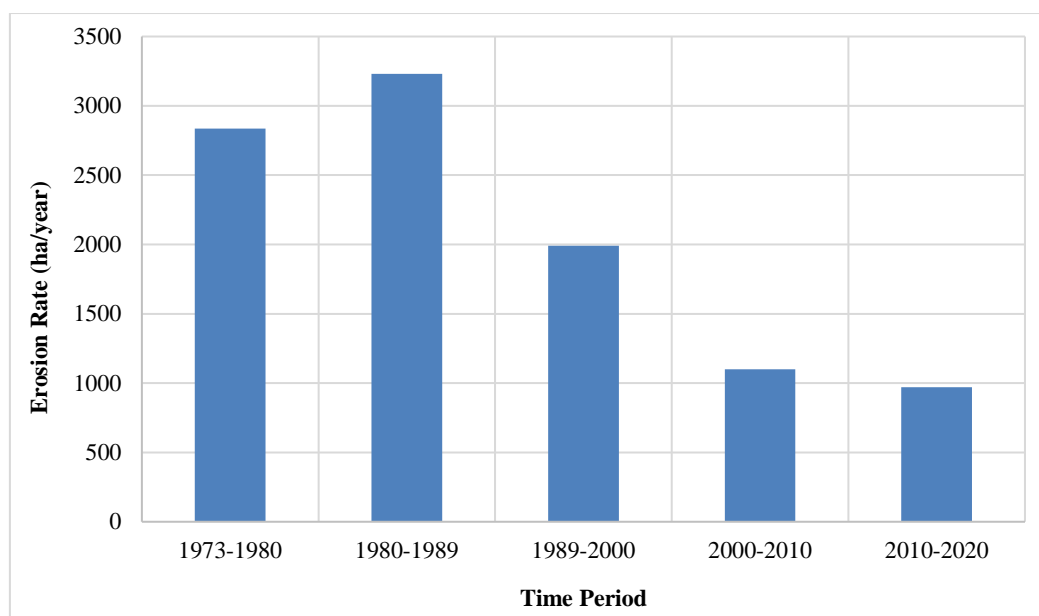


Figure 2.18: Erosion and Accretion of Jamuna River within Program AOI during 1973 to 2020



**Figure 2.19: Historical Erosion Rate of the Study Reach of Jamuna River since 1973**

Comparatively, more land was accreted on the left riverbank than on the right bank. The high rate of accretion has been observed for the 2000-2010 and 1973-1980 time periods and with rates of accretion at 1300 ha/year and 1230 ha/year, respectively.

### River Morphology at C I Sites

#### *Changes in Average Width*

Jamuna River has increased in width over the last few decades. The increase of width can also be observed in the pilot sites. To assess the increase in width, 10 km reaches for every site have been considered, where 5km of upstream and 5km of downstream were counted from the location.

After delineation of banklines, a 10 km reach for each of the two pilot sites was marked separately by GIS tools. Then widths of a few sections from each reach were measured and finally the average of those widths was calculated. Thus, average widths were calculated for different years from 1973 to 2020. The average width of the sites for different years is provided in Table-2.3.

**Table 2.3: Average Historical Width of 10 km Reaches at Two Pilot Sites**

Pilot Site	Average Historical Width of Jamuna River at Pilot Sites (km)					
	1973	1980	1989	2000	2010	2020
Fulchari	11.6	11.8	12.6	11.0	11.5	11.4
Kalihati (Alipur)	4.8	4.8	5.8	8.9	7.7	7.6

#### *Erosion and Accretion*

For the assessment of erosion and accretion in pilot sites, 10 km reach (5 km upstream and 5 km downstream) has been considered for each site. The details of erosion-accretion analysis of all four sites are provided below.

#### *Fulchari*

Table 2.4 and Table 2.5 show historical erosion and accretion of 10 km reach at Fulchari respectively. Fulchari is situated along the right bank of the Jamuna River. The highest erosion rate 160 ha/year was observed at 1980-1989. However erosion rate at Fulchari shows a decreasing trend which became 25 ha/year in recent time from 160 ha/year. On the other hand, highest accretion was observed here at



1973-1980. No or very little accretion occurred here after 1980. Figure 2.20 shows erosion at Fulchari for different time spans.

**Table 2.4: Erosion of 10 km Reach of the Jamuna River at Fulchari**

Year	Erosion at Fulchari (Left Bank), ha	Erosion rate (ha/year)
1973-1980	10	1.5
1980-1989	1440	160
1989-2000	180	15
2000-2010	175	15
2010-2020	250	25

**Table 2.5: Accretion of 10 km Reach of the Jamuna River at Fulchari**

Year	Accretion at Fulchari (Left Bank) ha	Accretion rate (ha/year)
1973-1980	885	125
1980-1989	0	0
1989-2000	0	0
2000-2010	30	3
2010-2020	50	5

*Alipur of Kalihati and Tangail Sadar*

Table-2.6 and Table-2.7 show historical erosions and accretions of 10 km reach at Alipur, respectively. This site experienced highest erosion during 1989-2000 at a rate of 180 Ha/year. Figure 2.21 shows erosion and accretion of Alipur for different time spans after 2000, the rate of erosion decreased as the guide bund of Jamuna Bridge (1998) has protected some areas in this 10 km region. The highest accretion rate at 60 ha/year occurred in 1973-1980 and there was no accretion from 1980 to 2010. An accretion rate of 7.5 ha/year was observed for the most recent decade.

**Table 2.6: Erosion of 10 km Reach of the Jamuna River at Alipur, Kalihati**

Year	Erosion at Alipur (Left Bank), ha	Erosion rate (ha/year)
1973-1980	230	30
1980-1989	1220	135
1989-2000	1960	180
2000-2010	250	25
2010-2020	110	10

**Table 2.7: Accretion of 10 km Reach of the Jamuna River at Alipur, Kalihati**

Year	Accretion at Alipur (Left Bank), ha	Accretion rate (ha/year)
1973-1980	430	60
1980-1989	0	0
1989-2000	0	0
2000-2010	0	0
2010-2020	75	7.5

This site has faced a high degree of riverbank erosion since 2016, especially at the downstream end of the new Dhaleshwari offtake due to the thalweg shifting towards the left bank-line, which resulted from the downstream movement of the right-bank Char system near the Jamuna River Multi-Purpose Bridge. DSAS analysis carried out by the Feasibility Study shows that while the average rate of erosion at the most erosion-prone reach (d/s of the new Dhaleshwari offtake) was nearly -minus 30.425 m/year from 2016

to 2019, it became approximately –minus 144.43 m/year from 2020 to 2021. Almost the entire reach was exposed to significant to severe degree of erosion along the bank-line, which expanded significantly during the last one and half years of analysis (From March 2020 to October 2021). Some existing bank protection works like revetments, CC block and geo-bag dumping works have been carried out, but several failure points have been observed here as well. Figure 2.22 illustrates the existing local conditions and protection works and erosion extent in the site at Alipur, Kalihati.

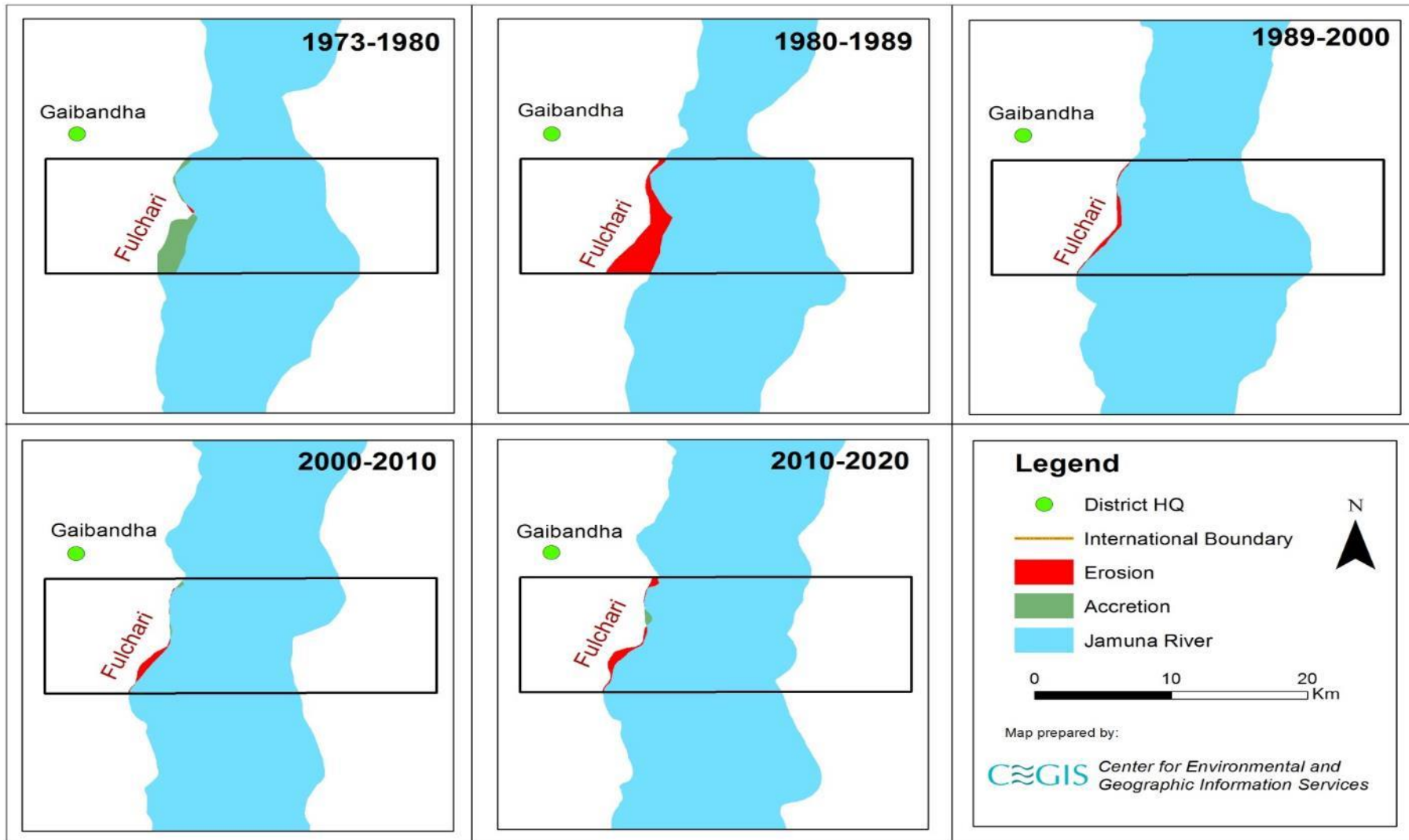


Figure 2.20: Erosion and Accretion of 10 km Reach of the Jamuna River at Fulchari

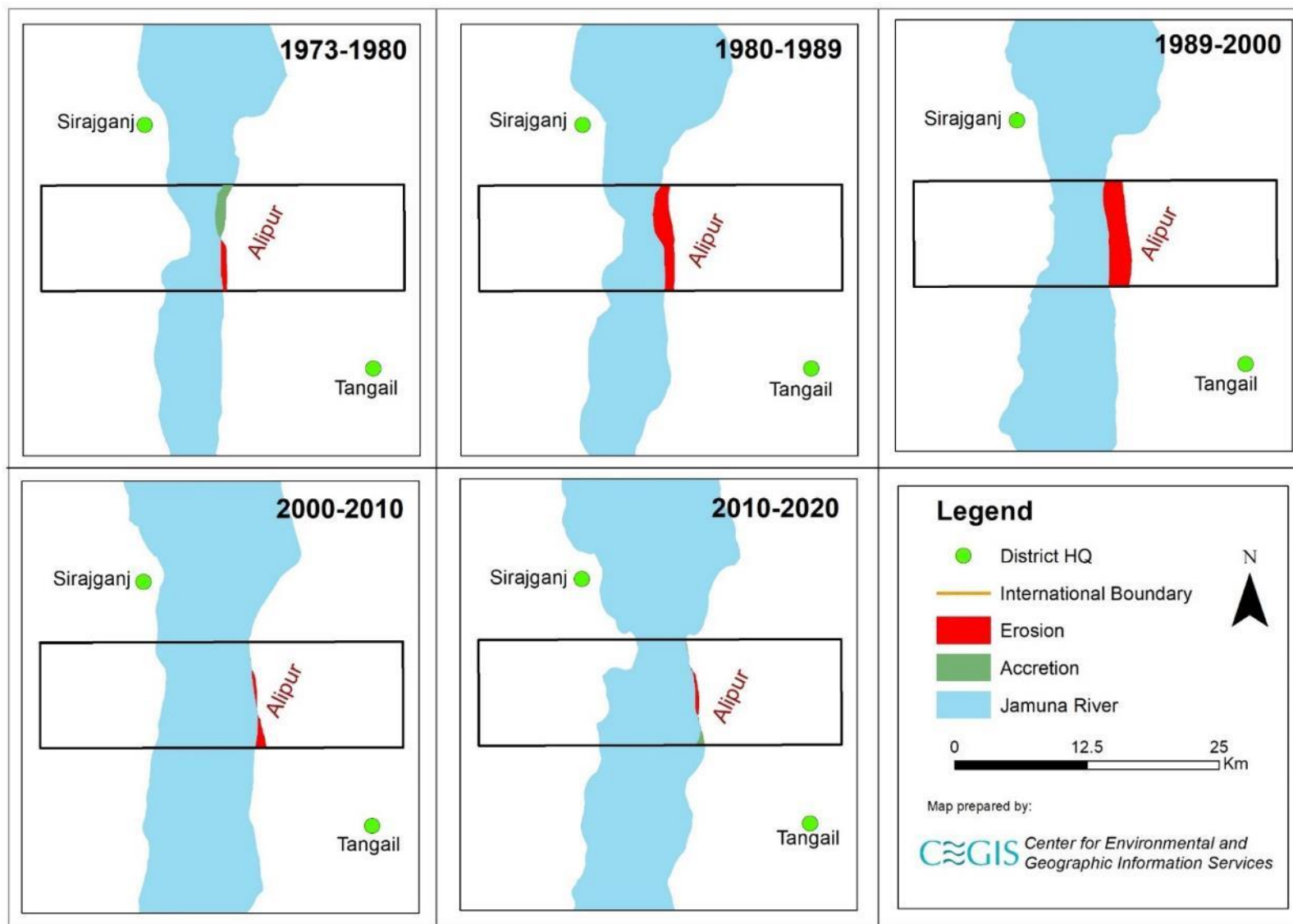
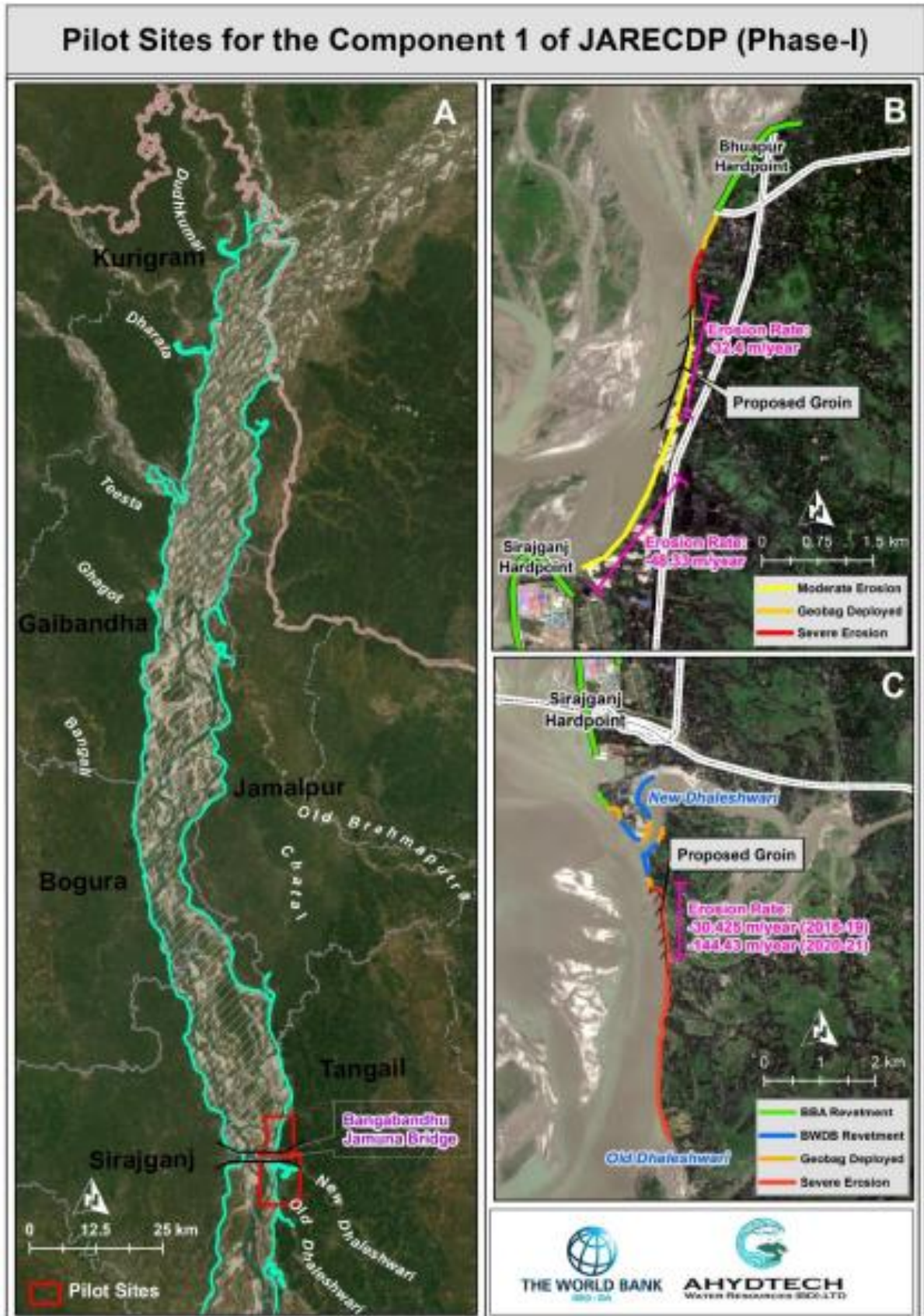


Figure 2.21: Erosion and Accretion of 10 km Reach of the Jamuna River at Alipur, Kalihati



Source: Feasibility Study Report

Figure 2.22: Existing Erosion Pattern at Kalihati Pilot site

### **Riverbank Stabilization Practices along the Jamuna River**

Riverbank protection or stabilization is a very expensive process. Hence, protective works are usually only considered for critical areas and areas with high land-use values. Bank protection structures along the Jamuna River were started in Bangladesh from 1963. Most of them involve groynes/spurs and revetment. The major large bank protection structures were constructed in the 1990s and included the Kamarjani permeable groynes, guide bunds for the Bangabandhu Bridge, Sirajganj Hard Point, hard points of Sariakandi and Mathurapara, Kalitola groyne, Bahadurabad revetment, and Bhuapur revetment. Table-2.8 and Table-2.9 show the overall condition of various structures along the right and left banks of the Jamuna River, respectively.

In the most recent decade, several major revetments were constructed along both banks of the Jamuna River for the management of the river and to reduce riverbank erosion. These include Kojjuri Revetment, PIRDP Revetment, Chauhali Revetment, and Zafarganj Revetment.

Recently Bangladesh Water Development Board (BWDB) prepared a River Stabilization Plan of the Jamuna River under the project Flood and Riverbank Erosion Risk Management Investment Program (FRERMIP) where revetments were proposed including land reclamation (**Figure 2.23**). In addition to that, future embankment, spill channel, alluvial and imposed floor corridor were suggested. It was projected that about 117,900 ha of land will be reclaimed if the proposed river stabilization works are implemented – creating land which could be used for development, settlement, commercial and other necessary purposes for the development of economic growth of the country.



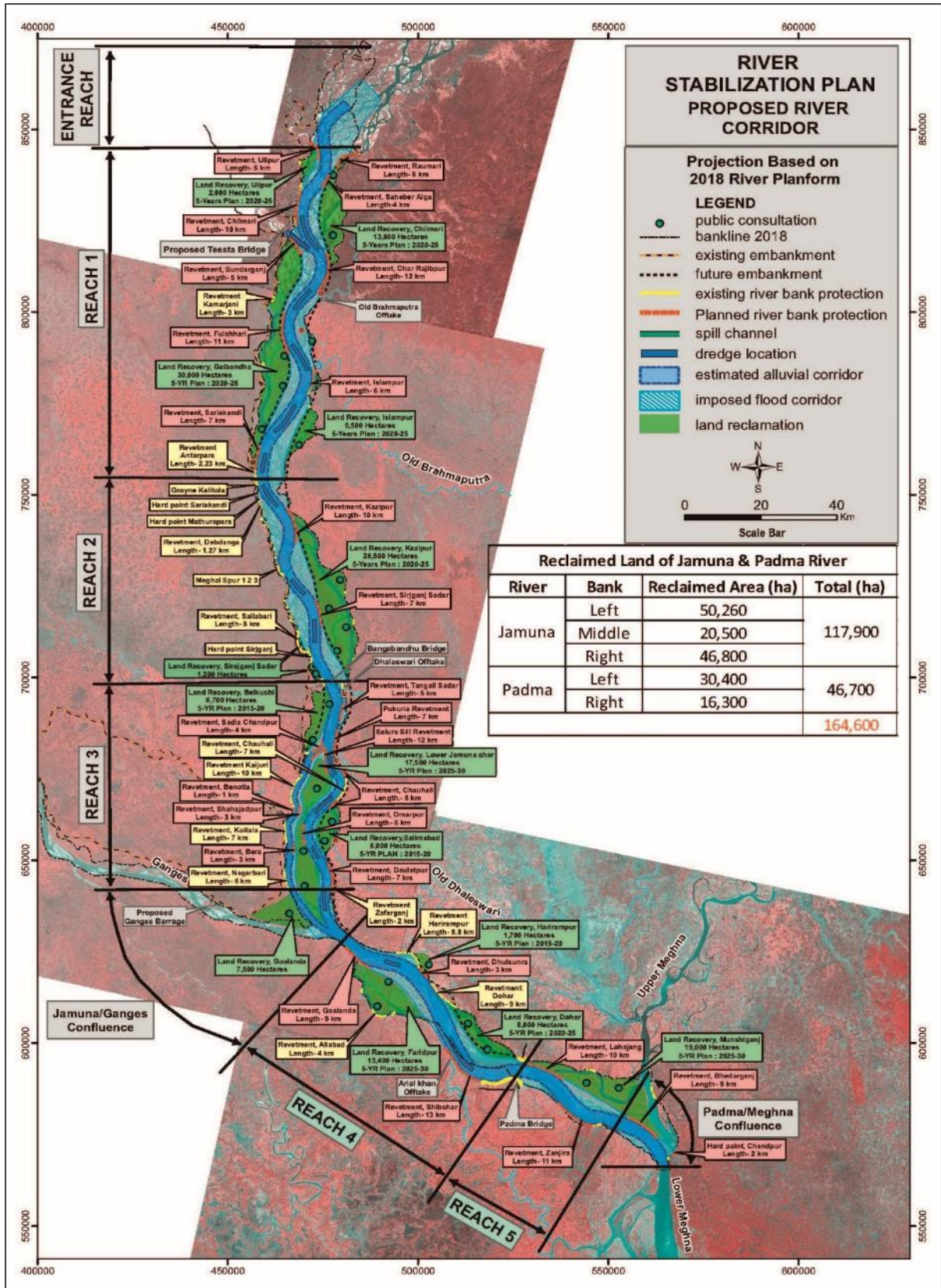


Figure 2.23: River Stabilization Plan by FRERMIP

**Table 2.8: Bank Protection Structures along the Right Bank of the Jamuna River**

Name of structure	Construction period	Exposed to the flow		Comments
		Minor Channel	Major channel	
Kamarjani permeable groyne	1994-95		1995	Major damages
Hasnapara Spur 1	2001-02	2002-03		Performance is not clear as it does not exposed to main channel
Hasnapara Spur 2	2001-02	2002-03		Performance is not clear as it does not exposed to main channel
Titparal Revetment	2005-06		2005-11	Minor damages but effective
Kalitola	1997-98		1997-11	Minor and major damages but effective
Sariakandi	1997-98		1997-11	Effective
Mathurapara	1997-98		1997-07	
Debdanga Revetment	2005-06		2005-08	Minor damages
Chandanbaisa (belmouth)	2001-02		2002-08	Damaged
Baniajan Spur	2001-02	2002-03		Erosion at the slope of the approach embankment in 2021
Meghai Spur 1	1999-00	2000-01	2004	Damaged in 2004
Meghai Spur 2	1999-00	2000-01		
Meghai Spur 3	1999-00	2000-01		
Singrabari Spur 1	1998-99		2002-03	Exposed for one year, damaged
Singrabari Spur 2	1998-99		2002-03	Damaged in 2002
Shuvagacha Spur 1	1999-00		2002-03	Damaged in 2002
Shuvagacha Spur 2	1999-00		2002-03	Damaged in 2003
Simla Spur 1	1999-01		2003	Damaged in 2003
Simla Spur 2	1999-01		2005	Exposed for one year
Simla Spur 3	1999-01		2002	Damaged in 2002
Shailabari Groyne	1980-81		1997-04	Damaged in 2004
Sirajganj Revetment	1997-98		1998-11	Minor damages, effective
Bangabandhu Bridge Right Guide Bund	1996-98		1996-11	Effective
Betil Spur	2000-02	2001-04		Damaged in 2004, after repairing damaged again 2007
Enayetpur Spur	2000-02	2001-04		Damaged in 2004, repaired in 2006
PIRDP, Geobag revetment	2004-06		2004-11	Effective
JMREMP Geo-bag revetment	2010			status is not available
FRERMIP, Project 1 (Kojjuri)	2018-2020			recently completed

\*Major channel: Perennial channel, Minor channel: Ephemeral channel; (Source: Sarker et al. 2011 and FRERMIP website)



**Table 2.9: Bank Protection Structures along the Left Bank of the Jamuna River**

Name of structure	Construction period	Exposed to the flow		Comments
		Minor Channel	Major channel	
Bahadurabad Revetment	1996-97		1997-98 2008-11	Effective
Ghutail	1999-00		20003-04 2007-11	Major damage, Effective
Pingna	2005-06	2005-06		Exposed only to the minor channel
Nolin bazaar	2001-02	2002-03		Rate of erosion was small
Bhuapur Revetment	1996-97	1998-99		
Bangabandhu Bridge Left Guide Bund	1997-98		1998-11	Effective
Chauhali Revetment	2018-2020			still effective
Jafarganj Revetment	2018-2020			still effective
Harirampur Revetment	2018-2020			still effective

Source: Sarker et al. 2011, FRERMIP website, BWDB

### Operation and Management of Navigation along the Jamuna

The Brahmaputra-Jamuna system was used for navigation popularly from Meghalaya-Assam to Bangladesh. Even before the Second World War, channels were continuously dredged using a dredger. There were several passenger and cargo berthing places along both banks of the Jamuna River. Sirajganj is an important station within the study reach. Chilmari was also an important inland port for the northern part of Bangladesh, but is no longer operational.

The Study reach of Jamuna is also included in the Routes under the Protocol on Inland Water Transit and Trade between Bangladesh and India. This portion is included in different routes, i.e., Kolkata-Raimangal-Mongla-Kawkhali-Barisal-Chandpur-Mawa-Aricha-Sirajganj-Chilmari-Daikhawa-Dhubri-Pandu-Silghat and back, and a second route – Karimganj-Ashuganj-Chandpur-Mawa-Aricha-Sirajganj-Chilmari-Daikhawa-Dhubri-Pandu-Silghat and back. To establish railway communication from Dhaka, the British Government introduced ferry service from Bahadurabad Ghat in Jamalpur to Teestamukh Ghat in Gaibandha in 1938. After the devastating flood of 1988, the station was relocated from Teestamukh Ghat to Balashi Ghat due to lack of navigability at the former station site. This popular ferry service has been inactive since 2004 due to heavy siltation and lack of navigability of the Jamuna River.

The annual average low flow of the Jamuna River is about 4,000 m<sup>3</sup>/s which has the potential to keep the river fairly navigable even during the dry season. However, the braiding Characteristics make the channel very dynamic and shallow. The channel development/abandonment in a year is a very common process in this river. Reducing the navigability in one channel and developing the same in another channel may occur within a few weeks to a few months. Migration of bank lines and shifting of channels may be several hundred meters to a kilometer in a year. Moreover, the siltation rate is very high and may be more than 100% in some places. This results in the cost of maintenance dredging being higher than capital dredging. It is very difficult to fix one navigation route in the Jamuna River. These Characteristics make navigation uncertain and difficult.

During the last decades the braiding and width of the river have increased and, subsequently, depth and stability of the braided channels have decreased. Due to this phenomenon, regular maintenance dredging is required for smooth navigation. Though the recurrent maintenance dredging works well in the lower reaches, it could not yield effective results in upper reaches. For maintaining the Protocol Route, Bangladesh Inland Water Transport Authority (BIWTA) installs bundling at critical locations every year. But it has limitations on the extent of improving the depth and it has slowed process of improvement. It might be better to apply this to the smaller channels that have less flow velocity.

Although the formal navigation is limited, the informal navigation by country boats is immense in the Jamuna River. Several hundred thousand people are living in the Chars of the river. The only means of communication for these people and to transport their usable commodities is informal navigation. The informal navigation also connects the people living along both banks of the river. Navigation is also serving their trade and transportation of agricultural products. This informal navigation is very risky and causes many casualties every year.

Even with many challenges, the Jamuna River has tremendous potential for navigation. Comprehensive river management measures such as bank protection and river training works may improve the existing navigation in the Jamuna River.

## **Hydrology of Brahmaputra-Jamuna River**

### ***Overview of River Network***

The hydrology of the study area is mainly governed by the Brahmaputra-Jamuna River. The course of the Brahmaputra River from the international border between Bangladesh and India to the confluence with the Ganges near Aricha is referred to in Bangladesh as the Brahmaputra-Jamuna River. The Brahmaputra rises in the Great glacier in the Kailash range of the Himalayas in Tibet (China) at an elevation of 5150 meters. Locally named as Yaluzangbu, it flows eastward – parallel to the Himalayas – for about 1700 km, and along the northeastern corner of India, where it takes a sharp bend towards the south and southwest to enter Arunachal Pradesh (India) becoming the Siang or Dihang. After being joined by two tributaries – the Dibang and the Lohit – the river is known as the Brahmaputra and flows westward. During its course through Arunachal Pradesh and Assam, the Brahmaputra is joined by several tributaries including the Dhansiri, the Manas, the Sankosh from Bhutan and the Subansiri, the Kameng, and others from India along its right bank. It is also joined by several left bank tributaries including the Dihing, the Disang, and the Kopili, among others. After traversing about 700 km in a south-westerly direction in the Assam valley, the river turns south again to enter Bangladesh at Kurigram District. Thereafter it is joined by many tributaries flowing through the northern part of West Bengal (India) and northern Bangladesh – the principal ones among them are the Dudhkumar, the Dharla, and the Teesta. The Manas, Ghagot and Hurasagar rivers are also major tributaries of the Brahmaputra. Downstream of the Teesta, at Dewanganj, the Old Brahmaputra originates on the left bank of the Brahmaputra and the main channel flows as the Jamuna River until it reaches Aricha, where it combines with the Ganges to form the Padma River.

The total catchment area of the Brahmaputra is about 552,000 sq. km of which 195,000 sq. km lies in India (33.6%), 47,000 sq. km lies in Bhutan (7.8%), 270,900 sq. km lies in China (50.5%) and 39,100 sq. km lies in Bangladesh (8.1%).

In the EBAA, the water level in the Brahmaputra attains its peak in July-August and the lowest flow occurs in February. The Brahmaputra is a large braided and multi-channel river with an average width of over 12 km in the flood season. The length of the Brahmaputra-Jamuna River between the border and its confluence with the Ganges near Aricha is approximately 230 km.

The Jamuna River has a number of distributaries and tributaries. Dudhkumar, Dharla, Teesta, Ghagot, Badai, Kageshawari, Girai, Bangali are the tributaries of the Jamuna River while Manas is A distributary and Hurasagar is branch river of the Jamuna. All these rivers are interconnected by numerous channels (khals), tributaries and distributaries forming a hydrological network in the entire northwest region. For example, the Mahananda and Punorbhaba rivers, which are major rivers of the northwest region, are connected to the Atrai-Karatoya-Bengali system which drains to the lower Jamuna through the Hurasagar/Baral in the south east corner of the region. Figure 2.24 shows the water resource system within the Program Area while the Figure 2.25 shows the River Network of Jamuna.

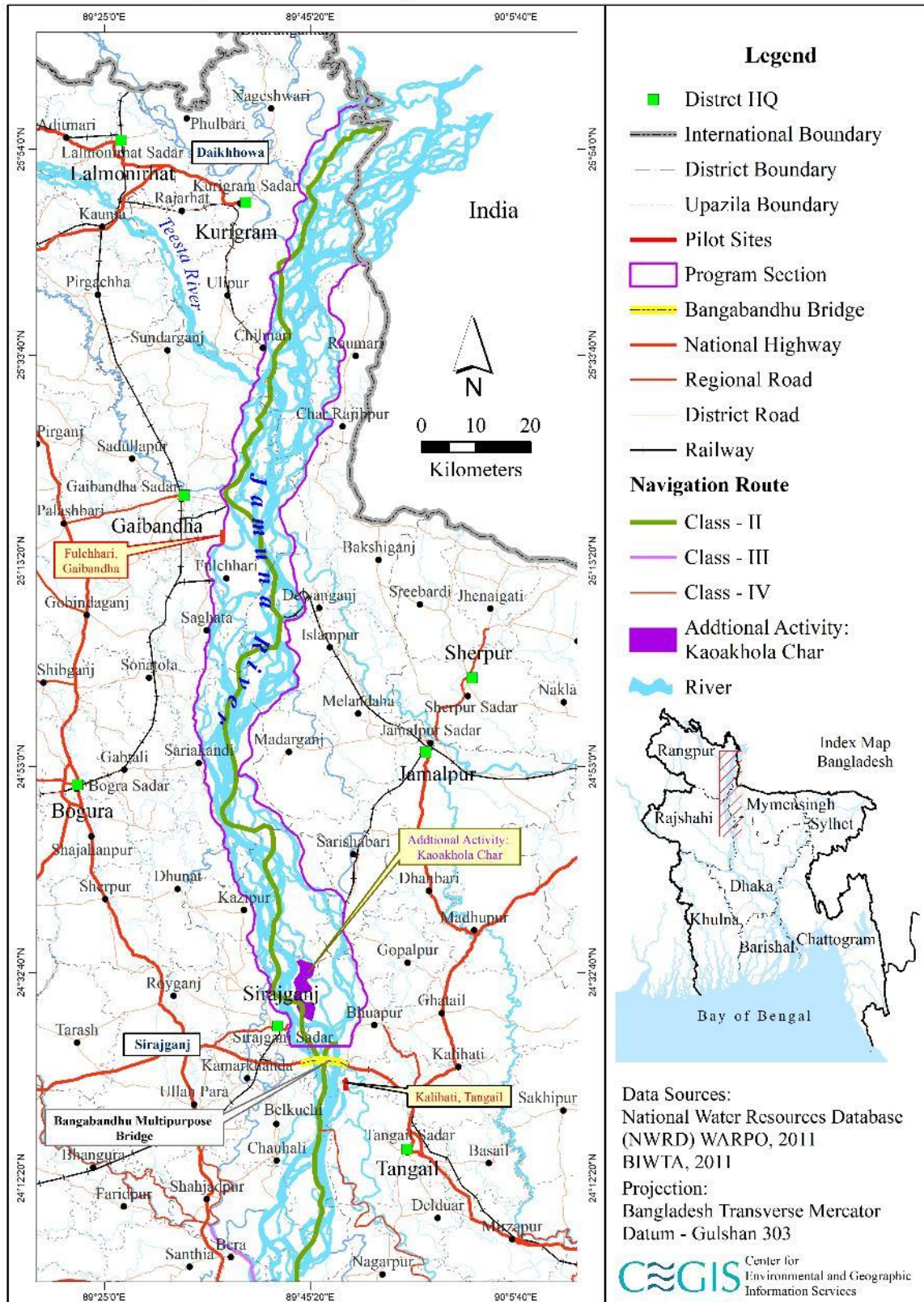
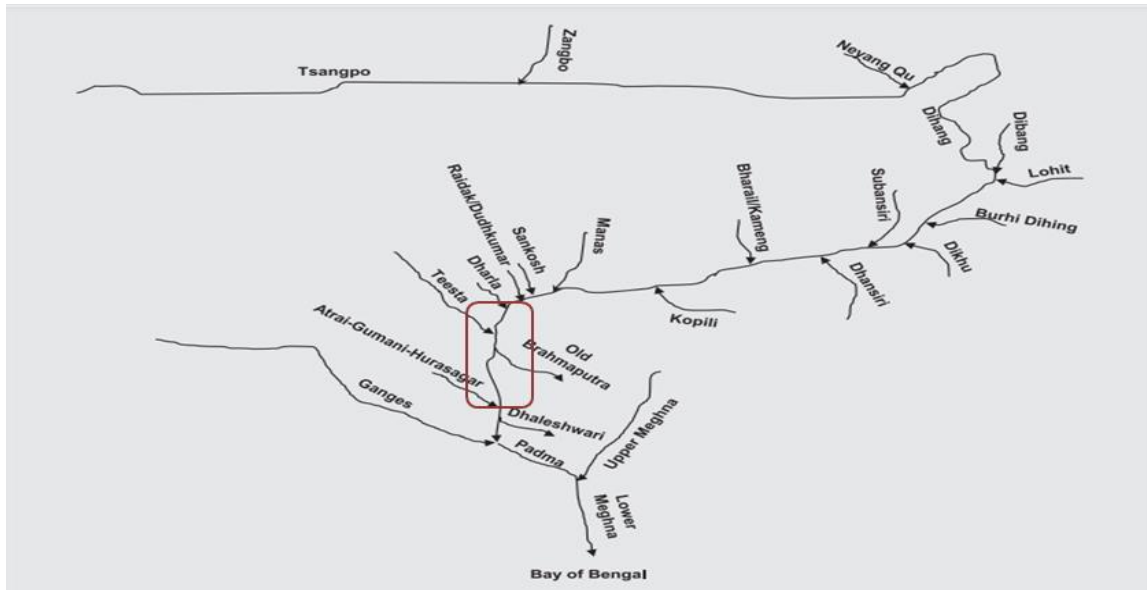


Figure 2.24: Water Resource System of the Study Area



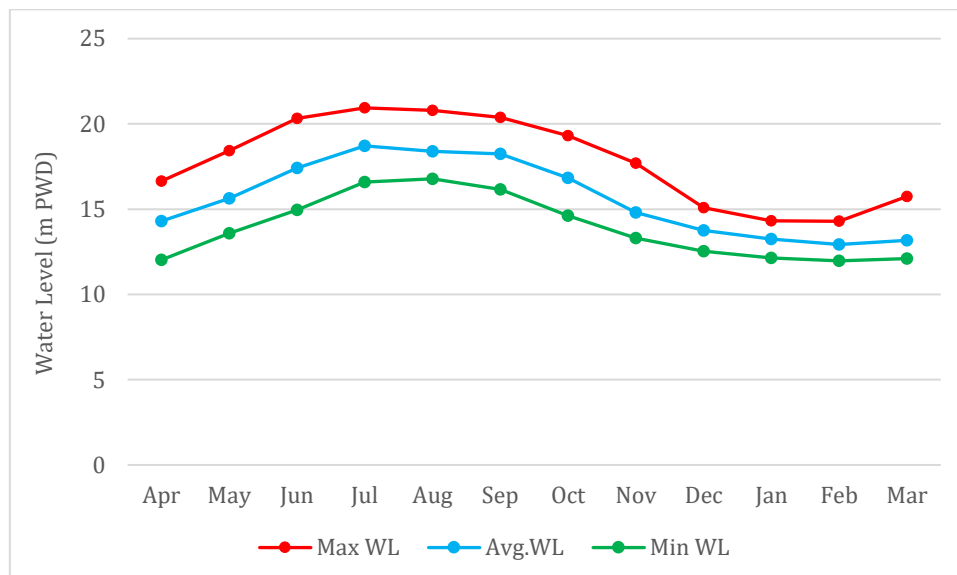
Source: (Mahanta et al., 2014)

**Figure 2.25: Jamuna River Network (Brahmaputra River Basin)**

### River Water Level

#### Water Level at Bahadurabad Transit Station

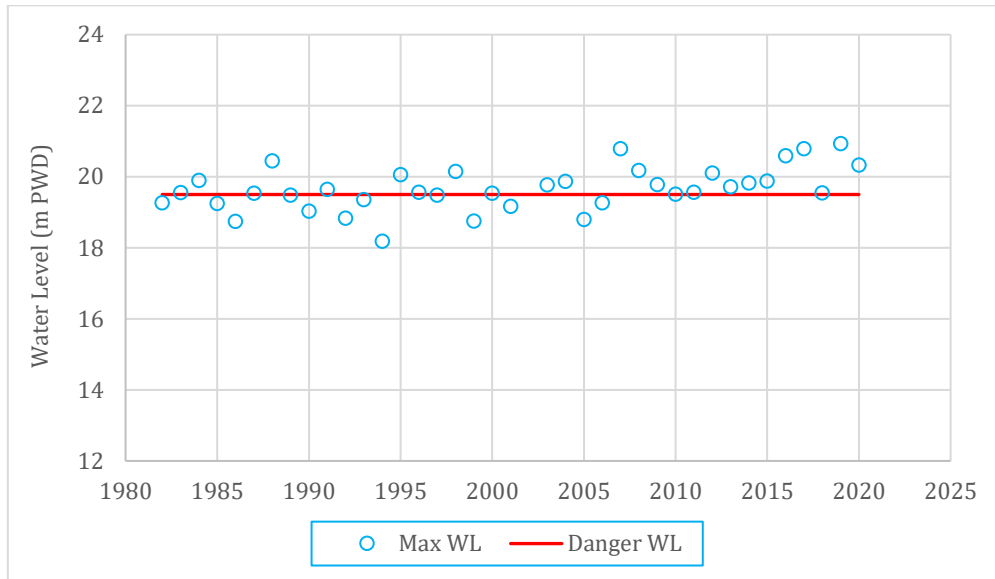
The water level data of the Bahadurabad Transit (Station No: 46.9L) of BWDB for the period from 1982 to 2020 (Figure 2.26) were collected and analyzed. The analysis shows that the maximum water level was 20.94 m PWD in July 2019 while the minimum water level was 11.97 m PWD in February 2015. The danger level of the river at Bahadurabad water level station is 19.50 m PWD. It is noted that whenever the river water rises above the danger level at this location, the flood may likely damage nearby crops and homesteads in the area.



Source: National Water Resources Database

**Figure 2.26: Monthly Water Level Analysis for Bahadurabad Transit (1982-2020)**

The historical annual maximum water level analysis was also carried out and is represented graphically in Figure 2.27 which shows that the maximum flow of the Brahmaputra-Jamuna River is above the danger level, i.e. >19.50 m PWD in most of the years

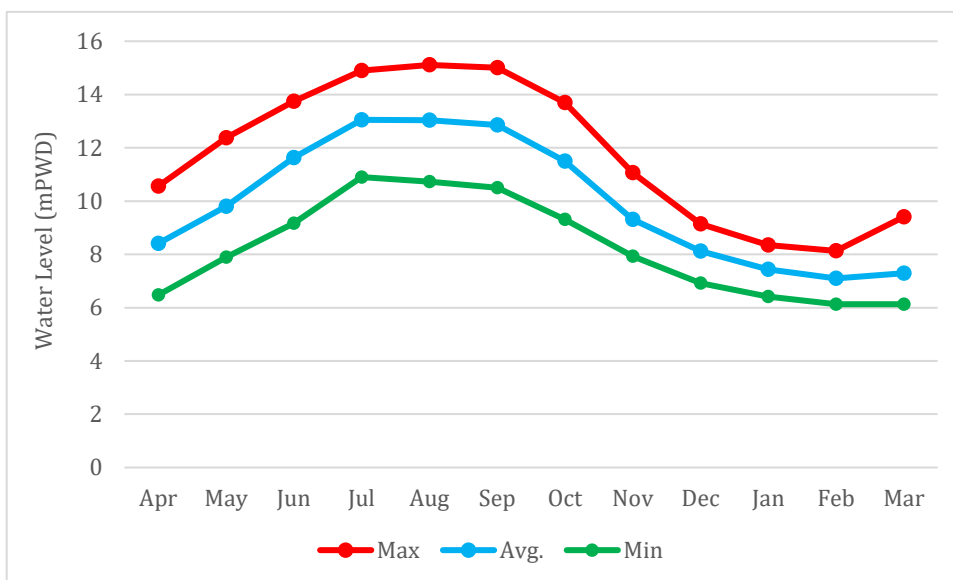


Source: National Water Resources Database

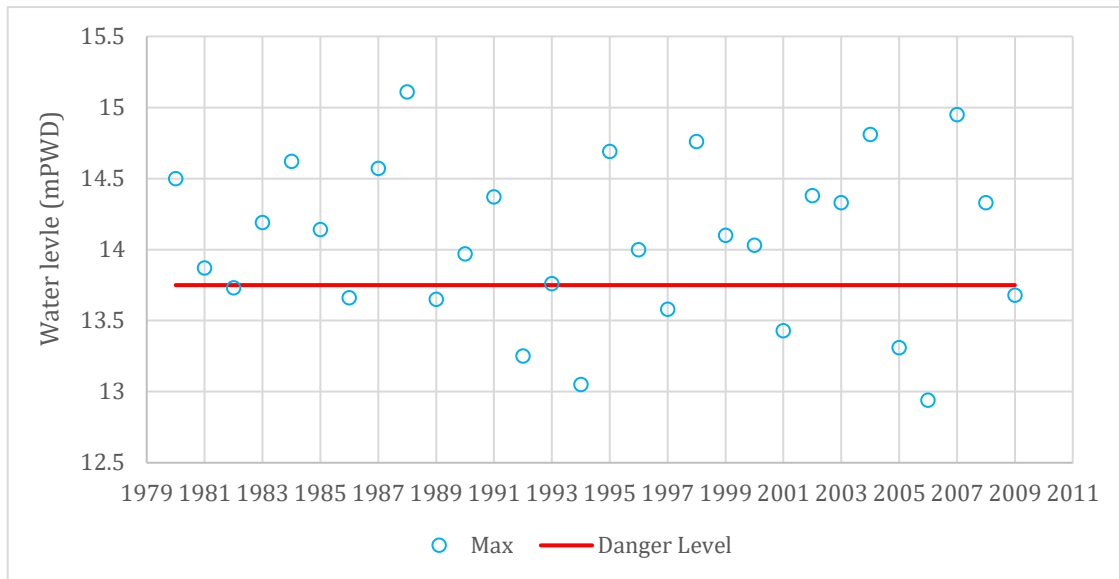
**Figure 2.27: Annual Maximum Water Level Analysis at Bahadurabad Station (1982-2020)**

#### Water Level at Sirajganj Station

The water level data of the Sirajganj (Station No: 49) of BWDB for the period from 1980 to 2009 were collected and analyzed. The analysis of the monthly variation of water level shows that the maximum water level is 15.11 m PWD in the month of August while the minimum water level is 6.13 m PWD in the months of February and March as presented in **Figure 2.28**. The danger level of the river at Sirajganj water level station is 13.75 m PWD.



Monthly water level of Jamuna River at Sirajganj



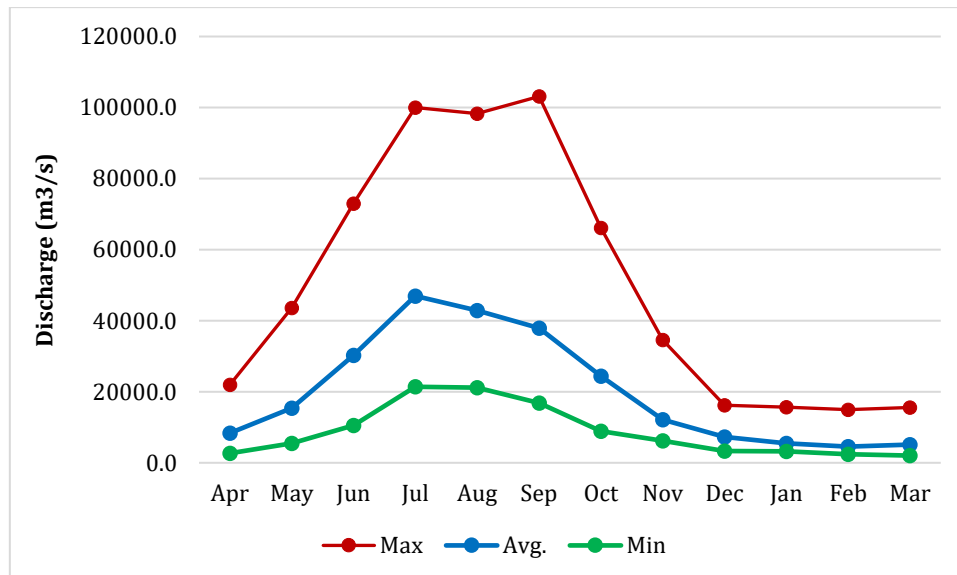
Annual maximum water level of Jamuna River at Sirajganj

**Figure 2.28: Water Level of the Jamuna River at Sirajganj Station**

### River Discharge

#### *Discharge at Bahadurabad Transit station*

Figure 2.29 shows the monthly variation of maximum, average and minimum discharge of the Brahmaputra-Jamuna River from the data of 1980 to 2020 at Bahadurabad transit station. It reveals that discharge of the river is high in monsoon (June-October) and the maximum discharge was recorded as 103,129 m<sup>3</sup>/sec in September, 1998. The discharge reduces in the dry season (November-April) with the minimum discharge recorded as 2037 m<sup>3</sup>/sec in March 2013.

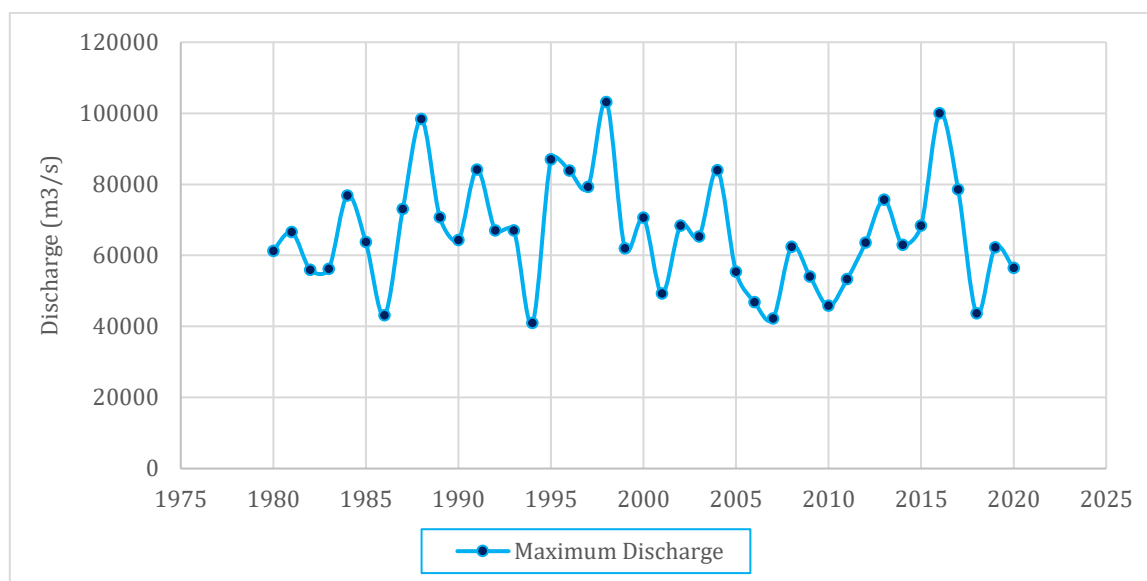


**Figure 2.29: Discharge of the Jamuna River at Bahadurabad Transit Station (1980-2020)**

The annual discharge data were analyzed for Bahadurabad Station for the period 1980 to 2020. The graph shown in Figure 2.30 indicates that the maximum discharge fluctuates from 40,000 to 100,000 m<sup>3</sup>/s. A range of the maximum discharge above 80,000 m<sup>3</sup>/s was recorded in the years 1974, 1988, 1991, 1995, 1996, 1998, 2004 and in 2016 where the maximum discharge of 103,129 m<sup>3</sup>/s was observed in



June, 1998. A slightly increasing trend of discharge has been observed in the river and it might be followed in the future based on past fluctuations as illustrated in the graph.



**Figure 2.30: Annual Maximum Discharge at Bahadurabad Transit (1980-2020)**

### ***Sediment Load/Transport***

Sedimentation is a key problem for the Brahmaputra-Jamuna River. From Assam (India), the Brahmaputra carries a huge load of sediment acquired from the rain-soaked Himalayan tributaries. In fact, with a suspended sediment load of 13 million tons per day during the flood season, the river is considered to be one of the most heavily sediment-laden large rivers in the world (Nishat, 2014). A part of this sediment is fine sand which is heavier than clay and silt and is deposited on the river banks as the floodwaters recede

### ***Flood Frequency Analysis***

Frequency analysis of the maximum water level at Bahadurabad station and Sirajganj station for the various return periods was carried out to assess the corresponding probable flood levels which are shown in Table-2.10. It appears from the analysis that the 50-year return period of flood levels is 20.95 mPWD and 15.27 m PWD at Bahadurabad and Sirajganj stations, respectively.

**Table 2.10: Flood Return Period of Brahmaputra-Jamuna River**

Return Period (Year)	Highest flood level (m PWD) at Bahadurabad station	Highest flood level (m PWD) at Sirajganj station
2	19.66	14.05
5	20.18	14.53
10	20.45	14.80
25	20.75	15.08
50	20.95	15.27
100	21.13	15.43

### ***Water Management Infrastructure***

During the last four to five decades, the Jamuna River has been undergoing strong metamorphosis in width, bank erosion, and braiding intensities. To cope with river related disasters, i.e., erosion and flooding, BWDB has constructed flood control embankments and various other kinds of infrastructure such as dykes, Groynes/spurs, revetments, guide bunds and other protective works along the bank of the Jamuna River. Recent surveys and estimations by CEGIS reveal that, there are 70 km of revetments, 21

Groynes, 3 hard points and a guide bund on the right bank and 24 km of revetments, 4 hard points, and 1 guide bund along the left along of the Jamuna River (Figure 2.31). According to a recent evaluation, the performance and stability of various structures vary in terms of reducing erosion rates and their influences on the overall morphology of the Jamuna River.<sup>5</sup> It was observed that most of the structures experienced considerable damage due to repeated undermining by scour. The main problems were associated with the deep scour due to outflanking and geotechnical stability problems associated with the launched slopes<sup>6</sup>.

A 180-km long flood protection embankment, namely the Brahmaputra Right bank Embankment (BRE), was built with World Bank assistance in early 1960s for flood control purposes covering Pabna-Sirajganj, Bogura and Rangpur Districts.<sup>7</sup> The original BRE had a setback of about 1.50 km from the Brahmaputra's right bank. In the 1970s, the embankment started to fail under sporadic erosion attacks. During 1980s, the frequency of BRE breaches by erosion increased rapidly as longer sections came within the range of rapidly eroding river bends which would cause bank line erosion rates of several hundred meters per year in the early stage of bend formation. To prevent flooding, these breaches were typically closed by local retirements at about 200 m set-backs. As a result of this minimal set-back distance the BRE has been retired several times in many places. At present perhaps only 41 km of the original BRE has remained in place upstream of Jamuna bridge. Currently, many long stretches of BRE are very close to the river bank line. Consequently, security of the area protected by the BRE has been seriously threatened and large areas of land and Cities with large populations, such as Sirajganj, are exposed to flooding. Figure 2.31 shows the major Water Management Infrastructures along the Jamuna River

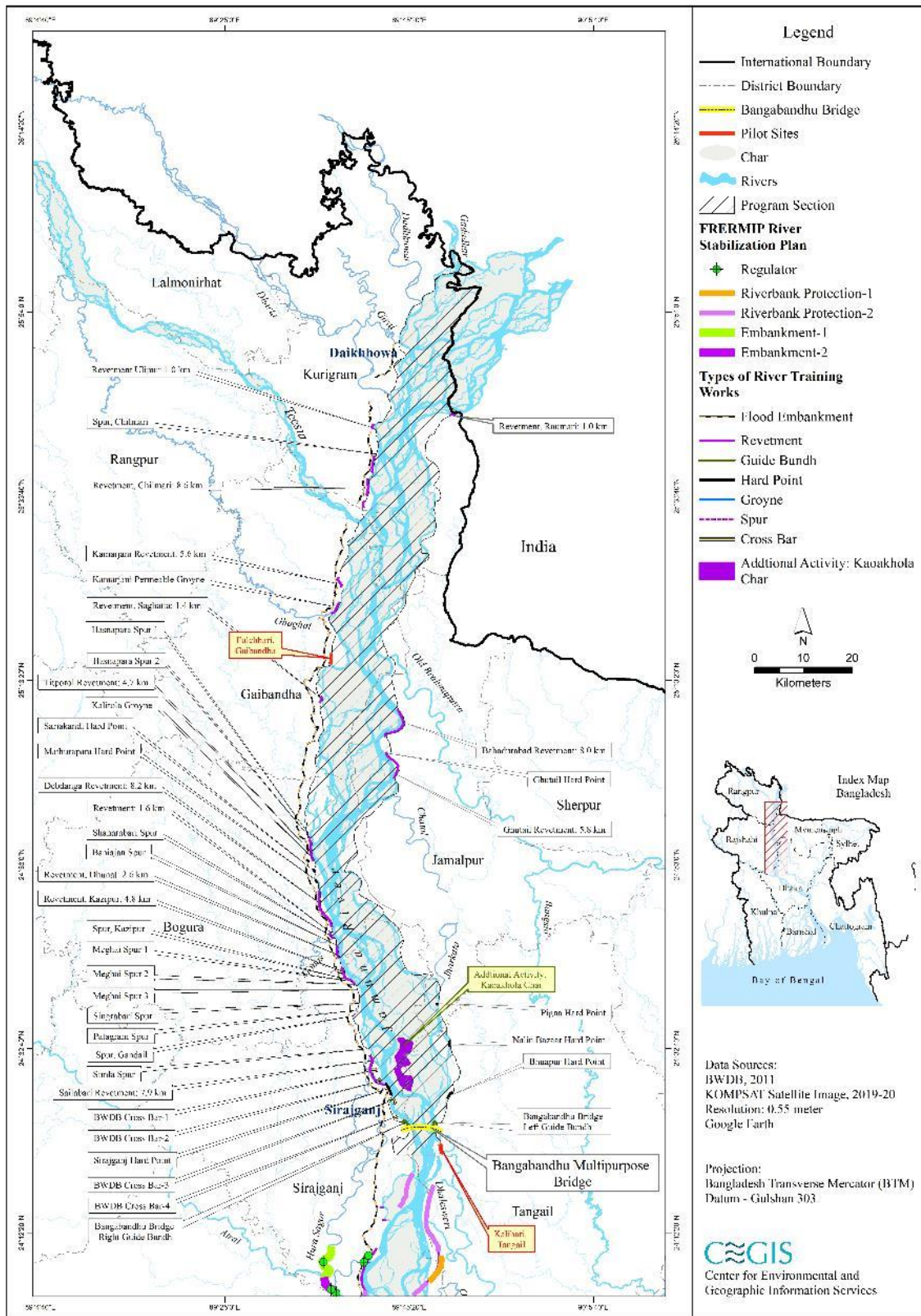
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<sup>5</sup> Sarker, M.H. *et al.* 2011. Riverbank Protection Measures in the Brahmaputra-Jamuna River: Bangladesh Experience (<https://www.researchgate.net/publication/263125674>).

<sup>6</sup> Launched slope means the river bank slope (from the levee to the river bed) to be protected by the erosion protection work (by placing of geo-bag or CC block or gravel)

<sup>7</sup> Zaman, Mohammad *et al.* Flooding and Erosion Risk Management in the Brahmaputra-Jamuna Floodplain: Hope and Despair. In M. Zaman and H. Khatun (eds.) *Development-induced Displacement and Resettlement in Bangladesh: Case Studies and Practices*. New York: Nova Publishers, Second Edition, 2019.





Source: CEGIS

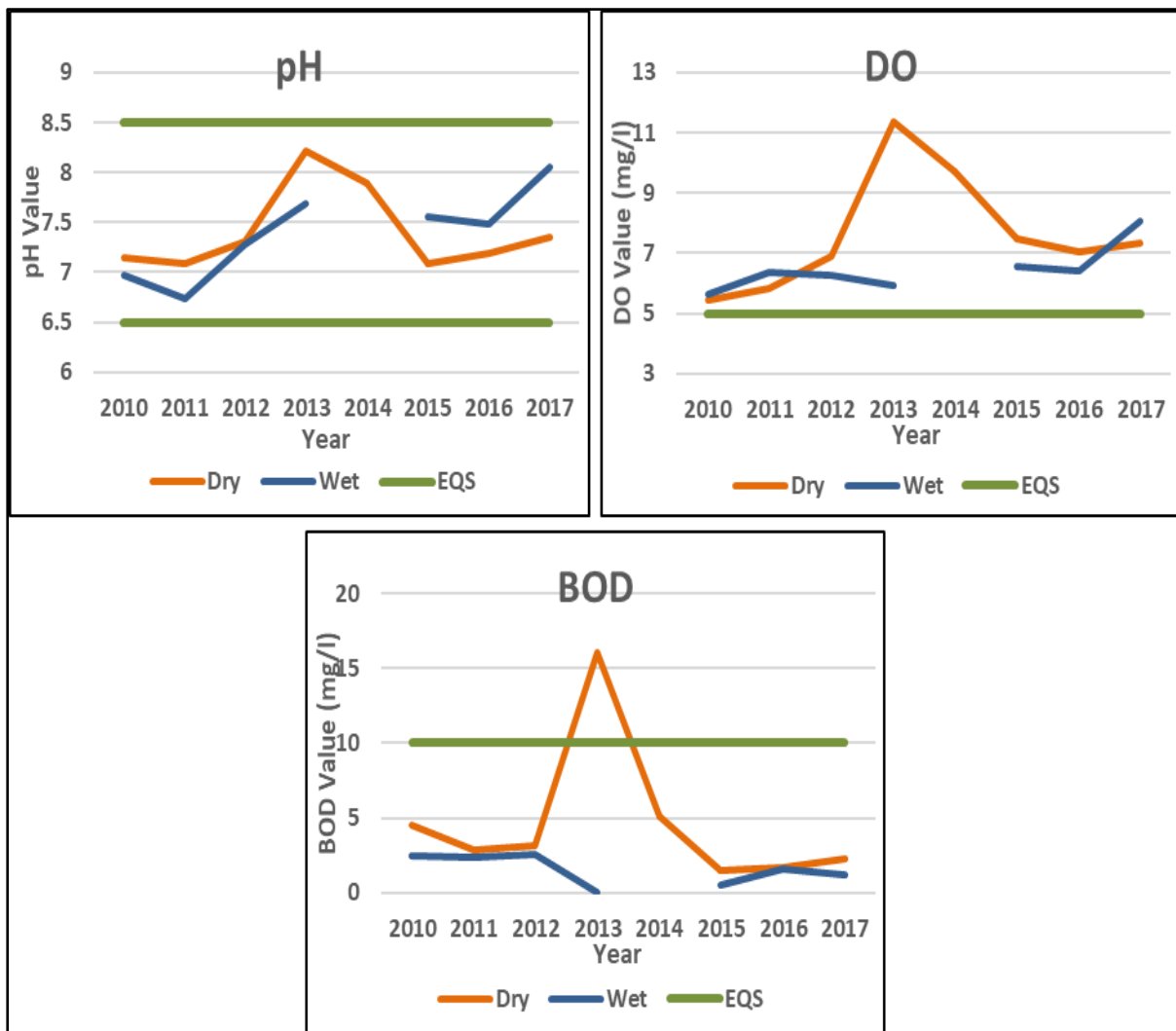
**Figure 2.31: Water Management Infrastructures along the Jamuna River**

**River Water Quality**

Department of Environment monitored the water quality of Jamuna River from the existing monitoring locations. Their monitoring considered only three basic water quality parameters- pH, Dissolved Oxygen

(DO), and Biochemical Oxygen Demand (BOD). Mean values for dry and wet periods were analyzed and compared with the Environmental Quality Standards (EQS) for inland freshwater (usage for fisheries, industries and irrigation) stated in Environmental Conservation Rules, 1997 of Bangladesh. Figure 2.32 provides the trend over 2010 to 2017 of the three parameters. It could be observed that the pH of Jamuna River was within the standard limits, and slightly alkaline. pH values ranged between 6.74 to 8.22. Values of the wet season from 2010 to 2013 were lower than the dry season which could be expected because of low water flow in dry season but, from 2015, pH of wet seasons were higher.

The oxygen condition was also suitable for fisheries. All the values of Dissolved Oxygen (DO), both in wet and dry periods, were above the minimum acceptable limit (5 mg/l). The values ranged from 5.44 mg/l to 11.36 mg/l in dry seasons and 5.62 mg/l to 8.05 mg/l in wet seasons. BOD values ranged between 0 mg/l and 5.1 mg/l, except in the dry season of 2013 (16 mg/l), where the maximum standard limit for fisheries is 6 mg/l.



Source: Water Quality Reports of Department of Environment, 2010 - 2017

**Figure 2.32: Trend of Water Quality of Jamuna-Brahmaputra River over 2010 to 2017**

Anwar (Anwar et al., 2017) analyzed the water quality of Jamuna River at 5 stations located within 10 km upstream from Jamuna Bridge. Along with basic water parameters, the nutrients such as Nitrate ( $\text{NO}_3$ ), Phosphate ( $\text{PO}_4$ ), and Ammonium ( $\text{NH}_4$ ) were also analyzed. pH, DO, BOD, Turbidity, and transparency values were within the standard limits of water quality for fisheries and irrigation purposes. Nitrate values ranged between 0.118 mg/l to 0.186 mg/l, where the EQS of water for fisheries is 5 mg/l. Ammonium values were also within the standard limit (1.5 mg/l) and the values were between 0.16 mg/l

to 0.50 mg/l. However, phosphate values were over the maximum acceptable range (0.5 mg/l). Phosphate values varied between 0.87 mg/l to 1.68 mg/l

Another recent study by CEGIS analyzed several parameters of Jamuna River water from two sampling locations. Table 2.11 shows the monitored values and the EQS as well. All the values were found within the standard limits. For a few parameters such as calcium, sodium, and arsenic standards were not found for water used for fisheries and irrigation. Rather drinking water quality standards are mentioned for comparison and the values were found even lower than the drinking water standards.

**Table 2.11: Water Quality of Jamuna-Brahmaputra River in 2019**

Water Quality Parameter	Unit	Guide Bandh (Bhuapur)	Kakua (Kalihati)	Environmental Quality Standards <sup>8</sup>
Temperature	(°C)	24.9	25	20 – 30
Turbidity	NTU	1.85	8.9	10*
Total Dissolved Solids (TDS)	mg/l	152	101	1000
Electric Conductivity (EC)	µS/cm	312	214	-
Hardness as CaCO <sub>3</sub>	mg/l	590	533	-
Calcium (Ca)	mg/l	12	19	75*
Sodium (Na)	mg/l	16	31	200*
Ammonia (NH <sub>3</sub> )	mg/l	0.44	0.39	0.5*
Nitrate-Nitrogen (NO <sub>3</sub> -N)	mg/l	1.62	0.81	5
Sulphate (SO <sub>4</sub> )	mg/l	2	12	400*
Arsenic (As)	mg/l	0.003	0.002	0.05*
Lead (Pb)	mg/l	0.001	0.001	0.1
Faecal Coliform	Number/100 ml	308	240	-

Source: CEGIS, 2019. *Environmental and Social Impacts Assessment of Technical Assistance Cooperation Project in Connection with Flood Management in Bangladesh*, Yellow River Engineering Consulting Co Ltd.

From the water quality data of the Jamuna-Brahmaputra River, it can be stated that the water quality is good for aquatic life. However, it is difficult to express the overall river condition through a few monitoring points as the braided properties of Jamuna River makes it very wide. This is important because water quality may vary at different locations as well as width-wise due to different causes. The effects on the left bank may be completely different to those on the right bank and water quality may vary significantly. Accumulation of pollution and the effects may be localized and occur within limited areas of influence. In this regard, another study of Bangladesh Water Development Board in 2014 may be relevant. The report states that the overall water quality conditions of Jamuna was within the environmental standards, but the tributary rivers and canals had water quality below the standards (Bangladesh Water Development Board, 2015). Five locations, i) Banaijan canal (at Sirajganj), ii) Ichamoti River (at Sirajganj), iii) DeuliBeel (at Bogura), iv) Bangali River (at Bogura), and v) Ghagot River (at Gaibandha) were considered for the analysis. All the DO and BOD values were lower and higher than the acceptable minimum and maximum values, respectively, except in the Bangali River.

## Water Pollution

### *Causes of Water Pollution*

Water pollution is the condition where water becomes contaminated by the presence of physical, chemical, or biological substances at concentrations that impair water quality and make it harmful for

human and animal consumption or other different purposes (WHO/UNEP, 1997; Schweitzer & Noblet, 2018). Pollution of river water is mostly caused by anthropogenic activities, which include discharge of harmful and waste materials, both in solid and liquid form, with no or minimum safe handling process. Release of pollutants in the open environment on the land or any wetland consequentially transports them into nearby rivers through natural or artificial drainage outlets. As the contaminants get loaded into the river, several mechanisms such as mixing (depending on stream velocity and direction), chemical decay (depending on atomic properties), aeration as a self-purification process of water (depending on water flow and available oxygen) take place. These complex processes continue along the river flow and the quality of water changes as the quality defining substances vary in concentrations.

Changes in river water quality impact the environment and human health. This causal relation can be demonstrated using D-P-S-I-R framework (Driver-Pressure-State-Impact-Response), developed by the European Environment Agency (EEA, 1999). Applying this model to river water pollution to identify the impacts shows that socio-economic drivers such as domestic, industrial and agricultural activities put pressure (release of wastewater and solid waste) on the environment that changes the condition from one state to another (increase of pollutants and change in water quality). Use of contaminated water causes ecological deterioration, human health problems, and other problems. Based on the impacts the responses change, which triggers the driver mechanism again.

Pollution of water can be identified by various indicators such as the concentrations of different substances, sediment quality of the river bed, distribution of pollution sources, and composition of microorganisms. In this study, the existing condition of the Jamuna River, in terms of water quality and the potential sources of water pollution, are analyzed.

### **Pollution Sources**

#### *Industrial pollution*

In Bangladesh, many industries are situated along the banks of rivers for various benefits. The major polluting industries are fertilizer, cement and textile industries. However, unlike the rivers around Dhaka, there are not as many industries located along the banks of the Jamuna River. Also, the water quality data (table 5.11) does not indicate the effects from industrial wastewater.

#### *Domestic pollution*

Domestic pollution depends on the settlement density and the condition of waste management available. The river crosses five districts – Kurigram, Gaibandha, Sirajganj, Bogura, and Jamalpur. Human density around Jamuna River is more than 800 person/km<sup>2</sup>. A large proportion of the wastes generated from those settlements enter the Jamuna River. Chars are important features of the Jamuna River. There are a number of permanent and newly reclaimed Chars with more than 800 km<sup>2</sup> of area where there are settlements already present and are potential for economic developments. These areas do not have any sort of formal waste management system. As a result, solid, liquid and sewage waste generated in these Chars eventually end up in the river. However, the huge amount of river water and the seasonal flood dilute and transport these pollutants towards the downstream and ultimately to the Bay of Bengal.

#### *Agricultural pollution*

Agricultural lands are plentiful adjacent to the Jamuna River. Specially, in the Char areas, agriculture is the main source of occupation among the inhabitants. Chemical fertilizers used in lands can cause water pollution after run-off events. The major fertilizers used in this area are Urea, TSP, MP, Gypsum and, in a few cases, Zn. Urea is widely used for production of Boro rice, potato, maize and other crops. The use of pesticides depends on the degree of pest infestation. Local farmers and the Sub-Assistant Agricultural Officer (SAAO) reported that farmers are using different types (granular/powder and liquid) of pesticides, including: Virthako; Sumithion; Rovral; Basudin; Sumikron; Setara; Dupont Fartera; Cumulus; Thiovit; Ektara; and others (Table 2.12) to prevent pest infestation in rice and non-rice crop fields. The residue or breakdown product of these pesticides might remain in the river water and sediment.

**Table 2.12: Use of Fertilizer and Pesticides in the Agriculture of the Project Influence Area**

Name of crop	Farmers using fertilizer (Kg/ha)						Pesticide used by farmers		
	Compost	Urea	TSP	MP	Gypsum	Zn	No. of application	Liq. (ml/ha) apx.	Gran. (kg/ha)
HYV Aman	-	140	60	40	-	5	1-2	250	5
Lt. Boro	-	120	40	30	-	-	1-2	150	-
HYV Boro	3,000	200	80	60	40	7	2-3	400	7
Wheat	-	160	80	50	-	-	1	200	-
Summer maize	-	180	90	60	-	-	1	250	-
Winter maize	-	180	80	60	-	-	1-2	200	-
Millet (Kawon)	-	80	50	50	-	-	-	-	-
Lentil	-	100	50	20	-	-	-	-	-
Blackgram	-	100	50	20	-	-	-	-	-
Khesheri	-	100	50	20	-	-	-	-	-
Mustard	-	160	90	60	-	-	1-2	200	-
Ground nut	-	180	100	60	-	-	1-2	200	-
Sesame	-	120	100	80	-	-	1-2	200	-
Jute	-	160	80	-	-	-	-	-	-
Potato	1,500	180	90	80	40	-	2—3	400	7
Chili	-	180	100	80	30	-	2—3	400	6
Onion		150	80	100	60	2	1-3	100	-
Coriander		150	80	60	-	-	-	-	-
Summer vegetables	2,000	120	60	40	20	-	2-3	400	5
Winter vegetables	2,500	140	70	50	30		2-3	400	5
Sugarcane	-	200	120	100	-	-	1-2	250	6

Note: The study area includes the piloting sites and their 1km Buffer area

Source: CEGIS estimation based on DAE and field investigation, 2021

### *Plastic pollution*

Plastic pollution can be examined from riverbed sediment. Being a wide and braided river, the water quality from the top surface of river may not precisely provide an indication of pollution and pollution sources. Tsering (Tsering et al., 2021) analyzed the riverbed sediment from 10 sampling locations of Brahmaputra River, including: 3 locations from Arunachal state in India; 5 from Assam in India; 1 from Jamuna River (near Jamuna Bridge); and 1 from Meghna River near the mouth of the Brahmaputra River into the Bay of Bengal. The study revealed a fluctuating trend of microplastic and plastics abundance over the river course where the maximum abundance was at the Jamuna River location. The study also mentioned that there are many industrial activities and domestic use of plastic bags in Assam in recent years with inadequate waste management practices which may flush wastes into Bangladesh in the wet periods. However, this plastic pollution does not have any relation with the SOP1 but for future SOPs a further study can be carried out to explore the pollution status in Bangladesh part of the Jamuna River.

## **Natural Disasters**

### ***Floods***

Flooding is one of the most common and major natural disasters in the Project AOI. The upstream rush of water and excessive rainfalls in the hilly areas causes water levels to rise in the Brahmaputra-Jamuna River resulting in catastrophic floods. Breaching of the existing flood management embankments also causes disastrous floods in the study area. In the last 30 years, the most devastating floods occurred in

1988, 1998, and 2004. During these periods of flooding, almost the entire study area was severely affected and a significant amount of damage occurred. The 1998 flood has the highest published discharge (103,129 m<sup>3</sup>/s) on the Jamuna River, at Bahadurabad, followed by the flood in 1988 (98,300 m<sup>3</sup>/s). Both these catastrophic floods have resulted in extensive inundation for more than a couple of months, not only in the region but also over the country. Table 2.13 provides a picture of the extreme flood events in the Jamuna River area.

**Table 2.13: Major Flood Impacts in the Jamuna River Area**

Year	Flood Duration (Days)	Flooded Area		Flood Level (m)
		Total Flooded area km <sup>2</sup>	Locations along the Jamuna River only	
1988	27	89,970 km <sup>2</sup>	Kurigram, Gaibandha, Bogra, Sherpur, Jamalpur, Sirajganj, Pabna, Tangail, Manikganj	-
1998	66	100,250 km <sup>2</sup>	All the upazilas along the Jamuna	20.37m
2004	16	56,000 km <sup>2</sup>	Kurigram, Gaibandha, Bogra, Sirajganj	20.18 m
2008	10	59250 km <sup>2</sup>	Kurigram, Gaibandha, Bogra, Sirajganj, Pabna	-
2017	20	Not available	Bogra, Brahmanbaria, Gaibandha, Jamalpur, Kurigram, Lalmonirhat, Rangpur, Sirajganj, Tangail	-
2019	28	Not available	Kurigram, Gaibandha, Lalmonirhat, Bogura, Nilphamari, Sirajganj, Jamalpur, Tangail,	-
2020	90	Not available	Jamalpur, Kurigram, Gaibandha, Tangail, Sirajganj, Bogura	-

Source: RMIP report, 2015 and EM-DAT data base

However, flood damage is mostly related to the accidental breaches that occur in the flood embankments along the Jamuna, rather than the severity of the flood event. Since flood embankments (BRE) along the Jamuna have been designed to protect the Project AOI from normal as well as extreme floods, flooding in the flood protected areas is primarily due to breaches in the embankments along the Jamuna which dominate the inundation cycle of the area. Table 2.14 shows the length and number of breaches in the BRE.

**Table 2.14: Length and Number of Breaches in BRE**

Year	Number of Locations	Length of Breaches (m)
1995	1	1,535
1996	2	4,830
1997	0	0
1998	1	876
1999	2	3,216
2000	0	0
2001	0	0
2002	0	0
2003	1	3,690
2004	1	990
2005	2	3,610
2006	2	2,350
2007	3	2,670
2008	1	487
2010	2	2,734
2011	0	0
2012	2	1,558
2013	2	5,250



Source: Fichtner/BWDB. 2014.

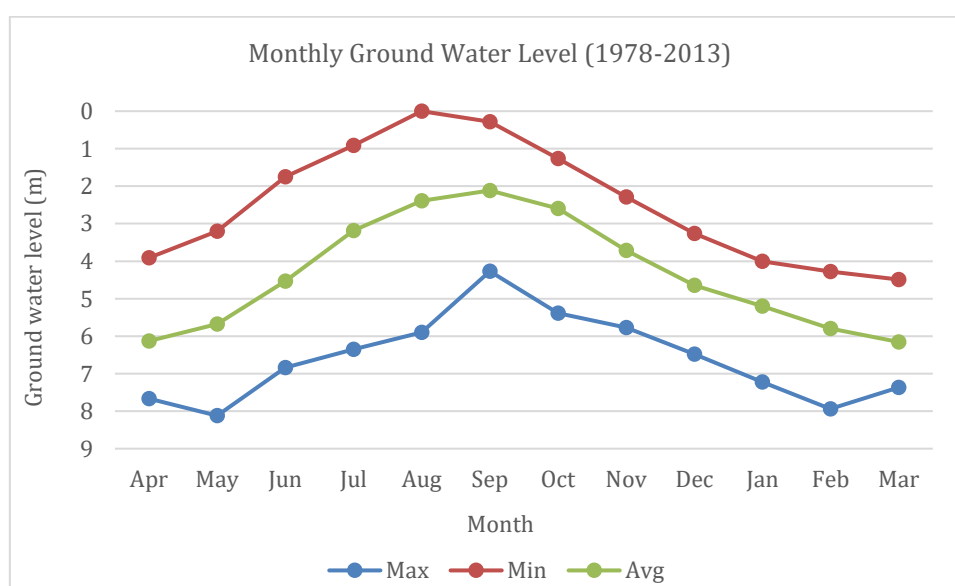
Over the years, due to continuous breaching, the integrity of the BRE is being threatened and large areas of rural and urban areas, such as Sirajganj, are being increasingly exposed to flooding.

### Storms

There is limited evidence of local seasonal storms, popularly known as Nor'westers (Kalbaishakhi). Severe Nor'westers are generally associated with tornadoes. The frequency of Nor'westers usually reaches the maximum in April, whereas it is low in May and minimum in March. Nor'westers and Tornadoes are more frequent in the afternoon. Nor'westers may occur in late February due to the early withdrawal of winter from the Shillong Plateau of India. Bangladesh, including the study area, is witnessing unusual casualties from lightning strikes well ahead of the monsoon, which is in the pre-monsoon season comprised of the months of March through May. These lightning strikes are generally related to the Nor'westers storm. Considering the massive death toll due to lightning, in 2016, the Government of Bangladesh has declared it a natural disaster. A study conducted by save the Society and Thunderstorm Awareness Forum (SSTAF) shows that at least 177 people were killed and 47 others injured in lightning strikes in the country in four months from March to June in 2021. Among the deceased, 149 were male and 28 females. Most of the victims of lightning strikes were farmers who died while working in their fields. The study also reveals that Sirajganj is the lightning hotspot and eighteen people died in the district in June 2021. Conversely, hailstorms are not a common phenomenon in the study area but may significantly damage crops when they occur. Thunderstorms, which produce lightning, also occur can damage buildings, ignite fires and kill people by direct contact. According to the Ministry of Disaster Management and Relief, 2,164 people died in lightning strikes in the country from 2011 to 2020. At least 216 people die every year on average in lightning strikes, more than by floods cyclones and other natural calamities.

### Groundwater

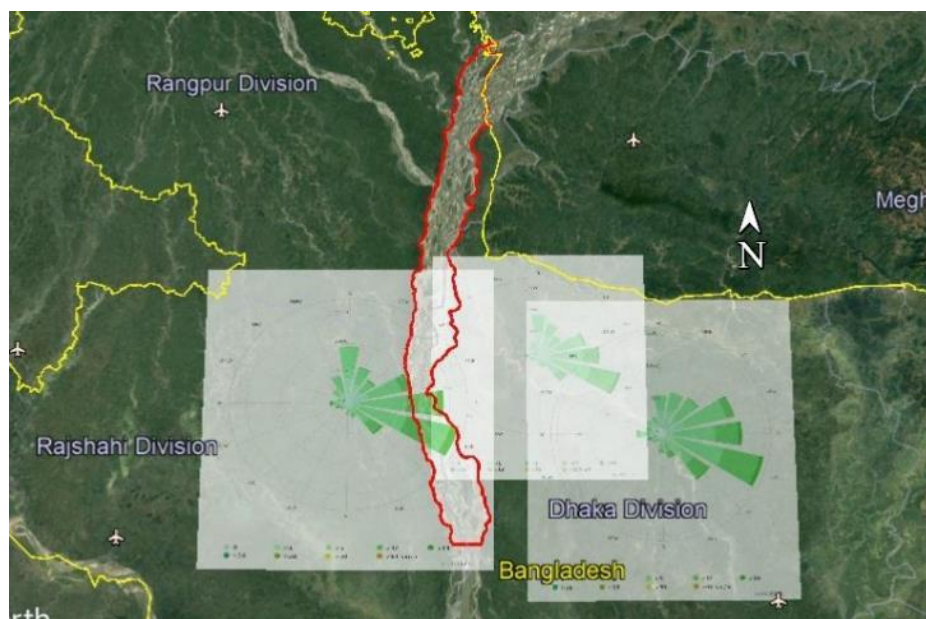
The groundwater data of BWDB observation well at Sirajganj station was collected from NWRD-CEGIS database archives for the period 1978 to 2013. The monthly maximum, average and minimum depth of groundwater from the ground surface are shown in **Figure 2.33**. It is observed from the analysis that the depth to groundwater from the ground surface decreases during the dry season, whereas the water table rises in the monsoon due to recharge by rain water and infiltration of peripheral river water. It is found that for Sirajganj station, the monthly maximum groundwater depth is 8.12 m which occurred in the month of May and minimum groundwater depth is 0 m which occurred in the month of August.



Source: NWRD, BWDB well station SIR001

**Figure 2.33: Depth of Groundwater at Sirajganj Station****Ambient Air Quality and Noise**

Ambient quality of air is mainly characterized by the presence of concentration of criteria pollutants, i.e., Particulate Matter (PM<sub>10</sub> and PM<sub>2.5</sub>), NO<sub>x</sub>, CO, SO<sub>2</sub> and Ozone (O<sub>3</sub>) in the lower atmosphere. The Department of Environment (DoE) has set national ambient air quality standards for these pollutants in ECR, 1997 and subsequent amendment 2005 to protect human health and ecosystems. The proposed project is located along the Brahmaputra-Jamuna River where very few industries are recorded, except a few earthen/sand related businesses. However, the major sources of air pollution in the project airshed come from nearby municipalities, towns or scattered industries and transportation sectors. Figure 2.34 indicates the predominant wind directions relative to the Project AOI.

**Figure 2.34: The Location of the Proposed Project along with Windrose Diagram**

According to a study conducted by BWDB (BWDB, 2015), air quality in the project area was recorded in 2014. Ambient air quality monitoring was conducted at five locations (Jumarbari, Saghata, Gaibandha, Sariakandi Hard Point, and Bogra) for 8hr continuous monitoring. **Table 2.15** shows the air quality monitoring data of the Project AOI along with national and international standards.

**Table 2.15: Secondary Data of Air Quality in the EBAA**

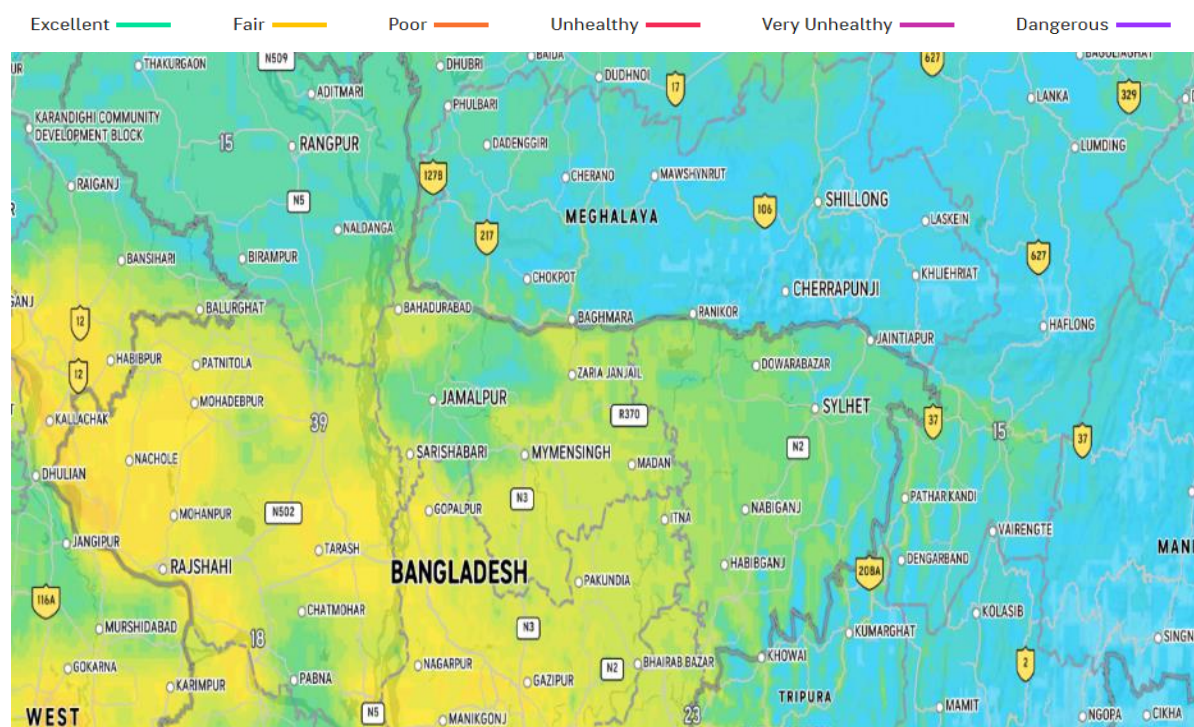
Sampling Location	Air Pollutants ( $\mu\text{g}/\text{m}^3$ )		
	SPM (8hr)	NO <sub>x</sub> (8hr)	SO <sub>2</sub> (8hr)
Jumarbari (market place), Saghata, Gaibandha	811	8.39	ND
Bharatkali, Saghata, Gaibandha	260	6.54	ND
Baoitara, Saidabad, Sirajganj	593	11.9	ND
Ratankandi, Ratankandi, Sirajganj	298	7.14	ND
Singrabari, Kajipur, Sirajganj	261	6.35	ND
SariakandiHP, Sariakandi, Bogra	1,188	10.56	ND
Anantapur, Ulipur, Kurigram	375	7.56	ND
National Standard (ECR, 2005)	200 (8hr)	100 (Annual)	365 (24hr)
International Standard (IFC, 2007)	-	200 (1hr)	20 (24hr)

Note: ND-Not Detected

Source: BWDB, 2015

At that time, the main sources of pollution in Jumarbari (market place), Saghata, Gaibandha, Sariakandi, and Bogra include local vehicles, especially trucks, *karimons* and *nasimons* (locally manufactured small three-wheelers). However, suspended particulate matter exceeds the national standard limit. Therefore, human health or ecosystems are potentially vulnerable due to dust dispersion in the EBAA.

Air quality of the study area changes as the seasons change. During the monsoon, ambient air quality of the study area is relatively fair to excellent in the study area. **Figure 5.35** shows the Air quality index of the overall study area.



Source: (Rajshahi Division Air Quality Index (AQI) and Bangladesh Air Pollution | AirVisual, 2021)

**Figure 2.35: Air Quality Indexing of the Proposed Project Airshed**

### Noise

The project area is located at the northern part of Bangladesh. Usually, the project area is calm and quiet as there are no noticeable noise generating sources. The main sources of local noise include rural vehicles, river vessels, diesel engine-based pumps, trucks and commercial activities. Based on a study conducted by BWDB in 2015 within the project area, the ambient noise levels are presented in **Table 5.16**.

**Table 2.16: Noise Levels in the EBAA**

Sampling Location	Classification of the Area as per ECR, 2006	Time of Noise Monitoring	Noise level, Leq (dBA)	ECR, 2006 Leq (dBA)	IFC 2007 Leq (dBA)
Jumarbari (market place), Saghata, Gaibandha	Commercial and mixed	Day Time	34-36	60	70
		Night Time	30-32	50	70
Bharatkali, Saghata, Gaibandha	Residential	Day Time	34-38	55	55
		Night Time	31-33	45	45
Baoitara, Saidabad, Sirajganj	Commercial and mixed	Day Time	36-38	60	70

Sampling Location	Classification of the Area as per ECR, 2006	Time of Noise Monitoring	Noise level, Leq (dBA)	ECR, 2006 Leq (dBA)	IFC 2007Leq (dBA)
		Night Time	32-34	50	70
Ratankandi, Ratankandi, Sirajganj	Commercial and mixed	Day Time	34-38	60	70
		Night Time	30-32	50	70
Singrabari, Kajipur, Sirajganj	Residential and rural	Day Time	36-38	55	55
		Night Time	31-34	45	45
SariakandiHP,Sariakandi, Bogra	Commercial and mixed	Day Time	46-51	60	70
		Night Time	46-48	50	70
Anantapur, Ulipur, Kurigram	Commercial and mixed	Day Time	34-37	60	70
		Night Time	30-33	50	70

Average noise levels were recorded as complying with both national and international standards. The rural commercial sites were denoted as mixed areas for fixing the standard limit. However, sudden peak noise or impulse noise of vehicles and loud speaker uses in festivals are the major noise sources in the study area.

### Land Resources

This section has been prepared based on the land use analysis of the overall Program AOI and Project AOI.

### Soil Characteristics

Thirty agro-ecological zones, 88 sub-regions and 536 units have been identified by adding successive layers of information on the physical environment which are relevant for land use and assessing agricultural potential in Bangladesh (FAO/UNDP, 1988 and BARC, 2018). In the study area, there are three Agro-Ecological Zones (AEZs) and river areas have been found. The distribution of AEZs of the Jamuna River Economic corridor study area are presented in **Table 5.17** and shown **Figure 5.36**.

**Table 2.17: Extent of AEZ in the Program AOI**

AEZs Name and Number	Area(ha)	Percentage (%)
Karatoya-Bangali Floodplain (AEZ-4)	22,592	11.1
Active Brahmaputra-Jamuna Floodplain (AEZ-7)	160,591	78.9
Young Brahmaputra and Jamuna Floodplain (AEZ-8)	9,363	4.6
Old Brahmaputra Floodplain (AEZ-9)	10,380	5.1
Low Ganges River Floodplain (AEZ-12)	611	0.3
<b>Ground Total</b>	<b>203,537</b>	<b>100</b>



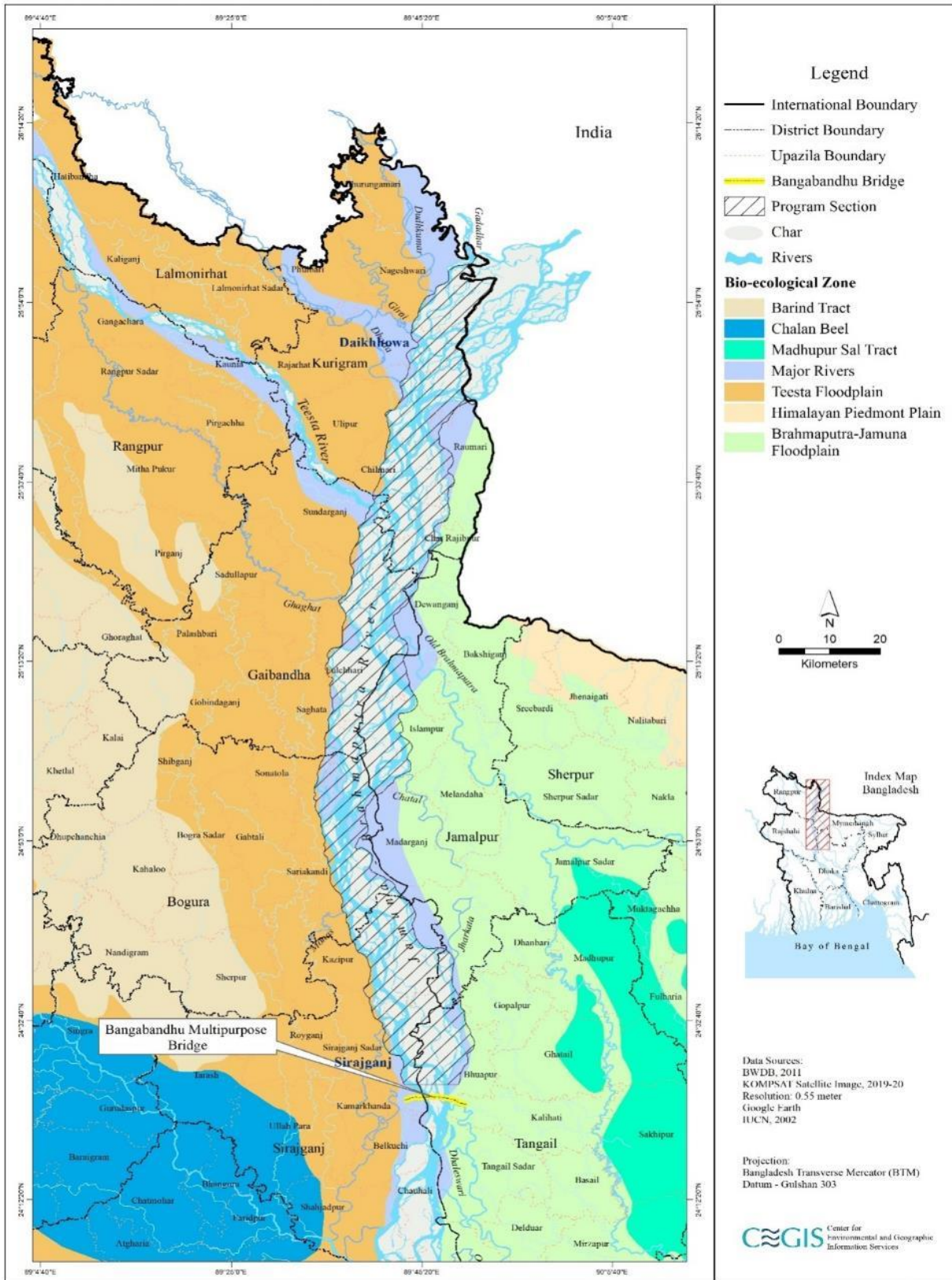


Figure 2.36: AEZs of the Jamuna River Economic Corridor Program Area

### Land Use

Land use of the Program AOI were derived by analyzing Landsat Satellite Images dated 2019. In the study area, the image shows that the major land use category is agricultural land (27%) of the gross area. The rest (73%) of the areas are comprised of baor, built up non-linear, Herb Dominated Area (Terrestrial), Orchards & Other Plantations (Trees), Perennial Beels, Ponds, Rivers and Khals, Rural Settlement and Sand Bar. Detailed land use of the study area is presented in **Table 5.18** and **Figure 5.37**.

**Table 2.18: Existing Land Use of the Program AOI**

Land use class	Area(ha)	% of gross area
Baor	318	0.16
Built-up Non-Linear	30	0.02
Crop Land	66,887	32.86
Herb Dominated Area (Terrestrial)	5,255	2.58
Orchards & Other Plantations (Trees)	237	0.12
Perennial Beels	11	0.005
Ponds	1	0.0004
Rivers and Khals	52,169	25.63
Rural Settlement	7,057	3.47
Sand Bar	71,572	35.16
<b>Grand Total</b>	<b>203,537</b>	<b>100.0</b>

Source: LANDSAT Satellite Image, 2019

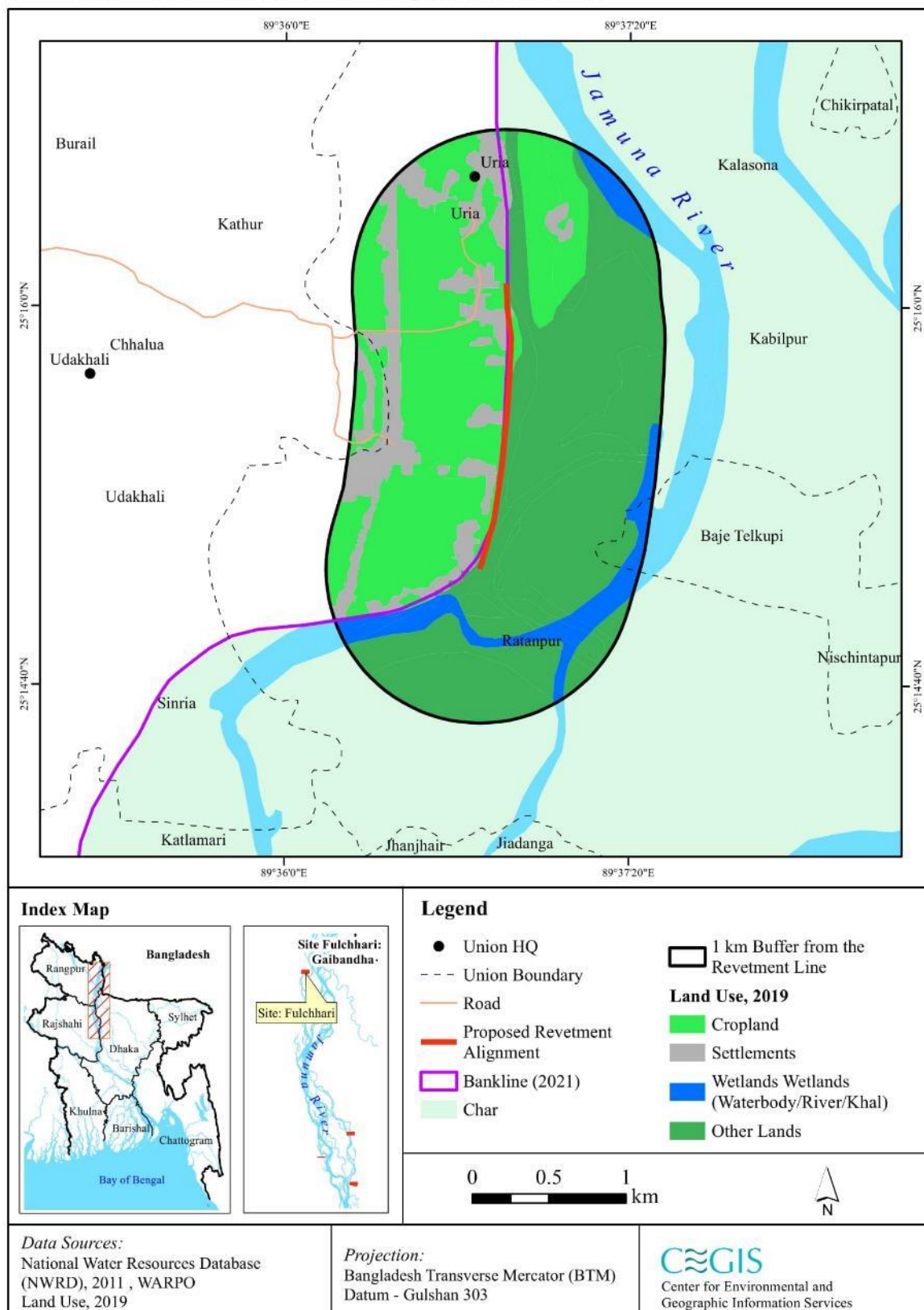
The land use at two Project AOI are presented in Figures 5.37 and 5.38 which shows that the crop lands varies from 21% to 42% and settlement varies from 13 % to 29%.

### Land Type

Land type classification is based on depth of inundation during the monsoon season due to normal Flooding on agriculture land. In terms of depth of flooding, the five classes of land type are recognized by the Soil Resource Development Institute (SRDI), 1988. According to the table, the study area is dominated by medium high land 33% followed by high land 29%. Detailed land types of the Project AOI are presented in **Table 5.19**.



**Land Use: Site Fulchhari, Fulchhari Upazila, Gaibandha**



**Figure 2.37: Land Use Map of the Piloting Site at Fulchhari and its 1km Buffer Area**

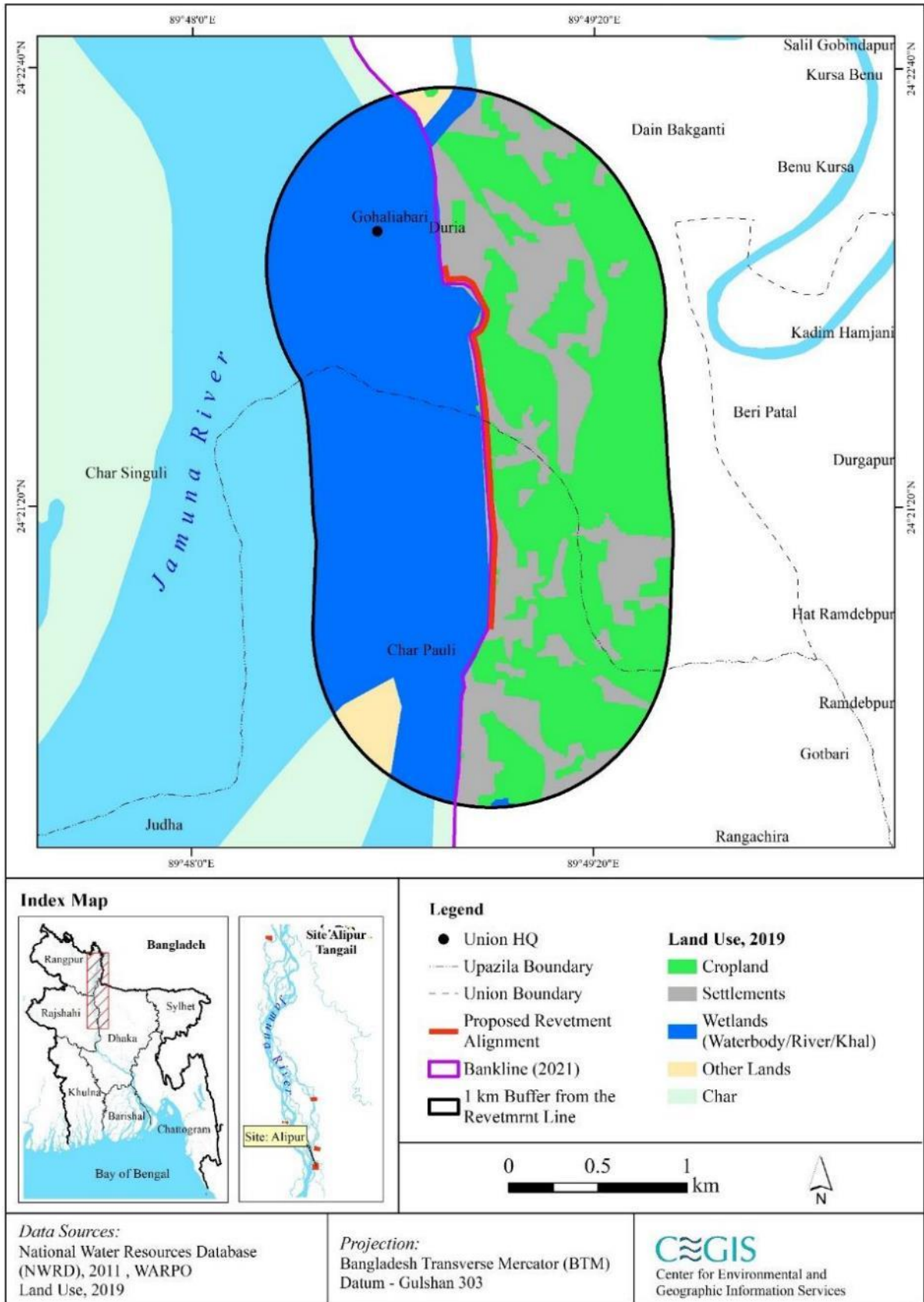


Figure 2.38: Land Use Map of the Piloting Site at Alipur, Kalihati site and its 1km Buffer Area

**Table 2.19: Detailed Land Type of the Program AOI and Project AOI**

Land Type	Program AOI (%of NCA)	Fulchari Project AOI (% NCA)	Kalihati Project AOI
Highland(F <sub>0</sub> )	3.3	0	0.0
Medium Highland (F <sub>1</sub> )	33.0	38.07624	7.0
Medium Highland(F <sub>1</sub> ) /Medium Lowland(F <sub>2</sub> )	0.2	61.92376	36.7
Medium Lowland(F <sub>2</sub> )	46.0	0	56.2
Lowland(F <sub>3</sub> )	17.5	0	0.0
<b>Grand Total</b>	<b>100</b>	<b>100</b>	<b>100.0</b>

Source: CEGIS estimation from SRDI, 1995

### Soil Texture

Soil texture is the relative proportions of sand, silt and clay. It is very important for soil Characteristics that guide crop selection, crop production and also field management. The dominated soil texture of the lands in the program area is loam (64.7%), followed by sand (13.8%), clay loam (13.2%), clay (4.2%), loam/sandy loam (2.3%), sandy loam (1.0%), and Sandy Loam/Clay Loam/Loam (0.8%). Detailed distribution of soil texture is presented in **Table 5.20**. Similarly, loam, sandy loam is dominating at the piloting sites as well (Table 5.20).

**Table 2.20: Soil Texture of the Program AOI and Project AOI**

Soil Texture	Program AOI (%of NCA)	Fulchari Project AOI (% NCA)
Clay	4.2	-
Clay Loam	13.2	-
Loam	64.7	34
Loam/Sandy Loam	2.3	66
Sand	13.8	-
Sandy Loam	1.0	<b>100</b>
Sandy Loam/Clay Loam/Loam	0.8	-
<b>Grand Total</b>	<b>100.0</b>	-

Source: CEGIS estimation from SRDI, 1995

### Irrigation

Both ground and surface water are the main source of irrigation. Deep Tube Wells, Shallow Tube Wells (STWs) and Low Lift Pumps (LLPs) are used for irrigation in the study area. The irrigation is being provided by withdrawal of groundwater which declines due to over exploitation during dry season. According to officials of local SAAO of DAE, crops are grown under rain-fed condition during Kharif-I and Kharif-II season. But supplementary irrigation is also provided to the fields of Potato, Wheat, Mustard, Maize, Chili, Onion, winter vegetables and Sugarcane cultivation. The cost of irrigation is high in the program and project influencing area. The local Upazila Agricultural Officer (UAO) reported that the irrigation cost increases during dry season due to lowering of groundwater Table. Detailed irrigation information is presented in **Table 5.21**.

**Table 2.21: Irrigated Area by Crop in the Project Influence Area**

Crop name	Irrigated Area		Cost (BDT/ha)		
	GW (% of NCA)	SW (% of NCA)	GW		SW
			DTW	STW	LLP
HYV Boro	95	5	10,000-12,000	14,000-14,500	9,500-10,000
Potato	100	-	2,000-2,200	2,000-2,500	1,800-2,000
Winter maize	100	-	3,000-3,500	5,000-5,500	2,000-2,200
Wheat	75	25	2,000-2,500	2,500-3,000	1,800-2,000
Winter vegetables	70	30	2,000-2,500	6,000-6,500	2,000-2,500
Mustard	80	20	2,200-2,500	2,200-2,500	1,800-2,000
Sugarcane	80	20	2,000-2,500	4,000-4,500	1,800-2,000
Chili	100	-	2,000-2,500	2,000-2,500	1,200-1,500
Onion	80	20	1,500-2,000	1,800-2,000	1,200-1,500

Source: CEGIS estimation based on DAE and field investigation, 2021

## **Annex 6.1: Biodiversity Baseline Report**





# Executive Summary

This baseline biodiversity assessment is a part of the preparation of ESIA for Jamuna River Sustainable Management Program, Project 1. The Biodiversity Area of Analysis (BAA) was defined covering the Project Area of Influence (AOI) of both sites, control area, possible hydrological and noise impacted area (directly and indirectly), etc. and was extended following the natural and physical boundary covering the river area between the banks, floodplains and charlands. The BAA included (i) the riverine consisting river and alluvial area, mudflats, sand-bars and submersible chars, (i) floodplain zone consisting terrestrial area, attached chars (river island), Croplands, grasslands, homestead vegetation, planted forest area, freshwater, sand-mining & storage area, and built-up area are common landcover and land use occurring in these habitats.

The river reaches to be intervened by the project is a part of the Jamuna-Brahmaputra IBA and a government declared fish sanctuary (fishing prohibited area). There is a national park (Madhupur National Park) at 32.7 km away and two Dolphin sanctuaries at 35.8 km and 36.8 km away from the Project site.

Newly emerged charland (Sandbar), mudflats, embayment area, and the river area are the natural habitats within the BAA. The floodplain and old charland are dominated by modified habitats like agricultural lands, settlements and developed areas. The river supports a huge diversity of fishes, amphibians, reptiles, waterbirds, mammals along with several invertebrates and floral species. The river and adjacent areas are significant for animals in several aspects such as important fishery ground for some commercially important fish, breeding ground for some threatened reptiles (e.g., Gharial), movement route for birds and large aquatic mammals (e.g., Dolphin). Different types of ecosystems and diversity in habitats allow supporting these species and produce numerous services.

Following are the key biodiversity features of the area:

- A total of 76 floral species were identified in the area, among them 40 species are trees, 33 herbs and shrubs, and 3 bamboo species
- A total of 332 vertebrate species were identified which included 25 species of mammals, 223 birds, 36 reptiles, 15 amphibians and 33 are fishes. A total of 25 species of mammal and a total of 223 species of birds are known to occur in the BAA. Around 36 number reptile, 15 species of amphibian are also known to occur here.
- The IBAT species list and national sources indicate a total of 38 CR and EN species (including 2 mammals, 13 reptiles, 9 birds, 13 fish and a floral species) within the 50buffer area of the Program section. Among them 27 are likely to present in the BAA which included Gangetic Dolphin, Gharial, fishing Cat, Three-striped Roofed Turtle, Black Softshell Turtle, Pallas's Fish-eagle, Black-bellied Tern, Indian Skimmer, and several fish species.
- The critical habitat assessment found Gharial, Ganges River Dolphin, fishingcat, and two other fishes (*Bagariusbagarius* and *Chitalachitala*) are triggering critical habitat criteria.



# 1. Introduction

## 1.1 Study Area

The study areas for biodiversity assessment were defined as the Biodiversity Area of Analysis (BAA) containing two major areas (BAA1 and BAA2) which is delineated through combining the Project AOI of both Pilot Site Kaoakola, Alipur and Fulchari extended upstream and downstream to include indirect impact area and up to the floodplain of the opposite bank, and including a control area. The BAA1 covered site 1 and 2 where BAA 2 site 3. The BAA covers a total area of 63715 ha. The following criteria were considered while delineating the BAA:

- Project Footprint (around 52 ha) and Project Influence Area (both direct and indirect)
- Impact of Noise from the Piling (piling will be the major activities)
- River area covering alluvial corridor, floodplain, and chars between the banks etc.
- Physical boundary (e.g., the countryside limit of the floodplain of the left-bank was considered up to an existing road)
- Possible hydrological Impacts of the intervention
- Control area (upstream area, downstream area and the habitats along the opposite bank of the river which are beyond the limit of project AOI)

The BAA1 extended to 8.31 km upstream from the proposed revetment of pilot site, and 13.71 km downstream of the Tangail Pilot site (covering the offtake area of Dhaleswari river) where BAA2 extended to 5.53 km upstream from the proposed revetment of pilot site, and 13.81 km downstream of the Fulchari Pilot site. The direct footprint area was along the left bank, but the BAA 1 extended up to the right bank and its floodplain. In BAA2 the direct footprint area was also with the left bank but only covered the minor charland not the main channel.

The BAA included: (i) the riverine consisting river and alluvial area, mudflats, sand-bars and submersible chars; and (ii) floodplain zone consisting of terrestrial area, attached chars (river island), Croplands, grasslands, homestead vegetation, planted forest area, freshwater, sand-mining & storage area, and built-up area are common landcover and land use occurring in these habitats.

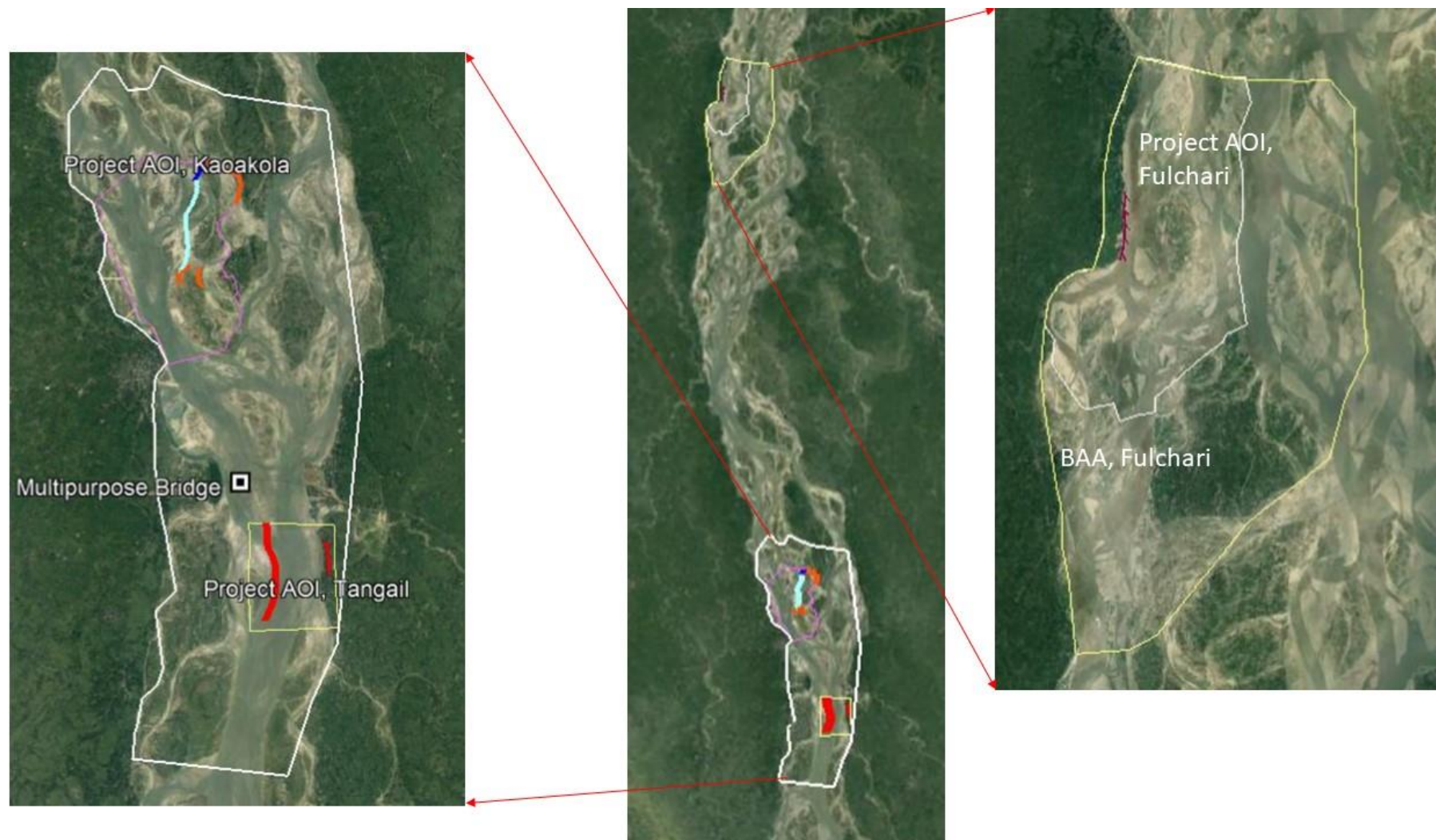


Figure 1.1: Map of the Study Area for Biodiversity Assessment

## **1.2 General Ecosystem Types and Features in the BAA**

The BAA of the project has three broad ecosystem types: Freshwater, Terrestrial and Charland (River Island) ecosystems.

### **1.2.1 Freshwater Ecosystems**

Freshwater ecosystems in the BAA comprised the river and partly the floodplain ecosystems (annual flooded area). Apart from the river ecosystem the freshwater ecosystem also includes Lentic habitats like ditches, seeps, ponds, seasonal pools, and basin marshes in the BAA.

### **1.2.2 Terrestrial Ecosystems**

The terrestrial ecosystem in the BAA is dynamic and is influenced by the water flow of the Brahmaputra-Jamuna River System. It is dominated by the agricultural landscape and homestead areas. Strong bond exists between the terrestrial and aquatic ecosystems through the food chain and the exchange of energy. The terrestrial ecosystems are often shaped and controlled by the flow of the river, and are sometimes engulfed by riverbank erosion.

In the terrestrial ecosystems throughout the BAA, the use of crop land increases by limiting the canopy cover. It indicates that the canopy cover areas gradually convert into crop cover, because crop cover is seen in the floodplains around human settlements.

### **1.2.3 Charland Ecosystems**

Charlands are newly accreted lands from river deposits. The Jamuna main channel is constantly shifting, eroding and depositing large areas of new charland in each flooding season. If new charlands do not erode quickly, they are colonized by pioneer vegetation (especially *Phragmites karka*, *Saccharum spontaneum* and *Ipomoea* sp.). Dense growth of grasses starts anchoring the loose deposits and accelerates further silt deposition. Subsequently, either natural succession (by other grasses, bushes and finally trees) or human activities result in development of new habitats. The ecological importance of these charlands is considerable as they provide settlement and livelihoods. Given the shortage of land in Bangladesh, stabilized charlands are quickly occupied by farmers and fishermen, who profit from the natural richness of these new and fertile lands.

## **1.3 Ecosystem Types and Features in the Project AOI**

### **1.3.1 Fulchari Project AOI**

Major types of ecosystem of Fulchari AOI consists of mudflat, sand, char and, grassland, cultivated land, wetlands, and homestead area (Figure 1.2). Numerous Charlands were identified during the preliminary survey. Most of the charlands are bare land and in some cases grassland. Different types of short and long grasses were present in these grasslands. Sandmining is a major threat to the aquatic ecosystem here. Homestead forest harbor different types of native and planted tree species which is the perfect habitat for number of wildlife species.

Aquatic ecosystem consists of different types of seasonal and permanent water bodies. Beside the Jamuna River, there are a few small rivers and canals. Ecosystem of these rivers and canals are different from the Jamuna River. The charlands and mudflats occurring within the project AOI are very rich with biodiversity, comprising aquatic species and many terrestrial animals. These habitats are connected with the Jamuna River system. People use the islands and the river banks for cultivation purposes. This human modified ecosystem also harbors many species.

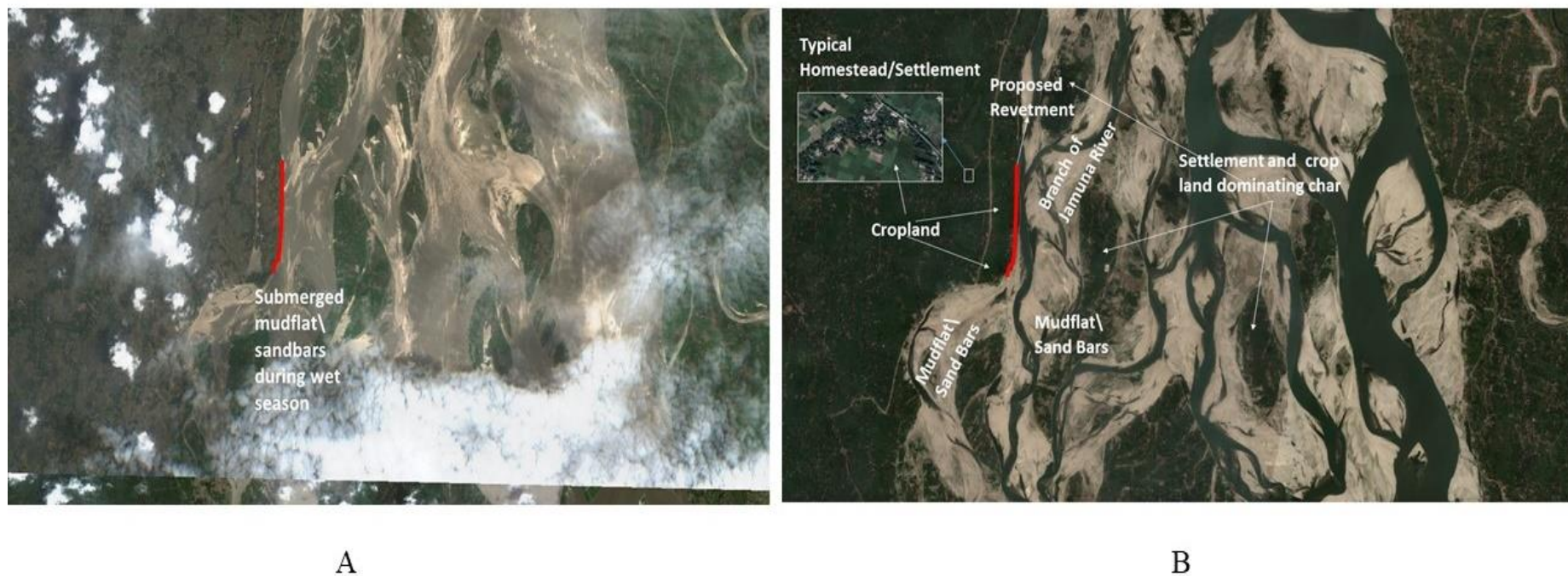


Figure 1.2: Ecosystem Types and Features around the Fulchari Project AOI in wet season (Fig. 1.2 A), dry season (Fig. 1.2 B).



**1.3.2 Alipur- Kalihati Project AOI**

The area is dynamic and vulnerable since it faces severe bank erosion every year. The terrestrial landscape (Figure 1.3) is dominated by sandy land, agricultural land, grassland and human settlement. The aquatic ecosystem in the area includes the riparian waterbody, numerous ponds and the Jamuna and Dhaleshwari River. The waterbody supports numerous native fish and aquatic species in the area. Sometimes, invasive fish species like Suckermouth Catfish are found. Sandmining is considered as the principal threat for erosion and it causes the area to be flooded during the monsoon.

Two invasive plant genera (*Acacia* spp. and *Eucalyptus* spp.) dominate the terrestrial ecosystem, which is periodically flooded during the monsoon. The Indian Flying Fox is the most frequent mammal in the area, and it prefers to inhabit tall trees along the river margins. A wide range of wild animals, including the Jungle Cat, Small Indian Mongoose, and Small Indian Civet, use human settlements and agricultural grounds. The area's grassland and fallow ground are important habitats for small vertebrates and invertebrates. Migratory birds use the seasonal charland as a rest stop, and resident waterbird species use it as a regular habitat. Charlands are used for agricultural practices by the local farmers. Ganges River Dolphin is frequently sighted in the Jamuna River along bankline proposed to be protected.



A

B

Figure 1.3: Ecosystem Types and Features near Alipur Project AO in wet season (Fig. 1.3 A), dry season (Fig. 1.3 B).

## 1.4 Data Sources and Field Survey

This baseline has been prepared on the basis of preliminary survey in the study area and the available secondary data. Besides, the earlier assessment on the Jamuna River, especially the Biodiversity Assessment Report of the IUCN prepared during the RMIP project which was a predecessor to this JRSMP. To fill the gap of the secondary data, preliminary surveys were conducted in the project influence area.

During the field survey, consultations with the location peoples were conducted in the villages near the project sites.

### 1.4.1 Biodiversity Assessment Survey Methods

Five vertebrate classes (mammals, birds, reptiles, amphibians and fish) and vascular plants were selected for the assessment of biodiversity. In addition, one terrestrial invertebrate taxon (butterfly) was included due to their value as indicators of ecosystem health. The methodology included: (i) desktop review' (ii) secondary data analysis; (iii) field survey; (iv) consultation with relevant stakeholders and aquatic and terrestrial biodiversity specialist; and (vi) result analyses.

#### Specialists consulted for Biodiversity Assessment

- Andrew Cauldwell, Ecologist
- Mr Zahir Uddin Ahmed, Ex-Deputy Chief Conservator of Forest
- Dr Firoj Jaman, Professor, Wildlife Biodiversity Lab, Dept of Zoology, Dhaka University
- Dr Md Ruknul Ferdous, Water Resources and Environmental Expert, Royal HaskoningDHV, NL
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- MrRoland Nathan Mondal, Fisheries Specialist, Agriculture and Fisheries Division, CEGID

#### World Bank Team

- Joe B. Tuyor, Lead Environmental Specialist, Regional Standards Coordinator, South Asia Region

#### *Desk review*

The desk review was done by reviewing previous published research articles, project reports, Bangladesh red book and encyclopaedia of animals and plants, news articles, and website browsing.

#### *Field survey methods*

It was not feasible to survey the entire Jamuna and only selected areas within the study area were assessed. The following site selection procedures were followed:

- Selection of pilot sites was random and considered the macro and micro habitats within the study area,
- Sites were representative of the different habitats and well demarcated,
- Ecologically sensitive sites were preferred,
- Confluence of major river and their tributaries were selected where possible,
- Important feeding ground for animals (Dolphins) were selected,
- Migratory routes of nationally important and threatened wild fauna,
- Sites supporting a diversity of wetland plants.

Collection of data was based on the direct observation (e.g., opportunistic survey and transect walks) in the field. However, some faunal species are elusive or occasionally present and data was supplemented

with observations of their evidence of presence (such as foot print, scats, burrows, nests, animal holes, carves on the trees or fruits made by animal, or whatever evidence was available).

In addition, informal meetings and Focus Group Discussions with local residents were undertaken to ascertain the existence and assess the status of prominent species such as turtle, gharial young, amphibians, snakes, monitor lizards, otters, dolphins, etc. Wildlife survey manuals and Photographs were showed to the local people in order to identify unobserved bird species occur in the study sites.

## 2 Legally Protected and Internationally Recognized Areas of High Biodiversity Value in and around the BAA

### 2.1 Defining the Protected Areas as per ESS6

The IBAT data lists a number of legally protected and internationally recognized sites with high biodiversity values. Table 2.1 presents the IBAT list and screening results. Figure 2.1 identifies the locations of legally protected areas and KBA around the BAA.

**Figure 2.1: Legally Protected and Internationally Recognized Area of High Biodiversity Value in and around the BAA**

Area Name	Distance from BAA (From nearest site)	Status and Designation	IUCN Category	Alignment with ESS 6	Screening Results
SilandaNagdemra Dolphin Sanctuary	35.8 km	Legally protected area by GoB, listed in the IBAT	VI	Qualifies as legally protected area	Relevant to the project site, included in the Biodiversity Risk Assessment
NagarbariMohonganj Dolphin Sanctuary	36.8 km				
Madhupur National Park Key Biodiversity Area	32.7 km	Legally protected area by GoB, and Important Bird Area, listed in the IBAT	IV	Qualifies as legally protected area	Terrestrial National Park not connected with the Jamuna River hydrology. Not relevant to the proposed intervention and excluded from the risk assessment
Jamuna Brahmaputra River Key Biodiversity Area	0 km	Important Bird Area, listed in the IBAT Not legally protected	Unknown	Qualifies as internationally recognized area but unmanaged	Relevant, included in the risk assessment
Bangabandhu Bridge Ecopark	7 km	GoB designated ecopark for scenic beauty, Legally Protected, not listed in the IBAT	Unknown	Qualifies as legally protected area.	Relevant, included in the risk assessment
Jamuna River Fish Sanctuary	0	GoB Designated Fish Sanctuary, not listed in the IBAT	Unknown	Does not qualify. it is only for fish conservation, not linked with ecosystem	Relevant to the project site, included in the Biodiversity Risk Assessment

				management	
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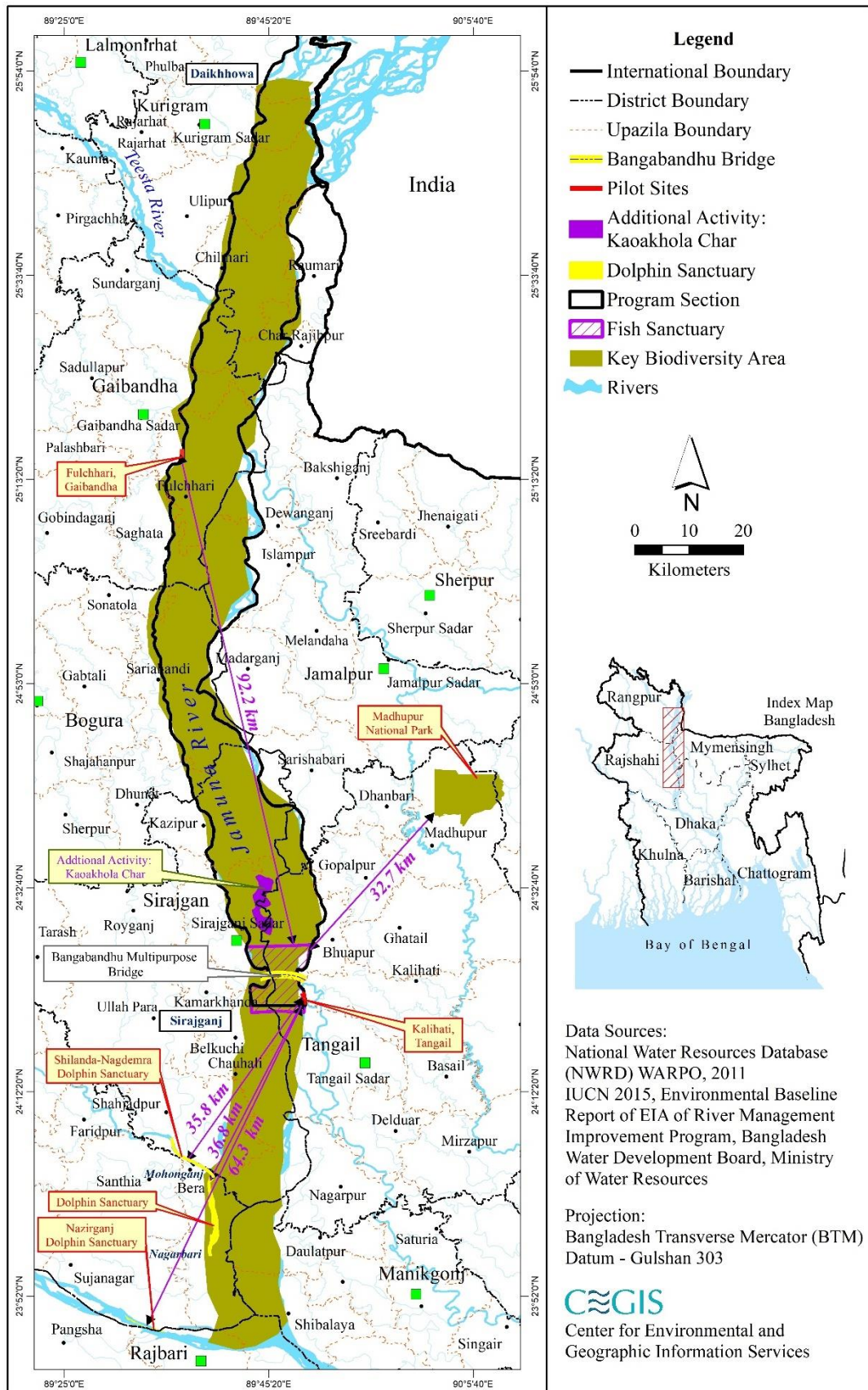


Figure 2.1: Location of Legally Protected Areas and KBAs around the BAA



## 2.2 Description of the Relevant Protected Area

### 2.2.1 Jamuna Brahmaputra River Important Bird and Biodiversity Area and KBA

The Jamuna-Brahmaputra River (JBR) is one of twenty Important Bird and Biodiversity Areas (IBAs) within Bangladesh. The JBR IBA covers about 200,000 ha, and elevation ranges between 5-20m. The IBA is recognized as important for significant populations of globally threatened bird species (criterion A1) and globally significant concentrations of congregatory bird species (criterion A4) as shown in Table 2.2.

**Table 2.2: Populations of IBA Trigger Species with their Details**

Species	IUCN Red List Category	Season	Year(s) of estimate	Population estimate	IBA Criteria Triggered
Common Pochard <i>Aythya ferina</i>	VU	unknown	2004	present	A4
Ferruginous Duck <i>Aythya nyroca</i>	NT	winter	2004	present	A4
Tufted Duck <i>Aythya fuligula</i>	LC	unknown	2004	present	A4
Garganey <i>Spatula querquedula</i>	LC	unknown	2004	present	A4
Gadwall <i>Mareca strepera</i>	LC	unknown	2004	present	A4
Northern Pintail <i>Anas acuta</i>	LC	unknown	2004	present	A4
Eurasian teal <i>Anas crecca</i>	NR	unknown	2004	present	A4
Indian Skimmer <i>Rynchopsalbicollis</i>	EN	winter	2004	present	A1
White-rumped Vulture <i>Gyps bengalensis</i>	CR	non-breeding	2004	present	A1

Note: (Year of most recent IBA criteria assessment 2004), This table presents the IBA criteria triggered and the species that triggered then at the time of assessment, the current IUCN Red List category may vary from that which was in place at that time.

### 2.2.2 Dolphin Sanctuaries

There are two Dolphin sanctuaries established by the government occurring near the BAA, namely Silonda-Nagderma WS at Boral River, and Nagarbari-Mohonganj WS at Jamuna River (Map 2.1). These sanctuaries qualify as legally protected areas with an IUCN Management category IV. The closest sanctuary is at around 36 km from the project footprint. A surveillance program conducted between 2015 and 2016 documented a total of 206 sightings, with 87 occurring in Nagarbari, 96 in Mohonganj, and 23 in Boral. Based on the high number of dolphin sightings over the winter months, a number of deep pools (kum) were found, the majority of which have already been placed within the administration of these sanctuaries (Aziz 2019). The Ganges River Dolphin is recognized as a Critical Habitat feature (Chapter 6), with potential impacts by the project, and the presence of these sanctuaries have relevance to the project for development of mitigation to protect dolphins.

### 2.2.3 Jamuna River Fish Sanctuary

The Ministry of Fisheries and Livestock (MoFL) has declared a total of 90.14 km<sup>2</sup> of the Jamuna Multi-purpose Bridge area as a fish sanctuary in 2021 (Figure 2.1) under the Protection and Conservation of

Fish Act, 1950. (E. B. Act No. XVIII of 1950). As per the declaration, any kind of fishing is prohibited in this area. In Bangladesh, a fish sanctuary is a type of water-based protected area where fishing is prohibited for a certain months or time in a year. Generally, a fish sanctuary is regarded as an essential and effective management tool for the preservation, conservation, and management of fisheries resources. Despite the fact that it is a form of refuge, it is not rigorously maintained as a wildlife sanctuary. According to the opinion of the fisheries officer, they ran several public awareness campaigns, put up billboards, and took the appropriate procedures to prohibit fishing in the sanctuary region.

#### **2.2.4 Bangabandhu Bridge Ecopark**

In Bangladesh, an Ecopark is an area of natural ecological habitat for flora and fauna for scenic beauties which is managed for providing recreational facilities for visitors (protected by Wildlife Protection and Safety Act, 2012). It is located in Saydabad Upazila, Sirajganj district. It is a planted forest created on land reclaimed from the river during construction of the Bangabandhu Multipurpose Bridge. The Ecopark was designated in 2008 by the Government. It has not been categorized as per IUCN PA categories. However, it might qualify the ESS 6 definition of "Legally Protected Area" due to its legal status. But, effective means of long-term conservation of biodiversity are missing. The proposed intervention will not have any impacts on the Ecopark because it is completely isolated from the project area by natural and physical boundary (Figure 2.1).

After the completion of the Jamuna bridge in 1998, the Bangladesh Forest Department took over several hundreds of acres of land area for a social afforestation program along the west bank side of the Jamuna/Bangabandhu bridge. It encompasses 600 hectares. A highway, a railway, a bridge, and a power transmission corridor go through the park, with the rest house, the forest beat office, and the other institutes. Trees were planted in the Ecopark, and they are now prospering and expanding into a forest.

A total of 89 species of wild animals were recorded from Bangabandhu Jamuna Ecopark. Among them 6 species were amphibians, 11 reptiles, 56 birds and 16 mammals. There are no documents of other biodiversity in this area. Among mammals, small terrestrial mammalian species were observed by Rahman et al. (2013) (hare, bat, rat, jungle cat, shrew, squirrel etc.). Terrestrial and arboreal bird species were dominant among birds' group. In reptilian groups lizard was highest in number (House lizard, gecko, monitor and skink). The dominant plants were: Shisu (*Dalbergia sissoo*), jam (*Eugenia jambolana*), mehoginy (*Switeniamahogoni*), babla (*Acacia arabica*), debdaru (*Polyalthia longifolia*), bandarlathy (*Cassia fistula*), kadam (*Anthocephalus chinensis*), wood apple (*Aegle marmelos*), coconut (*Cocos nucifera*), tetul (*Tamarindus indica*), betelnut (*Areca catechu*), amloki (*Emblica officinalis*), tulsi (*Ocimum sanctum*), margosa tree (*Azadirachata indica*), muktajuhri (*Acalypha indica*), arohor (*Cajanus cajan*), horitoki (*Terminalia chebula*), krishnachura (*Delonix regia*), nalkhagra (*Phragmites karka*) (Rahman et. al., 2013).

### 3 Land Cover and Land Use Classification and Habitat Mapping

#### 3.1 Methodology

The habitat characterization for the pilot sites was done following a systematic approach integrating the field survey and land use & Land Cover analysis. The survey was done in defined channel areas and these sampling areas were checked in Google Earth map for habitat identification and characterization. The Land Use and Land Cover analysis shown in Figure 3.1 was undertaken by classification of recent satellite image (image acquisition date March 2020). The identified land use and landcover classes were then categorized as either modified or natural as per the definition of ESS6 or mixed with modified habitat dominion.

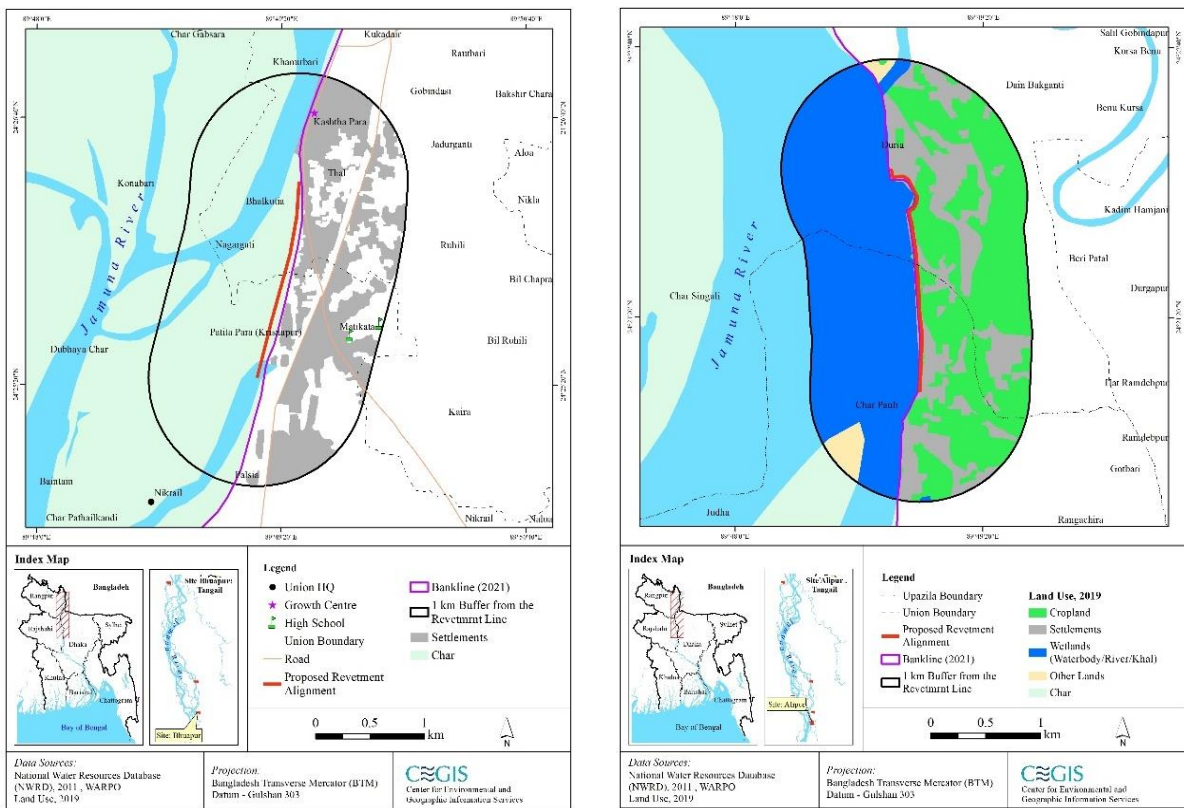


Figure 3.1: Land Use and Land Cover Classes in the Project AOI of the Two Pilot Sites

#### 3.2 Land Use Identification and Categorization

Land uses occurring in the BAA and their characteristics are presented in the Table 3.1 and Figure 3.2 below.

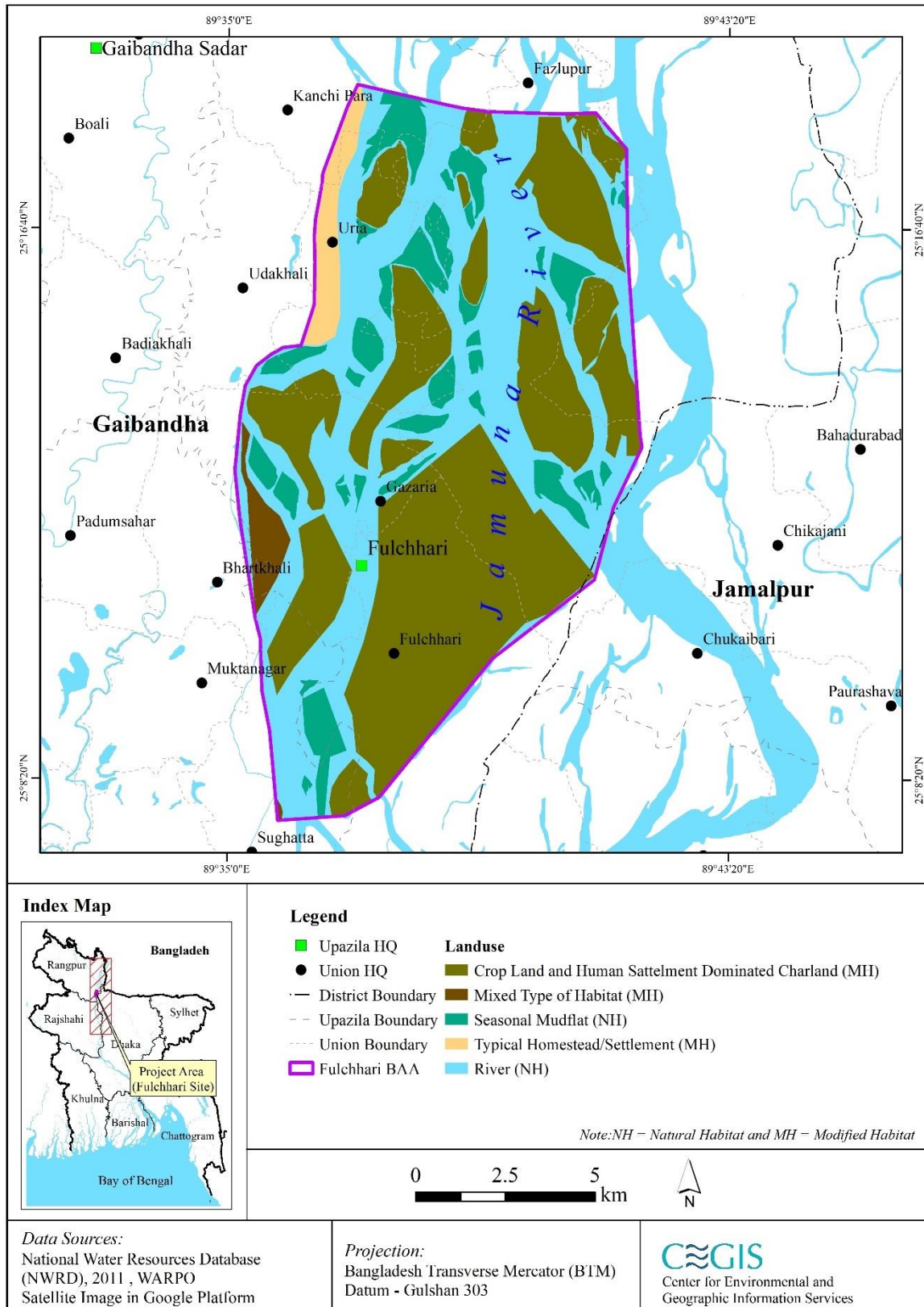


Figure 3.2a: Land Use Occurring in the Biodiversity Assessment Area of Fulchhari

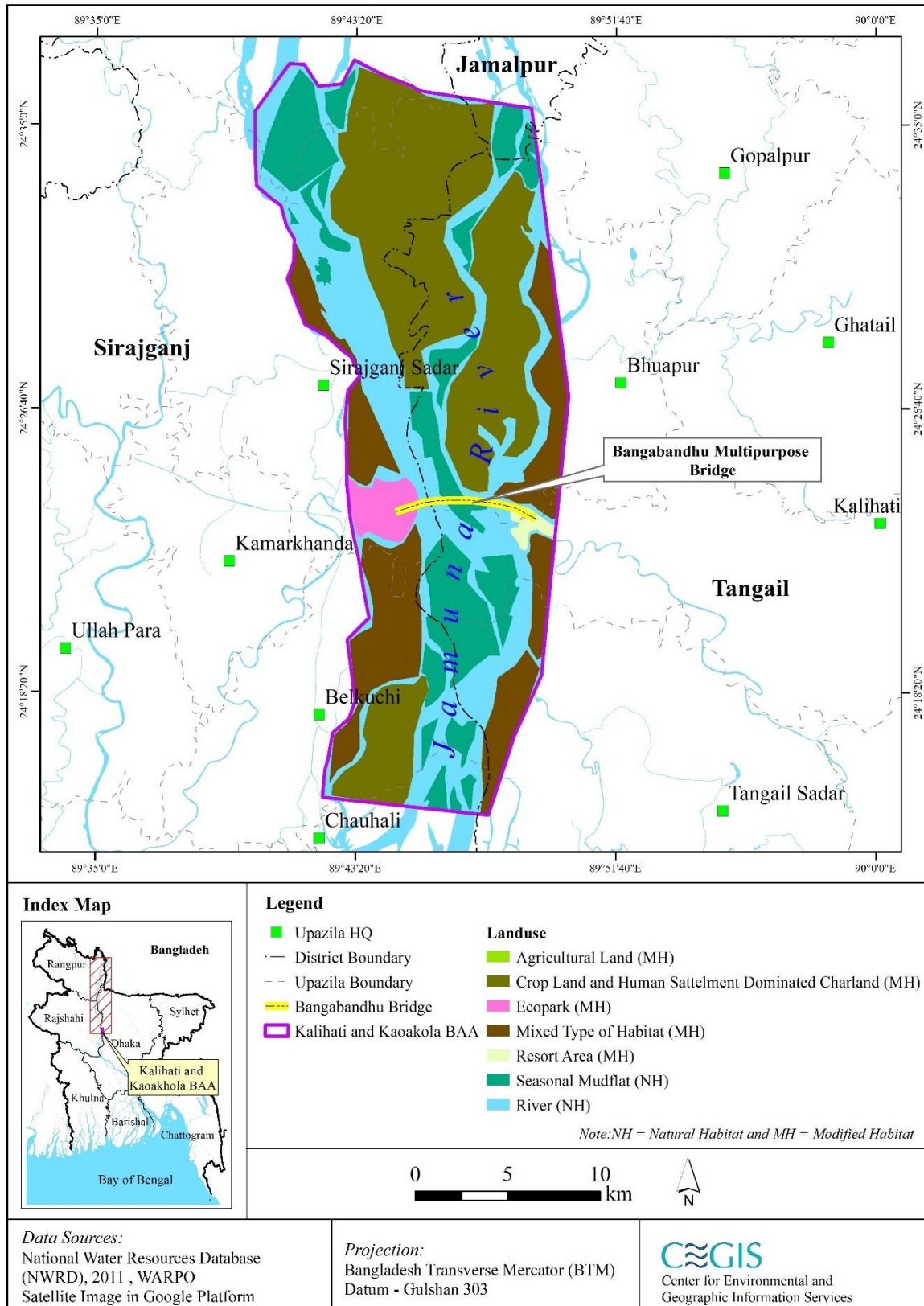


Figure 3.2b: Land Use Occurring in the Biodiversity Assessment Area of Kalihati-Kaoakola



**Table 3.1: Names and Location of Different Habitats of the BAA**

Habitat	Type	How do these habitats' function?
Charlands (Newly emerged Charlands)	Natural	Charlands cover with sand, grasses, long reeds and agricultural lands which provide habitat for diverse bird species including rare species. This habitat harbors large number of invertebrates. Different types of grassland specialist bird species also found here (e.g., Olive-backed Pipit, Paddy-field Pipit)The habitats are mostly used by migratory ducks (e.g., Cotton Pygmy Goose) and common resident waterbirds (e.g., Little egret, Indian Pond Heron)
Riverbanks	Mixed but mostly modified	The habitat mostly river bank, mostly eroding in nature. The natural levee is often covered by grasses or bushes. Used by waders, wagtails, egrets, and herons. Good habitat for invertebrates (e.g., dragonfly) and amphibious species (frogs, toads).
Agriculture lands (on settled charlands, and floodplain)	Modified	Major parts of the charlands and floodplain are occupied by agricultural crops such as wheat, lentils, paddy, sesame, peanut and maize fields. This area is also ideal habitat for different group of insects (e.g., dragonflies, butterflies). Form the good community of insectivorous birds, and amphibians. It is suitable habitat for insectivorous and granivorous birds. Some species interact in these areas when it is located next to a natural habitat.
Mudflats, embayment area	Natural	Newly emerged Charlands and some of the submerged char provide this type of habitats. Suitable habitat of water birds, water snakes, turtles, frogs, fish. Mudflats are suitable habitat for resting and breeding ground of wetland specialist bird species (e.g., Jacanas, Snips, Wild ducks)
Arboreal Habitat	Modified	There is an ecopark located within the EBAA. Basic habitat structure of the ecopark is arboreal. There is designated ecopark which is mostly a planted forest on the reclaimed land established during the construction of Bangabandhu Bridge. It serves habitat to a total of 89 species of wild animals. Among them 6 species were amphibians, 11 reptiles, 56 birds and 16 mammals.
River Water Area	Natural	This area is the core zone of river supported by deep waterbody. A diversity of fish, aquatic vegetation and crustaceans, reptiles and birds use the open water habitats. Kingfishers, Gulls, Terns, Cormorants, Herons, Egrets, and migratory birds collect their food from open water from river. 22 major carp spawn collection sites was identified in the Jamuna River.

### 3.2.1 Natural Habitats

#### *Newly Emerged Charland*

Char or Shoal is an important feature of a braided river like the Jamuna. Analysis of time series satellite images of 1973 to 2014 show that over 90 percent of the area within the river banks of the Jamuna had been char at one time during the 27-year period (see the Environmental Baseline Chapter of ESIA for details). Chars are variable in time and space in terms of their geographic locations. They survive through the constant interplay of erosion and accretion. The same analysis shows that about 75 percent of the chars remained between one and nine years, while only about 10 percent lasted for 18 years or more.

Some of the newly emerged charlands are covered with grasses. Many insectivore birds depend on these grasslands (Figure 3.4). Some of the insectivore birds in this habitat are Olive-backed Pipit, Paddy-field Pipit, Pied Starling, and Jungle Myna.



Some parts of the old Charlands are covered with long reeds. This reed land attracts insects and provide food for a large group of insectivore birds. Striated Babbler, Plain Prinia, Graceful Prinia, Gray-breasted Prinia, Ashy Drongo, Siberian Rubythroat, Bluethroat, Paddy field Warbler, Blyth's Reed Warbler, Clamorous Reed Warbler, Dusky Warbler use this habitat. This habitat also acts as their critical breeding habitats.

#### *Open Water/River*

A diversity of fish, aquatic vegetation and crustaceans, amphibians, reptiles and birds use the open water habitats. Kingfishers, Gulls, Terns, Cormorants, Herons, Egrets, and migratory birds collect their food from open water from river, canals, stagnant water inside the Charlands, ponds and lakes. Some wildlife commonly uses these habitats as feeding and breeding grounds. Open water also provides resting and roosting habitat for Ducks, Moorhens and Gulls.

#### *Marshy areas, Mudflats, Sandflats*

Some birds, particularly waders prefer these types of habitats. Newly emerged Charlands and some of the submerged char provide this type of habitats. Fish fingerlings, small fishes, crustaceans, and aquatic vegetation provide food for a diverse group of birds. Common birds in this habitat are Grey Heron, Purple Heron, Open-billed stork, Black Stork, Painted Stork, Purple Swamphen, Ruddy Shelduck, Common Shelduck, Bar-headed Goose, Gray-lag Goose and Mallard Duck. Lot of migratory ducks use this habitat as a resting area. This habitat is also used as breeding ground by Jacana, Snipes and other open nesters.

The mudflats/sandflats occurring in the BAA provide feeding habitat for a wide range of migratory and resident waders (Figure 3.3). Mudflats also support a variety of crustaceans, worms and other insects which attract shorebirds.



A Paddyfield Pipit (*Anthus rufulus*) in Mudflat near Rice Field sighted in Chauhali char, Shirajganj, in June 2021



A Red-wattled Lapwing (*Vanellus indicus*) in a Sandflat of Pabna Char, near Bera sighted in June 2021

**Figure 3.3: Pictures of Two Birds Observed during the Field Survey**

### **3.2.2 Modified Habitats**

Homestead areas, sand-mining and storage areas, ecopark, terrestrial agricultural lands, etc are common modified habitat within the BAA. These habitats provide shelter and forage to some wildlife, particularly granivorous and insectivorous birds, mongooses, jackals, and other wildlife. These modified habitats are found to be established a new community by of some particular wildlife such as homestead bird species and other wildlife those prefer modified habitats.

#### *Agricultural land*

A major part of the charlands and floodplain are occupied by agricultural crops such as wheat, lentils, paddy, sesame, peanut and maize fields. These green crop fields generate an abundance of insects that provide food for many insectivore birds. Some of the common insectivore birds in this habitat are Black

Drongo, Ashy Drongo, Striated Babbler, Plain Prinia, Graceful Prinia, Gray-breasted Prinia, Green Bee-eater etc. A large number of grain eater birds also aggregate during harvesting season of grain crops. Some of the grain eater birds are Spotted Dove, Eurasian Collared Dove, Red Turtle Dove, House Sparrow, Common Baya and Common Myna (Figure 3.4). Hole nesters suchlike Green Bee eater, White-throated Kingfisher, Pied Kingfisher, Common Kingfisher burrow at the edge of the agricultural lands, on the bank of the ponds and lakes to build their nests.



Red Collared Dove (*Streptopelia tranquebarica*) sighted in modified agricultural land in Pabna in June 2021



Graceful Prinia (*Prinia gracilis*) sighted in modified agricultural land in Pabna in June 2021

**Figure 3.4: Some Common Birds Sighted in an Agricultural Land in the BAA in June 2021**

#### *Homestead Vegetation*

The homestead vegetation mostly consists of bamboo thickets, mango, jackfruit and other fruit trees. Homestead vegetation provides food and breeding habitats for a number of resident birds. Different species of Mynas, Doves, Woodpeckers, Herons, Drongo are found regularly to build nests in homestead area.

## 4 Biodiversity

### 4.1 Flora

The vegetation in the BAA can be divided into planted and natural vegetation. Considering all floral diversity, a total of 76 species were identified, among them 40 species are trees, 33 herbs and shrubs, and 3 bamboo species (Table 4.1).

#### 4.1.1 Terrestrial Flora

Terrestrial vegetation is normally found in the terrestrial ecosystems, trees are normally found in the homesteads, settlements and along the embankment. The main purposes of planted trees are fruit (Bel, Khuksha, Olive, Am, Payara, Jam, Boroi, Tal, Chalta, Khejur, etc.) firewood (Rain tree, Dewa, etc.) and timber production (Arjun, Krishnachura, Eucalyptus, Rain Tree, Sissoo, Jarul, etc.). In the open and uncultivated areas, the plants that were normally seen are, Kansh (*Saccharum spontaneum*), Chhan (*Imperata cylindrica*), Ghagra (*Xanthium indicum*), Ban Palang (*Rumex meritimus*), DholKolmi (*Ipomoea carnea*), and legumes. In the agricultural fields, on the other hand, the common cultivated crops are paddy (*Oryza sativa*), wheat (*Triticum aestivum*), jute (*Corchorus capsularis*), sugarcane (*Saccharum officinarum*), potato (*Solanum tuberosum*), mustard (*Brassica campestris*), ground-nut (*Terminalia catappa*), pea (*Pisum sativum*) and a wide variety of seasonal vegetables.

Riparian vegetation is a group of plants that exist as an ecosystem alongside the river or a perennial flow or a stagnant water body. Being an ecosystem, it has mostly trees, shrubs, herbs and may have some climbers. Common riparian species are Boroi (*Zizyphus mauritiana*), sisso (*Dalbergia sisso*), *Eucalyptus* spp., pitali (*Trewianudiflora*), shimul (*Bombax ceiba*), rain tree (*Albizia saman*), ban palang (*Rumex maritimus*), ghagra (*Xanthium indicum*), bankhira (*Croton bonplandianum*), amrul (*Oxalis corniculata*), durba (*Cynodondactylon*),

Some commonly seen plant species are Aam (*Mangifera indica*), Kanthal (*Artocarpus heterophyllus*), Kalo Jam (*Syzygium cumini*), Litchi (*Litchi chinensis*), Pitali (*Trewiapolycarpa*) etc.

There is one species of plant (Haritaki *Terminalia chebula*) that is nationally threatened, (according to the Red Data Book of Vascular Plants of Bangladesh by Khan et al. 2001) and two species (Bora Bash *Bambusabalcooa*, Mahagoni *Swietenia mahagoni*) are globally endangered (EN) and near threatened (NT) respectively (Table 1 pf Annex 6.3).

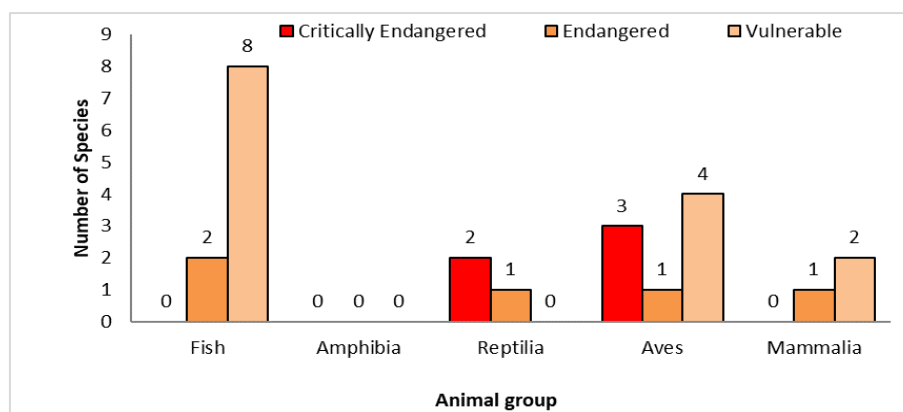
#### 4.1.2 Aquatic Flora

Aquatic flora usually found in river, khals, beels and in other water bodies. Common aquatic floras are Nal (*Phragmites karka*), DholKolmi (*Ipomoea carnea*), Kachuripana (*Pontederia crassipes*), Maloncho (*Alternanthera philoxeroides*), Thankuni (*Centella asiatica*). Common but invasive aquatic floras are Kachuripana (*Eichhornia crassipes*) which grow well in the stagnant aquatic environment where water flow is low or absent. No other exotic or threatened aquatic floral species was observed or found in secondary data in the BAA. However, one study reported 11 species of phytoplankton and of them 7 species were Diatoms, 3 species were Dinoflagellates and 1 species was Cyanobacteria.

### 4.2 Fauna

#### 4.2.1 Threatened and Near Threatened Vertebrate Species

A total of forty-seven (47) globally and nationally threatened and near threatened vertebrate species likely to occur in the project influence area. Among them, 6 species were mammals, 15 birds, 10 reptiles and 16 species are fishes (see Tables 4.1 and 4.2, and Annex 6.3). All 47 species of vertebrate animals occur in the BAA are threatened and near threatened species in terms of national status. Among birds, 3 species are critically endangered and one endangered. Two species of reptiles are critically endangered and one endangered (Figure 4.1). Only two species of fishes are under endangered category.



**Figure 4.1: Threatened Categories of Vertebrate Species Occur in the BAA**

**Table 4.1: Globally and Nationally Threatened and Near Threatened Species of Mammals and Reptiles in the BAA including the Piloting Sites (Based on Primary and Secondary Information)**

Code: CR: Critically Endangered; EN: Endangered; VU: Vulnerable; NT: Near Threatened; LC: Least Concern; NE: Not Evaluated

English Names	Scientific Name	Threatened Status	
		National	Global
<i>Mammals</i>			
Ganges River Dolphin	<i>Platanista gangetica</i>	VU	EN
Hog Deer	<i>Axis porcinus</i>	CR	EN
<i>Reptiles</i>			
Gharial	<i>Gavialis gangeticus</i>	CR	CR
Black Softshell Turtle	<i>Nilssonina nigricans</i>	EN	CR
Red-crowned Roofed Turtle	<i>Batagurkachuga</i>	CR	CR
Assam Roofed Turtle	<i>Pangshurasyhetensis</i>	CR	CR
Three-striped Roofed Turtle	<i>Batagurdhongoka</i>	CR	CR
Northern River Terrapin	<i>Batagurbaska</i>	CR	CR
Asian Giant Softshell Turtle	<i>Pelochelyscantorii</i>	CR	CR
Spotted Pond Turtle	<i>Geoclemys hamiltonii</i>	EN	EN
Crowned River Turtle	<i>Hardellathurjii</i>	EN	EN
Indian Eyed Turtle	<i>Moreniapetersi</i>	NT	EN
Gangetic Softshell Turtle	<i>Nilssoninagangetica</i>	EN	EN
Indian Peacock Softshell Turtle	<i>Nilssoniahurum</i>	LC	EN
Keeled Box Turtle	<i>Cuoramouhotii</i>	CR	EN
<i>Birds</i>			
Baer's Pochard	<i>Aythya baeri</i>	CR	CR
Yellow-breasted Bunting	<i>Emberiza aureola</i>	VU	CR
Indian Skimmer	<i>Rynchopsalbicollis</i>	CR	EN
Black-bellied Tern	<i>Sterna acuticauda</i>	CR	EN
Pallas's Fish-eagle	<i>Haliaeetus leucoryphus</i>	EN	EN
Greater Adjutant	<i>Leptoptilos dubius</i>	RE	EN
Swamp Grass-babbler	<i>Laticillacinerascens</i>	Not assessed	EN

English Names	Scientific Name	Threatened Status	
		National	Global
Painted Stork	<i>Mycteria leucocephala</i>	CR	NT
Indian Spotted Eagle	<i>Clanga hastata</i>	EN	VU

Source: Primary data collected in June 2021 and IUCN 2015<sup>9</sup> and IBAT; orange shaded cells – confirmed by consultation; green shaded cells – confirmed by direct sighting, no shade – identified from IBAT

**Table 4.2: Globally or Nationally Threatened and Near Threatened Bird Species in the BAA including the Piloting Sites (Based on Primary and Secondary Information)**

Code: R: Resident; M: Migratory; CR: Critically Endangered; EN: Endangered; VU: Vulnerable; NT: Near Threatened; LC: Least Concern

English Names	Scientific Name	Threatened Status	
		National	Global
<i>Birds</i>			
Baer's Pochard	<i>Aythya baeri</i>	CR	CR
Yellow-breasted Bunting	<i>Emberiza aureola</i>	VU	CR
Indian Skimmer	<i>Rynchopsalbicollis</i>	CR	EN
Black-bellied Tern	<i>Sterna acuticauda</i>	CR	EN
Pallas's Fish-eagle	<i>Haliaeetus leucoryphus</i>	EN	EN
Greater Adjutant	<i>Leptoptilos dubius</i>	RE	EN
Swamp Grass-babbler	<i>Laticillacinerascens</i>	Not assessed	EN
Painted Stork	<i>Mycteria leucocephala</i>	CR	NT
Indian Spotted Eagle	<i>Clanga hastata</i>	EN	VU

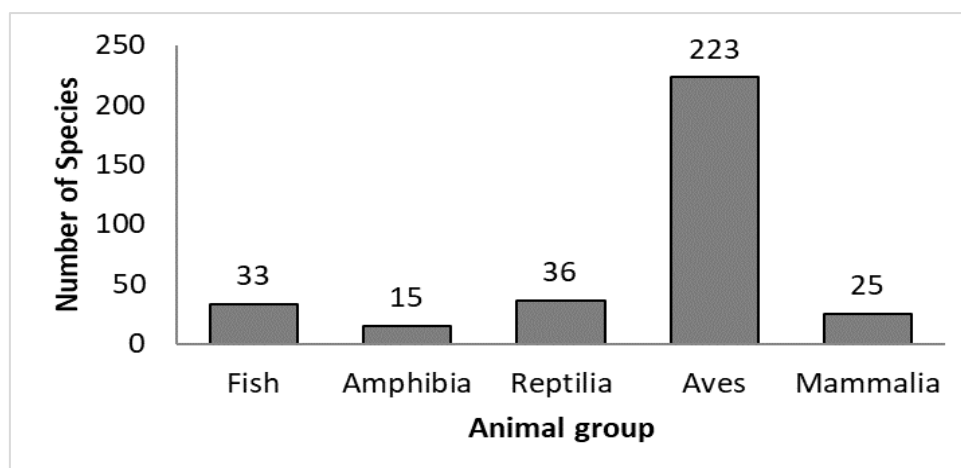
Source: Primary data collected in June 2021 and IUCN 2015<sup>10</sup> and IBAT; orange shaded cells – confirmed by consultation; green shaded cells – confirmed by direct sighting, no shade – identified from IBAT

#### *Vertebrates in general*

A total of 376 species of vertebrate was identified, including 25 species of mammals, 223 birds, 36 reptiles, 15 amphibians and 33 fishes. Nahida et al (2018) identified 77 fish species from different parts of Jamuna River which are likely to occur in the study area and during the survey period 33 fish species was identified (Figure 4.2 and Tables 4.2 to 4.6 and 4.11).

<sup>9</sup> IUCN 2015. Environmental Baseline (Revised) 2015. Environmental Assessment for River Management Improvement Program, Bangladesh Water Development Board

<sup>10</sup> IUCN 2015. Environmental Baseline (Revised) 2015. Environmental Assessment for River Management Improvement Program, Bangladesh Water Development Board



**Figure 4.2: Diversity of Vertebrate Species Sighted in the BAA**

#### *Mammals*

A total of 25 species of mammal are known to occur in the BAA (Figure 4.2 and Annex 6.3). The most notable species is the Ganges River Dolphin that occurs all along Brahmaputra and Jamuna River, including the major tributaries, but there are some hotspots where it is more common. The mammalian species diversity and density are relatively low in the BAA, because a large proportion of the area is wetland of some kind that are not suitable for terrestrial mammals. The mammals that occur in and around wetlands are few in number. Other sighted mammals of the area are Small Indian Mongoose (*Herpestesauropunctatus*), Golden Jackal (*Canis aureus*), Indian Flying Fox (*Pteropus giganteus*), Jungle Cat (*Felis chaus*), nationally endangered Fishing Cat (*Felis viverrina*), Asian Palm Civet (*Paradoxurus hermaphroditus*), and some species of rats and mice. Nationally vulnerable Ganges River Dolphin (*Platanista gangetica*) is not so abundant but still occur at some specific locations of the Jamuna River (Figure 4.3, Table 2 of Annex 6.3).

Among the terrestrial mammals, a few species of bats were recorded in the area in both wet and dry seasons. The two common species of bats in the area are Indian Pipistrelle (*Pipistrellus coromandra*) and Indian Flying Fox (*Pteropus giganteus*). These were more commonly found in and around the village groves and orchards. Bats are unlikely to be significantly impacted by the proposed project activities, and limited investigation into their presence was therefore conducted.



Graceful Prinia *Prinia gracilis*  
Sirajganj Char



Lesser Whistling Duck *Dendrocygnajavanica*  
Char Berkusa, Jamalpur

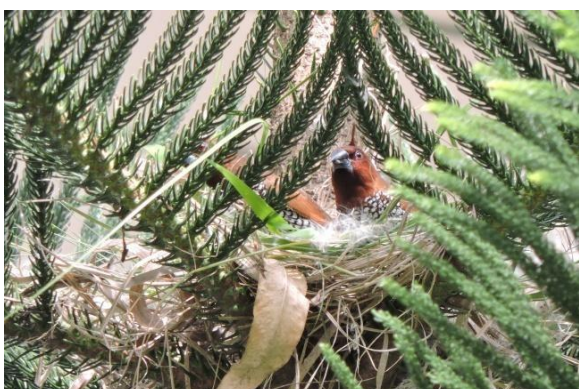




Paddyfield Pipit *Anthus rufulus*  
Chauhali Char, Sirajganj



Pied Kingfisher *Ceryle rudis*  
Jagata Char, Sirajganj



Scaly-breasted Munia *Lonchura unctulata*  
Water Development Board, Jamalpur



Small Pratincole *Glareola lactea*  
Sirajganj Char



Streak-throated Woodpecker *Picus xanthopygaeus*  
Water Development Board, Jamalpur



Tricoloured Munia *Lonchura malacca*  
Char Sisua, Jamalpur



White-tailed Stonechat *Saxicola leucurus*  
Char Berkusa, Jamalpur



Small Indian Mongoose *Urva auropunctata*  
Bangladesh Water Development Board, Sirajganj

**Figure 4.3: Birds and Mammals Species Sighted in the Area in and around the Pilot Sites**

#### Birds

The Charlands of Jamuna have been recognized as significant habitats of birds by Birdlife International (Birdlife DataZone 2020). Central Asian and East Asian-Australian migratory bird flyways crossed Bangladesh offering important wintering and staging ground for a variety of migratory shorebirds, many of which are significant globally. According to them these areas provide critical habitats for some species of birds including Spot-billed Duck (*Anas poecilorhyncha*), Cotton Pygmy-goose (*Nettapus coromandelianus*), critically endangered White-rumped Vulture (*Gyps bengalensis*), Black-bellied Tern (*Sterna acuticauda*), Black Stork (*Ciconia nigra*), Painted Stork (*Mycteria leucocephala*), River Lapwing (*Vanellus duvaucelii*). The nationally critically endangered Black-bellied Tern (*Sterna acuticauda*), and Near threatened Gray-headed Fish Eagle (*Ichthyophaga ichthyaetus*) and both nationally and globally vulnerable Lesser Adjutant (*Leptoptilos javanicus*) and Greater Spotted Eagle (*Clanga clanga*) are found in the BAA. Huge congregation of migratory winter birds including resident Lesser-whistling Ducks is sighted during November-March in the floodplains of Jamuna River.

A total of 223 species of bird are known to occur in the BAA, of which significant proportions are migratory winter visitors (84 species) (Annex 6.3, Table 3 and 4). Some common migratory species include Ruddy Shelduck (*Tadorna ferruginea*), Northern Pintail (*Anas acuta*), Gadwall (*Anas strepera*), Common Sandpiper (*Actitis hypoleucos*), Wood Sandpiper (*Tringa glareola*), and Little Stint (*Calidris minuta*). Wide variety of breeding resident birds also occur in the aquatic and terrestrial ecosystems of the BAA, viz. Lesser Whistling Duck (*Dendrocygna javanica*), Spot-billed Duck (*Anas poecilorhyncha*), Cotton Pygmy-goose (*Nettapus coromandelianus*), Little Egret (*Egretta garzetta*), Pied Kingfisher (*Megaceryle lugubris*), Sand Lark (*Calandrella raytal*), Zitting Cisticola (*Cisticola juncidis*), Black Drongo (*Dicrurus macrocercus*), Oriental Magpie Robin (*Copsychus saularis*), Red-vented Bulbul (*Pycnonotus cafer*), Spotted Dove (*Streptopelia chinensis*), Large-billed Crow (*Corvus macrorhynchos*) and House Sparrow (*Passer domesticus*), and Whiskered Tern (*Chlidonias hybridus*) (Source: transect data and Asian Waterbird Census 2014).

#### Reptiles

A total of 36 species of reptiles are known to occur in the area (Figure 4.4 and Table 5 of Annex 6.3). Gharial (*Gavialis gangeticus*) is both nationally and globally Critically Endangered species (IUCN 2015) and very rarely seen in the BAA (CARINAM 2010). It is certain that no stable population of the Gharial exist in the BAA; however, Gharials may have been moving between the two countries — Bangladesh and India — using the routes identified by (Rashid et al. (2014) and are therefore considered present in the BAA as indicated in Table 4.1. Three species of turtles are recorded, viz. Indian Roofed Turtle (*Pangshura tecta*, *Pangshura tentoria*), Spotted Flapshell Turtle (*Lissemys punctata*) and Peacock Soft-shell Turtle



(*Nilssonia hurum*), Gangetic soft-shell Turtle (*Nilssonia gangeticus*) and Yellow Turtle (*Morenia petersi*). Of these three species, the Peacock Softshell Turtle is a globally vulnerable species, because its population is declining throughout its range and Nationally Critically Endangered Narrow-headed Softshell Turtle (*Chitra indica*) (IUCN 2015). Two species of monitor lizards, viz. Bengal Monitor (*Varanus bengalensis*) and Yellow Monitor (*V. flavescens*) were found to occur in both wet and dry seasons. The first one is more common than the second. Both of these species control the populations of smaller organisms like rodents and snakes and hence play a key role in maintaining the ecological balance. Both of these species prefer water bodies, so the river Jamuna and its tributaries are ideal habitats for them. Since most of the reptiles are moisture-loving species, the BAA is the home of many reptiles of medium and small sizes such as Keeled Grass Skink, White-spotted Supple Skink, Yellow Monitor, Common Blind Snake, Indian Rat Snake, etc ( Table 5 of Annex 6.3).



Indian Bullfrog *Hoplobatrachustigerinus*  
Bangladesh Water Development Board, Jamalpur



Marbled Toad *Duttaphrynusstomaticus*  
Jamuna River Bank, Sirajganj



Microhylid Frog *Microhyla* spp.  
Bangladesh Water Development Board, Sirajganj



Cricket Frog *Fejervarya* spp.  
Bangladesh Water Development Board, Jamalpur



Brooke's House Gecko *Hemidactylus brookii*  
Bangladesh Water Development Board, Sirajganj



Oriental Garden Lizard *Calotes versicolor*

**Figure 4.4: Amphibians and Reptiles Sighted in and around the Pilot Sites**

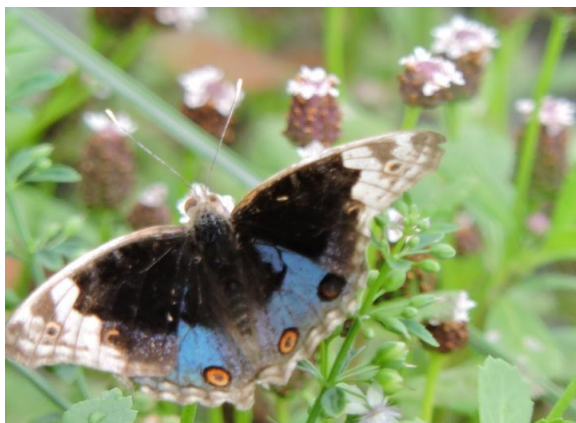
#### *Amphibians*

The stagnant water bodies and the moist terrestrial areas offer vast habitats for amphibians. Therefore, the amphibians are fairly common in the project influence area. A total of 15 species are known to occur (Figure 4.4, and Table 6 of Annex 6.3). Among the amphibians, only the frogs and toads are found in the area. Some common species are Skipper Frog (*Euphlyctiscyanophlyctis*), Cricket Frog (*Fejervaryaspp.*), Indian Bull Frog (*Hoplobatrachustigerinus*), and Common Toad (*Duttaphrynusmelanostictus*) (Hasan et al. 2014). There is no hunting for consumption of meat which was recorded during the FGDs, however, the amphibian population is in decline due to agricultural runoffs, pollution by insecticides and chemical fertilizers and alteration of aquatic habitat. Among the sighted species, no species are included into the threatened category.

#### *Invertebrates*

Wide varieties of terrestrial invertebrates are known to occur in the BAA as well as in entire Bangladesh, but there is no information on their diversity and abundance in the literature. The warm and humid climate of the country is favorable to lower organisms, especially the insect and spider fauna. The study area is similar to other areas of the country in terms of having diverse terrestrial invertebrate communities. Detailed invertebrate surveys were not carried out in the study area but a general assessment was made of invertebrate taxa in the area. A number of species of earthworms (e.g., *Dendrobena spp.*, *Apporectoda spp.*, *Lumbricus spp.*) exist in the area. They play a vital role in maintaining the humus of the soil and help the nitrogen and oxygen to penetrate the soil through its holes. There are many species of grasshoppers (order: Orthoptera) that cause a lot of damage to the crops. Other common invertebrates include many species of butterflies (67 species, Figure 4.5, and Annex 6.3), dragonflies, spiders and beetles.





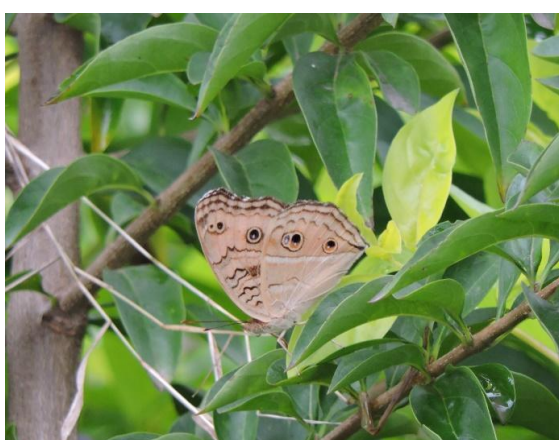
Blue Pansy *Junonia orithya*  
Pabna Char



Common Emigrant *Catopsilia pomona*  
Energy (CNG Station), Sirajganj



Common Pierrot *Castalius rosima*  
Energy (CNG Station), Sirajganj



Lemon Pansy *Junonia lemonias*  
Energy (CNG Station), Sirajganj



Striped Albatross *Appiasolferna*  
Energy (CNG Station), Sirajganj



Pale grass blue *Pseudozizeeria maha*  
Halkar Char, Jamalpur

**Figure 4.5: Butterflies Sighted in the Programmed Influence Sites**

**Table 4.3: Biodiversity in the BAA and the Pilot Sites in Relation to the whole Country of Bangladesh**

Taxon	Species in Bangladesh (Number)	Species in BAA	
		(Number)	% of the Country's Total
Fauna	<b>1051</b>	<b>299</b>	<b>28.5</b>
Mammals	128	25	19.5
Birds	706	223	31.6
Reptiles	168	36	21.4
Amphibians	49	15	30.6
Flora	<b>7095</b>	<b>67</b>	<b>0.94</b>
Gymnosperms	5	2	40
Angiosperms	3,000	512*	17.1

Source: IUCN-Bangladesh 2000, Consultant Ecological Survey (Khan 2014, Hassan 2003).

#### 4.2.2 Invasive Alien Species (IAS)

The pilot sites have fourteen IAS both of flora and fauna (Annex 6.3). Water Hyacinth, which was brought from South America during the British colonial period, is perhaps the first extensively introduced IAS in Bangladesh. During the 1980s, the introduction of Acacia and Eucalyptus from Australia sparked a number of debates in the country. All of the species in these two genera have been determined to be competitors to the native flora and to be environmentally unfavourable. Acacia and Eucalyptus are planted in the BAA since they can grow in many types of habitats, range of diverse climates and soil types. Local people plant these species for their high fecundity, rapid growth rates, and tolerance for a wide range of soil and climate niche. Perhaps most importantly, they are easy to cultivate for fuel wood, and timber due to their ability to coppice readily, tolerance for low quality sites, and low maintenance requirements.

No invasive fish species was found during the field survey. The only IAS fauna was Rock pigeon (*Columba livia*) observed in pilot sites (Figure 4.6). *Columba livia* is native to Europe and has been introduced worldwide as a food source, or for game. These pigeons prefer to live near human habitation, such as farmland and buildings. They cause considerable damage to buildings and monuments because of their corrosive droppings. They also pose a health hazard, since they are capable of transmitting a variety of diseases to humans and to domestic poultry and wildlife. Rock pigeon Rock pigeon are however, not expected to be associated with impacts caused by the project, and do not require control measures to be implemented.



**Figure 4.6: Invasive Flora (*Acacia* spp. And *Eucalyptus* spp.) and Fauna (*Columba livia*) Species from AlipurSite, Tangail**

#### 4.3 Fish Habitats in the BAA

The Jamuna River' alluvial floodplain area and charlands area are the major fish habitats in the BAA. There is a much interaction of sand bars/chars with fisheries. From the fisheries point of view, the island



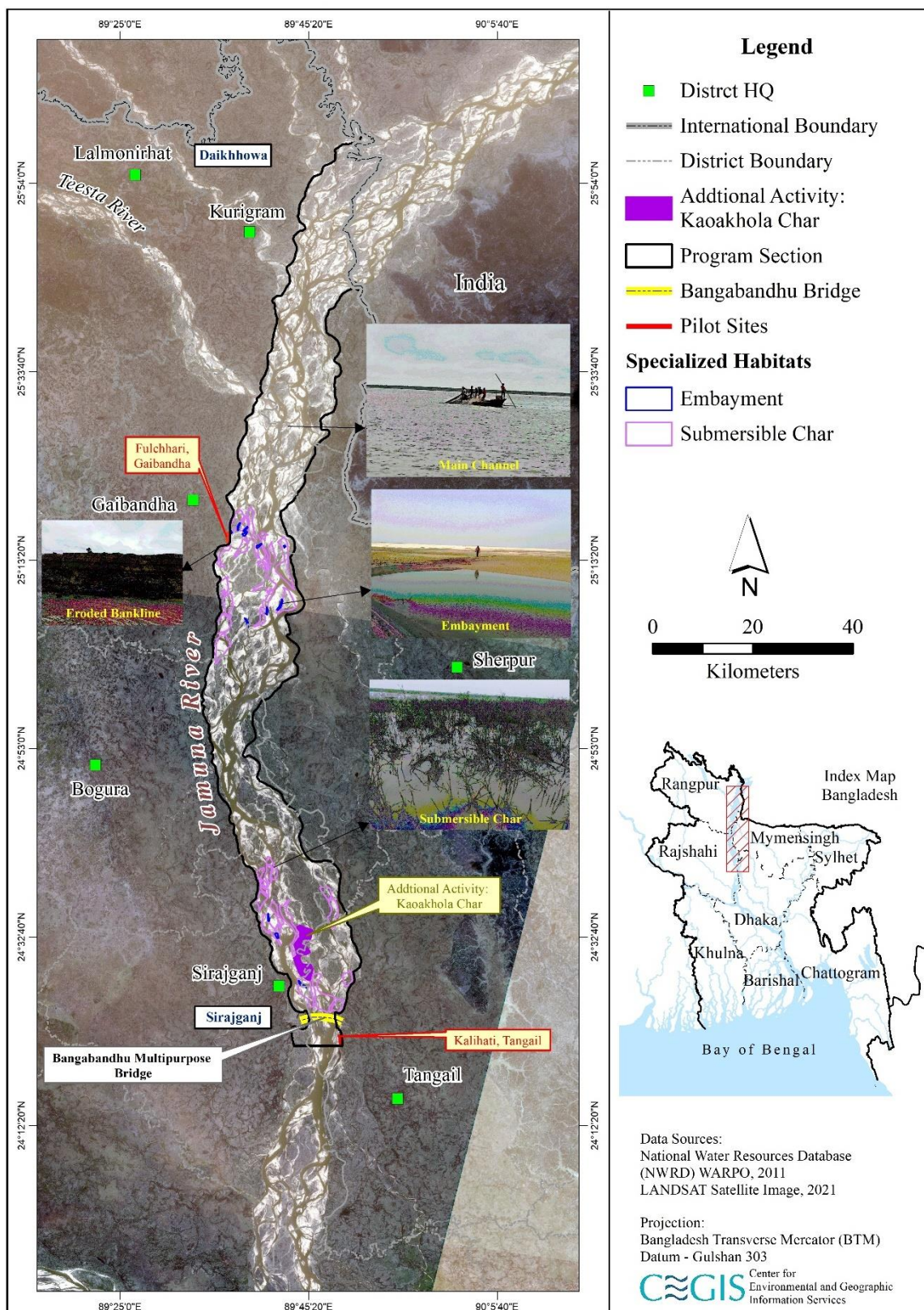
chars are very important for the river fisheries as it develops and grows in the mid-channel and deflects the river flow to both sides. The island char in its formation and merging process to form a larger char, creates embayment or river 'kole' having vegetation cover and chute/connecting channel in-between the embayment and the main channel.

The embayments and the submergible chars (Figure 4.7 and 4.8 function as grazing and nursing ground for small indigenous species of fish, including *Cabdiomorar* (Piyali) *Ailia punctata* (Banshpata), *Ailia coila* (Kajuli), *Eutropiichthysvacha* (Bacha), *Mystuscavasius* (Golsha), *Clupisomagarua* (Gharua), *Glossogobiusgiuris*(Baila), *Salmostomaacinaces*(Chela), *Gudusiachapra* (Chapila). The annual average flow is 20,000 m<sup>3</sup>/s with a maximum estimated discharge of 100,000 m<sup>3</sup>/s. Average depth of the river ranges from 18 to 27 m in the rainy season and decreases to 12 to 15m in the dry season (IUCN, 2015). High water flow and depth are favorable for large sized-fishes (such as Baghayer- Bagariusbagarius and Chital-Chitalachitala). The connectivity, associated floodplains and numerous Charlands and embayments (Kole) support a rich fish biodiversity and are recognized as unique habitat for inland freshwater fishes.

Both capture and culture fishery habitat exist in the BAA. The capture fishery includes the riverine habitat whereas the culture fishery comprises fish ponds. In the BAA, the river occupies many sand bars (chars) which are mostly emerged during dry season. In the wet season, the chars are submerged and act as a river channel. So, the chars have not been considered a separate area in the estimation of fish habitat.

The ponds situated in the BAA vary in size and the larger ponds retain water round the year at a level for which they are able to practice at least two cycles of fish culture by adopting semi-intensive culture method. Major carp, exotic carp and other fast-growing fish species are cultured in the ponds following polyculture technology. The small sized ponds hold water mostly for 36-40 weeks in a year and a single cycle of fish culture is practiced.

The estimated total fish habitat in the BAA is about 18,802 ha, which mainly covered by riverine ecosystem. There is no culture fishery. Areas of fish habitats in the project influence area is shown in Table 4.4.



**Figure 4.7: Important Habitats for Fish and Fisheries in Jamuna River near the Shortlisted and Selected Sites for Piloting**





Partial view of the main channel Jamuna River habitat



Scour habitat of the Jamuna River



Submerged Charland with reeds



Charland with bushes



Partial view of the main channel Jamuna River habitat



Scour habitat of the Jamuna River



Fishing in Submerged Charland



Charland with fishing gear

**Figure 4.8: Photographs of a Few Common Types of Fish Habitats in the Jamuna River****Table 4.4: Area of Fish Habitats in the BAA**

Habitat Category	Habitat Name	Habitat Area (Ha)		
		Tangail	Fulchari	Total
Capture	River	2950	6985	9935
	Floodplain	7252	1615	8867
<b>Total</b>		<b>10220</b>	<b>11600</b>	<b>18802</b>

Source: Land use 2019, based on satellite image Landsat 8

Department of Fisheries (DoF, 2020) has identified 22 major carp spawn collection sites in the Jamuna River. Among the sites, 20 sites fall in Sirajganj District and 2 sites fall in Pabna District as shown in Table 4.5. Presence of the spawn collection activities denotes the existence of major carp breeding ground in the Jamuna River. A total of 1087 kg spawn was collected in 2020 from different spawn collection spots of the Jamuna River. Details of spawn collection from the Januma River is given in Table 4.5 and Figure 4.9.



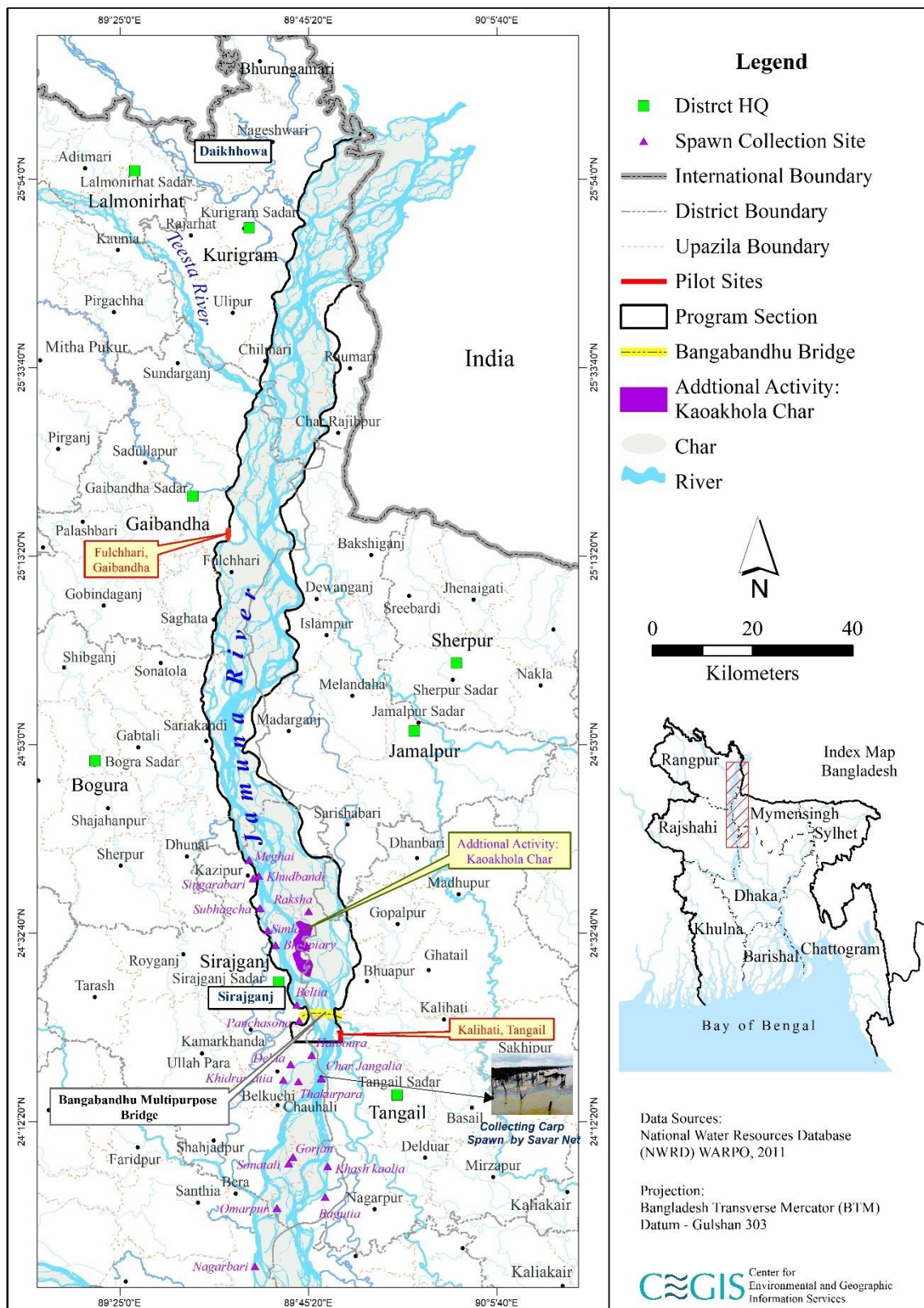


Figure 4.9: Major Carps Spawn Collection Sites in the BAA

Table 4.5: Carp Spawn/Fertilized Egg Collected from Jamuna River in 2020

District	Upazila	Collection Centre	Collection Period	Frequency of Spawning	Spawn Collected
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				Time	(kg)
Sirajganj	Sirajganj sadar	Vatpiary, Panchasona, Hatboyra, Shimla, Soyasekha	May to June	2	177
	Shahjadpur	Sonatali, Belotia, Tarotia.	June to July	3	36
	Chauhali	Khashkaolia, Basotia, Gorjan, Omarpur	June to July	2	400
	Belkuchi	Khiramatia, Delua, Thakurpara, Jangalia	June to July	3	157
	Kazirpur	Magai, Khudbandi, Shingrabari, Shuvagacha	May to June	3	179
Pabna	Bera	Raksha, Nagarbari	May to June	2	138
<b>Jamuna Total</b>					<b>1087</b>

Source: DoF, 2020 (FRSS, 2019-20)

#### 4.4 Fish Production

##### 4.4.1 Fish Production Trend in the Jamuna River

The Jamuna River contributes about 1.93% of total river fish production in Bangladesh and supports a wide number of key fish species, which are also economically important. This fish diversity includes species such as *Labeo rohita*, *L. calbasu*, *Wallago attu*, *Sperataaor*, *Bagariusbagarius*, *Clupisomagaru*, *Eutropiichthysvacha*, *Chitalachitala* and *Mastacembelusarmatus*. However, bank protection works along the river have changed the flow pattern and river morphology, which in turn affect connectivity and the river ecosystem, resulting in alteration of habitat condition, fish diversity and production.

The time series data of FRSS for last 36 years from 1983-84 to 2019-20 (Figure 4.10) shows that fish production from Jamuna River and dependent beels was almost stable up to 2014. Thereafter, an increasing trend was observed since 2014-15 which was due to fisheries management interventions. The pond production had an increasing trend similar to floodplain fisheries.

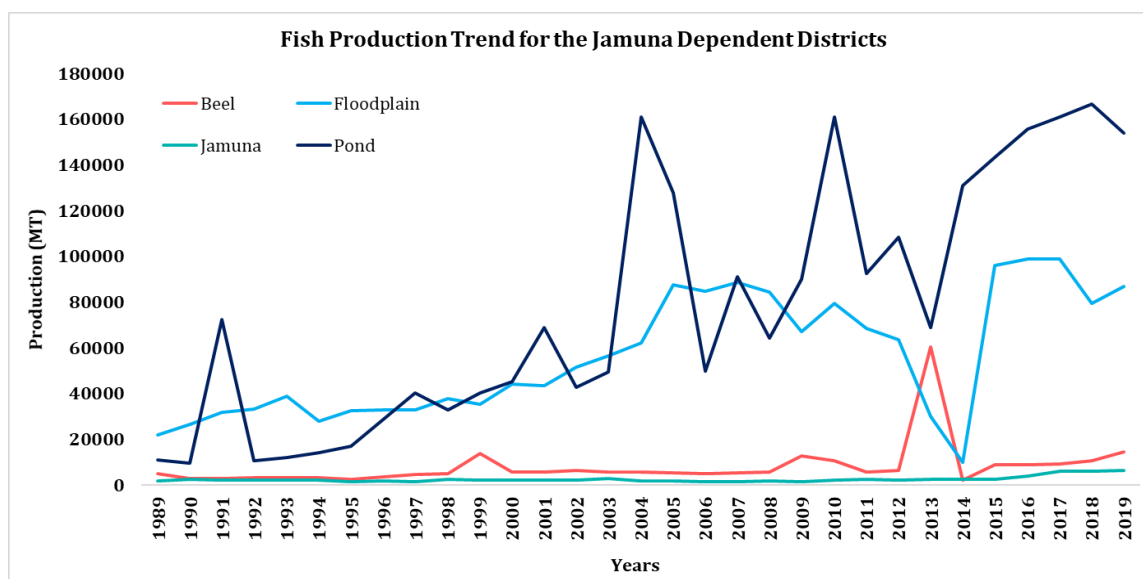


Figure 4.10: Annual Fish Production Trend in the Jamuna River

##### 4.4.2 Fish Production in the Phase 1 Piloting Sites

Annual fish production of the Jamuna River is about 6,388 MT in 2019-20 (DoF, 2020), which is about 1.93% of the total river fish production of Bangladesh. In BAA, the annual river production is estimated 283 MT and floodplain production is 766 MT. Fish production estimation by habitats in the BAA is shown in Table 4.6.



**Table 4.6: Fish Production Estimation in the BAA**

Habitat category	Habitat Name	Production (MT)		
		Alipur	Fulchari	Total
Capture	River	8	273	283
	Floodplain	10	475	485
<b>Sub-Total</b>		<b>18</b>	<b>748</b>	<b>766</b>

Source: CEGIS estimation based on DoF, 2020 (FRSS 2019-20)

#### 4.5 Fishing Effort

The Jamuna River is used for fishing by both commercial and recreational fishers. Local fishermen reported that the Jamuna River is being used for fishing by 200–300 people in the chosen pilot sites. About 70% of the fishermen are employed as full-time or commercial fishermen, while 30% are part-time fishermen. The commercial fishers harvest round the year using different types of fishing gears like seine net, drag net, gill net and lining, depending on seasonality. The part-time fishers catch fish mainly for family consumption. Fishing gears, seasonality of operation and target fish species are shown in Table 4.7.

##### 4.5.1 Illegal Fishing

Hilsa is caught by fishermen during ban period because that time hilsa migrate longitudinally upwards for breeding. Local fishermen claim that during the ban period, 5–10% of commercial fishermen indulge in hilsa fishing. They also use different types of destructive fishing gear such as, current jal, china jal.

##### 4.5.2 Indiscriminate Fishing

The capture fishery in the Jamuna is decreasing trend reported by local fishers due to indiscriminate fishing of brood fishes, fertilized egg collection of major carp and small fishes in the early stage by various illegal fishing gears. Examples of destructive gears are seine net (Ber Jal), Fix net (Savar Net) and ring net (China Jal) that are used to catch fish irrespective of various sizes or species and thus causing problems to declining fish biodiversity of the river.

**Table 4.7: Fishing Gear, Seasonality and Target Fish**

Gear Type	Gear name (local)	Seasonality	Target fish species
Pull net	Moiya Jal/Ghai Jal	Ashyin-Kartik	Chingri, Baila
	Panti/Noiri Jal	Kartik-Falgun/Chaitra	Boiral, Chingri, Beush, Chela
Seine net	Ber Jal	Bhadra-Kartik	All fishes preferably small fish
	Kochal Jal	Jaistha-Ashyin	Kaiyakata, Bashpata, Chela, Ghaira, Kechki, Phesa, Ita, Gulsha, Chingri, Guchi
Ring net	China Jal	Ashar-Bhadra	SIS fishes preferably Baila, Baim, Guchoi, Icha, Gulsha, Bashpatari, Tengra, Pabda
Gill net	Current Jal	Year round	Boiral/Chigasi, Rakla(Rayek), Punti, Gulsha, Dhaira, Catol, Baim, Baila, Pabda
	Current Jal	Ashyin-Kartik (Ilish ban period)	Ilish
	Nagini Jal	Ashar-Kartik	Boiral/Chigasi, Kharsul, Rakla/Rayek
Thread net	Sutar Jal	Year round	Air, Baghair
Push net	Bheoyal Jal	Ashar-Bhadra	Small fishes
Fix bag net	Savar Net	Jaishtha-Ashar	Fertilized egg of Rui, Catla, Chital
Cast net	Toira Jal	Year round	Gulsha, Baim, Tengra, Chela, Ghaira, Pabda
Fish Lining	Dawon Borshi	Ashar-Bhadro	Boal, Air, Beush Kata, Baghair, Ita, Ghaura, Bacha, Baim

Source: CEGIS field survey, June and November 2021

#### 4.5.3 Fish Catch per Unit of Effort (CPUE)

During field investigation, fish catch assessment surveys (CASS) were done along the river reach of the Jamuna and for knowing the details about the fishing gears and their operability. Firstly, the study team sampled five river reaches of the Jamuna on the basis of length of each piloting site. Then fishing units were sampled according to the FRSS Catch Assessment Survey guidelines (DoF, 2020). The gear specific detail information, captured fish species and the summary of catch per unit effort (CPUE) of the fishing gears are shown in Table 4.8. Field investigation reveals that seine net (Ber Jal) and gill net (Nagini Jal) got the highest CPUE (3.50 and 1.17 kg/hr/gear respectively).

**Table 4.8: Fishing Gears, Captured Species and Efficiency**

SI	Site name	Gear Type	Gear name	Captured fish species	Fish catch per unit effort (Kg/hr/gear)
1	Bahadurabad	Push net	Beoyal Jal	Baila, Kajuli, Bacha, Kaiyakata, Gulsha, Chingri	0.50
2		Seine net	Ber Jal	Chingri, Kajuli, Baila, Phesa, Kaiyakata, Guchi, Gutum, Bacha, Ghaura	3.50
3		Ring net	China Jal	Boiral, Chingri, Baila, Punti	0.06
4		Pull net	Panti Jal	Boiral, Chingri, Beushkata, Chela	0.21
5	Bhuapur	Seine net	Ber Jal	Banshpata, Chela, Ghaura, Gulsha, Chingri, Guchi, Beushkata, Phesa, Baila, Kaiyakata, Poa, Kajuli, Ghorpuiya, Kuchia,	1.75
		Seine net	Kona Ber Jal	Ghaura, Poa, Shilong, Kajuli, Kaiyakata	0.63
6		Ring net	China Jal	Guchi, Chingri, Baila, Gharbeka chela, Gulsha, Baus	0.02
8		Cast net	Toira Jal/ Jhaki Jal	Baila, Chingri, Kakila, Chela, Ayre, Beushkata	0.60
9	Kajipur	Seine net	Kochal Ber Jal	Chela, Kakila, Chanda, Punti, Mola, Guchi, Catla, Chingri, Baila, Chapila, Baus, Rui	3.50
10		Gill net	Nagini Jal	Boiral, Khorsul	1.17
11		Pull net	Noiri Jal	Chela, Chanda, Rui, Catla	0.80
12	Bherakhola	Gill net	Current Jal	Ghaura, Shilong, Bacha, Banshpata, Kaiyakata	0.70
13		Ring net	China Jal	Chingri, Guchi, Baila, Tengra, Poa, Punti	0.08
14	Alipur	Lift Net	Shib Jal	Rui, Catla, Chital, Boal, Ayre	2.7
15		Hook	Hook	Boal	0.06
16	Uria Char	Seine net	Ber Jal	Banshpata, Chela, Ghaura, Gulsha, Chingri, Guchi, Beushkata, Phesa, Baila, Kaiyakata, Poa, Kajuli, Ghorpuiya, Kuchia,	0.24
17		Ring net	China Jal	Boiral, Chingri, Baila, Punti	0.11
18		Gill net	Current Jal	Ilish, Ghaura, Shilong, Bacha, Banshpata, Kaiyakata	0.14
19		Push net	Hat Chotka	Baila, Kajuli, Bacha, Kaiyakata, Gulsha, Chingri	0.26
20		Push net	Pela	Baila, Kajuli, Bacha, Kaiyakata, Gulsha, Chingri	0.25
21		Push net	Thela Jal	Baila, Kajuli, Bacha, Kaiyakata, Gulsha, Chingri	0.43
22	Uria Ghat	Seine net	Ber Jal	Banshpata, Chela, Ghaura, Gulsha, Chingri, Guchi, Beushkata, Phesa, Baila, Kaiyakata, Poa, Kajuli, Ghorpuiya, Kuchia,	0.16

Sl	Site name	Gear Type	Gear name	Captured fish species	Fish catch per unit effort (Kg/hr/gear)
23		Gill net	Fash Jal	Ghaura, Shilong, Bacha, Banshpata, Kaiyakata, Ilish	0.14
24	Char Ratanpur	Ring net	China Jal	Boiral, Chingri, Baila, Punti	0.09
25		Push net	Hat Chotka	Baila, Kajuli, Bacha, Kaiyakata, Gulsha, Chingri	0.16
26		Cast net	Toira Jal/ Jhaki Jal	Baila, Chingri, Kakila, Chela, Ayre, Beushkata	0.23

Source: Catch Assessment Survey, June and November 2021

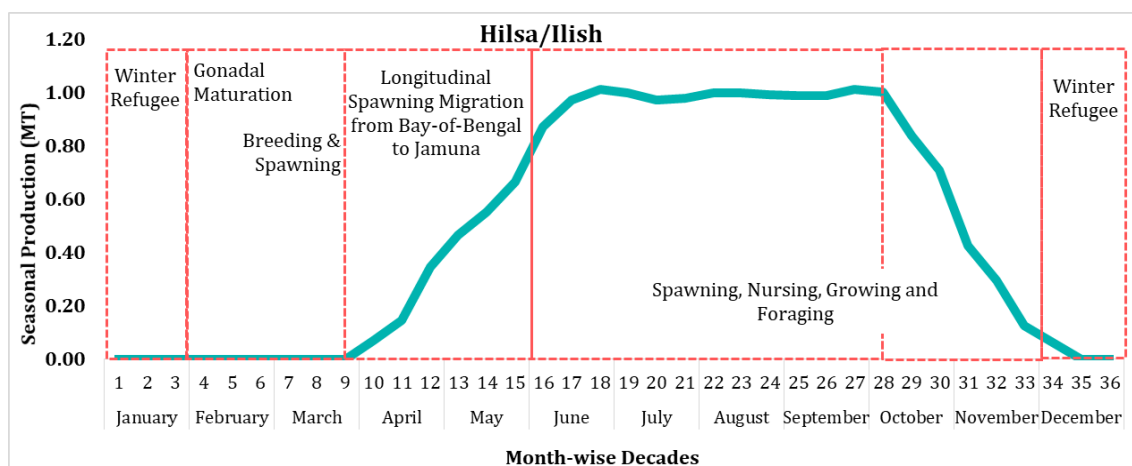
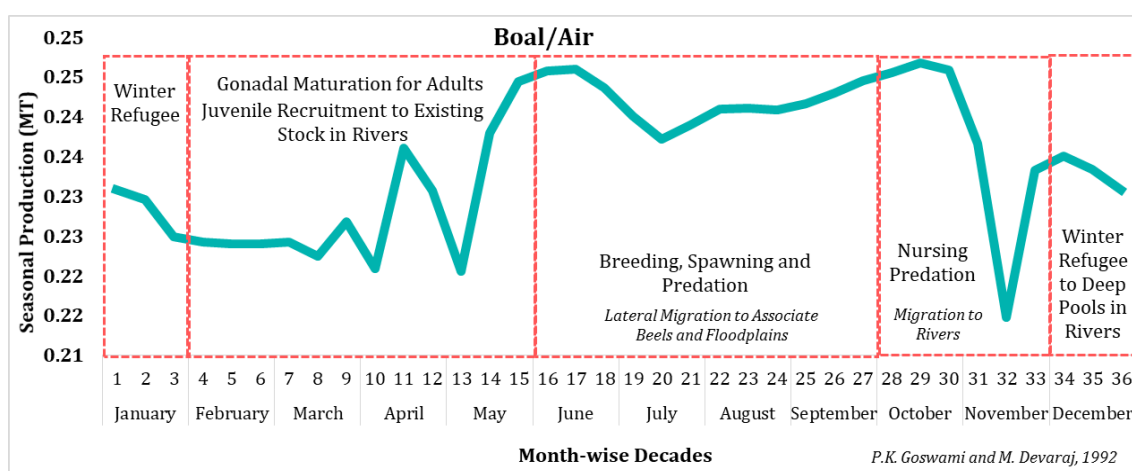
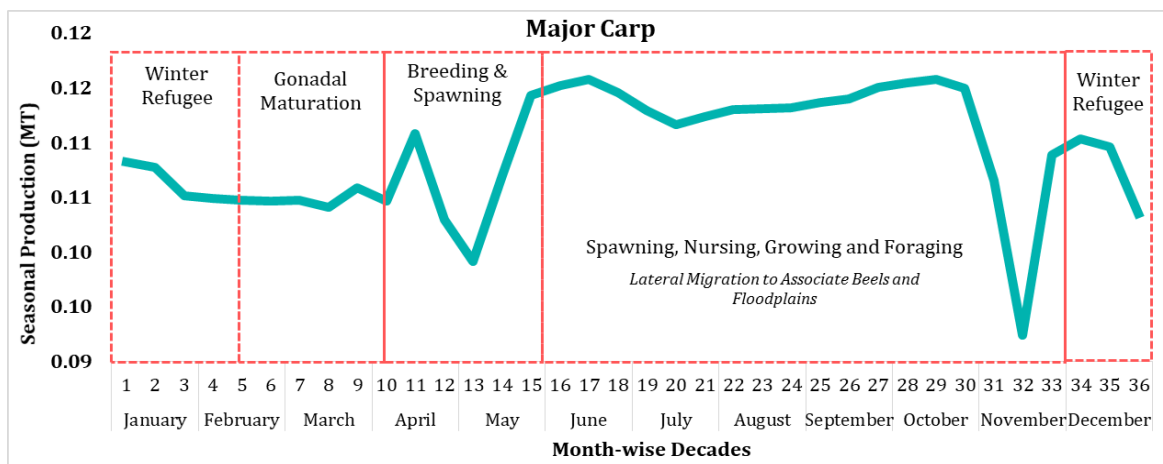
#### 4.6 Fish Biodiversity

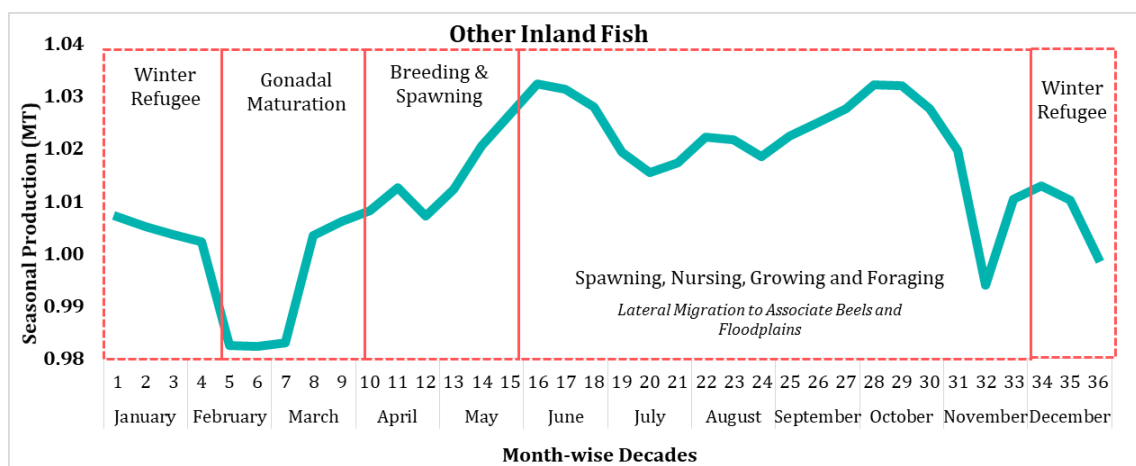
The Jamuna River study corridor contains about 36 different fish species, according to the present study. The species comprise 10 orders and 16 families. Among the observed fishes, 3 species are endangered, 7 vulnerable, 24 least concern and 1 data deficient according to IUCN Bangladesh 2015. A list of observed fishes and their conservation status is shown Annex 6.3.

Few studies on fish have been carried out in the Jamuna River. Among the studies, Shahjahan et. al (2001) identified 38 fish species, Rahman et al. (2014) recorded 57 species of fishes under 20 families and 9 orders and Majharul et. al (2016) identified 55 species under 44 genera and 28 families and Nahida et al (2018) identified 77 fish species under 10 orders 25 families and 54 genera in the catch of different gears in the Jamuna River.

The present study observed in Uria Union of FulchhariUpazila that river bank erosion resulted in assembling adults of some high valued fish species, which are Rui, Catla, Chital, Ayre and Boal, in the scouring sites. River bank is also very important for small species (Punti, Chingri, Bele, Chela, Taki). Local fishermen informed that about 60cm-6kg Length/Weighted individual of Rui and Catla, 94cm-7kg Length/Weighted individual of Chital, 90cm-6kg Length/Weighted individual of Boal, 120cm-10kg Length/Weighted individual of Ayre are caught in their catches of Pull Net along the erosion sites in Jamuna River of Uria Union. They also informed that the availability of these fish species has been increasing after erosion.

Seasonal production calendars (Figure 4.11) on Major Carp (Rui, Catla and Mrigel), Big Cat Fish (Boal and Air), Hilsha and other inland fishes were primarily developed based on the production probability of these fish groups in relation to the decadal water discharge and water depth, and bio-period (seasonal life history, based on literatures) of these fish groups. These calendars were validated with the fishing catchability of these fishes through consultation with local commercial fishers. In nature, spawning of majority of fishes occurs in the shallow and marginal areas of flooded rivers, generally coinciding with the south-west monsoon, and extending from April to September (FAO 2009). Several findings argue that temperature induces gonadal maturation (Quintana et al. 2004; Ardanaz et al. 2001; Peter 1981). From the month of February, winter-temperature is shifted to pre-monsoon temperature that induces gonadotropin hormone secretion during reproductive cycle in teleosts (Peter R. E., 1981). Gonadal maturation for all these groups is, thus, expected to occur from February to April with drastic rising water temperature. Several studies observed high recruitment into the *Wallago attu* stock in the months of January, February, March, April and May (Goswami and Devaraj 1992; Qasim and Qayyum 1962). Furthermore, from June to September, river, floodplain and beels are used as the nursery and foraging for growth. During post-monsoon season (October-November), all fishes migrate to their mother habitat (rivers and beels). During December-January, fishes move to the deep pools of the rivers for winter refuge. However, from the month of April Hilsha migrates from the Bay of Bengal to the Jamuna with pre-monsoon rising water discharge for spawning and start to go back to the Bay of Bengal from the month of November.





**Figure 4.11: Seasonal Production of Major Carp, Big Catfish (Boal/Air), Hilsha and the Other Inland Fishes**

#### 4.7 Species of Conservation Significance

A list of threatened species found in different studies on the Jamuna River, their IUCN status in Bangladesh and global is shown in Table 4.9.

**Table 4.9: A List of Threatened Fish Species in in the Jamuna River**

Scientific name	Common name	Local name	IUCN Bangladesh 2015	Global status
<i>Chitalachitala</i>	Clown Knife Fish	Chital	EN	NT
<i>Notopterusnotopterus</i>	Bronge Feather-back	Foli	VU	LC
<i>Gudusiachapra</i>	Indian River Shad	Chapila	VU	LC
<i>Channa marulius</i>	Great Snakehead	Gajar	EN	LC
<i>Bagarius bagarius</i>	Gangetic Goonch	Baghair	CR	NT
<i>Cabdiomorar</i>	Aspidopara	Morar, Morari	VU	NE
<i>Pethiaticto</i>	Two-spot Barb	Tit Punti	VU	LC
<i>Botiadarior</i>	Bengal loach	Rani	EN	LC
<i>Botialohachata</i>	Y-loach	Rani, Putul	EN	NE
<i>Neoeucirrhichthysmaydelli</i>	Goalpara Loach	Gutum, Puiya	CR	LC
<i>Rita rita</i>	Rita	Rita	EN	LC
<i>Sperataaor</i>	Long-whiskered catfish	Ayre	VU	LC
<i>Sperataseenghala</i>	Giant River-catfish	Guijja, Guijja Ayre	VU	LC
<i>Ompokbimaculatus</i>	Butter Catfish	Kani Pabda	EN	NT
<i>Ompokpabda</i>	Pabdah Catfish	Madhu Pabda	EN	NT
<i>Wallago attu</i>	Freshwater shark	Boal	VU	NT
<i>Clupisomagarua</i>	Garua Bacha	Ghaura	EN	NE
<i>Monopteruscuchia</i>	Gangatic mud eel	Kuchia	VU	VU
<i>Mastacembelusarmatus</i>	Zig-Zag Eel	Baim, Sal Baim	EN	NE

CR= Critical Endangered, EN= Endangered, UV =Vulnerable, NE=Not Evaluated

#### 4.8 Fish Migration

The Jamuna is connected with many rivers and khals of which important ones are the Bangali River, the Ichamati River, the Hurasagar river, the Ghagot River, the Manosh River, the Alai River, the Dudhkumar River and the Teesta Tiver. These rivers are connected either directly or through different khals. Many of

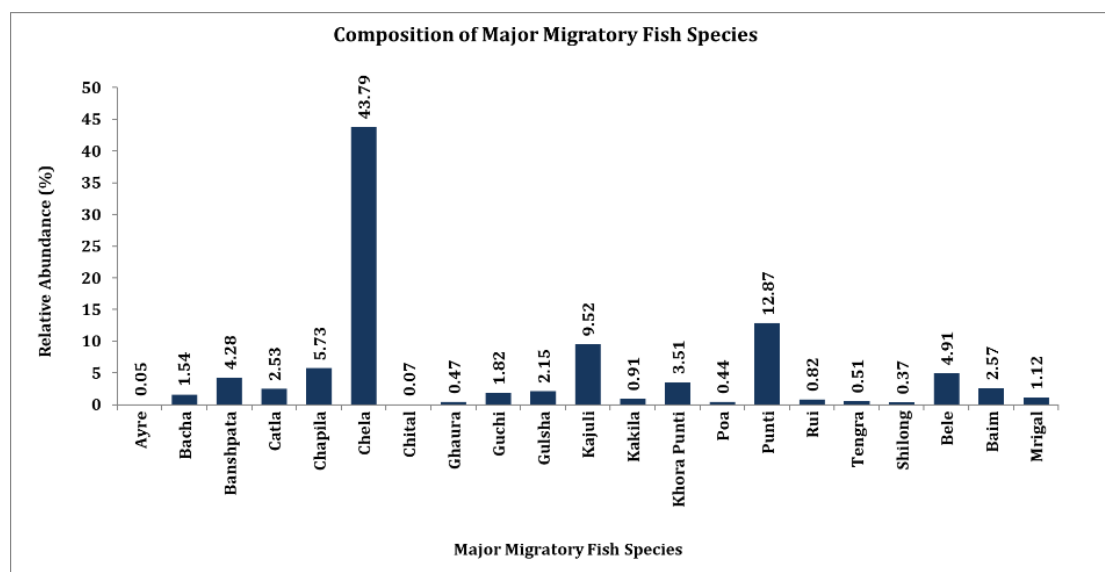


such rivers are located beyond the project influence site though they might have contribution in fisheries. There is many seasonal and perennial Beels which are connected with the rivers through the internal khals. This interlinked water system act as fish movement network in the entire area.

The riverine fishes particularly the Beel breeders generally migrate from the river to Beel through the connected Khals or to the floodplain when overtops the river and inundate the adjacent area during monsoon. Some species of fish remain confined in the river, some species migrate to the upstream of the river and some species migrate to Beels during monsoon season.

The Jamuna River acts as a longitudinal migration route for many riverine fish. The major migratory fish include Carps, Cat fishes and Hilsa. Major carp species like *Labeo rohita*, *Catlacatla*, *Cirrhinus cirrhosis*, *Labeo calbasu*, cat fishes like *Wallago attu*, *Sperataaor*, *Bagariusbagarius* and clupeid like *Tenualosailisha* use the river as longitudinal migration. Hilsa migrates into the Jamuna during March-May from Bay of Bengal through the Meghna and the Padma rivers (IUCN, 2015). Carp fishes migrate longitudinally to the upstream of the river and laterally to the inundated floodplains in the late dry season or early rainy season. Drifting migration of eggs and larvae occurs to the downstream or enter to floodplain with the floodwater. At the end of the rainy season, the adults and young migrate to the main river channel to avoid the harsh conditions of the floodplain during the dry season. Connecting khals between main rivers and other water bodies act as vital role for maintaining successful fish migration.

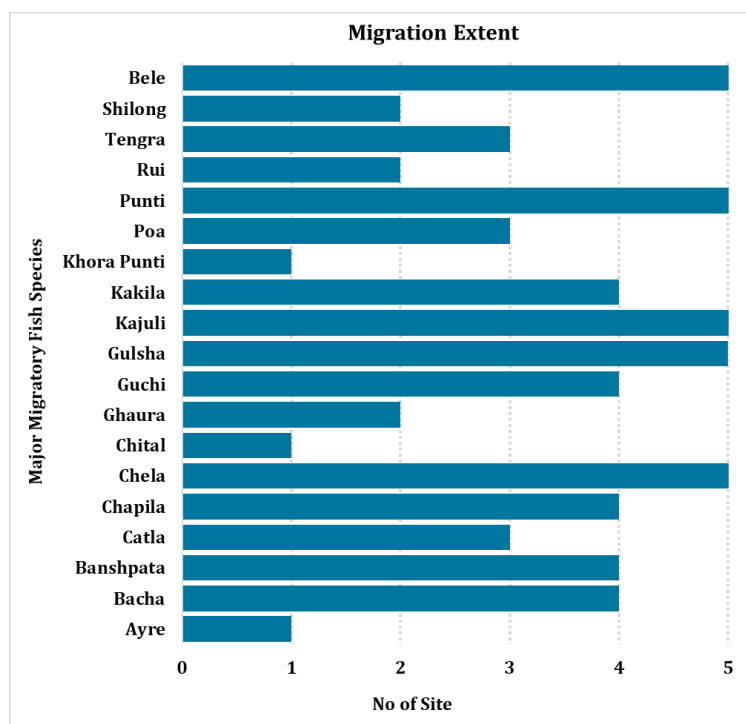
The Catch Assessment Survey, during the study period, found that two migratory fish species, including Chela, Punti and Kajuli are relatively abundant among available migratory species in the sample catches (**Figure 4.12**). On the other hand, the relative abundance of Ayre, Chital, Ghaura, Poa, Shilong and Tengra was low.



Source: CEGIS field investigation, July 2022

**Figure 4.12: Relative Abundance of Major Available Migratory Fish Species in the Instantaneous Catch**

Furthermore, some fish species, including Bele, Punti, Kajuli, Gulsha, and Chela are widely distributed in maximum sites, and the others are restricted in few sampling sites (Figure 4.13).



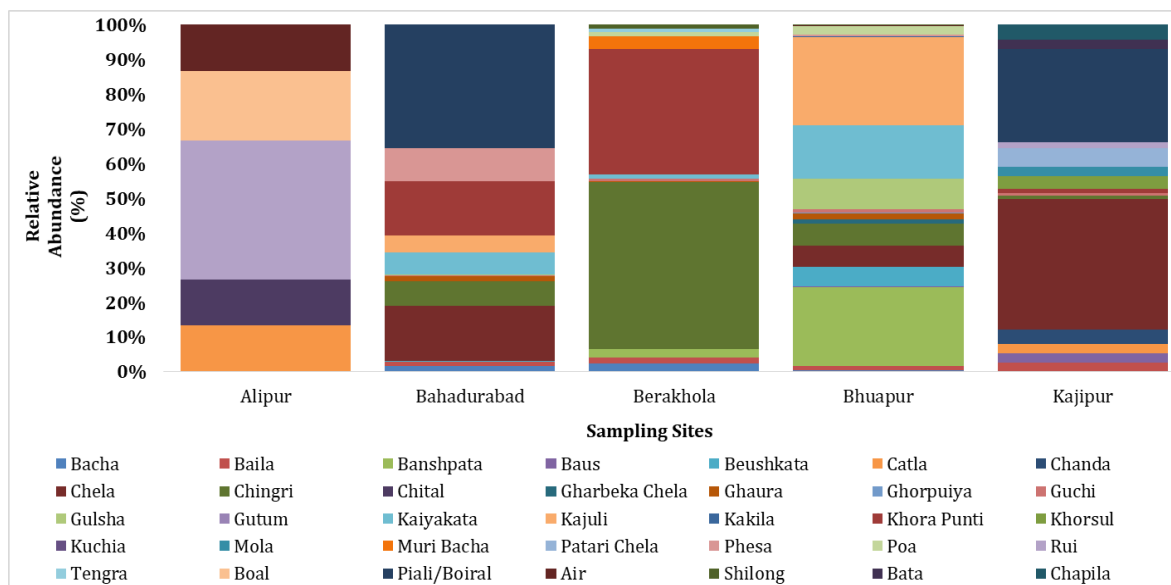
Source: CEGIS field investigation, July 2022

**Figure 4.13: Migration Extent along the Jamuna River within the Study Area**

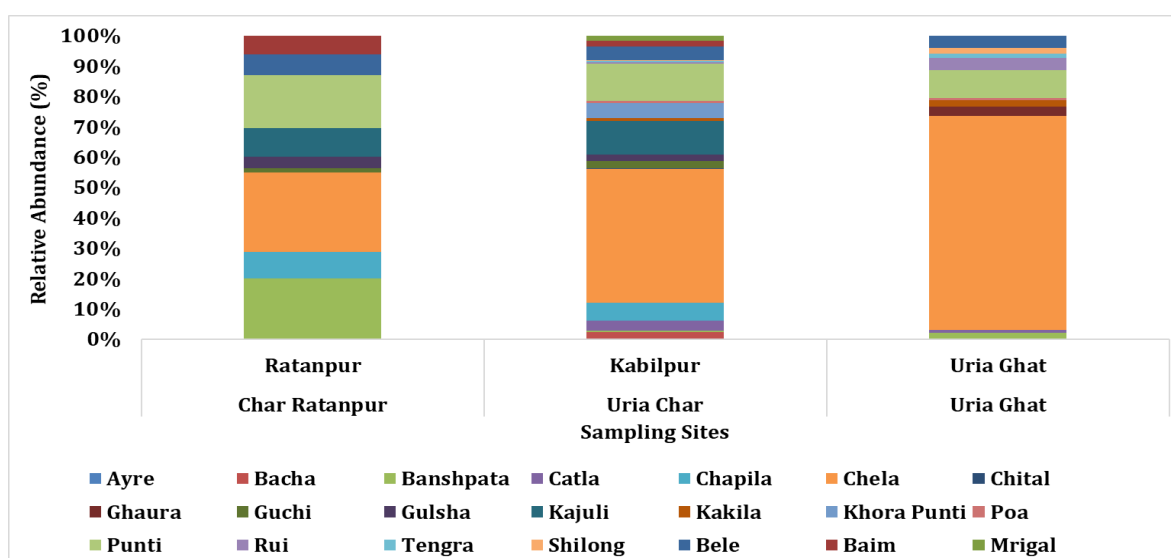
#### 4.9 Fish Catch Composition and Richness

In the present study, the fish catch was observed at five (05) locations in the Jamuna River within the study reach. It has been found that species composition varies with different sampling sites in the instantaneous catch during the study period. The following figure expresses the species compositional variation among different sampling sites (**Figure 4.14 A**). In the catch assessment, maximum (20 nos.) of fish species were observed at Bhuapur. More evenly distributed species (considering Shannon-Weiner Index) and high species richness (considering Simpson's Index) was observed at Alipur (**Table 4.10**).

In the present study, sixteen (16) catches were observed at three (03) locations in the Jamuna River within the study reach. It has been found that species composition varies with different sampling sites in the instantaneous catch during the study period. The following figure expresses the species compositional variation among different sampling sites (**Figure 4.14 B**). In the catch assessment, maximum (26 nos.) of fish species were observed at Uria char, Fulchari. More evenly distributed species (considering Shannon-Weiner Index) and high species richness (considering Simpson's Index) was observed at near Char Ratanpur, Fulchari (**Table 4.10**).



A



B

Source: CEGIS field investigation, July 2022, raw data are provided in Annex 6.3

**Figure 4.14: Species Composition in Instantaneous Catch during Study Period**

**Table 4.10: Instantaneous Species Evenness and Richness along the Jamuna River**

S/N	Site	Species Number	Shannon-Weiner Index	Simpson's Index	Dominant Fish No
1	Bahadurabad	14	0.70	0.77	4
2	Bhuapur	20	0.72	0.85	7
3	Kajipur	16	0.63	0.69	3
4	Bherakhola	12	0.54	0.64	3
5	Alipur	5	0.07	0.83	5
6	Char Ratanpur,	13	0.89	0.88	8

S/N	Site	Species Number	Shannon-Weiner Index	Simpson's Index	Dominant Fish No
	Fulchari				
7	Uria Char, Fulchari	26	0.72	0.84	6
8	Uria Ghat, Fulchari	15	0.62	0.74	4

Source: CEGIS field investigation, June and November 2021

## 5 Critical Habitat Assessment

### 5.1 Critical Habitat Criteria of the ESS6 of the World Bank

As per ESS6, Critical Habitats are defined as areas with high biodiversity importance or value including:

- (a) habitat of significant importance to Critically Endangered or Endangered species, as listed in the IUCN Red List of threatened species or equivalent national approaches;
- (b) habitat of significant importance to endemic or restricted-range species;
- (c) habitat supporting globally or nationally significant concentrations of migratory or congregator species;
- (d) highly threatened or unique ecosystems;
- (e) Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d).

### 5.2 Methodology of Determining Critical Habitat

The approach to critical habitat assessment started with screening ESS6 criteria to preliminarily assess whether these criteria would be applicable or not. Thereafter, the species list obtained from the IBAT dataset of species within a 50km radius of the project was reviewed and screened. The IBAT listed a total of 903 species including 9 globally Critically Endangered (CR) and 18 globally Endangered species. (defined in Section 1.1) and its vicinity. The list of species was further updated with the data from IUCN Red List of Bangladesh (IUCN Bangladesh 2015). While determining the conservation status, priority was given to the national red list ratings over and global IUCN Red list status.

Thereafter the relevance of critical habitat was assessed for each species on the basis of expert judgment. The judgment on whether the habitat is of “significant importance” or “significant concentration” was made through applying the following guidelines:

- Key Biodiversity Areas (KBA) including IBA and AZE sites, other protected areas and reasons for designation are important CH indicators but require appropriate justification against the ESS6 critical habitat criteria.
- Priority is placed on national red list ratings over IUCN (global) red list ratings.
- Prominent highly threatened species that are present or with a possible LOO within the BAA are recommended to be considered a critical habitat feature on a case-by-case basis.
- Critically Endangered (CR) species face an extremely high risk of extinction, and their survival is in a critical state. Therefore, if present in the BAA, consideration should be given towards ESS6 Criterion (a) being achieved, unless there are appropriate arguments for its exclusion.
- Where a significant proportion ( $\pm 1\%$ ) of the national or global population of a species has a likely presence within the BAA, critical habitat can be achieved under ESS6 Criterion (a), (b) or (c) as appropriate.
- ESS6 Criterion (b) can be achieved for restricted range species where the BAA overlaps a significant proportion ( $\pm 1\%$ ) of a species' distribution range.
- ESS6 Criterion (c) can additionally be achieved for migratory and congregatory species where a significant proportion ( $\pm 1\%$ ) of a species' national or global population is exposed to the BAA of impact.
- ESS6 Criteria (d) and (e) are to be assessed on a case-by-case basis using reliable data sources and expert opinion, with consideration given to legally protected areas, KBAs, IBAs, AZE sites, Ramsar Sites, World Heritage Sites, other conservation initiatives and the reasons for which they are designated.



### 5.3 Likelihood of Triggering ESS6 Criteria of Critical Habitat Assessment

A preliminary assessment suggested that there is likelihood of some species triggering the Criterion (a) but not the other criteria. Table 5.1 summarizes results of the assessment.

**Table 5.1: Species, Ecosystem and Landscape Level Factors in terms of ESS6 Criteria for the Jamuna River**

ESS6 Criteria for Critical Habitat	Likelihood of triggering in case of Jamuna River
(a)	The IBAT result listed 27 EN and CR species which are further screened in the following section gave a preliminary impression that this criterion is likely to be triggered. There is justification for critical habitat to be recognized for Ganges River Dolphin(VU), Gharial (CR), Fishing Cat (EN), Baghair (CR), and Chital (EN) in the Jamuna River. Their national threatened status is mentioned in first parenthesis. Project activities have the potential to impact Ganges River Dolphin, Baghair and Chital and net gain requirements may apply to these species.
(b)	The IBAT list and a preliminary assessment suggested there are no restricted range or endemic species occurring in the Jamuna River with potential to meet this criterion.
(c)	There are no known migratory or congregatory species likely to meet this criterion.
(d)	Jamuna River has not been considered as a highly threatened ecosystem. The braided nature of the river is sometimes referred to as a unique ecosystem, however similar habitats are also available in Padma and other major rivers in the country, and no critical habitat status is therefore recognized under this criterion.
(e)	Complex food chains involving fish and lesser organisms are required to sustain some of the species mentioned above, however insufficient data is available to justify a critical habitat status under this criterion.

### 5.4 Determination of Critical Habitat Occurrence

The IBAT data for 50km radius shows 9 globally Critically Endangered (CR) and 18 globally Endangered (EN) species but an assessment found 4 CR and 9 EN species are relevant to the BAA (Table 5.2). The screening assessment was based on the national database of Bangladesh's biodiversity, habitat preference of each species, and the Likelihood of Occurrence (LOO) of each species within the BAA. The species that had not been recorded previously in the BAA, and which were unlikely to occur were excluded from the list. More species were included based on the national data. Finally, the number of CR and EN species became 19. No endemic or restricted range species were found.

After the screening, an assessment was made to determine Critical Habitat Occurrence within the BAA as per the ESS6 criteria, and expert judgment on "habitat of Significant Importance" and "Significant Concentration of migratory species" (Table 5.3).

Table 5.2: Screening of IBAT List of CR and EN Species Extracted for 50km Radius of Project

Scientific Name English Names	Threatened Status		Habitat Requirements	Distribution Data in Bangladesh	LOO and Reasons for Exclusion
	National	Global			
<b>Mammals</b>					
<i>Platanista gangetica</i> Ganges River Dolphin	VU	EN	Major Rivers	Widely distributed (Khan 2018)	Present. Sighted at Kalihati site during the field visit. The site is located along the main channel of the river. Main channel of the river is the known habitat for Dolphins. In Fulchari study site, dolphin was sighted by local fisherman during fishing but the relative abundance was very much low because the study site was far away from the main channel.
<i>Axis porcinus</i> Hog Deer	CR	EN	Hilly forest	South east hilly region (IUCN BD 2015b)	Out of Range
<b>Reptiles</b>					
<i>Gavialis gangeticus</i> Gharial	CR	CR	Major river	Distributed in Padma, Jamuna-Brahmaputra and Teesta in Bangladesh. Within Jamuna, mostly braided area of Jamuna (upper Jamuna), Sandbars of Jamuna away from human disturbance (IUCN BD 2015d)	Likely Local Newspaper reported that a individual of Gharial was captured from Fulchari rea by local fisherman during fish catching. Probably the newly emmerged charlans are suitable habitat for the gharial species as well as it could be come from the Jamuna River of Indian Portion.
<i>Nilssonina nigricans</i> Black Softshell Turtle	EN	CR	Wetlands, River system (mostly tributaries) and streams	North East Haor (wetlands), Hilly Stream (Rangamati), Feni River, Dam's Reservoir, North-west wetlands. There are no records of occurrence in Jamuna and similar major river. They were mostly found in wetlands. (Khan 1982, 1987, IUCN BD 2015d),	Unlikely, Out of range

Scientific Name English Names	Threatened Status		Habitat Requirements	Distribution Data in Bangladesh	LOO and Reasons for Exclusion
	National	Global			
<i>Batagurkachuga</i> Red-crowned Roofed Turtle	CR	CR	Major river, wetlands	Recorded in Northern flashy rivers (Kongsho, Someswari); Tributary of Jamuna (Dhorla); Lower Meghna; (Dash 2012, Islam 2009, IUCN BD 2015d)	Unlikely, no recent records of occurrence, habitat exists but is highly disturbed
<i>Pangshurasyhetensis</i> Assam Roofed Turtle	CR	CR	Hilly Stream and low-lying wetlands, tropical hilly forest, fast flowing stream	North -Easter and South-Eastern Hilly stream and foothill wetlands (IUCN BD 2015d)	Out of Range
<i>Batagurdhongoka</i> Three-striped Roofed Turtle	CR	CR	Major River	Meghna, Jamuna, Padma (Khan 2018)	Possible
<i>Batagurbaska</i> Northern River Terrapin	CR	CR	Marine, Estuarine, Mangrove, Major Rivers	Sundarbans, Padma-Jamuna Confluence (Khan 2018)	Unlikely, Out of Range
<i>Pelochelyscantorii</i> Asian Giant Softshell Turtle	CR	CR	Estuarine and Major River Confluence	Sundarbans, Coastal wetlands, Estuarine area (IUCN BD 2015d, Khan 2018)	Unlikely, out of range
<i>Geoclemyshamiltonii</i> Spotted Pond Turtle	EN	EN	Inland wetlands	Widely distributed (Khan 2018)	Possible
<i>Hardellathurjii</i> Crowned River Turtle	EN	EN	Inland wetlands, Major Rivers	Widely distributed (Khan 2018)	Possible
<i>Moreniapetersi</i> Indian Eyed Turtle	NT	EN	Inland wetlands, distributary and tributaries of rivers	Widely distributed (Khan 2018)	Possible
<i>Nilssoniagangetica</i> Gangetic Softshell Turtle	EN	EN	Major River System	Widely distributed (Khan 2018)	Possible
<i>Nilssoniahurum</i> Indian Peacock Softshell Turtle	LC	EN	Inland Wetlands, Major River System	Widely Distributed (Khan 2018)	Possible
<i>Cuoramouhotii</i> Keeled Box Turtle	CR	EN	Hilly forest, wetland	South Eastern hilly region (Khan 2018)	Out of Range
<b>Birds</b>					
<i>Aythya baeri</i>	CR	CR	Major Wetlands with dense aquatic vegetation	North Eastern Wetlands, Padma River (Khan 2018)	Unlikely

Scientific Name English Names	Threatened Status		Habitat Requirements	Distribution Data in Bangladesh	LOO and Reasons for Exclusion
	National	Global			
Baer's Pochard					
<i>Emberiza aureola</i> Yellow-breasted Bunting	VU	CR	Wetlands, Grasslands	North Eastern Wetlands, Islands/Grass lands adjacent to major rivers like Padma, Jamuna (IUCN BD 2015c, Khan 2018)	Possible
<i>Rynchopsalbicollis</i> Indian Skimmer	CR	EN	Large river, Coastal Wetland	Padma, Jamuna, Estuary, Coastal Islands (Khan 2018)	Possible
<i>Sterna acuticauda</i> Black-bellied Tern	CR	EN	Large river, Coastal Wetland, Mudflats	Padma, Jamuna, Estuary, Coastal Islands (Khan 2018)	Possible
<i>Haliaeetus leucoryphus</i> Pallas's Fish-eagle	EN	EN	Wetlands, Estuarine area, Coastal Wetlands	North East and South West and Central Region of the Country (Khan 2018)	Possible
<i>Leptoptilos dubius</i> Greater Adjutant	RE	EN	Wetlands, Estuarine area, Coastal Wetlands	Regionally Extinct, North-western region (as vagrant) (IUCN BD 2015)	Unlikely, Out of Range
<i>Laticillacinerascens</i> Swamp Grass-babbler	Not assessed	EN	Inland wetlands	Possibly extant in Central region and North-western region	Out of Range
<i>Mycteria leucocephala</i> Painted Stork	CR	NT	shallow freshwater wetlands and marshes, flooded agricultural lands	Wetlands and floodplains of South-west region, River Padma, Ganges, the braided part of the Jamuna River	Possible
<i>Clanga hastata</i> Indian Spotted Eagle	EN	VU	Mainly in open areas and village groves.	Widely distributed in Bangladesh.	Possible
<b>Fish</b>					
<i>Schisturasijuensis</i>		EN	Wetlands, Caves	Not Present	Out of Range
<i>Pillaia indica</i>	Not assessed	EN	Small streams	Restricted to Bhutan	Possible
<i>Urogymnus polylepis</i> Giant Freshwater Whipray	Not assessed	EN	Estuarine and Major River with partial salinity	Estuarine habitats	Possible
<i>Tor putitora</i> Golden Mahseer	EN	EN	Hilly Stream, Fast flowing stream	Uncertain distribution within much of Bangladesh	Possible
<i>Chitalachitala</i>	NT	EN	Wetland, mainly in large river	The species is widely distributed throughout	Possible

Scientific Name English Names	Threatened Status		Habitat Requirements	Distribution Data in Bangladesh	LOO and Reasons for Exclusion
	National	Global			
Chital/ Clown Knife Fish				Bangladesh	
<i>Bagarius bagarius</i> Baghair	CR	NT	Wetland, mainly in large river.		Present
<i>Ompok bimaculatus</i>	NT	EN	Wetland		Possible
<i>Ompok pabda</i>	EN	NT			Possible
<i>Channa marulius</i> Gajar	EN	LC			Possible
<i>Botia Dario</i> Rani	EN	LC			Possible
<i>Rita rita</i> Rita	LC	EN			Possible
<i>Clupisomagarua</i> Ghaura	EN	NE	Wetland	Widely distributed	Possible
<i>Mastacembelus Armatus</i> Sal Baim	EN	NE	Wetland		Possible
<b>Flora</b>					
<i>Heritiera fomes</i>	Not assessed	EN	Mangrove	Sundarbans, Coastal area	Out of Range

Table 5.3: Assessment of Critical Habitat Occurrence

Scientific Name	English Names	Threatened Status		Population Size		Assessment of Critical Habitat
		National	Global	National Population	Global Population	
<b>Mammals</b>						
<i>Platanista gangetica</i>	Ganges River Dolphin	VU	EN	331 in Padma Jamuna. Average linear encounter rate in the Padma River was 0.53 dolphin/km and in the Jamuna River 1.45 dolphins/ km (Rashid et al. 2015).	Unspecified. Current population trend is Decreasing	Sighted at Kalihati site during the field visit. Dolphins are widely distributed in Bangladesh. Reliable data is not available on the local population; however, it is likely that greater than 1% (at least 3 individuals) of the national population occur, and <b>the BAA therefore has the potential to be of significant importance for this species under ESS6 Criterion (a).</b> (See Section 6.1 for additional data)
<i>Prionailurus viverrinus</i>	Fishing Cat	EN	VU	Unknown, decreasing, 50-70% decrease in population	Unknown, decreasing; 30-60% decrease globally (Mukherjee et al. 2016)	Widely distributed through much of the country. Based on known occurrence but lack of Red List data on population size, the BAA should be considered to have <b>significant importance for this species under ESS6 Criterion (a).</b> (See Section 6.7 for additional data)
<b>Reptiles</b>						
<i>Gavialis gangeticus</i>	Gharial	CR	CR	Current population is unknown, expert opinion indicated only 3-4 population present. IUCN redlist (2015) reported 32 populations during 1991-2000. Rashid et al (2014) reported 21 individuals	300 - 900 (650 individuals), Current Population Trend is Increasing. (Rashid et al., 2014)	The Upper reach of the Jamuna River which is mostly braided part of the river is a known hotspot of Gharial. The Gharial Study <sup>11</sup> conducted by IUCN (Funded by World Bank) found no Gharials nearby the BAA and its vicinity. According to the study, habitat within the BAA and its vicinity has low opportunity and high threats for Gharials. There is a claim of capturing a Gharial at a char off Sirajgaj by a Fisherman in 2019 which is around 15km upstream towards the opposite bank. While

<sup>11</sup> Hassan and Alam, 2016. Gharials of Bangladesh, IUCN Bangladesh. ISBN:978-984-34-1220-1. Available at <https://portals.iucn.org/library/sites/library/files/documents/2016-090.pdf>



Scientific Name	English Names	Threatened Status		Population Size		Assessment of Critical Habitat
		National	Global	National Population	Global Population	
				were captured/spotted during 2009 and 2012.		there is no evidence of continued presence, the occurrence of one individual potentially represents approximately 20% of the estimated population, and <b>the BAA therefore potentially of significant importance for Gharial under ESS6 Criterion (a).</b> (See Section 6.2 for additional data)
<i>Batagurdhongoka</i>	Three-striped Roofed Turtle	CR	CR	The actual number of populations is unknown but the population reduction is more than 90% in the last 10 years (IUCN BD 2015)	Population not known; globally decreasing (Daset al. 2014)	This species has not been recorded during baseline surveys. There are no recent records of sightings in and around the BAA. However, their suitable habitats exist, the species was once widely distributed. <b>Habitats within the BAA and BAA are unlikely to have significant importance for this species.</b>
<i>Geoclemyshamiltonii</i>	Spotted Pond Turtle	EN	EN	Not known/ Unspecified; 80% decrease	Unknown, abrupt decline since 1980 <sup>12</sup>	This species has not been recorded during baseline surveys. There is no recent record of sightings in and around the BAA. However, their suitable habitats exist. <b>Habitats within the BAA are unlikely to have significant importance for this species.</b>
<i>Hardellathurjii</i>	Crowned River Turtle	EN	EN	Unspecified, decreasing [ Once it was considered common in all major rivers up to 1990, at present 80-90% population may have declined] (Rashind 2011)]	Decreasing; Not known	This species has not been recorded during baseline surveys. There is no recent record of sightings in and around the BAA. However, their suitable habitats widely distributed. <b>Habitats within the BAA are unlikely to have significant importance for this species.</b>

<sup>12</sup> In Bangladesh, the species was considered rare after an abrupt population decline in the past 20 years and total disappearance from extensive parts of its range in Bangladesh (Rashid and Khan 2000). By 2011, the species was considered to be more threatened than previously thought and estimated to have lost at least half its population since 1980, qualifying nationally as Endangered (S.M.A. Rashid pers. comm. at Singapore Red List Workshop, 2011).

Scientific Name	English Names	Threatened Status		Population Size		Assessment of Critical Habitat
		National	Global	National Population	Global Population	
<i>Moreniapetersi</i>	Indian Eyed Turtle	NT	EN	Unspecified, decreasing [Once it was considered common in all major rivers up to 1990, at present 60% population may have declined] (Rashind 2011)]	Unspecified. Current population trend is Decreasing	This species has not been recorded during baseline surveys. There is no recent record of sightings in and around the BAA. However, their suitable habitats exist widely. <b>Habitats within the BAA are unlikely to have significant importance for this species.</b>
<i>Nilssoniagangetica</i>	Gangetic Softshell Turtle	EN	EN	Unspecified, 80-90% decrease (Ahmed et al. 2021, Rashid and Swingland 1990)	Unspecified. Current population trend is Decreasing	This species has not been recorded during baseline surveys. There is no recent record of sightings in and around the BAA. However, their suitable habitats widely distributed. <b>Habitats within the BAA are unlikely to have significant importance for this species.</b> (See Section 6.3 for additional data)
<i>Nilssoniahurum</i>	Indian Peacock Softshell Turtle	LC	EN	Unspecified, 60-70% decrease (IUCN BD 2015)	Unspecified. Current population trend is Decreasing (Das et al. 2021; Rashid and Swingland 1990)	This species has not been recorded during baseline surveys. There is no recent record of sightings in and around the BAA. However, their suitable habitats are widely distributed. <b>Habitats within the BAA are unlikely to have significant importance for this species.</b>
<i>Chitra indica</i>	Narrow-headed Softshell Turtle	CR	EN	Unknown, decreasing; 80-90% decrease in population Asian (Turtle Trade Working Group. 2000; Rashid and Khan 2000)	Unknown, decreasing, continuing decline of mature individuals	This species has not been recorded during baseline surveys. There is no recent record of sightings in and around the BAA. However, their suitable habitats are mostly distributed in large wetlands in North-east and south-west. <b>Habitats within the BAA are unlikely to have significant importance for this species.</b>
<b>Birds</b>						
<i>Emberiza aureola</i>	Yellow-breasted Bunting	VU	CR	Not known/ Unspecified	Not known; Europe, at least formerly, formed 25-49% of the global range. The European population is now estimated to number just 120-600 mature individuals (BirdLife	This species has not been recorded during baseline surveys. There is no recent record of sightings in and around the BAA. However, their suitable habitats widely distributed in the chars, grasslands. <b>Habitats within the BAA are unlikely to have significant importance for this species.</b>

Scientific Name	English Names	Threatened Status		Population Size		Assessment of Critical Habitat
		National	Global	National Population	Global Population	
					International 2022a)	
<i>Rynchopsalbicollis</i>	Indian Skimmer	CR	EN	Unknown, a total of 3,108 individuals were counted at NijhumDwip of Meghna Estuary in February 2020 (D.K. Das in litt. 2020). BirdLife International 2022b).	3,700 and 4,400 individuals, roughly equating to 2,450-2,900 mature individuals.	This species has not been recorded during baseline surveys. There is no recent record of sightings in and around the BAA. Another recent survey conducted in 2011-2012 winter season found no record in the entire Jamuna and Padma River (Sayam, et. al., 2014). Their population is mostly concentrated to Meghna estuarine islands. <b>Habitats within the BAA are unlikely to have significant importance for this species.</b>
<i>Sterna acuticauda</i>	Black-bellied Tern	CR	EN	0-50 (IUCN Bangladesh 2015)	10,000-25,000 individuals, roughly equating to 6,700-17,000 mature individuals (BirdLife International 2022c)	This species has not been recorded during baseline surveys. There is no recent record of sightings in and around the BAA. A recent survey conducted in 2011-2012 winter season targeting this species found no record in the entire Jamuna and Padma River (Chowdhury et al. 2014). <b>Habitats within the BAA are unlikely to have significant importance for this species.</b> (See Section 6.4 for additional data)
<i>Mycteria leucocephala</i>	Painted Stork	CR	NT	>50	25,000-35,000 individuals or 16,000-24,000 mature individuals (BirdLife International 2022e)	Recently observed at upper part (100+ km upstream of the project site) of the Jamuna River, however, not observed during the baseline survey. <b>Habitats within the BAA are unlikely to have significant importance for this species.</b>
<i>Clanga hastata</i>	Indian Spotted Eagle	EN	VU	<250	2,500-9,999 mature individuals, equating to 3,750-14,999 individuals, rounded here to 3,500-15,000 individuals (BirdLife International 2022f)	This species has not been recorded during baseline surveys. However, their suitable habitats are mostly distributed in large wetlands and river Charlands. <b>Habitats within the BAA are unlikely to have significant importance for this species.</b>
<b>Fish</b>						
<i>Bagariusbagarius</i>	Baghair	CR	NT	Not known, declining 30-50%	A considerable decline in the population in southern West	Regularly captured by fishermen in the Jamuna River within and adjacent areas of the project site. Based on

Scientific Name	English Names	Threatened Status		Population Size		Assessment of Critical Habitat
		National	Global	National Population	Global Population	
					Bengal of 29.2% over four decades from 1960 to 2000 has been reported (Mishra et al. 2009, Ng 2010).	regular occurrence and a CR threatened status, <b>the BAA is considered to have significant importance for this species under ESS6 Criterion (a).</b> (See Section 6.5 for additional data)
<i>Chitalachitala</i>	Chital/ Clown Knife Fish	NT	EN	Not known, declining 30-50%	Not known, declining (Chaudhry, 2010)	Regularly captured by fishermen in the Jamuna River within and adjacent areas of the project site. Based on known occurrence but lack of Red List population data on, the BAA should be considered to have <b>significant importance for this species under ESS6 Criterion (a) on a precautionary basis.</b>
<i>Channa marulius</i>	Gajar	LC	EN	Unknown and declining	Anecdotal information, long time field observation and expert consultation suggested a continued decline in population abundance.	Habitat is widely distributed in all rivers, beels, haors, reservoirs, canals, etc. <b>Habitats within the BAA are unlikely to have significant importance for these species.</b>
<i>Botiadario</i>	Rani	Lc	EN	Unknown and declining	Population of the species has probably declined by about 75% during the last two decades in Bangladesh	
<i>Rita rita</i>	Rita	LC	EN	Unknown and decreasing	Unknown	
<i>Ompokbimaculatus</i>	Kani Pabda	NT	EN	Unknown and decreasing	Unknown	Habitat is widely distributed in all rivers, beels, haors, reservoirs, canals, and ponds. <b>Habitats within the BAA are unlikely to have significant importance for any of these species</b>
<i>Ompokpabda</i>	Madhu Pabda/ Butter Catfish	NT	EN	Unknown and decreasing	Unknown	
<i>Clupisomagarua</i>	Ghaura	NE	EN	Unknown and declining	Unknown	
<i>Mastacembelus armatus</i>	Sal Baim	NE	EN	Unknown and declining	Unknown	

## 5.5 Screening of Critical Features against Potential Risk and Impacts

The potential critical habitat features (species which might trigger critical habitat criteria) were further evaluated on the basis of current threats and potential risk and impact due to the proposed interventions. Table 5.4 presents the final results.

**Table 5.4: Final Screening of Critical Habitat Features against Potential Project Impacts**

Species English and Scientific Name	Threat Status		Documented Threats	Potential Project Risks and Impacts	Mitigation and Net Gain Requirements
	Nat.	IUCN			
Gharial <i>Gavialis gangeticus</i>	CR	CR	habitat destruction, upstream embankments and entanglement in fishing nets	There is a potential disturbance to Gharial through noise emissions associated with piling and the increased presence of workers associated with construction activities. However, a minimal population of Gharial is expected if any at all.	Mitigation to flush sensitive species away from construction works will be applied which will address any unlikely impact to Gharial in the unlikely event that an individual appears. Impacts can be avoided and Net gain is therefore not required
Ganges River Dolphin <i>Platanista gangetica</i>	VU	EN	Poaching, Collection of oil from dolphin	Dolphin might be disturbed by intensive labour influx and noise impacts of pile diving for Groyne construction.	An alternative piling method with low noise emission will be applied to avoid impacts to Dolphins. Net gain will not be necessary, although local dolphin specialists will be engaged for pioneering approaches for future phases of the project when larger impacts are expected
<i>Prionailurus viverrinus</i> Fishing Cat	EN	VU	Human wildlife conflict, Indiscriminate killing, Anthropogenic Threats	Fishing cats were not found in survey period but the BAA does include suitable habitat for this species. Fishing cats will not be impacted by construction works on the river bank. The presence of workers may raise the levels of disturbance if any fishing cats occur, although impacts will be minimal.	Mitigation to raise awareness among workers will be applied to address any unlikely impacts and net gain is therefore not required.
Baghair <i>Bagarius bagarius</i>	CR	NT	Over fishing	Naturally eroding river bank is the preferred foraging habitat. The proposed intervention would alter this habitat by preventing the erosion, filling the scoured area with sand-filled geobags although the overall impact of the pilot phase to these fish will be low.	There is no known reliable mitigation, however a residual impact assessment will be constrained by the lack of data on these species. The Department of Fisheries will be consulted to investigate opportunities for developing effective mitigation.
Chital <i>Chitalachitala</i>	EN	NT	Over fishing, loss of floodplain connectivity, loss of habitat		

## 6 Assessment of Species Triggering Critical Habitat Criteria and Other Important Species

### 6.1 Ganges River Dolphin (*Platanista gangetica*)

#### 6.1.1 Distribution and Habitat Requirement

The EOO is 1,42,000 km<sup>2</sup> and AOO is 7,338 km<sup>2</sup> as estimated by IUCN.

Ganges River dolphin (*Platanista gangetica*) is the most notable globally Endangered mammal species of the Jamuna River (IUCN 2015, Rashid et al. 2015). It is facing high risk throughout the distribution range due to anthropogenic threats like destruction of natural habitats and damming of upper reaches of all trans-boundary rivers causing siltation and insufficient water flow. This consequently altered habitat and water quality; and finally declined the extent of occurrence in narrow river systems. It is now restricted to a few larger channels of Ganges-Brahmaputra-Jamuna-Meghna River system, thus enlisted as vulnerable (VU) in IUCN Bangladesh Red list and endangered (EN) globally (Alom 2015). Its' trade is also restricted by including it on the Convention on International Trade of Endangered Species of Flora and Fauna (CITES) Appendix I and considered as a flagship species by World Wide Fund for Nature (WWF) (Rashid et al. 2015).

*Platanista gangetica* solely lives in freshwater river system and estuaries where salinity level is low (Ahmed 2009). It is found in all connected rivers and tributaries including seasonally flooded and lowlands-Three dolphin sanctuaries have been declared in the Padma-Jamuna River system of which two are in the Jamuna River (see chapter 2 for further details) and one in the Padma River. It is also recommended to declare the whole Padma and Jamuna rivers as Padma-Jamuna dolphin sanctuary (Aziz 2019).

#### 6.1.2 Distribution in Jamuna River and in BAA

A field survey conducted in 2014 (by IUCN) encountered a respectable number of Dolphins in the Jamuna River and in and around the BAA (Figure 6.1). Generally, Dolphins are frequently sighted along the major channel of the Jamuna River. Similarly, within the BAA, the major channel of Jamuna seems most favorable for dolphins. During a survey in the dry season of 2014 by ICUN, 23 dolphins were encountered by the IUCN near the Kazipur reach of BAA. In another research, dolphin counts significantly varied between dry and wet (monsoon) season in the Jamuna River whereas it did not vary significantly between the two seasons for the Padma River. Overall dolphin encounter rate varied significantly between the Padma and Jamuna rivers. Average linear encounter rate in the Padma River was 0.53 dolphin/km and in the Jamuna River 1.45 dolphins/kilometer (Rashid et al. 2012).



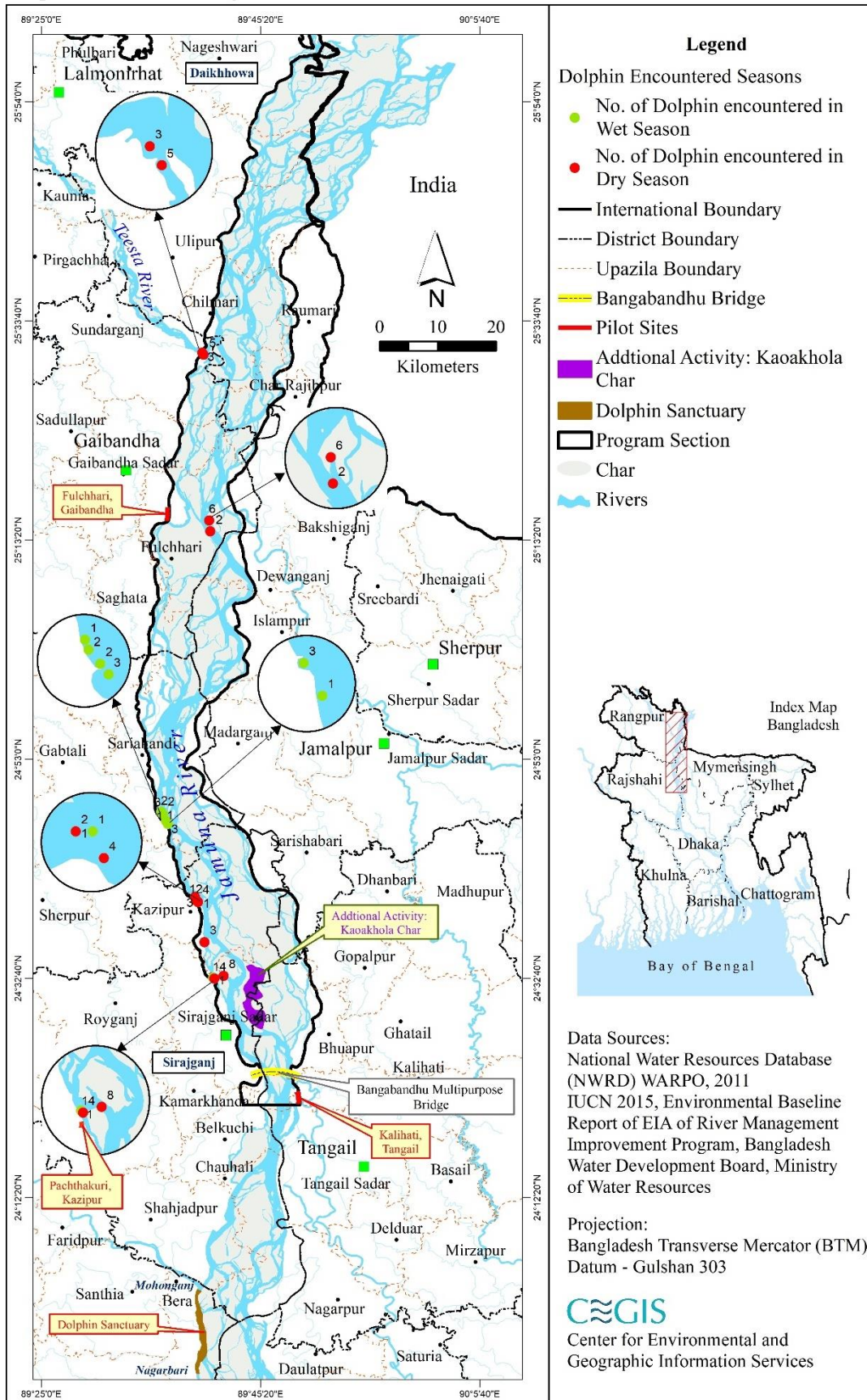


Figure 6.1: Dolphin Encounters in and around the Piloting Sites

### 6.1.3 Conservation Action Recommended by Bangladesh Dolphin Action Plan 2020-2030

The government has prepared a set of action plans<sup>13</sup> for conserving Dolphins in the Major rivers focusing on Jamuna and Padma. The plan sets a vision of securing river and coastal ecosystems of Bangladesh where dolphins flourish up to the carrying capacity. The overall goals of the action plan are:

- Reduce dolphin population decline in rivers and coastal waters of Bangladesh
- Ensure protection of existing dolphin habitats of Bangladesh

The strategic plan sets 26 action points (Annex 6.4) under the above two goals. These 26 action points have been planned under 8 strategic actions (Table 6.1).

**Table 6.1: Strategic Actions of Bangladesh Dolphin Conservation Plan 2020-2030**

Strategies of Government for Dolphin conservation	How it is adopted in JRSMP Project 1
<b>Goal 1: Reduce dolphin killing in rivers and coastal waters of Bangladesh</b>	
Increase the baseline knowledge on dolphins and their habitats	Linked study has been proposed for understanding Dolphin population in the BAA.
Reduce incidental and intentional killing of dolphins	Mitigation measures are proposed for preventing accidental killing of Dolphin during construction works ensure no net loss as per the requirement of ESS6
Develop skill, capacity and governance for improved protection	Dolphin sanctuaries occur nearby, and there may be opportunities for improved governance and protection of those areas
<b>Goal 2: Ensure protection of existing dolphin habitats of Bangladesh</b>	
Increase knowledgebase on dolphin habitat and threats	The linked studies would contribute to current knowledge base
Engage all actors and stakeholders in protection of dolphin habitat	Stakeholder Consultation has been planned during project implementation

## 6.2 Gharial (*Gavialis gangeticus*)

The only large reptile in the area is the crocodile (Gharial - *Gavialis gangeticus*) (Figure 6.2) which is extremely rare. It is a globally and nationally threatened species. Several decades ago, this species had wide distribution in the Ganges-Brahmaputra River System, but the population sharply declined due to the lack of food (fish), accidental killing by fishing nets and destruction of eggs by domestic dogs (Khan 1982, Rashid et al. 1986). Today, it is one of the rarest species of wildlife in Bangladesh and there have been no reports of its nesting since late-1980s although the species is captive bred and released into various parts of its range on a regular basis. Gharials may have been moving between Bangladesh and India using the routes identified by Rashid et al. (2014).

Gharialis are categorized as 'Critically Endangered' according to IUCN Red List which means species is at high risk of extinction. During 1987-2010 the estimated number of gharial sightings in Bangladesh was 906 individuals based on local interviews that may have included duplications (CARINAM 2012). In 2009 and 2010 it was found that the important Gharial sighting areas in Jamuna River are Chandanbaisha-Channabari, Faishar char and Char Koroiboishal/Char Lalsamar of Gaibandha (CARINAM 2012). This study found a total of 21 individuals from Padma-Brahmaputra and Jamuna River systems. At the time of

<sup>13</sup> Bangladesh Forest Department, 2019. CONSERVATION ACTION PLAN FOR GANGES RIVER DOLPHIN AND IRRAWADDY DOLPHIN OF BANGLADESH. Available at:

[https://bforest.portal.gov.bd/sites/default/files/files/bforest.portal.gov.bd/notices/3c350df6\\_a887\\_4067\\_bf6c\\_6df09f3492e2/Bangladesh%20Dolphin%20Action%20Plan%202020-2030\\_Final%20report%20April%202019.pdf](https://bforest.portal.gov.bd/sites/default/files/files/bforest.portal.gov.bd/notices/3c350df6_a887_4067_bf6c_6df09f3492e2/Bangladesh%20Dolphin%20Action%20Plan%202020-2030_Final%20report%20April%202019.pdf)

Dolphin Survey in project influence area, the team also searched for gharials. But there was no evidence of the presence of this animal. Again, at the time our baseline survey during August and September several FGDs were conducted and people informed that after 2012 no gharial was sighted from Jamuna. Although, it is evident from some reports in the daily newspapers that gharial still exist in the Brahmaputra-Jamuna River systems.



Note: Later released at the site of capture by Forest Department and members of an NGO, TEER (the right box shows data of some recent sighting or capture by fishermen)

**Figure 6.2: One of the Recently Captured Juvenile Gharial by the Fisherers at Jamuna River, Gaibandha**

### 6.3 Gangetic Softshell Turtle (*Nilssoniagangetica*)

Gangetic Softshell Turtle is a nationally endangered turtle species of Bangladesh, whose population has declined by than 50% because of threats such as trapping in fish nets, poaching and over-exploitation. It was one of the dominant species exported live for human consumption between 1977 and 1995 and the population has since not recovered (Rashid 1989). It resides the major river systems including the Jamuna-Brahmaputra and flood-plains of the BAA (Figure 6.3). One juvenile was observed to be captured from near Fulchari during the gharial survey (CARINAM 2012) and recently another juvenile was captured in the Jamuna River near Gaibandha.



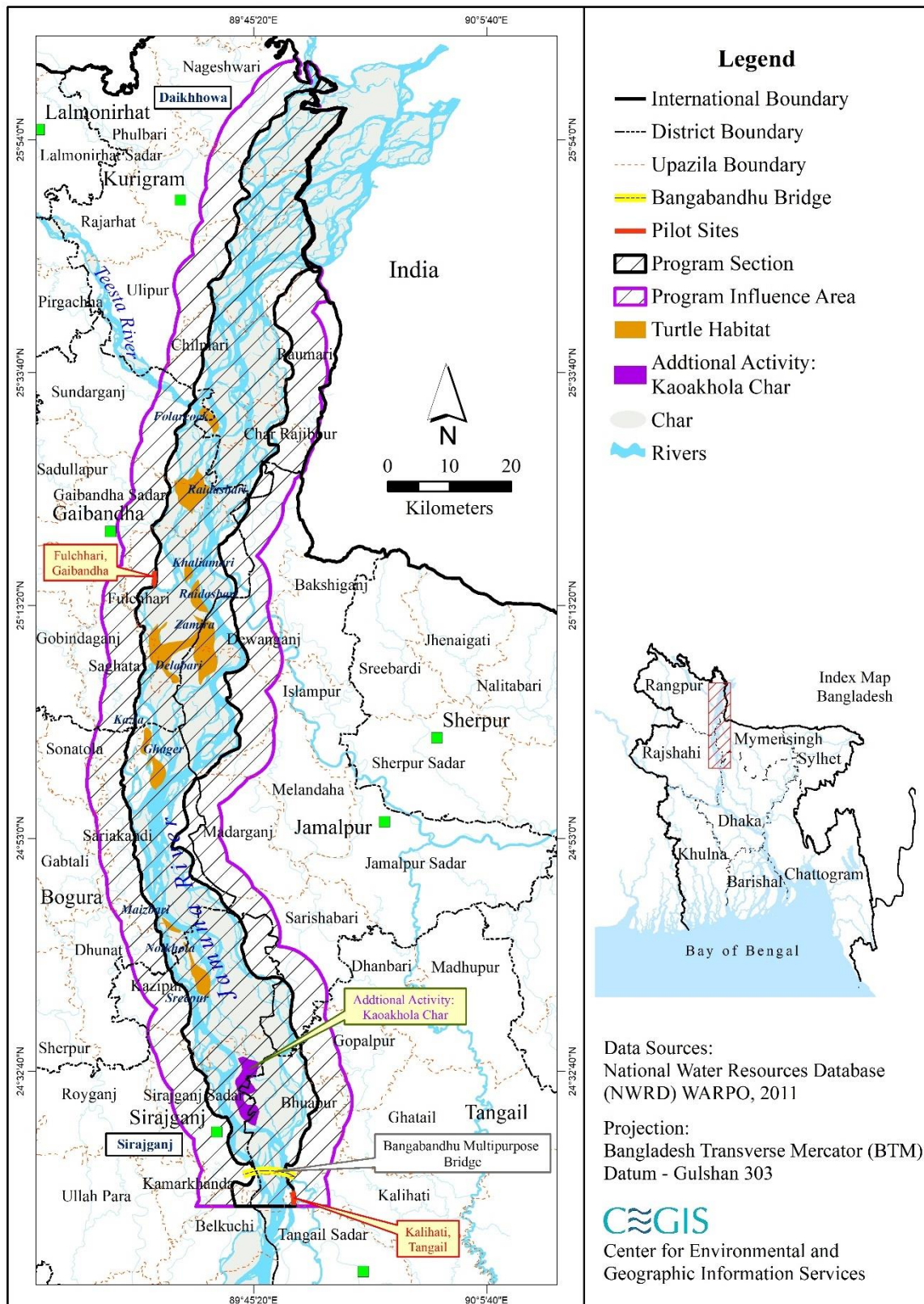


Figure 6.3: Turtle Habitat in the BAA

#### 6.4 Black-bellied Tern (*Sterna acuticauda*)

Black-bellied Tern is a globally Endangered species of bird. Chowdhury et al. (2014) conducted a survey on this species. Despite the intensive searches the team was unable to sight any Black-bellied Terns. However, a group of fishermen claimed to see nesting activities of terns including the Black-bellied Tern

(they were shown photographs) occurred near the Jamuna bridge at Sirajganj side. None of the *Sterna* sp. was recorded even after several visits to these sites. Chowdhury et al. (2014) did not declare Bangladesh no longer supports the Black-bellied Tern given that large stretches along the Jamuna River still remain poorly surveyed, and the opportunistic sighting of a pair of Black-bellied Tern in breeding plumage by A. B. M. S. Alam in January 2011 on the banks of the Jamuna River near Sariakandi, Bogra district, which initiated these searches. Three individuals were observed downstream of the Padma-Jamuna confluence in 2015 (Rashid 2018). However, it is apparent that a sharp decline has taken place since the 1990s and, if the species does still occur, the existing population must be very low.

### 6.5 Baghair (*Bagariusbagarius*)

One of the important catfishes found in the Jamuna River. A freshwater catfish species - important as food and game fish in Bangladesh, Bhutan, India and Nepal. It has been enlisted as critically endangered (CR) species in the IUCN Red List of Bangladesh (2015), however some studies indicated that the species occurs in many of the large rivers in Bangladesh and could be delisted as vulnerable<sup>14</sup>. It is carnivorous fish; feeds on small fishes, prawns, frogs, insects, etc. Therefore, *B. bagarius* is also important as a predator in top-down control of riverine food web.

The population has, however, steadily declined over the years. Yet sometimes large specimens are netted by the fishermen. Recently a 120 kg baghair was captured in the Jamuna River near Dewanganj, Jamalpur on 27<sup>th</sup> February 2021 (Figure 6.4). And very recently on 18<sup>th</sup> June 2021 another 48 kg baghair was captured near the same site<sup>15</sup>.



Source: Newzdevine Rp. 19 March 2021

**Figure 6.4: One of the Recently Captured Baghair by the Fishers at Jamuna River near Dewanganj, Jamalpur**

### 6.6 Hilsa (*Tenulosailisha*)

Hilsa is an anadromous fish (it migrates up rivers from the sea to spawn) and commonly known as 'Indian shad'. It is considered as the 'national fish' of Bangladesh. It migrates from the Bay of Bengal to the rivers Jamuna, Padma, Meghna and its tributaries for breeding and nursing purposes. Hilsa contributes 11% of the total fish production of Bangladesh. Hilsa constitutes 1% of the Gross Domestic Product (GDP) of

<sup>14</sup> Bijoya Paul, Md. Foijul Hasan, Md. Monirul Islam, Goutam Kumar, Kundu, Gouri Mondal, Samapti Saha, Md. Ghulam Mustafa. 2019. Evaluation of the status of threatened catfish *Bagariusbagarius* (Hamilton, 1822) from the Padma and Meghna river stretches of Bangladesh. Dhaka Univ. J. Biol. Sci. 28(1): 111-120, 2019 (January)

<sup>15</sup><https://www.risingbd.com/english/country/news/80330>. 18 June 2021

Bangladesh and provides a good support to the economy of the country by earning foreign exchange. Livelihood of a large number of people of our country directly or indirectly depends on Hilsa fishery. Approximately 0.5 million fishers directly depend on Hilsa fishing for their livelihoods. Another 2 million people indirectly depend on Hilsa fisheries by the activities like transportation, marketing and processing.

Hilsa production contributes 12.15% of the total fish production in Bangladesh; more the two-third of the global production; and tops the production among the 11 hilsa producing countries. Due to the enforcement and food aid support programs of the government there has been a 9% increase in the national hilsa production<sup>16</sup>.

Hilsa is found in most of the major rivers in Bangladesh but the abundance is comparatively low in the Jamuna River compared to the Padma and Meghna Rivers. Despite the low abundance some of the important sites for hilsa fishing include Gorilabari and Muktala near the Bangabandhu Jamuna Multipurpose Bridge. It is also caught at Balurchar of BelkuchiUpazila of Sirajganj district. In addition, some areas of Nagorpur, Kalihati and Bhuapur of Tangail district within the Jamuna River are known for hilsa.

### **6.7 Fishing Cat (*Prionailurusviverinus*)**

A critically endangered small feline and most enigmatic predator, and one of the largest among the 28 species of small cats found worldwide. They are excellent swimmers; mostly piscivorous and nocturnal in habit, usually inhabits in the vicinity of wetlands, along rivers, streams, oxbow lakes, swamps, and mangroves (Figure 6.5).

Widely distributed in Bangladesh in different fragmented habitats. Habitat loss is one of the major threats particularly, transformation of wetlands remains high on the list facing the Fishing cat. In addition, indiscriminate killing whenever found exposed in different habitats; for consumption by some indigenous people – the Santals and Oraon in north Bangladesh; and road kills. The char grassland of the Jamuna River makes an ideal habitat, but the extraction of grass and other human disturbances leaves them with little space to survive. The Santals go for traditional hunting early or late in the winter season in the charlands of the Padma and Jamuna Rivers, adjacent area of their settlements, and nearest districts but sometimes, they travel further away to other districts to hunt wildlife particularly small mammals like mongoose, rabbit, jackal, fishing cat, civet, or whatever they can find.

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<sup>16</sup> Department of Fisheries. 2020. National Fish Week 2020 Compendium (in Bangla), DOF, Ministry of Fisheries & Livestock. 160pp.





Photo by Neville Buck

**Figure 6.5: An Enigmatic Predator and Excellent Swimmer; Mostly Piscivorous and Nocturnal in Habit**

Project Fishing Cat Bangladesh, initiated by a group of young conservation biologists of Bangladesh, has been working on globally threatened species conservation and research in Bangladesh and abroad over the last decade or so.

### 6.8 Chital (Chitalachitala)

The habitat of Chital depends on the various environmental and ecological factors like vegetation type, height and scouring area of the river bank. Perennial water availability ensure food availability respecting prey populations, and thus result in providing predation opportunities for Chital. During wet season Charland becomes very suitable habitat for small fish species because they can use different aquatic vegetation for their feeding and breeding activity. The high abundance of small fish in Charland promote chital to come into the Charland for feeding. Rooted high plants, floating phytoplankton, benthic material or benthos (such as worms, insect larvae and snails) are also important as feed of Chital. However, the denser and more vegetation coverage creates also predation barrier for Chital.

### 6.9 Conservation Action of the Key Species

Conservation Actions are interventions that need to be undertaken to help improve the conservation status of the taxon being assessed. The key species of the BAA need different levels of conservation actions which are indicated in Table 6.2. The project activities could accelerate some of these conservation plans through selection of appropriate actions to achieve net gain for critical habitat features associated with the BAA.

**Table 6.2: Conservation Actions relevant to Species Triggering Critical Habitat Criteria**

Conservation Action Needed	Definition	Key Species
1. Land/Water Protection	Actions to identify, establish or expand parks and other legally protected areas	Ganges River Dolphin, Gharial, Fishing Cat
1.1 Site/Area Protection	Establishing or expanding public or private parks, reserves, and other protected areas roughly equivalent to IUCN Categories I-VI (includes marine protected areas)	Ganges River Dolphin, Gharial, Fishing Cat

Conservation Action Needed	Definition	Key Species
1.2 Resource & Habitat Protection	Establishing protection or easements of some specific aspect of the resource on public or private lands outside of IUCN Categories I-VI	Ganges River Dolphin, Gharial, Fishing Cat
2. Land/Water Management	Actions directed at conserving or restoring sites, habitats and the wider environment	Ganges River Dolphin, Gharial, Fishing Cat
2.1 Site/Area Management	Management of protected areas and other resource lands for conservation	Ganges River Dolphin, Gharial, Fishing Cat
2.2 Invasive/Problematic Species Control	Controlling and/or preventing invasive and/or other problematic plants, animals, and pathogens	
2.3 Habitat & Natural Process Restoration	Enhancing degraded or restoring missing habitats and ecosystem functions; dealing with pollution	Fishing Cat
3. Species Management	Actions directed at managing or restoring species, focused on the species of concern itself	Ganges River Dolphin,
3.1 Species Management	Managing specific plant and animal populations of concern	Ganges River Dolphin
3.1.1 Harvest Management	<i>harvest management of wild mushrooms, setting fishing quotas, setting catch-size limits, etc.</i>	Ganges River Dolphin
3.2 Species Recovery	Manipulating, enhancing or restoring specific plant and animal populations, vaccination programs	Ganges River Dolphin
4. Education & Awareness	Actions directed at people to improve understanding and skills, and influence behavior	Ganges River Dolphin, Gharial, Fishing Cat
4.2 Training	Enhancing knowledge, skills and information exchange for practitioners, stakeholders, and other relevant individuals in structured settings outside of degree programs	Ganges River Dolphin, Fishing Cat
4.3 Awareness & Communications	Raising environmental awareness and providing information through various media or through civil disobedience	Ganges River Dolphin, Gharial, Fishing Cat
5. Law & Policy	Actions to develop, change, influence, and help implement formal legislation, regulations, and voluntary standards	Ganges River Dolphin, Fishing Cat
5.1 Legislation	Making, implementing, changing, influencing, or providing input into formal government sector legislation or policies at all levels: international, national, state/provincial, local, tribal	Ganges River Dolphin
5.4 Compliance & Enforcement	Monitoring and enforcing compliance with laws, policies & regulations, and standards & codes at all levels	Ganges River Dolphin, Fishing Cat

Note: The factsheet of conservation action needed and definition were retrieved and modified from IUCN red list (<https://www.iucnredlist.org/>).

### 6.10 Bio-calendar of Key Species in Jamuna River

The bio-calendar of Jamuna River was made for the key species that inhabit the area. For constructing the calendar, field survey data and secondary information were considered. The water level data of Jamuna was incorporated to represent the eco-hydrological relationship.

Bangladesh climate is mostly subtropical monsoon, and has three distinct seasons: a hot pre-monsoon season from March to May, a rainy monsoon season from June to October, and a chilly dry winter season from November to February. The water level of the Jamuna is the maximum in the month of August while the minimum water level is in the month of February and March. The breeding activities of some resident bird species including other key species activates in pre-monsoon and ends in monsoon, while for

migratory birds, foraging activities continue in the dry season (Figure 6.6). In pre-monsoon season breeding activities is observed in Gharial, Gangetic Softshell Turtle, Resident waterbird, and back-bellied turn. Beside summer is the birth season of Gangetic Dolphin and Fishing Cat. So proper steps should take on this period to do the construction work crefully on this time. Moonsoon is the breeding and hatching season of Gharial, Gangetic Softshell Turtle and Narrow headed softshell turtle so proper maintenance and carefullness is essential in this period in constaction work.

Winter is the important period for different group of migratory bird and mating period of Fishing Cat, Gharial, Ganngetic Softshll turtle, and Black-bellied Tern. So for this region in the winter season it is important to take proper steps to do constraction work carefully in this time.

Details information about on important fish species has provided In the biocalender of fish portion.

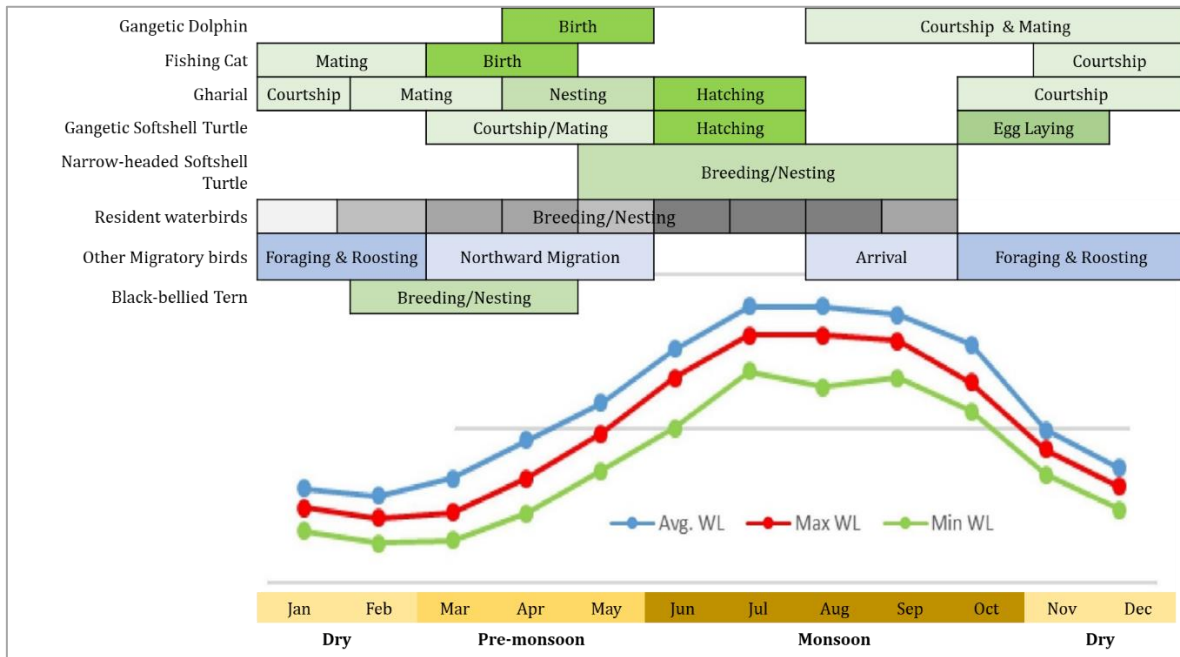


Figure 6.6: Bio-calendar of Important Wildlife Species in Jamuna River

## 7 Ecosystem Services

### 7.1 Provisioning Services

The major provisioning services that are provided by the ecosystems in the BAA are:

- The agro-ecosystems (agricultural areas) provide rice, wheat, oil seeds, spices, fruits, and jute.
- The freshwater ecosystems provide clean ground water and surface water that are used for drinking and irrigation purposes. The water bodies such as the rivers, beels, ponds, wetland areas, etc. provide fishes, crabs, shrimps
- Raw materials obtained from this ecosystem include bamboos, fruits, medicinal plants, timber and fuel-wood

### 7.2 Regulating Services

In the project influence area, the rural agricultural practices, in many locations have adopted agro-forestry, wherein tree species have been planted especially along the boundary of the agricultural plots. These trees through evapo-transpiration cause an impact on the climate regulation. Besides these the project influence area has large water bodies, which have some role on climate regulation at local level. The ecosystems in the project influence area have the biodegrading capability, which helps natural waste treatment. The flowing rivers in the project influence areas also help to remove the wastes downstream.

### 7.3 Cultural Services

Jamuna and its charland ecosystem offer a lot of recreational and environmental value. Charland ecosystem of project influence area plays an important role by allowing thousands of migratory birds to visit the ecosystem. This phenomenon enhances the biodiversity values of the ecosystem through producing producers and zooplanktons and enhances its eco-tourism values through attracting nature lovers and researchers, which may even generate huge revenues every year. The other attraction in the BAA is the presence of globally endangered 'Ganges River Dolphin'. Some rare birds such as lesser adjutants and open-billed storks occasionally visit these charlands Supporting Services.

### 7.4 Supporting Services

The BAA includes many small rivers and khals that connect the river with inland beels, depressions that retain water especially during the dry periods. These water bodies provide spawning grounds for the fish and act as migratory routes for the fish from river to floodplains. The khals also allow for intake of water for irrigation along with nutrient rich silts and clays into the floodplain, and for drainage back into the river. The system of beels and khals are also important for recharge of groundwater resources throughout the floodplain. Besides these leaf chlorophylls in the project implementation area, through the process of photosynthesis continuously using the carbon dioxides from the air and releasing oxygen. This service of the existing ecosystems in the project influence area is maintaining the air quality. The organic matter in the upper layers of the soil is enhancing its water holding capacity of the existing ecosystems and thereby a better water regime. The roots of the aquatic plants of the existing ecosystems are holding the water pollutant sand thereby enhancing and maintaining the quality of the surface water. In addition, the vegetation covers also somewhat regulate the natural hazards such as high wind speeds, erosion, etc. Some of beetles, especially 'lady bird beetle' commonly seen in the ecosystems of the project influence area, feed on many vegetable pests of which aphids, are common.

## 8 Baseline Threats

### 8.1 Current Threats

Jamuna River becomes one of the highly intervened rivers in Bangladesh (Figure 8.1). The right bank is almost protected by flood control structure and erosion protection structures which significantly disrupted the floodplain river connectivity. There are several interventions at left bank as well. Besides, the unsustainable sandmining by dredging, over fishing, and unplanned infrastructural development creates threats to ecosystem.

Apart from the infrastructural development activities, poaching, change of land use for economic purpose, growth of human settlements, use of agrochemical, are known threats to ecosystem and biodiversity in Jamuna as well as in BAA. The following section would describe threats to specific species.

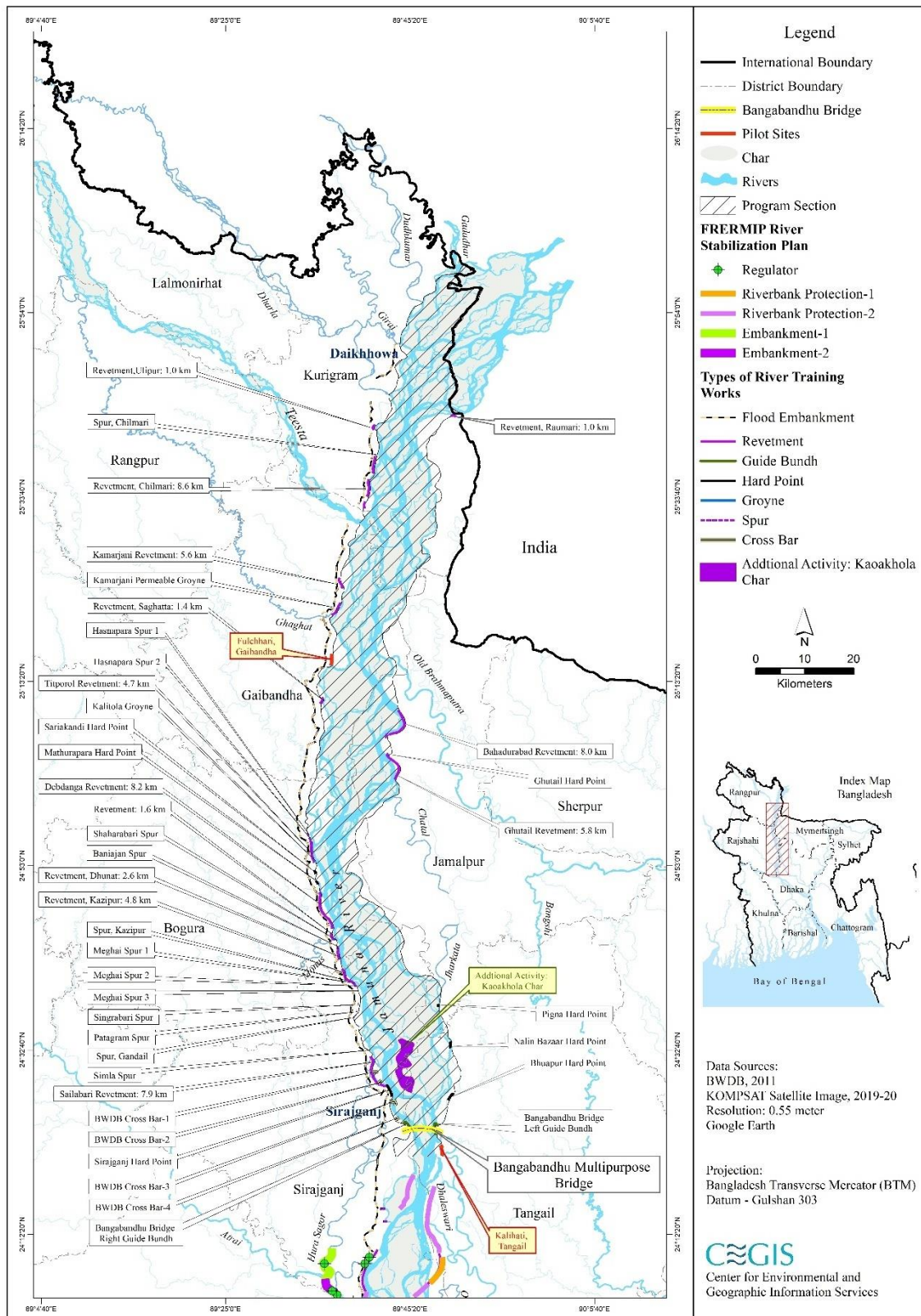


Figure 8.1: Water Management Intervention along the Jamuna River

## 8.2 Threats for Gharial

Gharials face several threats (Figure 8.2), but at present the most significant are habitat destruction, upstream embankments causing reduced water flow, death caused by entangling in fishing nets, increased fishing intensity and other human activities (navigation, agriculture, etc.) and lack of



enforcement (gharials face these threats even within protected areas (like fish sanctuary). Riverbank/Sand bar erosion has occurred by huge volumes of water and water currents during the rainy season that cause erosion of the riverbanks and sand bars. Nesting habitat is destroyed, and probable nests may be washed away. Large-scale sand mining destroys the sandy banks required by gharials and turtles for nesting and basking, and causes disruption to nesting and basking behavior. Pollution and siltation of rivers threaten the availability of natural prey items and plants needed by the hatchlings as a refuge within the river ecosystem. Fixed engine (bamboo barricade with nets) restricts movement and causes disturbance to gharials and other aquatic animals. At least fifty such fixed engines were observed in the Padma and Jamuna rivers. During fishing Gharials are often caught in fishing nets, their long slender snouts easily becoming entangled in the fine nets. Unable to surface to breathe, many drown. Others break free but with nets wrapped around their snouts they may starve to death.



Riverbank/Sandbar Erosion



Sand Mining

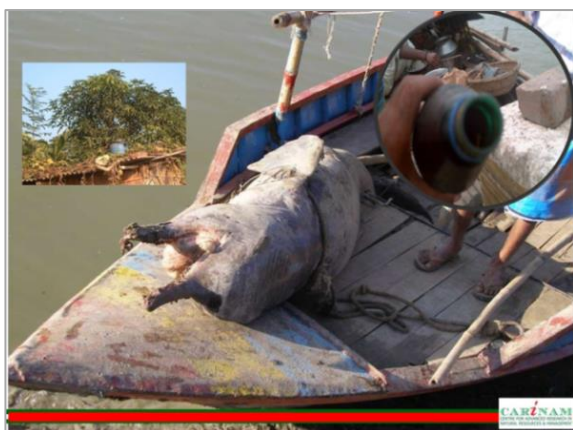


Bamboo barricade with nets

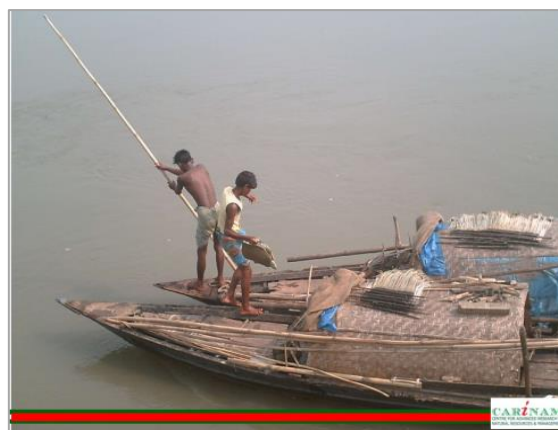
**Figure 8.2: Threats of Gharial in the BAA**

### 8.3 Threats for Turtles, Dolphin and Other Animals

Hunting and poaching are common threats to the survival of important aquatic species (Figure 8.1. Turtle poaching is done by Hazari borshi (= thousand hooks) used by some fishers to capture freshwater turtles often hook gharials as well. Dolphins are regularly poached by some fishers. Dolphins are regularly poached by some fishers using special nets. Oil is extracted by leaving the corpse in sun. Oil is used as a fish attractant by the fishers. Sometimes people hunt birds such as waterfowls including migratory ducks are often hunted in the chars of the Padma and Jamuna rivers causing disturbance to gharials and other aquatic fauna (Figure 8.3).



Dolphin Poaching



Turtle Poaching



Bird Hunting

**Figure 8.3: Threats for Turtles, Dolphin and Other Animals**

#### 8.4 Other Anthropogenic Threats

Every year natural habitats of both plants and animals have been reducing thus decrease biodiversity from the wilderness areas. Currently, due to the developmental activities, Bangladesh is losing large areas of habitats through degradation of terrestrial as well as aquatic habitats. There are many threats at the proposed programmed area of Jamuna River those have high impact on organisms in many ways such as habitat destruction, alteration and degradation. The people living in the project influence area exert high regressive influence on the surrounding ecosystems. Most of the people living in that area possess a sub-standard primitive life style. Their main source of livelihood is agriculture. Vast areas of stable and unstable floodplains have been subjected to the regression of tillage, mostly due to extensive agricultural activities. Such activities of the local people have seriously jeopardized the natural vegetation. There is no sign of natural succession; rather retrograding of the natural vegetation is commonly seen. Since the areas close to the riverbank are subjected to frequent erosion and flooding, the local people do not make plantation rotationally with different species in these areas. Very often fast-growing species on a noticeably short rotation cycles are planted in these areas. Commonly used species is *Eucalyptus*, which not only depletes the soil but also impairs the wildlife diversity, especially of the birds in the rural areas. During the FGDs and consultation meetings it transpired that the local people living near the riverbank preferred fast growing species, whereas those in stable zones (highland) preferred long rotation horticultural species, such as jackfruit and mango. Under this given scenario, the project may bring in opportunities of planting more of the long rotation species such as tamarind, mahogany, and may also

induce 'social forestry' programs. Such initiatives are likely to help the local people to develop their socio-economic condition and improve biodiversity as well. In the stable floodplains people build houses and plant long rotation horticultural and timber species. The planted horticultural species are used by people in many ways and allows small pockets of natural vegetation in the interspaces of the planted trees, particularly in the backyards of the homesteads.

#### 8.4.1 Use of Agrochemicals

Use of agrochemicals has increased these days in the terrestrial ecosystems of the project influence area, particularly in the agricultural lands to control certain weed plants, insects and rodent pests from agriculture lands. Heavy and irrational use of chemical such as urea and growth hormones make the environment toxic and many animals including amphibians, reptiles and birds suffered a lot in their natural habitats. Every year different species of insectivore birds and fish-eating birds has died due to ingest poison infected insects and fishes in the agricultural fields (Figure 8.4). All these chemicals enter into the terrestrial food chain and are gradually deposited to the higher trophic level through biological magnification. As a consequence, not only the local wildlife, but also the people suffer from adverse long-term effects of these agrochemicals. Although much is known about the potential impact of pesticides on the environment and health, more data is required to ascertain the present effects and future risks of increased use of pesticide in the program area.



**Figure 8.4: Threats from Extensive Agriculture and Agrochemicals**

#### 8.5 Climate Change

Climate change represents an emerging and increasingly serious threat to species; one that often exacerbates existing threats. For example, each species of plants and animals have specific habitat requirements and climate change could cause loss of sensitive terrestrial and aquatic flora and fauna. A slight drop or rise of average rainfall will translate into large seasonal changes. Many species are sensitive to moisture and temperature changes, particularly during hatching of eggs of birds and reptiles.

#### 8.6 Human-Wildlife Conflict

Human-wildlife conflict (HWC) is a term that describes unpleasant interactions between humans and wild animals that have negative repercussions for both people and their resources, as well as wildlife and their habitats (IUCN 2020). Human food security and the well-being of both humans and animals are influenced by HWC, which is caused by competition for natural resources between humans and wildlife. Bangladeshi farmers use many methods to protect their crops from wildlife. Probably farmers do the same in the BAA. The most effective way of doing this is to cover the field with netting. However, nets are costly and cannot be used in large fields. Another method farmer uses to reduce the bird population is direct hunting. However, all wild birds are protected in Bangladesh, and cannot be hunted without special permission from the government. People kill wildlife such as fishing cats, jungle cats, mongoose, monitor lizards and golden jackals without specific reason.

## 8.7 Current Protection Status for Existing Threats

Table 8.1 identifies CITES listed species in the Jamuna River BAA which are protected from local trade. There is no nationally proposed/declared Protected Area in the close vicinity of the pilot sites. However, the Jamuna River is declared as an IBA by Birdlife International. Besides, there are some areas with high conservation value such as Charland where migratory bird inhabits and/or take refuge or roost each year and some sections of the Jamuna River where dolphins were found. Among the available habitats, however, the most notable are parts of the river (unpolluted, deep and rich in fish) that are hotspots (i.e., high density areas) for the Ganges River Dolphin and the uninhabited 'Char' lands that are the shelters of thousands of migratory winter birds and the nesting grounds of many resident birds like wild ducks and terns. Based on findings of the field visits and the focus group discussion (FGDs) in and around the project influence area (Figure 8.5), the high-density areas for dolphins and winter birds were marked.



**Figure 8.5: Photograph of the Biodiversity Team Conducting FGD in Sirajganj**

**Table 8.1: List of Species of the Jamuna River BAA which are Protected from Local Trade by CITES.**

SL	Herpetofauna Species	Appendices	SL	Bird Species	Appendices	SL	Mammal Species	Appendices
1	<i>Hoplobatrachustigerinus</i>	II	1	<i>Tyto alba</i>	II	1	<i>Pagumalarvata</i>	III
2	<i>Moreniapetersi</i>	II	2	<i>Athene brama</i>	II	2	<i>Paradoxurus hermaphroditus</i>	III
3	<i>Pangshura tecta</i>	I	3	<i>Bubo coromandus</i>	II	3	<i>Viverrazibetha</i>	III
4	<i>Pangshura tentoria</i>	II	4	<i>Ketupazeylonensis</i>	II	4	<i>Viverricula indica</i>	III
5	<i>Nilssoniagangetica</i>	I	5	<i>Ninoxscutulata</i>	II	5	<i>Felis chaus</i>	II
6	<i>Nilssoniahurum</i>	I	6	<i>Butasturteesa</i>	II	6	<i>Prionailurusviverrinus</i>	II
7	<i>Chitra indica</i>	II	7	<i>Elanus caeruleus</i>	II	7	<i>Canis aureus</i>	III
8	<i>Lissemys punctata</i>	II	8	<i>Ichthyophagaichthyaetus</i>	II	8	<i>Pteropus giganteus</i>	II
9	<i>Varanus bengalensis</i>	I	9	<i>Milvus migrans</i>	II	9	<i>Platanista gangetica</i>	I
10	<i>Varanus flavescens</i>	I	10	<i>Spilornischeela</i>	II			
11	<i>Atretiumschistosum</i>	III	11	<i>Falco chicquera</i>	II			
12	<i>Xenochrophis piscator</i>	III	12	<i>Dendrocygna bicolor</i>	III			
13	<i>Naja kaouthia</i>	II	13	<i>Sarkidiornis melanotos</i>	II			
14	<i>Naja naja</i>	II	14	<i>Buteo buteo</i>	II			
15	<i>Daboia russelii</i>	III	15	<i>Buteo rufinus</i>	II			
16	<i>Gavialis gangeticus</i>	I	16	<i>Circus aeruginosus</i>	II			
			17	<i>Circus melanoleucos</i>	II			
			18	<i>Hieraetuspennatus</i>	II			
			19	<i>Pandion haliaetus</i>	II			
			20	<i>Falco peregrinus</i>	I			
			21	<i>Falco tinnunculus</i>	II			



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**Annex 6.2: Results from Integrated Biodiversity Assessment Tool**

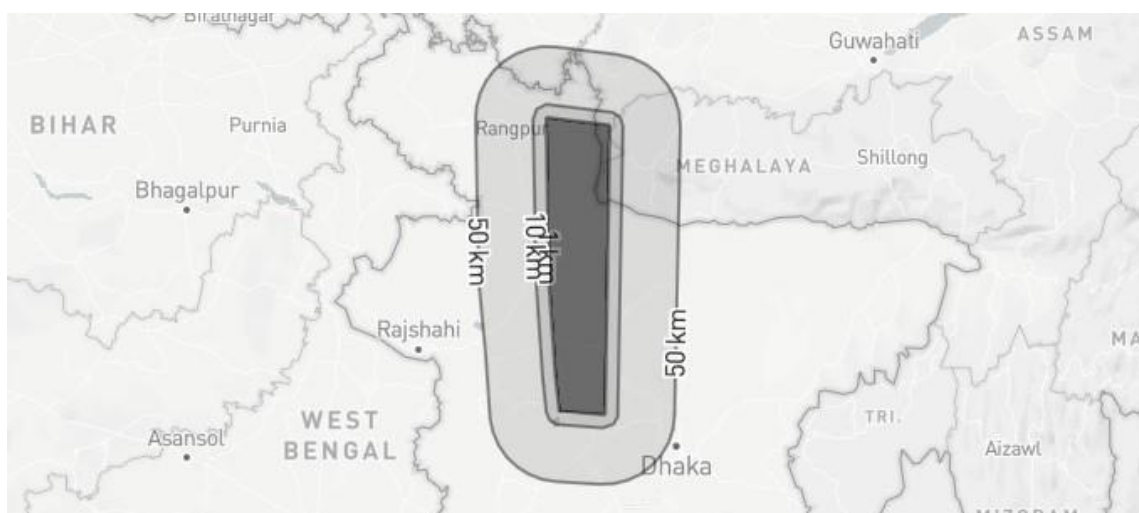


### **World Bank Group Biodiversity Risk Screen**

- Country: Bangladesh
- Location: [24.7, 89.6]
- IUCN Red List Biomes: Freshwater
- Created by: Md Istiak Sobhan

#### **Overlaps with:**

<b>Protected Areas</b>	1 km: 1	10 km: 1	50 km: 8	<b>10</b>
World Heritage (WH)	1 km: 0	10 km: 0	50 km: 0	<b>0</b>
<b>Key Biodiversity Areas</b>	1 km: 1	10 km: 0	50 km: 3	<b>4</b>
Alliance for Zero Extinction (AZE)	1 km: 0	10 km: 0	50 km: 0	<b>0</b>
<b>IUCN Red List</b>				<b>27</b>
<b>Critical Habitat</b>				<b>Likely</b>



Displaying project location and buffers: 1 km, 10 km, 50 km

This report is based on IFC Performance Standard 6 (PS6) but applies to World Bank Environmental and Social Standard 6 (ESS6)

#### **A. About this report**

The recommendations stated alongside any Protected Areas and Key Biodiversity Areas identified in this report are determined by the following:

##### Protected Areas

- 'Highest risk. Seek expert help' is stated if the report identifies a designation that includes either 'natural' or 'mixed world heritage site'.
- 'Assess for Critical Habitat' is stated if the report identifies a Strict Nature Reserve, Wilderness Area or National Park as coded by IUCN protected area categories Ia, Ib and II.



- 'Assess for biodiversity risk' is stated if the report identifies any other type of protected area.

#### Key Biodiversity Areas

- 'Highest risk. Seek expert help' is stated if the report identifies an Alliance for Zero Extinction site.
- 'Assess for Critical Habitat' is stated if the report identifies Critically Endangered or Endangered species OR species with restricted ranges OR congregatory species as coded in the IUCN Red List of Threatened Species.
- 'Assess for biodiversity risk' is stated if the report identifies any other type of Key Biodiversity Area.

IBAT provides initial screening for Critical Habitat values. Performance Standard 6 (PS6) defines these values for Critical Habitat (PS6: para. 16) and legally protected and internationally recognized areas (PS6: para. 20). PS6 will be triggered when IFC client activities are located in modified habitats containing "significant biodiversity value," natural habitats, Critical Habitats, legally protected areas, or areas that are internationally recognized for biodiversity. References to PS6 and Guidance Note 6 (GN6) are provided to guide further assessment and detailed definitions where necessary. Please see <https://www.ifc.org/ps6> for full details on PS6 and GN6.

The report screens for known risks within a standard 50km buffer of the coordinates used for analysis. This buffer is not intended to indicate the area of impact. The report can be used to:

- Scope risks to include within an assessment of risks and impacts
- Identify gaps within an existing assessment of risks and impacts
- Prioritize between sites in a portfolio for further assessment of risks and impacts
- Inform a preliminary determination of Critical Habitat
- Assess the need for engaging a biodiversity specialist
- Identify additional conservation experts or organizations to inform further assessment or planning

**WARNING:** IBAT aims to provide the most up-to-date and accurate information available at the time of analysis. There is however a possibility of incomplete, incorrect or out-of-date information. All findings in this report must be supported by further desktop review, consultation with experts and/or on-the-ground field assessment as described in PS6 and GN6. Please consult IBAT for any additional disclaimers or recommendations applicable to the information used to generate this report.

Please note, sensitive species data are currently not included in IBAT reports in line with the Sensitive Data Access Restrictions Policy for the IUCN Red List. This relates to sensitive Threatened species and KBAs triggered by sensitive species.

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### C. Priority Species

Habitat of Signiant importance to priority species will trigger Critical Habitat status (See PS6: para 16). IBAT provides a preliminary list of priority species that could occur within the 50km buffer. This list is drawn from the IUCN Red List of Threatened Species (IUCN RL). This list should be used to guide any further assessment, with the aim of confirming known or likely occurrence of these species within the project area. It is also possible that further assessment may confirm occurrence of additional priority species not listed here. It is strongly encouraged that any new species information collected by the project be shared with species experts and/or IUCN wherever possible in order to improve IUCN datasets.

### D. IUCN Red List of Threatened Species - CR & EN

The following species are potentially found within 50km of the area of interest.

For the full IUCN Red List please refer to the associated csv in the report folder.

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Nilssonina nigricans</i>	Black Softshell Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
<i>Gavialis gangeticus</i>	Gharial	REPTILIA	CR	Increasing	Terrestrial, Freshwater
<i>Batagurkachuga</i>	Red-crowned Roofed Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
<i>Pangshurasyllhetensis</i>	Assam Roofed Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
<i>Batagurdhongoka</i>	Three-striped Roofed Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Aythya baeri	Baer's Pochard	AVES	CR	Decreasing	Freshwater
Emberiza aureola	Yellow-breasted Bunting	AVES	CR	Decreasing	Terrestrial, Freshwater
Batagurbaska	Northern River Terrapin	REPTILIA	CR	Decreasing	Terrestrial, Marine, Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Pelochelyscantorii	Asian Giant Softshell Turtle	REPTILIA	CR	Decreasing	Terrestrial, Marine, Freshwater
Geoclemys hamiltonii	Spotted Pond Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Hardellathurjii	Crowned River Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Moreniapetersi	Indian Eyed Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Schisturasijuensis		ACTINOPTERYGII	EN	Unknown	Freshwater
Nilssoniagangetica	Indian Softshell Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Nilssoniahurum	Indian Peacock Softshell Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Platanista gangetica	South Asian River Dolphin	MAMMALIA	EN	Unknown	Freshwater
Axis porcinus	Hog Deer	MAMMALIA	EN	Decreasing	Terrestrial, Freshwater
Cuoramouhotii	Keeled Box Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Pillaia indica		ACTINOPTERYGII	EN	Unknown	Freshwater
Heritiera fomes		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial, Marine, Freshwater
Urogymnus polylepis	Giant Freshwater Whipray	CHONDRICHTHYES	EN	Decreasing	Marine, Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Rynchops albicollis	Indian Skimmer	AVES	EN	Decreasing	Terrestrial, Freshwater
Sterna acuticauda	Black-bellied Tern	AVES	EN	Decreasing	Terrestrial, Freshwater
Haliaeetus leucoryphus	Pallas's Fish-eagle	AVES	EN	Decreasing	Terrestrial, Freshwater
Leptoptilosdubius	Greater Adjutant	AVES	EN	Decreasing	Terrestrial, Freshwater
Laticilla cinerascens	Swamp Grassbabbler	AVES	EN	Decreasing	Terrestrial, Freshwater
Tor putitora		ACTINOPTERYGII	EN	Decreasing	Freshwater

**E. Restricted Range Species**

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Schisturasijuensis		ACTINOPTERYGII	EN	Unknown	Freshwater
Pillaia indica		ACTINOPTERYGII	EN	Unknown	Freshwater
Aborichthysgaroensis		ACTINOPTERYGII	VU	Unknown	Freshwater
Schisturainglisi		ACTINOPTERYGII	VU	Unknown	Freshwater
Schisturareticulofasciata		ACTINOPTERYGII	VU	Unknown	Freshwater
Garo khajuriai	Garo Spineless Eel	ACTINOPTERYGII	NT OR LR/NT	Unknown	Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Ctenops nobilis		ACTINOPTERYGII	NT OR LR/NT	Decreasing	Freshwater
Salvinia natans	Floating Fern	POLYPODIOPSIDA	LC OR LR/LC	Decreasing	Freshwater
Ophisternonbengalense	Bengal MudEel	ACTINOPTERYGII	LC OR LR/LC	Stable	Marine, Freshwater
Bengalaelanga	Bengala Barb	ACTINOPTERYGII	LC OR LR/LC	Unknown	Freshwater
Aplocheiluslineatus	Striped panchax	ACTINOPTERYGII	LC OR LR/LC	Decreasing	Freshwater
Xenentodoncancila		ACTINOPTERYGII	LC OR LR/LC	Unknown	Freshwater
Batasiobatasio		ACTINOPTERYGII	LC OR LR/LC	Unknown	Freshwater
Schisturamultifasciata		ACTINOPTERYGII	LC OR LR/LC	Unknown	Freshwater
Badis bloisyrus		ACTINOPTERYGII	LC OR LR/LC	Unknown	Freshwater
Psilorhynchushomaloptera	Homaloptera minnow	ACTINOPTERYGII	LC OR LR/LC	Unknown	Freshwater
Oreichthyscosuatis		ACTINOPTERYGII	LC OR LR/LC	Unknown	Freshwater
Oryziasdancena	IndianRicesh	ACTINOPTERYGII	LC OR LR/LC	Stable	Marine, Freshwater
Pseudosphromenuscupanus	SpiketailParadise Fish	ACTINOPTERYGII	LC OR LR/LC	Stable	Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Oryzias carnaticus</i>	Spotted Rice sh	ACTINOPTERYGII	LC OR LR/LC	Unknown	Marine, Freshwater
<i>Macrobrachium scaberrimum</i>		MALACOSTRACA	LC OR LR/LC	Unknown	Freshwater
<i>Macrobrachium rude</i>		MALACOSTRACA	LC OR LR/LC	Unknown	Freshwater
<i>Macrobrachium rosebergii</i>	Giant River Prawn	MALACOSTRACA	LC OR LR/LC	Unknown	Freshwater
<i>Pedostibes kempi</i>	Kemp's Asian Tree Toad	AMPHIBIA	DD	Unknown	Terrestrial, Freshwater
<i>Olyra horae</i>		ACTINOPTERYGII	DD	Unknown	Freshwater
<i>Pila olea</i>		GASTROPODA	DD	Unknown	Freshwater
<i>Lymnaea horae</i>		GASTROPODA	DD	Unknown	Freshwater
<i>Parreysia corbis</i>		BIVALVIA	DD	Unknown	Freshwater
<i>Parreysia annandalei</i>		BIVALVIA	DD	Unknown	Freshwater
<i>Prodasineura odoneli</i>		INSECTA	DD	Unknown	Terrestrial, Freshwater
<i>Macromia avovittata</i>		INSECTA	DD	Unknown	Terrestrial, Freshwater
<i>Gynacantha odoneli</i>		INSECTA	DD	Unknown	Terrestrial, Freshwater
<i>Davidius malloryi</i>		INSECTA	DD	Unknown	Terrestrial, Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Macromia pallida</i>		INSECTA	DD	Unknown	Terrestrial, Freshwater
<i>Badis kanabos</i>		ACTINOPTERYGII	DD	Unknown	Freshwater
<i>Batasiomerianiensis</i>		ACTINOPTERYGII	DD	Unknown	Freshwater
<i>Batasiopilurus</i>		ACTINOPTERYGII	DD	Unknown	Freshwater
<i>Nangra bucculenta</i>		ACTINOPTERYGII	DD	Unknown	Freshwater
<i>Pseudolaguvia ferruginea</i>		ACTINOPTERYGII	DD	Unknown	Freshwater
<i>Macrobrachium agwi</i>		MALACOSTRACA	DD	Unknown	Freshwater

### **Biodiversity features which are likely to trigger Critical Habitat**

#### **F. Protected Areas**

The following protected areas are found within 1 km and 10 km and 50 km of the area of interest.

For further details please refer to the associated csv file in the report folder.

Area name	Distance	IUCN Category	Status	Designation	Recommendation
Nagarbari-Mohonganj	1 km	VI	Designated	Dolphine Sanctuary	● Assess for biodiversity risk
Silanda-Nagdemra	10 km	VI	Designated	Dolphine Sanctuary	● Assess for biodiversity risk
Bangabandhu Safari Park Gazipur	50 km	Not Reported	Proposed	Safari Park	● Assess for biodiversity risk
Bhawal	50 km	IV	Designated	National Park	● ● Assess for biodiversity risk
Kadigarh	50 km	IV	Designated	National Park	● Assess for biodiversity risk
Madhupur	50 km	IV	Designated	National Park	● Assess for biodiversity risk
Modhutila Eco-Park	50 km	Not Reported	Proposed	Eco Park	● Assess for biodiversity risk

Area name	Distance	IUCN Category	Status	Designation	Recommendation
Nababganj	50 km	IV	Designated	National Park	● Assess for biodiversity risk
Nazirganj	50 km	VI	Designated	Dolphine Sanctuary	● Assess for biodiversity risk
Nokrek	50 km	Not Applicable	Designated	UNESCO-MAB Biosphere Reserve	● Assess for biodiversity risk

#### **G. Key Biodiversity Areas**

The following key biodiversity areas are found within 1 km and 10 km and 50 km of the area of interest.

For further details please refer to the associated csv file in the report folder.

Area name	Distance	IBA	AZE	Recommendation
Jamuna-Brahmaputra river	1 km	Yes	No	Assess for critical habitat
Madhupur National Park	50 km	Yes	No	Assess for biodiversity risk
Nokrek National Park	50 km	Yes	No	● Assess for critical habitat
Sareswar Beel	50 km	Yes	No	Assess for critical habitat



**H. Species with potential to occur**

Area Taxonomic group	Total assessed species	Total (CR, EN & VU)	CR	EN	VU	NT	LC	DD
REPTILIA	29	16	7	6	3	3	9	1
AVES	253	16	2	5	9	18	219	0
ACTINOPTERYGII	164	8	0	3	5	9	120	27
MAMMALIA	6	6	0	2	4	0	0	0
MAGNOLIOPSIDA	55	1	0	1	0	1	49	4
CHONDRICHTHYES	1	1	0	1	0	0	0	0
MALACOSTRACA	42	1	0	0	1	3	24	14
INSECTA	122	1	0	0	1	1	109	11
GASTROPODA	81	0	0	0	0	0	67	14
AMPHIBIA	33	0	0	0	0	0	32	1
BIVALVIA	50	0	0	0	0	0	43	7
POLYPODIOPSIDA	5	0	0	0	0	0	5	0
LILIOPSIDA	62	0	0	0	0	0	61	1

**I. Recommended citation**

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**J. Recommended Experts and Organizations**

For projects located in Critical Habitat, clients must ensure that external experts with regional expertise are involved in further assessment (GN6: GN22). Clients are encouraged to develop partnerships with recognized and credible conservation organizations and/or academic institutes, especially with respect to potential developments in natural or Critical Habitat (GN6: GN23). Where Critical Habitats are triggered by priority species, species specialists must be involved. IBAT provides data originally collected by a large network of national partners, while species information is sourced via the IUCN Red List and allied Species Specialist Groups. These experts and organizations are listed below. Please note that this is not intended as a comprehensive list of organizations and experts. These organizations and experts are under no obligation to support any further assessment and do so entirely at their discretion and under their terms. Any views expressed or recommendations made by these stakeholders should not be attributed to the IFC or IBAT for IFC partners.

**Birdlife Partners**

URL: <https://www.birdlife.org/worldwide/partnership/birdlife-partners>

**K. Directory for Species Survival Commission (SSC) Specialist Groups and Red List Authorities**

URL: <https://www.iucn.org/commissions/ssc-groups>

**Annex 6.3: List of Species Sighted in the Biodiversity Assessment Area**



**Table 1: Floral Diversity of Jamuna Rivers and Chars around the Piloting Sites**

Code: EN: Endangered; NT: Near Threatened; LC: Least Concern; NE: Not Evaluated

[Source of this status - <https://www.iucnredlist.org/>]

SL	English Name	Common Name	Scientific name	Importance	IUCN Global Status
<b>Herb (Aquatic)</b>					
1	Tall Reed	Nal	<i>Phragmites karka</i>	Fuel	LC
2	Pink Morning Glory	DholKolmi	<i>Ipomoea carnea</i>	Ornamental, Medicinal	NE
3	Alligator Weed	Maloncho	<i>Alternanthera philoxeroides</i>	Medicinal	NE
4	Morning Glory	Kolmi	<i>Ipomoea aquatica</i>	Vegetable	NE
5	Asiatic Pennywort	Thankuni	<i>Centella asiatica</i>	Medicinal and Vegetables	LC
6	Common Water-hyacinth	Kachuripana	<i>Eichhornia crassipes</i>	Fertilizer, fodder	NE
<b>Herb (Terrestrial)</b>					
7	Japanese Mazus	Goya	<i>Mazuspumilus</i>	Medicinal	NE
8	Pygmy Groundcherry	Bon Tepari	<i>Physalis lagascae</i>	-	LC
9	Madras Carpet	Namutiful	<i>Grangeamaderaspatana</i>	-	LC
10	Common Knotweed	Chemti Sag	<i>Polygonum plebeium</i>	Fertilizer	LC
11	Bonpland's Croton	Ban Tulsi	<i>Croton bonplandianus</i>	Medicinal	NE
12	Fringed Spider Flower	Choto Hurhuri	<i>Cleome ruidosperma</i>	-	NE
13	Bitter Vine	Asam Lota	<i>Mikania micrantha</i>	Medicinal	NE
14	Wild Sugarcane	Kansh	<i>Saccharum spontaneum</i>	Fuel, thatching	LC
15	Cogongrass	Chhan	<i>Imperata cylindrica</i>	Fuel, Medicinal	LC
16	Rough Cocklebur	Ghagra	<i>Xanthium indicum</i>	Medicinal, vegetable	NE
17	Golden Dock	Ban Palang	<i>Rumex meritimus</i>	Medicinal	NE
18	Turkey Tangle Frogfruit	Bhui Okra	<i>Phyla nodiflora</i>	Medicinal	LC
19	Cape Periwinkle	Nayantara	<i>Catharanthus roseus</i>	Ornamental and Medicinal	NE
20	Bermuda grass	Durba Grass	<i>Cynodonactylon</i>	Medicinal	NE
21	Cupgrass	Nol Grass	<i>Eriochloaprocera</i>	Cattle food and Fuel	LC
22	Common Basil	Tulshi	<i>Ocimum sanctum</i>	Medicine	NE
23	Prickly Sesban	Dhoincha	<i>Sesbania aculeata</i>	Fuel and Fertilizer	NE
24	Jute	Pat	<i>Corchorus spp.</i>	Food and Fuel	NE
25	Pearl Millet	Bajra	<i>Pennisetum typhoides</i>	Cattle food	NE
26	Napier Grass	Napier Grass	<i>Pennisetum purpureum</i>	Cattle food	LC
<b>Woody Herb (Terrestrial)</b>					
27	Coconut	Narikel	<i>Cocos nucifera</i>	Fruit and Fuelwood	NE
28	Bamboo	Makhla Bash	<i>Bambusa nutans</i>	Furniture, Construction	NE
29	Mahal Bamboo	Tolla Bash	<i>Bambusalongispiculata</i>	Furniture, Construction	NE
30	Female Bamboo	Bora Bash	<i>Bambusabalcooa</i>	Furniture, Construction	NE
<b>Shrub (Terrestrial)</b>					
31	Salt Cedar	Ban Jhau, Nona-	<i>Tamarix dioica</i>	Medicinal	NE

SL	English Name	Common Name	Scientific name	Importance	IUCN Global Status
		Gach, Urichiya			
32	Groundnut	Badam	<i>Arachis hypogaea</i>	Food, Fuel	NE
33	Caesarweed	JongliGhagra	<i>Urena lobata</i>	Medicinal	LC
34	Indian Palm	Boroi	<i>Ziziphus jujuba</i>	Fuelwood and Fruit	LC
35	Guava	Peyara	<i>Psidium guajava</i>	Fruit	LC
36	Common Fig	Dumur	<i>Ficus carica</i>	Fruit and Fuelwood	LC
<b>Tree (Terrestrial)</b>					
37	Neem, Indian lilac	Neem	<i>Azadirachta indica</i>	Timber and medicine	LC
38	Bengal Quince	Bel	<i>Aeglemarmelos</i>	Medicinal fruits	NE
39	White Marudah	Arjun	<i>Terminalia arjuna</i>	Timber and Medicinal	NE
40	Spanish Cherry	Bakul	<i>Minusopselengi</i>	Fruit, Ornamental	NE
41	Indian Gooseberry	Amla	<i>Phyllanthus emblica</i>	Medicinal	LC
42	Ashoka Tree	Ashoka	<i>Saraca indica</i>	Medicinal	LC
43	Billeric Myrobalan	Bohera	<i>Terminalia belerica</i>	Medicinal	LC
44	Chebolic Myrobalum	Bohera	<i>Terminalia chebula</i>	Medicinal	LC
45	Indian Coral Tree	Mandar	<i>Erythrina variegata</i>	Ornamental	LC
46	Indian Ash Tree	Jiga	<i>Lanneacoromandelica</i>	Medicinal & Timber	LC
47	Cluster Fig	Khuksha	<i>Ficus hispida</i>	Fuelwood & Fruit	LC
48	Flame Tree	Krishnachura	<i>Delonix regia</i>	Ornamental	LC
49	Mahogany	Mahagoni	<i>Swietenia mahagoni</i>	Timber, Medicinal	NT
50	Brown Salwood	Acacia	<i>Acacia mangium</i>	Timber	LC
51	Olive	Jolpai	<i>Olea europaea</i>	Medicinal, Timber	NE
52	Pipal	Osoth	<i>Ficus religiosa</i>	Fuel wood	NE
53	Rain tree	Meghsirij	<i>Albizia saman</i>	Firewood, timber, Avenue	NE
54	Sugar Apple (Ata)	Ata	<i>Annona squamosa</i>	Fruit, Fuel	LC
55	Wild Mango/Hog Plum	Bilati Amra	<i>Spondiaspinnata</i>	Fruit	NE
56	Mango	Aam	<i>Mangifera indica</i>	Fruit and Timber	NE
57	Jackfruit	Kanthal	<i>Artocarpus heterophyllus</i>	Timber, Fruits	NE
58	Black Plum	Jam	<i>Syzygiumcumini</i>	Fruit	LC
59	Indian Jujube	Boroi	<i>Zizyphusmauritiana</i>	Fruit	NE
60	Elephant Apple	Chalta	<i>Dillenia indica</i>	Fruit	LC
61	Palmyra Palm	Tal	<i>Borassus flabellifer</i>	Timber, Fruit	EN
62	Silver Date Palm	Khejur	<i>Phoenix sylvestris</i>	Fruit and Fuelwood	NE
63	Betel Palm	Shupari	<i>Areca catechu</i>	Fruit and Timber	NE
64	Monkey Jack fruit	Dewa	<i>Artocarpus lakoocha</i>	Fruits	NE
65	Ear-leaf Acacia	Akashmoni	<i>Acacia auriculiformis</i>	Timber	LC
66	River Redgum	Eucalyptus	<i>Eucalyptus camaldulen</i>	Timber	NE
67	North Indian Rosewood	Sissoo	<i>Dalbergia sisso</i>	Timber	LC
68	Trewia	Pitali	<i>Trewiapolycarpa</i>	Timber and fuelwood	NE
69	Queen's Crape Myrtle	Jarul	<i>Lagersroentia speciosa</i>	Timber	NE
70	Candahar Tree	Gamar	<i>Gmelina arborea</i>	Timber	LC

SL	English Name	Common Name	Scientific name	Importance	IUCN Global Status
71	Burflower-Tree	Kadam	<i>Anthocephalus chinensis</i>	Timber and fuelwood	NE
72	Siamese Rough Bush	Sheora	<i>Sterblus asper</i>	Timber plants	NE
73	Golden Shower Tree	Sonalu	<i>Cassia fistula</i>	Ornamental	LC
74	Red Silk Cotton	Simul	<i>Bombax ceiba</i>	Cotton and Fuelwood	LC
75	Indian Banyan	Bot	<i>Ficus bengalensis</i>	Fuelwood	NE
76	Weeping Fig	Pakur	<i>Ficus comosa</i>	Timber	NE

Source: Primary data collected in June 2021 and IUCN 2015<sup>17</sup>

<sup>17</sup> IUCN 2015. Environmental Baseline (Revised) 2015. Environmental Assessment for River Management Improvement Program, Bangladesh Water Development Board



**Table 2: List of mammals known to occur in the BAA (primary and secondary information)**

Code: EN: Endangered; VU: Vulnerable; NT: Near Threatened; LC: Least Concern

SL	English Name	Scientific Name	Local Name	National Status	Global Status
<b>ORDER: RODENTIA</b>					
<b>Family: Sciuridae</b>					
1	Northern Palm Squirrel	<i>Funambulus pennantii</i>	Dora Kathbirali	LC	LC
	Family: Muridae				
2	Lesser Bandicoot-Rat	<i>Bandicota bengalensis</i>	KhetIdur, Metholdur	LC	LC
3	Greater Bandicoot-Rat	<i>Bandicota indica</i>	DhariIdur, BaroIdur	LC	LC
4	Little Indian Field Mouse	<i>Mus booduga</i>	Metholdur, MethoNengtiIdur	LC	LC
5	Eastern House Mouse	<i>Mus musculus</i>	NengtiIdur	LC	LC
6	House Rat	<i>Rattus rattus</i>	Indur	LC	LC
7	Asiatic Long-tailed Climbing Mouse	<i>Vandeleuria oleracea</i>	GechoIdur, GechoNengtiIndur	LC	LC
<b>ORDER: CARNIVORA</b>					
<b>Family: Viverridae</b>					
8	Masked Palm Civet	<i>Pagumalarvata</i>	Boishne Ula	VU	LC
9	Asian Palm Civet	<i>Paradoxurus hermaphroditus</i>	Gandhagakul, Nongar, Shairel, Haila	LC	LC
10	Large Indian Civet	<i>Viverrazibetha</i>	Baro Bagdash, Huicha	NT	LC
11	Small Indian Civet	<i>Viverricula indica</i>	Choto Baghailla, Bagdash	NT	LC
	Family: Felidae				
12	Jungle Cat	<i>Felis chaus</i>	Ban Biral, Wab	NT	LC
13	Fishing Cat	<i>Prionailurus viverrinus</i>	Mecho Biral, Baghailla, Dash Bagh	EN	VU
<b>Family: Herpestidae</b>					
14	Small Indian Mongoose	<i>Herpestes auropunctatus</i>	Choto Benji, Nakul	LC	LC
15	Indian Grey Mongoose	<i>Herpestes edwardsii</i>	Baro Benji	LC	LC
<b>Family: Canidae</b>					
16	Golden Jackal	<i>Canis aureus</i>	Shial, Shial Pandit	LC	LC
<b>Family: Viverridae</b>					
17	Smooth-coated Otter	<i>Lutraperspicillata</i>	Wud Biral	CR	VU
<b>ORDER: EULIPOTYPHLA</b>					
<b>Family: Soricidae</b>					
18	Asian House Shrew	<i>Suncus murinus</i>	Chika, Chhucho	LC	LC
<b>ORDER: CHIROPTERA</b>					
<b>Family: Pteropodidae</b>					
19	Greater Short-nosed Fruit Bat	<i>Cynopterus sphinx</i>	Kola Badur	LC	LC
20	Indian Flying Fox	<i>Pteropus giganteus</i>	Baro Badur	LC	LC
21	Leschenault's Rousette	<i>Rousettus leschenaultii</i>	Kola Badur	LC	LC
<b>Family: Megadermatidae</b>					
22	Greater False Vampire Bat	<i>Megaderma lyra</i>	BhuaDainiBadur	LC	LC

SL	English Name	Scientific Name	Local Name	National Status	Global Status
<b>Family: Vespertilionidae</b>					
23	Indian Pipistrelle	<i>Pipistrellus coromandra</i>	Chamchika	LC	LC
24	Greater Asiatic Yellow Bat	<i>Scotophilusheathi</i>	BoroRongilaChamchika	LC	LC
25	Lesser Asiatic Yellow Bat	<i>Scotophiluskuhlii</i>	Choto HoldeyChamchika	LC	LC
<b>ORDER: CETARTIODACTYLA</b>					
<b>Family: Platanistidae</b>					
26	Ganges River Dolphin	<i>Platanista gangetica</i>	Nadir Shushuk, Shishu, Hucchum	VU	EN

[Source: Primary data collected in June 2021 and IUCN 2015<sup>18</sup>]

<sup>18</sup> IUCN 2015. Environmental Baseline (Revised) 2015. Environmental Assessment for River Management Improvement Program, Bangladesh Water Development Board

**Table 3: List of resident birds sighted in BAA (primary and secondary information)**

Code: CR: Critically Endangered; EN: Endangered; VU: Vulnerable; NT: Near Threatened; LC: Least Concern

SL	English Name	Scientific Name	Local Name	National Status	Global Status
<b>ORDER: ANSERIFORMES</b>					
<b>Family: Dendrocygnidae</b>					
1	Lesser Whistling-duck	<i>Dendrocygnajavanica</i>	Choto Sarali Hans, Shingali Hans	LC	LC
<b>Family: Anatidae</b>					
2	Spot-billed Duck	<i>Anas poecilorhyncha</i>	Metey Hans	LC	LC
3	Cotton Pygmy- goose	<i>Nettapuscoromandelianus</i>	Bali Hans	LC	LC
<b>ORDER: PICIFORMES</b>					
<b>Family: Picidae</b>					
4	Rufous Woodpecker	<i>Celeusbrachyurus</i>	Lal Kaththokra	LC	LC
5	Fulvous-breasted Woodpecker	<i>Dendrocoposmacei</i>	Jarad Kaththokra	LC	LC
6	Black-rumpedFlameback	<i>Dinopiumbenghalense</i>	Sonali Kaththokra, Kathkhutalu, Kurailla	LC	LC
7	Eurasian Wryneck	<i>Jynx torquilla</i>	EureshioGharbetha	LC	LC
8	Streak-throated Woodpecker	<i>Picusxanthopygaeus</i>	DagigolaKathkurali	LC	LC
<b>Family: Megalaimidae</b>					
9	Blue-throated Barbet	<i>Psilopogon asiaticus</i>	Dhonia, BeghbouBasantabouri	LC	LC
10	Coppersmith Barbet	<i>Psilopogonhaemacephala</i>	Choto Basantabouri	LC	LC
11	Lineated Barbet	<i>Psilopogonlineatus</i>	Gorkhod, Beghbou, KutlushBasantabouri	LC	LC
<b>ORDER: UPUPIFORMES</b>					
<b>Family: Upupidae</b>					
12	Common Hoopoe	<i>Upupa epops</i>	Hudhud, Solaiman Pakhi	LC	LC
<b>ORDER: CORACIIFORMES</b>					
<b>Family: Coraciidae</b>					
13	Indian Roller	<i>Coracias benghalensis</i>	Nilkantha, Chhatkaia, Tauwa, Thormocha	LC	LC
<b>Family: Alcedinidae</b>					
14	Common Kingfisher	<i>Alcedo atthis</i>	Pati Machranga	LC	LC
<b>Family: Halcyonidae</b>					
15	White-throated Kingfisher	<i>Halcyon smyrnensis</i>	DholagolaMachranga	LC	LC
<b>Family: Cerylidae</b>					
16	Pied Kingfisher	<i>Cerylerudis</i>	PakraMachranga	LC	LC
<b>Family: Meropidae</b>					
17	Green Bee-eater	<i>Meropsorientalis</i>	Suichora, Banshpati	LC	LC
18	Blue-tailed Bee- eater	<i>Meropsphilippinus</i>	Neel-lejShuichora	LC	LC
<b>ORDER: CUCULIFORMES</b>					
<b>Family: Cuculidae</b>					
19	Plaintive Cuckoo	<i>Cacomantismerulinus</i>	Koroon Papia	LC	LC

SL	English Name	Scientific Name	Local Name	National Status	Global Status
20	Pied Cuckoo/Jacobin Cuckoo	<i>Clamatorjacobinus</i>	Papiya, Pakra Papia	LC	LC
21	Indian Cuckoo	<i>Cuculusmicropterus</i>	Bou-kotha- kou	LC	LC
22	Western Koel	<i>Eudynamysscolopacea</i>	Kokil, Kokil	LC	LC
23	Common Hawk Cuckoo	<i>Hierococcyxvarius</i>	Chokhgelo	LC	LC
<b>Family: Centropodidae</b>					
24	Greater Coucal	<i>Centropus sinensis</i>	Baro Kanakukkal, Boro Kubo	LC	LC
<b>ORDER: PSITTACIFORMES</b>					
<b>Family: Psittacidae</b>					
25	Rose-ringed Parakeet	<i>Psittaculakrameri</i>	Tiya	LC	LC
<b>ORDER: CAPRIMULGIFORMES</b>					
<b>Family: Apodidae</b>					
26	House Swift	<i>Apus nipalensis</i>	GhorBatashi	LC	LC
27	Asian Palm Swift	<i>Cypsiurusbalasiensis</i>	AsioTalbatashi, Nakkati	LC	LC
<b>ORDER: STRIGIFORMES</b>					
<b>Family: Tytonidae</b>					
28	Barn Owl	<i>Tyto alba</i>	Lakhi Pecha	LC	LC
<b>Family: Strigidae</b>					
29	Spotted Owlet	<i>Athene brama</i>	Khuruley Pencha	LC	LC
30	Dusky Eagle Owl	<i>Bubo coromandus</i>	MeteyHutompecha	LC	LC
31	Brown Fish Owl	<i>Ketupazeylonensis</i>	Bhutum Pecha, KhoiraMechopecha	LC	LC
32	Brown Hawk Owl	<i>Ninoxscutulata</i>	KhoiraShikrepecha	LC	LC
33	Collared Scops Owl	<i>Otus lettia</i>	KonhiNimpecha	LC	LC
<b>Family: Caprimulgidae</b>					
34	Large-tailed Nightjar	<i>Caprimulgus macrurus</i>	Lenja Ratchora	LC	LC
<b>Order: COLUMBIFORMES</b>					
<b>Family: Columbidae</b>					
35	Grey-capped Emerald Dove	<i>Chalcophaps indica</i>	Pati Shamaghughu, SabujGhughu	LC	LC
36	Rock Dove	<i>Columba livia</i>	Jalali Kobutar	LC	LC
37	Eastern Spotted Dove	<i>Spilopelia chinensis</i>	Tila Ghughu	LC	LC
38	Eurasian Collared Dove	<i>Streptopeliadecaecto</i>	EurashioKonthighughu	LC	LC
39	Oriental Turtle Dove	<i>Streptopeliaorientalis</i>	Rajghughu	LC	LC
40	Red Turtle Dove	<i>Streptopeliaatranquebarica</i>	Lal Rajghughu	LC	LC
41	Yellow-footed Green Pigeon	<i>Treron phoenicoptera</i>	HoldeypaHarial	LC	LC
<b>ORDER: GRUIFORMES</b>					
<b>Family: Rallidae</b>					
42	White-breasted Waterhen	<i>Amaurornisphoenicurus</i>	Dahuk	LC	LC
43	Watercock	<i>Gallicrex cinerea</i>	Kora, Bon Kora	LC	LC
44	Common Moorhen	<i>Gallinula chloropus</i>	Jolmurgi, Donkui	LC	LC
45	Purple Swamphen	<i>Porphyrioporphyrus</i>	Kalim, Kaiem	LC	LC

SL	English Name	Scientific Name	Local Name	National Status	Global Status
<b>ORDER: CHARADRIFORMES</b>					
<b>Family: Rostratulidae</b>					
46	Greater Painted Snipe	<i>Rostratulabenghalensis</i>	Rongila, Boiragi Chaga	LC	LC
<b>Family: Jacanidae</b>					
47	Pheasant-tailed Jacana	<i>Hydrophasianuschirurgus</i>	Naew, Mewa, Jol Mayur	LC	LC
48	Bronze-winged Jacana	<i>Metopidius indicus</i>	Jolpipi, Pipi	LC	LC
<b>Family: Charadriidae</b>					
49	River Lapwing	<i>Vanellusduvaucelii</i>	Nodi Titi	NT	NT
50	Red-wattled Lapwing	<i>Vanellus indicus</i>	Hot Titi	LC	LC
51	Yellow-wattled Lapwing	<i>Vanellusmalarbaricus</i>	Holdegal Titi	NT	LC
<b>Family: Glareolidae</b>					
52	Little Pratincole	<i>Glareola lacteal</i>	Babui Batan, Choto Babubatan	LC	LC
<b>Family: Laridae</b>					
53	Black-bellied Tern	<i>Sterna acuticauda</i>	KalapetPanchil	CR	EN
54	Little Tern	<i>Sterna albifrons</i>	Choto Panchil	LC	LC
55	River Tern	<i>Sterna aurantia</i>	Nodia Panchil	NT	VU
56	Whiskered Tern	<i>Chlidoniashybrida</i>	JulphiPanchil	LC	LC
<b>ORDER: ACCIPITRIFORMES</b>					
<b>Family: Accipitridae</b>					
56	Shikra	<i>Accipiter badius</i>	Pati Shikre	LC	LC
57	Indian Spotted Eagle	<i>Clanga hastata</i>	Deshi Gut-eegol, Gutimar	EN	VU
58	White-eyed Buzzard	<i>Butasturteesa</i>	DholachokhTishabaj	LC	LC
59	Black-winged Kite	<i>Elanus caeruleus</i>	Katua Chil	LC	LC
60	White-rumped Vulture	<i>Gyps bengalensis</i>	Shakun, Bangla Shakun	CR	CR
61	Brahminy Kite	<i>Haliastur Indus</i>	Sankha Chil, Lal Chil	LC	LC
62	Gray-headed Fish Eagle	<i>Ichthyophagaichthyaetus</i>	Meteymatha Kura-eegol, Ukhosh	NT	NT
63	Black Kite	<i>Milvus migrans</i>	Bhuban Chil	LC	LC
64	Oriental Honey Buzzard	<i>Pernis ptilorhyncus</i>	Madhu Chil, Madhubaj	LC	LC
65	Crested Serpent Eagle	<i>Spilornischeela</i>	Tila Nag-eegol, Teela Eagle	LC	LC
66	Changeable Hawk Eagle	<i>Nisaetuscirrhatus</i>	BohurupiShikrey-eegol, Sadal	LC	LC
<b>ORDER: FALCONIFORMES</b>					
<b>Family: Falconidae</b>					
67	Red-headed Falcon	<i>Falco chicquera</i>	Turmoti Baj, Lalghar Shaheen	LC	NT
<b>ORDER: PODICIPEDIFORMES</b>					
<b>Family: Podicipedidae</b>					
68	Little Grebe	<i>Tachybaptus ruficollis</i>	Choto Duburi, Dubalu	LC	LC
<b>ORDER: SULIFORMES</b>					
<b>Family: Anhingidae</b>					
69	Oriental Darter	<i>Anhinga melanogaster</i>	Shap-pakhi, Ragga, Goyar	NT	NT
<b>Family: Phalacrocoracidae</b>					
70	Little Cormorant	<i>Phalacrocorax niger</i>	Choto Pankouri, Panikamur	LC	LC

SL	English Name	Scientific Name	Local Name	National Status	Global Status
<b>ORDER: PELECANIFORMES</b>					
<b>Family: Ardeidae</b>					
71	Grey Heron	<i>Ardea cinerea</i>	Dhupni Bok, Dhushor Bok, Pidali, Daing Bok	LC	LC
72	Purple Heron	<i>Ardea purpurea</i>	Oikka Bok, Lalche Bok	LC	LC
73	Pond Heron	<i>Ardeolagrayii</i>	Deshi Kanibok, Kani Bok, Kurchey Bok	LC	LC
74	Cattle Egret	<i>Bubulcus ibis</i>	Go-bok	LC	LC
75	Little Heron, Green Backed Heron	<i>Butorides striata</i>	Khudey Bok, Shobuj Bok	LC	LC
76	Great Egret	<i>Ardea alba</i>	Boro Boga, Jathua Bok	LC	LC
77	Little Egret	<i>Egretta garzetta</i>	Chhoto Boga, Dhub Boga	LC	LC
78	Cinnamon Bittern	<i>Ixobrychus cinnamomeus</i>	Khoira Bogla, Nol Ghonga, Lal Bok	LC	LC
79	Yellow Bittern	<i>Ixobrychus sinensis</i>	Holdey Bogla, Holdey Bok	LC	LC
80	Intermediate Egret	<i>Ardea intermedia</i>	Majhla Boga, Majhari Bok	LC	LC
81	Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	Kalamatha Nishibok, Waak, Nishi Bok	LC	LC
<b>Family: Threskiornithidae</b>					
82	Black-headed Ibis	<i>Threskiornis melanocephalus</i>	Kalamatha Kasteychora	VU	NT
<b>ORDER: CICONIIFORMES</b>					
<b>Family: Ciconiidae</b>					
83	Asian Openbill Stork	<i>Anastomus oscitans</i>	Shamukhol	LC	LC
84	Lesser Adjutant Stork	<i>Leptoptilos javanicus</i>	Choto Modontak	VU	VU
<b>ORDER: PASSERIFORMES</b>					
<b>Family: Irenidae</b>					
85	Golden-fronted Leafbird	<i>Chloropsis aurifrons</i>	Patabulbuli, Horbola	LC	LC
<b>Family: Laniidae</b>					
86	Long-tailed Shrike	<i>Lanius schach</i>	Lenja Latora, Baghatiki	LC	LC
<b>Family: Aegithinidae</b>					
87	Common Iora	<i>Aegithina tiphia</i>	Pati Fotikjol, Towfik	LC	LC
<b>Family: Artamidae</b>					
88	Ashy Woodswallow	<i>Artamus fuscus</i>	Metey Bonababil	LC	LC
<b>Family: Campephagidae</b>					
89	Large Cuckooshrike	<i>Coracinamacei</i>	Gudhuka, Boro Kabashi	LC	LC
90	Black-headed Cuckooshrike	<i>Coracinamelanoptera</i>	Kabashi	LC	LC
91	Small Minivet	<i>Pericrocotus cinnamomeus</i>	Choto Saheli, Sath Saili	LC	LC
92	Common Woodshrike	<i>Tephrodornis pondicerianus</i>	Pati Bonlatora	LC	LC
<b>Family: Corvidae</b>					
93	Large-billed Crow	<i>Corvus leuillanti</i>	Dar Kak	LC	LC
94	House Crow	<i>Corvus splendens</i>	Pati Kak	LC	LC
95	Rufous Treepie	<i>Dendrocitta vagabunda</i>	Kutum, Harichacha, Taira	LC	LC



SL	English Name	Scientific Name	Local Name	National Status	Global Status
<b>Family: Dicruridae</b>					
96	Bronzed Drongo	<i>Dicrurus aeneus</i>	Bronze Fingey, Chota	LC	LC
97	Ashy Drongo	<i>Dicrurus leucophaeus</i>	Metey Fingey, Neel Fingey	LC	LC
98	Black Drongo	<i>Dicrurus macrocercus</i>	Kala Fingey	LC	LC
<b>Family: Monarchidae</b>					
99	Black-naped Monarch	<i>Hypothymis azurea</i>	Kalaghar Rajon	LC	LC
100	Asian Paradise-flycatcher	<i>Terpsiphone paradisi</i>	Dudhraj, Eshio Shabulbuli	LC	LC
<b>Family: Oriolidae</b>					
101	Black-hooded Oriole	<i>Oriolus xanthornus</i>	Haldey Pakhi, Haludia	LC	LC
<b>Family: Rhipiduridae</b>					
102	White-throated Fantail	<i>Rhipidura albicollis</i>	Dholagola Chatighurani, Chak-dil	LC	LC
<b>Family: Muscicapidae</b>					
103	Oriental Magpie Robin	<i>Copsychus saularis</i>	Doel, Doi Nachani, Deilla	LC	LC
104	Gray-headed Canary Flycatcher	<i>Culicicapaceylonensis</i>	Metematha Kanarichutki	LC	LC
105	White-tailed Stonechat	<i>Saxicola leucurus</i>	Dholalej Shilafidda	LC	LC
<b>Family: Turdidae</b>					
106	Orange-headed Thrush	<i>Zosterocitrina</i>	Komla Dama	LC	LC
<b>Family: Sturnidae</b>					
107	Jungle Myna	<i>Acridotheres fuscus</i>	Jhuti Shalik	LC	LC
108	Bank Myna	<i>Acridotheres ginginianus</i>	Gang Shalik	LC	LC
109	Common Myna	<i>Acridotheres tristis</i>	Bhat Shalik	LC	LC
110	Asian Pied Starling	<i>Sturnus contra</i>	Gobrey Shalik	LC	LC
111	Chestnut-tailed Starling	<i>Sturnus malabaricus</i>	Kath Shalik	LC	LC
<b>Family: Paridae</b>					
112	Great Tit	<i>Parus major</i>	Boro Tit	LC	LC
<b>Family: Hirundinidae</b>					
113	Plain Martin	<i>Riparia paludicola</i>	Khoiragola Nakuti	LC	LC
<b>Family: Pycnonotidae</b>					
114	Red-vented Bulbul	<i>Pycnonotus cafer</i>	Bangla Bulbul	LC	LC
115	Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>	Sipahi Bulbuli, Jhutkuli	LC	LC
<b>Family: Cisticolidae</b>					
116	Zitting Cisticola	<i>Cisticola juncidis</i>	Bhomra Soton	LC	LC
117	Graceful Prinia	<i>Prinia gracilis</i>	Shundori Prinia	LC	LC
118	Gray-breasted Prinia	<i>Prinia hodgsonii</i>	Metebok Prinia	LC	LC
119	Plain Prinia	<i>Prinia inornata</i>	Nirol Prinia	LC	LC
<b>Family: Zosteropidae</b>					
120	Oriental White-eye	<i>Zosterops palpebrosus</i>	Udoi Dholachokh	LC	LC
<b>Family: Sylviidae</b>					
121	Striated Grassbird	<i>Megalurus palustris</i>	Dagi Ghaspakhi	LC	LC
122	Common Tailorbird	<i>Orthotomus sutorius</i>	Tuntuni	LC	LC

SL	English Name	Scientific Name	Local Name	National Status	Global Status
<b>Family: Timaliidae</b>					
123	Striated Babbler	<i>Turdoidesearlei</i>	Dagi Satarey	LC	LC
124	Jungle Babbler	<i>Turdoidesstriatus</i>	Satbhaila, Satbhai, Bon Satarey	LC	LC
<b>Family: Alaudidae</b>					
125	Oriental Skylark	<i>Alauda gulgula</i>	UdoiOvrobhorot	LC	LC
126	Indian Short-toed Lark	<i>Calandrella raytal</i>	Bali Bhorot	LC	LC
127	Ashy-crowned Sparrow Lark	<i>Eremopterix grisea</i>	MetechadiChoruivorot	LC	LC
128	Rufous-winged Bushlark	<i>Mirafraassamica</i>	Bangla Jharbhorot	LC	LC
<b>Family: Nectariniidae</b>					
129	Pale-billed Flowerpecker	<i>Dicaeumerythrorhynchos</i>	MetethotFuljhuri	LC	LC
130	Purple Sunbird	<i>Nectarinia asiatica</i>	BeguniMoutushi	LC	LC
131	Purple-rumped Sunbird	<i>Nectariniazeylonica</i>	Beguni-komorMoutushi	LC	LC
<b>Family: Motacillidae</b>					
132	Paddyfield Pipit	<i>Anthusrufulus</i>	Dhani Tulika	LC	LC
133	White-browed Wagtail	<i>Motacillamaderaspatensis</i>	DholavruKhonjon	LC	LC
<b>Family: Estrildidae</b>					
134	White-throated Munia, Indian Silverbill	<i>Lonchuramalabarica</i>	Deshi Chandithot	LC	LC
135	Tricolored Munia	<i>Lonchuramalacca</i>	Khoyra Munia	LC	LC
136	Scaly-breasted Munia	<i>Lonchurapunctulata</i>	Tila Munia	LC	LC
<b>Family: Ploceidae</b>					
137	Baya Weaver	<i>Ploceusphilippinus</i>	Babui, Baoi, Baloi	LC	LC
138	Black-breasted Weaver	<i>Ploceusbenghalensis</i>	Bangla Babui	LC	LC
<b>Family: Passeridae</b>					
139	House Sparrow	<i>Passer domesticus</i>	Pati Chorui	LC	LC

Source of status - IUCN Bangladesh 2015

Check for Whiskered Tern, Red Avadavat,

**Table 4: Migratory birds sighted in the project area (primary and secondary information)**

Code: CR: Critically Endangered; EN: Endangered; VU: Vulnerable; NT: Near Threatened; LC: Least Concern

SL	English Name	Scientific Name	Local Name	National Status	Global status
<b>ORDER: ANSERIFORMES</b>					
<b>Family: Anatidae</b>					
1	Fulvous Whistling-Duck	<i>Dendrocygna bicolor</i>	Baro Sarali Hans	LC	LC
2	Northern Pintail	<i>Anas acuta</i>	Lenja Hans	LC	LC
3	Northern Shoveler	<i>Spatula clypeata</i>	UttureyKhunte-hansh, Khunte Hans	LC	LC
4	Common Teal	<i>Anas crecca</i>	Pati tilihash, Patari Hans	LC	LC
5	Eurasian Wigeon	<i>Marecapenelope</i>	EureshioShithihash, Shithihash	LC	LC
6	Mallard	<i>Anas platyrhynchos</i>	Nilshir, Nilmatha Hash	LC	LC
7	Garganey	<i>Spatula querquedula</i>	Giria Hash, Nairoli Hans	LC	LC
8	Gadwall	<i>Mareca strepera</i>	Piang Hash	LC	LC
9	Greylag Goose	<i>Anseranser</i>	MeteyRajhash, Dhushur Rajhans	LC	LC
10	Bar-headed Goose	<i>Anser indicus</i>	Dagi Rajhash, Raj Hans	LC	LC
11	Common Pochard	<i>Aythya ferina</i>	Pati Bhutihash	LC	LC
12	Tufted Duck	<i>Aythya fuligula</i>	Tiki Hash, Bamunia Hans	LC	LC
13	African Comb Duck	<i>Sarkidiornis melanotos</i>	Nakta Hansh, Nakta	NT	LC
14	Ruddy Shelduck	<i>Tadornaferruginea</i>	KhoiraChokachoki	LC	LC
15	Common Shelduck	<i>Tadornatadorna</i>	Pati Chokachoki	LC	LC
16	Ferruginous Duck	<i>Aythya nyroca</i>	Morche Rong Vuti Hans	NT	NT
<b>ORDER: GRUIFORMES]</b>					
<b>Family: Rallidae</b>					
16	Common Coot	<i>Fulicaatra</i>	Kalo Koot, Jal Kutkut	LC	LC
<b>ORDER: CHARADRIFORMES</b>					
<b>Family: Scolopacidae</b>					
17	Common Sandpiper	<i>Actitis hypoleucos</i>	Cha Pakhi, Pati Batan	LC	LC
18	Little Stint	<i>Calidris minuta</i>	ChhotoChapakhi, Choto Chaha	LC	LC
19	Temminck's Stint	<i>Calidris temminckii</i>	TemingerChapaki, Teminker Chaha	LC	LC
20	Common Snipe	<i>Gallinagogallinago</i>	Pati Chega	LC	LC
21	Pintail Snipe	<i>Gallinagostenura</i>	Lenja Chega	LC	LC
22	Eurasian Curlew	<i>Numenius arquata</i>	EureshioGulinda, BoroGulinda	NT	NT
23	Spotted Redshank	<i>Tringa erythropus</i>	Tila Lalpa	LC	LC
24	Common Greenshank	<i>Tringa nebularia</i>	Pati Shobujpa	LC	LC
25	Green Sandpiper	<i>Tringa ochropus</i>	Shobuj Batan	LC	LC
26	Marsh Sandpiper	<i>Tringa stagnatilis</i>	Bil Batan	LC	LC
27	Common Redshank	<i>Tringa tetanus</i>	Pati Lalpa	LC	LC
28	Wood Sandpiper	<i>Tringa glareola</i>	Bon Batan	LC	LC
<b>Family: Burhinidae</b>					
29	Eurasian Thick-knee	<i>Burhinus indicus</i>	Deshi Motahatoo	LC	LC
<b>Family: Charadriidae</b>					

SL	English Name	Scientific Name	Local Name	National Status	Global status
30	Kentish Plover	<i>Charadrius alexandrinus</i>	Kentish Jiria	LC	LC
31	Little Ringed Plover	<i>Charadrius dubius</i>	Choto Jiria, Choto Nothjiria	LC	LC
32	Lesser Sand Plover	<i>Charadrius mongolus</i>	Choto Dhuljiria	LC	LC
33	Pacific Golden Plover	<i>Pluvialis fulva</i>	ProshantoSonajiria	LC	LC
34	Gray-headed Lapwing	<i>Vanellus cinereus</i>	Metematha Titi	LC	LC
	White-tailed Lapwing	<i>Vanellusleucurus</i>			LC
<b>Family: Recurvirostridae</b>					
35	Black-winged Stilt	<i>Himantopus himantopus</i>	KalapakhThengi, Lal pa Dhenga	LC	LC
<b>Family: Laridae</b>					
37	Brown-headed Gull	<i>Larus brunnicephalus</i>	KhoiramathaGangchil, Gonga Koitar	LC	LC
38	Pallas's Gull	<i>Larus ichthyaetus</i>	Baro Bodorkoitar, PalasiGangchil	LC	LC
39	Black-headed Gull	<i>Larus ridibundus</i>	Gongakoitar, KalamathaGangchil	LC	LC
<b>ORDER: ACCIPITRIFORMES</b>					
<b>Family: Accipitridae</b>					
40	Greater Spotted Eagle	<i>Clanga clanga</i>	Boro Gutie-eegol, Boro Chitra Egol	VU	VU
41	Common Buzzard	<i>Buteo buteo</i>	Pati Tishabaj	LC	LC
42	Long-legged Buzzard	<i>Buteo rufinus</i>	LombapaTishabaj, Idurmara Chil	LC	LC
43	Eurasian Marsh Harrier	<i>Circus aeruginosus</i>	PoschimaPankapashi, Kuria Chil	LC	LC
44	Pied Harrier	<i>Circus melanoleucos</i>	DholaKapashi, Rakhalbhulani	LC	LC
45	Booted Eagle	<i>Hieraaetuspennatus</i>	BootpaEegol	LC	LC
<b>Family: Pandionidae</b>					
46	Osprey	<i>Pandion haliaetus</i>	Machmural	LC	LC
<b>ORDER: FALCONIFORMES Family: Falconidae</b>					
47	Peregrine Falcon	<i>Falco peregrinus</i>	Boheribaj, Peregrine Shaheen	LC	LC
48	Common Kestrel	<i>Falco tinnunculus</i>	Pati Kestrel, Shapkhauri Baj	LC	LC
<b>ORDER: PODICIPEDIFORMES</b>					
<b>Family: Podicipedidae</b>					
49	Great Crested Grebe	<i>Podiceps cristatus</i>	BoroKhopaduburi	LC	LC
<b>ORDER: SULIFORMES</b>					
<b>Family: Phalacrocoracidae</b>					
50	Great Cormorant	<i>Phalacrocorax carbo</i>	BoroPankouri	LC	LC
51	Indian Cormorant	<i>Phalacrocorax fuscicollis</i>	Deshi Pankouri	LC	LC
<b>ORDER: CICONIFORMES</b>					
<b>Family: Ciconidae</b>					
52	Black Stork	<i>Ciconia nigra</i>	Kala Manikjor	VU	LC
53	Painted Stork	<i>Mycteria leucocephala</i>	Ranga Manikjor, Sonajongha	CR	NT
54	Woolly-necked Stork	<i>Ciconia episcopus</i>	<a href="http://datazone.birdlife.org/species/factsheet/asian-">http://datazone.birdlife.org/species/factsheet/asian-</a>	CR	VU

SL	English Name	Scientific Name	Local Name	National Status	Global status
			woollyneck-ciconia-episcopus		
<b>ORDER: PASSERIFORMES</b>					
<b>Family: Laniidae</b>					
55	Brown Shrike	<i>Lanius cristatus</i>	Khoira Latora, Badami Kosai	LC	LC
55	Gray-backed Shrike	<i>Lanius tephronotus</i>	Metepith Latora	LC	LC
<b>Family: Campehagidae</b>					
56	Black-winged Cuckooshrike	<i>Coracinamelaschistos</i>	Kalapakh Kabashi	LC	LC
<b>Family: Muscipidae</b>					
57	Verditer Flycatcher	<i>Eumyiasthalassina</i>	Ambar Chutki, Nil Katkatia	LC	LC
58	Taiga Flycatcher	<i>Ficedula albicilla</i>	Taiga Chutki, LalbokChotok	LC	LC
59	Siberian Rubythroat	<i>Luscinia calliope</i>	SiberioChunikonhi	LC	LC
60	Bluethroat	<i>Luscinia svecica</i>	Neelgola Fidda	LC	LC
61	Blue Rock-thrush	<i>Monticola solitarius</i>	Neel Shiladama	LC	LC
62	Black Redstart	<i>Phoenicurusochruros</i>	Kala Girdi	LC	LC
63	Common Stonechat	<i>Saxicola torquatus</i>	Pati Shilafidda	LC	LC
<b>Family: Hirundinidae</b>					
64	Red-rumped Swallow	<i>Hirundodaurica</i>	Lalkomor Ababil	LC	LC
65	Barn Swallow	<i>Hirundorustica</i>	Pati Ababil	LC	LC
66	Sand Martin	<i>Riparia riparia</i>	Bali Nakuti	LC	LC
<b>Family: Sylviidae</b>					
67	Paddyfield Warbler	<i>Acrocephalus Agricola</i>	Dhani Futki	LC	LC
68	Blyth's Reed Warbler	<i>Acrocephalus dumetorum</i>	BlaitherNolfutki, Tikra	LC	LC
69	Clamorous Reed Warbler	<i>Acrocephalus stentoreus</i>	Bachal Nolfutki	LC	LC
70	Pallas's Grasshopper Warbler	<i>Locustellacerthiola</i>	PalasiForingfutki	LC	LC
71	Tickell's Warbler	<i>Phylloscopusaffinis</i>	TikelerPatafutki	LC	LC
72	Common Chiffchaff	<i>Phylloscopuscollybita</i>	Pati Chifchaf	LC	LC
73	Dusky Warbler	<i>Phylloscopusfuscatus</i>	KalcheyFutki	LC	LC
74	Yellow-browed Warbler	<i>Phylloscopusinornatus</i>	HoldevruFutki	LC	LC
75	Blyth's Leaf Warbler	<i>Phylloscopusreguloides</i>	BlaitherPatafutki	LC	LC
76	Greenish Warbler	<i>Phylloscopustrochiloides</i>	ShobjeFutki	LC	LC
<b>Family: Motacillidae</b>					
77	Rosy Pipit	<i>Anthusroseatus</i>	Golapi Tulika	LC	LC
78	Olive-backed Pipit	<i>Anthushodgsoni</i>	Jolpaipith Tulika, Muchassi	LC	LC
79	Richard's Pipit	<i>Anthusrichardi</i>	Richarder Tulika	LC	LC
80	Forest Wagtail	<i>Dendronanthus indicus</i>	Bon Khonjon	LC	LC
81	White Wagtail	<i>Motacilla alba</i>	DholaKhonjan	LC	LC
82	Gray Wagtail	<i>Motacilla cinerea</i>	MeteyKhonjon	LC	LC
83	Citrine Wagtail	<i>Motacillacitreola</i>	Sitrin Khonjon	LC	LC
84	Yellow Wagtail	<i>Motacilla flava</i>	HoldeyKhonjon	LC	LC

Source of status - IUCN Bangladesh 2015

**Table 5: List of Reptilia sighted in the BAA (primary and secondary information)**

Code: CR: Critically Endangered; EN: Endangered; VU: Vulnerable; NT: Near Threatened; LC: Least Concern; DD: Data Deficient; NE: Not Evaluated

SL	English Name	Scientific Name	Local Name	National Status	Global Status
<b>ORDER: TESTUDINES</b>					
<b>Family: Geoemydidae</b>					
1	Yellow Turtle	<i>Moreniapetersi</i>	HoldeyKachim	NT	VU
2	Indian Roofed Turtle	<i>Pangshura tecta</i>	Kori Kaitta	LC	LC
3	Median Roofed Turtle	<i>Pangshura tentoria</i>	MajhariKachim	NT	LC
<b>Family: Trionychidae</b>					
4	Ganges Softshell Turtle	<i>Nilssoniagangetica</i>	Kuchrong, Khalua Kasim	EN	EN
5	Peacock-Softshell Turtle	<i>Nilssoniahurum</i>	Dhum Kasim	LC	VU
6	Narrow-headed Softshell Turtle	<i>Chitra indica</i>	Chim Kasim	CR	EN
7	Spotted Flapshell Turtle	<i>Lissemys punctata</i>	Shundi Kasim	LC	LC
<b>ORDER: SQUAMATA</b>					
<b>Family: Agamidae</b>					
8	Common Garden Lizard	<i>Calotes versicolor</i>	Raktachosa, Girgiti	LC	LC
<b>Family: Gekkonidae</b>					
9	Brook's House Gecko	<i>Hemidactylus brookii</i>	KhoskhosheyTiktiki	LC	NE
10	Yellow-bellied House Gecko	<i>Hemidactylus flaviviridis</i>	Goda Tiktiki	LC	NE
11	Common House Gecko	<i>Hemidactylus frenatus</i>	MosrinTiktiki	LC	LC
<b>Family: Scincidae</b>					
12	White-spotted Supple Skink	<i>Lygosomaalbopunctata</i>	Sada Chiti Anjon	LC	NE
13	Bowring's Supple Skink	<i>Lygosomabowringii</i>	Bowringer Anjan	LC	NE
14	Keeled Grass Skink	<i>Eutropiscarinata</i>	Anjon	LC	LC
15	Bronze Grass Skink	<i>Eutropismaularia</i>	TamateyAnjon	LC	NE
<b>Family: Varanidae</b>					
16	Bengal Monitor	<i>Varanus bengalensis</i>	Bangla Gui, GuiShap	NT	NT
17	Yellow Monitor	<i>Varanus flavescens</i>	Sona Gui	NT	EN
<b>Family: Tylopidae</b>					
18	Common Blind Snake	<i>Indotyphlopsbraminus</i>	DumukhaShap	LC	NE
19	Diard's Blind Snake	<i>Argyrophisdiardii</i>	Baro DumukhaShap	LC	LC
<b>Family: Boidae</b>					
20	Common Sand Boa	<i>Eryx conicus</i>	Balu Bora	DD	NE
<b>Family: Natricidae</b>					
21	Striped Keelback	<i>Amphiesmastolatatum</i>	Chiru Shap, Dora Shap	LC	NE
22	Olive Keelback	<i>Atretiumschistosum</i>	MaittaShap	LC	LC
23	Checkered Keelback	<i>Xenochrophis piscator</i>	DhoraShap	LC	NE
	Painted Keelback	<i>Xenochrophiscerasogaster</i>	DhoraShap	LC	NE
24	Indian Rat Snake	<i>Ptyas mucosa</i>	Daraj, Dhaman Shap	LC	NE



SL	English Name	Scientific Name	Local Name	National Status	Global Status
	Indo-Chinese rat snake	<i>Ptyaskorros</i>	Daraj Shap	NT	NE
<b>Family: Colubridae</b>					
25	Common Vine Snake	<i>Ahaetulla nasuta</i>	LaodogaShap	LC	NE
26	Common Cat Snake	<i>Boiga trigonata</i>	PhonimonoshaShap	NE	LC
27	Ornate Flying Snake	<i>Chrysopeleaornata</i>	Kalnigini, UrantaShap	LC	NE
28	Painted Bronzeback Tree Snake	<i>Dendrelaphis pictus</i>	RangilaGechoShap, Dora Bet Anchra	LC	NE
29	Common Wolf Snake	<i>Lycodonaulicus</i>	GharginniShap	LC	NE
<b>Family: Homalopsidae</b>					
30	Common Smooth Water Snake	<i>Enhydrisenhydris</i>	Paina, Huria Shap	LC	LC
	Siebold's Water Snake	<i>Enhydrissieboldii</i>	PainaShap	NE	LC
<b>Family: Elapidae</b>					
31	Common Krait	<i>Bungarus caeruleus</i>	Kal-keuteyShap	LC	NE
32	Banded Krait	<i>Bungarus fasciatus</i>	Shakini, Shonkhini	LC	LC
	Wall's Krait/Sind Krait	<i>Bungaruswalli</i>	<a href="https://www.iucnredlist.org/es/species/127914642/127914645">https://www.iucnredlist.org/es/species/127914642/127914645</a>	NE	LC
33	Monocled Cobra	<i>Naja kaouthia</i>	GokhraShap	NT	LC
34	Spectacled Cobra	<i>Naja naja</i>	KhoiaGokhraShap	NT	LC
<b>Family: Viperidae</b>					
35	Russell's Viper	<i>Daboia russelii</i>	Chandra-bora	NT	LC
<b>ORDER: CROCODYLIA</b>					
<b>Family: Gavialidae</b>					
36	Gharial	<i>Gavialis gangeticus</i>	Ghorial, Baishal	CR	CR

Source of status - IUCN Bangladesh 2015

**Table 6: List of Amphibians sighted in the BAA (primary and secondary information)**

Code: LC: Least Concern; DD: Data Deficient; NE: Not Evaluated

SL	English Name	Taxon and Scientific Name	Local Name	National Status	Global Status
<b>ORDER: ANURA</b>					
<b>Family: Bufonidae</b>					
1	Marbled Toad	<i>Duttaphrynusstomaticus</i>	Khoskhosey Bang	LC	LC
2	Common Toad	<i>Duttaphrynusmelanostictus</i>	Kuno Bang	LC	LC
<b>Family: Dicroglossidae</b>					
3	Skipper Frog	<i>Euphlyctiscyanophlyctis</i>	Mali Bang, Kotkoti Bang	LC	LC
4	Pierre's Cricket Frog	<i>Fejervaryapierrei</i>	Pierrer Jhijhi Bang	LC	LC
5	Nepal Cricket Frog	<i>Fejervaryanepalensis</i>	Nepali Jhijhi Bang	LC	LC
6	Syhadra Cricket Frog	<i>Fejervaryasyhadrensis</i>	Bon Jhijhi Bang	LC	LC
7	Terai Cricket Frog	<i>Fejervaryateraiensis</i>	Teraier Jhijhi Bang	LC	LC
8	Asmat's Cricket Frog	<i>Fejervaryaasmati</i>	Asmater Jhijhi Bang	LC	NE
9	Indian Bull Frog	<i>Hoplobatrachustigerinus</i>	Sona Bang, Kola Bang	LC	LC
	Jerdon's Bull Frog	<i>Hoplobatrachuscrassus</i>	Kola Bang	NE	LC
<b>Family: Microhylidae</b>					
10	Ornate Microhylid Frog	<i>Microhyllaornata</i>	Choto Laubichi Bang	LC	LC
11	Mymensingh Microhylid Frog	<i>Microhyllamymensinghensis</i>	Mymensingher Laubichi Bang	LC	NE
<b>Family: Ranidae</b>					
12	Leaping Frog/ Yellow-striped Frog	<i>Hylaranatyleri</i>	Pana Bang	LC	LC
13	Two-striped Grass Frog	<i>Hylaranataipehensis</i>	Sobuj Dhani Bang	DD	LC
<b>Family: Rhacophoridae</b>					
14	Common Tree Frog	<i>Polypedatesleucomystax</i>	Dorakata Gecho Bang	LC	LC
15	Maculated Tree Frog	<i>Polypedates maculatus</i>	Chitra Gecho Bang	LC	LC

Source of status - IUCN Bangladesh 2015

**Table 7: List of butterfly species in the BAA**

Code: NA: Not Available; EN: Endangered; VU: Vulnerable; LC: Least Concern; NE: Not Evaluated [Source: CEGIS field investigation June & November 2021, IUCN Bangladesh 2015; Imam et al. (2020).

SL	English Name	Scientific Name	Local Name	National Status	Global Status
<b>Family: NYMPHALIDAE</b>					
<b>Sub-family: Nymphalinae</b>					
1	Common Eggfly	<i>Hypolimnasbolina</i>	Jamui	LC	NE
2	Common Leopard	<i>Phalantaphalantha</i>	Chita	LC	NE
3	Common Castor	<i>Ariadne merione</i>	Morchepata	LC	NE
4	Common Baron	<i>Euthalia aconthea</i>	Bhushanda	LC	NE
5	Common Sailor	<i>Neptshylas</i>	Charbatashi	LC	NE
6	Common Sergeant	<i>Athymaperius</i>	Banrara	LC	NE
7	Grey Pansy	<i>Junoniaatlites</i>	Chandnori	LC	NE
8	Peacock Pansy	<i>Junoniaalmana</i>	Noyan	LC	LC
9	Lemon Pansy	<i>Junonialemonias</i>	Ushum	LC	NE
<b>Sub-family: Danainae</b>					
10	Plain Tiger	<i>Danaus chrysippus</i>	Tamot	LC	NE
11	Striped Tiger	<i>Danaus genutagenuta</i>	Baghballa	LC	NE
12	Blue Tiger	<i>Tirumala limniace</i>	Himolkuchi	LC	NE
13	Common Crow	<i>Euploea core</i>	Kauwa	LC	LC
<b>Sub-family: Satyrinae</b>					
14	Common Palmfly	<i>Elymniashypermnestra</i>	Khairchak	LC	NE
15	Common Five-ring	<i>Ypthimabaldus</i>	Panchbundi	VU	NE
16	Common Four-ring	<i>Ypthimahuebneri</i>	Charbundi	LC	NE
17	Common Bushbrown	<i>Mycalesisperseus</i>	Janglabirha	VU	NE
18	Dark-branded Bushbrown	<i>Mycalesismineus</i>	Khairabirha	LC	NE
19	Common Evening Brown	<i>Melanitsleda</i>	Sanjhla	LC	NE
<b>Sub-family: Heliconiinae</b>					
20	Tawny Coster	<i>Acraea terpsicore</i>	Harinchara	LC	NE
<b>Family: PAPILIONIDAE</b>					
<b>Sub-family: Papilioninae</b>					
21	Common Rose	<i>Pachlioptaaristolochiae</i>	Alte	LC	NE
22	Common Mormon	<i>Papilio polytes</i>	Kalim	LC	NE
23	Common Jay	<i>Graphiumdoson</i>	Minji	LC	NE
24	Tailed jay	<i>Graphiumagamemnon</i>	Choltak	LC	NE
25	Blue Mormon	<i>Papilio polymnestor</i>	Barunpakha	LC	NE
<b>Family: PIERIDAE</b>					
<b>Sub-family: Pierinae</b>					
26	Common Gull	<i>Ceporanerissa</i>	Kuchila	LC	NE
27	Indian Cabbage White	<i>Pieris canidia</i>	Sarin	LC	NE
28	Psyche	<i>Leptosianina</i>	Phurus	LC	NE
29	Common Jezebel	<i>Delias eucharis</i>	Hartoni	LC	NE
30	Red-Spot Jezebel	<i>Delias descombesi</i>	Konka	LC	NE
31	Common Wanderer	<i>Pareronia hippia</i>	Tallar	VU	NE
<b>Sub-family: Coliadinae</b>					
32	Mottled Emigrant	<i>Catopsiliapyranthe</i>	Chitpaira	LC	NE

SL	English Name	Scientific Name	Local Name	National Status	Global Status
33	Common Emigrant	<i>Catopsiliapomona</i>	Pairachali	LC	NE
34	Three-Spot Grass Yellow	<i>Euremablanda</i>	NA	LC	NE
35	Common Grass Yellow	<i>Euremahecabe</i>	Holud	LC	NE
36	Striped Albatross	<i>Appiaslibythea</i>	DhulKapash	LC	NE
<b>Family: LYCAENIDAE</b>					
<b>Sub-family: Polyommatnae</b>					
37	Common Pierrot	<i>Castaliusrosimon</i>	Tilaiya	LC	NE
38	Common Cerulean	<i>Jamidesceleno</i>	Surul	LC	NE
39	Pale Grass Blue	<i>Pseudozizeerimaha</i>	Dhupi	LC	NE
40	Lesser Grass Blue	<i>Zizi naots</i>	Para	LC	NE
41	Tiny Grass Blue	<i>Zizulahylax</i>	Tinni	LC	NE
42	Dark Grass Blue	<i>Zizeeriakarsandra</i>	Choy	LC	NE
43	Forget-me-not	<i>Catochrysopsstrabo</i>	Ringtam	VU	NE
44	Quaker	<i>Neopithecopszalmora</i>	Korhi	LC	NE
45	Slate Flash	<i>Rapa lamanea</i>	Rimly	LC	NE
46	Indigo Flash	<i>Rapa lavaruna</i>	NA	VU	NE
47	Plains Cupid	<i>Chiladespandava</i>	Rulki	LC	NE
48	Gram Blue	<i>Euchrysopsnejeus</i>	Joural	LC	NE
49	Lime Blue	<i>Chiladeslajus</i>	Tura	LC	NE
50	Pea Blue	<i>Lampidesboetcus</i>	Kharia	LC	NE
51	Common Lineblue	<i>Prosotasnora</i>	Chandandarhi	LC	NE
52	Tailless Lineblue	<i>Prosotasdubiosa</i>	NA	VU	NE
53	Common Ciliate Blue	<i>Antheneemolus</i>	Ayandarhi	VU	NE
54	Pointed Ciliate Blue	<i>Anthenelycaenina</i>	NA	EN	NE
55	Centaur Oakblue	<i>Arhopalacentaurus</i>	NA	LC	NE
<b>Family: Theclinae</b>					
56	Yamfly	<i>Loxuraatymnus</i>	Fitepalash	VU	NE
57	Monkey Puzzle	<i>Rathinda amor</i>	Chatul	VU	NE
58	Redspot	<i>Zesiuschrysomallus</i>	Not Assessed by IUCN BD 2015		
59	Chocolate Royal	<i>Remelanajangala</i>	NA	VU	NE
60	Common Silverline	<i>Spindasisvulcanus</i>	Rupapatia	LC	NE
<b>Family: HESPERIIDAE</b>					
<b>Sub-family: Hesperinae</b>					
61	Straight Swift	<i>Parnaragutatus</i>	Nilbijuri	LC	NE
62	Dark Palm Dart	<i>Telicotabambusae</i>	NA	VU	NE
63	Pale Palm Dart	<i>Telicota colon</i>	Not Assessed by IUCN BD 2015		
64	Obscure Branded Swift	<i>Pelopidas agna</i>	NA	LC	NE
65	Conjoined Swift	<i>Pelopidas conjuncta</i>	NA	LC	NE
<b>Sub-family: Pyrginae</b>					
66	Common Snow Flat	<i>Tagiadesjapetus</i>	Pollobini	VU	NE
<b>Sub-family: Coliadinae</b>					
67	Brown Awl	<i>Badamiaexclamatonis</i>	NA	VU	NE

**Table 8: Invasive alien species reported from different ecosystems of Bangladesh**

Note- Habitat type: TER – terrestrial, AQU – aquatic, AGR – agricultural, FOR – forest, WF – waste and fallow land; Major use(s): M – medicinal, Ni – nitrogen fixation, W – weed, Ti – timber

SL	Scientific name	Common name	Native range	Habitat type(s)	Major use(s)
<b>Life form: Bird</b>					
1	<i>Columba livia</i>	Rock pigeon	Europe	TER	P
<b>Life form: Plant</b>					
2	<i>Acacia auriculiformis</i>	Acacia	Australia and Pacific	FOR	Ti, Ni
3	<i>Acacia mangium</i>	Black wattle	Australia and Pacific	FOR	Ti, Ni
4	<i>Croton bonplandianum</i>	Croton	South America	AGR, WF	W, M
5	<i>Dalbergia sissoo</i>	Sissoo	India	FOR	
6	<i>Eichhornia crassipes</i>	Water hyacinth	South America	AQU	W
7	<i>Eucalyptus camaldulensis</i>	Eucalyptus	Australia	FOR	Ti
8	<i>Eucalyptus tereticornis</i>	Eucalyptus	Australia	FOR	Ti
9	<i>Eucalyptus brassiana</i>	Eucalyptus	Australia	FOR	Ti
10	<i>Imperata cylindrica</i>	Cogon grass	North America	FOR, WF	W
11	<i>Ipomoea carnea</i>	Pink morning glory	South America	AQU	W, M
12	<i>Mikania micrantha</i>	Mile-a-minute weed	South America	FOR, AGR, WF	W, M
13	<i>Swietenia mahagoni</i>	True mahogani	North America and Caribbean	FOR	Ti
14	<i>Urena lobata</i>	Caesar weed	South America, Africa	FOR, WF	W

Source: Mukul et al. 2021. Invasive Alien Species of Bangladesh. In: Invasive Alien Species: Observations and Issues from Around the World, First Edition. Edited by T. Pullaiah and Michael R. Ielmini. John Wiley & Sons Ltd.

**Table 9: A list of observed fishes in the Jamuna River**

Order	Family	Scientific name	English name	Local name	Environment	Local Abundance
Siluriformes	Bagridae	<i>Sperataaor</i>	Long-whiskered Catfish	Air	Demersal	Low
		<i>Sperataseenghala</i>	Giant River Catfish	Beushkata	Demersal	Low
		<i>Mystuscavasius</i>	Gangetic Mystus	Golsha	Demersal	Medium
		<i>Mystusbleekeri</i>	Bleeker's Mystus	Tengra	Demersal	Medium
	Schilbeidae	<i>Eutropiichthysvacha</i>	Bacha	Bacha	Pelagic	Low
		<i>Siloniasilondia</i>	Silond Catfish	Shilong/Daing /Metora	Demersal	Low
		<i>Eutropiichthysmurius</i>	Indus Garua	Muri Bacha	Demersal	Low
		<i>Ailia punctata</i>	Jamuna Ailia	Bashpata	Demersal	Medium
		<i>Clupisomagarua</i>	Garua Bacha	Gharua	Demersal	Low
		<i>Ailia coila</i>	Gangetic Ailia	Kajuli	Pelagic	Medium
Perciformes	Gobiidae	<i>Glossogobiusgiuris</i>	Fresh Water Goby	Baila	Benthopelagic	Low
	Ambassidae	<i>Chanda nama</i>	Asian Glass Fish	Chanda	Benthopelagic	Low
	Sciaenidae	<i>Otolithoidespama</i>	Pama Croaker	Poa	Benthopelagic	Medium

Order	Family	Scientific name	English name	Local name	Environment	Local Abundance
Cypriniformes	Cyprinidae	<i>Labeo calbasu</i>	Black Rohu	Baus	Demersal	Medium
		<i>Cabdiomorar</i>	Aspidoparia	Piyali/ Boiral/ Chigasi	Benthopelagic	High
		<i>Catlacatla</i>	Catla	Catla	Benthopelagic	Low
		<i>Amblypharyngodonm icrolepis</i>	Indian Carplet,	Mola	Benthopelagic	Medium
		<i>Salmostomaacinaces</i>	Silver Razorbelly Minnow	Chela	Benthopelagic	High
		<i>Puntius chola</i>	Chola Barb	Khora Punti	Benthopelagic	Medium
		<i>Labeo ariza</i>	Ariza Labeo	Dhuira	Benthopelagic	Low
		<i>Chela cachius</i>	Silver Hatchlet Barb	Gharbeka Chela	Benthopelagic	Low
		<i>Labeo rohita</i>	Rohu	Rui	Benthopelagic	Medium
		<i>Chela cachius</i>	Silver Hatchlet Barb	Patari Chela	Benthopelagic	Low
	Cobitidae	<i>Lepidocephalichthysg untea</i>	Guntea Loach	Gorpuiya	Demersal	Low
		<i>Lepidocephalichthysb erdmorei</i>	Burmese Loach	Gutum	Demersal	Low
Osteoglossiformes	Notopteridae	<i>Chitalachitala</i>	Humped Featherback	Chital	Demersal	Low
Synbranchiformes	Mastacembeli dae	<i>Macrognathuspancal us</i>	Stripped Spiny eel	Guchi	Benthopelagic	Low
	Synbranchida e	<i>Monopteruscuchia</i>	Gangetic Mufeel	Kuchia	Demersal	Low
Siluriformes	Sisoridae	<i>Gagatacenia</i>	Indian Gagata	Kaiya Kata	Demersal	High
Beloniformes	Belonidae	<i>Xenentodoncancila</i>	Needle Fish	Kakila	Pelagic-neritic	Low
Mugiliformes	Mugilidae	<i>Rhinomugilcorsula</i>	Corsula	Khorsulla	Pelagic	medium
Clupeiformes	Clupeidae	<i>Gudusiachapra</i>	Indian river Shad	Koitta/Chapila	Pelagic	Medium
	Engraulidae	<i>Setipinnaphasa</i>	Gangetic Hairfin Anchovy	Phasa	Pelagic	Low
Anabantiformes	Channidae	<i>Channa punctata</i>	Spotted Snakehead	Taki	Benthopelagic	medium
		<i>Channa striata</i>	Striped Snakehead	Shol	Benthopelagic	medium

Source: CEGIS field survey, July 2022

Note: IUCN Status= EN-Endangered, VU-Vulnerable, LC-Least Concern, DD-Data Deficient

**Annex 6.4: Dolphin Conservation Actions Recommended by Dolphin  
Conservation Plan 2020-2030**



Threat objective	Strategic actions	Priority
<b>Reducing Direct Loss of Dolphins</b>		
<i>Goal: Reduce dolphin killing in rivers and coastal waters of Bangladesh</i>		
Increase knowledgebase on dolphins and their habitats	Assess and monitor country-wide population status, distribution and their habitats of dolphins	High
	Investigate home range, dispersal patterns and movement of dolphins	Medium
	Understand ecology, feeding and breeding behavior of dolphins	High
Reduce incidental and intentional killing of dolphins	Assess and monitor the scale and seasonality of incidental and intentional killing of dolphins	High
	Train and engage communities in rescue and rehabilitation of entangled dolphins	High
	Explore early warning device for gillnet to reduce killing by entanglement	Medium
	Understand and reduce scale of traditional use of dolphin body parts	High
Develop skill, capacity and governance for improved protection	Train and orient local BFD staffs on dolphin ecology, human-dolphin interaction and their protection	Medium
	Enforce Wildlife (Protection & Security) Act 2012 to stop intentional killing of dolphins	High
	Ensure protection of deep water- pools in winters when upstream waterflow remains critically low	High
	Coordinate and sensitize local administration and law enforcing agencies on importance of dolphin protection	Medium
Understand socio- economic dimensions about dolphins	Assess knowledge, attitude and perception of local communities about dolphins and their habitats	Medium
	Assess nature, scale and economic value of dolphin body parts in local markets	High
	Raise awareness about ecological importance and legal protection of dolphins and their habitats	High
<b>Reducing Loss and Degradation of Dolphin Habitats</b>		
<i>Goal: Ensure protection of existing dolphin habitats of Bangladesh</i>		
Increase knowledgebase on dolphin habitat and threats	Assess country-wide seasonal habitats and range of dolphins	High
	Identify and prioritize threats to dolphin habitats	High
	Identify and monitor critical winter habitats of dolphins	High
Increase protected area network for dolphins	Declare protected areas of identified dolphin hotspots and implement regulations	High
Engage all actors and stakeholders in protection of dolphin habitat	Protect and restore dolphin habitats from the impacts of developmental projects (e.g., dam)	Medium
	Engage local communities in protection of dolphin habitats	High
	through CBOs, CMCs, etc.	
	Advocate with neighbouring countries for ensuring critical level of waterflow from upstream rivers	High

Threat objective	Strategic actions	Priority
	Coordinate with relevant government bodies for dolphin habitat protection and management at local level	Medium
	Mainstream dolphin and their habitat conservation with national and regional developmental activities	High
Understand and reduce dependency of local communities on dolphin habitats	Assess site-based socio- economic dimensions and dependency of fishermen on dolphin habitats	Medium
	Assess current patterns of resource harvest and explore mechanism or determine threshold of sustainable resource use of dolphin habitats	Medium
	Explore and provide AIGAs for heavily dependent fishermen who earn living on dolphin habitats	High

## **Annex 7.1 Socio-Economic Baseline Condition**

## 7 Socio-Economic Baseline Condition

### 7.1 Socio-economic Profile of The JRECD Program AOI

#### 7.1.1 Overview

People living in the floodplain have historically adjusted by adapting their agricultural practices, cropping patterns, and settlements to annual flooding. But the high or abnormal floods (bonna), associated with widespread damage to standing crops, properties, and loss of human lives, are viewed as a calamity or disaster. As a result, those who are displaced migrate only a short distance and a large majority of the displaced adapt to their river-dependent lives and livelihoods.<sup>19</sup> However, the twin forces of erosion and flooding have a toll on the floodplain people, who lead a poverty-stricken life, particularly those who are displaced and live in Chars and along the embankments. Char dwellers are among the poorest and highly vulnerable to natural hazards of flood and erosions.

Historically, the Jamuna was once famous for its trade and navigational routes. Many markets and growth centers had flourished along the routes of the riverine country.<sup>20</sup> However, continuous shifting of the river interrupted navigation, and hence many market and growth centers lost their significance as trade centers. Aside from this, many large landowners living along the banklines had become landless due to continuing erosions and instability of the river, which is truly reflected in local ethos and stories: *Nodir ekulbhange, okul gore eitonodirkhela, Sokal belar raja are bhai fakir sondhabela* (Breaking this bank and building the other is the river's lark, It makes the rich man of the morn a destitute by dark).<sup>21</sup> Thus, riverbank erosion caused by the shifting of river channels remains a perennial problem for Bangladesh.

It is, therefore, evident that many people in the Jamuna floodplain are perennially at the risk of displacement. Therefore, the proposed bankline protection works and stabilization of the Jamuna River to a manageable navigation channel over the Program period will likely reduce the risks and bring about new opportunities and economic growth leading to social and economic transformation in the riverine regions.

#### 7.1.2 Erosion Vulnerability, Displacement and Migration

The Jamuna is a multi-channel braided river changing its courses nearly every year at a noticeable rate. As a result, the width of the river has increased over time. Historical data indicate that the width of this river increased from 4.5 miles in 1830 to 7.5 miles by 1963, moving westward gradually. In the recent past, during 1984 and 1992, the width of the river Brahmaputra increased from 9.72 to 11.22 km. However, a declining rate is noticed in recent years. Although a detail analysis of erosion and accretion have been presented in Annex 5.1, **Table 7.1** provides a gross information on erosion along the Jamuna River from 1973-2020 to give a glimpse of erosion severity.

**Table 7.1: Erosion of the Jamuna (from Bangladesh-India border to Sirajganj) during 1973-2020**

Year	Erosion at Left Bank (ha)	Erosion at Right Bank (ha)	Total Erosion (ha)	Erosion rate (ha/year)
1973-1980	11820	8030	19850	2835
1980-1989	12840	16250	29090	3230

<sup>19</sup> C. E. Haque and M. Q. Zaman, Human Responses to Riverine Hazards in Bangladesh: A Consideration for Sustainable Floodplain Development. *World Development*, Vol. 21(1), 1993.

<sup>20</sup> Radhakamal Mukerjee. *The Changing Face of Bengal: A Study in Riverine Economy*. University of Calcutta Press, 1938.

<sup>21</sup> M.Q. Zaman, The Social and Political Context of Adjustment to Riverbank Erosion Hazard and Population Resettlement in Bangladesh. *Human Organization*, Vol. 48(3), 1989.

1989-2000	11460	10430	21890	1990
2000-2010	6340	4660	11000	1100
2010-2020	5380	4310	9690	970

Source: Spatial assessment by CEGIS using Arc-GIS tool of Remote Sensing techniques, 2021

The river's shifting nature and monsoon flooding lead to various vulnerabilities, having tremendous impact on the life and livelihoods of the people in the floodplain. **Table 7.2** summarizes multiple types of risks and vulnerabilities and associated impacts on people and associated assets in the Program area.

**Table 7.2: Vulnerability Types, Component, and Impacts**

Type of Vulnerability	Immediate impacts	Socio-economic Impacts
Physical Vulnerability	<ul style="list-style-type: none"> <li>Loss of cultivable land</li> <li>Eviction of homesteads</li> <li>Infrastructural damage</li> </ul>	<ul style="list-style-type: none"> <li>Decreasing household asset</li> <li>Increasing number of landless people and increasing dependency on khas land (government owned land)</li> <li>Increasing land rent for homestead construction</li> <li>Dependency on the charity/relief for living</li> <li>Interrupted service delivery</li> </ul>
Economic Vulnerability	<ul style="list-style-type: none"> <li>Loss of agricultural production</li> <li>Loss and damage assets and properties</li> <li>Recurrent cost for household construction and maintenance</li> </ul>	<ul style="list-style-type: none"> <li>Low income and unemployment;</li> <li>Limited or no access to productive resources such as land;</li> <li>Persistent poverty</li> </ul>
Social Vulnerability	<ul style="list-style-type: none"> <li>Disruption of neighborhood and family ties due to displacement of settlement</li> <li>Loss of political influences due to displacement of community and disperse resettlement</li> <li>Life risk for handicapped people</li> </ul>	<ul style="list-style-type: none"> <li>Social helplessness and loss of support</li> <li>Gendered based violence;</li> <li>Poor health status and diseases;</li> <li>Marginalization</li> </ul>
Environmental Vulnerability	<ul style="list-style-type: none"> <li>Environmental degradation;</li> <li>Poor drainage and relief;</li> <li>Loss of vegetation and trees;</li> <li>Increasing risk of hazards</li> </ul>	<ul style="list-style-type: none"> <li>Crowded living on risk-prone zones;</li> <li>Poor living environment;</li> <li>Migration to inhabitable areas</li> </ul>
Informational Vulnerability and Governance issues	Lack of relief system and/or limited opportunity of relief distribution due to poor/interrupted communication	Asset and life loss due to poor evacuation system and the lack of early warning system

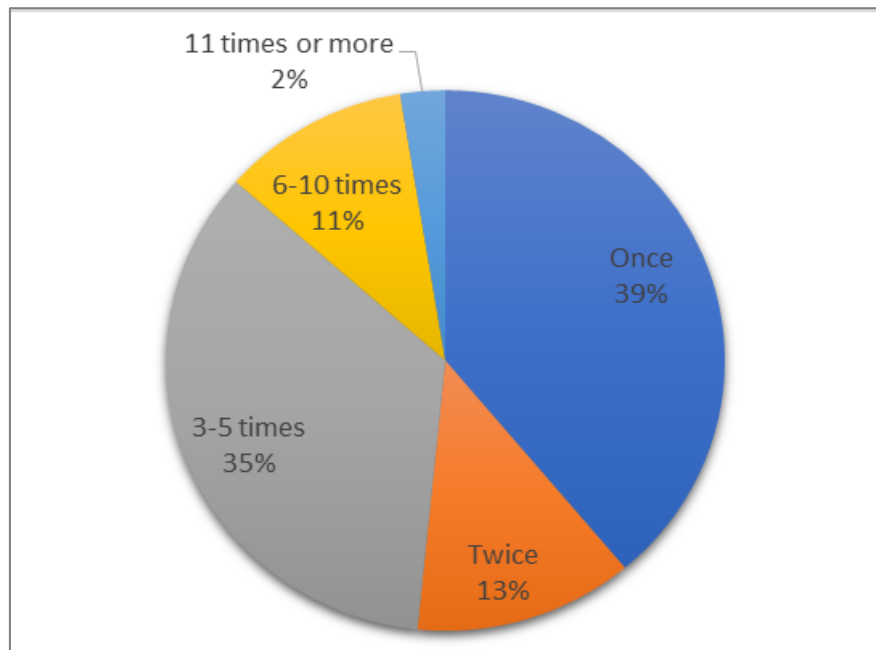
Source: Adapted from Zaman, 2020<sup>22</sup>

As evident, the vulnerability is multi-dimensional, from physical to economic to social and environmental and informational. The indicators of various types of vulnerability clearly show their interconnectedness. This is perhaps more so within the context of disaster and displacement in the Char/floodplain. For example, physical vulnerability, such as exposure to risk and settlement in the hazard-prone Chars, is a symptom of economic vulnerability. The economic vulnerability in turns shapes social and environmental vulnerability, pushing people into the most fragile and risk-prone areas, making them even more vulnerable.

<sup>22</sup> Mohammad Q. Zaman, Vulnerability, Disaster and Survival in Bangladesh. In Anthony Oliver-Smith and Susanna Hoffman (eds.) *The Angry Earth: Disaster in Anthropological Perspectives*, Second Edition, NY: Routledge 2020.

There are various responses to these vulnerabilities.<sup>23</sup> From institutional side, local government institutions play a vital role, especially during high flood and support people by providing relief and cash-aid. However, in reality, people displaced by erosion rarely receive any support or assistance from local administration. The erosion displaced families largely rely on kin and *samaj* (social unit based on kin and non-kin alliances) organizations for local adjustments and support in terms of relocation and rehabilitation. The people living along the bankline and/or Chars make such adjustments fairly regularly due to endemic displacement in the floodplain.

As reported in the 2014 RMIP Study<sup>24</sup> conducted among the people on the right bank of the Jamuna from Sirajganj to Gaibandha, 86% of those surveyed had experienced displacement caused by erosion. However, the frequency of displacement varies. About 39% of households experienced displacement once; another 35% were displaced 3 to 5 times, and 2% reported to have experienced displacement 11 times or more (see, **Figure 7.1**). The frequency and number indicate the precariousness and uncertainty that prevail in the floodplains due to erosion and displacement.<sup>25</sup>



Source: RMIP, Vol 2, 2014

**Figure 7.1: Frequency of Displacement Experienced by Riverbank Residents**

Thus, erosions by the Jamuna River have impoverished millions over the years. Box 1 illustrates the "story of the rich man in the morn a destitute by dark." This is too often told by people living with flood and erosion; once a large landowner now landless and living on rented land and dependent on neighbors or relatives for livelihoods. This mutual support is a very common adaptive practice among people in the Jamuna floodplain.

### Box 1: From Rich Landowner to Impoverished Landless

<sup>23</sup> C. E Haque and M.Q. Zaman. Coping with Riverbank Erosion Hazard and Displacement in Bangladesh: Survival Strategies and Adjustments. *Disasters*, Vol. 13(4) 1989.

<sup>24</sup> RMIP Vol. 2 cited earlier.

<sup>25</sup> Similar patterns have recently been reported from the Meghna Lower estuary. See Bimal K Paul et al. Coping Strategies of People Displaced by Riverbank Erosion. In M. Zaman and M. Alam (eds) *Living on the Edge*, cited earlier.

Alim ul Haque (pseudonym) was a rich landowner with some 500 *bighas*<sup>26</sup> of cultivable land in the 1970s. He accumulated the lands through inheritance and purchases. In his "original" village, he was a powerful social leader (*matabbar*) and used to help and support people in need affected by flood and erosion. Alim had eight children (four sons and four daughters). He never sent his children to school for education; land cultivation was their main economic stay and source of livelihood.

Like many of his villages, Alim experienced repeated displacement due to erosion by the Jamuna. However, he always moved back a short distance within the village, hoping that erosion will stop one day and be able to access his lands once they reappear as the dynamic process of erosion and accretion in the Jamuna system. He also did not want to migrate elsewhere because he feared losing his traditional social status and honor (*izzat*). Alim lost all his land to the Jamuna over the last 30 years and moved 20 times in and around his village. Finally, when all lost and gone to the river, Alim moved to a Char. He had to face displacement three times in the Char and then moved to the flood control embankment as informal settlers. The embankment was washed away the following year during the flood season. Alim finally moved inside the embankment and rented a piece of land for Taka 3,000 per year, a jump from Taka 2,000 in 2019 due to competitive land market caused by erosion.

Alim is now a helpless-tired elderly person who fought with the aggression of the mighty Jamuna River for the past 50 years. He now lives on his social safety net (SSN) allowance and occasional help from his sons and neighbors. Alim ul Haque's story reflects his resiliency and adaptation to the endemic erosion phenomenon and his ultimate pauperization caused by river erosion.

*Source: Interview held at Kholabari Bazaar, Dewanganj, Jamalpur, in June 2021.*

Alim ul Haque's displacement experience may appear high; however, it is not uncommon in the Jamuna floodplain and Char areas. Haque and Zaman<sup>27</sup> found that nearly 12% of those displaced (N=321) in Kazipur Upazila moved 13 times or more over 40 years. In Kazipur, 33% of those displaced moved between 1.5 to 8 km in their last reported displacement. These patterns are also reported in Char studies in the Padma River basin.<sup>28</sup> These patterns confirm that displacement is more common with short-distance migration despite unstable land and insecure lifestyles and the environment. Haque and Zaman<sup>29</sup> further observed that Charland people want to live and work within the Char environment.

### **7.1.3 The Social Tale of the Chars in the Program AOI**

Char (or Charland, in plural Chars/Charlands) is the Bangla term of the riverine island and all types of bar<sup>30</sup>. The braided Jamuna has 56 large Chars and 226 small sandy and vegetated Chars<sup>31</sup>. The Jamuna Chars are of three types: the island Chars, attached Chars, and sand bars. Some island Chars are relatively stable and settled; others are vegetated and good for year-round cultivation. In addition, there are others, such as sandbars, that are typically flooded; the sandbars are visible and used only during the winter/dry season. There are also Chars contiguous to riverbanks, called attached Chars, often indistinguishable from

<sup>26</sup> 1 bigha = 33 decimal

<sup>27</sup> Cited earlier (1989), Tables 3/4

<sup>28</sup> See, Shafi Noor Islam, Floods, Charlands Erosion and Settlement Displacement in the Ganges-Padma River Basin. In Mohammad Zaman and Mustafa Alam (eds), *Living on the Edge: Char Dwellers in Bangladesh*. Springer 2021.

<sup>29</sup> Cited above (1989).

<sup>30</sup> <https://en.banglapedia.org/index.php/Char>

<sup>31</sup> <http://en.banglapedia.org/>



the floodplain. In general terms, Chars refer to all alluvial deposits – large or small, temporary or permanent – either in the river or close to the banklines.<sup>32</sup>

Char settlements are unique in Character and evolve over time. As soon as the new Chars emerge as sand bars during the dry seasons, the first step in establishing ownership rights in new Chars is to get "possession" that involve conflicting claims by people from both banks because there are enormous difficulties in determining ownerships of such alluvial formations; moreover, such sand bars often disappear during the following flood seasons. The *Bengal Alluvion and Diluvion Regulation* of 1825 and its subsequent amendments in 1950 (i.e., East Bengal Tenancy Act) and more recent post-independent amendments to 1994 are a complex set of rules that indeed provoke more conflicts than actually settling ownerships of such Charlands.<sup>33</sup> The new Chars are not surveyed for determining ownerships and titles by the Government of Bangladesh's Department of Land Records and Survey (DLRS) Department until these Chars are stabilized and are above the normal flood level that can typically take up to 30 years. The huge gap of 30 years in effect helps the locally powerful individuals/groups to grab newly emerged land before survey and settlement.<sup>34</sup> Thus, the alluvial Charlands remain subject to perennial dispute and protracted litigation among conflicting claimants due to difficulties identifying whether the land is an accretion or a reformation in situ.

An estimated 6 million people live in Jamuna Chars in the 200 km stretch from Kurigram to the Jamuna Bridge site in Sirajganj. Within this reach, some of the northern districts such as Kurigram, Rangpur and Gaibandha are relatively poorer with a large segment of Char population. Many NGO programs, including the Chars Livelihood Programme (CLP), funded by DFID and AusAID, and Practical Action (a British NGO), have worked in the northern districts for several years to improve livelihoods and reduce vulnerability among the poor, more particularly women in the Chars with some positive results.<sup>35</sup> However, the limited NGO interventions are inadequate to address the needs of Char people at large. Health, education, and other essential services are still major issues for Char dwellers due to isolation and lack of necessary infrastructure.

For settlement purposes, Char people usually select comparatively higher ground that are flood proofed to build their houses to reduce vulnerability and risks.<sup>36</sup> Typically, Char villages live in groups or clusters, coming from the mainland or other Chars after being displaced. This builds a sense of community through *samaj* organization as social capital to help each other in crisis. Box 2 provides an example of Char living and livelihood in one of the districts covered by the Program AOI.

### Box 2: A Tale of Tiner Char in Jamalpur

Tiner Char is a large Char, located in Chukaibari Union Parishad (Smallest Rural Administrative and Local Government Unit), comprising a number of small Chars. It includes Char Projapoti, Munnia, Boral, Zigatola, and Char Holka Hawrabari. The study team visited Char Holka Hawrabari, administratively located under Ward no. 2 of Chukaibari UP. This Char is now inhabited by around one thousand families. Each family includes 7-8 members on average. Land of this Char was owned by the people of Chukaibari

<sup>32</sup> Mohammad Zaman and Mustafa Alam (eds), *Living on the Edge: Char Dwellers in Bangladesh*. Springer 2021.

<sup>33</sup> Mohammad Zaman and Md. Akhtar Hossain, The Charland Administration and Governance: Need for a Paradigm Shift. In Mohammad Zaman and Mustafa Alam (eds), *Living on the Edge: Char Dwellers in Bangladesh*. Springer 2021.

<sup>34</sup> M. Q. Zaman, Social Structure and Process in Charland Settlement in the Brahmaputra-Jamuna Floodplain, *Man (NS)*, Vol. 26(4), 1991.

<sup>35</sup> Suzanne Hanchett, Projects, Programs, and Services for Marginalized Groups: The Case of Women in Bangladesh River Island (*Chars*). Paper presented at the International Union of Anthropological and Ethnological Sciences (IUAES) meetings, Poznan, Poland, August 2019

<sup>36</sup> Ian Tod and Monzu Morshed, Flood Proofing to Reduce the Vulnerability of Char Communities: Experiences and Future Directions. In M. Zaman and M. Alam (eds) *Living on the Edge*, cited earlier.

### Box 2: A Tale of Tiner Char in Jamalpur

UP, who used to cultivate here. Due to erosion, they lost their land, moved to the mainland. This Char reappeared around 30 years ago and gradually became cultivable. At the beginning, landowners constructed temporary houses for staying with or without family during the planting and harvesting time. When the Jamuna River eroded their cultivable and homestead land on the mainland, they were forced to migrate to this Char permanently about 10 years ago. The dynamic processes of erosion, accretion, displacement, and migration are reflected in the tale of Tiner Char. People who call Tiner Char home have diverse occupations.

Agriculture and crop production is the dominant mode of livelihood. Many are also engaged in livestock rearing as a livelihood supportive option. Each house has cattle. Usually, Char dwellers take money from rich relatives or investors from the mainland for buying cattle. They rear and then sell the cattle after a year or two. Upon selling, the principal goes to the investor, and the profit is divided in half between investor and farmer. Fishing is also a source of income and livelihood. However, there are only limited number of professional fishers; many catches seasonally and/or for household consumption. Another significant source of employment and income is wage or day laboring by Char dwellers, especially during the off-season. They usually work in Chars, but mostly in the mainland for higher wages. Temporary inter-district migration is also common during the harvesting season. A new trend among the younger population is out-migration for employment. Several young men and women from Tiner Char are working in the garments industry in Dhaka and Gazipur.<sup>37</sup> The numbers are increasing over the years as currently employed workers take their people for work and opportunities offered by the city. Finally, very few educated persons from Tiner Char are in government jobs by police, army, and school teachers.

Tiner Char inhabitants visit Dewanganj, a sub-district, for all sorts of their needs, including healthcare. Currently, no NGO is working in Tiner Char. The Char Livelihoods Program (CLP) was active in the area until the CLP wind up its Phase II program.

Flooding and storm surges often hit them; during such time, affected households stay on a temporarily built elevated platform called '*macha*' (made of bamboo) as an adaptive strategy to floods.

*Source: Interviews (June 2021)*

#### 7.1.4 Settlement Patterns

The bankline erosion victims and displaced households generally move to the countryside due to familiarity and social support, coupled with available alternative lands for settlement, either own and/or rented. Many without any choices or alternatives have been found to resettle beside the flood embankment. Indeed, thousands of families are currently living on embankments along the reach on both sides of the Jamuna River. Those who live on the embankment are typically absolute landless and destitute.

Since the embankment is owned by BWDB, there is no need to pay and/or rent for reconstruction of houses on the embankment.<sup>38</sup> Typically, displaced families from local villages or neighbourhoods resettle on the embankment in a cluster to maintain their close-knit social ties and relationship for personal security and thus “re-create” their lost village on the embankment, under their traditional samaj leadership. For example, in Kazipur-Sirajganj area, sections of embankment settled by people are known

<sup>37</sup> This has also been reported in a recent study. See Hafiza Khatun et al. Out Migration as a Survival Strategy for Char Dwellers. In Mohammad Zaman and Mustafa Alam (eds), *Living on the Edge: Char Dwellers in Bangladesh*. Springer 2021.

<sup>38</sup> Officially, BWDB is against such encroachment or settlement on the embankment that affect the long-term stability of the structure owing to cutting of slopes by the settlers and rat holes due to housing and settlement. Settlements on the embankment are allowed primarily on humanitarian grounds.

by names of those villages already lost to the river. This provides them a sense of “identity” and continuity of lives on the embankment.

Settlement in the Char land varies in terms of the age and stability of the Char. If the Char is older, people prefer to move there because of the higher stability of the land. On the other hand, if the Char is new, the settlements are typically limited to only few households and are dispersed. In contrast, older and stable Chars have large settlements and are usually clustered based on kinship and other social considerations (see Photo-1a that presents a cluster type settlement).



Photo-1a: Char settlement



Photo-1b: Settlement beside flood embankment

**Figure 7.2: Typical Settlements in Chars and on the Flood Embankment in the Program AOI**

In the Jamuna River area as well as in the project AOI, a considerable number of people who are functionally and absolute landless are living beside embankment (see photo-1b).

## 7.2 The Study Area for Socio-economic Baseline of the Project

The study area for socioeconomic analysis of the Project level baseline (Figure 7.3) has been defined as Socio-economic Area of Analysis (SAA) which covers the Project AOI (of the Component 1 of the Project 1 of the JRSMP SOP), and the Union<sup>39</sup> intersected by the project footprint (Table 7.3). It would thus cover the direct impact area, indirect area, and control area beyond the Project AOI. In addition to the SAA, socio-economic data collection and analysis were done for the Program AOI as well.

<sup>39</sup>Union is the Smallest Rural Administrative and Local Government Unit in Bangladesh.

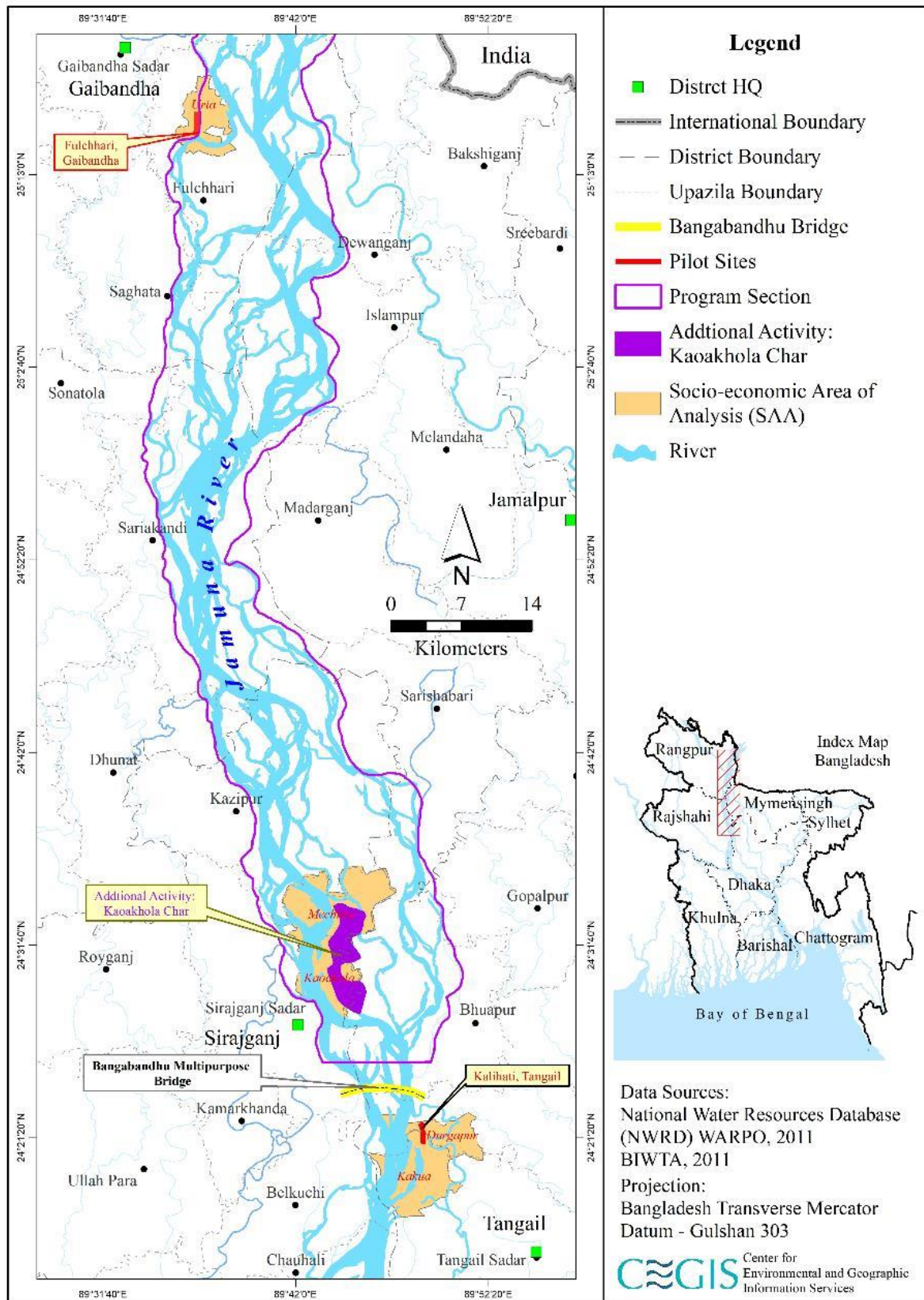


Figure 7.3: Map of the Socio-economic Area of Analysis



**Table 7.3: Administrative Boundary of the Socio-economic Area of Analysis for JRSMP Project 1**

Name of the Pilot Site	District	Upazila (sub-district)	Unions intersected by the Project and therefore covered by the SAA
Fulchari	Gaibandha	Fulchari	Uria
Tangail-Kalihati	Tangail	Kalihati	Gohaliabari
		Tangail Sadar	Kakua
Kaoakola	Sirajganj	Sirajganj Sadar	Mechhra
			Kaoakola

### 7.3 Data Collection Approaches

This socio-economic baseline section has been prepared with data from both primary and secondary sources. The scope and depth of primary data was restricted by the prolonged Covid lockdowns in the country. The primary data are thus complemented by secondary data where needed. The secondary sources include Housing and Population Census-2011 (published in 2012) by Bangladesh Bureau of Statistics, Social Assessment Report prepared for RMIP project,<sup>40</sup> and other published literature. The primary data was collected at four different times – first in June 2021, second in October 2021 (in Tangail-Kalihati site) third in February 2022 (in Kaoakola site) and fourth in July 2022 (in Fulchari site). For the Program AOI. Rapid Rural Appraisal (RRA) methods were used in the Program AOI and SAA, along with informal interviews, FGDs with occupational and multi-stakeholder groups, and group discussion at Union Parishad Level. Here, occupational groups refer to: famers, fishers, agriculture labourers, etc. Furthermore, FGDs with Char dwellers and displaced people have also been carried out. The Stakeholders Consultation and the Gender SEA-SH Team carried out separate consultation activities and interviews in the Program/Pilot areas, which are reported in the respective reports,<sup>41</sup> The Social Baseline Team conducted resource mapping exercises for qualitative data for the baseline assessment (see **Figure 7.4**).

<sup>40</sup> The River Management Improvement Program (RMIP) was prepared in 2014 for bankline protection and other measures to reduce erosion on the rightbank from the Jamuna Bridge site (Sirajganj) to Gaibandha. (The Project was later dropped). The Jamuna River Sustainable Management Program (JRSMP) has used the same reach (200 km) with multi-phase approaches for river stabilization and improved channel navigation and other activities. The RMIP data is a very useful secondary source for this ESIA. Therefore, this ESIA has extensively used the RMIP data in preparing this report.

<sup>41</sup> JRSMP - Stakeholders Engagement Plan and Gender and SEA\_SH Action Plan, November 2021.

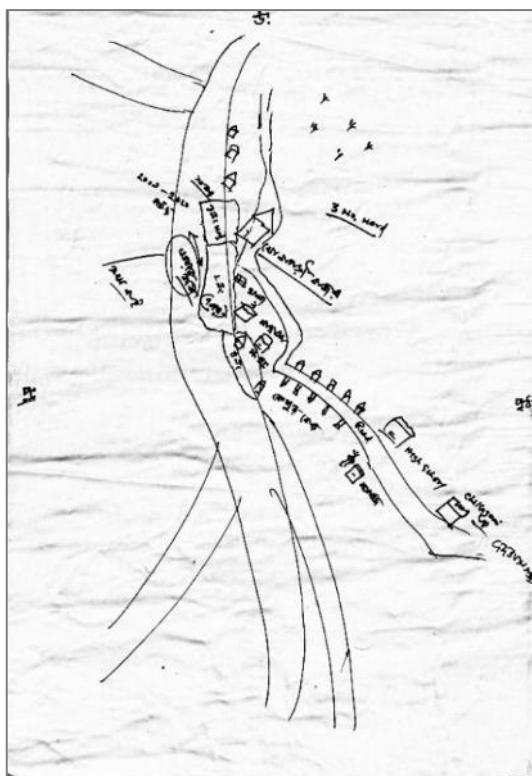


Photo: Resource mapping at Kholabari bazaar,  
Dewanganj Upazila

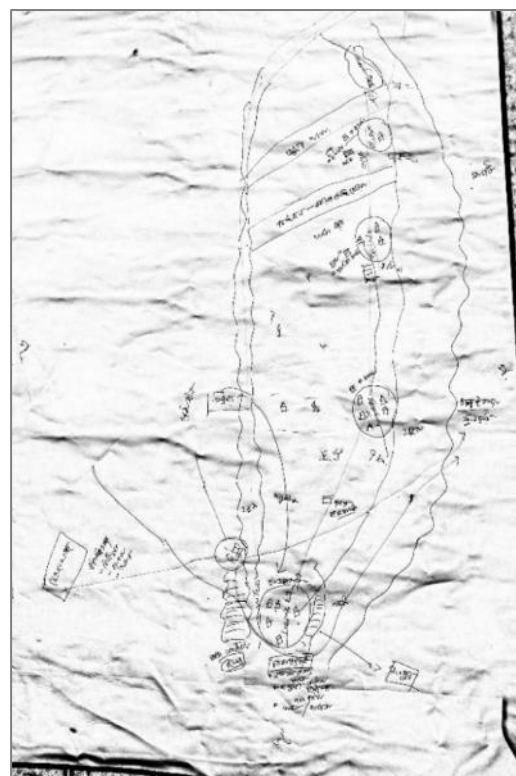


Photo: Resource mapping at Tiner Char

**Figure 7.4: Field Interviews and Resource Mapping**

#### 7.4 Socio-economic Description of SAA

In this section, socio-economic profiles of all three sites are presented – first using available Union level (lowest administration unit)<sup>42</sup> secondary data (see Table 7.4), followed by description of the three pilot sites.

**Table 7.4: Comparative Profiles Selected Unions/Mouzas in the Pilot Sites**

	Selected project sites		
	Fulchari	Tangail-Kalihati	Kaoakola
Administrative area included in the study	one Union	Two Unions	Two Unions
Population	18,755	57,464	48,719
Male	49.6	51.08	50.6
Female	50.4	49.20	49.4
Sex ratio	98.4	103	102.3
Household	4,721	12,352	11,049
Household size	4.0	4.7	4.4
Density per sq.km.	722	715	514
Growth rate (Upazila)	1.06	1.28	1.38
Literacy rate	33.55	35.99	33.2
<b>Housing</b>			

<sup>42</sup> Administratively, the two sites are located in four Unions covering six *mouzas* (revenue unit/village). The data presented relate to the administrative areas and not “footprint” of the pilot sites. The pilot sites are separately discussed.

	Selected project sites		
	Fulchari	Tangail-Kalihati	Kaoakola
Pucca	0.5	0.39	0.3
Semi-pucca	3.8	1.51	0.9
Kutchra	94.2	97.12	98
Jhupri	1.5	1.02	0.8
<b>Sanitation</b>			
Sanitary (water-sealed)	15	2.57	18
Sanitary (non-water-sealed)	39.1	24.52	50.6
Non-sanitary	36.7	58.25	25.8
None	23.9	14.65	5.6
<b>Source of Drinking Water (%)</b>			
Tap	0.1	0.46	0.1
Tube-Well	99.2	96.38	95.1
Other	0.7	3.2	4.8
Electricity Connection (%)	10.9	23.14	7.9
<b>Housing Tenancy (%)</b>			
Owned	94.2	88.61	96.5
Rented	0.1	9.8	2.4
Rent free	5.7	1.58	1.1

Source: BBS, 2012 (population was projected for 2020)

#### 7.4.1 Socio-economic Condition of Fulchari Pilot Site SAA

This pilot site includes Uria village of Uria Union. This Union has been severely affected by riverbank erosion. Major parts of the Union are Charlands, which have been eroded three times and reappeared. However, till now now, the majority land area of this Union is eroded area by the Jamuna River. Internal displacement driven by erosion is very common in this Union. Key features of this site are described briefly.

##### *Landholding*

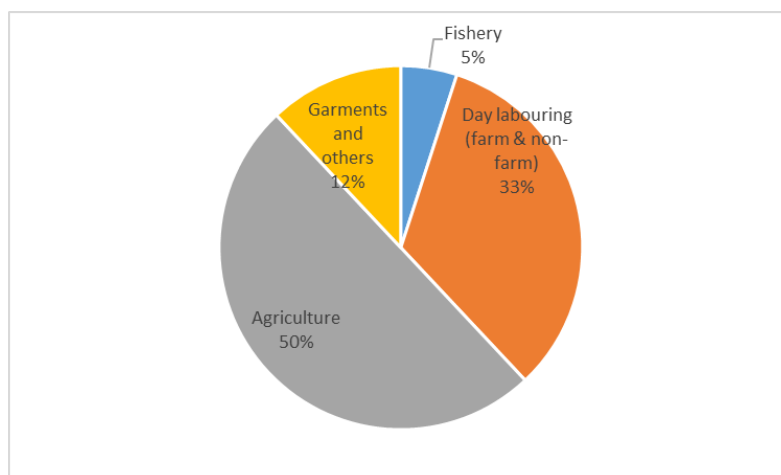
A major part of Union, where the pilot site is located, has been eroded into the Jamuna river. According to the local people, this area once was a Charland. Following the historical trajectory, this Charland has been disappeared three times since its first emergence in 1971. People from various parts of the District immigrated to this area and have settled down. Landownership in Charlands is very complicated. Legally, all lands are attached to DC and the ownership of the lands are yet to settle. However, people are using the lands as per a social recognition of their ownership. But in the mainland part of the Union, where the proposed project is located, lands are mostly privately owned.

Most of the landholders cultivate their land by themselves. A number of sharecroppers are also found in this area. In charlands, there is also a process of land grabbing by local powerful actors, who grab both private and the *Khas* land.

##### *Employment and livelihoods*

Agriculture is the main mode of livelihood in this area. According to an estimation, about 50% of people are involved in agriculture. About 33% people are involved in agriculture and other manual labouring activities. About 5% people are involved in artisanal fishing. The remaining 12% people are involved in garments industries in urban area (Dhaka, Savar, Chattogram), trading, construction sector, and other factory worker (Figure 7.5).





Source: Field Survey, 2021 and 2022

**Figure 7.5: Distribution of Population by Occupation in Fulchari**

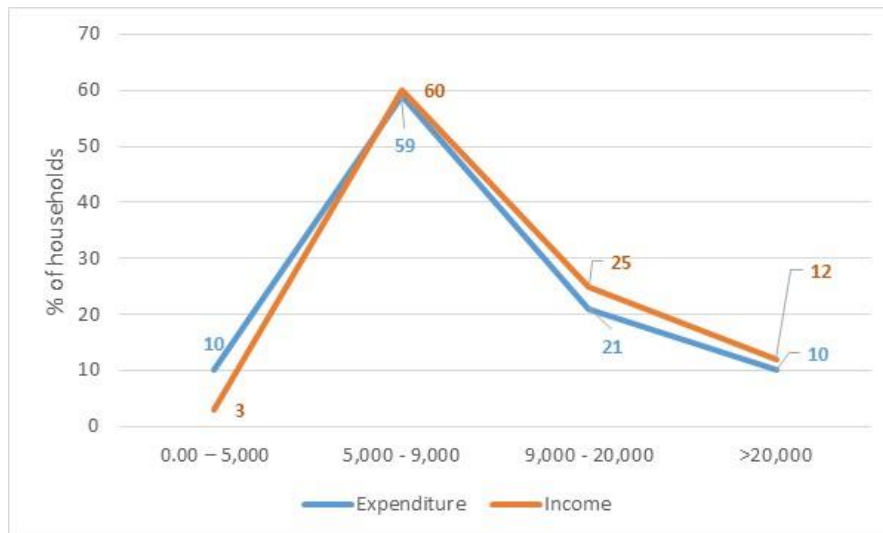
A number of people are involved in rickshaw pulling, and construction workers in the urban area during the lean period. In a peak season, the average daily income of each fisher is between BDT600 to 1000, which drops to BDT200 to 400 in the lean period. The average approximate wage for agriculture labourers is BDT400 to 500, including additional two times food for breakfast and lunch. However, women agriculture labourers receive a poor amount of wage approximately between BDT250 to 350.

Rearing of duck and chicken by women is very common in this area, which has an influential contribution to household income. In addition, cattle rearing is also dominantly found among people, which provides daily nutrition and handsome cash. People usually rear cattle for selling in the market during the EID-ul-Adha<sup>43</sup>. A number of people out migrated to an urban area with families, and earn their livelihood by involving in manual labouring activities. Besides, local people are also involved in trading both large and small scale.

#### *Income and Expenditure*

Household income and expenditure were assessed following the response of local people asked during group discussion and informal interviews. According to findings, most people belong to BDT 5000 to BDT 9000 category for both income and expenditure (see Figure 7.9). There is a discrepancy between the number of earning and expending households in this group, suggesting indebtedness. Also, about 12% households have earning of more than BDT 20000 per month, whereas about 10% households expend this amount in a month.

<sup>43</sup> EID-ul-Adha is a Muslim festival, in which livestock are sacrificed.



Source: Field Study, 2021

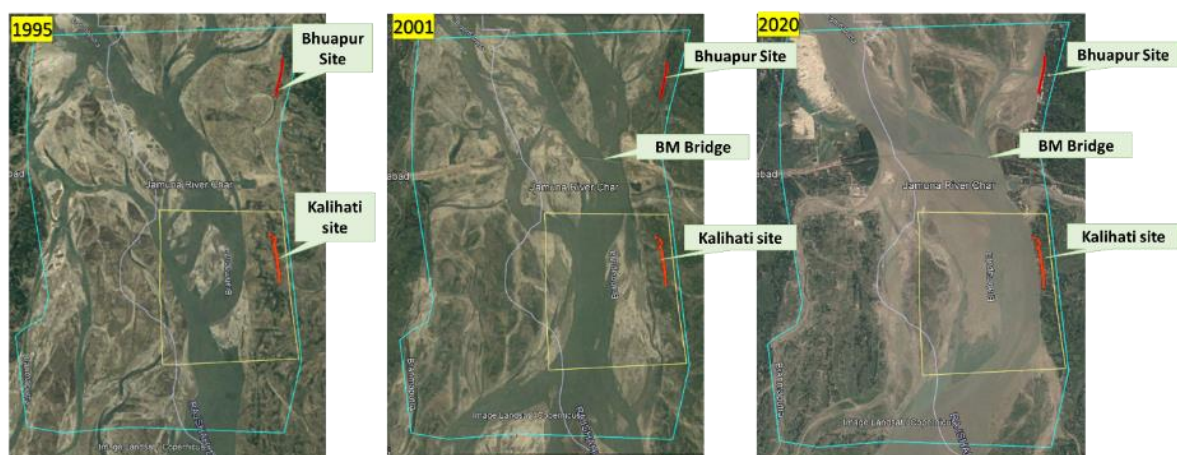
**Figure 7.6: Distribution of People according to Income and Expenditure**

#### 7.4.2 Socio-economic Condition of the Tangail-Kalihati Site SAA

This pilot site includes parts of two villages: Char Pauli and Alipur villages/mauzas. This area has been severely affected by riverbank erosion by the Jamuna River over the years. People tried to adapt to this disaster, migrated to urban area, changed occupation, etc. Key features of this site are described briefly.

##### *Bankline Erosion and Impact*

Figure 7.7 compares satellite images of 1995, 2001 and 2020 to illustrate the changes in river bankline and Charlands during this period which was triggered by construction of Bangabandhu bridge. According to local people, the erosion rate was negligible before the construction of Jamuna Bridge in 1998. After the construction of the Bridge, erosion started at a slower rate, which then accelerated since 2014. In the downstream of the bridge, the bankline migrated eastward causing rapid erosion in Kalihati and Tangail. According to local people, between 2014 and 2021, about 3,500 families have been displaced due to erosion. Of them, about 300 families have been displaced in 2021. Many of them have experienced 6-7 times displacement internally. Most of these displaced families have been forced to live on khas land because of their destitute condition driven by erosion. Some of them have taken a lease of private land and settled.

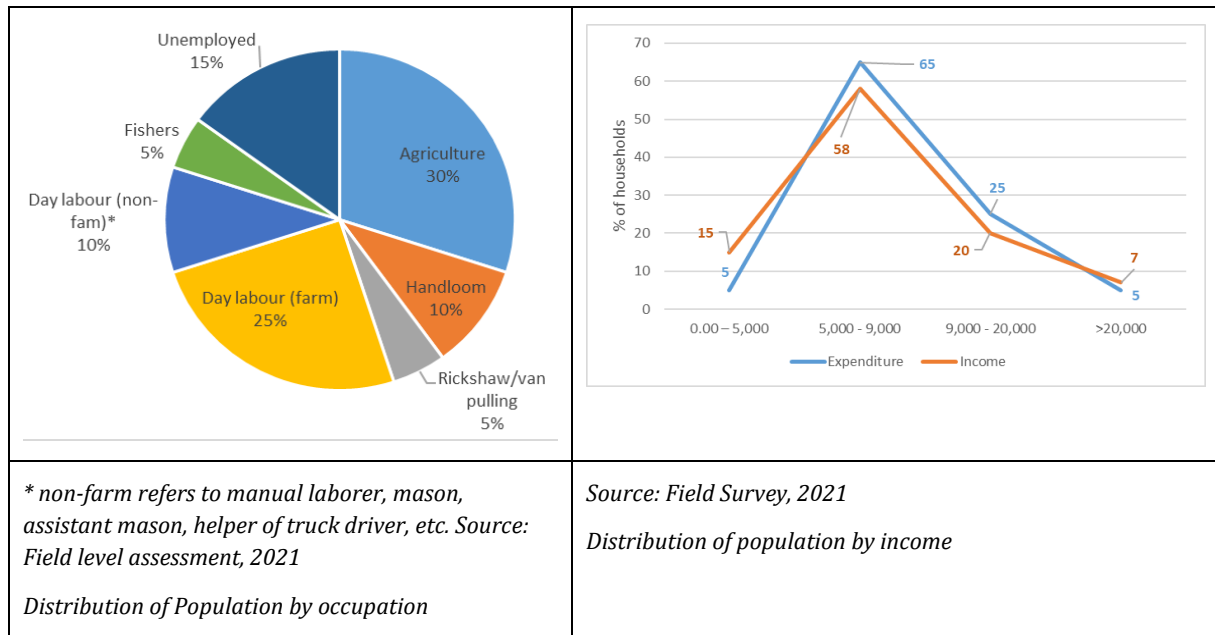


**Figure 7.7: Abrupt Change in River Bankline and Charland after Construction of Bangabandhu Bridge**



Employment and livelihoods

This area was known for handloom industries, which is now lost its significance due to erosion. The overall share of employment is shown in Figure 7.8.



**Figure 7.8: Distribution of Population by Occupation and Income**

Agriculture is the dominant livelihood activity in this area. 30% people were reported to be involved in agriculture. Moreover, the number of farm labourers is 25%. The agriculture sector thus supports 75% people in Kalihati. Although the handloom industry is declining, a considerable number of people (10%) remain involved in this sector. In Box 3, major livelihood groups are described briefly.

### **Box 3: Livelihood and Occupational Profiles of People in Tangail-Kalihati Site**

#### **Farming**

Although agriculture is the dominant mode of livelihood, this practice is declining due to the erosion-driven land crisis in this area. Moreover, a significant cultivable land is now under lease and sold out for settlement of erosion victims. Most of the landowners produce crops by themselves with family labour and with the help of a few hired labour. The next cultivators are sharecropper, who produce crops following mutual terms and conditions of the landowners.

#### **Handloom**

Tangail handloom is famous for its unique weaving, patterns, and tradition. This industry was a successor of the famous Muslin, and thus was established in the nineteenth century in Tangail. This industry in this area is a 'cottage industry', and the looms are mostly installed in households. Most of the total installed looms has a unit size of five looms. Women are the main workforce of this industry, who can work easily at their home. Thus, handloom was a crucial livelihood source for local people before the recent aggressive river erosion (2014-2021), which caused about 3500 looms to disappear. Women became jobless and men have changed their occupation to manual labourers.

#### **Van/Rickshaw puller**

In the past, there were a very few people involved in the rickshaw/van pulling profession in this area. Presently, many of people are engaged in this profession being affected by river erosion. In fact, people who were heavily involved in agriculture or handloom have transformed into rickshaw-van pullers. Recently, a significant of them has moved to Dhaka because of: a) the increasing number of pullers, and b) lower income at the locality and hit by Covid-19 pandemics.

#### **Laborer's (farm and non-farm)**

The large number of labourers are who lost their cultivable and homestead land due to river erosion. The farm labourer usually works within Tangail district, and often out-migrate to other district during the harvesting season. This group often involve in earth-working. Most of the non-farm workers are employed in Balumahal located at Bhuapur, Surajganj, and Fulchari.

#### **Fishes**

The number of fishers is decreasing as the catch is gradually being lesser in the river. Because of the higher price of fishing gears and other related cost, fishing appears as a less economically viable option for survival in the competitive market. Therefore, many of them are changing this occupation and transforming into both farm and non-farm workers.

#### *Income and Expenditure*

Household income and expenditure were assessed following the response of local people asked during group discussion and informal interviews. According to findings, most people belong to BDT 5000 to BDT 9000 category for both income and expenditure (see Figure 7.8). There is a discrepancy between the number of earning and expending households in this group, suggesting indebtedness. Also, about 7% households have earning of more than BDT 20000 per month, whereas about 5% households expend this amount in a month. Socio-economic Condition of the Kaoakola SAA

The proposed Kaoakola development site spreads into two Unions: Mechrha and Kaoakola. In this description, therefore, both unions have been considered.

#### *Landholding*

The Kaoakali union has almost been eroded into the mighty Jamuna river due to severe erosion since the 1980s. Since then, the government stopped the collection of land tax. According to local people, people marched to the District Commissioner's office to postpone land tax in 1995. However, the land re-emerged around 30 years back from now. After reemergence, the original owners re-occupied their land, following the record before the erosion. According to the national legislation, this reoccupation needs to be settled through the local office, in which the land office will do a survey and update the record. However, like in many cases in the char area, the local land office is reluctant to conduct the survey and settle the issue. Eventually, the land tax and land registry were suspended, and since land re-occupation has no legal recognition, landholders cannot sell their land formally. Thus, landholders are forced to re-occupy their land without legal recognition and sell informally in stamp paper.

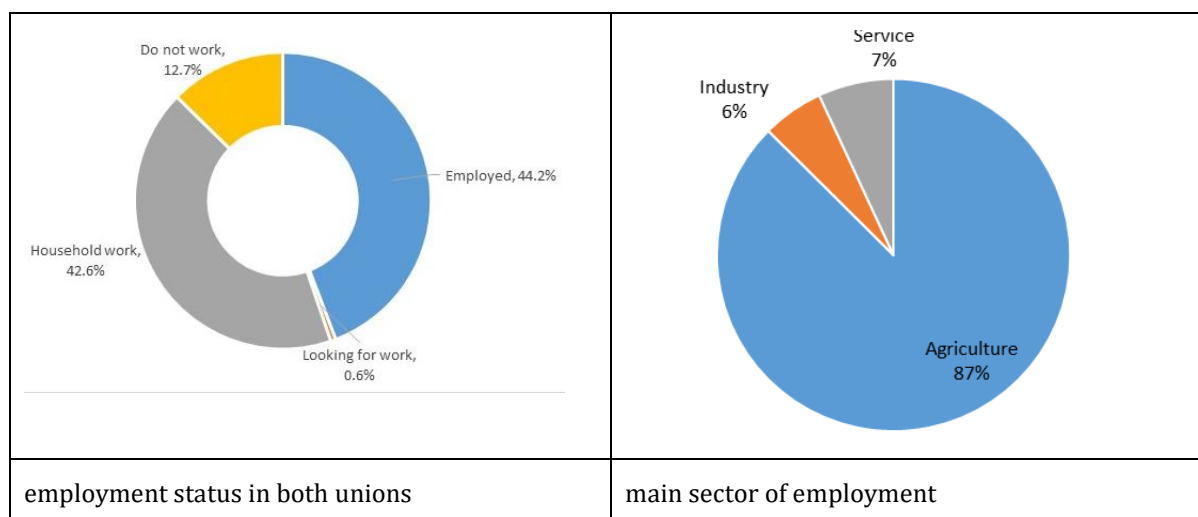
Out of total landholders in Kaoakali union, about 60% are absentee. This group left their village being displaced due to river erosion and settled in Sirajganj Sadar. They usually lease out their land in terms of annual rent and/or in a sharecropping system. Following the sharecropping system, landholders are given the share of crops and/or sale value of that crop.

Since not all the land of the union re-appeared, many people are still landless and are living in the union. They live in two modes: renting the land from the 'original' owners and settling in the voluntarily donated land.

For any development work or driven land acquisition, this charland union witnesses a legal crisis because of claims and counter-claims involved in land ownership. Although people are de-facto land controllers and entitled to the land (according to the previous record), the compensation process is complicated due to the absence of a new survey record. Apprehending this dynamic, landholders are often reluctant to transfer their land to the government.

#### Employment and livelihoods

According to BBS (2012), about 44% of more than seven years old but not attending school are employed in both unions. About 0.6% of the eligible workforce are looking for jobs.



Source: BBS, 2012

**Figure 7.9: Employment Status**

Following BBS (2012), about 87% of employed people are involved in the agriculture sector, referring to the dominance of agriculture as the mainstay of their livelihood. The alluvial char land provides a fertile ground for producing diverse crops, including rice, jute, maize, Grass pea (*Lathyrus sativus*), linseed, almond, eggplant, mustard, chili, onion, garlic, etc. The agriculture sector encompasses fishery and livestock. Around 3% of people of Kaoakali union are involved in the fishery, most of them are open water

capture fishers. Almost every family raises cattle, including cows, goats and sheep. Some people also keep horses for riding. Raising chickens is also very common in almost every family.

On the other hand, about 6% of people are involved in industrial sectors, who usually work in the local handloom industry and other factories. Whereas, about 7% of people are involved in the service sector.

#### *Existing social facilities*

The following tables shows the existing social infrastructures and facilities available in both Kaoakola and Mechhra unions.

Table: Existing social infrastructures and organizations in Kaoakola and Mechhra unions

Type	Kaoakola (Nos.)	Mechhara (Nos.)
Jame mosque	18	25
Community centre	01	04
School-cum-cyclone shelter	01	02
Local NGO	-	01
Registered youth club	-	02
Library	01	-
Registered youth club	02	-
Bazaar (market)	02	05
Post office (local)	03	03
Bridge/culvert	12	12
Khas (state-owned) pond	01	02
Eidgha	09	09

Source: Union Website, 2022

## 7.5 Socio-economic Profiles of Households in the SAA

### 7.5.1 Demography

Union level demographic features of three short-listed and two pilot sites are presented in Table 7.5. The discussion aims to present a broad overview of the SAA.

Table 7.5: Demographic Profiles of People in the Unions<sup>44</sup> of the SAA

Name of Project site	Households	Population			Sex ratio	Population density [sq. km]
		Both (nos.)	Male (%)	Female (%)		
Tangail-Kalihati	12,352	57,464	50.8	49.2	103	715
Fulcahri	4,721	18,755	49.6	50.4	98.4	722
Kaoakola	11,049	48,719	50.6	49.4	102.3	514
<b>Total/Average</b>	<b>28,122</b>	<b>124,938</b>	<b>50.33</b>	<b>49.67</b>	<b>101.2</b>	<b>650.33</b>

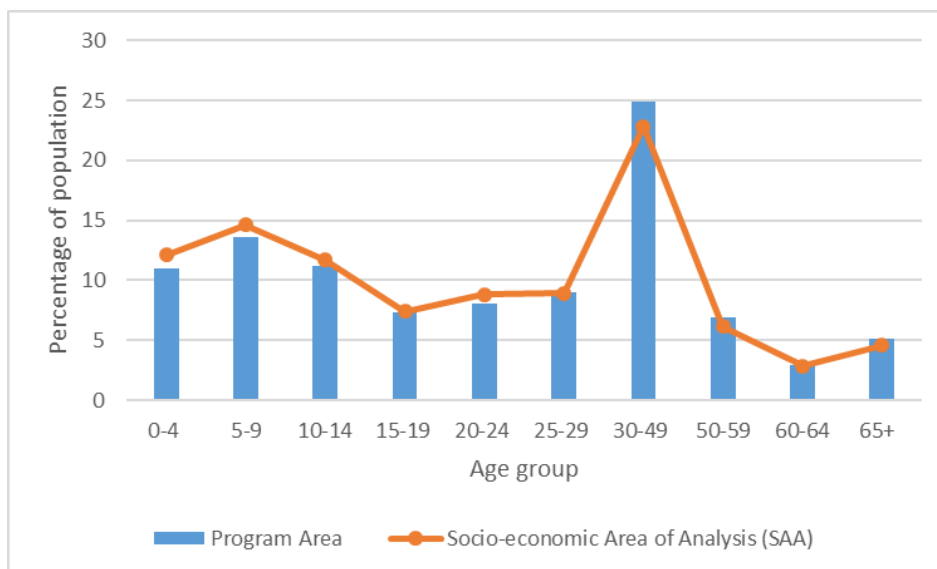
The unions in the two pilot project areas have a total of 17,023 households with a population of 76,219. Of them, 50.2% are males, and 49.8% are females. The sex ratio is 100.7, which refers to 100.7 males per

<sup>44</sup> The Union is the lowest administrative unit in the country for which census data are available. The impact or project foot print will be on village/mouza (revenue unit) on a much smaller scale. Since proper field studies of pilot sites were not possible for covid restrictions and protocol, the union level data have been used to explain the general socio-economic profiles in the project area. The UPs of each piloting site are presented in the Table 7.3.



100 females. The average density is 718 per square kilometre. The average household size is 4.5, and most households comprise 3 to 4 members per household. (BBS, 2012; projected for 2020).<sup>45</sup>

The age composition shows that the age group 30 to 49 is the highest in the SAA of three (03) project sites. (see **Figure 7.10**). Because of lower infant and under-five mortality (U5MR), the percentage of children is also noticeable.



Source: BBS, 2012

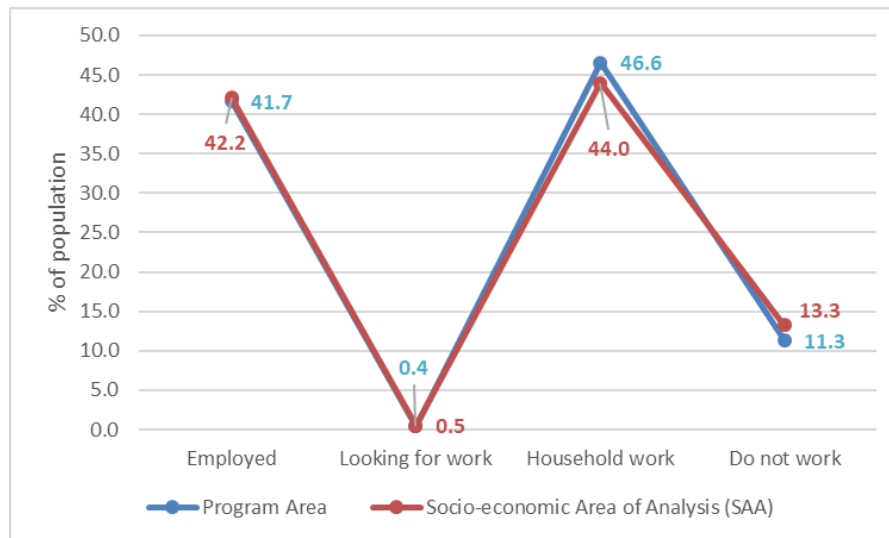
**Figure 7.9: Distribution of Population by Age**

### 7.5.2 Employment Status

The BBS (2012) estimates employment status into four categories: employed, looking for work, household work, and not working (excluding school-age children up to 7 years old). The employment status shows that less than half of the population is employed. Here, employment includes earning people involved in any work, and therefore it discounts household work as employment.

Compared to the Program AOI, employment status in the SAA is slightly higher. On the other hand, the "do not work" category is marginally higher in the SAA (13.3%), referring to higher school dropout and unemployment. Since these people are not permanently employed, aged above seven years but not attending schools, the census did not include them into the used category, although many of them occasionally involved in income-earning work. (See **Figure 7.11**).

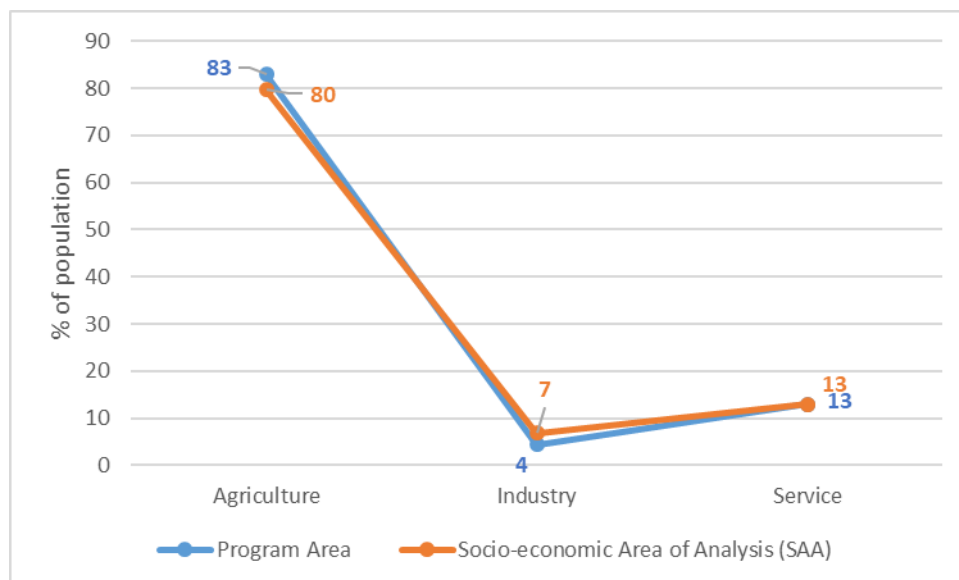
<sup>45</sup> The population projection for 2020 was estimated following 'simple linear method' by considering upazila wise growth rate estimated in Housing and Population census, 2011 (BBS, 2012). Thus, growth rate for Fulchari is 1.06 and for Tangail-Kalihati 1.28.



Source: BBS, 2012

**Figure 7.10: Employment Status**

In the following figure, the employed population has been distributed into three sectors: agriculture, service, and industry. Thus, according to data (BBS, 2012), agriculture is the dominant mode of livelihood in the Program AOI, estimated at 83%. This group includes farmers, including sharecroppers, fishers of both professional and seasonal, livestock and poultry farmers. The second-largest employment sector is service, which refers to salaried employees working in the office, teaching, etc., and people involved in transportation service. About 13% of people in the SAA are engaged in the service section, which is similar in the program AOI (13%). Also, involvement in commercial/industrial sector (including garment) is higher in the SAA (7%) than that of the program AOI (4%). (See **figure 7.12**).



Source: BBS, 2012

**Figure 7.11: Sectoral Involvement of People in the Study Area**

### 7.5.3 Diverse Employment Patterns in the Floodplain

The field study (FGDs, KII and consultations) conducted in June, September and November of 2021 and January and February of 2022 along the program corridor and C1 project sites found that the people are engaged in a diversity of activities for income sources and to earn their livings (Figure 7.13)). The available BBS data have limited value to understand the variety of economic activities in the floodplain.

This section provides a summary of the field-level findings, further complemented with secondary sources. Overall, the employment and occupational patterns in the Jamuna River area can be divided into six broad categories: small farmers, laborers, fishers, involved in service, industrial workers, and businessperson/trader. People are not exclusively involved these groups, rather often change and/or are forced to change their occupations due to riverbank erosion, flooding and other factors. The Figure 7.13 and the following occupational group-wise discussion highlights these occupational mobilities. Generally, most of the mobilities are found among small farmers and labourers. There is also an increasing trend among children of both groups, particularly girls, to be engaged in the garment industries.

#### *Small farmers*

The number of large farmers is too small in the riverine areas due to endemic erosions.<sup>46</sup> As a result, large landholders have gradually transformed into small landholders. Besides, many large, medium, and small landholders currently have no cultivable land of their own, and instead are cultivating as sharecroppers solely. Sharecropping practice is widely found around the Jamuna River. This practice is typical of two types: *Adha* (half) and *Tebhaga* (one-third) between the owners and cultivators. If the landowner provides inputs, the yield is distributed into *ada* or half; otherwise, total yield is divided into three (*Tebhaga*), and only one third is given to the landowner.

These small farmers combine their cultivation with rearing livestock at their homes, and usually both male and female members take care of these cattle. Moreover, livestock is commonly found in every household especially in Char areas due to ample grazing opportunities. Some small-scale farmers also reported seasonal fishing in Jamuna River as another option for income. So, multiple occupations are common practices. Therefore, erosion has forced the general population to change their occupation and to look for alternative sources of income for survival and sustenance. Short-distance migration was reported during the stakeholders' meetings and FGDs. Some displaced families migrated to nearby areas and purchased and/or rented land for homesteads. Most of the displaced families tend to remain within the vicinity with the hope that land will re-emerge. However, access and ownership remain uncertain in the riverine context

#### *Wage Labor and Transportation*

This includes both absolute and functionally landless people, in which absolute landless have no land either cultivable or homestead; whereas functionally landless only have homestead land. This group lost their land into Jamuna river, thus, being forced they opted for laboring activities. Generally, they are agricultural labourers, and mostly work locally. Some small farmers, especially their children, are involved in transportation services, such as powered country boats and other local transports to earn a livelihood. Others, particularly young family members moved to cities - Dhaka, Chattogram, Gazipur, etc. - for working in garment industry.

#### *Temporary Migration for Work*

Temporary seasonal migration to other districts was reported during the harvesting season, and also for earthwork. Although such migration is for agricultural work, some also work in urban centers as transport worker such as in rickshaw pulling, and construction work. The destination varies depending on personal contacts and network; however, the following were reported as typical destinations: Gazipur, Chattogram, Cox's Bazaar, Faridpur, Munshiganj, Shariatpur, Sunamganj and Sylhet.

#### *Fishers*

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<sup>46</sup> There are, however, powerful persons (with political links with local administration and beyond) who have control over large area of Charlands without any ownership rights. The land is typically leased out annually through local informal systems and/or sharecropped under local arrangements.

The involvement in fishery sector is gradually declining because of scarce fish stock in Jamuna River, less catch with large-hole net, ban on certain gears, and ban on fishing during certain period. Some fishers who own a boat and nets, pick up fellow fishers as partner in fishing during fishing season. The income usually ranges from Taka 10,000 to Taka 15,000 per person/month for couple of months only.

#### *Service Sectors*

Literacy rate in the bankline villages is reportedly good. Erosion stricken people have very good motivation for educating their children; however, in Char areas the picture is different due to lack of ability and educational institutions. In Jamalpur District where field studies were carried out, many people have office jobs, both private and government. There are many in teaching occupation. Service sectors also include, transportation of both roadway and waterway. Many people are also involved in transportation sectors, with their own small vehicles. Waterway transportation is usually involved in goods carrying to the upazila market, and passenger carrying from mainland to isolated Chars.

#### *Industrial workers*

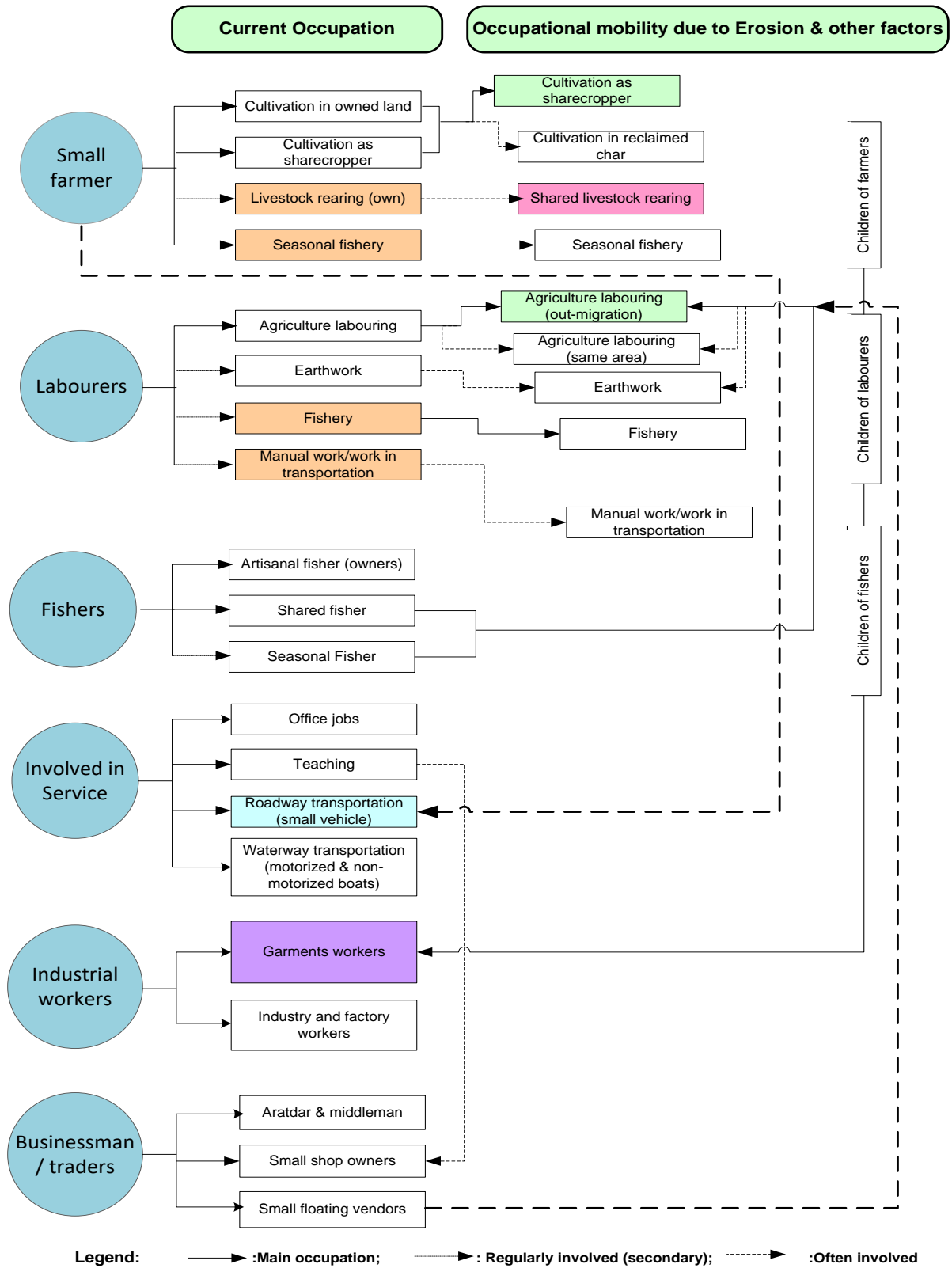
Industrial workers mostly refer to those in the garment sector. This trend is increasing, especially among the people living in isolated Chars. Both males and females from these families, move to city areas like Dhaka, Chattogram, and Gazipur for working in garment industries. Besides, a considerable number of people from the countryside are involved in local factories such as handloom factories. Also, a few moves to city area to work as industrial workers.

#### *Traders and Businessmen*

There are also significant local opportunities for local trades and businesses. Local traders deal with agricultural produce as a middleman to sell to the retailer or other intermediaries. The Char land is fertile and can yield a few cash crops including maize. These traders buy from the local cultivators directly.<sup>47</sup> There are also small shop at village markets, who are professional retailers. On the other hand, some local level teachers or people with other major occupation often involve in retailing in their shops in village market. Furthermore, there are floating traders who visit rural areas and sell among others beautification items.

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<sup>47</sup> See, M. Aminur Rahman et al. Crop Production Patterns and Marketing in Char Areas: Adapting to Hazards and Vulnerability. In Mohammad Zaman and Mustafa Alam (eds), *Living on the Edge: Char Dwellers in Bangladesh*. Springer 2021.



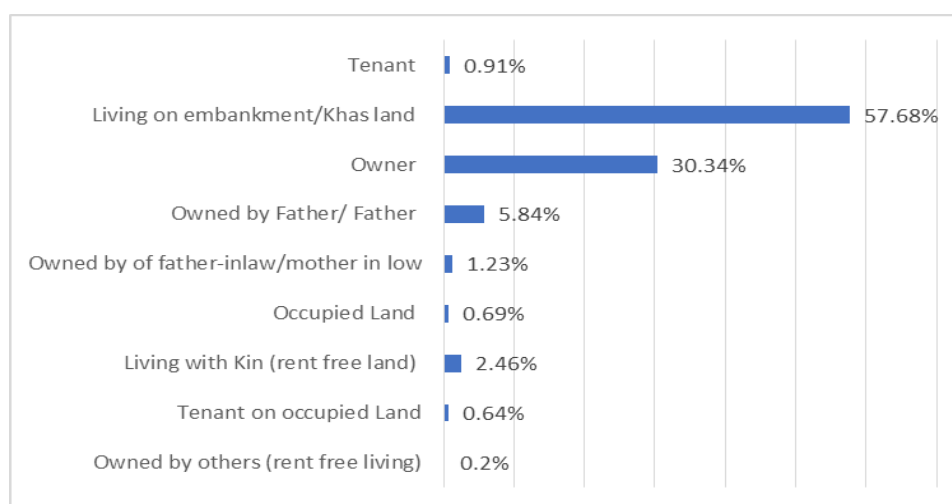
Source: Assessed and synergized by the writer based on findings, 2021

**Figure 7.12: Mapping Livelihood and Occupational Patterns**

## 7.5.4 Landholding/Land Tenure

### *Landownership in Kalihati and Fulchari*

Land ownership varies in terms of location of the area. About 95% people throughout the Program AOI have entitled homestead land. About 2% are living on rented land, and about 3% are living on rent-free land including khas land. About 4% are living on rent-free land and about 1% on rented land (BBS, 2012, and preliminary field survey in 2021 and 2022). However, landownership at the closest vicinity of the river area shows a different picture, in which people living on the khas land or embankment is the highest. For example, according to the RMIP (2014) report, about 58% people close to the Jamuna River are living on embankment or khas land, whereas about 30% have entitlement to their lands. People who lost their all land including cultivable and homestead now live as tenants, and/or with their kin, or on occupied khas land (see, Figure 7.14).



Source, RMIP, 2014

**Figure 7.13: Land Ownership Pattern**

### *Landownership in Kaoakola Char*

In Kaoakola Char, the third site of C1, the story of land ownership is completely different. The Kaoakola union has almost been eroded into the mighty Jamuna River due to severe erosion since the 1980s and it re-emerged in 1995. According to the national legislation, this reoccupation of lands needs to be settled through the local government office, in which the land office will do a survey and update the record and local DC office will initiate a legal procedure to determine the ownership. People who owned the land before disappearance of the Char has right to claim the ownership. Until the determination of the ownership, the land is attached to DC office.

Currently the land of Kaoakola is attached to DC office because such land survey and thereafter legal procedure to determine the ownership is yet to be initiated. However, people have reoccupied and have been using the land as per the social recognition and consensus based on their earlier record of land ownership. People can not pay any taxes because the ownership of the land has not been legalized yet.

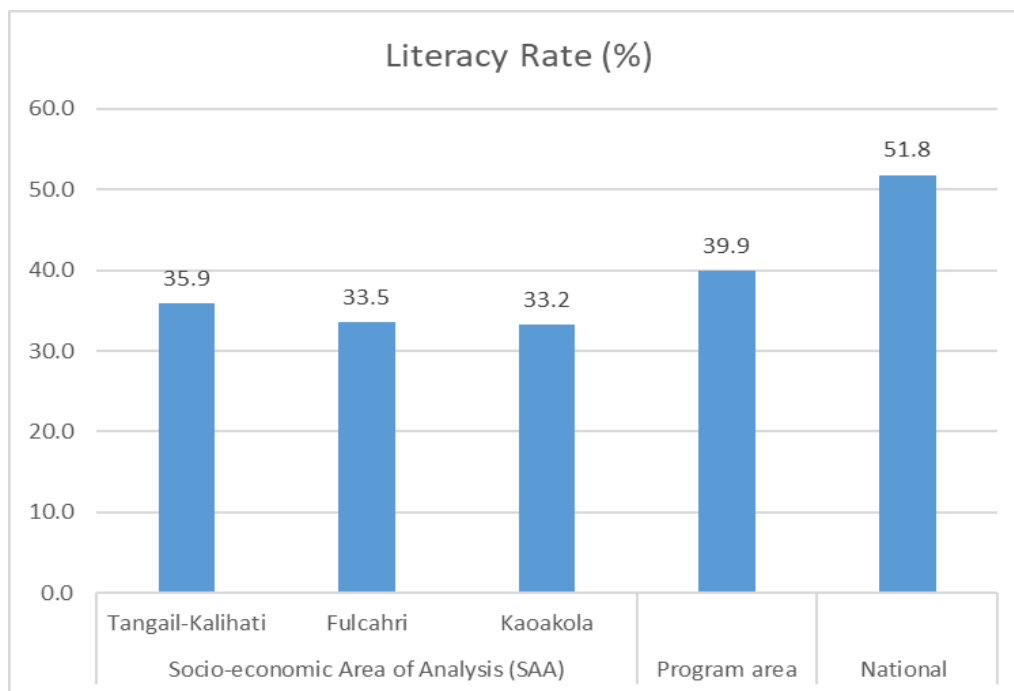
Out of total landholders in Kaoakola union, about 60% are absentee. This group left their village being displaced due to river erosion and settled in Sirajganj Sadar. They usually lease out their land in terms of annual rent and/or in a sharecropping system. Following the sharecropping system, landholders are given the share of crops and/or sale value of that crop.

Since not all the land of the union re-appeared, many people are still landless and are living in the union. They live in two modes: renting the land from the 'original' owners and settling in the voluntarily donated land.

For any development work in Char which needs land acquisition, it involves a legal complexity because of – i) claims and counter-claims involved in land ownership, ii) reluctance of the local government in initiating the legal procedure of reoccupation of lands in the re-emerged Chars. Although people are de-facto land controllers and entitled to the land (according to the previous record and social acceptance), the compensation process is complicated due to the absence of a new survey record. Apprehending this dynamic, landholders are often reluctant to transfer their land to the government without any compensation.

### 7.5.5 Education

In the Program AOI, about 40% people can read and write, which is lower than the national average (52%). However, literacy rates vary around the project footprint sites. Tangail-Kalihati site shows the higher literacy than that of Fulchhari (33.5%) and Kaoakola (33.2%) sites (See **Figure 7.15**). (BBS, 2012).

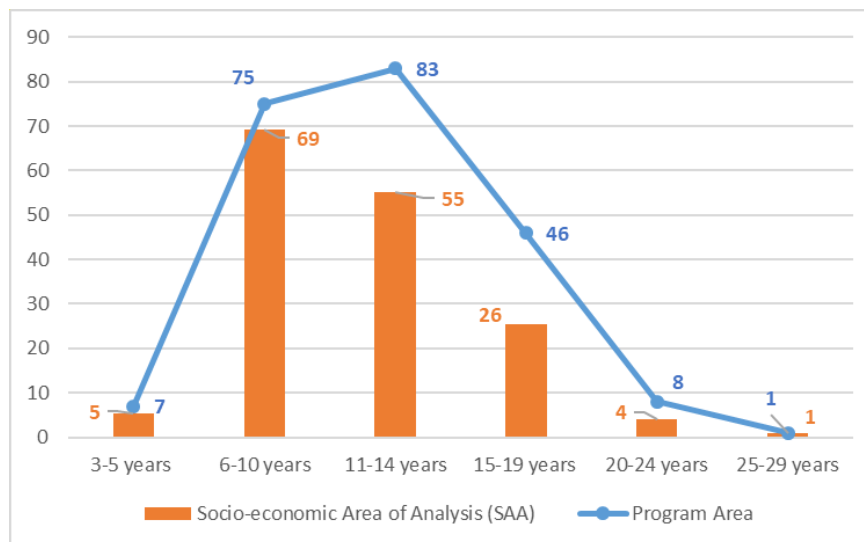


Source: BBS, 2012

**Figure 7.14: Literacy Rate**

**Figure 7.16** shows the school attendance rate by age in both Program AOI and SAA. Compared to three sites, attendance rate is higher in the Program AOI. However, the difference in attendance from the higher secondary onward is noticeable. In all age groups, attendance rate is lower in the SAA than that of Program AOI. (BBS, 2012).



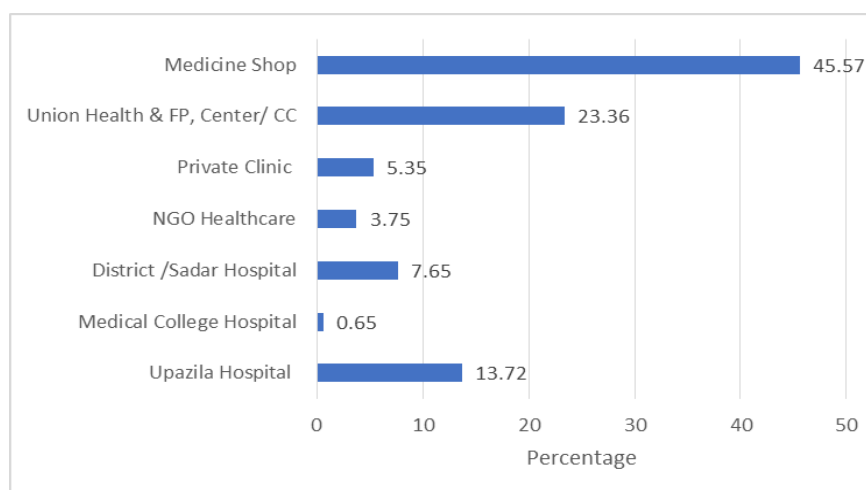


Source: BBS, 2012

**Figure 7.15: School Attendance Rate**

### 7.5.6 Health and Health Care

For common diseases, local people prefer to go the informal healthcare/workers such as medicine shops or village doctors. Besides, people most frequently accessed to the Union Health and Family Planning Centre and the Community Clinics. However, people accessed to the Upazila Health Complex and district hospital less frequently in the case of more severe health problems. This implies the preference of closer facilities rather than the distant ones, since it involves additional expense and troublesome journeys (see **Figure 7.17**). (RMIP, 2014).



Source: RMIP, 2014

**Figure 7.16: Perception on Health Seeking by Service Providers**

Bangladesh has a shortage of physicians, which problematizes the health care services. At present, the physicians per 1000 people is 0.63 (WB, 2022)<sup>48</sup>. There is a huge gap between sanctioned positions of

<sup>48</sup> World Bank (2022). World Health Organization's Global Health Workforce Statistics, OECD, supplemented by country data. Accessed from: <https://data.worldbank.org/indicator/SH.MED.PHYS.ZS?locations=BD>

physicians and the number of available physicians that caused delayed health care, negligence, and improper treatment (DGHS, 2022)<sup>49</sup>.

The crude death rate (CDR) was estimated per 1000 population in districts given below. By comparing among the following districts, the CDR is higher in Bogura and Sirajganj. The Infant Mortality Rate (IMR) and Under 5 years Mortality Rate (U5MR) are higher in Sirajganj district, accounted for 29 and 37.3 respectively. On the contrary, Jamalpur has the lowest IMR and U5MR (Table 7.6).

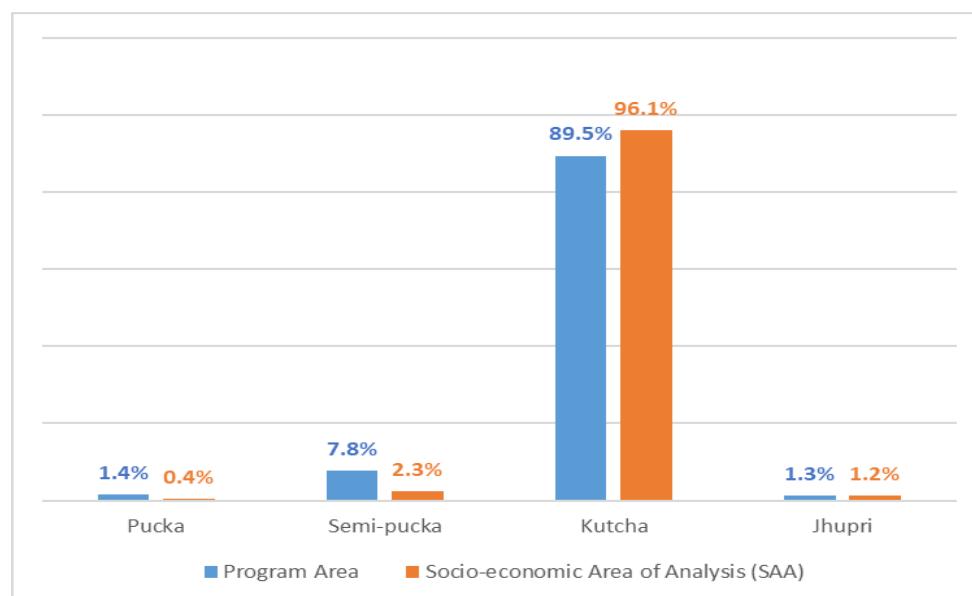
**Table 7.6: Crude Death rate, infant mortality rate and under 5 mortality rate in the entire reach**

Districts	Crude Death Rate (CDR)	Infant Mortality Rate (IMR)	Under 5 years Mortality Rate (U5MR)
Bogura	5.5	23.4	29.8
Gaibandha	4.0	22.7	28.4
Jamalpur	4.2	18.4	25.7
Kurigram	4.7	12.4	19.8
Sirajganj	5.3	29.0	37.3
Tangail	4.8	20.1	27.6

(BBS: 2019<sup>50</sup>)

### 7.5.7 Housing

According to BBS (2012), most of the houses are 'kutcha' in both the SAA and Program AOI. The construction materials of these kutcha houses include: mud, tin, wood, etc. Although kutcha houses are higher in the SAA than that of Program AOI, semi-pukka houses are higher in Program AOI. (See **Figure 7.18**). (BBS, 2012).



Source: BBS, 2012

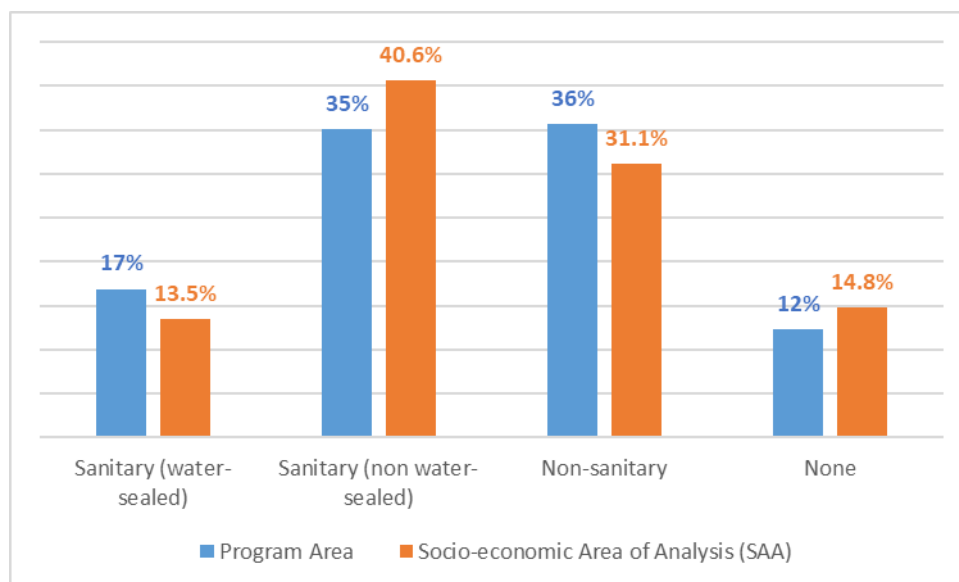
**Figure 7.17: Households by Construction Type/Materials**

<sup>49</sup> DGHS (2022). Real time health information dashboard: Upazila wise physician distribution. Accessed from: [http://103.247.238.81/webportal/pages/hw\\_hrm\\_upz\\_physician\\_distribution.php](http://103.247.238.81/webportal/pages/hw_hrm_upz_physician_distribution.php)

<sup>50</sup> Bangladesh Bureau of Statistics (BBS) (2019), Report on Bangladesh Sample Vital Statistics 2018. Reproduction, Documentation & Publication Section (RDP). Statistics and Informatics Division (SID), Ministry of Planning, Government of the Peoples' Republic of Bangladesh, Dhaka, Bangladesh

### 7.5.8 Sanitation

According to BBS (2012), about 12% and 14.8% households respectively in the program and SAA have no individual sanitation facility. They share toilets with their neighbours. These household are located at the riverside and on the embankment. Sanitary latrines are higher in the Program AOI than that of SAA (See **Figure 7.19**). (BBS, 2012).



Source: BBS, 2012

**Figure 7.18: Sanitation Facilities by Type**

### 7.5.9 Electricity

At present, about 33.3% households are enjoying electricity from gridline in the overall Program AOI, which is noticeably lower in the SAA (13.48%) (BBS, 2012). The presence of solar electricity is increasingly found in the project area, especially in Char area.

### 7.5.10 Drinking Water

Tube wells are the main source of drinking water both in the program and the SAA area, which covers about 96% households in both the program and the SAA. About 0.3% households in the SAA has supplied tap water, which is slightly higher (1%) in the Program AOI. These households are located in urban area and are connected with the piped water supply. However, about 2.4% of households in this area still use river or pond water for drinking (BBS, 2012).

### 7.5.11 Transportation Network

Communication through roadway networks is the most common in the entire Program AOI. Waterway is largely used for carrying agricultural produce from the Char area to the local market and *arotdar* (wholesale supplier). However, waterway is the main mode of communication for residents of isolated Chars. There are engine boats that are used to travel to different stations (ghats), which carry both residents and goods (see Figure 7.20).



Fragile road network along the riverside

Boat *ghat* at the country side for communication to the Char area

### Figure 7.19: Roadway and Waterway Transportation Network

The area of program AOI shows the availability of various types of communication networks. Thus, there are national highway that connect the entire north Bengal with Dhaka city. Also, there are regional highways and local roadway networks. A railway line that crosses the Jamuna River through Bangabandhu Bridge is an important communication route from Dhaka to the program area. The river also plays a crucial role for waterway communication that includes three classes of navigation routes: class-I, III and IV<sup>51</sup>. Also, the program AOI includes a protocol route between India and Bangladesh. (see Figure 7.21).

#### 7.5.12 Poverty

Figure 7.22 and 7.23 shows upper and lower poverty situation in the Program AOI. This refers to the poverty headcount ratio in the Program AOI, which has been presented for upazilas. Both upper and lower poverty line has been shown in separate maps (see below). According to data, Kurigram district is the highest poverty-stricken area. In this area, more than 60% people are poor following the upper poverty line, whereas about 50% are extreme poor (lower poverty line). Bogura has the lower poor people, estimate as less than 10% following lower poverty. Also, this area has the lower poverty headcount according to the upper poverty line.

<sup>51</sup> The waterways of Bangladesh have been classified into four categories depending on least available depth (LAD) ranging from 3.90 m to 1.50m



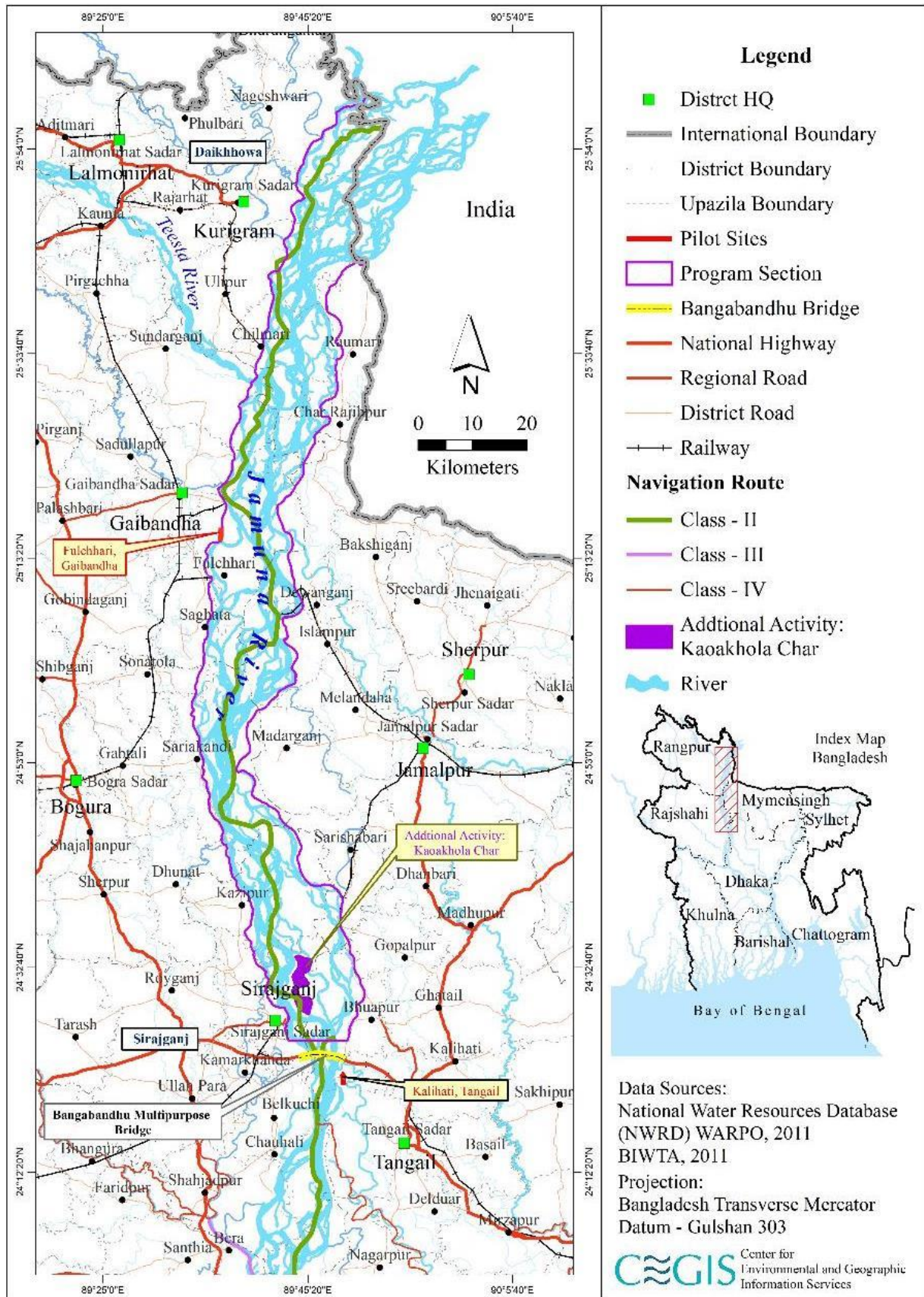


Figure 7.20: Map of the Road and Waterways Network in the Program AOI



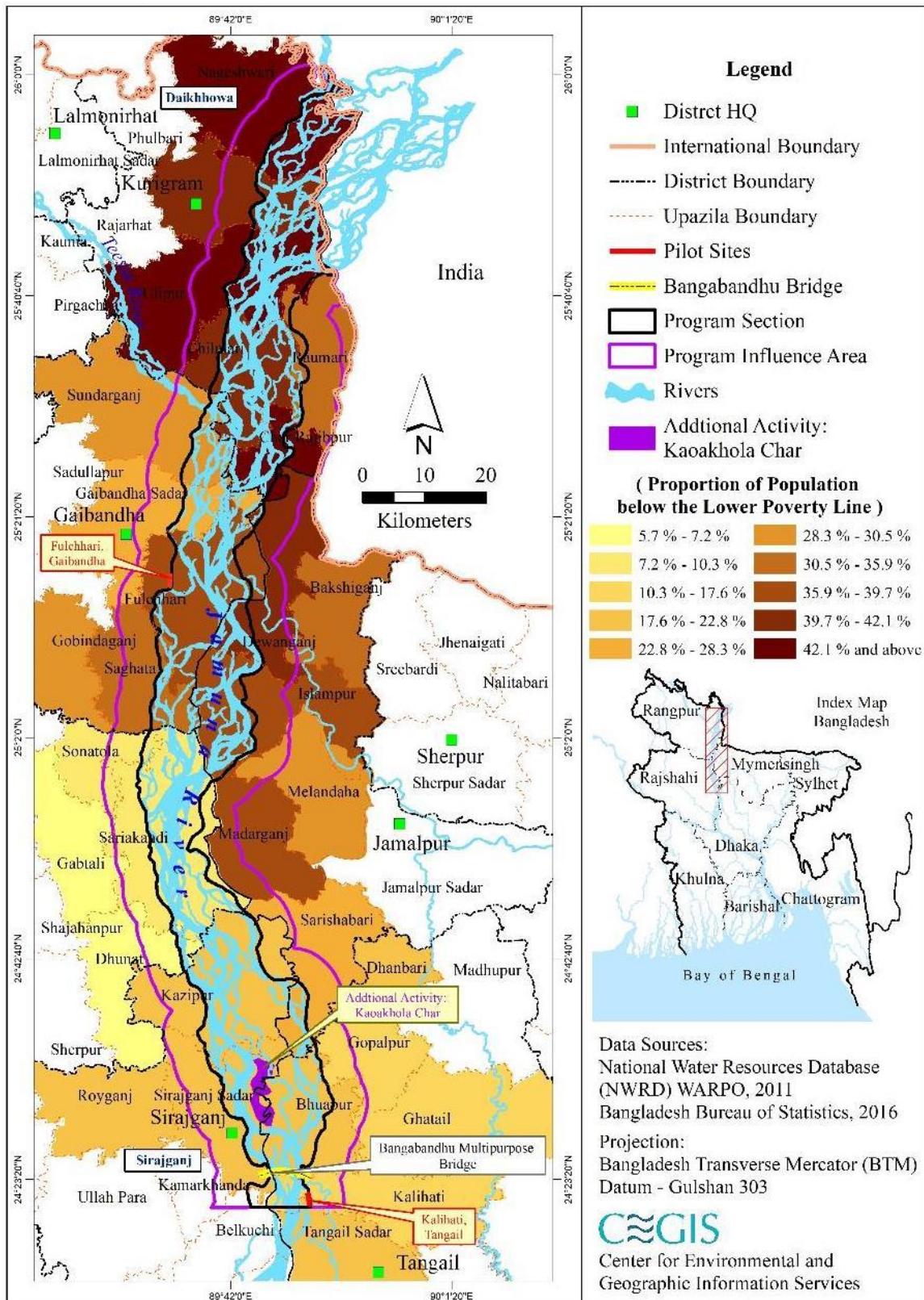
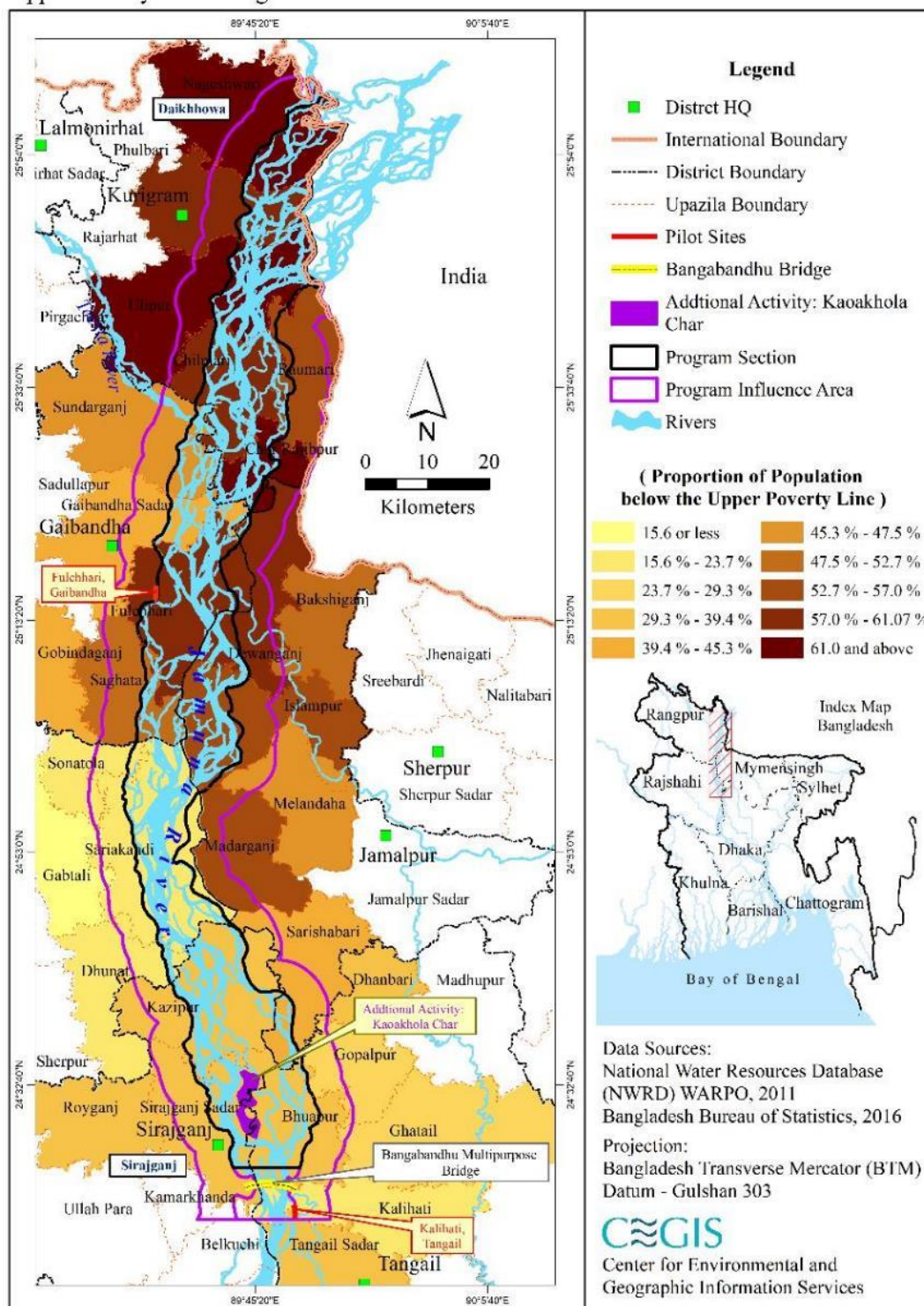


Figure 7.21: Map of the Below Lower Poverty Headcount Ratio in the Program AOI



August, 2022

Figure 7.22: Map of the Below Upper Poverty Headcount Ratio in the Program AOI

### 7.5.13 Livelihood Vulnerability and Assessment

There is an overall precarity in life and living in the floodplain that needs to be recognized. Very broadly, as the social baseline conditions indicate, the population in the project/Program AOI has a low development status on (i) human (i.e., low literacy/education, skill levels); (ii) financial (i.e., 50-60% of the population belong to lower and/or upper poverty level); and (iii) physical capital (i.e., poor housing, little or no land; nearly two-thirds living on the old embankment and Chars are landless). However, the natural capital plays an important role for these floodplain communities that depend to a large degree



on agricultural products, fruit trees, backyard poultry, and livestock. These are mostly grown or raised for own sustenance and only to a small degree for commercial purposes. In addition, local people are also involved in a variety of occupations such as fishing, trading (petty trade, transportation, shop keeping, *forias/beparis*<sup>52</sup>), artisan/skilled labor – for example, carpenters, masons, electricians, rickshaw/van puller, tailoring, cobbler, barber, sweet maker, *chatai* (bamboo mat) maker, and wage employment in government and private sectors, including garments.<sup>53</sup> In sum, livelihood sources for the floodplain inhabitants are largely dependent on natural resources. Therefore, there are opportunities to improve livelihood mid and long-term through increasing the commercialization of agricultural products and the productivity of agricultural inputs as well as diversifying the livelihoods using existing natural/human resources.

## 7.6 Gender Analysis

### 7.6.1 Demographic composition

Out of total population in the pilot project sites (Tangail-Kalihati and Fulchari), the sex ratio is 100.7 referring to around 101 males per 100 females. This scenario is the same for both the pilot area. According to a study (RMIP, Vol 2, 2014), about 6% households are female-headed in the country side, which is relatively higher in Charlands. The primary reasons for female-headed households are: male migration, abandonment, divorce, and widowhood. The female-headed households are socially and economically disadvantaged. The majority of them have less earnings than that of the male-headed HHs.

### 7.6.2 Marriage

According to marital status, about 8.5% women are widowed at Tangail-Kalihati (or Alipur) site, which 0.5% at Fulchari site and 7.7 at Kaoakali site (BBS, 2012). Thus, divorce rate for women in Tangail-Kalihati is higher than that of Fulchari for both men and women.

### 7.6.3 Economic participation

According to Table 7.7, there is a considerable gap between male and female concerning gender segregated employment status. The rate of male employment is significantly higher in Fulchari (34.9%), Tangail-Kalihati (38.8%), and Kaoakola (42.3%) sites, whereas only 4.5% of Fulchari, 1.7% in 0.9% women of Tangail-Kalihati, and 1.9% women of Kaoakola areas are employed. In both areas, women are mostly involved in household work (BBS, 2012).

**Table 7.7: Percentage of Gender Segregated Employment Status**

	Fulchari (%)		Tangail-Kalihati (%)		Kaoakola (%)	
	Male	Female	Male	Female	Male	Female
Employed	34.9	4.5	38.8	1.7	42.3	1.9
Looking for work	0.5	0.2	0.4	0.1	0.4	0.1
Household work	3.9	43.4	0.8	43.9	0.3	42.3
Do not work	5.6	7.0	6.7	7.7	6.5	6.2

Source: BBS, 2012

<sup>52</sup> Small/medium traders, who purchase various agricultural produces, are part of the value/market chain in the local and regional markets or bazaars. See M. Aminur Rahman et al, Crop Production Patterns and Marketing in Char Areas: Adapting to Hazards and Vulnerability. In M. Zaman and M. Alam (eds) *Living on the Edge: Char Dwellers in Bangladesh*, cited earlier.

<sup>53</sup> Hafiza Khatun, et al, Out Migration as a Survival Strategy for Char Dwellers. In M. Zaman and M. Alam (eds) *Living on the Edge: Char Dwellers in Bangladesh*, cited earlier.

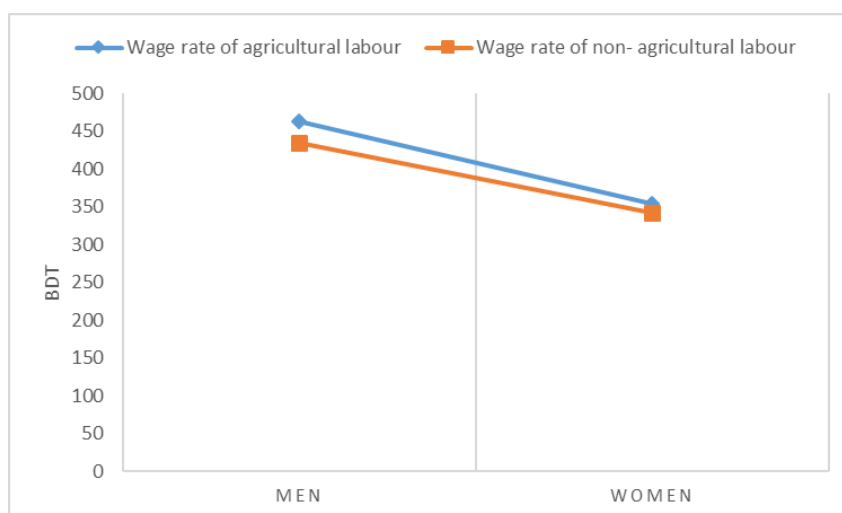
Table 7.8 shows the distribution of employed men and women in three large sectors. Thus, men are mostly involved in agriculture sector. Women in both Tangail-Kalihati and Fulchari are mostly involved in service sector (3.4% in Tangail-Kalihati and 10.2% in Fulchari). However, in all sectors the presence of men is predominant. According to the field findings, some women and young girls work in garment industry in Dhaka and regularly send money to families.

**Table 7.8: Percentage of Gender Segregated Employed People**

Sectors	Fulchari (%)		Tangail-Kalihati (%)		Kaoakola (%)	
	Male	Female	Male	Female	Male	Female
Agriculture	84.3	1.1	54.7	0.6	85.8	1.7
Industry	1.5	0.2	4.6	0.2	4.6	1.0
Service	2.7	10.2	36.6	3.4	5.3	1.6

Source: BBS, 2012

There is a discrepancy of wage rate between men and women. The following figure shows the average wage differences (see figure 7.24).



Source: BBS, 2012

**Figure 7.23: Gender Segregated Daily Average Wage Rate**

The daily average rate also varies in terms of agricultural and non-agricultural work. Thus, in all project area, women have lesser wage rate than that of men (see Table 7.9).

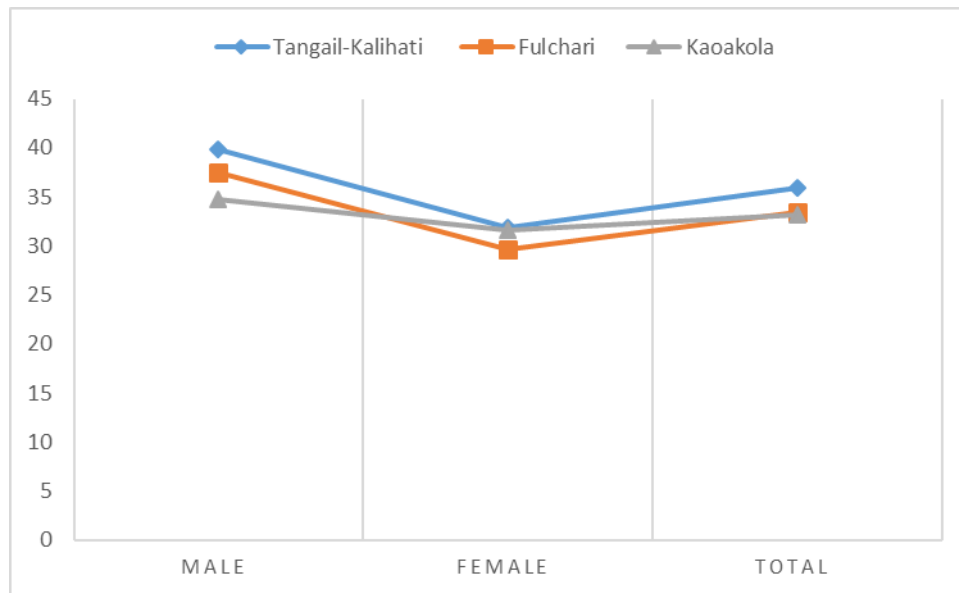
**Table 7.9: Site-specific Gender Segregated Daily Wage Rate in BDT**

Type of activities	Fulchari		Tangail-Kalihati		Kaokola	
	Men	Women	Men	Women	Men	Women
Wage rate of agricultural labour (BDT)	450	350	550	420	500	400
Wage rate of non-agricultural labour (BDT)	430	320	450	300	430	320

Source: BBS, 2012

#### 7.6.4 Education

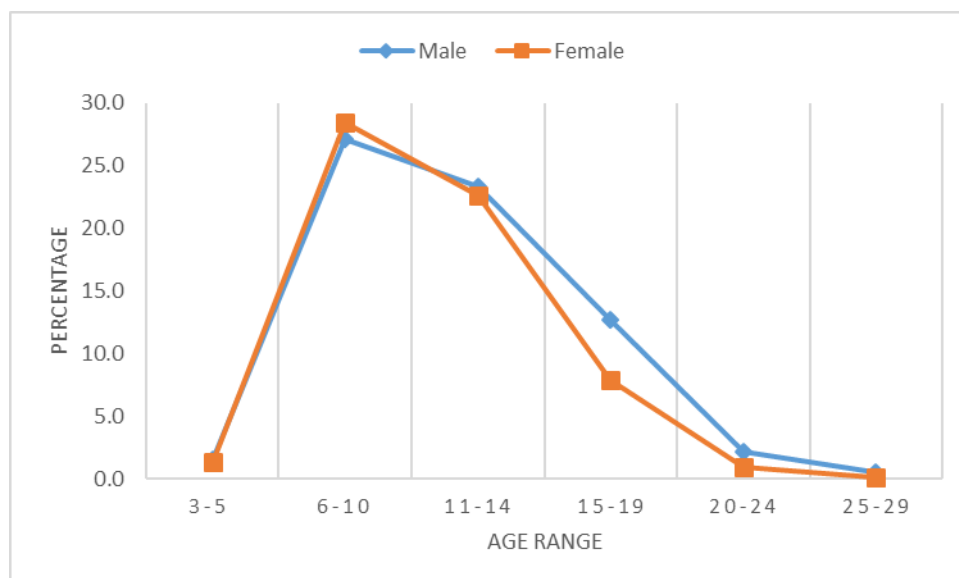
Following the gender segregated literacy rate (Figure 7.25), male literary rate is comparatively higher in all project sites than that of female, although the overall literary rate for Tangail-Kalihati site is slightly higher than Fulchari and Kaoakola char site (BBS, 2012).



Source: BBS, 2012

**Figure 7.24: Gender Segregated Literary Rate**

There is also a variation in enrolment between male and female. Although the enrolment rate is almost equal at the age of first schooling, this rate for female overtops the male at the primary and pre-secondary schooling. The secondary level enrolment then becomes a threshold, from which female enrolment starts gradual drop, and conversely, male enrolment increases (Figure 7.26).



Source: BBS, 2012

**Figure 7.25: Gender Segregated Enrolment**

### 7.6.5 Women empowerment

**Ownership of land:** In the case of the right to land, both women and men enjoy land ownership in the project. Conventionally, muslim families follow Muslim inheritance law while distributing land and other assets. Thus, a man receives twice than that of woman. However, there is a significant gap between convention and practice in the distribution of inherited land or asset. Thus, parents often prefer to distribute the majority share to a son while depriving a daughter, and the son often forces parents to do so. In many cases, the inherited land remains undistributed among children for a longer time, and if wish,

a brother gives a very little amount of land or share a very insignificant amount of earning from the land to their sisters. Women, in fear of losing kinship ties, often overlook this improper distribution of land. The noticeable crisis emerges in the case of female-headed households, in which brother(s) ignores or denies land rights to sister-in-law in the case of the death of her husband. Although women can purchase land by her name, land is often registered for male members of families. The Hindu families follow Hindu inheritance law. According to the Hindu Law of Inheritance (Amendment) Act, 1929, a daughter is fifth in line to her father's property. In the absence of a son, son's son, son's son's son and widows the daughter inherits the property from her father.

***Gender-based participation in public atmosphere:*** While males enjoy open participation at public or social sphere, women have very limited space. The religious bindings play a vital role in shaping this limited participation level. Women are remained 'invisible' socially and culturally because of the embedded social structure and men are considered the bread earner of a household. Women's earning is mostly considered as supplementary to the household income. Thus, the involvement in the economic sectors shapes the presence in the public sector. Since many women are involved in household work, which is private, women do not need to appear publicly.

Against this overall feature, a considerable number of women are increasingly involved in the public sphere such as in petty business, local government election, and NGO based associations. A large number of females of Char area are also increasingly moving outside e.g. in Dhaka city for working in the garment industry, which contributes to household income significantly. Thus, the male-dominated relationship pattern is turning down slowly and leaving space for females. This is noticeably found in educated families who are involved in the service sector. More importantly, Char dwellers and other vulnerable families are gradually investing in educating their children, which is anticipated to derive positive gender relationships.

***Gender-based decision-making role:*** Women can express their opinion in families within which both men and women are involved in income-generating activities. But women's opinion is hardly considered in important and critical issues like land, agriculture and livestock. Women can participate in decision-making process but in general, their opinion is given less importance.

Women have certain skills and social capital of their own. But this capital varies based on their age, economic status, and marital status. Generally, women from well-off families, married and middle-aged women enjoy more freedom than poor and unmarried women. But some aged and married women living on the embankment in Bhuapur (Tangail) and Fulchari (Gaibandha) informed that '*they used to work hard in their young age and in traditional agricultural system men had to depend on women for seed preservation, crop processing*'. During that time women had a certain level of control over household resource and was considered an important part of household'. On contrary, young and newly married women reported that 'they used to enjoy more freedom than that of their mothers and grandmothers.

For daily expenditure, their husbands give them money only when they have handsome income. The men only work outside of the home and do not participate in household works like cooking, cleaning or washing. As mentioned above, women are not allowed to go to the market for selling or buying products. If they want to do so, they need prior approval from their husbands or in-laws. When they go, it is to see a doctor and sometimes to tailor.

***Sexual Exploitation and Abuse, and Sexual Harassment (SEA/SH):*** Although the situation is changing, domestic violence is still prevalent all across Bangladesh including the project areas. All the participants of the focus groups discussions (both men and women), admitted that women are beaten frequently by their husbands if they do not perform or act as 'expected'. This expectation comes from the gender roles such as performing household chores, serving food to the family member on time, taking care of children, helping the husband in agricultural activities, staying at home and limiting a woman's mobility to household premises except when there is a health issue involving the children. In addition, if a woman questions her husband's ability to feed the family or argue with him on a valid ground, this could be considered as unexpected behavior, which generally results in domestic violence. Also, women are often beaten even during pregnancy by their husbands and the reasons are mostly associated with less income by the husbands, not getting the food served by their wives on time, the women asking for money and the

basic needs from their husbands. While they are beaten, the perception is that women depend on men so men have right to beat them, and for the same reason, Women do not go to their UP members to request punishment of their spouses through local arbitration. The women say that very few women will raise voice unless they have a well-off paternal family. Thus, gender-based violence is a big issue in the bankline communities and Chars. The reflection can be found in the response to the question asked to women at Chars- 'when do women feel safe or in what condition/environment do women feel safe,' - they replied that women feel safe- when they are at home, even in the absence of their spouses and when they go out only with their husbands.

### **7.7 Vulnerable Groups/Communities**

People living along the Bankline and in Chars are generally poor and vulnerable to risks of displacement. These include displaced communities now living on embankments, the poor and landless, female-headed households and those under the poverty line, the elderly, and the Char dwellers as tenant farmers, fishers, small landowners, etc. They face everyday vulnerability to disasters and a range of other causal factors, including access to land and limited livelihood sources.

The perception about Char dwellers and their living conditions are fundamentally different than those living in the mainland.<sup>54</sup> The Char dwellers are not helpless victims of disasters; instead, they adopt active adaptive strategies to live with and manage the everyday catastrophe. But these groups may further be disproportionately impacted or disadvantaged by project interventions due to loss of land, displacement and loss of livelihood sources. The precarious bid for survival must be understood in its context. The first priority of these vulnerable people is to be protected from the riverbank erosion and seasonal flooding. Bank erosion turned them impoverished, as their economy, like traditional rural livelihood system, mostly depends on land. Thus, erosion caused their precarious situation. As this study found, many erosion victims who once controlled considerable amount of land, and eventually, the rural power are now powerless, poor people and depend on the Charity or the state allowance. Many of these people are now living on the state-owned khas land: no rights on the land and under the condition of easy eviction because of their helplessness. Further, although their eroded land re-emerged in the form of Char, many of them are unable to reoccupy and claim their ownership because of at least two reasons. First, local powerful actors grab the land as soon as its re-emergence. Second, the claim needs to be settled in the local land office subject other conditions, but the reluctance of the land office, and in some cases, the tendency to consider the land as khas delays and often denies their claim on the land. Thus, the land grabbing and the complexity of land administration also caused vulnerability.

### **7.8 Indigenous People**

There are no known indigenous people or small ethnic minority groups or settlements. This will be further verified during project planning and implementation. Should any small ethnic minority groups be found, appropriate plans will be prepared.

### **7.9 Cultural Heritage and Historical Sites**

There are no known cultural heritage or historical sites in the pilot areas. In case of any chance finds, proper management plans will be prepared in compliance with GOB archaeological regulations and ESF requirements.

### **7.10 Agriculture and Livestock**

Agricultural land in the Project Influencing Area of Fulchari site is 243 hectares and in Kalihait-Tangail site (Alipur) is 101.4 hectares. Cropping pattern, Cropping Intensity and area under different cropping pattern are land class are presented in Table 7.10 and 7.11.

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<sup>54</sup>Mohammad Zaman and Mustafa Alam (eds), *Living on the Edge: Char Dwellers in Bangladesh*, cited earlier.

**Table 7.10: Existing Cropping Patterns of the Fulchari Project AOI**

Land Type	Kharif-I(March-June)	Kharif-II(July-October)	Rabi(November-February)	Fulchari Project AOI	
				Area(ha)	% of NCA
F1 (MHL)	Vegetables	Fallow	Vegetables	6	27.27
	Fallow	HYV Aman	Maize	4	18.18
	Fallow	HYV Aman	Mustard-HYV Boro	5	22.73
	Jute	Fallow	Onion	3	13.64
	Jute	Fallow	Pulse	4	18.18
			sub-total	22	100.00
F2 (MLL)	Jute	Fallow	Maize	21	27.63
	Fallow	HYV Aman	HYV Boro	31	40.79
	Fallow	Fallow	Maize	17	22.37
	Jute	Fallow	Chili	7	9.21
			sub-total	76	100.00
F3 (LL)	Fallow	Fallow	HYV Boro	90	62.07
	Fallow	Fallow	Maize	11	7.59
	Fallow	Fallow	Ground nut	44	30.34
		sub-total	145	100.00	
<b>Grand Total</b>				<b>243</b>	<b>243</b>
<b>Single Cropped Area</b>				<b>162</b>	<b>162</b>
<b>Duble Cropped Area</b>				<b>172</b>	<b>172</b>
<b>Triple Cropped Area</b>				<b>334</b>	<b>334</b>
<b>Total</b>				<b>135</b>	<b>135</b>
<b>Cropping intensity (%)</b>				<b>243</b>	

Note: The study area is defined as the 1km buffer area of the proposed revetment / Bankline to be protected.

Sources: CEGIS estimation based on DAE and field investigation, 2021 and 2022

**Table 7.11 Existing Cropping Patterns of the Tangail-Kalihati Project AOI**

Land Type	Kharif-I (March-June)	Kharif-II (July-October)	Rabi (November-February)	Kalihati Project AOI	
				Area (%)	Area (ha)
F1 (MHL)	Sesame	Fallow	Mustard	10.4	0.7
	Jute	Fallow	Maize	23.4	1.7
	Sesame	Fallow	Blackgram	11.7	0.8
	Millet (Kawon)	Fallow	Potato	11.7	0.8
	Fallow	Fallow	HYV Boro	36.4	2.6
	Sesame	Fallow	Khesheri	6.5	0.5
				100.00	7.1
F2 (MLL)	Fallow	Fallow	HYV Boro	26.4	9.8
	Jute	Fallow	Maize	13.2	4.9
	Fallow	Fallow	Ground nut	26.4	9.8
	Fallow	Fallow	Khesheri	7.5	2.8

Land Type	Kharif-I (March-June)	Kharif-II (July-October)	Rabi (November-February)	Kalihati Project AOI	
				Area (%)	Area (ha)
	Fallow	Fallow	Millet	11.3	4.2
	Fallow	Fallow	LT Boro	15.1	5.6
			sub-total	100	37.2
F3 (LL)	Fallow	Fallow	HYV Boro	55.4	31.6
	Fallow	Fallow	Maize	25.7	14.6
	Fallow	Fallow	Ground nut	10.2	5.8
	Fallow	Fallow	Khesheri	8.7	5.0
			Sub-total	100.00	57.0
Grand Total (NCA)					101.4
Single Cropped Area					92.0
Double Cropped Area					9.5
Triple Cropped Area					0
Total Cropped Area					110.9
Cropping intensity (%)					109.3

Note: The study area is defined as the 1km buffer area of the proposed revetment / Bankline to be protected.

Sources: CEGIS estimation based on DAE and field investigation, 2021 and 2022

### 7.10.1 Farming Practices

Crops are grown during two seasons: Kharif (March-October) and Rabi (November-February). During Kharif season mostly (HYV Aman) rice, maize, jute, sesame, Millet (Kawon) and vegetables are produced whereas during the rabi season crops such as (Lt and HYV Boro) rice, maize, Khesheri, wheat, ground nut, pulses, chili, onion, coriander, mustards, potato and other vegetables are grown. Main agricultural constraints include erosion, flood, drainage congestion, siltation of inland waters, and scarcity of water for irrigation. Livestock and poultry keeping play a significant role in the rural agro-based economy as well, however shrinking and degrading pastures, fodder shortages, disease, and lack of veterinary services are among key problems encountered.

### 7.10.2 Agricultural Labor

In the SAA, most of the crop production is being done manually. So, agricultural labor (seed sowing, intercultural operations, harvesting and post-harvest technologies) is considered as one of the essential inputs for crop production. The labor requirement is not uniform throughout the year and it varies from crop to crop and season to season. In the peak periods (November-January, April-May and July-August), the requirement is very high. The main activities carried out during the peak periods are (i) harvesting of HYV Aman and transplanting of Boro/ sowing of Rabi crops; (ii) harvesting of Boro and Rabi crops and sowing of Kharif-I crops and (iii) harvesting of Sesame, Jute and other Kharif-I crops and transplanting of HYV Aman (iv) Sowing and harvesting of annual crops, Onion, and pulses etc. During the peak period, laborers move from one region to another in search of work.

### 7.10.3 Crop Production and Damage

The yield level of different crops is closely associated with the supply level of input use and agricultural practices. In determining the yield level of four locations of Aman and Boro crops, the average yield value of High Yielding Variety (HYV) and local varieties has been considered. The yield rate of Kharif and Rabi crops includes average yield value of all crops are presented separate location. The crop yield rate has been estimated from the information collected from DAE offices. The details of the cropping pattern, production and damages are presented in 7.12.



**Table 7.12: Existing Cropped Area, Annual Production and Damage in the Project Influencing Area of Fulchari**

Crop name	Cropped Area	Damage free		Damaged		Total production	Production loss
	(ha)	Area	Yield	Area	Yield	(Metric ton)	(Metric ton)
		(ha)	(Metric ton/ha)	(ha)	(Metric ton/ha)		
HYV Aman	40	39	3.1*	1	1.8	121	1.8
HYV Boro	131	129	4.2*	2	2.5	542	5
<b>Total rice</b>	171	168		3		663	7
Maize	53	53	4.3	-	-	228	-
Ground nut	44	44	1.6	0	1.1	70	0
Jute	35	35	2.2	0	0	77	0
Chilli	7	7	2.8	-	-	19.6	-
Onion	3	3	12	0	1	36	-
Mustard	4	3	1.4	0	0.98	4.2	
Summer vegetables	5	5	1.2	-	-	6.2	-
Winter vegetables	6	5	9	1	8.5	45	8.5
<b>Total non-rice</b>	6	6	9.5	-	7.5	57	-
<b>Grand Total</b>	163	161		1		543	9

Note: The study area is defined as the 1km buffer area of the proposed revetment / Bankline to be protected. Sources: CEGIS estimation based on DAE and field investigation, 2021

\*cleaned/husked

rice

#### **7.10.4 Livestock Resources**

Livestock and poultry, being an essential element of integrated farming system, play an important role in the economy of the project area. The contribution of the livestock sector to overall GDP has been provisionally estimated at 1.78% for 2013-14. Its share of agricultural GDP in 2016-17 was 15% (provisionally estimated). Despite its modest share of overall GDP, livestock serves an essential role as a source of protein, employment generation, export earning, and provision of food security. Livestock resources play an important role in the sustenance of landless people, livelihood options for the rural poor families and are potentially important for poverty reduction. Livestock information's were collected from DoL of the study area. Figure 7.27 and 7.28 demonstrate the beef fattening and poultry farm respectively in the study area.



**Figure 7.26: Beef Fattening in the Study Area**



**Figure 7.27: Poultry Farm Inside the Study Area**

## **Annex 9.1: Occupational Health and Safety**

## 9 Occupational Health and Safety

This Chapter will guide Project 1 contractors to prepare site and contract specific occupational health and safety (OHS) plan based on the information on design, construction program, and work forces for both BWDB and BIWTA components.

### 9.1.1 Purpose

The Occupational Health and Safety Plan (OHSP) is the key tool to manage occupational health and safety (OHS) risks associated with the Project. Its core purpose is to ensure that all activities are planned, carried out, controlled and directed with consistent, approved, health and safety management practices, procedures or standards.

This document is a framework for the Contractor to a practical approach to manage OHS risks as per ESS2 requirements, World Bank Group as Environmental Health and Safety Guidelines (EHSGs), Good International Industry Practices, specific international standards such as US OSHA, AUS/NZ, UK, etc. and Bangladesh's regulatory framework, and requirements will be stated in the contract, such as:

- Bangladesh Labor Act, 2006 (as amended through July 22, 2013)
  - Chapter VII of the Labor Act 2006, Special Provisions Relating to Health Hygiene and Safety
  - Chapter VI of the Labor Act 2006, Safety, Sections 61 to 78 addresses all construction related safety
  - The 2013 amendment on the Labor Act, makes a large number of revisions to the 2006 Act in terms of compensation due to death (s19), termination of employment (s 23, s24 and s27), resolving dispute over a child's age (s36), dangerous work for children (s39), emergency exits (s62); access to gangways, stairs etc. for workers (s72), adding a new section 78a concerning mandatory use of personal safety equipment, notification of competent authority in case of incident (s80), establishment of a health center in companies employing more than 5000 workers (s89), adding a new section on formation of a safety committee (s90a), compulsory group insurance (s99), adding a new section 124a entitled 'Payment of dues including wages through conciliation, and prohibition on deducting money to survivors of a worker who has died (s155).
- ESS2 – Labor and Working Conditions
  - The Borrower will develop and implement Labour Management Procedures applicable to the Project.
  - Measures relating to occupational health and safety will be applied to the project. The OHS measures will include the requirements of ESS2 and will consider the General Environmental Health and Safety Guidelines (EHSGs) and, as appropriate, the industry-specific EHSGs and other GIIP.
  - The OHS measures will be designed and implemented to address, (a) identification of hazards, (b) provision of preventive and protective measures, (c) training of project workers, (d) documentation, reporting, and remedies of occupational incidents, (e) emergency prevention and preparedness and response arrangements to emergency situations, and (f) remedies for adverse impacts such as occupational injuries, deaths, disability and disease.
  - All parties who employ or engage project workers will develop and implement procedures to establish and maintain a safe working environment, including that workplaces, machinery, equipment and processes under their control are safe and

without risk to health, including by use of appropriate measures relating to chemical, physical and biological substances and agents. Such parties will actively collaborate and consult with project workers in promoting understanding, and methods for, implementation of OHS requirements, as well as in providing information to project workers, training on occupational safety and health, and provision of personal protective equipment without expense to the project workers.

- Workplace processes will be put in place for project workers to report work situations that they believe are not safe or healthy, and to remove themselves from a work situation which they have reasonable justification to believe presents an imminent and serious danger to their life or health. Project workers will not be retaliated against or otherwise subject to reprisal or negative action for such reporting or removal.
  - Project workers will be provided with facilities appropriate to the circumstances of their work, including access to canteens, hygiene facilities, and appropriate areas for rest.
  - A system for regular review of occupational safety and health performance and the working environment will be put in place and include identification of safety and health hazards and risks, implementation of effective methods for responding to identified hazards and risks, setting priorities for implementation, and evaluation of results.
- World Bank Group Environmental Health and Safety Guidelines (EHSGs), 2007.
  - ILO Code of Practice. 1992, Safety and Health in Construction Industry ISBN 92-2-107104-9
  - Safety and Health in Building and Civil Engineering Work, ILO Codes of Practices
  - American National Standard Institute (ANSI) for Personal Protective Equipment (PPE). As for example, Eye and Face Protection (ANSI Z87.1-1989), Head Protection (ANSI Z89.1-1986), Foot Protection (ANSI Z41.1-1991) or equivalent acceptable to the Engineer.
  - Good International Industry Practices (e.g., OSHA)
  - ESF/Safeguards Interim Note: COVID 19 Considerations in Construction/Civil Works Projects, April 7, 2020.

### **9.1.2 Scope**

OHS framework is applicable to all activities related to the JRSMP Project 1 construction.

Some of the key high-risk activities may involve the following:

- Vehicles and driving;
- Ground control and support structures;
- Construction of a coffer dam at pile site (e.g., Groyne construction);
- Excavation work;
- Pile driving
- Operation of mobile equipment on site and on community roads including passenger vehicles, truck dumpers, excavators, graders, loaders etc.;
- Work at height and dropped objects;
- Work in confined space;
- Work over or near water;
- Material haulage;
- Manual handling;
- Lifting and crainage;
- Welding work;

- Concrete batching;
- Maintenance and operation of the vessels and other water transports;
- Maintenance and operation of the site camp and other facilities like workshop and first aid center; and

### **9.1.3 Objectives and Targets**

Following are the objectives of developing the OHS framework:

- Safe operation with Zero harm to community members and Contractor's Staff
- Meet or exceed the contractual safety obligations

The Contractor will establish project specific measurable targets to achieve above mentioned objectives. The determination of these targets is based upon Contractor's continual improvement philosophy, external peer group benchmarking and stakeholders' input. The Contractor will establish targets for each Project for every fiscal year and can make targets as the following:

- Total Recordable Injury Rate of 1.5 or less (or based on the Contractor previous yearly trend)
- Lost Time Injury Frequency Rate of 0.5 or less (or based on the Contractor previous yearly trend)

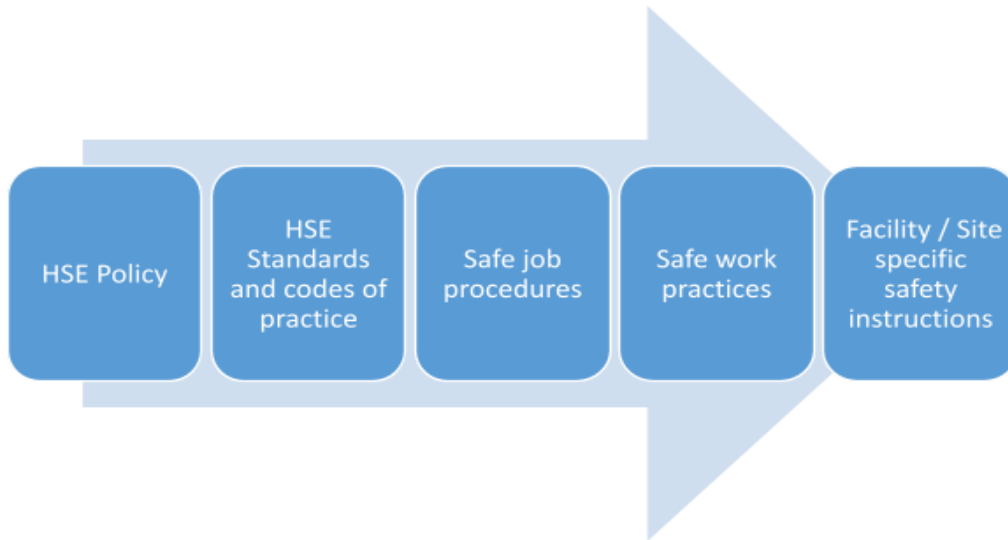
Project Senior Leadership, Project Manager, Construction Manager and Technical Director are fully committed to achieve the above-mentioned targets. Leading and lagging indicators should be established by the Contractor to drive performance to meet these targets. Following are some leading indicators showing senior management commitment. Complete details of all Key Performance Indicators (KPIs) should be presented in "PR13: Measurement" Process of Contractor's project specific OHS framework.

- All Project Manager complete 1 Walk-through Inspection per month.
- All Construction Managers complete 2 Walk-through Inspections per month with their assigned Health and Safety Officer.
- All OHS supervisors complete 1 site inspection weekly.

### **9.1.4 Working Together for Success**

The responsibility for safety cannot be "delegated" to "OHS Officers or HSE Managers". The OHS staff of the Contractor support line management by assisting in jobsite training, serving as trained and knowledgeable observers, providing administrative assistance, monitoring and evaluating the success of the safety program and acting to continuously improve this plan. While this role is important, commitment and active participation by everyone, every day, on every task, is necessary if the Contractor is to achieve the level of safety excellence that the Borrower expects.

The Contractor follows a hierarchy of OHS implementation. Mandatory requirements are established by the HSE policy, followed by the agreed OHS Management system standard, linked to other OHS system controls such as; standards, codes of practices, safe job procedures, safe work practices and facility / site specific safety instructions and any other safe systems of work that fosters a safe environment at the work execution level (refer to diagram in **Figure 9.1**).



**Figure 9.1: OHS Management System**

Requirements at any level must meet and support the requirements at higher levels. The HSE policy and OHS management system standard apply to all activities covered in the scope of this OHS framework.

All relevant OHS documents and tools are available and held by the OHS Officer of the project.

#### **9.1.5 OHS Framework Review and Revision**

This document provides a comprehensive framework to meet the contractual obligations to achieve safe work. The OHS Plan will be a set of living documents that will undergo routine review and updates when any of the following happens:

- There is a change in the scope of the project, or
- A yearly periodic review, or
- There is a change in construction methodology/technique based on site condition, or
- Following a significant OHS hazard or a major accident, and instructed by the Engineer, or
- At the end of the Project (to allow for improvements in subsequent projects).

The Contractor's OHS Officers are responsible for the review and update.

In addition, the Contractor can also prepare, submit and implement OHS sub plans and Standard Operating Procedures (SOPs) to address specific construction hazards either as a separate document or as part of the Method Statement.

#### **9.1.6 OHS Management System Expectations**

The Contractor management should believe in Zero harm to community and all individuals while carrying operational activities. To ensure that the Contractor has prepared the OHS Plan in accordance with the following minimum expectations in line with the policies stated above:

- Safety requirement mentioned in the contract document;
- National regulations and district level by laws (if any);
- ESS2 – Labor and Working Conditions and associated Guidance Note
- World Bank Group Environmental, Health and Safety, General Guidelines-2007;
- ESF/Safeguards Interim Note: COVID 19 Considerations in Construction/Civil Works Projects, April 7, 2020.



- International Labour Organization Code of Practice in Health and Safety in Construction, 1992; and
- Good International Industry Practices (e.g., OSHA, ANSI).

Given above, all resources of standards and guidelines have been described. Following principles further elaborates on this.

- Wherever there is a conflict in guidance of the above, the more stringent safety requirement shall be applied. The Contractor will make sure that all applicable local regulations are always complied with.
- In this document 'Shall' and 'must' signifies a mandatory requirement whereas 'Should' will be used to mention a recommended practice that the Contractor management will strive to accomplish.

## 9.2 Hazard Risk Assessment

A hazard risk assessment is a critical examination of health and safety hazards at a construction site and operation and maintenance (O/M) work. Performing regular hazard risks assessments can help construction and O/M stakeholders comply with OHS regulations. Hazard risks assessments can help OHS and technical teams implement corrective measures to protect workers from health and safety threats during construction and operation stages.

### 9.2.1 Hazard Risks Assessment Codes

The principle behind the Hazard Risks Assessment System and the assignment of Hazard Risks Assessment Codes (HRACs) is to identify and control workplace hazards. HRACs are based on the hazard severity, probability of occurrence, and number of people exposed or potentially adversely affected in the event of an accident. While all hazards should be resolved as soon as possible, the Hazard Risks Assessment System is a safety risk ranking method to assist in making informed decisions concerning hazard control while providing decision makers with a consistent and defensible approach for prioritizing safety hazard abatement efforts based on available resources and with consideration towards competing demands and priorities.

### 9.2.2 Likelihood and Consequence of Hazards

HRACs require assigning values for likelihood or probability of an outcome occurring, and the consequence or severity of a potential outcome. Based on these assigned values, a matrix format is used to place the specific hazard within a specific location of the matrix. This location can then be used to determine an HRAC number for that hazard activity.

The Likelihood or probability Code is considered numerical (1 through 5). These are presented in **Table 9.1**.

**Table 9.1: Likelihood Ratings**

Sl.	Likelihood	Definition
1	Remote (1)	Unlikely to occur but known in the sector; probability 0.1%-1%
2	Possible (2)	Likely to occur once or more during construction/ organization; probability 1%-10%
3	Occasional (3)	Likely to occur once every two years or more; probability 10%-50%
4	Likely (4)	Occurs more than once or twice per year, is continuous or certain to occur; probability 50%-80%
5	Frequent (5)	Multiple occurrences have happened frequently in the industry; probability >80% and above

Next is the Consequence or severity Code, varies from 1 to 5 and is presented in **Table 9.2**.

**Table 9.2: Consequence Ratings**

Sl.	Consequence	Definition
1	Incidental (1)	No impact or minor First Aid injury
2	Minor (2)	First aid injury (e.g., minor cuts and bruises, eye irritation from dust) or very minor health effect
3	Moderate (3)	Lost Time/ Non-Lost Time injury (e.g., sprains, fracture, cut, lacerations, burns or bruises) or health effect (i.e., deafness or dermatitis)
4	Serious (4)	Major injuries: amputations, major fractures, multiple injuries, or health effects: severely life shortening disease, occupational illness, Single Fatality (drowning)
5	Catastrophic (5)	Multiple fatalities or Multiple permanent disabilities

**9.2.3 Risks Assessment Matrix**

The hazard risks assessment matrix is presented in **Table 9.3**. This matrix helps OHS team to prioritize workplace hazards by identifying them as high, warning, medium, and low. Those hazards identified as high will require the most stringent controls available as well as immediate attention. They may even demand that such activities be cancelled from the Project. Specific workplace controls can be applied so that the associated hazards are more effectively controlled and therefore, result in a revised assessment category to a more acceptable level. Note that the box at the bottom indicates that if we can eliminate the hazard (such as eliminating the task that subjects the worker to the hazard or allowing an outside specialized contractor to complete the task for the worker), the hazard no longer exists and therefore can be removed from a project’s control process – this is the ultimate hazard control.

**Table 9.3: Risk Matrix**

Likelihood Severity	Remote (1)	Possible (2)	Occasional (3)	Likely (4)	Frequent (5)
Incidental (1)	Low (1)	Low (2)	Low (3)	Low (4)	Low (5)
Minor (2)	Low (2)	Low (4)	Low (6)	Medium (8)	Medium (10)
Moderate (3)	Low (3)	Low (6)	Medium (9)	Warning (12)	Warning (15)
Serious (4)	Low (4)	Medium (8)	Warning (12)	High (16)	High (20)
Catastrophic (5)	Low (5)	Medium (10)	Warning (15)	High (20)	High (25)

Table 9.4: Summary of Risks, their Significance and Control Measures

Sl	Activity	Hazards	Reasons	Risk Ranking			Fatality Risk?	Control Measures	Risk Ranking			Residual justification	Responsibility
				Likelihood	Conseq.	Risk			Likelihood	Conseq.	Risk		
<b>Mobilization and Construction of Groins</b>													
1	Workforce mobilization/ Construction/ site preparation	Crowded workplace and accommodation	<ul style="list-style-type: none"> <li>Lack of spaces among workers</li> <li>Social confliction</li> <li>Different political and religious views</li> <li>Lack of awareness</li> </ul>	3	3	9	Multiple	<ul style="list-style-type: none"> <li>Enough space among the workers should be ensured to avoid this accident</li> <li>Prohibit religious or political discussion among the workers</li> <li>Safety of Female workers should be ensured</li> <li>Provide trainings on labor code of conduct</li> <li>Standard design of accommodation providing enough space to each person.</li> </ul>	2	2	4	Though enough precaution measures and training will be provided to the workers, still there might have some chaos among the workers	Site Supervisor
				4	4	16	Multiple		2	2	4		
				3	4	12	Single/ Multiple		2	4	8		
				2	5	10	Single		1	4	4		
2	Equipment mobilization & construction materials transport through public road (especially pre-cast piles)	Being struck or run over by moving machines, 3rd party accident from loose material Traffic congestion	<ul style="list-style-type: none"> <li>Driving at unsafe speed and not to conditions</li> <li>Equipment failure</li> <li>Distraction</li> </ul>	3	5	15	Multiple	<ul style="list-style-type: none"> <li>SOP04: Mobile Equipment.</li> <li>SOP05: Barricading and Signage.</li> <li>SOP07: Safe Driving.</li> <li>SOP09: Material Haulage (Loading and Unloading).</li> <li>SOP10: Traffic Interface Planning.</li> <li>SOP22: Equipment Inspection &amp; Maintenance.</li> </ul>	2	4	8	If an accident occurs it may still result in multiple fatalities. None of these controls restricts a truck to only killing one person	OHS Staff/ Supervisor

SI	Activity	Hazards	Reasons	Risk Ranking			Fatality Risk?	Control Measures	Risk Ranking			Residual justification	Responsibility
				Likelihood	Conseq.	Risk			Likelihood	Conseq.	Risk		
											after taking precaution measure. So it is assumed some risk will be there but likelihood will be reduced		
3	Piling / Excavating	Lifting/rigging/collapsing	<ul style="list-style-type: none"> <li>Faulty equipment</li> <li>Lack of training</li> <li>Contact with machinery during lifting, movement of piling rigs etc.</li> <li>Naked bore holes</li> </ul>	3	4	12		<ul style="list-style-type: none"> <li>SOP 03: Excavation</li> <li>SOP 08: Piling and Grouting</li> <li>SOP12: Lifting and Rigging</li> <li>SOP14: Work Near or Over Water</li> <li>SOP 22: Equipment Inspection and Maintenance</li> <li>SOP 28SOP 28: Contractor Security Management</li> </ul>	3	3	9	Largely administration controls. Likelihood reduced due to lower potential of multiple fatalities	Site Engineer
	In-situ stitching of pile section	Crushing or pinching injuries during in-situ stitching between sections Collision with other ships or working boat	<ul style="list-style-type: none"> <li>Lack of trained worker</li> <li>Absence of proper signage and signals</li> </ul>	2	3	6	Single/ Multiple	<ul style="list-style-type: none"> <li>Well trained worker should be engaged for such type of work</li> <li>Performing hot work in safe locations away from fire hazards</li> <li>Never perform hot work in an area where flammable vapors or combustible materials exist; and using guards to “confine the heat, sparks, and slag, and to protect the immovable fire hazards.</li> </ul>	1	3	3	Protective measures and proper awareness can eliminate this hazard mostly	Site engineer

SI	Activity	Hazards	Reasons	Risk Ranking			Fatality Risk?	Control Measures	Risk Ranking			Residual justification	Responsibility
				Likelihood	Conseq.	Risk			Likelihood	Conseq.	Risk		
								<ul style="list-style-type: none"> <li>PR11: Personal Protective Equipment (PPE)</li> <li>Loud Whistle should be blown before starting the construction activities</li> <li>Proper signage and signal can avoid collision</li> </ul>					
4	Construction of groin	Land sliding due to earth works, and preparation of slope	<ul style="list-style-type: none"> <li>Unstable surroundings</li> <li>Lack of Barricading and faulty ground support</li> </ul>	2	5	10	Multiple	<ul style="list-style-type: none"> <li>SOP 03: Excavation</li> <li>SOP05: Barricading and Signage</li> <li>SOP14: Work Near or Over Water</li> <li>SOP 29: Cofferdam Construction</li> </ul>	2	3	6	Likelihood would be reduced but still there is chance to happen accident if the precaution measures not implemented strictly	Site Engineer And OHS Staff/ Supervisor
		Swept away by river wave resulting drowning	Sudden strong river flow and wave	1	4	4	Single/multiple	<ul style="list-style-type: none"> <li>SOP05: Barricading and Signage</li> <li>SOP14: Work Near or Over Water</li> <li>SOP 29: Cofferdam Construction</li> </ul>	1	4	4	Drowning could still occur but likelihood may be reduced	Site Engineer And OHS Staff/ Supervisor
5	Work during extreme weather	Extreme Heat Exposure	Working under direct sunlight for a long time	3	3	9	Multiple	<ul style="list-style-type: none"> <li>SOP11: Severe Weather</li> <li>SOP14: Working Near or Over Water</li> <li>SOP 24: Worker Welfare Facilities</li> <li>SOP 23: First Aid</li> </ul>	2	3	6	Control measures can reduce the likelihood but not reduce the consequences	OHS Staff/ Supervisor
		Extreme Rain, Flood and	<ul style="list-style-type: none"> <li>Working under direct</li> </ul>	3	5	15	Multiple	<ul style="list-style-type: none"> <li>SOP11: Severe Weather</li> </ul>	3	3	9	Control measures can	

SI	Activity	Hazards	Reasons	Risk Ranking			Fatality Risk?	Control Measures	Risk Ranking			Residual justification	Responsibility
				Likelihood	Conseq.	Risk			Likelihood	Conseq.	Risk		
		disaster event	rain <ul style="list-style-type: none"> <li>Working near eroding river bank</li> <li>Working near high water level of river</li> <li>Working near river</li> </ul>					<ul style="list-style-type: none"> <li>SOP14: Working Near or Over Water</li> <li>SOP 23: First Aid</li> </ul>				reduce the likelihood of the consequences	
6	Operation of construction equipment and vehicles	Noise	Continuous noise exposure during piling and other machinery operation	4	3	12		<ul style="list-style-type: none"> <li>SOP 09: Material Transport (land and water)</li> <li>SOP22: Equipment Inspection &amp; Maintenance.</li> <li>SOP28: Plant Construction and Operation</li> </ul>	3	3	9	Unlikely to drop the likelihood to "Possible" due to the typically poor implementation of noise controls	OHS Staff/ Supervisor
7	Scaffolding / Ladder works for piling operation	Falling from Height	Missing toe board, incomplete scaffolding, unguarded openings etc.	3	4	12	Single (multiple could occur but unlikely)	<ul style="list-style-type: none"> <li>SOP02: Working at Height</li> <li>SOP05: Barricading and Signage</li> <li>SOP13: Scaffold Erection</li> <li>SOP15: Illumination</li> <li>SOP22: Equipment Inspections and Maintenance</li> </ul>	2	3	6	Depends on the complexity of work and implementation of the proposed measures the risks likelihood will be decreased but still might have	OHS Staff/ Supervisor

SI	Activity	Hazards	Reasons	Risk Ranking			Fatality Risk?	Control Measures	Risk Ranking			Residual justification	Responsibility
				Likelihood	Conseq.	Risk			Likelihood	Conseq.	Risk		
											some fatal physical injuries		
		Falling objects due to missing nets or throwing/dropping material during dismantling	Missing safety nets or barricading of the working area, and throwing/dropping material during dismantling	3	4	12	Single (multiple could occur but unlikely)	<ul style="list-style-type: none"> <li>SOP02: Working at Height</li> <li>SOP05: Barricading and Signage</li> <li>SOP13: Scaffold Erection</li> <li>SOP15: Illumination</li> <li>SOP22: Equipment Inspections and Maintenance</li> </ul>	3	3	9	Due to the complexity of controls for working at heights Lapses still possible with the implementation of working at height controls. Could still result in fatality.	OHS Staff/ Supervisor
8	Construction material	Dealing with grouting materials may cause acute inhalation toxicity. Irritating to the skin. Contact with powder or wetted form may result in irritation, rash and dermatitis	<ul style="list-style-type: none"> <li>Continuous contact</li> <li>Lack of protective equipment</li> </ul>	3	4	12	Unlikely	<ul style="list-style-type: none"> <li>SOP21: Hazardous Materials</li> <li>SOP 22: Equipment Inspection and Maintenance</li> <li>SOP 24: Worker Welfare Facilities</li> <li>SOP28: Plant Construction and Operation</li> </ul>	2	2	4	Potential still exists for irritation, rash and dermatitis and permanent damage. In addition, the controls are focused on PPE.	OHS Staff/ Supervisor



SI	Activity	Hazards	Reasons	Risk Ranking			Fatality Risk?	Control Measures	Risk Ranking			Residual justification	Responsibility
				Likelihood	Conseq.	Risk			Likelihood	Conseq.	Risk		
		and permanent damage											
9	Site preparation / construction	Soil Fungus	<ul style="list-style-type: none"> <li>Breathing the fungus</li> <li>Lack of protective measures</li> </ul>	3	3	9	Multiple	<ul style="list-style-type: none"> <li>SOP 23: First Aid</li> <li>SOP 24: Worker Welfare Facilities</li> <li>SOP 25: Camp Management</li> <li>SOP 28: Plant Construction and Operation</li> </ul>	2	3	6	Proper use of PPE can reduce the likelihood but won't reduce the consequence	OHS Staff/ Supervisor/ Site supervisor
10	Site preparation / construction	Viruses including COVID-19 virus	<ul style="list-style-type: none"> <li>Highly transmitted</li> <li>Lack of PPE</li> </ul>	3	5	15	Multiple	<ul style="list-style-type: none"> <li>Medical screening and proof of vaccination are needed prior to the employment</li> <li>The Contractor may conduct induction training or workshop for all workforce to introduce the basics of these diseases, how they transmit and about the preventive measures.</li> <li>Contractor can organize vaccination program in the camp for the non-vaccinated workforce prior to the engagement on-site.</li> <li>Use masks properly to inhibit the inhalation of virus or bacteria or other dust materials</li> <li>Maintain a safe distance (6 feet) among workers to prevent the infectious from other carriers including human body</li> <li>Contractor will develop a Grievance procedure in place that will be adopted for COVID-19 where both workers and community members have an establish mechanism to contact the Project authority</li> </ul>	2	3	6	Protective measures might reduce the likelihood but still the chance of fatalities or even death will be same	

SI	Activity	Hazards	Reasons	Risk Ranking			Fatality Risk?	Control Measures	Risk Ranking			Residual justification	Responsibility
				Likelihood	Conseq.	Risk			Likelihood	Conseq.	Risk		
								(e.g., point of contact, phone numbers) regarding COVID-19 issues. <ul style="list-style-type: none"> <li>As this project is associated with construction works, guidance given in the ESF/Safeguards Interim Note on COVID 19 (Issued on April 7, 2020) should be followed strictly.</li> <li>PR14: Pandemic Action Plan</li> </ul>					
11	Natural disaster	Storm and thunderstorm	Natural	3	4	12	Multiple	<ul style="list-style-type: none"> <li>SOP11: Severe Weather</li> <li>SOP 24: Worker Welfare Facilities</li> <li>SOP 25: Camp Management</li> <li>SOP 26: Emergency Response Plan</li> <li>Supervisor should take away all the workforce in a well-protected zone inside the work premises. If it is converted to cyclone, take shelter in the nearest cyclone shelter</li> <li>Follow the command and instruction of the respective site supervisor</li> </ul>	3	3	9	Control measures can reduce the likelihood of the consequences	OHS Staff/ Supervisor / Site supervisor
		High tide/flooding	Natural	3	4	12	Single/ Multiple	<ul style="list-style-type: none"> <li>SOP05: Barricading and Signage</li> <li>SOP14: Work Near or Over Water</li> <li>SOP 26: Emergency Response Plan</li> <li>SOP 28: Contractor Security Management</li> <li>SOP 29: Cofferdam Construction</li> </ul>	2	3	6	Control measures can reduce the likelihood of the consequences	OHS Staff/ Supervisor / Site supervisor
12	Manual handling and material lifting	Ergonomic	<ul style="list-style-type: none"> <li>Lack of training of Heavy load</li> </ul>	3	4	12	Single/ Multiple	<ul style="list-style-type: none"> <li>Proper training needs to be provided to use the right tool in a right way</li> <li>Lifting capable weight in a right direction</li> </ul>	2	4	8	Likelihood would be reduced by	OHS Staff/ Supervisor

SI	Activity	Hazards	Reasons	Risk Ranking			Fatality Risk?	Control Measures	Risk Ranking			Residual justification	Responsibility
				Likelihood	Conseq.	Risk			Likelihood	Conseq.	Risk		
			lifting, <ul style="list-style-type: none"> <li>Repetitive work and so on</li> </ul>					<ul style="list-style-type: none"> <li>Take break if there is any repeated works like hammering.</li> <li>Switch the hand periodically</li> </ul>				proper implementation of measures and training but consequence might be still potential	
13	Mobilization	Water Traffic causes collision with working boat and other regular ships or cargo	<ul style="list-style-type: none"> <li>Deployment of working vessels</li> <li>Absence of navigational aid</li> <li>Lack of light</li> </ul>	4	3	12	Multiple	<ul style="list-style-type: none"> <li>SOP 06: Safe Driving</li> <li>SOP 09: Material Transport (land and water)</li> <li>SOP14: Working Near or Over Water</li> <li>SOP 15: Illumination</li> <li>SOP 26: Emergency Response Plan</li> <li>SOP 28: Contractor Security Management</li> <li>To alert other vessels in the area of the emergency situation during construction, a visual distress signaling device may be used in conjunction with alarms</li> </ul>	2	3	6	Largely administration controls. Likelihood reduced due to lower potential of multiple fatalities	OHS Staff/ Supervisor
		Noise pollution	Continuous engine sound	3	3	9	Unlikely cause any fatality	<ul style="list-style-type: none"> <li>SOP 09: Material Transport (land and water)</li> <li>SOP 22: Equipment Inspection and Maintenance</li> <li>SOP 24: Worker Welfare Facilities</li> </ul>	3	3	9	Unlikely to drop the likelihood to "Possible" due to the typically poor implementation of noise controls	OHS Staff/ Supervisor / Site engineer
15	Natural disaster	Storm and thunderstorm	Natural	3	4	12	Multiple	<ul style="list-style-type: none"> <li>SOP11: Severe Weather</li> <li>SOP 24: Worker Welfare Facilities</li> <li>SOP 25: Camp Management</li> </ul>	3	2	6	Although humans can do little or nothing	OHS Staff/ Supervisor /Site

SI	Activity	Hazards	Reasons	Risk Ranking			Fatality Risk?	Control Measures	Risk Ranking			Residual justification	Responsibility
				Likelihood	Conseq.	Risk			Likelihood	Conseq.	Risk		
		High tide/flooding may cause anchor failure and sudden swift of cranes and rigging	Natural	3	4	12	Single/ Multiple	<ul style="list-style-type: none"> <li>SOP 26: Emergency Response Plan</li> <li>SOP05: Barricading and Signage</li> <li>SOP14: Work Near or Over Water</li> <li>SOP 26: Emergency Response Plan</li> <li>SOP 28: Contractor Security Management</li> </ul>	2	3	6	to protect the incidence or intensity of most natural phenomena but the control measures can reduce the likelihood of the consequences	Supervisor
<b>Construction of Mobile Barge Terminal and Jetty</b>													
16	Piling / Excavating	Lifting/rigging/collapsing	<ul style="list-style-type: none"> <li>Faulty equipment</li> <li>Lack of training</li> <li>Contact with machinery during lifting, movement of piling rigs etc.</li> </ul>	3	4	12	Single/ Multiple	<ul style="list-style-type: none"> <li>SOP 03: Excavation</li> <li>SOP 04: Mobile Equipment</li> <li>SOP 08: Piling and Grouting</li> <li>SOP12: Lifting and Rigging</li> <li>SOP13: Scaffolding</li> <li>SOP 22: Equipment Inspection and Maintenance</li> <li>SOP 28: Contractor Security Management</li> </ul>	2	3	6	Largely administration controls. Likelihood reduced due to lower potential of multiple fatalities	Site engineer
17	Construction equipment	Noise exposure	Continuous noise exposure during construction and other machinery sound	4	3	12	Multiple	<ul style="list-style-type: none"> <li>SOP 09: Material Transport (land and water)</li> <li>SOP 22: Equipment Inspection and Maintenance</li> <li>SOP 24: Worker Welfare Facilities</li> </ul>	3	3	9	Unlikely to drop the likelihood to "Possible" due to the typically poor implementation of noise	OHS Staff/ Supervisor

SI	Activity	Hazards	Reasons	Risk Ranking			Fatality Risk?	Control Measures	Risk Ranking			Residual justification	Responsibility
				Likelihood	Conseq.	Risk			Likelihood	Conseq.	Risk		
												controls	
18	Machineries and Equipment mobilization	Navigation/ transportation/ collision Hazards	<ul style="list-style-type: none"> <li>Deployment of working vessels</li> <li>Absence of navigational aid</li> </ul>	3	3	9	Multiple/ single	<ul style="list-style-type: none"> <li>SOP 06: Safe Driving</li> <li>SOP 09: Material Transport (land and water)</li> <li>SOP14: Working Near or Over Water</li> <li>SOP 15: Illumination</li> <li>To alert other vessels in the area of the emergency situation, a visual distress signalling device may be used in conjunction with alarms</li> </ul>	2	3	6	Largely administration controls. Likelihood reduced due to lower potential of multiple fatalities	Site supervisor
19	Natural disaster	Storm, cyclone, flooding and high tide	Natural	3	4	12	Multiple	<ul style="list-style-type: none"> <li>SOP11: Severe Weather</li> <li>SOP14: Working Near or Over Water</li> <li>SOP 24: Worker Welfare Facilities</li> <li>SOP 26: Emergency Response <u>Plan</u></li> <li>Supervisor should take away all the workforce in a well protected zone inside the work premises If it is converted to cyclone, take shelter in the nearest cyclone shelter</li> <li>Follow the command and instruction of the respective site supervisor,</li> </ul>	3	2	6	Although humans can do little or nothing to protect the incidence or intensity of most natural phenomena but the control measures can reduce the likelihood of the consequences	OHS Staff/ Supervisor
<b>Installing Navigation Aids</b>													
20	Installation	Water traffic	Deployment of several working vessels	3	3	9	Multiple	<ul style="list-style-type: none"> <li>SOP 06: Safe Driving</li> <li>SOP 09: Material Transport (land and water)</li> <li>SOP14: Working Near or Over Water</li> </ul>	2	3	6	Largely administrative controls. Likelihood	Site engineer

SI	Activity	Hazards	Reasons	Risk Ranking			Fatality Risk?	Control Measures	Risk Ranking			Residual justification	Responsibility
				Likelihood	Conseq.	Risk			Likelihood	Conseq.	Risk		
								<ul style="list-style-type: none"> <li>SOP 15: Illumination</li> <li>SOP 26: Emergency Response Plan</li> <li>SOP 28: Contractor Security Management</li> </ul>				reduced due to lower potential of multiple fatalities	
		Fall into water from working vessel	<ul style="list-style-type: none"> <li>Unguarded edge of working vessel</li> <li>Struck by another vessel</li> </ul>	3	4	12	Single / Multiple but unlikely	<ul style="list-style-type: none"> <li>SOP05: Barricading and Signage</li> <li>SOP 07: Cell Phone Use</li> <li>SOP14: Work Near or Over Water</li> <li>SOP 26: Emergency Response Plan</li> <li>SOP 28: Contractor Security Management</li> </ul>	2	3	6	These controls will reduce the likelihood but won't reduce the consequence	Site engineer / OHS Staff/ Supervisor
21	Natural disaster	Storm, cyclone, flooding and high tide	Natural	3	4	12	Multiple	<ul style="list-style-type: none"> <li>SOP11: Severe Weather</li> <li>SOP14: Working Near or Over Water</li> <li>SOP 24: Worker Welfare Facilities</li> <li>SOP 26: Emergency Response Plan</li> <li>Rescue team and boat should be ready for instant use</li> </ul>	3	2	6	Although humans can do little or nothing to protect the incidence or intensity of most natural phenomena but the control measures can reduce the likelihood of the consequences	OHS Staff/ Supervisor
<b>Hydrographic Survey</b>													
22	Access and egress	Slips, Trips and Falls	Dirty floor	3	4	12	Single	<ul style="list-style-type: none"> <li>SOP 24: Worker Welfare Facilities</li> <li>SOP 25: Camp management</li> </ul>	2	3	6	Unlikely to significantly reduce the likelihood.	Site Supervisor

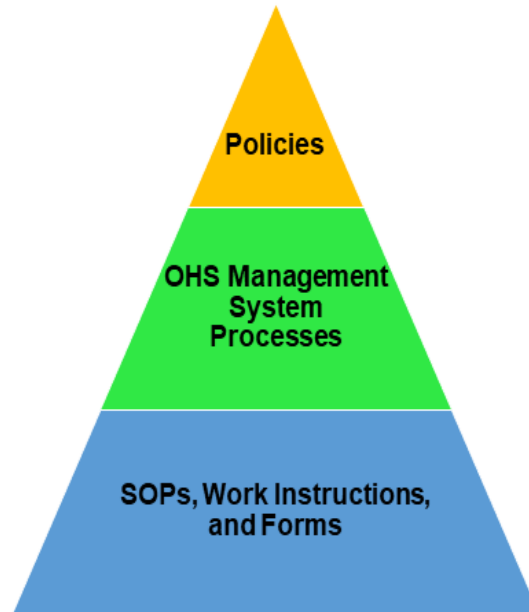
SI	Activity	Hazards	Reasons	Risk Ranking			Fatality Risk?	Control Measures	Risk Ranking			Residual justification	Responsibility
				Likelihood	Conseq.	Risk			Likelihood	Conseq.	Risk		
												Slips, trips and falls are common in the construction industry	
23	Offshore activities	Staffs and equipment fall into water from vessel	<ul style="list-style-type: none"> <li>Unguarded edges of the ship</li> <li>Carelessness</li> </ul>	2	5	10	Multiple	<ul style="list-style-type: none"> <li>SOP05: Barricading and Signage</li> <li>SOP 07: Cell Phone Use</li> <li>SOP14: Work Near or Over Water</li> <li>SOP 26: Emergency Response Plan</li> <li>SOP 28: Contractor Security Management</li> </ul>	1	3	3	Controls should reduce the likelihood significantly	Site Engineer
26	Offshore activities	Drowning ships and life loss	High tide, storm or cyclone	3	5	15	Multiple	<ul style="list-style-type: none"> <li>Monitor weather forecast and avoid activities during high tide, storm and cyclone season.</li> <li>SOP11: Severe Weather</li> <li>SOP14: Working Near or Over Water</li> <li>SOP 24: Worker Welfare Facilities</li> <li>SOP 26: Emergency Response Plan</li> <li>Rescue team and boat should be ready for instant use</li> </ul>	2	3	6	If natural disaster occurs, it may still result the drowning ships and life loss. None of these controls will prevent this type of hazard but it will reduce the likelihood.	OHS Staff/ Supervisor





#### 9.2.4 Summary of Assessed Hazard Risks

The project's potential risks and their significance have been assessed using the methodology described in Section 9.2.1 and 9.2.2. A summary of these risks and their significance along with the control measures are presented in **Annex 9-1**. The risk matrix will be revisited once construction details are available from C1 Consultant. OHS Plan Documents Structure hierarchy is shown in Figure 9.2.



**Figure 9.2: Document Hierarchy of the OHS Plan**

#### 9.2.5 Policies

Contractor's operating policies are the highest-level document. They provide with direction when the Contractor operates in different geographies of the world. These are based on the Contractor's senior management commitments and they guide in day-to-day operations.

#### 9.2.6 Human Resources Policy

Contractor's human resources policies should focus on the responsibility to respect human rights and play a positive role in the communities where they operate. To this end, Contractor should commit to respecting human rights as set out in the United Nations Universal Declaration of Human Rights and the International Labour Organization (ILO) Declaration on Fundamental Principles and Rights at Work, as well as adhere to the United Nations Guiding Principles on Business and Human Rights, the Voluntary Principles on Security and Human Rights and the World Bank Environmental and Social Standards 2: Labor and Working Conditions.

The Contractor must continually assess the human rights context of their activities, including impacts that they may cause and those to which they may contribute or be directly linked. This determines the prevention, mitigation and control measures required, including using leverage from their business relationships.

Contractors should recognize, respect and abide by all project workers, community worker, and employment laws and expect their subcontractors and other third-party companies to meet the same standards. No child or forced labor is allowed under the project/program – by the contractors or subcontractors or primary suppliers. These include prohibitions on child labor, forced labor and discriminatory behavior.

Contractors should value and respect the traditions and the culture of the many different communities in the project area where they do business.

Contractors should believe their business activities contribute to the economic well-being and quality of life. Contractors should recognize the effect that their activities may have on local communities, and they value and strive to engage in a meaningful way with the communities where they do business to help ensure that they positively contribute to the welfare of the local communities.

Contractors should endeavor to conduct business with communities who share their values and business principles.

### **9.2.7 Contractor's Health and Safety Policies**

**Safety and Environmental Sustainability is not a choice, it's a lifestyle.** Contractors should support a safe work environment and ensuring the safety of all employees and the clients. They should recognize Safety as a Core Value of their business. Contractors will be responsible for the compliance of OHS/CHS including the compliance for their respective sub-contractors.

**Safety and Environmental Sustainability are non-negotiable.** Contractors should prevent occupational injury or illness always takes precedent, even over operating productivity. Compliance with National and Local legislation, as well as client and industry safety and environmental standards must be maintained at all times.

**Everyone has a role to play.** Contractors' Occupational Health and Safety Plan should be built on best practices and industry leading safety management systems. To be successful, such a plan must start with proper attitudes toward injury and illness prevention on the part of all employees. It also requires cooperation on all Health and Safety matters, not only between management and employees, but also between each employee and his or her co-workers.

Recognize the responsibilities of Health, Safety and Environment are shared:

- Contractors accept responsibility in leading the Health and Safety program and for its effectiveness and improvement.
- Supervisors, Officers, and Managers should be responsible for developing positive attitudes towards Health and Safety in themselves and those they supervise and ensuring that all activities are performed with the utmost regard for the Safety and Health of those involved.
- Employees are responsible for wholehearted, genuine cooperation with all aspects of the health and safety program.
- Provide education to participating personnel, thus enabling them to understand and share in the responsibility for monitoring and protecting the environment.
- Maintain an effective reporting and communication system, and develop a project action plan commensurate with company standards and regulatory/client requirements.

Contractors should make responsible decisions and should believe in environmental sustainability by applying the core values and upholding the code of conduct. They should protect their employees, the public and the environment.

### **9.2.8 Alcohol and Drug Policy**

The use of alcohol and illegal drugs shall be strictly forbidden on all project sites.

All project workers on the project shall comply with the following.

- No project worker shall distribute, possess, consume, or use alcohol or illegal drugs on the work site or in any vehicle or any other equipment.
- No project worker shall report to work or be at work under the influence of any drug, or substance that may cause impairment and/or will affect their ability to work safely.
- No project worker shall misuse prescription or non-prescription drugs while at work. If a project worker is taking a prescription or non-prescription drug for which there is a potential unsafe side effect, he has an obligation to report such potential to the supervisor.

- Management reserves the right to conduct searches of premises and worksites where there are reasonable grounds to conclude there is or has been use or possession of substances prohibited under this Policy.
- Any person taking medication that can affect or restrict their ability to do their job safely must advise and must discuss with his/her direct supervisor.
- Smoking at work places should be banned except in designated smoking areas which are equipped with fire extinguisher, “smoking permitted here” signs and trash cans, and possession of lighters and matches should be prohibited before entering work areas
- Management at their discretion may conduct ‘Reasonable Cause Suspicion Testing’ if there are evident reasons to believe that the person in question is impaired.
- Management may also conduct Post Incident Alcohol & Drug testing to rule out if this may be a contributory factor in the incident.

### **9.2.9 Business Conduct and Ethics Code**

Each Contractor’s Business Conduct and Ethics Code should be built on the core values and highlights the principles that guide their business conduct. Use it for guidance about their ethical standards and where to take worker’s questions or concerns

#### *Ethical decision making*

Ethical decision making is essential to the success of each Contractor. Some decisions are obvious and easy to make; others are not. By asking questions below can help to make the right ethical decisions.

Four yes answers are required to qualify an action as ethical.

1. Is it legal?
2. Is it consistent with company policies? If the proposed action does not comply with company policy, you should not do it.
3. Is it in the best interests of my co-workers, the company, and the community?
4. If it were made public, would I be comfortable?

If the answer to any of these questions is “No”: STOP. If you’re not sure: speak to the Project Manager.

### **9.2.10 Organization Values**

#### *Diversity and Inclusion*

The Contractor should learn from and respect the cultures in which they operate. They should have an inclusive work environment that values the uniqueness and diversity of individual talents, experiences and ideas. They should provide equal opportunity and to treat personnel without illegal bias. Contractors will not discriminate based on race, religion, color, national origin, age, sex, gender identity, disability, political preference, membership or non-membership in any lawful organization

#### *Integrity and Trust*

Contractors should be honest with themselves and others and honour the company commitments. They should trust, respect and support each other. All employees should earn the trust of their colleagues and partners by operating with the highest ethical standards in all they do.

#### *Partnership*

Build trusting and mutually beneficial relationships by collaborating with the communities, customers, suppliers and other business partners. Objective should be in succeeding with partners.

*Protect People and the Environment*

Contractors should place the highest priority on the health and safety of the employees, communities and protection of the assets. Deliver world-class performance with a focus on preventing high-consequence incidents.

### **9.2.11 OHS Management System Processes**

The OHS Management System Process forms a framework of each Contractor's OHS management plan (OHS Plan) and these are the Contractors' second-tier documents after policies. Contractors for both Components 1 and 2 should develop the following OHS Management System Processes based on the project and site requirements:

- PR01: Induction Process
- PR02: Job Hazard Analysis
- PR03: Meetings
- PR04: Personnel Competency and Training
- PR05: Short Service Worker Program (with tools for assessment)
- PR06: Reward and Recognition
- PR07: Disciplinary Process
- PR08: Permit to Work Process
- PR09: Work Observation Process
- PR10: Critical Risk Protocols
- PR11: Personal Protective Equipment (PPE)
- PR12: Incident Investigation
- PR13: Measurement - Leading and Lagging Indicators
- PR14: Pandemic Action Plan (COVID-19)
- PR15: OHS Compliance Audit
- PR16: Inspections
- PR17: Personal Risk Assessment
- PR18: Risk Management
- PR19: Document Control

### **9.2.12 Standard Operating Procedures (SOP), Work Instructions and Forms**

Standard Operating Procedures and Work Instructions are mostly technical in nature and are third-tier documents in overall risk management approach. Forms and checklists provide support for implementing the controls mentioned in these SOPs. Table 9-4 presents a list of SOPs, which will be developed by the Components 1 and 2 contractors of Project 1 based on project specific risk assessment matrix and be part of their OHS Plan.

**Table 9.5: List of Standard Operating Procedures**

Component 1	Component 2
SOP 01: Dredging	
SOP 02: Work at Height	
SOP 03: Excavation	SOP 03: Excavation
SOP 04: Mobile Equipment	SOP 04: Mobile Equipment

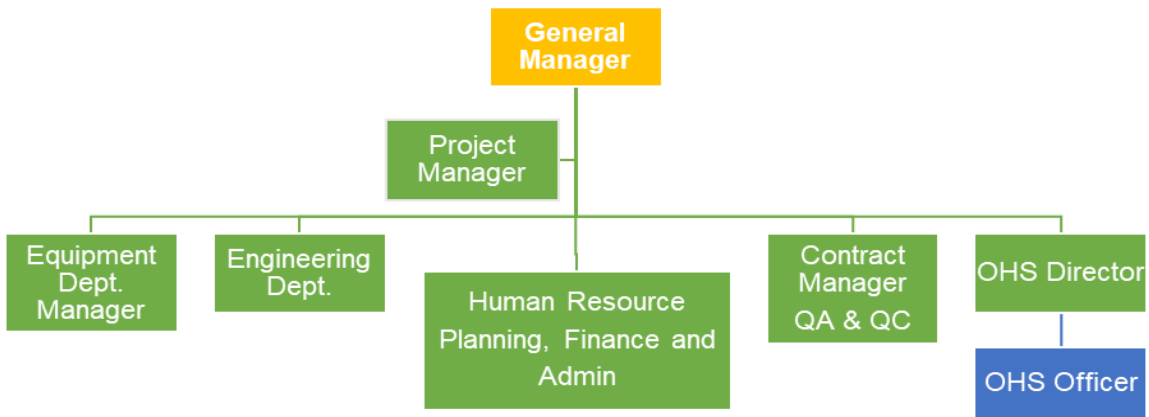
Component 1	Component 2
SOP 05: Barricading and signs	SOP 05: Barricading and signs
SOP 06: Cell Phone Use	SOP 06: Cell Phone Use
SOP 07: Safe Driving	SOP 07: Safe Driving
SOP 08: COVID19 Guidance	SOP 08: COVID19 Guidance
SOP 09: Material Haulage (Loading and Unloading)	
SOP 10: Traffic Interface Planning	SOP 10: Traffic Interface Planning
SOP11: Severe Weather	SOP11: Severe Weather
SOP 12: Lifting and Hoisting	SOP 12: Lifting and Hoisting
SOP 13: Scaffold Erection	
SOP 14: Working Near or Over Water	SOP 14: Working Near or Over Water
SOP 15: Illumination	SOP 15: Illumination
SOP 16: Ground Support	
SOP 17: Water Management	
SOP 18: Ventilation	
SOP 19: Fire	SOP 19: Fire
SOP 20: Electrical Systems	
SOP 21: Hazardous Material Management	SOP 21: Hazardous Material Management
SOP 22: Equipment Inspection & Maintenance	SOP 22: Equipment Inspection & Maintenance
SOP 23: First Aid	SOP 23: First Aid
SOP 24: Project Worker Welfare Facilities	SOP 24: Project Worker Welfare Facilities
SOP 25: Camp Management	
SOP 26: Emergency Response Plan	SOP 26: Emergency Response Plan
SOP 27: Operation of Crushing and Batching Plants	
SOP 28: Contractor Security Management	
SOP 29: Cofferdam Construction	
SOP 30: Work in Confined Space	
Others	

The specific direction of Contractors is shown through the health and safety policy and the responses to Contractual/applicable laws, regulations, guidelines, and standards as above. These considerations together assist Contractors' continuing contention to provide/develop/apply and review OHS provision and their consistent applications at site.

### 9.3 Project Organization

#### 9.3.1 Contractor Organogram

A typical Contractor's organogram is presented in **Figure 9.3**.



**Figure 9.3: Contractor Organogram**

### 9.3.2 OHS Organogram

A Contractor's typical OHS organization should resemble that shown in **Figure 9.4**.



**Figure 9.4: Contractor's OHS Organization**

### 9.3.3 Roles and Responsibilities

These roles and responsibilities give a holistic understanding pertaining to implementation of the OHS Plan which comprises multiple processes and SOPs. However, each process and SOP may also have additional specific requirements pertaining to a specific role.

#### *General Project Manager*

- Overall accountability for the development, implementation and maintenance of the OHS Plan.
- Accountable for allocation of sufficient resources for the execution of the plan.
- Ensure that empowered and competent personnel are available for the execution of the plan



- Make sure that Sr. Leadership (all directors, Construction Managers and other line management personnel) are fully aware of their responsibilities as per the Processes and SOPs of the OHS Plan.
- Discourage achievement of operational results at the cost of safety violations
- Develop a culture where it is safe to speak up and provide the time, people and resources to respond to OHS concerns identified by their workers
- Review Executive Summary of incidents, ensure that Root Causes are being identified and resources are provided for the closure of Preventive and Corrective Actions

*Project Manager*

- Overall accountability for the development, implementation and maintenance of the OHS Plan.
- Accountable for allocation of sufficient resources for the execution of the plan.
- Ensure that empowered and competent personnel are available for the execution of this plan
- Make sure that Sr. Leadership (all directors, Construction Managers and other line management personnel) are fully aware of their responsibilities as per the Processes and SOPs of the OHS Plan.
- Demonstrate visible leadership, walk to talk behavior to reinforce the implementation of the OHS Plan
- Attend monthly OHS Committee/Progress Review Meeting and monitor the performance through leading and lagging indicators.
- Discourage achievement of operational results at the cost of safety violations
- Develop a conducive culture where Personnel are authorized to \*STOP unsafe work without fear of retribution
- Develop a culture where it is safe to speak up and provide the time, people and resources to respond to OHS concerns identified by their workers.
- Ensure that Work Observation program is utilized, and all incidents are fully investigated
- Review Executive Summary of incidents, ensure that Root Causes are being identified and resources are provided for the closure of Preventive and Corrective Actions
- Encourage reward and recognition where personnel demonstrate safe behavior or identify hazards and fairly apply disciplinary process when personnel cut short.

*\*ILO COP 2.2.12. Where there is an imminent danger to the safety of workers, the employer should take immediate steps to stop the operation.*

*OHS Director*

- Be a Subject Matter Expert of the OHS Plan. Provide training and awareness regarding the implementation of the OHS Plan that includes multiple Processes and SOPs.
- Convene monthly OHS Committee/Progress Review meeting and share implementation progress, points of concern.
- Be familiar with all local, national, and international laws that are applicable to the operations.
- Establish and maintain a professional relationship with Company /Contractor and subcontractor representatives.
- Establish an audit system that measures the effectiveness of the OHS Plan.

*OHS Officer*

- Be a Subject Matter Expert of the OHS Plan. Provide training and awareness regarding the implementation of the OHS Plan that includes multiple Processes and SOPs.
- To be familiar with all local, national, and international laws that are applicable to Operations.
- Raise concern in the monthly OHS Committee/Progress Review meeting regarding implementation of controls stipulated in the OHS Plan.
- Provide training to staffs on the OHS Plan. Conduct regular sessions for all project team members to inculcate the requirements of the OHS Plan.
- To report to the Contractor's Management Team on implementation progress, monthly KPIs.
- To ensure that sufficient training and induction of all personnel is being provided and maintained.
- To ensure that visit induction is given to all visitors before they are allowed to visit the site.
- To develop the OHS awareness of all personnel employed on the project and ensures their participation in all aspects of the health and OHS program
- Provide guidance for the purchase of personal protective equipment
- Regular inspection of construction safety and security as per PR09: Work Observation Process
- Provide guidance to employees regarding their emergency response responsibilities.
- Decide whether a potential rescue service or team is adequately trained and equipped to perform permit space rescues of the kind needed at the facility and whether such rescuers can respond in a timely manner, and organize drills
- Review of OHS management plan annually.

*OHS Staff/ Supervisor*

- Perform the assigned inspections and discuss the findings with OHS Officer
- Ensure communication procedure and system to communicate emergency events to site technical supervisor and emergency authorities (e.g., Incident Response Center (IRC) and/or Police, health centers)
- Communicate with construction site personnel to help them understand the hazards of the site and understand the demands of the operating personnel about OHS matters.

*Site Technical Supervisors (part of the technical team)*

- They allocate tasks and check that the project workers are implementing OHS requirements to standard. They provide feedback and guidance on OHS implementation.
- Ensure that the controls stipulated in PTW (Permit to Work) are implemented and STOP the work when critical controls are missing or compromised
- Discuss Job Hazard Analysis (JHA) and conduct effective Tool Box Talk with all project workers. Ask questions to ensure that they have a good understanding.
- Ensure that all new employees receive training as per PR01: Induction Process and PR05: Short Service Worker Process
- Conduct worksite observations, discuss safety concerns with project workers
- Develop a culture where it is safe to speak up and provide the time, people and resources to respond to OHS concerns identified by their workers. They are also responsible for escalating

issues that can't be resolved by the project workers or at the supervision level to OHS Team or senior management.

- Responsible for making an incident scene safe and secure and for ensuring that hazards, near misses and incidents are entered into the reporting system.
- Ensure all project workers use appropriate PPEs and train them how to use PPEs.

#### *Workers*

- Conduct Personal Risk Assessment Take 5 (Stop, Look, Assess, Control, and Monitor) and do not proceed to work if unsafe to do.
- Use authority to STOP work if observe an unsafe work by fellow worker or SSW.
- Report hazards and at-risk behavior as and help the Contractor management to develop a conducive safety culture.
- Use PPE as provided.
- Conduct a visual inspection of equipment at the beginning of the operation and ensure that equipment is de-energized before working on a piece of equipment.
- Ensuring that they wear appropriate PPE for the activity that they undertake.
- Be aware and mindful of hazards related to any work activity; do not undertake a job or task if physically or mentally not fit.
- Seek clarification for uncertainty relating to a task with the Supervisor.
- Do not undertake a job if not competent to do so.
- Raise improvement opportunities.
- Report near misses and actual incidents.

### **9.4 Incident Reporting**

The Contractor is required to notify IA and PIU of all incidents including near misses. All incidents must be reported to the site superintendent immediately. All incidents that require medical attention, or have the potential for medical attention require the immediate notification of the project management team.

### **9.5 Investigations**

An investigation must be conducted by the contractor supervisors for all incidents involving their workers. The preliminary investigation report must be submitted to the project management team within twenty-four hours of occurrence. These reports must be completed to the satisfaction of the PIU.

### **9.6 Audits, Inspections and Corrective Action**

Contractors shall inspect their work areas and their subcontractors' work areas on an on-going basis to verify compliance with OHSE regulations. Contractors are expected to conduct formal inspections on their job sites and provide copies of the inspections to PIU. If non-compliance items are observed, the contractor must rectify any unsafe acts and/or conditions without delay. Work which is not in compliance with applicable OHSE standards will be stopped until corrective action is implemented.

Inspections on their job sites and provide copies of the inspections to PIU. If non-compliance items are observed, the contractor must rectify any unsafe acts and/or conditions without delay. Work which is not in compliance with applicable OHSE standards will be stopped until corrective action is implemented.

**Annex 10.1: Summary of the Community Health and Safety Impacts  
and Risks**

## 10 Community Health and Safety Impacts and Risk

### 10.1 Introduction

The Community Health and Safety (CHS) plan recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. In addition, communities that are already subjected to impacts from climate change may also experience an acceleration or intensification of impacts due to the project activities. The preparation of this CHS Plan is a mandate as per the World Bank's ESS-4 and included with the ESIA report of the JRSMP. This CHS plan addresses the health, safety, and security risks and impacts on project-affected communities and the corresponding responsibility of Borrowers to avoid or minimize such risks and impacts, with particular attention to people who, because of their particular circumstances, may be vulnerable.

#### 10.1.1 Objectives

The objectives of the CHS Plan are to:

- Describe actions required to implement the construction-related management and preventive measures outlined in the Environment Assessment document and required by the World Bank's ESS4, Community Health and Safety and Guidance Note 4 (Community Health and Safety).
- Describe the processes and standard operating procedures required to conduct the tasks related to a specific project implementation.
- Describe additional measures required to implement Good International Industry Practice (GIIP).
- Facilitate the addition and/or modification of control measures as new data become available via monitoring activities, health centers and community-based sources.
- Outline the roles and responsibilities of the positions in charge of implementing the CHS Plan, including monitoring and evaluation.
- Devise a training plan for all workforces and community members who are directly exposed to the health and safety hazards of the Project.
- Describe the processes for recording and reporting non-conformances, as well as measurement and reporting of key performance indicators (KPI).

#### 10.1.2 Scope

The scope of the CHS Plan addresses the commitment to:

- Mitigate potential impacts and hazard risks of Project related activities that may affect the health and safety of communities within the areas of influences of four pilot sites under Component 1 and along the transportation route.
- Maintain a healthy workforce and labor pool in the community; and
- Contribute to the improved health, safety and wellbeing of the local community in the areas of influence.

In many respects, the programs within the scope of CHS Plan will inform the Social Management Plan. The plan will be implemented at the beginning of the construction phase and continue to the end of the Project life. The plan has been informed by the provisions of the World Bank's ESS4: Community Health and Safety and Guidance Note 4 (Community Health and Safety), World Bank Group's (WBG's) Environmental Health and Safety Guidelines (EHSGs), Good International Industry Practices (GIIP), and the Project's ESIA.

This Plan applies to Project construction and operational stage and the associated risks and potential impacts that these activities may have on community health, safety, and security. The geographical scope is described by the Project Area of Influence which comprises two parts:

- The physical footprint of the project, comprising the area occupied by direct components, such as two pilot sites, along the navigation route, and Associated Facilities (Area of Direct Influence).
- The area directly and indirectly affected outside the physical footprint, as determined by the presence and interaction of Project aspects with the environmental and social characteristics of the surrounding area (Area of Indirect Influence). The Area of Indirect Influence encompasses the 'Project Affected Communities'.

The risks and potential project impacts to community health, safety, and security can emanate from both within and outside the so-called "project fence." For this reason, the scope of this plan focuses on the management of aspects associated with the interaction of construction activities, the workforce, and the community.

The central element of the CHS Plan is a set of control measures designed to avoid or mitigate the adverse effects of project activities on the health, safety, and security of the community, while at the same time, enhancing the beneficial effects and capitalize on opportunities that may contribute to improving overall community well-being.

Implementation Agency's staffs involved in the Community Relations, Environment Health and Safety staffs of the Contractors and the Engineer will be responsible for the Community Health and Safety Plan with input from the Social Team.

This OHS Plan is currently preliminary draft and dynamic in nature and will continue to be developed and modified in consultation with all relevant stakeholders, including but not limited to BWDB, BIWTA and community, throughout the lifecycle of the Project, especially, after the detailed design where site specific information and community interaction path will be determined.

### ***10.1.3 Relation of the Community Health and Safety Plan with Other Management Plans***

The Community Health and Safety Plan is related to, overlaps, shares objectives or can supplement strategies with the following management plans of the Contractor:

- Occupational Health and Safety Plan;
- Community Development Plan;
- Stakeholder Engagement Plan;
- Biodiversity Management Plan;
- Procurement Plan;
- Security Management Plan;
- Traffic Management Plan;
- Emergency Preparedness and Response Plan;
- SEA/SH Action Plan
- Water Management Plan; and
- Air Quality Management Plan.
- Adoption of ESCOPs

Some plans named above are related to disciplines where no significant impact on communities is expected, because of small scale construction. However, these disciplines remain related to this Plan for monitoring and follow-up purposes.

#### **10.1.4 General Strategy for Mitigation/Control**

In terms of community health and safety, the Contractor's strategy will be to implement programs that contribute to the maintenance of a healthy workforce and local community and protect against potential negative health effects of the Project within the Project AOI. As such the following programs have been identified for implementation and must be committed by the contractor in bid document:

- Health Services Program;
- Disease Prevention Program;
- Subcontractor Integrity Program;
- External Emergency Response and Preparedness;
- Security with Integrity Program;
- Community Health and Safety Awareness Program;
- Safety of Services Program by maintaining quality Management Systems;
- Potential Risks and Impacts on Ecosystem Services Program; and
- Positive Lifestyles Program.

The underlying principles that guide the approach and implementation of the Community Health and Safety programs are:

- Accountability and transparency – understanding that confidentiality of health data overrides any need to demonstrate vulnerability in a population, sub-population or individual. Planning and implementation of social management is conducted in an environment of accountability and transparency, with the disclosure of agreements, general monitoring results, and processes to relevant stakeholders;
- Confidentiality – Handling and monitoring of health data is conducted in an environment of confidentiality to an international standard of medical ethics;
- Equity assurance – administering actions to benefit all members of a vulnerable sub-population, avoiding discrimination, and avoiding personal identification of any individual who may be at risk;
- Leveraging – as disenfranchised communities are identified; the Contractor will consider leveraging or focusing other programs to these sub-populations to assure some equity in Project impacts;
- Cultural context – Action Plans are culturally appropriate and based on clear understanding of affected people's expectations, basic needs and vulnerabilities;
- Evidence-based health management planning – The Community Health and Safety Management Plan is developed from a clear understanding of Project impacts and risks and affected communities at all stages of the Project lifecycle;
- Participatory planning for development and implementation of detailed action plans – where possible, planning, implementation and monitoring of health management actions are undertaken in partnership with affected people, organizations from government and civil society that can provide insights to identify possible causal pathways;
- Flexibility in implementation – health management implementation is recognized as necessarily flexible and subject to change, in response to on-going engagement, data collection and monitoring results, and emerging challenges; and
- Balanced internal responsibility for implementation – responsibility for the implementation of the Community Health and Safety Management Plan will be shared between the Project's Community Relations Department, the Environment, Health, and Safety Department; and all other departments and staff whose activities may affect or impact local communities.



## **10.2 Evaluation of Risks and Impacts and Mitigation**

This section identified the possible hazards and its impact/risks with ratings (Table 10.5) on the local community due to the construction and operational activities of this project. Annex 10-1 presents impacts and risks with likelihood, consequence, risks and propose mitigation/control measures to avoid or reduce the magnitude of the risks to the nearby communities. Since, detail design of pilot sites and construction activities are yet to finalize, the control measures are generic in nature, site and construction specific controls will be provided when additional details are available from the technical team of both Components 1 and 2 of Project 1.

The assessment process involved the following steps

- Identification of potential hazards
- Assess Risks/Impacts on the local communities
- Impacts on the projects by the affected communities
- Estimated risks before mitigation
- Control Measures
- Residual risks
- Responsible person to implement the control measures.

Table 10.1: Risk Ratings

Risk Matrix				Likelihood				
				Unlikely to occur but known in the sector; probability 1%-1%	Likely to occur once or more during construction/ organization; probability 1%-10%	Likely to occur once every two years or more; probability 10%-50%	Occurs more than once or twice per year, is continuous or certain to occur; probability 50%-80%	Multiple occurrences have happened frequently in the industry; probability > 80% & above
				Remote (1)	Possible (2)	Occasional (3)	Likely (4)	Frequent (5)
				1	2	3	4	5
Severity	No impact or minor First Aid illness	Incidental	1	1	2	3	4	5
	First aid illness (e.g., minor fever, pain) or very minor health effect; one incidence during the construction	Minor	2	2	4	6	8	10
	Medical treatment cases (e.g., infections, high fever, cough), destruction of crops, 2-3 one incidences during the construction	Moderate	3	3	6	9	12	15
	Major health issues, hospitalization, bank failures, or threat to structures: Single Fatality (drowning)	Serious	4	4	8	12	16	20
	Multiple fatalities or erosion of Multiple houses	Catastrophic	5	5	10	15	20	25
Color coding								
Color		Risk			Score			
Light Blue		Low			1-6			
Blue		Medium			8-10			
Yellow		Warning			12-15			
Red		High			16-25			

**Summary of the Community Health and Safety Impacts and Risks**

Hazards	Reasons	Risk Ranking			Control Measures	Evaluation after measures			Responsibility
		Likelih.	Conseq.	Risk		Likelih.	Conseq.	Risk	
Faulty Design	Faulty design of Groin and revetment construction can lead to collapse of the river bank and arise sudden flooding that will inundate the nearby communities.	3	5	15	Ensure the design comply with national and international standards. Verify the design with a checking engineer. Identify critical and risky activities and develop emergency preparedness and response plans with allocation of responsibilities to local communities and authorities.	2	3	6	Project engineer / Design team/Checking Engineer
	River stabilization can narrow down the floodplain width, which might cause high current and destroy charlands	3	3	9	Design and implement protective measures for the vulnerable. e chars	1	3	3	Project engineer / Design team/Checking Engineer
	Displacement of people due to bank protection failure can cause unrest in the communities	2	4	8	Develop a communication protocol to inform the community of any significant consequences during the construction of bank protection work	1	2	2	OHS Officer / Community Liaison officer
Vulnerable health services	Breaches of medical ethics, including the potential for direct and indirect discrimination of, and violence against, affected persons, specific communities and subpopulations	2	2	4	Collaborate with local governments and communities to develop or share in third party health data collection and reporting. Contractor will set clear expectations and protocols for the management of medical data to prevent access to, and disclosure of medical data to, non-medical personnel.	1	2	2	Medical Officer
	Lack of continued services, especially to the most vulnerable communities	4	3	12	The health services program will use environmental, social, economic and health data to continually track and evaluate the changing vulnerability of communities within the area of influence so that action can be focused on the most vulnerable communities at any given time.	2	2	4	Community Liaison Officer
	Stress on the public healthcare services	4	2	8	The Contractor will engage sufficient number of register medical doctor and establish health center for its workforces and work with local government to identify any necessary	2	2	4	Medical Doctor/ Community

Hazards	Reasons	Risk Ranking			Control Measures	Evaluation after measures			Responsibility
		Likelih.	Conseq.	Risk		Likelih.	Conseq.	Risk	
					follow-up actions if health status is negatively affected by the Project in areas of influence. Possible actions may include supporting provision of affordable health services, including mobile health outreach clinics within the areas of influence.				Liaison Officer
Spread of Communicable Disease (Tuberculosis (TB), COVID-19)	Increased workforce (Local and migrated) and crowded accommodation camp may spread these diseases to the community	4	4	16	<ul style="list-style-type: none"> <li>Medical screening and proof of vaccination are needed prior to the employment</li> <li>The Contractor conduct induction training or workshop for all workforce and introduce the basics of these diseases, how they transmit and the preventive measures against them.</li> <li>Contractor can organize vaccination program in the camp for the non-vaccinated workforce</li> <li>Any positive cases should be dealt diligently and treated in designated hospital. After emergency care treatment should be continued at worker's home with the family to maintain isolation, the Contractor will bear the cost of treatment.</li> </ul>	2	2	4	Medical Doctor/OHS manager
	COVID-19 and other similar infections can spread by the project workers to the community	4	4	16	Follow all precautions listed above. Working site and labor camp should strictly maintain COVID-19 protocol, if the cases are widespread. Follow all COVID-19 protocol (washing hands, wear mask, maintain 6 feet distance etc.)	2	3	6	Medical Doctor/OHS manager
Vector- borne diseases <ul style="list-style-type: none"> <li>Malaria</li> <li>Chikungunya</li> <li>Dengue</li> <li>Lymphatic filariasis</li> </ul>	Stagnant water and poor sanitation conditions can spread vector-borne diseases Increased burden of disease in workforce, results in increased demand on Project health services and reduce productivity.	5	4	20	<p>The Contractor will develop program to limit bodies of stagnant water, spray insecticides, develop support in nearby communities, and create community awareness. In compliance with the ESF of the World Bank.</p> <p>The Contractor will encourage good sanitation practices, and the use of mosquito nets throughout the area of influence. Provide information for training of workers in Chikungunya and Dengue awareness so they can take knowledge back to communities.</p> <p>Develop educational materials regarding vector-borne disease transmission to the communities</p> <p>Evaluate supporting the community health authorities with</p>	2	3	6	Medical Doctor/OHS manager

Hazards	Reasons	Risk Ranking			Control Measures	Evaluation after measures			Responsibility
		Likelih.	Conseq.	Risk		Likelih.	Conseq.	Risk	
					lymphatic filariasis eradication programs to ensure adequate coverage of target areas with community directed treatment programs				
Increased incidence of water related disease and food-borne illness	There are potential linkages between health and health impact pathways (e.g., number of bodies of stagnant water, number of people with access to improved sanitation facilities), which is crucial for water related disease and food-borne illness.	3	3	9	<ul style="list-style-type: none"> <li>Support the development of improved sanitation and improved water facilities.</li> <li>Organize focus group discussions with local government, existing communities and in-migrants to help knowledge exchange and establish common expectations for sanitary conditions in the areas of influence.</li> <li>Disseminate information on the linkages between improved water sources, sanitation conditions and human health, and on good hygiene practices, will promote use of the improved facilities and minimize the increased incidence of water related disease and food-borne illness in the areas of influence.</li> </ul>	2	2	4	Medical Doctor/Community Liaison Officer
Vaccine preventable diseases <ul style="list-style-type: none"> <li>Measles</li> <li>Mumps</li> <li>Rubella</li> <li>Chicken pox</li> <li>Pneumonia</li> <li>Influenza</li> <li>Typhoid</li> </ul>	Potential increase in outbreaks in the community related to population influx or the introduction of personnel who are not immunized	3	3	9	Ensure and implement pre-employment medical checkup for the workforce	2	2	4	Medical Doctor/OHS manager
	Increased burden of disease in community will increase the demand on local community health services	2	2	4	Implement infectious disease outbreak management program for workers to reduce potential outbreaks to the local communities	1	2	2	Medical Doctor/Community Liaison Officer
	Diminished quality of health care and treatment for local communities as existing, limited capacity is overwhelmed	2	2	4	<ul style="list-style-type: none"> <li>Require active vaccinations program to workforce as necessary if possible</li> <li>Develop educational materials regarding communicable diseases transmission to the communities</li> </ul>	1	2	2	Medical Doctor/Community Liaison Officer
Sexually transmitted diseases and	<ul style="list-style-type: none"> <li>The influx of people may bring communicable diseases to the project</li> </ul>	3	3	9	<ul style="list-style-type: none"> <li>Establish workers' camps separated from local communities with strict protocols for interaction with local communities in order to avoid project impacts from</li> </ul>	2	2	4	Medical Doctor/ Gender Specialist/

Hazards	Reasons	Risk Ranking			Control Measures	Evaluation after measures			Responsibility
		Likelih.	Conseq.	Risk		Likelih.	Conseq.	Risk	
substance use	<p>area, including sexually transmitted diseases (STDs), or the incoming workers may be exposed to diseases to which they have low resistance.</p> <ul style="list-style-type: none"> <li>Workers with health concerns relating to substance abuse, mental issues or STDs may not wish to visit the project's medical facility and instead go anonymously to local medical providers, thereby placing further stress on local resources.</li> </ul>				<p>labor influx.</p> <ul style="list-style-type: none"> <li>Engagement of skilled trainers to raise awareness among project workers of the risks, expected behaviors, and consequences of violations, communicated through training, and publicized codes of conduct. It may also be important to raise awareness of the risks among community members and local health authorities and inform them about available grievance mechanisms.</li> <li>Arrange and support local organizations and/or government initiatives on community STD education, prevention, and treatment programs.</li> </ul>				Community Liaison Officer
Sexual Exploitation and Abuse and Sexual Harassment (SEA/SH)	<ul style="list-style-type: none"> <li>Large influx of workers, particularly in impoverished communities, may increase the likelihood of exploitive and coercive sexual relations with community members, particularly minors in exchange for goods or money.</li> <li>Close proximity without appropriate supervisory and preventative measures may increase</li> </ul>	3	3	9	<ul style="list-style-type: none"> <li>Contractor shall be responsible to develop a SEA/SH Action Plan as part of their CHS Plan where SEA/SH Prevention and Response Action Plan will be clearly mentioned</li> <li>The action plan of CHS will include a sample of the Code of Conduct (CoC) that will be used in the project, and will include provisions for addressing SEA and SH risks and also the prohibitions against any illegal sexual activity with anyone</li> <li>Establish workers' camps separated from local communities with strict protocols for interaction with local communities in order to avoid project impacts from labor influx.</li> <li>Extensive training for Awareness raising strategy which describes how workers and local communities will be</li> </ul>	2	2	4	Gender Specialist/Community Liaison Officer/OHS manager

Hazards	Reasons	Risk Ranking			Control Measures	Evaluation after measures			Responsibility
		Likelih.	Conseq.	Risk		Likelih.	Conseq.	Risk	
	<p>the risk of sexual exploitation by project workers of female domestic workers and vendors</p> <ul style="list-style-type: none"> <li>Female laborers working alongside male laborers, without separate latrine and other sanitation facilities for males and females; and lacking of specific mechanisms for females to share concerns about their working environments can increase the risk of sexual harassment.</li> </ul>				<p>sensitized to SEA and SH risks, and the worker's responsibilities under the CoC.</p> <ul style="list-style-type: none"> <li>Set up and run a SEA/SH compliant GRM.</li> <li>Make available qualified service provider for dealing with potential cases of SEA/SH.</li> </ul>				
Emergency events and lack of preparedness and response	Internal and external emergencies may occur which require preparedness by the project stakeholders and a response procedure commensurate to the level of emergency situation	3	4	12	<ul style="list-style-type: none"> <li>Develop an emergency preparedness and response plan (EPRP) to contain emergencies at the pilot site level and at the program level.</li> <li>The Contractor will work with local authorities to coordinate with the national emergency response network in the areas of influence and to ensure implementation of the project specific emergencies and make arrangements with external emergency services (Fire, ambulance, etc.), if the resources available with the Contractor is not sufficient to contain the emergency.</li> <li>Conduct capacity building and train local communities as needed to make sure the communities know what to do during an emergency.</li> </ul>	2	2	4	Rescue Team/ Community Liaison Officer
Use of security forces (e.g., police, Ansar, or private)	Project will engage security forces to ensure human and material security of project-	4	4	16	<ul style="list-style-type: none"> <li>The operations and selection of the Project's security personnel will be guided by the relevant provisions of</li> </ul>	2	3	6	OHS manager/ Community



Hazards	Reasons	Risk Ranking			Control Measures	Evaluation after measures			Responsibility
		Likelih.	Conseq.	Risk		Likelih.	Conseq.	Risk	
security personnel)	affected communities and project workers and assets. There are potential risks that could arise from the use or presence of security personnel or related aspects of the use of security personnel				<p>ESS 2 (Labor conditions) and ESS4 (Community Health, Safety and Security).</p> <ul style="list-style-type: none"> <li>Adoption/compliance with the World Bank Group's Good Practice Notes on Assessing and Managing the Risks and Impacts of the Use of Security Personnel and a project/contract specific Code of Conduct for the security personnel.</li> <li>The Contractor will carry out a continuous risk assessment of the security arrangements in place, monitor its security personnel, and identify any necessary corrective or preventive actions for continuing security operations.</li> <li>Security will be provided in a manner that does not jeopardize the community's safety and security, or the client's relationship with the community.</li> <li>Security arrangements will follow the principle of proportionality, respect for human rights, and good international practice.</li> <li>Enforce a Code of Conduct for the security personnel</li> </ul>				Liaison Officer
Lack of awareness on health and safety	Awareness on Community Health and Disease Prevention may arise from the interaction of project workers with local communities	3	3	9	<p>Community health and disease prevention awareness campaigns will be applied consistently throughout the Project duration and will include awareness of:</p> <ul style="list-style-type: none"> <li>Linkages between improved water sources, sanitation conditions</li> <li>Common water related disease and food borne illness</li> <li>Good hygiene practices</li> <li>Adopting ESCOP 3, ESCOP 17 will mitigate the risk</li> </ul>	2	2	4	Medical Doctor/ OHS Manager/ Community Liaison Officer
Traffic and road safety	Traffic and Road Safety Awareness	4	3	12	<ul style="list-style-type: none"> <li>Engage community consultations and monitoring and management plans to prevent potential negative impacts resulting from poor traffic and road safety culture.</li> <li>Ensure continuous monitoring of traffic and pedestrian</li> </ul>	2	2	4	OHS Manager/ Community Liaison Officer

Hazards	Reasons	Risk Ranking			Control Measures	Evaluation after measures			Responsibility
		Likelih.	Conseq.	Risk		Likelih.	Conseq.	Risk	
					<p>Interface in the project area.</p> <ul style="list-style-type: none"> <li>Promote traffic safety awareness in communities in the Direct Area of Influence and along the transportation route.</li> <li>Adopting ESCOP 14 will mitigate the risk</li> </ul>				
Management and safety of hazardous materials	Hazardous Materials Management and Safety Awareness	2	4	8	<ul style="list-style-type: none"> <li>Ensure hazardous materials management safety communications to communities' close proximity of the project to deter workers, their families and others from collecting, reusing, recycling or reselling Project waste (e.g.; diesel, cement concrete etc.).</li> <li>Communications will include examples of hazardous materials used in Project construction, operation and rehabilitation, the risks to human health, and appropriate methods of use and disposal.</li> <li>Adopting ESCOP 2 will mitigate the impact</li> </ul>	2	2	4	Project engineer/OHS Manager/Community Liaison Officer
Security Coordination	Use of Security Personnel and community engagement for smooth operation	2	3	6	<ul style="list-style-type: none"> <li>Engage with communities about the project's impacts on community safety and security, create awareness concerning the Code of Conduct commitment and project grievance mechanism, as outlined in the Stakeholder Engagement Plan (SEP) and SEA/SH Action Plan of the ESIA.</li> <li>Ensure that Security staff coordinate regularly with other departments, such as Community Relations and Human Resources.</li> <li>Community Relations Officer of the Contractor will share information with communities about security arrangements, the Contractor's security policies, and the expected conduct of security personnel.</li> <li>Arrange dialogue with communities about security issues to identify potential risks and local concerns, and can serve as an early warning system.</li> <li>ESCOP 17 will mitigate the risk</li> </ul>	2	2	4	Project Security officer/OHS manager/Community Liaison officer

Hazards	Reasons	Risk Ranking			Control Measures	Evaluation after measures			Responsibility
		Likelih.	Conseq.	Risk		Likelih.	Conseq.	Risk	
	Positive Lifestyles Program	3	4	12	<p>Encourage culturally appropriate positive lifestyle choices in an effort to:</p> <ul style="list-style-type: none"> <li>Establish good financial management choices with the compensation payment.</li> <li>Deter an increase in alcohol use, substance abuse and tobacco use.</li> <li>Avoid violence against women, including sexual harassment, sexual exploitation and abuse.</li> <li>Avoid ethnic- or religious- based violence.</li> <li>Conduct awareness campaigns within the workplace and at religious institutions (e.g., mosque), local governments, schools, and health clinics.</li> </ul>	2	2	4	
Poor quality Management Systems to maintain safety of Services	<p>The Construction may pose safety risks on community health and safety, for example, risks associated with:</p> <ul style="list-style-type: none"> <li>Infrastructure construction and heavy equipment movement, such as, struck by moving vehicle.</li> <li>Overwater construction hazard, such as drowning, flooding, or water-related diseases.</li> <li>Water and sanitation services, such as contaminated water or spread of disease.</li> <li>Electricity supply, which may result in electric</li> </ul>	4	4	16	<ul style="list-style-type: none"> <li>The Contractor will establish and implement appropriate quality management systems to anticipate and minimize risks and impacts.</li> <li>The Contractor will apply hierarchy of controls, such as, eliminate/ substitute, and engineering control of hazards and if hazards are low risk, then introduce administrative controls and as a final resort provide appropriate personal protective equipment.</li> </ul>	3	4	12	Project Supervisor/OH S manager

Hazards	Reasons	Risk Ranking			Control Measures	Evaluation after measures			Responsibility
		Likelih.	Conseq.	Risk		Likelih.	Conseq.	Risk	
	<p>shock from electrical cabinets or cables.</p> <ul style="list-style-type: none"> <li>Service providers, which may use their service for the purpose of financial, sexual, or other exploitation, particularly of vulnerable groups such as women, children, and the elderly.</li> </ul>								
Potential Risks and Impacts on Ecosystem Services	<p>The project's direct impacts on ecosystem services may result in adverse health and safety risks to and impacts on affected communities. With respect to ESS4, ecosystem services are limited to provisioning and regulating services as defined in ESS1.</p>	2	3	6	<ul style="list-style-type: none"> <li>Contractor will identify the project's potential risks and impacts on ecosystem services that may be exacerbated by climate change.</li> <li>Adverse impacts will be avoided, and if they are unavoidable, the Contractor will implement appropriate mitigation measures.</li> <li>Adopting ESCOP 12, 13 along with other ESCOP will mitigate the risk</li> </ul>	2	2	4	Project Ecologist/ Community Liaison officer

### **10.3 Community Health and Safety Management Framework**

#### **10.3.1 Health Services Program**

The health services program will enhance and monitor effective change in access to health, and any linkage to health status in general and in terms of the area of influence and specific communities and subpopulations (e.g., women, girls, children, in-migrants, visible minority) within the project area. The health services program will use environmental, social, economic and health data to continually track and evaluate the changing vulnerability of communities within the area of influence so that action can be focused on the most vulnerable communities at any given time.

Contractors will work with local government to identify any necessary follow-up actions if health status is negatively affected by the Project in areas of influence. Possible actions will include supporting provision of affordable health services, including mobile health outreach clinics within the areas of influence.

The Contractor understands the potential consequences of breaches of medical ethics, including the potential for direct and indirect discrimination of, and violence against, affected persons. Health data must be confidential to the individual and health professionals only. To minimize breaches of confidentiality, the Contractor will identify opportunities for collaboration with local governments and communities to develop or share in third party health data collection and reporting for the communities in the areas of influence. In any case, the Contractor will set clear expectations and protocols for the management of medical data to prevent access to, and disclosure of medical data to, non-medical employees, managers or others. The Contractor will carry out a continuous risk assessment of the procedures in place, monitor its medical staff, and identify any necessary corrective or preventive actions for continuing operations.

At closure of the construction, the Contractor will work to maximise likelihood of continued improvement to general health and wellbeing. Under the Social Management Framework, the Contractor will work with local government to identify options to protect and enhance the health of communities in the areas of influence post-closure. During the closure phase, the Contractor will transfer knowledge of general health status, trends in health status over the life of the Project, and predictions for changes in health status for different post-closure scenarios to the government.

#### **10.3.2 Disease Prevention Program**

The Disease Prevention Program will focus on methods to reduce of community exposure of water related disease. The program will be delivered through active mitigation (e.g., limiting bodies of stagnant water), development support in nearby communities, and community awareness. The program will be informed by health monitoring.

#### **10.3.3 Pandemic Action Plan Program (COVID-19)**

To protect the health and safety of workers, as well as surrounding communities from pandemic, it is strongly recommended to conduct a workplace review and risk assessment for exposure to COVID-19 and other infectious disease where the nature of works, stage of implementation, project activities, and status of the project must be taken into consideration. In addition, vulnerable groups such as migrant workers as well as women, older workers, at-risk workers including those with underlying health conditions, or those with combined vulnerability factors who will also be disproportionately impacted, should also be considered.

Contractors will setup COVID-19 screening, testing and quarantine management as it applies to new workers, existing workers returning to site, and visitors to site. Project contractor/Management must need to engage local Governments, community leader, businesses, and healthcare providers contributing to an overall community mitigation strategy to minimize illness and death rates as well as the social and economic impact of COVID-19. Project management should put emphasis on community mitigation

measures and choose which ones to put in place to prepare for and respond to community transmission of COVID-19. Implementation of community mitigation measures of COVID-19 is based on:

- Detection of confirmed cases of COVID-19 with no epidemiologic link to known cases.
- COVID-19 Response Plan will be developed which will be monitored and progress is reported regularly to Senior Management (and the Board) for review and improvement.
- The project will dedicate community outreach / community relations staffs who will establish channels of communication with local communities. These channels will be used to communicate the Project's response to COVID-19, and to provide COVID-19 prevention information to communities in a culturally appropriate way
- Contractors should establish proper channels of communication and collaboration with local/regional health institutions in their jurisdiction.
  - These channels will be used to communicate and coordinate with the COVID-19 response, for reporting cases and contact tracing.
  - The project will be following health protocols from local health authorities regarding the management of cases and fatalities
- The project authority will develop a Grievance procedure in place that will be adapted for COVID-19 Grievances.
  - Both workers and community members have an immediate way to contact the Project (e.g., by phone) regarding any potential grievance linked to COVID-19.
  - There is evidence that grievances received linked to COVID-19 are being prioritized and resolved promptly.
- Frequent meetings with community authorities either through seminar or FGDs should be conducted to make the community aware of the severity and fatality of COVID-19 and also inspire them to follow the WHO recommended precautions. In addition, awareness campaign should be taken place among the community by putting up poster or leaflet distribution in Bengali language.

#### **10.3.4 Chikungunya and Dengue**

Chikungunya, dengue and other vector borne disease reduction campaigns will be applied consistently throughout the Project duration and will include awareness of linkages between stagnant water and dengue, including through poor sanitation conditions. Open water sources are created and/or enlarged, as a result of construction activities and storage of plant, materials and equipment, with the potential for increased mosquito breeding sites. Increased burden of disease in workforce, results in increased demand on Project health services and reduce productivity.

Perform a baseline entomological study to define the most predominant vector species in the Project area, as well as determining the susceptibility of mosquitoes to the different classes of insecticides. The Contractor will encourage good sanitation practices, and the use of mosquito nets throughout the area of influence. The Contractor will support development of local knowledge and on the exposure pathways and determinants of exposure in vulnerable communities. The Health Services Program will inform the Disease Prevention Program of the most vulnerable communities (with highest dengue incidence) for prioritized action. Provide information for training of workers in Chikungunya and Dengue awareness so they can take knowledge back to communities. Actions and lessons learned in the areas of influence will regularly inform Occupational Health and Safety training.

#### **10.3.5 Sanitation and Water Supply**

Contractors will support the development of improved sanitation and improved water facilities. Through stakeholder engagement, the Contractor will encourage people to construct, adopt and effectively use improved sanitation and water facilities. Focus groups with local government, existing communities and

in-migrants may be implemented to help knowledge exchange and establish common expectations for sanitary conditions in the areas of influence.

The facilitation and dissemination of information on the linkages between improved water sources, sanitation conditions and human health, and on good hygiene practices, will promote use of the improved facilities and minimize the increased incidence of water related disease and food-borne illness in the areas of influence.

On-going monitoring of health and health impact pathways (e.g., number of bodies of stagnant water, number of people with access to improved sanitation facilities) will be implemented by the Contractor with regular feedback to those affected.

### **10.3.6 Sexually Transmitted Diseases**

Stakeholder engagement activities will include culturally specific and gender specific awareness education about incidence of sexually transmitted diseases in the areas of influence, information on pathways of exposure, and any local evidence to aid acceptance of this information and dispel current myths about causes of HIV/AIDS. Contractors will assist communities in developing education materials such as those using anecdotal epidemiology that would aid increasing acceptance of evidence-based research and facts regarding HIV/AIDS.

### **10.3.7 Subcontractor Integrity Program**

Contractors will be clear about its expectations of subcontractors during all phases. Contractors will continually monitor and evaluate companies' performance, including performing spot checks on-site, to ensure that the expected level of safety culture is being adhered to. The subcontractor integrity program will be broad and include, but not be limited to the performance regarding the following:

- General traffic safety;
- Hazardous materials management;
- Community health and safety;
- Occupational health and safety; and
- Adherence to construction standards stated in the general and specific conditions of the main contract.

### **10.3.8 Emergency Preparedness and Response Planning**

Contractors will develop an emergency preparedness and response plan (EPRP) to contain emergencies. A risk assessment will be conducted during the Stage 2 E&S study covering major emergencies and corresponding management measures for the project. Contractors will work with local authorities to strengthen the national emergency response network in the areas of influence and to ensure implementation of the project specific emergencies and make arrangements with external emergency services (Fire, ambulance, etc.), if the resources available with a given Contractor is not sufficient to contain the emergency.

If an external emergency arises not due to the Project but something where collaboration from the Contractor is needed for both labor and emergency equipment, Contractors can extend collaboration to work with local authorities and communities. Contractors will develop procedures in the EPRP on actions that need to be taken when an external emergency event is triggered. The EPRP prepared by the contractor will cover both project-specific and emergencies in the communities. The Contractor will conduct capacity building and train local communities as needed to make sure the communities know what to do during an emergency. Contractors will work with local authorities to make sure they are aware of it and if needed strengthen the emergency response network to be able to coordinate with the Project.

During each Project phase, the Contractor will communicate potential hazards, potential emergency scenarios, and health risks associated with emergency scenarios. Consultations will be held with



communities and community leaders in the areas of influence and along the transportation route, and specific emergency response and preparedness measures will be determined and incorporated in the emergency response plan. Trainings and awareness for the communities on the emergency response plan will be carried out by contractors.

The following aspects of the Emergency Preparedness and Response Plan will be jointly addressed by Contractors, the community and government representatives:

- Definition of information and notification chain(s) within government/regulatory agencies (who needs to be informed, who has which responsibility and access to/control over resources), following notification of the authorities by the Contractor that an emergency situation has occurred;
- Media information chain (local radio) – such as warnings of embankment failure in up and downstream areas;
- Evacuation procedures for the local affected population;
- Awareness of operations and their risks and preparedness to respond (e.g., sufficient capacity of beds in local hospital);
- Preparedness of state/community emergency response teams (fire brigade) and awareness of risks and potential emergency scenarios, availability of PPE adequate for specific risks such as respirators, full-body harness etc.;
- Knowledge of site plan by ambulance teams (fastest access to critical points such as embankment, explosive storage);
- Training requirements of key people (police, hospitals and local health centres) and alignment of their training plans with the Contractor training plans;
- Commitment to coordinated emergency drills between the Contractor and police, fire fighters, national disaster management authority, etc., and aligned plans for drills; and
- Nomination of community representatives in the preparation of the external plan, and in the planning of and participation in, drills.
- Designated coordinator for EPRP implementation and
- Measures for restoration and cleanup of the environment following any major accident.

### **10.3.9 Security with Integrity Program**

The operations and selection of the Project's security personnel will be guided by the relevant provisions of ESS 2 (Labor conditions) and ESS4 (Community Health, Safety and Security) and the associated GN4: Guidance Notes:

- Security will be provided in a manner that does not jeopardize the community's safety and security, or the client's relationship with the community;
- All security personnel must read, sign and adopt the Code of Conduct in line with ESS4;
- Security personnel may not be used to force or extract work from workers;
- Contractors will carry out a continuous risk assessment of the security arrangements in place, monitor its security personnel, and identify any necessary corrective or preventive actions for continuing security operations;
- Security arrangements will follow the principle of proportionality, respect for human rights, and good international practice;
- Contractors will ensure that those providing security are not implicated in past abuses;
- Contractors will provide adequate training in the use of force and appropriate conduct toward workers and communities;

- Contractors will ensure that security personnel act within the applicable legislation of the country;
- Contractors will not sanction any use of force except when used for preventive and defensive purposes in proportion to the nature and extent of the threat;
- Contractors will provide a grievance mechanism to express concerns about the security arrangements and acts of security personnel;
- If security personnel are permitted to use force, instructions must be clear on when and how force may be used, specifying that security personnel are permitted to use force only as a matter of last resort and only for preventive and defensive purposes in proportion to the nature and extent of the threat, and in a manner that respects human rights;
- Security personnel will be instructed to exercise restraint and caution, clearly prioritizing prevention of injuries or fatalities and peaceful resolution of disputes. The use of physical force will be reported to and investigated by the Contractor;
- Any persons injured because of the action of security personnel will be transported to medical facilities;
- The instructions for security personnel will make clear that arbitrary or abusive use of force is prohibited; and
- Unlawful acts of any security personnel will be reported to the appropriate authorities.
- The contractor will require them to act within the applicable law and any requirements set out in the Environmental and Social Commitment Plan (ESCP)

Contractors may seek support from government authorities and appropriate non-governmental organizations (NGOs) to aid preventative planning, evaluation, monitoring and follow-up to ensure security services providers meet Project expectations. Support may include strategies to identify and manage presence of ex-combatants and ex-military personnel within the community and within the Project security services.

Contractors' security services' responsibilities will include preventing hazardous materials or waste from leaving the Project site or the hazardous waste disposal site for the Project.

Contractor will endeavor to monitor in-migration trends and vulnerability indicators through interaction with the community, including incidence of sexual violence and perceived security. Recording good social and health performances in the project area is key to protecting community security and lowering the potential for conflicts and acts of violence in the Direct Area of Influence and Indirect Area of Influence.

Contractors will need to establish mitigation measures in relations to engaging and partnering with local stakeholders, such as supporting the extension of policing services to prevent the intensification of violent conflicts.

### **10.3.10 Community Health and Safety Awareness Program**

#### *Awareness on Community Health and Disease Prevention*

Where an assessment identifies risks, for example communicable diseases, which may arise from the interaction of project workers with local communities, the ESIA for the project describe such risks and measures to address them. Such measures can include, more generally, the use of skilled trainers to raise awareness among project workers of the risks, expected behaviors, and consequences of violations, communicated through training, and publicized codes of conduct. It is also important to raise awareness of the risks among community members and local health authorities and inform them about available grievance mechanisms. In addition, Contractors will create awareness of linkages between stagnant water and dengue, including through poor sanitation conditions in the community's close proximity to the Project. Provide information for training of community representatives in Chikungunya and Dengue awareness so they can take the knowledge back to their respective communities.

Community health and disease prevention awareness campaigns will be applied consistently throughout the Project duration and will include awareness of:

- Linkages between improved water sources, sanitation conditions and human health;
- Common water related disease and food borne illness rates in the areas of influence;
- Good hygiene practices;
- Benefits to properly using the improved facilities; and
- Evidence of improvement in target communities to encourage adoption in other communities.

#### *Traffic and Road Safety Awareness*

Stakeholder engagement activities, an effective communication strategy, as well as monitoring and management plans will help the Contractor prevent potential negative impacts resulting from a poor in-country safety culture. These actions include the following:

- Clear expectations regarding road safety culture, road safety behavior and road safety training, provided to workers and contractors;
- On-going monitoring of traffic and Pedestrian Interface in the project area (e.g., near misses, reports from communities, reports from project traffic) with regular feedback to those affected; and
- Knowledge transfer to workers and affected communities regarding road user awareness with advice on strategies for interacting with project traffic.

In addition, Contractors will promote traffic safety awareness in communities in the Direct Area of Influence and along the transportation route.

#### *Hazardous Materials Management and Safety Awareness*

Contractors will provide hazardous materials management safety communications to communities in the areas of influence to deter workers, their families and others from collecting, reusing, recycling or reselling Project waste. Communications will include examples of hazardous materials used in Project construction, operation and rehabilitation, the risks to human health, and appropriate methods of use and disposal.

During the closure phase, the Contractor will disseminate information on residual site hazards, including the hazardous materials waste disposal site (landfill). Awareness training will include dissemination of information relating to, as for example, the sand mining and the potential impacts of damaging the slope and soil cover, which would jeopardise the rehabilitation success and expose the communities in the areas of influence to unnecessary and preventable health and environmental risk.

#### *Use of Security Personnel*

Contractors will engage with communities about the project's impacts on community safety and security, create awareness concerning the Code of Conduct commitment and project grievance mechanism, as outlined in the Stakeholder Engagement Plan (SEP), LMP and SEA/SH action Plan.

Contractors will avoid internal operational silos by ensuring that their Security staff coordinate regularly with other departments, such as Community Relations and Human Resources. Through its Community Relations function, Contractors will share information with communities about security arrangements, the Contractors' security policies, and the expected conduct of security personnel. Dialogue with communities about security issues can also help Contractors to identify potential risks and local concerns, and can serve as an early warning system.

Community members will be informed through the awareness program, where to go with complaints about the conduct of security personnel. Can they lodge such complaints through the company's general

community grievance mechanism or is there one specifically for security concerns—or even an alternative complaint mechanism (for example, as part of the local justice system)? Contractors will maintain a clear process and communicate it. The awareness will also provide information on the community members' ability to make complaints without fear of intimidation or reprisal.

Gender considerations are also important, as women often have different experiences and interactions with security personnel. For example, the potential for sexual harassment or sexual violence against women can increase from an expanded presence of private or public security forces in a project area. Contractors should consider consulting and creating awareness separately for women's group, which may offer important perspectives and may help Contractors to identify a fuller range of potential risks and community concerns. At the same time, security personnel's awareness of and respect for culturally specific gender issues may help the local population accept their presence. Contractors might consider recruiting female security guards to improve cultural acceptance and reducing tensions, particularly in situations where there are frequent interactions between guards and women from the community.

#### *Positive Lifestyles Program*

Through the Community Development Plan, the Contractor will encourage culturally appropriate positive lifestyle choices to:

- Establish good financial management choices;
- Deter an increase in alcohol use, substance abuse and tobacco use;
- Avoid violence against women, including sexual violence;
- Avoid ethnic- or religious- based violence;
- Adopt good hygiene practices and sanitation; and
- Reduce the potential for STDs.

Awareness campaigns may be conducted within the workplace and at religious institutions, local governments, schools, and health clinics.

#### *SEA/SH awareness program*

Apart from the reasons of this hazard indicated in the Risk matrix (Table 10.2), other examples of SEA/SH need to be considered but are not limited to:

- A project worker tells women in the community that he can get them jobs related to the work site (cooking and cleaning) in exchange for sex
- A worker that is connecting electricity input to households says that he can connect women headed households to the grid in exchange for sex.
- A project worker gets drunk after being paid and rapes a local woman.
- A project worker denies passage of a woman through the site that he is working on unless she performs a sexual favor.
- A manager tells a woman applying for a job that he will only hire her if she has sex with him.
- Male staff comment on female staffs' appearances (both positive and negative) and sexual desirability.
- When a female staff member complains about comments male staff are making about her appearance, they say she is "asking for it" because of how she dresses.
- A male staff touches female staff members' buttocks wither in project or in community when she passes her destination.
- School or college girls might be get seduced or tempted by the project staff by offering gifts or other benefits

To protect and prevent community SEA/SH Strengthen community engagement and awareness-raising is essential. Critical awareness activities need to be conducted which will include training and awareness-raising sessions with women, girls, boys and men in communities of concern as well as with other stakeholders (including implementing and operational partners, government officials, civil society organizations, and companies in the private sector). To prevent SEA effectively, all staff and project workers must make sure that project Persons of Concern (PoC) are aware of their rights and entitlements. On the other hand, PoC from contractor and project management side should know that they are entitled to assistance that they should never be expected to provide any form of sexual favor, and that demands for such favors are strictly prohibited. Community and project victims should also know how and where to report SEA incidents safely and confidentially when they occur. As part of prevention, trainings and information campaigns should be put in place for all project personnel and PoC. Training and information campaigns may include the distribution of information sheets, posters and videos, or community meetings, focus group discussions, etc.

Beside that the project will include a general Code of Conduct (CoC) as well as a Labor Code of Conduct, covering the GBV/SEA/SH related risks for the contractors, sub-contractors, and laborers who will be employed under the project. A SEA-SH compliant GRM will also be set up for this purpose.

## **10.4 Other Measures to Manage CHS Risks**

### **10.4.1 Safety of Services by Maintaining Quality Management Systems**

The Contractor will establish and implement appropriate quality management systems to anticipate and minimize risks and impacts. Projects may provide many kinds of services to communities, such as those relating to education and health, social security and social protection, transport, and utilities, such as electricity and gas, water and sanitation, and waste disposal. Management systems that address the safety of such services are important because without adequate protection measures the provision of such services can present dangers for communities. Such systems address the community health and safety risks posed by project services, for example, risks associated with:

- Infrastructure construction and heavy equipment movement, such as, struck by moving vehicle;
- Water or irrigation canals, such as drowning, flooding, or water-related diseases;
- Waste disposal, such as toxicity, waste dump collapse, or air pollution;
- Quarries or excavation works, such as rock falls or hazardous equipment;
- Water and sanitation services, such as contaminated water or spread of disease;
- Electricity supply, which may result in electric shock from electrical cabinets or cables;
- Service providers, which may use their service for the purpose of financial, sexual, or other exploitation, particularly of vulnerable groups such as women, children, and the elderly.

In such circumstances, the Contractor will apply hierarchy of controls, such as, eliminate/substitute, and engineering control of hazards and if hazards are low risk, then introduce administrative controls and as a final resort provide appropriate personal protective equipment.

## **10.5 Potential Risks and Impacts on Ecosystem Services**

The project's direct impacts on ecosystem services may result in adverse health and safety risks to and impacts on affected communities. With respect to ESS4, ecosystem services are limited to provisioning and regulating services as defined in ESS1. Where appropriate and feasible, the Contractor will identify the project's potential risks and impacts on ecosystem services that may be exacerbated by climate change. Adverse impacts will be avoided, and if they are unavoidable, the Contractor will implement appropriate mitigation measures.

As indicated in ESS1, ecosystem services are the benefits that people derive from ecosystems. The provisioning services that ecosystems provide include the products people obtain from the ecosystems,

such as food, freshwater, timbers, fibers, and medicinal plants. Regulating services of ecosystems are the benefits people obtain from the regulation of ecosystem processes, such as surface water purification, carbon storage and sequestration, climate regulation, and protection from natural hazards. Ecosystems and ecosystem services affected by the project need to be part of the environmental and social assessment as required by ESS1 and mitigation and preventive measures should be identified in the ESIA and accordingly field implement them to preserve the ecosystem.

## **10.6 Organization, Roles, and Responsibilities**

The requirements of this CHS Plan will be stewarded and implemented by the Project. The Environment, Health and Safety (EHS) Officer will own this Plan.

The following roles and responsibilities are examples of the type of roles that will apply during the construction phase. As the needs of the Project change over time, some roles may be replaced and or combined with others that are more appropriate to the Project's needs at the time.

### **10.6.1 Environment, Health and Safety (EHS) Officer**

- Responsible for overall implementation including coordination with government and community representatives
- Responsible for ensuring safe behaviors by Project personnel such that community safety is protected
- Investigates and analyses community safety events when/if they occur and escalates findings and required remedial actions to Management as required
- Responsible for notification of community safety incidents, as described in the Environmental and Social Management Plan.

### **10.6.2 Medical Doctor/Coordinator**

- Responsible for health support coordination, delivery and implementation of health services to the workforces
- Ensure health specifications and programs/procedures meets Country health regulatory requirements
- Develops and coordinates the implementation of health inspection and audit programs to monitor compliance with health requirements
- Provides review of disease prevalence data and recommends changes to address disease prevalence and severity.

### **10.6.3 Security and Community Health Representative**

- In consultation with Medical Doctor/Coordinator, identifies and evaluates community health risks
- Identifies mitigation steps to address community health issues affected by project activities
- Conducts inspections and audits for effective implementation of community health programs
- Management and coordination of security guards employed by the Project
- Management of security incidents which occur both on the Project site and outside the site
- Collects, analyses data, reports on and provides recommendations on initiatives for continuous improvement in the community health program performance and compliance.

## **10.7 Training and Competency**

Contractors will ensure that personnel responsible for the execution of tasks and requirements in this Plan are competent based on education, training, and experience.

This CHS Plan requires training be provided to workers who may be exposed to hazards (health, safety or security) associated with Project activities. This training is part of the mitigation framework to be developed based on specific project activities and implemented by the Contractor, so it is not addressed in detail within this document. The training and increase in Project worker awareness associated with health, hygiene and sanitation, communicable disease, sexually transmitted infection (STI) and HIV/AIDS education campaigns are a key component in minimizing health risks to the community posed by activities of the Project.

This Plan requires workforce awareness program/training be provided as part of camp initiation as well as incorporated into ongoing and regular training commitments, particularly with regard to the management of communicable diseases. This training is applicable to all Government, Contractor, sub-contractor, and Engineering personnel and will be developed and implemented by Contractors in association with the Engineer following the Government review and approval. Training will include, but not be limited to:

- Voluntary Principles for Security and Human Rights training for all Project security guards and security management, including the appropriate use of force and protection of human rights
- STI and HIV/AIDS prevention and awareness training for all workforces
- Driver training to improve driver and vehicle safety, as well as systems for monitoring and enforcement
- Road and traffic safety awareness for school children and the community leaders
- Sanitation and nutrition awareness and education for all workforces, with a focus on messages which can be taken home to families to encourage good sanitation and nutrition practices in rural settings
- Respiratory illness and infectious disease management, including TB
- Vector-borne disease awareness including Chikungunya and Dengue
- Speed restrictions in populated areas, safe driving in rural areas, safe driving in dusty environments, defensive driving and basic first aid
- Guidance for all workforces with potential occupational exposures and prevention to SARS-CoV-2
- Benefits of vaccinations and disease prevention
- Adverse impacts of Drug and Alcohol usage.

## 10.8 Performance Indicators

The Borrower will review and endorse indicators which will be monitored to determine the effectiveness of the Community Health, Safety, and Security impact and risk mitigation measures.

Examples of indicators may include, but should not be limited to:

- Rates of communicable disease in the Project workforce
- Rates of communicable disease in the community
- Project related safety and security incidents in the community
- Number of grievances or claims of Project related impacts on the community.

The development of risk and impact management strategies will include specific performance indicators. Indicators will be included in the monthly report of any given Contractor and the Engineer, with the aim that regular reviews for effectiveness and achievement of desired outcomes are part of the report development process. This will ensure that improvements and additional preventions can be implemented as and when required.



Project environmental assessment report should include provisions for specific community health monitoring which may be undertaken in partnership with government, NGOs, or third parties with the intent to share the data with Government or appropriate health planning and consideration by the Government.

Community health indicators may include, but not be limited to:

- Rates of Chikungunya and Dengue, and other vector-borne diseases
- Community health aspects, i.e., rate of STI's, TB, HIV/AIDS.

The Borrower may, at its discretion, audit any contractors, subcontractors, or suppliers to assess compliance with this Plan. The Borrower may also, at its discretion, undertake audits of other third-party facilities and providers associated with the Project, as relevant to the ESMP.

## **10.9 Monitoring and Maintenance**

### **10.9.1 Confidentiality Requirements**

Contractors will ensure health data are handled to an international standard of medical ethics. Health data is confidential to the individual and health professionals only. Contractors will assure that data is stripped of all personal identifiers before dissemination to other (non-medical) company employees or external bodies, reducing the potential for any internal or external discrimination of employees or community members. Sample size and relative risk of personal identification will need to be considered before combined health data is published internally and externally. Contractors understands that confidentiality of health data overrides any need to demonstrate vulnerability in a population, sub-population or individual.

### **10.9.2 Community Health Monitoring**

Community health monitoring will include monitoring of exposure pathways as well as disease. Regular feedback to local communities will be important to provide evidence and encouragement for long-term adoption of positive health related behaviours.

Contractors will identify opportunities for collaboration with local governments and communities to develop or share in health data collection and reporting for the communities within the areas of influence. Data would preferably be collected and analyzed by community and gender, age and socio-economic or other health-associated status if data size allowed and is protective against confidentiality breaches.

### **10.9.3 Audit**

Contractors will conduct an annual internal community health and safety audit to evaluate the ethical compliance, comprehensiveness and effectiveness of the Community Health and Safety Plan. Periodically the plan may be audited by qualified external auditors to verify the internal auditing.

## **10.10 Review and Update**

The Plan shall be regularly updated, considering the following aspects, as applicable:

- Updated Project design;
- Change in project phase;
- Operational experience;
- Ongoing stakeholder consultation;
- New regulatory requirements and changed legislative framework; and
- Emerging social change and community health issues such as new communicable or non-communicable diseases.

There is no authoritative guidance on the frequency of the updates, however, in line with international best practice, yearly update would be advisable, and more often if major changes have occurred.

Responsibility for the update lies with the Environment, Health and Safety Officer, in cooperation with other departments such as the Security and Community Health Representative, and following the feedback from the GRM.



**Annex 11.1: List of the Participants of the Expert Consultation for  
Validating VEC and R-CIA Result**

**Expert Consultation For  
Identification of Valued Environmental and Social Components for Rapid Cumulative Impact  
Assessment**

**Jamuna River Sustainable Management Program, Phase 1**

<b>Date</b>	29 November 2021
<b>Place</b>	CEGIS Conference Room, CEGIS Office
<b>Meeting Topic</b>	Identification of Valued Environmental and Social Components for Rapid Cumulative Impact Assessment

**List of Participants**

- Mr Zahir Uddin Ahmed, Ex-Deputy Chief Conservator of Forest
- Mr Motaleb Hossain Sarker, Water Resources Specialist, Water Resources Division, CEGIS
- Dr Md Ruknul Ferdous, Water Resources and Environmental Expert, Royal HaskoningDHV, NL
- Dr. Kazi Md. Noor Newaz, Environmental Specialist, Ecology, Forestry and Biodiversity Division, CEGIS
- Kazi Kamrull Hassan, Environmental Specialist and Urban Planner, Water Resources Division, CEGIS
- Md Mohammed Mukteruzzaman, Fisheries and Biodiversity Specialist, Power, Energy and Mineral Resources Division, CEGIS
- Mr. Mushfiq Ahmed, Wildlife Biologist, Ecology, Forestry and Biodiversity Division, CEGIS
- Muhammad Shifuddin Mahmud, Socio-Economic Specialist, Socio-economic and Institutional Development, CEGIS
- Mr Roland Nathan Mondal, Fisheries Specialist, Agriculture and Fisheries Division, CEGID
- Mr Wahiduzzaman Kallol, OHS Specialist, JRSMP-ESIA
- Mr Fazole Rabbe, Biodiversity Specialist, JRSMP-ESIA
- Dr Masud Karim, TL, JRSMP-ESIA
- Dr Md Shibly Sadik, DTL, JRSMP-ESIA

## **Annex 12.1: Environmental and Social Code of Practices**

## **Introduction**

The objective of the Environmental and Social Code of Practices (ESCOPs) is to address all potential and general construction related impacts and risks during implementation of the Project. The ESCOPs consist of environmental and social management guidelines and OHS practices to be followed by the contractors for sustainable management of all environmental, social, health and safety issues. These ESCOPs shall be annexed to the general conditions of all the contracts, including subcontracts, carried out under the Project.

The list of ESCOPs prepared for the Project is given below.

- ESCOP 1: Waste Management
- ESCOP 2: Fuels and Hazardous Goods Management
- ESCOP 3: Water Resources Management
- ESCOP 4: Drainage Management
- ESCOP 5: Soil Quality Management
- ESCOP 6: Erosion and Sediment Control
- ESCOP 7: Top Soil Management
- ESCOP 8: Topography and Landscaping
- ESCOP 9: Quarry Areas Development and Operation
- ESCOP 10: Air Quality Management
- ESCOP 11: Noise and Vibration Management
- ESCOP 12: Protection of Flora
- ESCOP 13: Protection of Fauna
- ESCOP 14: Road Transport and Road Traffic Management
- ESCOP 15: Construction Camp Management
- ESCOP 16: Cultural and Religious Issues
- ESCOP 17: Community and Workers Health and Safety
- ESCOP 18: Construction and Operation Phase Security
- ESCOP 19: Operation of Heavy Equipment Management
- ESCOP 20: Excavation
- ESCOP 21: Lifting and Materials Handling

Contractors will prepare site specific management plans, namely Construction Environmental and Social Action Plan (CESAP) and Occupational Health and Safety Plan, in compliance with World Bank and Government Regulation and guidelines and based on the guidance given in the ESCOPs. The CESAP and OHS Plan will form the part of the contract documents and will be used as monitoring tool for compliance. It is mandatory for the main contractors procured directly by the project to include these ESCOPs in their subcontracts. Violation of the compliance requirements will be treated as non-compliance leading to the corrections or otherwise imposing penalty on the contractors.

**ESCAP 1: Waste Management**

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
General Waste	Soil and water pollution from the improper management of wastes and excess materials from the construction sites.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Develop site specific waste management plan for various specific waste streams (e.g., reusable waste, flammable waste, construction debris, food waste etc.) prior to commencing of construction and submit to supervision consultant for approval.</li> <li>• Organize disposal of all waste generated during construction in the designated disposal sites approved by the Project.</li> <li>• Minimize the production of waste materials by 3R (Reduce, Recycle and Reuse) approach.</li> <li>• Segregate and reuse or recycle all waste, wherever practical.</li> <li>• Vehicles transporting solid waste shall be covered with tarps or nets to prevent spilling waste along the route.</li> <li>• Train and instruct all personnel in waste management practices and procedures as a component of the environmental induction process.</li> <li>• Provide refuse containers at each worksite.</li> <li>• Request suppliers to minimize packaging where practicable.</li> <li>• Place a high emphasis on good housekeeping practices.</li> <li>• Maintain all construction sites in a clean, tidy and safe condition and provide and maintain appropriate facilities as temporary storage of all wastes before transportation and final disposal.</li> <li>• Potable water should be supplied in bulk containers to reduce the quantity of plastic waste (plastic bottles). Plastic bag use should be avoided.</li> </ul>
Hazardous Waste	Health hazards and environmental impacts due to improper waste management practices	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Collect chemical wastes in 200-liter drums (or similar sealed container), appropriately labeled for safe transport to an approved chemical waste depot. Adopt chain of custody handling</li> <li>• Store, transport and handle all chemicals avoiding potential environmental pollution.</li> <li>• Store all hazardous wastes appropriately in banded areas (with capacity for storage of 110% contents) away from water courses.</li> <li>• Make available Material Safety Data Sheets (MSDS) for hazardous materials on-site during construction.</li> <li>• Collect hydrocarbon wastes, including lube oils, for safe transport off-site for reuse, recycling, treatment or disposal at approved locations (with capacity for storage of 110% contents)).</li> <li>• Construct concrete or other impermeable flooring to prevent seepage in case of spills.</li> <li>• Use covered storage for any hazardous waste</li> </ul>



**ESCOP 2: Fuels and Hazardous Goods Management**

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Fuels and hazardous goods.	Materials used in construction have a potential to be a source of contamination. Improper storage and handling of fuels, lubricants, chemicals and hazardous goods/materials on-site, and potential spills from these goods may harm the environment or health of construction workers.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Prepare spill control procedures and submit them for supervision consultant approval.</li> <li>• Train the relevant construction personnel in handling of fuels and spill control procedures.</li> <li>• Store dangerous goods in banded areas (on top of concrete or other impermeable flooring) away from watercourses.</li> <li>• Refueling shall occur only within banded areas.</li> <li>• Store and use fuels in accordance with material safety data sheets (MSDS). Make available MSDS for chemicals and dangerous goods on-site.</li> <li>• Transport waste of dangerous goods, which cannot be recycled, to a designated disposal site. Adopt chain of custody for handling</li> <li>• Provide spill kits where hazardous material are used and stored; and ensure personnel are trained in the correct use.</li> <li>• Provide training on using spill kits to the personnel involved in handling of hazardous waste</li> <li>• Provide protective clothing, safety boots, helmets, masks, gloves, goggles, to the construction personnel, appropriate to materials in use.</li> <li>• Make sure all containers, drums, and tanks that are used for storage are in good condition and are labelled with expiry date. Any container, drum, or tank that is dented, cracked, or rusted might eventually leak. Check for leakage regularly to identify potential problems before they occur.</li> <li>• Store all liquid fuels in fully banded storage containers, with appropriate volumes, a roof, a collection point and appropriate filling/decanting point.</li> <li>• Store hazardous materials above flood level considered for construction purposes</li> <li>• Put containers and drums in temporary storage in clearly marked areas, where they will not be run over by vehicles or heavy machinery.</li> <li>• Take all precautionary measures when handling and storing fuels and lubricants, avoiding environmental pollution.</li> <li>• Avoid the use of material with greater potential for contamination by substituting them with more environmentally friendly materials.</li> </ul>

**ESCOP 3: Water Resources Management**

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Hazardous material and Waste	Water pollution from the storage, handling and disposal of hazardous materials and general construction waste, and accidental spillage	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Follow the management guidelines proposed in ESCOPs 1 and 2.</li> <li>• Minimize the generation of sediment, oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes). These substances must be contained on site and must not enter waterways or storm water systems.</li> </ul>
Discharge from construction sites	Construction activities, sewerages from construction sites and work camps may affect the surface water quality. The construction works will modify groundcover and topography changing the surface water drainage patterns of the area. These changes in hydrological regime lead to increased rate of runoff, increase in sediment and contaminant loading, increased flooding, and effect habitat of fish and other aquatic biology.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Install temporary drainage works (channels and bunds) in areas required for sediment and erosion control and around storage areas for construction materials.</li> <li>• Install temporary sediment basins, where appropriate, to capture sediment-laden run-off from site.</li> <li>• Divert runoff from undisturbed areas around the construction site.</li> <li>• Stockpile materials away from drainage lines</li> <li>• Prevent all solid and liquid wastes entering waterways by collecting solid waste, oils, chemicals, bitumen spray waste and wastewaters from brick, concrete and asphalt cutting where possible and transport to an approved waste disposal site or recycling depot.</li> <li>• Wash out ready-mix concrete agitators and concrete handling equipment at washing facilities off site or into approved bunded areas on site. Ensure that tires of construction vehicles are cleaned in the washing bay (constructed at the entrance of the construction site) to remove the mud from the wheels. This should be done in every exit of each construction vehicle to ensure the local roads are kept clean. This contaminated water should be drained to the wastewatermanagement facilities onsite.</li> </ul>
Soil erosion and siltation	Soil erosion and dust from the material stockpiles will increase the sediment and contaminant loading of surface water bodies.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Stabilize the cleared areas not used for construction activities with vegetation or appropriate surface water treatments as soon as practicable following earthwork to minimize erosion.</li> <li>• Ensure that roads used by construction vehicles are swept regularly to remove dust and sediment.</li> <li>• In case of dirt roads, any damage made by the construction vehicle should be repaired.</li> <li>• Water the loose material stockpiles, access roads and bare soils on an as required basis to minimize dust. Increase the watering frequency during periods of high risk (e.g., high winds).</li> </ul>
Construction activities in water bodies	Construction works in the water bodies will increase sediment and contaminant loading, and effect habitat of fish and other aquatic	<p>The Contractor Shall:</p> <ul style="list-style-type: none"> <li>• Dewater sites by pumping water to a sediment basin prior to release off site – do not pump directly off site.</li> <li>• Protect water bodies from sediment loads by silt screen or other barriers.</li> <li>• Minimize the generation of sediment, oil and grease, excess</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	biology.	<p>nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes). These substances must not enter waterways or storm water systems.</p> <ul style="list-style-type: none"> <li>Do not discharge cement and water curing used for cement concrete directly into water courses and drainage inlets. The site should be equipped with facilities to store these types of waste and wastewater with management facilities.</li> </ul>
Drinking water	Untreated surface water is not suitable for drinking purposes due to presence of suspended solids and ecoli.	<p>The Contractor Shall:</p> <ul style="list-style-type: none"> <li>Provide drinking water that meets NEQS standards. Drinking water to be chlorinated at source, and ensure presence of residual chlorine 0.1 ~ 0.25 ppm as minimum after 30 minutes of chlorine contact time.</li> </ul>

#### **ESCOP 4: Drainage Management**

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Excavation and earth works, and construction yards	Lack of proper drainage for rainwater/liquid waste or wastewater owing to the construction activities harms environment in terms of water and soil contamination, and mosquito growth.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>Prepare drainage management procedures and submit them for supervision consultant approval.</li> <li>Prepare a program to prevent/avoid standing water, which supervision consultant will verify in advance and confirm during implementation.</li> <li>Provide alternative drainage for rainwater if the construction works/earth-fillings cut the established drainage line.</li> <li>Establish local drainage line with appropriate silt collector and silt screen for rainwater or wastewater connecting to the existing established drainage lines already there. No discharge to river or any water course.</li> <li>Rehabilitate road drainage structures immediately if damaged by contractors' road transports.</li> <li>Build new drainage lines as appropriate and required for wastewater from construction yards connecting to the available nearby recipient facilities. Ensure wastewater quality conforms to NEQS, before it is being discharged into the recipient water bodies.</li> <li>Ensure that there will be no water stagnation at the construction sites and camps.</li> <li>Provide appropriate silt collector and silt screen at the inlet and manholes and periodically clean the drainage system to avoid drainage congestion.</li> <li>Protect natural slopes of drainage channels to ensure adequate storm water drains.</li> <li>Regularly inspect and maintain all drainage channels to assess and alleviate any drainage congestion problem.</li> </ul>
Ponding of water	Health hazards due to mosquito breeding	<ul style="list-style-type: none"> <li>Do not allow ponding of water especially near the waste storage areas and construction camps.</li> <li>Discard all the storage containers that are capable of storing</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		water, after use or store it in an inverted position.

### **ESCOP 5: Soil Quality Management**

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Storage of hazardous and toxic chemicals	Spillage of hazardous and toxic chemicals will contaminate the soils	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Strictly manage the wastes management plans proposed in ESCOP1 and storage of materials in ESCOP2.</li> <li>• Construct appropriate spill contaminant facilities for all fuel storage areas.</li> <li>• Establish and maintain a hazardous material register detailing the location and quantities of hazardous substances including the storage, and their disposal.</li> <li>• Train personnel and implement safe work practices for minimizing the risk of spillage.</li> <li>• Identify the cause of contamination, if it is reported, and contain the area of contamination. The impact may be contained by isolating the source or implementing controls around the affected site.</li> <li>• Remediate the contaminated land using the most appropriate available method.</li> </ul>
Construction material stock piles	Erosion from construction material stockpiles may contaminate the soils	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, straw bales or bunds.</li> <li>• All construction materials are to be covered</li> </ul>

### **ESCOP 6: Erosion and Sediment Control**

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Clearing of construction sites	Cleared areas and slopes are susceptible for erosion of top soils, which affects the growth of vegetation and causes ecological imbalance.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Prepare site specific erosion and sediment control measures and submit them for supervision consultant approval.</li> <li>• This should include a Top soil stripping, storage and reuse plan</li> <li>• Reinstate and protect cleared areas as soon as possible.</li> <li>• Cover unused areas of disturbed or exposed surfaces immediately with mulch/grass turf/tree plantations.</li> </ul>
Construction activities and material stockpiles	The impact of soil erosion are (i) Increased run off and sedimentation causing a greater flood hazard to the downstream, and (ii) destruction of aquatic environment by erosion and/or deposition of sediment damaging the spawning grounds of	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Locate stockpiles away from drainage lines.</li> <li>• Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, straw bales or bunds.</li> <li>• Remove debris from drainage paths and sediment control structures.</li> <li>• Cover the loose sediments of construction material and water them if required.</li> <li>• Divert natural runoff around construction areas prior to any site disturbance.</li> <li>• Install protective measures on site prior to construction, for</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	fish	<p>example, sediment traps.</p> <ul style="list-style-type: none"> <li>• Install 'cut off drains' on large cut/fill batter slopes to control water runoff speed and hence erosion.</li> <li>• Observe the performance of drainage structures and erosion controls during rain and modify as required.</li> </ul>
Soil erosion and siltation	Soil erosion and dust from the material stockpiles will increase the sediment and contaminant loading of surface water bodies.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Stabilize the cleared areas not used for construction activities with vegetation or appropriate surface water treatments as soon as practicable following earthwork to minimize erosion.</li> <li>• Ensure that paved roads used by construction vehicles are swept regularly to remove sediment.</li> <li>• Water the material stockpiles, access roads and bare soils on an as required basis to minimize dust. Increase the watering frequency during periods of high risk (e.g. high winds).</li> </ul>

### **ESCOP 7: Topsoil Management**

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Land clearing and earth works	Earthworks will impact the fertile top soils that are enriched with nutrients required for plant growth or agricultural development.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Strip the topsoil to a depth of 15 cm and store in stock piles of height not exceeding 2m.</li> <li>• Remove unwanted materials from top soil like grass, roots of trees and similar others.</li> <li>• The stockpiles will be done in slopes of 2:1 to reduce surface runoff and enhance percolation through the mass of stored soil and to ensure stability and safety.</li> <li>• Locate topsoil stockpiles in areas outside drainage lines and protect from erosion.</li> <li>• Construct diversion channels and silt fences around the topsoil stockpiles to prevent erosion and loss of topsoil.</li> <li>• Spread the topsoil to maintain the physico-chemical and biological activity of the soil. The stored topsoil will be utilized for covering all disturbed area and along the proposed plantation sites.</li> <li>• Prior to the re-spreading of topsoil, the ground surface will be ripped to assist the bunding of the soil layers, water penetration and revegetation</li> </ul>
Transport	Vehicular movement outside ROW or temporary access roads will affect the soil fertility of the agricultural lands	<ul style="list-style-type: none"> <li>• Limit equipment and vehicular movements to within the approved construction zone.</li> <li>• Plan construction access to make use, if possible, of the final road alignment.</li> </ul>

**ESCOP 8: Topography and Landscaping**

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Land clearing and earth works	Construction activities especially earthworks will change topography and disturb the natural rainwater/flood water drainage as well as will change the local landscape.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Prepare landscaping and plantation plan and submit the plan for supervision consultant approval.</li> <li>• Ensure the topography of the final surface of all raised lands (construction yards, approach roads and rails, access roads, etc.) are conducive to enhance natural draining of rainwater/flood water.</li> <li>• Keep the final or finished surface of all the raised lands free from any kind of depression that causes water logging.</li> <li>• Undertake mitigation measures for erosion control/prevention by grass-turfing and tree plantation, where there is a possibility of rain-cut that will change the shape of topography.</li> <li>• Cover immediately the uncovered open surface that has no use of construction activities with grass-cover and tree plantation to prevent soil erosion and bring improved landscaping.</li> <li>• Reinstate the natural landscape of the ancillary construction sites after completion of works.</li> </ul>

**ESCOP 9: Quarry Areas Development and Operation**

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Development and operation of borrow areas	Borrow areas will have impacts on local topography, landscaping and natural drainage.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Prepare quarry area management plan and submit the plan for supervision consultant approval. Check whether Environmental Clearance is required or not. If required, follow the prescribed procedure.</li> <li>• Use only approved quarry and borrow sites</li> <li>• Identify new borrow and quarry areas in consultation with Project Director, if required.</li> <li>• Reuse excavated or disposed material available in the project to the maximum extent possible.</li> <li>• Store topsoil for reinstatement and landscaping.</li> <li>• Develop surface water collection and drainage systems, anti-erosion measures (berms, revegetation etc.) and retaining walls and gabions where required. Implement mitigation measures in ESCOP 3: Water Resources Management, ESCOP 6: Erosion and Sediment Control</li> <li>• The use of explosives should be used in as much minimum quantity as possible to reduce noise, vibration and dust.</li> <li>• Control dust and air quality deterioration by application of watering and implementing mitigation measures proposed in ESCOP 10: Air Quality Management</li> <li>• Noise and vibration control by ESCOP 11: Noise and Vibration Management.</li> </ul>

**ESCOP 10: Air and Dust Quality Management**

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Air quality can be adversely affected by vehicle exhaust emissions and combustion of fuels.	<p>The Contractor shall</p> <ul style="list-style-type: none"> <li>• Prepare air quality management plan (under the Pollution Prevention Plan) and submit the plan for supervision consultant approval.</li> <li>• Fit vehicles with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition.</li> <li>• Operate the vehicles in a fuel-efficient manner.</li> <li>• Cover loads of all haul vehicles carrying dusty materials moving outside the construction site.</li> <li>• Impose speed limits (10 km/h) on all vehicle movement at the worksite to reduce dust emissions.</li> <li>• Control the movement of construction traffic.</li> <li>• Water construction materials prior to loading and transport.</li> <li>• Service all vehicles regularly to minimize emissions.</li> <li>• Limit the idling time of vehicles not more than 2 minutes.</li> </ul>
Construction machinery	Air quality can be adversely affected by emissions from machinery and combustion of fuels.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Fit machinery with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition in accordance with the specifications defined by their manufacturers to maximize combustion efficiency and minimize the contaminant emissions. Proof or maintenance register shall be required by the equipment suppliers and contractors/subcontractors.</li> <li>• Machinery causing excess pollution (e.g. visible smoke) will be banned from construction sites.</li> <li>• Service all equipment regularly to minimize emissions.</li> <li>• Provide filtering systems, duct collectors or humidification or other techniques (as applicable) to the concrete batching and mixing plant to control the particle emissions in all its stages, including unloading, collection, aggregate handling, cement dumping, circulation of trucks and machinery inside the installations.</li> </ul>
Construction activities	Dust generation from construction sites, material stockpiles and access roads is a nuisance in the environment and can be a health hazard, and also can affect the local crops;	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Water the material stockpiles, access roads and bare soils on an as required basis to minimize the potential for environmental nuisance due to dust. Increase the watering frequency during periods of high risk (e.g. high winds). Stored materials such as gravel and sand shall be covered and confined to avoid their being wind-drifted.</li> <li>• Minimize the extent and period of exposure of the bare surfaces.</li> <li>• Restore disturbed areas as soon as practicable by vegetation/grass-turfing.</li> <li>• Store the cement in silos and minimize the emissions from silos by equipping them with filters.</li> <li>• Establish adequate locations for storage, mixing and loading of construction materials, in a way that dust dispersion is prevented because of such operations.</li> <li>• Not water as dust suppression on potentially contaminated areas so that a liquid waste stream will be generated.</li> <li>• Crushing of rocky and aggregate materials shall be wet-crushed, or performed with particle emission control systems.</li> <li>• Not permit the burning of solid waste. Install small scale incinerator if needed.</li> </ul>

**ESCOP 11: Noise and Vibration Management**

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Noise quality will be deteriorated due to vehicular traffic	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Prepare a noise and vibration management plan (under the Pollution Prevention Plan) and submit the plan for supervision consultant approval.</li> <li>• Maintain all vehicles in order to keep it in good working order in accordance with manufactures maintenance procedures.</li> <li>• Make sure all drivers will comply with the traffic codes concerning maximum speed limit, driving hours, etc.</li> <li>• Organize the loading and unloading of trucks, and handling operations for the purpose of minimizing construction noise on the work site.</li> </ul>
Construction machinery	Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Appropriately site all noise generating activities to avoid noise pollution to local residents.</li> <li>• Use the quietest available plant and equipment ensuring the Noise Control Rules 2004.</li> <li>• Maintain all equipment in order to keep it in good working order in accordance with manufactures maintenance procedures. Equipment suppliers and contractors shall present proof of maintenance register of their equipment.</li> <li>• Install acoustic enclosures around generators to reduce noise levels.</li> <li>• Fit high efficiency mufflers to appropriate construction equipment.</li> <li>• Avoid the unnecessary use of alarms, horns and sirens.</li> </ul>
Construction activity	Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Night work is generally not permitted.</li> <li>• If it is needed to work at night, notify adjacent landholders prior any typical noise events outside of daylight hours.</li> <li>• Educate the operators of construction equipment on potential noise problems and the techniques to minimize noise emissions.</li> <li>• Employ best available work practices on-site to minimize occupational noise levels following Noise Control Rules 2004.</li> <li>• Install temporary noise control barriers where appropriate.</li> <li>• Notify affected people if major noisy activities will be undertaken, e.g. blasting.</li> <li>• Plan activities on site and deliveries to and from site to minimize impact.</li> <li>• Monitor and analyze noise and vibration results and adjust construction practices as required.</li> <li>• Avoid undertaking the noisiest activities, where possible, when working at night near residential areas.</li> </ul>



**ESCOPE 12: Protection of Flora**

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Vegetation clearance	Local flora are important to provide shelters for the birds, offer fruits and/or timber/fire wood, protect soil erosion and maintain a healthy environment. As such damage to flora has wide range of adverse environmental impacts.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Prepare a plan for protection of flora and submit the plan for supervision consultant approval.</li> <li>• Minimize disturbance to surrounding vegetation.</li> <li>• Use appropriate type and minimum size of machine to avoid disturbance to adjacent vegetation.</li> <li>• Get approval from supervision consultant for clearance of vegetation.</li> <li>• Make selective and careful pruning of trees where possible to reduce the need ortree removal.</li> <li>• Control noxious weeds by disposing of at designated dump site or burn on site.</li> <li>• Clear only the vegetation that needs to be cleared in accordance with the engineering plans and designs. These measures are applicable to both the construction areas as well as to any associated activities such as sites for stockpiles, disposal of fill a, etc.</li> <li>• Not burn off cleared vegetation – where feasible, chip or mulch and reuse it for the rehabilitation of affected areas, temporary access tracks or landscaping. Mulch provides a seed source, can limit embankment erosion, retains soil moisture and nutrients, and encourages re-growth and protection from weeds.</li> <li>• Return topsoil and mulched vegetation (in areas of native vegetation) to approximately the same area of the roadside it came from.</li> <li>• Avoid work within the drip-line of trees to prevent damage to the tree roots and compacting the soil.</li> <li>• Minimize the length of time the ground is exposed or excavation left open by clearing and re-vegetate the area at the earliest possible.</li> <li>• Ensure excavation works occur progressively and re-vegetation done at the earliest</li> <li>• Provide adequate knowledge to the workers regarding nature protection and the need toavoid felling trees during construction</li> <li>• Supply appropriate fuel (bottled gas) in the work camps to prevent fuel wood collection.</li> </ul>

**ESCOP 13: Protection of Fauna**

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction activities	The location of construction activities can result in the loss of wild life habitat and habitat quality,	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Prepare a plan for protection of fauna and submit the plan for supervision consultant approval.</li> <li>• Limit the construction works within the designated sites allocated to the contractors.</li> <li>• Check the site for animals trapped in, or in danger from site works and use a qualified person to relocate the animal.</li> </ul>
	Impact on migratory birds, its habitat and its active nests	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Not be permitted to destroy active nests or eggs of migratory birds.</li> <li>• Minimize the tree removal during the bird breeding season (February to April). If works must be continued during the bird breeding season, a nest survey will be conducted by a qualified biologist prior to commence of works to identify and locate active nests.</li> <li>• If bird nests are located/ detected within the ledges and roadside embankments, then those areas should be avoided.</li> <li>• Petroleum products should not come in contact with the natural and sensitive ecosystems. Contractor must not release oil, oil wastes or any other substances harmful to migratory birds' habitats, to any waters, wetlands or any areas frequented by migratory birds.</li> </ul>
Vegetation clearance	Clearance of vegetation may impact shelter, feeding and/or breeding and/or physical destruction and severing of habitat areas	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Restrict the tree removal to the minimum numbers required.</li> <li>• Relocate hollows, where appropriate.</li> <li>• Fell the hollow bearing trees in a manner which reduces the potential for fauna mortality. Felled trees will be inspected after felling for fauna and if identified and readily accessible will be removed and relocated or rendered assistance if injured. After felling, hollow bearing trees will remain unmoved overnight to allow animals to move of their own volition.</li> </ul>
Night time lighting	Lighting from construction sites and construction camps may affect the visibility of night time migratory birds that use the moon and stars for navigation during their migrations.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Use lower wattage flat lens fixtures that direct light down and reduce glare, thus reducing light pollution,</li> <li>• Avoid flood lights unless they are absolutely required.</li> <li>• Use motion sensitive lighting to minimize unneeded lighting.</li> <li>• Use, if possible, green lights that are considered as bird's friendly lighting instead of white or red colored lights.</li> <li>• Install light shades or plan the direction of lights to reduce light spilling outside the construction area.</li> </ul>
Construction camps	Illegal poaching	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Provide adequate knowledge to the workers regarding protection of flora and fauna, and relevant government regulations and punishments for illegal poaching.</li> <li>• Ensure that staff and Subcontractors are trained and empowered to identify, address and report potential environmental problems.</li> <li>• Ensure all workers sign a code of conduct incorporating all ESCOP provisions</li> </ul>

**ESCOP 14: Road Transport and Road Traffic Management**

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Increased traffic use of road by construction vehicles will affect the movement of normal road traffics and the safety of the road-users.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Prepare a traffic management plan specifying speed limit and submit the plan for supervision consultant approval.</li> <li>• Strictly follow the Project's 'Traffic Management Plan' and work with close coordination with the Traffic Management Unit.</li> <li>• Prepare and submit an additional traffic plan, if any of his traffic routes are not covered in the Project's Traffic Management Plan, and require traffic diversion and management.</li> <li>• Include in the traffic plan to ensure uninterrupted traffic movement during construction: detailed drawings of traffic arrangements showing all detours, temporary road, temporary bridges temporary diversions, necessary barricades, warning signs / lights, road signs etc.</li> <li>• Provide signs at strategic locations of the roads complying with the schedules of signs contained in the National Traffic Regulations.</li> </ul>
	Accidents and spillage of fuels and chemicals	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Restrict the transport of oversize loads.</li> <li>• Operate vehicles, if possible, to non-peak periods to minimize traffic disruptions.</li> <li>• Enforce on-site speed limit (max 10km/h).</li> </ul>

**ESCOP 15: Construction Camp Management**

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Siting and Location of construction camps	Campsites for construction workers are the important locations that have significant impacts such as health and safety hazards on local resources and infrastructure of nearby communities.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Prepare a construction camp management plan ensuring labor influx management and submit the plan to NTDC, WB and supervision consultant for approval.</li> <li>• Locate the construction camps within the designed sites or at areas which are acceptable from an environmental, cultural or social point of view.</li> <li>• Consider the location of construction camps away (this distance should be consulted with the local community) from communities to avoid social conflict in using natural resources such as water or to avoid the possible adverse impacts of the construction camps on the surrounding communities.</li> <li>• Submit to the supervision consultant for approval a detailed layout plan for the development of the construction camp showing the relative locations of all temporary buildings and facilities that are to be constructed together with the location of site roads, fuel storage areas (for use in power supply generators), solid waste management and dumping locations, and drainage facilities, prior to the development of the construction camps.</li> <li>• Local authorities responsible for health, religious and security shall be duly informed on the set up of camp facilities so as to maintain effective</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		surveillance over public health, social and security matters.
Construction Camp Facilities	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	<p>Contractor shall provide the following facilities in the campsites:</p> <ul style="list-style-type: none"> <li>• Adequate housing for all workers.</li> <li>• Safe and reliable water supply, which should meet NEQS. Drinking water to be chlorinated at source, and ensure presence of residual chlorine 0.1 ~ 0.25 ppm as minimum after 30 minutes of chlorine contact time (WHO guideline).</li> <li>• Hygienic sanitary facilities and sewerage system. The toilets and domestic waste water will be collected through a common sewerage. Provide separate latrines and bathing places for males and females with total isolation by location. The minimum number of toilet facilities required is one toilet for every ten persons. The WBG EHS guideline for accommodation must be met.</li> <li>• Treatment facilities for sewerage of toilet and domestic wastes.</li> <li>• Storm water drainage facilities.</li> <li>• Paved internal roads.</li> <li>• Provide in-house community/common entertainment facilities. Dependence of local entertainment outlets by the construction camps to be discouraged/prohibited to the extent possible.</li> </ul>
Disposal of waste	Management of wastes is crucial to minimize impacts on the environment	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Ensure proper collection and disposal of solid wastes within the construction camps.</li> <li>• Insist waste separation by source; organic wastes in one container and inorganic wastes in another container at household level.</li> <li>• Store inorganic wastes in a safe place within the household and clear organic wastes on daily basis to waste collector. Establish waste collection, transportation and disposal systems with the manpower and equipment/vehicles needed.</li> <li>• Do not establish site specific landfill sites. All solid waste will be collected and removed from the work camps and disposed in approved waste disposal sites.</li> </ul>
Fuel supplies for cooking purposes	Illegal sourcing of fuel wood by construction workers will impact the natural flora and fauna	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Provide fuel to the construction camps for their domestic purpose, in order to discourage them to use fuel wood or other biomass.</li> <li>• Made available alternative fuels like natural gas or kerosene on ration to the workforce to prevent them using biomass for cooking.</li> <li>• Conduct awareness campaigns to educate workers on preserving the protecting the biodiversity and wildlife of the project area, and relevant government regulations and punishments on wildlife protection.</li> </ul>
Health and Hygiene	Increased risk of communicable diseases and burden on local health services to be transmitted including malaria, exacerbated by inadequate health and	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Provide first aid health care facilities within construction sites.</li> <li>• Provide first aid facility round the clock. Maintain stock of medicines in the facility and appoint fulltime designated first aider or nurse.</li> <li>• Provide ambulance facility for the laborers during emergency to be transported to nearest hospitals.</li> <li>• Initial health screening (body temperature, illness, COVID symptom, symptom of any contagious diseases) of the laborers coming from outside areas.</li> <li>• Train all construction workers in basic sanitation and health care issues and safety matters, and on the specific hazards of their work.</li> <li>• Provide adequate drainage facilities throughout the camps to ensure that</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	safety practices.	<p>disease vectors such as stagnant water bodies and puddles do not form. Regular mosquito repellent sprays during rainy season in offices and construction camps and yards.</p> <ul style="list-style-type: none"> <li>• Not dispose food waste openly as that will attract rats and stray dogs.</li> <li>• Carryout short training sessions on best hygiene practices to be mandatory by all workers. Place display boards at strategic locations within the camps containing messages on best hygienic practices.</li> </ul>
Safety	In adequate safety facilities to the construction camps may create security problems and fire hazards	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Provide appropriate security personnel (police or private security guards) and enclosures to prevent unauthorized entry in to the camp area. These should meet ESS 1 and ESS4 requirements and GPN</li> <li>• Maintain register to keep a track on a head count of persons present in the camp at any given time.</li> <li>• Encourage use of flameproof material for the construction of labor housing / site office. Also, ensure that these houses/rooms are of sound construction and capable of withstanding wind storms/cyclones.</li> <li>• Provide appropriate type of firefighting equipment suitable for the construction camps</li> <li>• Display emergency contact numbers clearly and prominently at strategic places in camps.</li> <li>• Communicate the roles and responsibilities of laborers in case of emergency in the monthly meetings with contractors.</li> </ul>
Social and cultural aspect for Camp setup	Labor Influx in the project area will have risk of social conflict, illicit behavior and crime, burden on and competition for public service provision	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• The Contractor will schedule construction time particularly near the settlements, to cause least disturbance to the local population, particularly women.</li> <li>• Contractor will take due care of the local community and observe sanctity of local customs and traditions by his staff. Contractor will warn the staff strictly not to involve in any unethical activities including SEA-SH and to obey the local norms and cultural restrictions. The worker must sign the code of conduct and have training</li> <li>• The Contractor will carry out the construction activities in such a way that the open defecation timings by the local community should not be affected. The normal defecation timings are early in the morning and at late in the evening. So, the Contractor will have to take care of these timings.</li> <li>• During construction activities, if privacy of the nearby households is affected, the Contractor will inform the house owner to make some arrangements. Similarly, Contractor will take care as much as possible that the construction activities should not affect the privacy.</li> <li>• The Contractor will also ensure that noise and light pollution from the labor camp is kept at minimal levels especially at night.</li> </ul>
Site Restoration	Restoration of the construction camps to original condition requires demolition of	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Dismantle and remove from the site all facilities established within the construction camp including the perimeter fence and lockable gates at the completion of the construction work.</li> <li>• Dismantle camps in phases and as the work gets decreased and not wait for the entire work to be completed.</li> <li>• Give prior notice to the laborers before demolishing their camps/units.</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	construction camps.	<ul style="list-style-type: none"> <li>• Maintain the noise levels within the national standards during demolition activities.</li> <li>• Different contractors should be hired to demolish different structures to promote recycling or reuse of demolished material.</li> <li>• Reuse the demolition debris to a maximum extent. Dispose remaining debris at the designated waste disposal site.</li> <li>• Handover the construction camps with all built facilities as it is if agreement between both parties (contractor and landowner) has been made so.</li> <li>• Restore the site to its condition prior to commencement of the works or to an agreed condition with the landowner.</li> </ul>

### **ESCOP 16: Cultural and Religious Issues**

Project Activity/ Impact Source	Environmental Impacts/ risk	Mitigation Measures/ Management Guidelines
Construction activities near religious and cultural sites	Disturbance from construction works to the cultural and religious sites, and contractors lack of knowledge on cultural issues cause social disturbances.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Communicate to the public through community consultation regarding the scope and schedule of construction, as well as certain construction activities causing disruptions or access restriction.</li> <li>• Not block access to cultural and religious sites.</li> <li>• Restrict all construction activities within the footprints of the construction sites.</li> <li>• Stop construction works that produce noise (particularly during prayer time) should there be any mosque/religious/educational institutions close to the construction sites and users make objections.</li> <li>• Take special care and use appropriate equipment when working next to a cultural/religious institution.</li> <li>• Stop work immediately and notify the site manager if, during construction, an archaeological or burial site is discovered. It is an offence to recommence work in the vicinity of the site until approval to continue is given. Employ chance find procedures</li> <li>• Provide separate prayer facilities to the construction workers.</li> <li>• Show appropriate behavior with all construction workers especially women and elderly people.</li> <li>• Allow the workers to participate in praying during construction time.</li> <li>• Resolve cultural issues in consultation with local leaders and supervision consultants.</li> <li>• Establish a mechanism that allows local people to raise grievances arising from the construction process as per the project GRM.</li> <li>• Inform the local authorities responsible for health, religious and security duly informed before commencement of civil works so as to maintain effective surveillance over public health, social and security matters.</li> </ul>
Construction activities in a site where no known cultural heritage is present	Encountering an unknown cultural heritage	<ul style="list-style-type: none"> <li>• Identify the protected sites in the project areas and ensure that there is no protected monument within 200 feet from a proposed project site. If the proposed site is not located in a notified area, and there are no apparent archaeological values associated with the site, take no further action.</li> <li>• If, during the implementation of works, unlisted cultural heritage is</li> </ul>

Project Activity/ Impact Source	Environmental Impacts/ risk	Mitigation Measures/ Management Guidelines
		<p>encountered in any form, the contractor shall follow the below procedure:</p> <ul style="list-style-type: none"> <li>○ Stop the construction activities in the area of the chance find</li> <li>○ Delineate the discovered site or area</li> <li>○ Secure the site to prevent any damage or loss of removable objects</li> <li>○ Notify the supervisory Engineer who in turn will notify the responsible local authorities (Local UNO and the Regional Office of the Department of Archaeology for Kalihati and Bhuapur site the regional office is in Dhaka and for Sirajganj site the regional office is in Rajshahi).</li> <li>○ Department of Archaeology would be in charge of protecting and preserving the site before deciding on subsequent appropriate procedures.</li> <li>○ Decisions on how to handle the finding shall be taken by the Local UNO and Department of Archaeology. This could include changes in the layout (such as when finding an irremovable remain of cultural or archeologically importance), conservation, restoration and salvage.</li> <li>○ Implementation of the authority decision concerning the management of the finding shall be communicated in writing.</li> <li>○ Construction work could resume only after permission is given from the responsible local authorities and the relevant Ministry concerning safeguard of the heritage.</li> <li>○ The PIU shall obtain written record of the assessment of the potential impacts on the site, by the Department of Archaeology- whatever the case might be.</li> <li>○ All findings must be registered and all the photographs, copies of communication with decision making authorities, conclusions and recommendations/guidance and implementation reports should be documented properly and presents to the Implementing Agencies (IAs) and the World Bank</li> </ul> <ul style="list-style-type: none"> <li>● All personnel, especially those working on earth movements and excavations, are to be inducted on the identification of potential heritage items/sites and the relevant actions for them with regards to this procedure during the Project implementation or any other stage during the entire project cycle</li> </ul>

### **ESCOP 17: Worker Health and Safety**

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Best practices	Construction works may pose health and safety risks to the construction workers and site visitors leading to severe injuries and deaths. The population in the proximity of the construction site and the construction workers will be exposed to a number of (i) biophysical health	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>● Prepare an Occupational Health and Safety plan and submit the plan for supervision consultant's approval.</li> <li>● Implement suitable safety standards for all workers and site visitors which should not be less than those laid down on the international</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	<p>risk factors, (e.g. noise, dust, chemicals, construction material, solid waste, waste water, vector transmitted diseases etc.), (ii) risk factors resulting from human behavior (e.g. STD, HIV etc.) and (iii) road accidents from construction traffic.</p>	<p>standards (e.g. International Labor Office guideline on 'Safety and Health in Construction; World Bank Group's 'Environmental Health and Safety Guidelines') and contractor's own national standards or statutory regulations, in addition to complying with the National Standards.</p> <ul style="list-style-type: none"> <li>• Provide the workers with a safe and healthy work environment, taking into account inherent risks in its particular construction activity and specific classes of hazards in the work areas.</li> <li>• Provide personal protection equipment (PPE) for workers, such as safety boots, helmets, masks, gloves, protective clothing, goggles, full-face eye shields, and ear protection. Maintain and ensure the used and dirty PPE is being cleaned properly and provide new PPE if not washable and reusable.</li> <li>• Safety procedures include provision of information, training and protective clothing to workers involved in hazardous operations and proper performance of their job.</li> <li>• Conduct Job Hazard Analysis for all work-related procedure</li> <li>• Appoint an environment, health and safety manager to look after the health and safety of the workers.</li> <li>• Inform the local authorities responsible for health, religious and security duly informed before commencement of civil works and establishment of construction camps so as to maintain effective surveillance over public health, social and security matters.</li> </ul>
	<p>Child and pregnant labor</p>	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Not employ any one below 14 years (minimum age) according to the Labor Act 2006.</li> <li>• Employ or engage labor only over the minimum age of 18 As per the World Bank ESS2.</li> </ul> <p>A child over the minimum age 14 (National law) and under the age of 18 (ESS2) will not be employed or engaged if the project is likely to be hazardous, interfere with the child's education, or be harmful to the child's health or physical, mental, spiritual, moral, or social development.</p> <ul style="list-style-type: none"> <li>• Must not employ pregnant women or women who delivered a child within 8 preceding weeks.</li> </ul>
<p>Accidents</p>	<p>Lack of first aid facilities and health care facilities in the immediate vicinity will aggravate the health conditions of the victims</p>	<p>The Contractor shall</p> <ul style="list-style-type: none"> <li>• Ensure health care facilities and first aid facilities are readily available. Appropriately equipped first-aid stations should be easily accessible throughout the place of work.</li> <li>• Document and report occupational accidents, diseases, and incidents.</li> </ul>



Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<ul style="list-style-type: none"> <li>• Shall prepare a workplace reporting procedure.</li> <li>• Prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, so far as reasonably practicable, the causes of hazards, in a manner consistent with good international industry practice.</li> <li>• Identify potential hazards to workers, particularly those that may be life-threatening and provide necessary preventive and protective measures.</li> <li>• Ensure all the vehicle drives have license and training.</li> <li>• Provide awareness to the construction drivers to strictly follow the driving rules.</li> <li>• Provide adequate lighting in the construction area, inside the tunnels, inside the powerhouse cavern and along the roads.</li> </ul>
Construction Camps	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	<p>The Contractor shall provide the following facilities in the campsites to improve health and hygienic conditions as mentioned in ESCOP 16 Construction Camp Management</p> <ul style="list-style-type: none"> <li>• Accommodation facilities for men and women will be separated as per WBG accommodation standards</li> <li>• Adequate ventilation facilities</li> <li>• Safe and reliable water supply meeting WBG EHS guideline.</li> <li>• Hygienic sanitary facilities and sewerage system.</li> <li>• Treatment facilities for sewerage of toilet and domestic wastes</li> <li>• Storm water drainage facilities.</li> <li>• Recreational and social facilities</li> <li>• Safe storage facilities for petroleum and other chemicals in accordance with ESCOP 2</li> <li>• Solid waste collection and disposal system in accordance with ESCOP1.</li> <li>• Arrangement for trainings</li> <li>• Paved internal roads.</li> <li>• Security fence at least 2.4 m height.</li> <li>• Sick bay and first aid facilities</li> </ul>
Water and sanitation facilities at the construction sites	Lack of Water sanitation facilities at construction sites cause inconvenience to the construction workers and affect their personal hygiene.	<p>The contractor shall</p> <ul style="list-style-type: none"> <li>• Provide portable toilets at the construction sites, if about 25 people are working the whole day for a month. Location of portable facilities should be at least 6 m away from storm drain system and surface waters. These portable toilets should be cleaned once a day and all the sewerage should be pumped from the collection tank once a day and should be brought to the common septic</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<p>tank for further treatment.</p> <ul style="list-style-type: none"> <li>• There should be no sewage discharge onsite - all project wastewater to be treated in an approved facility</li> <li>• Provide safe drinking water facilities to the construction workers at all the construction sites.</li> </ul>
Other ESCOPs	Potential risks on health and hygiene of construction workers and general public	<p>The Contractor shall follow the following ESCOPs to reduce health risks to the construction workers and nearby community</p> <ul style="list-style-type: none"> <li>• ESCOP 2: Fuels and Hazardous Goods Management</li> <li>• ESCOP 4: Drainage Management</li> <li>• ESCOP 10: Air Quality Management</li> <li>• ESCOP 11: Noise and Vibration Management</li> <li>• ESCOP 15: Road Transport and Road Traffic Management</li> </ul>
Trainings	Lack of awareness and basic knowledge in health care among the construction workforce, make them susceptible to potential diseases.	<p>The Contractor shall</p> <ul style="list-style-type: none"> <li>• Train all construction workers in basic sanitation and health care issues (e.g., how to avoid malaria and transmission of sexually transmitted infections (STI) HIV/AIDS and COVID 19 safety procedure.</li> <li>• Train all construction workers in general health and safety matters, and on the specific hazards of their work. Training should consist of basic hazard awareness, site specific hazards, safe work practices, and emergency procedures for fire, evacuation, and natural disaster, as appropriate.</li> <li>• Implement COVID-19, malaria, HIV/AIDS and STI education campaign targeting all workers hired, international and national, female and male, skilled, semi- and unskilled occupations, at the time of recruitment and thereafter pursued throughout the construction phase on ongoing and regular basis. This should be complemented by easy access to condoms at the workplace as well as to voluntary counseling and testing. The worker code of conduct must be signed and followed.</li> </ul>

### **ESCOP 18: Construction and Operation Phase Security**

Project Activity/ Impact Source	Impacts /Concerns	Mitigation Measures/ Management Guidelines
Construction Phase	Inadequate construction site security poses a significant risk to assets, construction materials	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Provide appropriate security personnel (i.e. security</li> </ul>

Project Activity/ Impact Source	Impacts /Concerns	Mitigation Measures/ Management Guidelines
	<p>and property. Theft/vandalism of assets, materials and property would increase construction costs and cause delays in project completion.</p>	<p>guards) to prevent unauthorized entry into the camp area. WBG's guideline must be met in this case.</p> <ul style="list-style-type: none"> <li>• Employ night watchman for periods of significant on-site storage or when the area necessitates.</li> <li>• Ensure all assets (i.e., tools, equipment, etc.) and construction materials at construction site are identified, inventoried and tracked as closely as possible. All assets should be clearly labeled and marked. Keep records of tool serial numbers and check inventory on a regular basis.</li> <li>• All tools and equipment should have a check out/in system, if not in use should be secured and stored in a proper place to prevent theft or loss. Provide storage sheds for the secure storage of equipment and tools when not in use.</li> <li>• Ensure there is proper fencing around construction site perimeter. Fencing should be chain-link at least 2.4 m above high and secured with a steel chain and lock. If possible, the entire site should be fenced; if this is not possible, make sure construction trailer and any equipment storage areas are fenced.</li> <li>• Ensure the construction site has controlled access points (one or two entry points at most), allowing for close monitoring of comings and goings from the site.</li> <li>• Workers should be easily identified and have credentials that indicate site access.</li> <li>• Ensure no unauthorized access to the site.</li> <li>• No trespassing signs should be posted in conspicuous areas throughout the job site.</li> <li>• List of employees who have after hour access to the property should be available to the BWB and local authorities.</li> <li>• Ensure job site is properly lighted at night. Well-lit areas should include any office trailers and equipment storage trailers. Floodlights operated by sensors should also be installed where appropriate.</li> <li>• Pre-employment screening investigations should be used to verify the applicants relating to their employment, education and criminal history background.</li> <li>• Enforce a Code of Conduct on the workers in the construction camps regulating their behaviour vis-à-vis the neighbouring communities, including on SEA-SH.</li> </ul>
	<p>Improper security measures may pose security risk for construction workers and especially foreign staff on construction sites.</p>	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Prepare site specific security plan.</li> <li>• Maintain register to keep track of number of persons present in the camp at any given time.</li> <li>• Provide appropriate security personnel at job sites as mentioned above.</li> <li>• Ensure proper fencing: Fencing should be chain-link at least 2.4 m above high and secured with a steel chain and</li> </ul>

Project Activity/ Impact Source	Impacts /Concerns	Mitigation Measures/ Management Guidelines
		lock <ul style="list-style-type: none"> <li>• Ensure controlled access points to job site as mentioned above.</li> <li>• Ensure works have easily identified credentials as mentioned above.</li> <li>• Ensure job sites are properly lighted at night, as mentioned above.</li> </ul>
Operation Phase	Vandalism/damage (including use of explosives) and theft of infrastructure (i.e., metals and etc.).	<ul style="list-style-type: none"> <li>• Ensure strategic infrastructure sites are secure and fenced with controlled access points. Fencing should be chain-link at least 2.4 m high and secured with a steel chain and lock.</li> </ul>

### **ESCOP 19: Operation of Heavy Equipment Management**

Project Activity/ Hazard Source	Hazard Risks	Preventive Measures
Grid station, tower erection		The Contractor shall <ul style="list-style-type: none"> <li>• All above listed hazards shall be prevented through safe working procedures, training of the operators and workers and exclusion of the operation, ensuring visibility and providing signaler etc. where applicable.</li> </ul>
Before Operations	Hazards associated with Heavy equipment movement are: <ul style="list-style-type: none"> <li>• Run over</li> <li>• Pinch in / caught in between</li> <li>• Falling of equipment form road edge / into excavations</li> <li>• Falling of loads</li> <li>• Overturning</li> <li>• Driver negligence / poor operations</li> </ul>	<ul style="list-style-type: none"> <li>• All construction equipment shall be maintained, equipped and operated in accordance with manufactures' requirements.</li> <li>• Only authorized and trained personnel shall operate equipment.</li> <li>• Equipment operators and truck drivers shall make a pre-shift safety inspection of their equipment. Any conditions that effect safe operation shall be corrected before use.</li> <li>• All visibility aids like side / back view mirrors will be available with all site vehicles and machinery.</li> <li>• Blocking of side / back wind shields will not be allowed by any means like curtains, posters, wall papers etc.</li> <li>• Use 3-point mounting and dismounting technique onto/from heavy equipment - NEVER JUMP OFF HEAVY EQUIPMENT.</li> </ul> Predefined hand signals or use of two-way radios between the operator and person in charge of the work crew to accomplish any and all movement.
During Operation		<ul style="list-style-type: none"> <li>• Designate the route for earth moving machinery; avoid reversing where possible by providing in – out route.</li> <li>• Separate routes will be established for site vehicles and pedestrians where applicable.</li> <li>• All site staff will be trained for the following:</li> <li>• Always try to walk on the driver side of equipment as the passenger side has a larger blind spot. Place a flag person for signaling.</li> <li>• Arrange to provide enough space to allow the equipment and</li> </ul>

Project Activity/ Hazard Source	Hazard Risks	Preventive Measures
		<p>workers to perform the planed tasks safely otherwise safe distance will be maintained from all sides of the heavy equipment while they are in use.</p> <ul style="list-style-type: none"> <li>• Use of high visibility vest for all site personnel.</li> <li>• Prohibition of cell phone use while operating any equipment.</li> <li>• Not permit transporting workers on equipment or vehicles that are not equipped with seats for passengers.</li> <li>• Deployment of flagman when heavy equipment is in motion, especially where machinery and workers are working at close distance to ensure communication between the operator and flagman to maintain safe movement.</li> <li>• Cordon of swing radius of vehicles in danger zones with warning tape of barriers.</li> <li>• Restriction of work under any suspended or overhead load.</li> <li>• Restrictions onoverloading of dumpers and insurance of offloading at level ground with rear wheels stop logs at the edges.</li> <li>• Insurance of reverse alarm with the site vehicles.</li> <li>• Exclusion: exclusion will be done by specifying the work area by barricades / fencing/isolating from pedestrian / worker.</li> <li>• Visibility: best view around machinery directly from the operator position will be ensured by adequate visibility aids (clear front, side and rare screens with side / back view mirrors covering all blind areas).</li> </ul> <p>Signaler: A signaler will be provided in a safe position to direct operation and any pedestrian movements in danger zones.</p>
After Operations		<p>The Contractor shall</p> <ul style="list-style-type: none"> <li>• Never leave any machinery / vehicle unattended in running position or key inside.</li> <li>• After completion of operation all equipment shall be switched off and doors locked where applicable.</li> <li>• Bucket of excavator, loader shall be grounded.</li> <li>• All power transmission shall be neutral.</li> <li>• All equipment shall be parked in secured ground.</li> </ul>

**ESCOP 20: Excavation**

Project Activity/ Hazard Source	Hazard Risks	Preventive Measures
Sloping and benching	<ul style="list-style-type: none"> <li>• Landslides, cave-ins, excavation collapse</li> <li>• Falling, rolling or dislodging material</li> <li>• Personal Falls, machinery falls into excavated area or trenches</li> <li>• Water accumulation</li> </ul>	<p>The slopes and configurations of sloping and benching systems will be selected and constructed by contractor and will be in accordance with the approved design following applicable code and designed by a registered professional engineer.</p> <ul style="list-style-type: none"> <li>• Allowable configurations and slopes: Excavations will be sloped at an angle not steeper than one and one-half horizontal to one vertical (34 degrees measured from the horizontal), unless the contractor follows other applicable design procedures approved by the engineer.</li> </ul>

Project Activity/ Hazard Source	Hazard Risks	Preventive Measures
	<ul style="list-style-type: none"> <li>• Confined Space</li> <li>• Being struck or crushed by a workplace vehicle,</li> <li>• Machinery Hazards; Loading and dumping hazards, e.g. struck by or pinch in between object, crushed by when reversing, overloading, overturning of the vehicles while unloading.</li> </ul>	<ul style="list-style-type: none"> <li>• Sloping and benching systems not utilizing previous options will be approved by a registered professional engineer. Designs shall be in written form and shall include at least the following:               <ol style="list-style-type: none"> <li>a) The magnitude of the slopes that were determined to be safe for the particular project;</li> <li>b) The configurations that were determined to be safe for the particular project;</li> <li>c) The identity of the registered professional engineer approving the design; and</li> <li>d) At least one copy of the design shall be maintained at the jobsite while the slope is being constructed. After that time the design need not be at the jobsite, but a copy shall be made available to the PMU upon request.</li> </ol> </li> </ul>
Design of support systems, shield systems, and other protective systems		<p>Designs of support systems, shield systems, and other protective systems shall be selected and constructed by contractor and shall be in accordance with the approved design specifications following applicable code and designed by a registered professional engineer.</p> <ul style="list-style-type: none"> <li>• Design of support systems, shield systems, or other protective systems that are drawn from manufacturer's tabulated data shall be in accordance with all specifications, recommendations, and limitations issued or made by the manufacturer.</li> <li>• Deviation from the specifications, recommendations, and limitations issued or made by the manufacturer shall only be allowed after the manufacturer issues specific written approval.</li> <li>• Manufacturer's specifications, recommendations, and limitations, and manufacturer's approval to deviate from the specifications, recommendations, and limitations shall be in written form at the jobsite during construction of the protective system. After that time this data may be stored off the jobsite, but a copy shall be made available to the PMU upon request.</li> <li>• Support systems, shield systems, and other protective systems not utilizing Option i, Option ii or Option iii, above, shall be approved by a registered professional engineer.</li> <li>• Designs shall be in written form and shall include the following:               <ol style="list-style-type: none"> <li>a. A plan indicating the sizes, types, and configurations of the materials to be used in the protective system; and</li> <li>b. The identity of the registered professional engineer approving the design.</li> <li>c. At least one copy of the design shall be maintained at the jobsite during construction of the protective system. After that time, the design may be stored off the jobsite, but a copy of the design shall be made available to the PMU upon request.</li> </ol> </li> </ul>
Selection of Materials and equipment.		Materials and equipment used for protective systems shall be free from damage or defects that might impair their proper function. Manufactured materials and equipment used for protective

Project Activity/ Hazard Source	Hazard Risks	Preventive Measures
		<p>systems shall be used and maintained in a manner that is consistent with the recommendations of the manufacturer, and in a manner that will prevent employee exposure to hazards.</p> <ul style="list-style-type: none"> <li>• When material or equipment that is used for protective systems is damaged, the competent person shall examine the material or equipment and evaluate its suitability for continued use. If the competent person cannot assure the material or equipment is able to support the intended loads or is otherwise suitable for safe use, then such material or equipment shall be removed from service, and shall be evaluated and approved by a registered professional engineer before being returned to service.</li> <li>• Installation and removal of support - Members of support systems shall be securely connected together to prevent sliding, falling, kickouts, or other predictable failure.</li> <li>• Support systems shall be installed and removed in a manner that protects workers from cave-ins, structural collapses, or from being struck by members of the support system.</li> <li>• Individual members of support systems shall not be subjected to loads exceeding those which those members were designed to withstand.</li> <li>• Before temporary removal of individual members begins, additional precautions shall be taken to ensure the safety of employees, such as installing other structural members to carry the loads imposed on the support system.</li> <li>• Removal shall begin at, and progress from, the bottom of the excavation. Members shall be released slowly so as to note any indication of possible failure of the remaining members of the structure or possible cave-in of the sides of the excavation.</li> <li>• Backfilling shall progress together with the removal of support systems from excavations.</li> <li>• Additional requirements for support systems for trench excavations: <ul style="list-style-type: none"> <li>a. Excavation of material to a level no greater than 2 feet (.61 m) below the bottom of the members of a support system shall be permitted, but only if the system is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the support system.</li> <li>b. Installation of a support system shall be closely coordinated with the excavation of trenches.</li> </ul> </li> </ul>
Shield systems		<ul style="list-style-type: none"> <li>• Shield systems shall not be subjected to loads exceeding those which the system was designed to withstand.</li> <li>• Shields shall be installed in a manner to restrict lateral or other hazardous movement of the shield in the event of the application of sudden lateral loads.</li> <li>• Employees shall be protected from the hazard of cave-ins when entering or exiting the areas protected by shields.</li> <li>• Employees shall not be allowed in shields when shields are being installed, removed, or moved vertically.</li> </ul>

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<b>Project Activity/ Hazard Source</b>	<b>Hazard Risks</b>	<b>Preventive Measures</b>
		<ul style="list-style-type: none"><li>Excavations of earth material to a level not greater than 2 feet (.61 m) below the bottom of a shield shall be permitted, but only if the shield is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the shield.</li></ul>



**ESCOPE 21: Lifting and Materials Handling**

Project Activity/ Hazard Source	Hazard Risks	Preventive Measures
Mechanical Handling	<p>Injuries associated with mechanical handling of loads may result from:</p> <ul style="list-style-type: none"> <li>• Unsafe operating practices</li> <li>• Inappropriate condition of equipment</li> <li>• Improper loading</li> <li>• Carrying too heavy a load</li> <li>• Improper training</li> </ul>	<p><u>General Requirements</u></p> <ul style="list-style-type: none"> <li>• Lifting equipment selection shall be based on a risk assessment and shall be suitable for the task for which it will be used.</li> <li>• Lifting equipment selection should also consider the various operating environments under which the equipment may be used.</li> <li>• All lifting equipment used will comply with the necessary legal requirements.</li> <li>• All lifting equipment must be clearly marked with its safe working load as well as a unique identification number. Where the load capacity is variable, a table of load to conditions must be affixed.</li> <li>• Testing, including non-destructive testing where relevant, must be carried out by accredited contractors.</li> <li>• No equipment may be used if proof of inspection and test is not available (as recorded in the register).</li> <li>• No purpose made or adapted lifting equipment will be used, unless the special adaptation has been approved (after risk assessment) by the respective Responsible Engineer and the approval as well as limitations on use or special instructions are held with the register and communicated to the user.</li> <li>• Only employees who have been tested, found competent and authorized will be allowed to operate lifting equipment.</li> </ul>
Manual handling	<p>Injuries associated with manual handling of loads may result from:</p> <ul style="list-style-type: none"> <li>• Unsafe working habits</li> <li>• Improper lifting</li> <li>• Carrying too heavy a load</li> <li>• Incorrect gripping</li> <li>• Failure to wear correct personal protective equipment</li> <li>• Improper training</li> </ul>	<ul style="list-style-type: none"> <li>• Training in safe manual handling methods.</li> <li>• Inspect material for the physical size and weight, and sharp or jagged edges, rough or slippery surfaces, slivers or burrs.</li> <li>• Adequate supervision.</li> <li>• Wearing of the correct personal protective equipment.</li> <li>• Pre-employment medical examinations and periodic examinations may reveal a hernia, knee or back injuries.</li> <li>• Consider physical matters such as small worker – heavy load.</li> <li>• Keep fingers away from pinch points, especially when setting down material.</li> <li>• When handling timber, pipes or other long objects, keep the hands away from the ends to prevent them from being pinched.</li> <li>• Wipe off grease, wet, slippery or dirty objects before handling them.</li> <li>• Keep hands free from oil and grease.</li> <li>• When possible, use holders, containers, handles or tongs when manually handling material.</li> </ul>

**Annex 12.2: Draft ToR for Contracting GO/Social Consulting Firm to  
Design Livelihood Restoration and Development**

### **The Project and Objectives**

The overall objectives of the Jamuna River Economic Corridor Development Project (the Project) are to reduce the adverse impacts of flood and erosion and stabilize the Jamuna River systems to enhance sustainable management of water resources. The Project will be executed in multiple phases (Phase 1,2&3) covering approximately 200 plus km stretch of the Jamuna River. The first phase, among others, will focus on piloting riverbank protection and river training in two selected Pilot sites in Bhuapur and Tangail. The Bangladesh Water Development Board (BWDB) is the implementing agency (IA) for the Project.

The two pilot sites in Bhuapur and Tangail will acquire land for bank protection works resulting in displacement of affected households and loss of livelihood sources. Furthermore, displaced households and others who are vulnerable, including adjacent char settlers and those living on the existing embankments, will likely need additional support to restore their livelihoods. Income restoration programs may require support and services for three to five years before they become viable. The program might also risk some community by increasing flooding and erosion in some area (especially in Flood flow zone) by narrowing down. Therefore, the livelihood restoration program should have link with resilience building and disaster risk financing solutions (e.g., Shock Responsive Social Protection System or Adaptive Social Protection<sup>55</sup>).

Both short-term and long-term training and employment have been considered in the project. The following activities constitute the core of the of the short and long-term strategies of the Livelihood Restoration and Development Plan (LRDP) for the Project: (i) Prioritization of the project-related job for the affected people/communities; (ii) Livelihood restoration allowances to make the transition to restoration; and (iii) training and facilitation support for skill development and small businesses, based on livelihood surveys and needs assessments.

### **Terms of Reference – Tasks and Responsibilities**

The BWDB will hire an experienced NGO/social consulting firm (hereafter consultants) to assist the Project Management Unit (PMO) in the design, development and implementation of the LRDP as per the Resettlement Policy Framework (RFP) and Resettlement Action Plan (RAP) for the two Pilot sites. A provision of US\$30,000 has been kept in the DPP for hiring the services for design and planning of the LRDP.

The Project will plan livelihood improvement and trainings for an estimated 500 men and women/girls covering both *directly* and *indirectly* affected by project interventions. The types of training will be identified based on proper survey and assessment and may include but not limited to: (a) training for improved agricultural/livestock practices, poultry and fisheries; (b) training in handicrafts and marketing; (c) training in other alternative employment – for instance, motor driving, electric/solar technician; and (d) training of local youth in computer and survey skills. Training particularly suited to women will include training by the agriculture extension department through farmer field schools, particularly the cultivation of high value crops including orchards and vegetables. Moreover, the LRDP might include development of community awareness against false sense of security (from the erosion protection work).

The Livelihood consultants to be hired will initially undertake the following tasks as steps to LRDP planning and implementation.

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<sup>55</sup> Bowen et al., 2020. Adaptive Social Protection: Building Resilience to Shocks (English). International Development in Focus Washington, D.C. : World Bank Group. <http://documents.worldbank.org/curated/en/579641590038388922/Adaptive-Social-Protection-Building-Resilience-to-Shocks>

- Analyze economic activities of APs (by gender, age group, education, skills, income, household size, preference and options) to assess their needs.
- Analyze their vulnerability and risk associated with JRSMP
- Identify multiple income restoration programs (both individual and group specific) and Resilience Enhance Programs through consultation with APs and also market and financial analysis, if required
- Linking the LRDP with Disaster Risk Financing Solutions Programs (e.g. Crop Insurance, Shock Responsive Social Protection System, etc.) of the JRSMP
- Pilot test LRDP with selected APs as a trial by involving local CBOs/NGOs
- Develop estimated cost for LRDP, framework for implementation and institutional supervision
- Evaluate the program and provide additional support where needed.

In sum, the tasks and responsibilities of the Livelihood consultants to be hired shall be but not limited to the following:

- During the construction phase, many employment opportunities will be created, both for skilled and unskilled labor. The consultants will prepare a data base of the displaced and/or affected persons (DPs) or their children who are 18 years and above to accommodate/maximize absorption of local people in the project activities.
- The consultants will prepare inventory of the DPs/children covering age, health, gender, education, relevant experience and willingness to work with the contractor.
- The consultants will guide and facilitate the applicants, arrange clearance from relevant authorities for suitability for work with the project.
- The consultants shall liaise with the contractor/ sub-contractors for openings available as per the experience and qualification required for the jobs. The contractor, under the contract Clause 6.1 section 8 Specific Provision of Particular Conditions of Contract (Part-B), is required to hire locally available labor – skilled and unskilled (males and females) from the affected communities in project construction work.
- The consultants will inform the DPs about the available job opportunities on the project.
- The expert will negotiate with the contractor in fixing salary/wage of the DPs or their children without any gender discrimination in wages for the same type of jobs.
- The consultants will collect the data of the technical institutions/centers in the area and will manage short courses of skills required during construction of the project. The selected candidates will undertake training at project costs.

### **Key Qualifications and Experience**

The consultants to be hired must be technically qualified for planning and implementation of the LRDP within the overall scope of work mentioned above. Prior experiences in planning and implementation of similar income restoration activities, particularly in IFI assisted projects will be asset. Preferences will be given to NGOs with experience in livelihood restoration dealing with cash assistance to support lost income, assistance to re-establish businesses, employment in construction sites, capacity building activities in the production of high-value vegetable, livestock, poultry and fisheries and training for skilled labor.

**Annex 13.1: National Consultation Workshop on Environmental and  
Social Studies**

**Minutes of National Consultation Workshop on Environmental and Social Studies of the proposed “  
Jamuna River Sustainable Management Project -1 (JRSMP)”**

**Venue: Multi-purpose Conference Hall, BWDB**

**Date: 17<sup>th</sup> April 2023**

A national consultation workshop on "Environmental and Social (E&S) studies of Jamuna River Sustainable Management Project-1" was organized by 03 IAs (BWDB, BIWTA, and IDRA) on 17<sup>th</sup> April 2023 in the Multi-purpose conference hall of Pani Bhaban. The Workshop took place in high breed mode.

Senior officials of MoWR, Ministry of Planning, Bangladesh Water Development Board (BWDB), Joint River Commission (JRC), various government offices, national and international agencies, and departments participated in the Workshop. Mr. Nazmul Ahsan, Secretary Ministry of Water Resources (MoWR), attended the Workshop as Chief Guest, while Mr. Md. Nurul Islam Sarker, Director General, BWDB, Presided over it. Dr. Ainun Nishat, Professor Emeritus, BRAC University, and Dr. Hossain Zillur Rahman, Head PoE (Panel of Experts), were also at the Workshop as guests of honor. The list of esteemed participants is attached (Appendix-1).

Dr. Shyamol Chandra Das, Chief Engineer (Civil)-Planning, welcomed the participants and briefly introduced the project background and components.

Following the welcome session, Dr. SM Habibullah Bahar, Managing Director of Ahydtech Geomorphic Ltd., and his teammates presented the Feasibility Report of component-1 of the program.

Sustainable development of the country. The Secretary, MoWR and Chief Guest of the event, Mr. Nazmul Ahsan, shared his insights and directives regarding the project's potential following the feasibility report presentation. In his speech, he emphasized the Workshop's importance and holistically focused on the project content. He also suggested ensuring the stakeholder's participation, taking note of the expert comments, and adopting the recommendations in the report.

The Chairperson, Md. Nurul Islam Sarker thanked the Center for Environmental and Geographic Information Services (CEGIS) and World Bank for organizing the Workshop. He thanked all the experts, distinguished guests, consultant teams, members of different national and international agencies, reporters, and print media for their participation. He requested that the consultant teams present their findings and that the participants provide valuable comments.

Md. Mizanur Rahman Bhuiyan, Superintending Engineer, Bangladesh Inland Water Transport Authority (BIWTA), then presented the findings on Jamuna River Sustainable Management Project-1 (Navigation Channel Development).

After that, the Team Leader of the Environmental and Social Impact Assessment (ESIA) of the Jamuna River Sustainable Management Program, Dr. Masud Karim presented the findings on behalf of the Center for Environmental and Geographic Information Services (CEGIS).

Mr. Subir Chowdhury, director of the Insurance Development and Regulatory Authority (IDRA), presented the findings on Disaster Risk Financing of Jamuna River Sustainable Management Project-1.

After all the scheduled presentations, Dr. Ramjan Ali Pramanik, ADG, WWestern Region, BWDB wrapped up the remarks. He also moderated a question-and-answer session, where experts gave valuable opinions. Detail of the remarks/opinions were as follows:

Name	Affiliation	Comments and Suggestions
Dr. Ainun Nishat	Professor Emeritus BRAC university	<p>He advised separating the entire project into two parts. One project will focus on the master plan, including the feasibility and ESIA study, and the other should prioritize the bank protection work. He also suggested including the detailed dredging management plan. Though he appreciated the ESIA study's methodology and approach, he asked to conduct an extensive environmental and social study where all the critical species, ecological zones, social components, etc., would be thoroughly studied. Moreover, he urged using local knowledge and expertise and the dynamic river management system of Bangladesh in the country's overall river development. He has also raised concerns about the public consultation and the engagement of local people in the project. He suggested having maximum participation of local stakeholders in the overall project agenda.</p> <p>Additionally, he asked to use the existing data, information, or lesson learning from previous studies/projects. About the technical findings, he suggested evaluating the performance of existing groynes. He was concerned that the proposed closure might erode the Charland, which should be thoroughly analyzed.</p>
Dr. Hossain Zillur Rahman	Head of the Panel of Experts (PoE)	<p>In line with Dr. Ainun Nishat, he also emphasized the extensive study of environmental and social components in the study area. Likewise, he also suggested evaluating the performance of existing groyne. In addition, Dr. Rahman has proposed conducting a thorough study on the ecological and social study of the Charland with a particular focus on developing the livelihood of the people of the adjacent chars.</p>
Syed Hasan Imam	Engineer, BWDB and PD, CEIP-1	<p>The SEP, LMP, SEA, ESCP, RPF, and other ESF should be more innovative and digitalized. Especially for the RAP, Property Assessment and Valuation Committee (PAVC) should work efficiently and effectively to avoid the challenges of multiple land ownership and extra compensation claim. Since the nature of the river is unpredictable, he highly emphasized incorporating a Disaster Risk Management Plan for the proposed project. In addition, he asked to assess the proposed project's impact on the existing infrastructure or development work with a particular</p>

Name	Affiliation	Comments and Suggestions
		focus on the navigation route.
Mr. Kabirul Islam	National River Conservation Commission	He appreciated the proposed development work but was concerned about the legalization. He suggested having a consensus meeting among all the relevant implementing agencies. He also accentuated working extensively to change people's perception of the narrowing river concept. Moreover, he asked to use the knowledge of other countries' river management systems in the current development work of Bangladesh. Another concern was the impact on biodiversity due to land reclamation. Additionally, he requested to define the beneficiaries of reclaimed land clearly.
Sheikh Sharif	Joint Secretary, Ministry of Shipping	He emphasized having more extensive public consultation and rationalizing their understanding of the proposed development work. He also requested to include more local experts and knowledge.
Sanjida Khan	Representative, Association for Land Reform and Development	Her concern was to engage more local people and experts from different sectors, including academicians and researchers.
Dr. Md. Abdul Matin	Professor, Department of Water Resources Engineering, BUET	He said that BWDB has a lot of successful projects, and the lesson of which could be used in the future development work. However, he has emphasized to analyze the river morphology thoroughly considering past, present and future trends. He suggested developing a comprehensive master plan for the proposed development work. Moreover, he suggested expanding the work's dimension and volume, including the detailed study of the Jamuna River. He asked to use local knowledge and expertise more inclusively.
Dr. Md Munsur Rahman	Professor, Institute of Water and Flood Management, BUET	His major concern was that the river would change due to the interventions; hence it would impact the surrounding environment and the disaster risk, which should be analyzed dynamically and more comprehensively. Moreover, he suggested studying the river morphology thoroughly.
		He suggested using the lesson learned from previous projects, including the reason behind the success and failure of the past work. Moreover, he was concerned about the public consultation and survey budget allocation. He marked that the fund was not enough



Name	Affiliation	Comments and Suggestions
		for thorough public engagement.
Dr. M Firoz Alam	Professor, Department of Zoology, Dhaka University (DU)	He asked to thoroughly study all the environmental components and list all the species in the study area. Moreover, he suggested monitoring biodiversity during the project's whole life cycle. His primary concern was the adaptation of recommendations during project implementation. He said that the maximum project failed to address the recommendations for environmental management. He also raised a question about proper budget allocation for environmental studies compared to the budget for technical studies.
Dr. Rezaur Rahman	Professor, Institute of Water and Flood Management, BUET	He asked to protect the charlands as a sanctuary. He suggested collecting ecological data more comprehensively for the current development work and exclusively for future master plans. He recommended adapting the ecosystem approach in project implementation. He also asked to consider different habitats and sanctuaries during future work. His particular suggestion was to ensure the minimum disturbance of ecosystem resources. Moreover, he raised a question about the feasibility of navigation without dredging. Consequently, he asked to conduct a separate ESIA for navigation and dredging.
Ms. Sarwar Jahan	Institute of Water Modelling (IWM)	She appreciated BWDB for undertaking such a challenging project. Her major suggestion was to develop a robust plan, including a maintenance and monitoring plan is essential for the project's ultimate success. She raised a question on whether the space between spurs has been considered based on a trial-and-error basis or not. Another question was whether the spur design had considered multiple combinations. Moreover, implementing the spur will erode the char downstream, hence, her concern about the protection measures against that. She also suggested having either a physical model or a 3D model for the proposed top block groyne. Long-term simulation is also required. Moreover, she added to analyze all the hydrological parameters collectively rather than separately to extract a better result. At last, she suggested incorporating a Bangladesh Bridge Authority (BBA) member in different workshops.

**Key suggestions:**

1. Comprehensive Master plan of development works at Jamuna river
2. Continued extensive Public Consultation Meeting (PCM) during implementation and immediately after the effectiveness of the SOP1 and before field mobilization. Participants must include communities and other relevant stakeholders from civil society.
3. RPF, SEP, LMP, SEA, ESCP should be more innovative and digitalized. Specially for RPF, Property Assessment and Valuation Committee (PAVC) should work efficiently and effectively to avoid compensation corruption.
4. Extensive studies are necessary on biodiversity and other environmental components.
5. Engaging local people/communities and local experts from different sectors
6. Incorporating the Lesson learned from the past and current river management works in Bangladesh
7. Proper budget allocation for public consultation and other stakeholder engagement program.
8. Physical model or 3D model for the proposed Top Block Groyne is essential and also the Long-term simulation is required.

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The Workshop Proceedings in the form of Minutes for Office Records.

Signature:

Md. Nurul Islam Sarker

Workshop Chairperson & Director General, BWDB.



## Registration Sheet

National Consultation Workshop on Environment & Social Studies  
Jumuna River Sustainable Management Project-1

Date: 17<sup>th</sup> April 2023

Venue: Multi-purpose Conference Hall (Level - 11), Pami Bhaban, BWDB, 72 Green Road, Dhaka

## Participant List

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## Registration Sheet

National Consultation Workshop on Environment & Social Studies

*Jumuna River Sustainable Management Project-1*

Date: 17<sup>th</sup> April 2023

Venue: Multi-purpose Conference Hall (Level - 11), Pani Bhaban, BWDB, 72 Green Road, Dhaka

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**Registration Sheet**  
 National Consultation Workshop on Environment & Social Studies  
 Jomuna River Sustainable Management Project-1  
 Date: 17<sup>th</sup> April 2023  
 Venue: Multi-purpose Conference Hall (Level - 11), Panti Bhaban, BWDB, 72 Green Road, Dhaka

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Done: /



## Registration Sheet

National Consultation Workshop on Environment & Social Studies  
 Jumuna River Sustainable Management Project-1

Date: 17<sup>th</sup> April 2023

Venue: Multi-purpose Conference Hall (Level - 11), Pami Bhaban, BWDB, 72 Green Road, Dhaka

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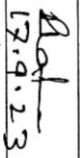





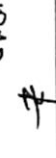



## Registration Sheet

### National Consultation Workshop on Environment & Social Studies

#### Jumna River Sustainable Management Project-1

Date: 17<sup>th</sup> April 2023

Venue: Multi-purpose Conference Hall (Level - 11), Pani Bhaban, BWDB, 72 Green Road, Dhaka

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03.	M. A. Shaukat Khan	BWDB	EXECN	shaukat.khan@gmail.com 01912619119		 17.04.23
4	FAYAZUDDIN AHMAD	WB	SOCIAL DEV CONSULTANT	fahmad10@worldbank.org		 17.04.23
5	Engr. Siddiqul Kaur Sahu	BWDRS	SE/Planning-2		01860748580	
6	Md. Zahangir Alam	PD-ES/WRD DoF - DoF	PD-CSAWMP	Zalun08@yahoo.com 015845328	01824916050 Mozammel	
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8.	Dr. Jibam Kumar Sarker, Peng	BWDB	SE, DC-IV, BWDB	01711242087	01830252713	
	Angela Thompson	NHE	Engineer	athompson@nhe.gov.bd		








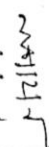





## Registration Sheet

National Consultation Workshop on Environment & Social Studies

*Jumuna River Sustainable Management Project-1*

Date: 17<sup>th</sup> April 2023

Venue: Multi-purpose Conference Hall (Level - 11), Panti Bhawan, BWDDB, 72 Green Road, Dhaka

Serial No.	Name	Organization	Designation	Email and Cell Number	Driver Contact details	Signature
	Sufat Mahmud	BWDDB	AE	0167349147	01752550640	
	Mojibasa Tsuda	Trea advisor	Advisor	01713040634	01713040634	H. Tsuda
	Md Mahfuzur Rihman	BWDDB	SE	01917289561	01629462577	
	MD ISHRAKUL	NHE	TR SECRETARY	01712000329	—	
	Nasim Jahan	BWDDB	SE	01552312711	0196056736	
	Shah Fyamin Ullah	MoWR	Deputy Secretary	01711911924		
	D. K. M. Sadu	BWDDB	SC	0172002944	01715160098	
	Md. Abdul Basheer	BWDDB	SE	01782615546	01711585293	
	Md. Ahsan Habib	BWDDB	EF, Design Center	01913838117	01719501835	
	Md. Enayul Ullah	BWDDB	EE, Design	01727585258	01719574210	







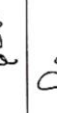

## Registration Sheet

### National Consultation Workshop on Environment & Social Studies

#### Jumuna River Sustainable Management Project-1

Date: 17<sup>th</sup> April 2023

Venue: Multi-purpose Conference Hall (Level - 11), Pani Bhaban, BWDB, 72 Green Road, Dhaka

Serial No.	Name	Organization	Designation	Email and Cell Number	Driver Contact details	Signature
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	Md. Moniruzzaman	MONUP	Ass. Director	01911282728		
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	Dr. Md. Saifur Raheem	BWDB	CSO & DG/SE	01724708905		
	Md. Anwarul Islam	ISPMC	Executive Sp.	01732226333		






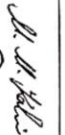

## Registration Sheet

National Consultation Workshop on Environment & Social Studies

*Jumna River Sustainable Management Project-1*

Date: 17<sup>th</sup> April 2023

Venue: Multi-purpose Conference Hall (Level - 11), Panti Bhawan, BWDB, 72 Green Road, Dhaka

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	Ms. Betal Uddin Biceen	BWDB	Deputy Asst. Engr.	0171264593		
	Tamratul Feroous	BWDB	XEN	01869508516		
	Ms. Abdul Hannan	MWDDB	CE, Hydrology	01712101250	01818133258 Mannan	
	Mohammad Akbarul- Kabir	BWDB	FEELN/10-2	01711938202	01922988231 Tofiq	
	Mohammad Alamin	WARPO	PSO	01556555684		



## **Annex 13.2: Stakeholder Consultations**



Table 1: Details of the Stakeholder Consultation Conducted in SEAA

Place	Date	Participants			Type of Consultation	Issue discussed	Key points raised	Action Taken
		Total	Male	Female				
<b>Consultation conducted in June 2021.</b>								
Chikajani Union Parishad, Dewanganj, Jamalpur	21 June 2021	30	21	9	Public Consultation Meeting (PCM)	<ul style="list-style-type: none"> <li>Project objectives and scope of work</li> <li>Briefing on the project and potential environment and social impacts</li> <li>Project activities under different components</li> <li>Mitigation measures and grievance mechanism</li> <li>Stakeholder engagement process and World bank policies on disclosure</li> <li>Land ownership pattern and land tenure</li> <li>Land acquisition and compensation process</li> <li>Future plan of action</li> <li>Stakeholders' opinion about the project</li> </ul>	<ul style="list-style-type: none"> <li>The union and the whole Upazila is under threat of erosion</li> <li>Already two wards (ward 1&amp;2) of Chikajani Union are wiped out into the river and 60% of ward three is gone into the river</li> <li>There is no flood protection embankment in this union. Therefore, every year the Chikajani and adjacent area remain inundated for 20-25 days</li> <li>Need immediate action to protect river erosion from Erendabari to Deoanganj</li> <li>Bank protection needed through piling from river bed</li> <li>Embankment is must to protect the flood</li> <li>Whether the char people and displaced people receive compensation for their land during project implementation</li> <li>People shows their positive attitude about the project</li> </ul>	<ul style="list-style-type: none"> <li>The SOP 2 might cover this area.</li> <li>Land compensation issues has been considered duly while preparing RPF and the ESMP as well</li> </ul>
Char Halka Haowaibari, Chukaibari Union, Dewanganj, Jamalpur.	21 June 2021	16	16	0	FGD with Char people	<ul style="list-style-type: none"> <li>Project objectives and scope of work</li> <li>Stakeholders' opinion about the project</li> <li>Project activities under different components</li> <li>Stakeholder engagement process and World bank policies</li> </ul>	<ul style="list-style-type: none"> <li>Sustainability and stabilization of char</li> <li>People are mainly agricultural farmer</li> <li>Once a land goes into the river, it declared as khash by govt. In that case what will be the process of compensation?</li> <li>Any type of land purchasing is off</li> </ul>	<ul style="list-style-type: none"> <li>Land compensation issues has been considered duly while preparing RPF and the ESMP as well</li> </ul>

Place	Date	Participants			Type of Consultation	Issue discussed	Key points raised	Action Taken
						on disclosure		
Kholabari, Chikajani Union, Dewanganj, Jamalpur.	22 June 2021	22	22	0	FGD with Fishing groups	<ul style="list-style-type: none"> <li>• Same as above</li> </ul>	<ul style="list-style-type: none"> <li>• Due to the siltation of river the availability of big fish has decreased</li> <li>• Fishermen could not catch fish due to the govt. monitoring and regulations</li> <li>• This group of people are changing their occupation and involved themselves in daily wage</li> <li>• Due to river erosion became landless and living into others land as a tenant</li> </ul>	<ul style="list-style-type: none"> <li>• This discussion informed the livelihood analysis of ESIA and identification of vulnerable groups</li> <li>• To address such vulnerabilities, Livelihood Restoration and Development Plan has been considered in ESMP</li> </ul>
Kholabari, Chikajani Union, Dewanganj, Jamalpur.	22 June 2021	18	18	0	FGD with Agricultural group	<ul style="list-style-type: none"> <li>• Same as above</li> </ul>	<ul style="list-style-type: none"> <li>• A farmer became landless due to river erosion</li> <li>• Vulnerable groups became more vulnerable and marginalized</li> <li>• People are sought to protect the river erosion to save their life</li> <li>• People are willing to provide land for any kind of bank protection activity</li> </ul>	<ul style="list-style-type: none"> <li>• Same as above</li> <li>• SOP 2 might consider erosion protection work for this area</li> </ul>
2 No. Kholabari, Chikajani Union, Dewanganj, Jamalpur.	22 June 2021	14	14	0	FGD with Displaced People	<ul style="list-style-type: none"> <li>• Same as above</li> </ul>	<ul style="list-style-type: none"> <li>• All the displaced people become marginalized and living on others land as a tenant</li> <li>• Land owners become landless and farmer turned into wage laborer</li> <li>• Showed positive attitude to the project</li> <li>• Want Bank protection work and embankment</li> <li>• If any land reclaimed from the project, give priority the displaced people to distribute</li> <li>• Built resettlement site for the displaced people</li> </ul>	<ul style="list-style-type: none"> <li>• Same as above</li> <li>• The compensation for land acquisition has been duly considered under RPF</li> <li>• SOP 2 might consider livelihood restoration for the erosion evicted people</li> </ul>



Place	Date	Participants			Type of Consultation	Issue discussed	Key points raised	Action Taken
Gobindashi union Parishad, Gobindashi, Bhuapur, Tangail.	23 June 2021	27	24	3	Public Consultation Meeting (PCM)	<ul style="list-style-type: none"> <li>Project objectives and scope of work</li> <li>Briefing on the project and potential environment and social impacts</li> <li>Project activities under different components</li> <li>Mitigation measures and grievance mechanism</li> <li>Stakeholder engagement process and World bank policies on disclosure</li> <li>Land ownership pattern and land tenure</li> <li>Land acquisition and compensation process</li> <li>Future plan of action</li> <li>Stakeholders' opinion about the project</li> </ul>	<ul style="list-style-type: none"> <li>The chars of under the union is under threat of erosion</li> <li>Four Unions i.e. Gobindashi, Nikrail, Gabchara &amp; Arjuna of Bhuapur Upazila are vulnerable to river erosion</li> <li>Already two wards of Gobindashi Union are wiped out into the river</li> <li>Prepare resettlement site for the displaced people living in the embankment</li> <li>Compensation for land acquisition should be ensured</li> <li>appropriate and regular river training work are needed to protect bank erosion</li> <li>People shows their positive attitude about the project</li> </ul>	<ul style="list-style-type: none"> <li>SOP 2 might consider this area to be protected</li> <li>The compensation for land acquisition has been duly considered under RPF</li> </ul>
Patitapara, Nikrail Union, Bhuapur, Tangail	23 June 2021	19	19	0	FGD with Agricultural Group	<ul style="list-style-type: none"> <li>Project objectives and scope of work</li> <li>Stakeholders' opinion about the project</li> <li>Project activities under different components</li> <li>Stakeholder engagement process and World bank policies on disclosure</li> </ul>	<ul style="list-style-type: none"> <li>River erosion accelerated after the construction of Banggabandhu bridge</li> <li>Most of the farmers become landless and turned into wage laborer</li> <li>appropriate and regular river training work are needed to protect bank erosion</li> <li>People shows their positive attitude about the project</li> <li>When new char accredited, the land owners take position of the land according to their previous documents but they cannot buy or sell any land. Because any kind of buying and selling is off from the govt.</li> </ul>	<ul style="list-style-type: none"> <li>SOP 2 might consider this area to be protected</li> <li>The compensation for land acquisition has been duly considered under RPF</li> </ul>

Place	Date	Participants			Type of Consultation	Issue discussed	Key points raised	Action Taken
Dovaya, Nikrail Union, Bhuapur, Tangail	23 June 2021	21	21	0	FGD with Displaced People	<ul style="list-style-type: none"> <li>• Same as above</li> </ul>	<ul style="list-style-type: none"> <li>• All the displaced people become marginalized and living on others land as a tenant</li> <li>• Some are migrating to another Upazila and districts which is less vulnerable to river erosion and have work opportunity</li> <li>• Land owners become landless and farmer turned into wage laborer</li> <li>• Showed positive attitude to the project</li> <li>• Want Bank protection work and embankment</li> <li>• If any land reclaimed from the project, give priority the displaced people to distribute</li> <li>• Built resettlement site for the displaced people</li> </ul>	<ul style="list-style-type: none"> <li>• This discussion informed the livelihood analysis of ESIA and identification of vulnerable groups</li> <li>• To address such vulnerabilities, Livelihood Restoration and Development Plan has been considered in ESMP</li> <li>• The compensation for land acquisition has been duly considered under RPF</li> </ul>
Gandhail Union Parishad, Kazipur, Sirajganj	24 June 2021	31	26	5	Public Consultation Meeting (PCM)	<ul style="list-style-type: none"> <li>• Project objectives and scope of work</li> <li>• Briefing on the project and potential environment and social impacts</li> <li>• Project activities under different components</li> <li>• Mitigation measures and grievance mechanism</li> <li>• Stakeholder engagement process and World bank policies on disclosure</li> <li>• Future plan of action</li> <li>• Stakeholders' opinion about the project</li> </ul>	<ul style="list-style-type: none"> <li>• The chars of under the union is under threat of erosion,</li> <li>• Prepare resettlement site for the displaced people living in the embankment</li> <li>• Compensation for land acquisition should be ensured</li> <li>• appropriate and regular river training work are needed to protect bank erosion</li> <li>• People shows their positive attitude about the project</li> </ul>	<ul style="list-style-type: none"> <li>• Same as above</li> </ul>

Place	Date	Participants			Type of Consultation	Issue discussed	Key points raised	Action Taken
Purbokhuksia, Gandhail Union, Kazipur, Sirajganj.	24 June 2021	17	17	0	FGD with Agricultural Group	<ul style="list-style-type: none"> <li>• Same as above</li> </ul>	<ul style="list-style-type: none"> <li>• A farmer became landless due to river erosion</li> <li>• Vulnerable groups became more vulnerable and marginalized</li> <li>• People are sought to protect the river erosion to save their life and livelihood</li> <li>• People are willing to provide land for any kind of bank protection activity</li> </ul>	<ul style="list-style-type: none"> <li>• This discussion informed the livelihood analysis of ESIA and identification of vulnerable groups</li> <li>• To address such vulnerabilities, Livelihood Restoration and Development Plan has been considered in ESMP</li> <li>• The compensation for land acquisition has been duly considered under RPF</li> </ul>
Shingrabari, Kazipur Union, Kazipur, Sirajganj	24 June 2021	13	13	0	FGD with Fisherman Group	<ul style="list-style-type: none"> <li>• Same as above</li> </ul>	<ul style="list-style-type: none"> <li>• Availability of fish has decreased</li> <li>• Need alternative livelihood</li> </ul>	<ul style="list-style-type: none"> <li>• Same as above</li> </ul>
Baropakhia, Shonaton Union, Shajadpur, Sirajganj	25 June 2021	19	19	0	FGD with Char People	<ul style="list-style-type: none"> <li>• Same as above</li> </ul>	<ul style="list-style-type: none"> <li>• Sustainability and stabilization of char</li> <li>• People are mainly agricultural farmer</li> <li>• Once a land goes into the river, it declared as khash by govt. In that case what will be the process of compensation?</li> <li>• Any types of land transaction is nearly non-existent due to erosion</li> </ul>	<ul style="list-style-type: none"> <li>• Same as above</li> </ul>
<b>Consultation meetings conducted in September and November 2021</b>								<ul style="list-style-type: none"> <li>•</li> </ul>
Pingna,	14 Sept. 2021	8	8	0	Group	<ul style="list-style-type: none"> <li>• Project objectives and scope of work</li> </ul>	<ul style="list-style-type: none"> <li>• Flood proofing is highly required for protecting assets</li> </ul>	<ul style="list-style-type: none"> <li>• This discussion informed the</li> </ul>

Place	Date	Participants			Type of Consultation	Issue discussed	Key points raised	Action Taken
Sharishabari, Jamalpur					discussion with community people	<ul style="list-style-type: none"> <li>Stakeholders' opinion about the project</li> <li>Project activities under different components</li> <li>Stakeholder engagement process and World bank policies on disclosure</li> </ul>	<ul style="list-style-type: none"> <li>Erosion needs to be prevented</li> <li>Flood and erosion-affected rural people are mainly hard to reach; therefore, the benefits of the project must ensure the benefits for these poor people.</li> <li>Proper compensation is required without administrative complicity.</li> </ul>	<ul style="list-style-type: none"> <li>livelihood analysis of ESIA and identification of vulnerable groups</li> <li>To address such vulnerabilities, Livelihood Restoration and Development Plan has been considered in ESMP</li> <li>The compensation for land acquisition has been duly considered under RPF</li> </ul>
Krishnapur, Bhuapur, Tangail	13 Sept. 2021	12	12	0	Group discussion with community people	<ul style="list-style-type: none"> <li>Project objectives and scope of work</li> <li>Stakeholders' opinion about the project</li> <li>Project activities under different components</li> <li>Stakeholder engagement process and World bank policies on disclosure</li> </ul>	<ul style="list-style-type: none"> <li>Flood proofing is highly required for protecting assets</li> <li>Erosion needs to be prevented</li> <li>Rural employment is highly needed.</li> <li>Aligning the river into a proper channel to avoid erosion</li> <li>Proper compensation is required without administrative complicity.</li> </ul>	<ul style="list-style-type: none"> <li>SOP 1 is implementing a small scale river training work and bank protection work</li> <li>Their suggestions were duly considered while designing the project</li> <li>The compensation for land acquisition has been duly considered under RPF</li> </ul>
Pachthakur,	14 Sept. 2021	10	10	0	Group	<ul style="list-style-type: none"> <li>Project objectives and</li> </ul>	<ul style="list-style-type: none"> <li>Effective and immediate measures</li> </ul>	<ul style="list-style-type: none"> <li>SOP2 might</li> </ul>

Place	Date	Participants			Type of Consultation	Issue discussed	Key points raised	Action Taken
Kazipur, Sirajganj					discussion with community people	<ul style="list-style-type: none"> <li>scope of work</li> <li>Stakeholders' opinion about the project</li> <li>Project activities under different components</li> <li>Stakeholder engagement process and World bank policies on disclosure</li> </ul>	<ul style="list-style-type: none"> <li>are required against riverbank erosion</li> <li>Flood proofing is also highly demanding</li> <li>Engagement of local people in the project activities is a must</li> </ul>	<ul style="list-style-type: none"> <li>consider erosion protection of this area</li> <li>SEP has been prepared to ensure stakeholder engagement</li> <li>C 1 also considered flood proofing measures</li> </ul>
Katadara, Fulchhari	15 Sept. 2021	11	0		Group discussion with community people	<ul style="list-style-type: none"> <li>Project objectives and scope of work</li> <li>Stakeholders' opinion about the project</li> <li>Project activities under different components</li> <li>Stakeholder engagement process and World bank policies on disclosure</li> </ul>	<ul style="list-style-type: none"> <li>Effective and immediate measures are required against riverbank erosion</li> <li>Flood proofing is also highly demanding</li> <li>Engagement of local people in the project activities is a must</li> </ul>	<ul style="list-style-type: none"> <li>SOP2 might consider erosion protection of this area</li> <li>SEP has been prepared to ensure stakeholder engagement</li> <li></li> </ul>
Gohalabari Union Parishad, Kalihati, Tangail	1 November 2021	6	6	0	Meeting with Local Govt. Body	<ul style="list-style-type: none"> <li>Project objectives and scope of work</li> <li>Project activities under different components</li> <li>Mitigation measures and grievance mechanism</li> <li>Stakeholder engagement process and World bank policies on disclosure</li> <li>Land acquisition and compensation process</li> <li>Future plan of action</li> <li>Stakeholders' opinion about the project</li> </ul>	<ul style="list-style-type: none"> <li>Take immediate action to protect river erosion and save community people;</li> <li>Proper compensation to affected persons;</li> <li>Engage the local Govt. bodies in to the project work so that they can monitoring the quality of work; and</li> <li>Rehabilitate the project affected peoples through Asroyon/resettlement; and</li> <li>Enable early warning system for river erosion</li> </ul>	<ul style="list-style-type: none"> <li>SOP 1 is implementing a small scale river training work and bank protection work</li> <li>Their suggestions were duly considered while designing the project</li> <li>The compensation for land acquisition has been duly considered under RPF</li> </ul>

Place	Date	Participants			Type of Consultation	Issue discussed	Key points raised	Action Taken
Char Mouli Bazar, Kakua Union, Tangail Sadar Chukaibari Union,	3 November 2021	12	12	0	Group discussion with Agricultural group	<ul style="list-style-type: none"> <li>Project objectives and scope of work</li> <li>Stakeholders' opinion about the project</li> <li>Project activities under different components</li> <li>Stakeholder engagement process and World bank policies on disclosure</li> </ul>	<ul style="list-style-type: none"> <li>Protection of homesteads and agricultural land from erosion</li> <li>Ensure alternative livelihood for the displaced people due to river erosion</li> <li>Provide compensation for land at market price</li> <li>River training work should be maintaining regularly</li> <li>Provide proper compensation for loss of land, crops and tress</li> <li>Rehabilitate the PAPs by project if any</li> </ul>	<ul style="list-style-type: none"> <li>SOP 1 is implementing a small scale river training work and bank protection work</li> <li>Their suggestions were duly considered while designing the project</li> <li>The compensation for land acquisition has been duly considered under RPF</li> </ul>
Alipur, Gohalabari Union Parishad, Kalihati, Tangail	2 November 2021	24	24	0	Group discussion with Local elite with community people	<ul style="list-style-type: none"> <li>Same as above</li> </ul>	<ul style="list-style-type: none"> <li>Take immediate action to protect river erosion and save community people;</li> <li>Working opportunity in the project</li> <li>If any land reclaimed from the project, give priority the displaced people to distribute;</li> <li>Prepare resettlement/Asroyon site for the vulnerable people and</li> <li>Training for income and small business</li> <li>Create job opportunity for the unemployed group</li> </ul>	<ul style="list-style-type: none"> <li>SOP 1 is implementing a small scale river training work and bank protection work</li> <li>Their suggestions were duly considered while designing the project</li> <li>The compensation for land acquisition has been duly considered under RPF</li> <li>Livelihood Restoration and Development Plan has been prepared</li> </ul>

Place	Date	Participants			Type of Consultation	Issue discussed	Key points raised	Action Taken
AlipurModdhopara, Gohalabari Union Parishad, Kalihati, Tangail	2 November 2021	9	9	0	Group discussion with community people	<ul style="list-style-type: none"> <li>• Same as above</li> </ul>	<ul style="list-style-type: none"> <li>• Protection of homesteads and agricultural land from erosion</li> <li>• Provide compensation for land at market price</li> <li>• Provide proper compensation for loss of land, crops and tress</li> <li>• Rehabilitate the PAPs by project if any</li> <li>• Working opportunity in project</li> </ul>	<ul style="list-style-type: none"> <li>• Same as above</li> </ul>
<b>Consultation meeting at Kawakhola Site</b>								
Katanga Primary School, Kawakhola Char, Sirajganj	21 January 2022	60	40	20	Public Consultation Meeting (PCM)	<ul style="list-style-type: none"> <li>• Project objectives and scope of work</li> <li>• Briefing on the project and potential environment and social impacts</li> <li>• Project activities under different components</li> <li>• Mitigation measures and grievance mechanism</li> <li>• Stakeholders' opinion about the project</li> </ul>	<ul style="list-style-type: none"> <li>• If the dead canals are re-excavated therefore the char people will be benefitted. But, in that case the enclosure should be developed at the off-take of the canal</li> <li>• Construct guide wall both side of the canal either the canal will be silted up again</li> <li>• Physical structure i.e. road needs to develop for the development of char people</li> <li>• Working opportunity in the project</li> <li>• Provide proper compensation for loss of land, crops and tress</li> </ul>	<ul style="list-style-type: none"> <li>• The alignment of the canal re-excavation has been fixed ensuring the protection of the land from erosion</li> <li>• A cross dam at the off-take of the canal has been considered to prevent erosion of the canal-banks</li> <li>• Additional Revetment construction has been considered</li> <li>• The compensation for land acquisition has been duly considered under RPF</li> <li>• Livelihood Restoration and Development</li> </ul>

Place	Date	Participants			Type of Consultation	Issue discussed	Key points raised	Action Taken
							Plan has been prepared	
Barni Char, Shirajganj	20 January 2022	7	5	2	Group discussion with community people	<ul style="list-style-type: none"> <li>Project objectives and scope of work</li> <li>Stakeholders' opinion about the project</li> <li>Project activities under different components</li> <li>Stakeholder engagement process and World bank policies on disclosure</li> </ul>	<ul style="list-style-type: none"> <li>Develop physical infrastructure in the char for better livelihood and communication</li> <li>If any land acquired by the project, people should be compensated properly</li> </ul>	<ul style="list-style-type: none"> <li>Same as above</li> </ul>
Boroitola Ghat, Kawakhola Char, Sirajganj	19 January 2022	10	10	0	Group discussion with community people	<ul style="list-style-type: none"> <li>Project objectives and scope of work</li> <li>Stakeholders' opinion about the project</li> <li>Project activities under different components</li> <li>Stakeholder engagement process and World bank policies on disclosure</li> </ul>	<ul style="list-style-type: none"> <li>Take initiative to protect the Boroitola Ghat from erosion</li> <li>If the adjacent khal is re-excavated then people will be benefited by going a long distance through boat, as there is no road network in the char</li> <li>In that case, Guide wall need to be constructed at both side of the canal either the canal will be silted up again and erosion could take place</li> <li>Working opportunity in the project</li> <li>Provide proper compensation for loss of land</li> </ul>	<ul style="list-style-type: none"> <li>Same as above</li> </ul>
Mechrapara, Kazir hat, Shirajganj	19 January 2022	17	15	2	Group discussion with community people	<ul style="list-style-type: none"> <li>Project objectives and scope of work</li> <li>Stakeholders' opinion about the project</li> <li>Project activities under different components</li> <li>Stakeholder engagement process and World bank policies on disclosure</li> </ul>	<ul style="list-style-type: none"> <li>If the proposed khal is re-excavated the erosion will take place again in the char</li> <li>The communication system should be developed without re-excavating the canal</li> <li>Develop physical infrastructures i.e. road, health center etc. for better life of the char people.</li> <li>Working opportunity in the project</li> <li>Provide proper compensation for loss of land</li> </ul>	<ul style="list-style-type: none"> <li>Same as above</li> </ul>



Place	Date	Participants			Type of Consultation	Issue discussed	Key points raised	Action Taken
<b>Consultation meeting at Uria Union, Fulchori, Gaibandha</b>								
Sadek Khaner Bazar (Kabilpur), 9 No. Ward, Uria Union, Fulchori	25 July 2022	8	8	0	Group discussion with community people	<ul style="list-style-type: none"> <li>• Project objectives and scope of work</li> <li>• Project activities under different components</li> <li>• Mitigation measures and grievance redress mechanism</li> <li>• Stakeholder engagement process and World bank policies on disclosure</li> <li>• Land acquisition and compensation process</li> <li>• Future plan of action</li> <li>• Stakeholders' opinion about the project</li> </ul>	<ul style="list-style-type: none"> <li>• The Sadek Khan Bazar is situated on the opposite side of the project location. Only on the east side of Uria Union especially Ward 5 has extreme river erosion. If the project is implemented the people of the area will be highly benefited. People's life and resource will be saved from erosion.</li> <li>• On the other hand, Ratonpur could be vulnerable to river erosion as it is located at the opposite downstream of the project site. In that case, protection work also may be needed for Ratonpur.</li> <li>• If the project is implemented people of Kabilpur and aAtunpur will be benefited as they can easily perform their daily activities like transporting their produced crops and goods, attending school by students, and other activities.</li> <li>• If they can easily carry their good to the Bazar, they will get comparatively more price than the present time.</li> <li>• They will be able to get health services facilities from the Union and Upazila health complex. Especially the pregnant women will be able to get their health services when needed</li> <li>• The agricultural land of Kabilpur and Ratonpur will be saved from erosion and they will be able to manage most of their needs by their own production.</li> </ul>	<ul style="list-style-type: none"> <li>• This discussion informed the livelihood analysis of ESIA and identification of vulnerable groups</li> <li>• To address such vulnerabilities, Livelihood Restoration and Development Plan has been considered in ESMP</li> <li>• The compensation for ladh acquisition has been duly considered under RPF</li> </ul>

Place	Date	Participants			Type of Consultation	Issue discussed	Key points raised	Action Taken
Ratonpur, 5 No. Ward, Uria Union, Fulchori	25 July 2022	7	2	5	Informal Group Discussion	<ul style="list-style-type: none"> <li>• Project objectives and scope of work</li> <li>• Project activities under different components</li> <li>• Mitigation measures and grievance redress mechanism</li> <li>• Stakeholder engagement process and World bank policies on disclosure</li> <li>• Land acquisition and compensation process</li> <li>• Future plan of action</li> <li>• Stakeholders' opinion about the project</li> </ul>	<ul style="list-style-type: none"> <li>• If the protection work took place at Uria, Ratonpur could be vulnerable to river erosion as it is located at the opposite downstream of the project site.</li> <li>• In that case, protection work also should be taken to protect the Ratonpur Char from erosion</li> <li>• If the project is implemented people of will be benefited as they can easily transport their produced crops and goods.</li> <li>• If they can easily carry their good to the Bazar, they will get comparatively more price than the present time.</li> </ul>	<ul style="list-style-type: none"> <li>• This discussion informed the livelihood analysis of ESIA and identification of vulnerable groups</li> <li>• To address such vulnerabilities, Livelihood Restoration and Development Plan has been considered in ESMP</li> <li>• The compensation for ladn acquisition has been duly considered under RPF</li> </ul>

Place	Date	Participants			Type of Consultation	Issue discussed	Key points raised	Action Taken
Uria Union Parishad, Fulchori, Gaibandha	26 July 2022	36	28	8	Formal Consultation meeting	<ul style="list-style-type: none"> <li>• Project objectives and scope of work</li> <li>• Project activities under different components</li> <li>• Mitigation measures and grievance redress mechanism</li> <li>• Stakeholder engagement process and World bank policies on disclosure</li> <li>• Land acquisition and compensation process</li> <li>• Future plan of action</li> <li>• Stakeholders' opinion about the project</li> </ul>	<ul style="list-style-type: none"> <li>• On an average about 70-80% people of Uria Union is farmer and dependent on agriculture.</li> <li>• The east side of Uria Union especially Ward 5 is highly vulnerable to extreme river erosion.</li> <li>• All the displaced people become marginalized and live on other's land as a tenant</li> <li>• Land owners become landless and farmers turned into a wage laborer</li> <li>• Some people migrated to other places especially Dhaka as a Rickshaw puller, and Garments workers for their livelihood.</li> <li>• Want Bank protection work and embankment for flooding</li> <li>• If the project is implemented the people of the area will be highly benefited. People's life and resource will be saved from erosion.</li> <li>• The land price will be increased if the project implemented</li> <li>• Out migration due to the river erosion will be stopped.</li> <li>• Agricultural production will also be increased</li> <li>• Provide compensation for land at market price if any land is acquired</li> <li>• Provide proper compensation for loss of land, crops and tress</li> <li>• Working opportunity for the local people in project</li> </ul>	<ul style="list-style-type: none"> <li>• This discussion informed the livelihood analysis of ESIA and identification of vulnerable groups</li> <li>• To address such vulnerabilities, Livelihood Restoration and Development Plan has been considered in ESMP</li> <li>• The compensation for ladn acquisition has been duly considered under RPF</li> </ul>

**Table 2: Details of the Information Stakeholder Consultation Conducted in Kawakhola Char**

Type of Discussion	Date	Place	Participants			Opinion
			Total	M	F	
Informal FGD1	20/01/2022	Bonnir Char	11	8	3	<ul style="list-style-type: none"> <li>Establishment of Village Growth Center/village would be helpful to trade their crops and to avoid the hassle to transport their crops to long distance Gobindapur bazar.</li> <li>Elevate their own homeland instead to construct the elevated/raised shelter place</li> <li>Establishing veterinary services/facilities at char.</li> <li>Establishment of Hospitals and school</li> </ul>
Informal FGD2	20/01/2022	Baraitola ghat	12	12	0	<ul style="list-style-type: none"> <li>Everybody was agreed willingly to implement the protection interventions of Baraitola Ghat</li> <li>Motor-bike is the only way to travel inside the char area after crossing the Jamuna river. So, they urged to improve the communication facilities inside the char area.</li> <li>They admit and agree the canal excavation from baraitola ghat would be helpful but both banks of the excavated khal need to be protected to avoid the erosion</li> </ul>
Informal FGD3	19/01/2022	Khijirpur / Mecchra	8	6	2	<ul style="list-style-type: none"> <li>If the total khal is excavated from baraitola to Mecchra then the mecchra and Khijirpur char will be in high risk of erosion.</li> <li>As the Jamuna river and Mecchra has divided by a temporary char land the erosion will be high if no bank protection works take place for the excavated canal.</li> <li>They wish and request to improve the road facilities.</li> <li>Education and medical facilities were also their priority issues.</li> </ul>

**Table 3: Details of the Public Consultation Meeting Conducted at Khudra Katenga, Kawakhola**

In Katanga Primary School, Kawakhola Char, Sirajganj, formal public consultation meeting was held on 21 January 2022, and totally 60 participants were attend the meeting and among them 20 were female and 40 were male.

Sl no	Potential CDD Activity proposed by Feasibility Team	Findings from the Consultation	Opinion of the local people on E&S Impacts and Risks
1	River bank Protection near Boroitola Ghat (1.5~2km in total)	<p>The bank protection by geobank dumping without constructing any permanent structure might not require acquisition/reacquisition of land.</p> <p>Such improved traditional approach of bank erosion is now a day very common in Bangladesh and is treated as a temporary solution. In case of geobag dumping, there is a high opportunity for community labor. Since the extent of the work is very limited, it would not make any significant workload on current ESIA preparation, if the CDD component is covered by an ESMF.</p> <p>In our opinion, this can qualify as a CDD without impacting the ESIA preparation significantly but we are not sure whether BWDB can implement this under LCS.</p>	<p>The E&amp;S risk associated with bank protection by geobag might be moderate to low. The earlier studies on Environmental Impacts of Geobag use in erosion protection work did not report any significant environmental risk.</p> <p>The need of land acquisition/compensation is unclear to us. However, C1 consultant team explained that the geobag will be placed on the river bank slope and underwater which will not require any acquisition.</p>
2	River bank protection at vulnerable locations of the canal flowing along the North-eastern and eastern part of the Union (e.g., at Bonnir Char)	If the work is completed using geobag placement, considering the extent of work this should not impact the ESIA preparation extensively.	Similar to the Sl. no 1 activity, the E&S risk associated with this activity might be moderate to low.

Sl no	Potential CDD Activity proposed by Feasibility Team	Findings from the Consultation	Opinion of the local people on E&S Impacts and Risks
3	Re-excavation of a canal to improve navigability between Boroitola boat point to Khudro Katanga	<p>While proposing this as an option, the participants came into an agreement that this can only be implemented if the bank protection component is included. The community raised the following concerns:</p> <ul style="list-style-type: none"> <li>● Agreed that this might benefit the community by saving their transportation time and cost.</li> <li>● But, canal re-excavation might require land acquisition/compensation. And similarly, land acquisition would be needed to dispose the excavated materials</li> <li>● If the banks of the re-excavated canal are not protected, it would increase erosion risk significantly.</li> </ul>	<p>In our opinion, this proposed activity is associated with high or substantial E&amp;S risk and should be decided on the basis of hydro-dynamic modeling. Therefore, it may not comply with the CDD work criteria<sup>56</sup>. It can be included as an additional activity of C1 and in that case further E&amp;S survey, RAP, stakeholder consultation etc. are needed to revise the current ESIA.</p>
4	Construction of new rural roads to improve connectivity and resilience	<p>Participants were expressing their demand that communication is extremely poor in the area. Therefore, it is very much important to have proper infrastructure for their lives and livelihood in chars. Currently, the union has only one road which is 1~2 km long and connect only a small part of the community with a growth center. Traditionally, these chars have very poor road connectivity because government does not have any development work in most of these char areas. Therefore, rural development and roads connectivity are always high priority for them. However, rural development and rural road connectivity are not mandated activity of BWDB. LGED is the mandated agency for this.</p>	<p>Such activity involves land acquisition and substantial environmental and social risk.</p>

<sup>56</sup> Low to moderate risks work only for CDD.

Sl no	Potential CDD Activity proposed by Feasibility Team	Findings from the Consultation	Opinion of the local people on E&S Impacts and Risks
5	Construction of embankment cum road along the canal from Boroitola to Khudro Katanga	<p>Community agreed that this activity would benefit them a lot by improving their flood resilience, road connectivity. However, they warned the following:</p> <ul style="list-style-type: none"> <li>● While constructing embankment, sufficient drainage should be provided</li> <li>● Embankment should not prevent the monsoon flood, because their agriculture and livelihood highly depend on monsoon flood. According to them, flood deposits fertile sediments (alluvium) on their agricultural land which is an essential element for their agriculture.</li> <li>● Construction of embankment would require land acquisition</li> </ul>	In our opinion, this activity is associated with substantial E&S risk and would impact significantly the current ESIA preparation.
7	Raising of growth center, schools, and other community area for improving flood resilience	Highly beneficial and support the concept of flood proofing strategy for char livelihood. But BWDB might not be the mandated agency for such development work.	The E&S risk associated with such activities is generally moderate to low.

**Table 4: Details of the Public Consultation Meeting at Sirajganj**

The 2nd Public Consultation was held on 10th February 2022 at Char Kawakhola in order to discuss the aforementioned activities and ensure public activities associated with it. Around 120 people from Kaokola union attended the meeting. BWDB officials (both from local and Head office) including the Executive Engineer of the Sirajganj BWDB, also attend the meeting. The feasibility study team and ESIA study team jointly organized the meeting.

Sl no	Issues	Public Opinion
1	Agreement of the Community on the Proposed Work	<ul style="list-style-type: none"> <li>• People agreed on the proposed activities and ensured that the proposed canal re-excavation would not affect the residents of the Kaowakhola union.</li> <li>• In general, people asked for at least 2 to 3 season crop damage compensation only as they have agreed to the benefits they are going to get after the building of raised flood platforms at those lands.</li> <li>• It is expected that the people of Mechrha will also agree with the proposed activities. There is an opportunity to optimize the excavation in the section of the canal which flows across the Mechrha union.</li> </ul>
2	Land Requirement and Land Take	<ul style="list-style-type: none"> <li>• Following the discussion at the Public Consultations, it can be interpreted that land acquisition might be possible to avoid.</li> <li>• People expressed interest in disposing of excavated materials on unused land, schoolyard, hospital yard, marketplace, lowlands and other community facility areas.</li> <li>• Needs to be resolved by contacting with DC office about the actual ownership.</li> <li>• Besides, we also strongly agree that local people claiming ownership of those lands should be compensated for crop damage)</li> </ul>
3	Compensation for Land take	<ul style="list-style-type: none"> <li>• Compensation might also be needed against land occupancy/ownership as well.</li> <li>• This was also a request from the local people as well.</li> </ul>
4	Possible CDD Activity	<ul style="list-style-type: none"> <li>• Proposed work at the pilot site, a Community-Driven Development (CDD) Activity will be implemented with active participations of the communities.</li> </ul>



Photographs of Consultation Meetings

Consultation conducted in January 2022.



*Photo: Consultation with in local people Char Kawakhola*



*Photo: Consultation with in local people Char Kawakhola*



*Photo: FGD in Char Kawakhola*



*Photo: Stakeholder Consultation in Char Kawakhola*



*Photo: FGD in Char Kawakhola.*



*Photo: FGD in Char Kawakhola*





***Consultation Meeting at Uria Union Parishad, Fulchori, Gaibandha***



***Consultation with Uria Union Parishad Chairman and Members***



***Consultation with Community people at Ratonpur and Kabilpur***

## Participants List

Preparation of ERS Documents under ESF of the World Bank for  
Jamuna River Economic Corridor Development Program (JARECDP) (Phase 1 Stage 1)

## Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Jamalpur Upazila: Dewanganj Union: Chikazani Vill: Chikazani

Sl No.	Name	Occupation/Designation	Address	Signature
১	শ্রীমতী: মতিউররহমান	ইউনিয়ন পরিষদ	২নং চাঁদমাঠ গ্রাম, চিকাজানি	[Signature]
২	শ্রীমতী: রাসিমুল ইসলাম	ছাত্র	চিকাজানি, ২নং ওয়ার্ড	[Signature]
৩	শ্রীমতী: মৃগাঙ্কর	ইউনিয়ন পরিষদ	১নং চিকাজানি গ্রাম, চিকাজানি	[Signature]
৪	শ্রীমতী: মাসুদা	"	" " ২	[Signature]
৫	শ্রীমতী: মনজুরা	"	" " ২	[Signature]
৬	শ্রীমতী: মৃগাঙ্কর	"	" " ২	[Signature]
৭	শ্রীমতী: মৃগাঙ্কর	মেসার্স	" " ২	[Signature]
৮	শ্রীমতী: মৃগাঙ্কর	ইউনিয়ন পরিষদ	২নং চাঁদমাঠ গ্রাম, চিকাজানি	[Signature]
৯	শ্রীমতী: মৃগাঙ্কর	ইউনিয়ন পরিষদ	২নং চাঁদমাঠ গ্রাম, চিকাজানি	[Signature]
১০	শ্রীমতী: মৃগাঙ্কর	ইউনিয়ন পরিষদ	২নং চাঁদমাঠ গ্রাম, চিকাজানি	[Signature]
১১	শ্রীমতী: মৃগাঙ্কর	ইউনিয়ন পরিষদ	২নং চাঁদমাঠ গ্রাম, চিকাজানি	[Signature]
১২	শ্রীমতী: মৃগাঙ্কর	ইউনিয়ন পরিষদ	২নং চাঁদমাঠ গ্রাম, চিকাজানি	[Signature]

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Preparation of E&S Documents under ESF of the World Bank for  
Jamuna River Economic Corridor Development Program (JARECDP) (Phase 1 Stage 1)

## Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Jamalpur Upazila: Dewanganj Union: Chikajani Vill: Chikasani

Sl No.	Name	Occupation/Designation	Address	Signature
১০	শ্রী: বসন্ত কামাল	আসিস্টেন্ট	বাসন্ত কামাল বাড়ি, চিকাজানি উপজেলা, জামালপুর	
১৪	শ্রী: আব্দুল হাকিম	F.P.P. V.	চিকাজানি	আব্দুল হাকিম
১৫	শ্রী: বিলকিস উল্লাহ	F.P.P. V.	চিকাজানি	বিলকিস
১৬	শ্রী: জাহাঙ্গীর	সহকারী	11	
১৭	শ্রী: কামাল হোসেন	F.P.P. V.	"	কামাল হোসেন
১৮	শ্রী: দেবী	F.P.P. V.	"	দেবী
১৯	শ্রী: কামাল	F.P.P. V.	"	কামাল
২০	Subir Kumar Datta	S.A.E PI-O office	Dewanganj.	
২১	শ্রী: কামাল	u.p. (M)	চিকাজানি ইউনিয়ন	
২২	শ্রী: আব্দুল হাকিম	Secretary	চিকাজানি ইউনিয়ন	
২৬	শ্রী: আব্দুল হাকিম	up secretary	চিকাজানি ইউনিয়ন	
২৪	শ্রী: আব্দুল হাকিম	U.P. (M)	"	

Center for Environmental and Geographic Information Services (CEGIS)  
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Preparation of E&S Documents under ESF of the World Bank for  
Jamuna River Economic Corridor Development Program [IARECDP] (Phase 1 Stage 1)

Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Jamalpur Upazila: Dewanganj Union: Chikaganj Vill: Chikaganj

Sl No.	Name	Occupation/Designation	Address	Signature
১৫	শেখ মোহাম্মদ হোসেন	সকল	জামালপুর জেলা	[Signature]
১৬	শ্রীমান মোহাম্মদ হোসেন	সকল	জামালপুর	[Signature]
১৭	শ্রীমান মোহাম্মদ হোসেন	সকল	জামালপুর	[Signature]
১৮	শ্রীমান মোহাম্মদ হোসেন	সকল	জামালপুর	[Signature]
১৯	শ্রীমান মোহাম্মদ হোসেন	সকল	জামালপুর	[Signature]
২০	শ্রীমান মোহাম্মদ হোসেন	সকল	জামালপুর	[Signature]

Center for Environmental and Geographic Information Services (CEGIS)  
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Preparation of E&S Documents under ESF of the World Bank for  
Jamuna River Economic Corridor Development Program (JARECDP) (Phase 1 Stage 1)

Participant List  
Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Jamulpur Upazila: Dewanganj Union: Chikasepi Vill: Chokaganj

Sl No.	Name	Occupation/Designation	Address	Signature
৩১	আনজুম শাহা	UP সদস্য	চিকাগনি	
৩২	আব্দুল হকিম	UP সদস্য	চিকাগনি	
৩৩	বাহিনুর রহমান	বাসস	চিকাগনি	
৩৪	মুহাম্মদ হোসেন	চিকাগনি	চিকাগনি	

Center for Environmental and Geographic Information Services (CEGIS)  
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Preparation of E&S Documents under ESI of the World Bank for  
Jamuna River Economic Corridor Development Program (JARECDP) [Phase 1 Stage 1]

Participant List  
Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: ভাওয়ালপুর Upazila: পেটয়ানজাঙ্গ Union: চুনিয়াড়ী Vill: চক্ৰবর্তী হাটলা  
বাড়ী

SI No.	Name	Occupation/Designation	Address	Signature
১	শ্রী: কাজী মোঃ	কির্কি	চক্ৰবর্তী	
২	শ্রী: মোঃ হাছিম	কির্কি	চক্ৰবর্তী	
৩	শ্রী: মুন্সুর হোসেন	ব্যবসায়ী	চক্ৰবর্তী	
৪	শ্রী: মোঃ জাহাঙ্গীর	কৃষি	চক্ৰবর্তী	
৫	শ্রী: মুন্সুর হোসেন	কৃষি	চক্ৰবর্তী	
৬	শ্রী: মুন্সুর হোসেন (স্বামী)	কৃষি	চক্ৰবর্তী	
৭	শ্রী: মুন্সুর হোসেন	কৃষি	চক্ৰবর্তী	
৮	শ্রী: মোঃ হাছিম	কৃষি	চক্ৰবর্তী	
৯	শ্রী: মোঃ হাছিম	কৃষি	চক্ৰবর্তী	
১০	শ্রী: মুন্সুর হোসেন	কৃষি	চক্ৰবর্তী	
১১	শ্রী: মোঃ হাছিম	কৃষি	চক্ৰবর্তী	
১২	শ্রী: মুন্সুর হোসেন	কৃষি	চক্ৰবর্তী	
১৩	শ্রী: মুন্সুর হোসেন	কৃষি	চক্ৰবর্তী	
১৪	শ্রী: মুন্সুর হোসেন	কৃষি	চক্ৰবর্তী	
১৫	শ্রী: মুন্সুর হোসেন	কৃষি	চক্ৰবর্তী	
১৬	শ্রী: মুন্সুর হোসেন	কৃষি	চক্ৰবর্তী	
১৭	শ্রী: মুন্সুর হোসেন	কৃষি	চক্ৰবর্তী	
১৮	শ্রী: মুন্সুর হোসেন	কৃষি	চক্ৰবর্তী	
১৯	শ্রী: মুন্সুর হোসেন	কৃষি	চক্ৰবর্তী	
২০	শ্রী: মুন্সুর হোসেন	কৃষি	চক্ৰবর্তী	
২১	শ্রী: মুন্সুর হোসেন	কৃষি	চক্ৰবর্তী	
২২	শ্রী: মুন্সুর হোসেন	কৃষি	চক্ৰবর্তী	

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## Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: ভাঙ্গাইল Upazila: পেটখান চাঁদ Union: চুলুইবাড়ী Vill: করতালিয়া

SI No.	Name	Occupation/Designation	Address	Signature
২০	স্বা. শ্রীধার (স্বা.স্ব.)	কৃষি	করতালিয়া	স্বা. শ্রীধার
২৪	স্বা. আমিরুল	কৃষি	করতালিয়া	স্বা. আমিরুল
২৫	স্বা. মুহাম্মদ	কৃষি	করতালিয়া	স্বা. মুহাম্মদ
২৬	স্বা. আলী হোসেন আলম	ব্যক্তি/চিকিৎসক	করতালিয়া	স্বা. আলী হোসেন

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Participant List  
Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Jamalpur Upazila: Dewanganj Union: Chikazani Vill: Kholabaru

Sl No.	Name	Occupation/Designation	Address	Signature
১	Shohel	হাট/মসজিদ	খোলাবাড়ী	Shohel
২	আল-আমিন	হাট/মসজিদ	খোলাবাড়ী	Amr
৩	আজিন	হাট	খোলাবাড়ী	Amr
৪	সো: মাহিনা ইসলাম	হাট	খোলাবাড়ী	Amr
৫	সো: মো: সানি	কৃষি	খোলাবাড়ী	Amr
৬	সো: দুলাল	কৃষি	খোলাবাড়ী	Amr
৭	সো: জাহাঙ্গীর	কৃষি	খোলাবাড়ী	Amr
৮	সো: পুনু	হাট	খোলাবাড়ী	Amr
৯	সো: মো: জাহাঙ্গীর	হাট	খোলাবাড়ী	Amr
১০	জাহাঙ্গীর	হাট	খোলাবাড়ী	Amr
১১	জাহাঙ্গীর	কৃষি	খোলাবাড়ী	Amr
১২	সানি	কৃষি	খোলাবাড়ী	Amr

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## Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Jamalpur Upazila: Dewanganj Union: Chukajari Vill: Kholabari

SI No.	Name	Occupation/Designation	Address	Signature
১০	শ্রী: মঞ্জিলদীন	ফরাসী	খোলাবাড়ী	শ্রী মঞ্জিল
১১	শ্রী: মোহাম্মদ মিয়া	কৃষি	খোলাবাড়ী	খোলাবাড়ী
১২	শ্রী: মোহাম্মদ আলম	কৃষি	চকমাড়ী	শ্রী মোহাম্মদ
১৩	শ্রী: মোহাম্মদ হোসেন	খিঁচুড়ী	খোলাবাড়ী	শ্রী মোহাম্মদ
১৪	শ্রী: মোহাম্মদ হোসেন	কৃষি	খোলাবাড়ী	খোলাবাড়ী
১৫	শ্রী: মোহাম্মদ	কৃষি	খোলাবাড়ী	খোলাবাড়ী
১৬	শ্রী: মোহাম্মদ	কৃষি	চকমাড়ী	খোলাবাড়ী
১৭	শ্রী: মোহাম্মদ	খিঁচুড়ী	খোলাবাড়ী	খোলাবাড়ী
১৮	শ্রী: মোহাম্মদ	কৃষি	খোলাবাড়ী	খোলাবাড়ী
১৯	শ্রী: মোহাম্মদ	কৃষি	খোলাবাড়ী	খোলাবাড়ী
২০	শ্রী: মোহাম্মদ	খিঁচুড়ী	খোলাবাড়ী	খোলাবাড়ী
২১	শ্রী: মোহাম্মদ	কৃষি	খোলাবাড়ী	খোলাবাড়ী
২২	শ্রী: মোহাম্মদ	কৃষি	খোলাবাড়ী	খোলাবাড়ী

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Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Jamalpur Upazila: Dewanganj Union: Chikajaru Vill: Khotabaru

Sl No.	Name	Occupation/Designation	Address	Signature
১	ডিরাপ আলী	কৃষি	(খোলাবাড়ী)	ডিরাপ
২	শ্রী: আমজাম হাফ	কৃষি	(খোলাবাড়ী)	Amir
৩	শ্রী: শ্রী: রাসাদ	১। কৃষি	১	রাসাদ
৪	শ্রী: মুহা আলম	" কৃষি	"	মুহা আলম
৫	শ্রী: আব্দুল হুসেইন	শ্রী: শিক্ষক	"	শ্রী: হুসেইন
৬	শ্রী: মাহিবউদ্দিন	কৃষি	(খোলাবাড়ী)	মাহিব
৭	শ্রী: মাহিবুল	কৃষি	(খোলাবাড়ী)	মাহিবুল
৮	শ্রী: মাহাজামুল সব্বাগ	কৃষি	(খোলাবাড়ী)	মাহাজামুল
৯	শ্রী: আমজাম আলম	কৃষি	(খোলাবাড়ী)	শ্রী: আমজাম আলম
১০	শ্রী: শ্রী: মাহিবুল	কৃষি	(খোলাবাড়ী)	শ্রী: মাহিবুল
১১	শ্রী: মাহিবুল	কৃষি	(খোলাবাড়ী)	শ্রী: মাহিবুল
১২	শ্রী: মাহাজামুল আলম	কৃষি	(খোলাবাড়ী)	শ্রী: মাহাজামুল আলম

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## Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Jammu Division, Puzila: Dewanganj Union: Chikarou Vill: Kholabari Date: 22.06

Sl No.	Name	Occupation/Designation	Address	Signature
১৩	শ্রী: পুন্যন	ব্যবসায়ী	খোলাবাড়ী	পুন্যন
১৪	শ্রী: শ্রী: খালদা	কৃষি	৷	খালদা
১৫	৷ ব্রজেন	কৃষি	৷	ব্রজেন
১৬	৷ (সান) মিতা	কৃষি	৷	(সান) মিতা
১৭	৷ শ্রী: ব্রজ	ব্যবসায়ী	খোলাবাড়ী	ব্রজ
১৮	৷ শ্রী: শ্রী: খালদা	কৃষি	খোলাবাড়ী	শ্রী: শ্রী: খালদা

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## Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: ভাঙ্গালপুর Upazila: পেটয়ামগড় Union: চিলাভাঙ্গা Vill: ২নং খোলাবাড়ী

Sl No.	Name	Occupation/Designation	Address	Signature
২	বেজাউল-হক	কৃষি	২নং খোলাবাড়ী	বেজাউল-হক
৩	জিয়ান আলী	কৃষি	২নং খোলাবাড়ী	জিয়ান
৬	মোঃ বিক্রমাদিত্য হোসেন	কৃষি	২নং খোলাবাড়ী	বিক্রমাদিত্য
৪	মোঃ আব্দুল হামিদ	কৃষি	২নং খোলাবাড়ী	আব্দুল হামিদ
৫	মোঃ হোসেন	কৃষি	৩নং খোলাবাড়ী	হোসেন
৬	মোঃ আব্দুল হোসেন	কৃষি	৩নং খোলাবাড়ী	আব্দুল হোসেন
৭	আব্দুল হামিদ	কৃষি	২নং খোলাবাড়ী	আব্দুল হামিদ
৮	আব্দুল হামিদ	কৃষি	৩নং খোলাবাড়ী	আব্দুল হামিদ
৯	মোঃ আব্দুল হোসেন	কৃষি	২নং খোলাবাড়ী	আব্দুল হোসেন
১০	আব্দুল হামিদ	কৃষি	২নং খোলাবাড়ী	আব্দুল হামিদ
১১	আব্দুল হামিদ	কৃষি	২নং খোলাবাড়ী	আব্দুল হামিদ
১২	আব্দুল হামিদ	কৃষি	২নং খোলাবাড়ী	আব্দুল হামিদ
১৩	মোঃ আব্দুল হোসেন	কৃষি	২নং খোলাবাড়ী	আব্দুল হোসেন

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## Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Tangail Upazila: Bhuapur Union: Gobindaski Vill: Gobindaski Date: 23.0

Sl No.	Name	Occupation/Designation	Address	Signature
1	শ্রী সুনীল কুমার	কর্মকর্তা	গোবিন্দস্কি	
২	শ্রী: সুনীল কুমার	কর্মকর্তা	গোবিন্দস্কি	
৩	শ্রী সুনীল কুমার	SAAO	"	
৪	শ্রী সুনীল কুমার	SAAO	"	
৫	শ্রী সুনীল কুমার	SAAO	"	
৬	শ্রী সুনীল কুমার	সেভেন ফাউন্ডেশন	গোবিন্দস্কি	
৭	শ্রী সুনীল কুমার	কর্মকর্তা	গোবিন্দস্কি	
৮	শ্রী সুনীল কুমার	জিকি	রাউন্ডি বাড়ি	শ্রী সুনীল কুমার
৯	শ্রী সুনীল কুমার	ই.সি.সি.সি.	গোবিন্দস্কি	
১০	শ্রী সুনীল কুমার	ই.সি.সি.সি.	গোবিন্দস্কি	শ্রী সুনীল কুমার
১১	শ্রী সুনীল কুমার	ই.সি.সি.সি.	গোবিন্দস্কি	
১২	শ্রী সুনীল কুমার	ই.সি.সি.সি.	গোবিন্দস্কি	

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## Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Tangail Upazila: Bhuapur Union: Grobindaski Vill: Grobindaski Date: 23.6

SI No.	Name	Occupation/Designation	Address	Signature
1	শ্রীমতী সুলতানা হুসনা	কমিউনিটি	গোবিন্দস্কি	
2	শ্রীমতী সুলতানা হুসনা	কমিউনিটি	গোবিন্দস্কি	
3	শ্রীমতী সুলতানা হুসনা	SAAO	"	
4	শ্রীমতী সুলতানা হুসনা	SAAO	"	
5	শ্রীমতী সুলতানা হুসনা	SAAO	"	
6	শ্রীমতী সুলতানা হুসনা	ইউনিয়ন সচিব	গোবিন্দস্কি	
7	শ্রীমতী সুলতানা হুসনা	কমিউনিটি	গোবিন্দস্কি	
8	শ্রীমতী সুলতানা হুসনা	জিক্রী	রাউৎ বাড়ি	শ্রীমতী সুলতানা হুসনা
9	শ্রীমতী সুলতানা হুসনা	ইউ.পি. সদস্য	গোবিন্দস্কি	
20	শ্রীমতী সুলতানা হুসনা	ইউ.পি. সদস্য	গোবিন্দস্কি	শ্রীমতী সুলতানা হুসনা
১৯	শ্রীমতী সুলতানা হুসনা	ইউ.পি. সদস্য	গোবিন্দস্কি	
২১	শ্রীমতী সুলতানা হুসনা	ইউ.পি. সদস্য	গোবিন্দস্কি	

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Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Tangail Upazila: Bhuapur Union: Gobindashu Vill: Gobindashu Date: 23.06

SI No.	Name	Occupation/Designation	Address	Signature
১৬	আব্দুল হক	স্বামী	৩৩৩৩৩৩৩৩	আব্দুল হক
১৭	বিনয় কুমার	কৃষক	আব্দুল হক	বিনয় কুমার
১৮	আব্দুল হক	স্বামী	আব্দুল হক	আব্দুল হক
১৯	আব্দুল হক	স্বামী	আব্দুল হক	আব্দুল হক
২০	আব্দুল হক	স্বামী	আব্দুল হক	আব্দুল হক
২১	আব্দুল হক	স্বামী	আব্দুল হক	আব্দুল হক
২২	আব্দুল হক	স্বামী	আব্দুল হক	আব্দুল হক
২৩	আব্দুল হক	স্বামী	আব্দুল হক	আব্দুল হক
২৪	আব্দুল হক	স্বামী	আব্দুল হক	আব্দুল হক

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**Participant List**

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Tangail Upazila: Bhuapur Union: Gobindashi Vill: Gobindashi Date: 23.06

Sl No.	Name	Occupation/Designation	Address	Signature
২৫	ইকবাল	স্বামী	দাশুপুড় বাজী	ইকবাল
২৬	আমিনুল ইসলাম	স্বামী	করকি মাড়	আমিনুল
২৭	শেখ রুবেল	স্বামী	করকি মাড়	শেখ রুবেল
২৮				
২৯				
৩০				

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## Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Tangail Upazila: Bhuapur Union: Nikraw Vill: patilapara Date: 23.06

Sl No.	Name	Occupation/Designation	Address	Signature
১	হানুয়ার	ব্যবসা	শান্তিগোলাড়া	হানুয়ার
২	শ্রী নরেশ্বর চন্দ্র বসু	কৃষক	শান্তিগোলাড়া	নরেশ্বর
৬	সুমান	কৃষিজাত	শান্তিগোলাড়া	সুমান
৪	বিশ্ব কাম	কৃষিজাত	শান্তিগোলাড়া	বিশ্ব কাম
৫	জুবাইলা	কৃষিজাত	শান্তিগোলাড়া	জুবাইলা
৬	শ্রীমতী ২১২	কৃষিজাত	শান্তিগোলাড়া	২১২
৭	শ্রী: মোহাম্মদ হক	কৃষিজাত	শান্তিগোলাড়া	মোহাম্মদ
৮	শ্রী: রাসুল হক	কৃষি	শান্তিগোলাড়া	রাসুল হক
৯	সফা হু	কৃষি	শান্তিগোলাড়া	সফা হু
১০	আমির	কৃষি	শান্তিগোলাড়া	আমির
১১	আব্দুল	কৃষি	শান্তিগোলাড়া	আব্দুল
১২	আব্দুল কাম	কৃষিজাত	শান্তিগোলাড়া	আব্দুল কাম

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Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Tanjail Upazila: Bhuapur Union: Nikrail Vill: Petitapara Date: 23.0

Sl No.	Name	Occupation/Designation	Address	Signature
১৫	শ্রীমতী সন্ধ্যা দেবী	বাড়ী	শ্রীমতী সন্ধ্যা দেবী - শ্রীমতী সন্ধ্যা দেবী	শ্রীমতী সন্ধ্যা দেবী
১৬	শ্রীমতী সন্ধ্যা দেবী	বাড়ী	শ্রীমতী সন্ধ্যা দেবী - শ্রীমতী সন্ধ্যা দেবী	শ্রীমতী সন্ধ্যা দেবী
১৭	শ্রীমতী সন্ধ্যা দেবী	বাড়ী	শ্রীমতী সন্ধ্যা দেবী - শ্রীমতী সন্ধ্যা দেবী	শ্রীমতী সন্ধ্যা দেবী
১৮	শ্রীমতী সন্ধ্যা দেবী	বাড়ী	শ্রীমতী সন্ধ্যা দেবী - শ্রীমতী সন্ধ্যা দেবী	শ্রীমতী সন্ধ্যা দেবী
১৯	শ্রীমতী সন্ধ্যা দেবী	বাড়ী	শ্রীমতী সন্ধ্যা দেবী - শ্রীমতী সন্ধ্যা দেবী	শ্রীমতী সন্ধ্যা দেবী
২০	শ্রীমতী সন্ধ্যা দেবী	বাড়ী	শ্রীমতী সন্ধ্যা দেবী - শ্রীমতী সন্ধ্যা দেবী	শ্রীমতী সন্ধ্যা দেবী

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## Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Tongail Upazila: Bhugpur Union: NIKRAUL Vill: Dhovaiya Date: 23.06

SI No.	Name	Occupation/Designation	Address	Signature
১	মোঃ. সবুখাঃ	ইউ.পি. সদস্য	দোভায়া	
২	মোঃ ইমরাতুল	কৃষক	পাড়িতাপাড়া	
৩	মোঃ মিজানুর রহমান	শিক্ষক	পাড়িতাপাড়া	
৪	মোঃ রাসিমুল রহমান	কৃষক	দোভায়া	
৫	মোঃ এরশাদ মিয়া	ব্যবসা	পাড়িতাপাড়া	
৬	মোঃ মুজাহ্বর প্রাঃ	কৃষক	বাহাদুর ডুকা	
৭	মোঃ ছুরমান আলী	ব্যবসা	পাড়িতাপাড়া	
৮	মোঃ জামাল প্রাঃ	কৃষক	বাহাদুর ডুকা	মোঃ নবাবজি
৯	মোঃ নবাব আলী	ড্রাইভার	মার্চি ডাঙা	মোঃ নবাবজি
১০	মোঃ মোকাম্মল প্রাঃ	u	দোভায়া	মোঃ মোকাম্মল
১১	মোঃ খালিদ শেখ	কৃষক	পাড়িতাপাড়া	খালিদ
১২	মোঃ আনজু প্রাঃ	ড্রাইভার	বাহাদুর ডুকা	আনজু

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Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Tangail Upazila: Bhugapur Union: NIKRAIL vill: Dhovaiya Date: 23.0

SI No.	Name	Occupation/Designation	Address	Signature
১৬	স্বাঃ সফিউল হোসেন	ড্রাইভার	দোভায়া	সফিউল
১৮	স্বাঃ জামাল স্বাঃ	কৃষক	দোভায়া	জামাল
১৯	আব্দুল আলী	কৃষক	দোভায়া	আব্দুল
২৬	স্বাঃ জুমান -	কৃষক	দোভায়া	জুমান
১৭	স্বাঃ বাবুল	কৃষক	দোভায়া	বাবুল
১৮	<del>স্বাঃ বাবুল</del> স্বাঃ আব্দুল	কৃষক	দোভায়া -	আব্দুল
১৯	আব্দুল হামিদ	কৃষক	দোভায়া	হামিদ
২০	স্বাঃ নাজিমুল হোসেন	কৃষক -	সফিউল	(স্বাক্ষর)
২১	স্বাঃ সফিউল হোসেন	কৃষক -	সফিউল	সফিউল

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Participant List

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Shiras jans

District: ~~Bandar~~ Upazila: Kazipur Union: ~~Bandar~~ Vill: ~~Bandar~~ Date: 24.06

Sl No.	Name	Occupation/Designation	Address	Signature
১	মোঃ মনজুরুল আলম	ইউপি এফসি	শ্যামপুর	
২	মোঃ আব্দুল হামিদ	বাগমতীন বাগমতীন	১১	মোঃ হামিদ
৩	মোঃ রকিবুল আলম	ইউপি এফসি	১১	
৪	মোঃ আব্দুল হামিদ	বাগমতীন	দুর্ভোগা	
৫	মোঃ আব্দুল হামিদ	ইউপি এফসি	কামিলাপুর	
৬	মোঃ আব্দুল হামিদ	ইউপি এফসি	বঙ্গমহালা	মুহিব
৭	মোঃ আব্দুল হামিদ	ইউপি এফসি	সকিলা ডেপুটি	মোঃ হামিদ
৮	মোঃ আব্দুল হামিদ	ইউপি এফসি	বরই ডেপুটি	মোঃ হামিদ
৯	মোঃ আব্দুল হামিদ	ইউপি এফসি	শ্যামপুর	
১০	মোঃ রাসেল রানা	ছাত্র	বরই ডেপুটি	
১১	মোঃ আব্দুল হামিদ	ইউপি এফসি	বরই ডেপুটি	
১২	মোঃ আব্দুল হামিদ	ইউপি এফসি	শ্যামপুর	মোঃ হামিদ

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Participant List  
Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Shirajganj Upazila: Kazipur Union: Gandail Vill: Gandail Date: 24.11

Sl No.	Name	Occupation/Designation	Address	Signature
২৬	শ্রীমতী: কুমারী হুমায়ুন	কৃষিকার্ম	গন্ডিগা মুন্সিগাঁও	কুমারী হুমায়ুন
২৮	শ্রীমতী: মোঃ হুমায়ুন	কৃষিকার্ম	গন্ডিগা মুন্সিগাঁও	হুমায়ুন
২৯	শ্রীমতী: আমলিয়া হুমায়ুন	কৃষিকার্ম	গন্ডিগা মুন্সিগাঁও	আমলিয়া
৩০	শ্রীমতী: মনোজ হুমায়ুন	কৃষিকার্ম	গন্ডিগা মুন্সিগাঁও	মনোজ
৩১	শ্রীমতী: জামিনা	কৃষিকার্ম	গন্ডিগা মুন্সিগাঁও	জামিনা
৩২	শ্রীমতী: মনোজ হুমায়ুন	কৃষিকার্ম	গন্ডিগা মুন্সিগাঁও	মনোজ
৩৩	শ্রীমতী: মনোজ হুমায়ুন	কৃষিকার্ম	গন্ডিগা মুন্সিগাঁও	মনোজ
৩৪	শ্রীমতী: মনোজ হুমায়ুন	কৃষিকার্ম	গন্ডিগা মুন্সিগাঁও	মনোজ
৩৫	শ্রীমতী: মনোজ হুমায়ুন	কৃষিকার্ম	গন্ডিগা মুন্সিগাঁও	মনোজ
৩৬	শ্রীমতী: মনোজ হুমায়ুন	কৃষিকার্ম	গন্ডিগা মুন্সিগাঁও	মনোজ
৩৭	শ্রীমতী: মনোজ হুমায়ুন	কৃষিকার্ম	গন্ডিগা মুন্সিগাঁও	মনোজ
৩৮	শ্রীমতী: মনোজ হুমায়ুন	কৃষিকার্ম	গন্ডিগা মুন্সিগাঁও	মনোজ
৩৯	শ্রীমতী: মনোজ হুমায়ুন	কৃষিকার্ম	গন্ডিগা মুন্সিগাঁও	মনোজ
৪০	শ্রীমতী: মনোজ হুমায়ুন	কৃষিকার্ম	গন্ডিগা মুন্সিগাঁও	মনোজ
৪১	শ্রীমতী: মনোজ হুমায়ুন	কৃষিকার্ম	গন্ডিগা মুন্সিগাঁও	মনোজ
৪২	শ্রীমতী: মনোজ হুমায়ুন	কৃষিকার্ম	গন্ডিগা মুন্সিগাঁও	মনোজ
৪৩	শ্রীমতী: মনোজ হুমায়ুন	কৃষিকার্ম	গন্ডিগা মুন্সিগাঁও	মনোজ
৪৪	শ্রীমতী: মনোজ হুমায়ুন	কৃষিকার্ম	গন্ডিগা মুন্সিগাঁও	মনোজ
৪৫	শ্রীমতী: মনোজ হুমায়ুন	কৃষিকার্ম	গন্ডিগা মুন্সিগাঁও	মনোজ
৪৬	শ্রীমতী: মনোজ হুমায়ুন	কৃষিকার্ম	গন্ডিগা মুন্সিগাঁও	মনোজ
৪৭	শ্রীমতী: মনোজ হুমায়ুন	কৃষিকার্ম	গন্ডিগা মুন্সিগাঁও	মনোজ
৪৮	শ্রীমতী: মনোজ হুমায়ুন	কৃষিকার্ম	গন্ডিগা মুন্সিগাঁও	মনোজ
৪৯	শ্রীমতী: মনোজ হুমায়ুন	কৃষিকার্ম	গন্ডিগা মুন্সিগাঁও	মনোজ
৫০	শ্রীমতী: মনোজ হুমায়ুন	কৃষিকার্ম	গন্ডিগা মুন্সিগাঁও	মনোজ

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Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Shirajganj Upazila: Kazipur Union: Gandail Vill: Gandail Date: 24.06.20

Sl No.	Name	Occupation/Designation	Address	Signature
২৫	Md. Rashidul Hasan মো: আর. হারিস	Health Assistant স্বাস্থ্য কর্মী	Gandhail-02 গান্ধাই	Hasan হারিস
২৬	মোঃ আমিনুল ইসলাম	মিস্ত্রী	কুমকুড়িয়া	Amir
২৭	মোছাঃ মামা আব্দুল	উপসহকারী কৃষি রক্ষক	ফুলকোচা	Amir
২৮	মোঃ মুজলিম উদ্দিন	"	শিবলবাড়ীয়া	Mujim
৩০	মোঃ মোসারফ হোসেন	স্বত্বাধিকারী	শিবাব মাড়ো	Mosaraf
৩২	মো: জা: ওয়াহ	উদ্যোগ	গান্ধাই	Wah

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Participant List  
Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Shikaripur Upazila: Kazipur Union: Gondaul Vill: Purba Khokshi

SI No.	Name	Occupation/Designation	Address	Signature
১	শ্রী: সাজ্জাদুল	কৃষিকার	পূর্ব-খুকশিয়া	সাজ্জাদুল
২	শ্রী: মোহাম্মদ	কৃষিকার	পূর্ব-খুকশিয়া	মোহাম্মদ
৩	শ্রী: বেঙ্গল	কৃষিকার	পূর্ব-খুকশিয়া	বেঙ্গল
৪	শ্রী: মোহাম্মদ হোসেন	কৃষিকার	পূর্ব-খুকশিয়া	মোহাম্মদ
৫	শ্রী: মোহাম্মদ হিদা	বেতকার	৫	মোহাম্মদ হিদা
৬	শ্রী: মোহাম্মদ হোসেন	কৃষিকার	পূর্ব-খুকশিয়া	মোহাম্মদ হোসেন
৭	শ্রী: ডি. এ. ডি. এ. এ. এ.	কৃষিকার	পূর্ব-খুকশিয়া	ডি. এ. ডি. এ. এ.
৮	শ্রী: মোহাম্মদ হোসেন	কৃষিকার	পূর্ব-খুকশিয়া	মোহাম্মদ হোসেন
৯	শ্রী: মোহাম্মদ হোসেন	কৃষিকার	পূর্ব-খুকশিয়া	মোহাম্মদ হোসেন
১০	শ্রী: মোহাম্মদ হোসেন	কৃষিকার	পূর্ব-খুকশিয়া	মোহাম্মদ হোসেন
১১	শ্রী: মোহাম্মদ হোসেন	কৃষিকার	পূর্ব-খুকশিয়া	মোহাম্মদ হোসেন
১২	শ্রী: মোহাম্মদ হোসেন	কৃষিকার	পূর্ব-খুকশিয়া	মোহাম্মদ হোসেন

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## Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Shirajganj Upazila: Karipur Union: Gendaul Vill: Purbakhoksha Date: 24. ৫

SI No.	Name	Occupation/Designation	Address	Signature
২৩	শাহা ছামল	চাষুরী	পূর্ব চুকাঙ্গিয়া	শাহা ছামল
২৪	আঃ আলী আমদ	কৃষি জেড	পূর্ব চুকাঙ্গিয়া	আঃ আলী আমদ
২৫	শাহ আলী মন্ডল	কৃষি জেড	পূর্ব চুকাঙ্গিয়া	শাহ আলী মন্ডল
২৬	আঃ আলী আমদ	কৃষি জেড	পূর্ব চুকাঙ্গিয়া	আঃ আলী আমদ
২৭	আঃ আলী আমদ	কৃষি জেড	পূর্ব চুকাঙ্গিয়া	আঃ আলী আমদ

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Participant List  
Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Shirasgong Upazila: Kasipur Union: Kasipur Vill: Shingra barui

SI No.	Name	Occupation/Designation	Address	Signature
১	হরি সতল	ভেলে	সিংড়া বাড়ী	হরি
২	বাবু দান	ভেলে	সিংড়া বাড়ী	বাবু দান
৩	তুগাম	ভেলে	সিংড়া বাড়ী	তুগাম
৪	বব্বি হালদাবু	ভেলে	সিংড়া বাড়ী	বব্বি
৫	দালিণ	ভেলে	সিংড়া বাড়ী	দালিণ
৬	সুন্দাম হালদাবু	ভেলে	সিংড়া বাড়ী	সুন্দাম
৭	নারায়ন	ভেলে	সিংড়া বাড়ী	নারায়ন
৮	গোবিন্দ চন্দ্র	ভেলে	সিংড়া বাড়ী	গোবিন্দ
৯	মোঃ বাজিউল ইসলাম	ভেলে	সিংড়া বাড়ী	মোঃ বাজিউল ইসলাম
১০	হুমু	ভেলে	সিংড়া বাড়ী	হুমু
১১	মোঃ বাজিউল ইসলাম	ভেলে	সিংড়া বাড়ী	মোঃ বাজিউল ইসলাম
১২	শ্রী বিষ্ণু হাওদার	ভেলে	সিংড়া বাড়ী	বিষ্ণু
১৩	শ্রীঃ জুসুম রানা	বৃষ্টি সদস্য	বৃষ্টি সদস্য	জুসুম

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Participant List  
Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Shikaripour Upazila: Sahazadpur Union: Sonatori Vill: Baropokwa

SI No.	Name	Occupation/Designation	Address	Signature
১	শ্রী: রাউফিক	ভোল	বারলাখিয়া	রাউফিক
২	শ্রী: নওশাদ	ফরি	বারলাখিয়া	নওশাদ
৬	শ্রী: আমজাদ আলী	ভোল	বারলাখিয়া	আমজাদ
৪	শ্রী: মোহাম্মদ আলী	ফরি	বারলাখিয়া	মুহাম্মদ
৫	শ্রী: শ্রী: জনী	ফরি	বারলাখিয়া	জনী
৬	শ্রী: আমজাদ	ফরি	বারলাখিয়া	-
৭	শ্রী: আব্দুল মিয়া	ইমাম	বারলাখিয়া	আব্দুল
৮	শ্রী: আমজাদ ইমাম	ফরি	বারলাখিয়া	আমজাদ
৯	শ্রী: মোহাম্মদ হামিদ	ফরি	বারলাখিয়া	মোহাম্মদ
১০	শ্রী: মিজানুর রহমান	বন্যায়ী	বারলাখিয়া	মিজানুর
১১	শ্রী: মোহাম্মদ হামিদ	ফরি	বারলাখিয়া	মোহাম্মদ
১২	শ্রী: মান্নান মিয়া	ফরি	বারলাখিয়া	মান্নান
১৩	শ্রী: রাউফিক	ফরি	বারলাখিয়া	রাউফিক

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## Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Shivarajjong Upazila: Sahazadpur Union: Sonatorail Vill: Baropakhia

Sl No.	Name	Occupation/Designation	Address	Signature
১৪	হুসাইন	কৃষিকার	সাহাযদপুর	হুসাইন
১৫	শ্রী: মোঃ মোস্তাফিজ হোসেন	কৃষক	সহ সাহাযদপুর	মোস্তাফিজ
১৬	শ্রী: মোঃ মজিবুল হক	কৃষক	সহ সাহাযদপুর	মজিবুল
১৭	মাসুম হোসেন	ছাত্র	সহ সাহাযদপুর	মাসুম
১৮	শ্রী: মোস্তাফিজ হোসেন	কৃষক	সহ সাহাযদপুর	মোস্তাফিজ
১৯	শ্রী: মোস্তাফিজ হোসেন	কৃষক	সহ সাহাযদপুর	মোস্তাফিজ

Center for Environmental and Geographic Information Services (CEGIS)  
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**AHYDTECH Water Resources (BD) Ltd.**  
 ADVANCED HYDROLOGY HYDRAULIC GEOMORPHOLOGY  
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SL No.	Name	Occupation	Address	Mobile No.	Signature
১	আব্দুল হক	ইঞ্জিনিয়ার	কাজলিয়া (মুন্সি)		আব্দুল হক
২	আব্দুল হক	ইঞ্জিনিয়ার	হ		আব্দুল হক
৩	আব্দুল হক	হ	হ		আব্দুল হক
৪	আব্দুল হক	হ	হ		আব্দুল হক
৫	আব্দুল হক	হ	হ		আব্দুল হক
৬	আব্দুল হক	হ	হ		আব্দুল হক
৭	আব্দুল হক	হ	হ		আব্দুল হক
৮	আব্দুল হক	হ	হ		আব্দুল হক
৯	আব্দুল হক	হ	হ		আব্দুল হক
১০	আব্দুল হক	হ	হ		আব্দুল হক
১১	আব্দুল হক	হ	হ		আব্দুল হক
১২	আব্দুল হক	হ	হ		আব্দুল হক
১৩	আব্দুল হক	হ	হ		আব্দুল হক
১৪	আব্দুল হক	হ	হ		আব্দুল হক
১৫	আব্দুল হক	হ	হ		আব্দুল হক
১৬	আব্দুল হক	হ	হ		আব্দুল হক
১৭	আব্দুল হক	হ	হ		আব্দুল হক
১৮	আব্দুল হক	হ	হ		আব্দুল হক
১৯	আব্দুল হক	হ	হ		আব্দুল হক
২০	আব্দুল হক	হ	হ		আব্দুল হক
২১	আব্দুল হক	হ	হ		আব্দুল হক
২২	আব্দুল হক	হ	হ		আব্দুল হক
২৩	আব্দুল হক	হ	হ		আব্দুল হক
২৪	আব্দুল হক	হ	হ		আব্দুল হক
২৫	আব্দুল হক	হ	হ		আব্দুল হক
২৬	আব্দুল হক	হ	হ		আব্দুল হক
২৭	আব্দুল হক	হ	হ		আব্দুল হক
২৮	আব্দুল হক	হ	হ		আব্দুল হক
২৯	আব্দুল হক	হ	হ		আব্দুল হক
৩০	আব্দুল হক	হ	হ		আব্দুল হক
৩১	আব্দুল হক	হ	হ		আব্দুল হক
৩২	আব্দুল হক	হ	হ		আব্দুল হক
৩৩	আব্দুল হক	হ	হ		আব্দুল হক
৩৪	আব্দুল হক	হ	হ		আব্দুল হক
৩৫	আব্দুল হক	হ	হ		আব্দুল হক
৩৬	আব্দুল হক	হ	হ		আব্দুল হক
৩৭	আব্দুল হক	হ	হ		আব্দুল হক
৩৮	আব্দুল হক	হ	হ		আব্দুল হক
৩৯	আব্দুল হক	হ	হ		আব্দুল হক
৪০	আব্দুল হক	হ	হ		আব্দুল হক
৪১	আব্দুল হক	হ	হ		আব্দুল হক







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## Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Gaibandha Upazila: Fulchhari Union: Usia Vill: Sadekhan Bayar Date: 25.07.22

Sl No.	Name	Occupation/Designation	Address	Signature
	শ্রী: লাক্ষ্মী কান্ত	কৃষি	যাদুতিলক কৃষি	লাক্ষ্মী কান্ত
	শ্রী: নাদির কুদ্দাস শ্রী: ইউসুফ আলী	কৃষি দিন কুদ্দাস	কাবিল গুর কাবিল গুর	নাদির শ্রী: ইউসুফ আলী
	শ্রী: হাছিমুল ইসলাম শ্রী: গামর	ব্যবসায় কৃষি	কাবিল গুর কাবিল গুর	হাছিমুল গামর
	শ্রী: মোহাম্মদ আলী	কৃষি	কাবিল গুর	গামর মোহাম্মদ আলী
	শ্রী: মাহমুদ আলী খান	কৃষি	কাবিল গুর	মাহমুদ আলী
	শ্রী: মোহাম্মদ হামিদ	কৃষি	কাবিল গুর	মোহাম্মদ হামিদ

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## Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Gaibandha Upazila: Fulchhari Union: Usia Vill: Ratampur Date: 25.07.22

Sl No.	Name	Occupation/Designation	Address	Signature
	শ্রী: মোহাম্মদ হোসেন	কৃষি	রতনপুর	
	শ্রী: মুজিব আলী	কৃষি	৫	
	নাছিম আলী	কৃষি	৫	
	বাহাদুর আলী	কৃষি	৫	
	মুহাম্মদ বেগম	কৃষি	৫	
	মুহাম্মদ বেগম	৫	৫	
	মুহাম্মদ বেগম	৫	৫	

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Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Gaibandha Upazila: Fulbari Union: Uria Vill: Uria Date: 26.07.22

Sl No.	Name	Occupation/Designation	Address	Signature
১	শ্রী: শাহাদাত হোসেন	সহকারী প্রকৌশলী	উপজিলা পরিষদ	
২	শ্রী: নজরুল ইসলাম	ইউনিয়ন সদস্য	৫ ৫ ৫	
৬	শ্রী: জাহাঙ্গীর হোসেন	ফেলো		
৪	শ্রী: মোঃ সাদেক হোসেন	কাঁচা বিক্রয়		
৫	শ্রী: মোঃ আমজাদ হোসেন	কৃষি		
৬	শ্রী: মোঃ বাবুল হোসেন	কৃষি		
৭	শ্রী: মোঃ আমিন হোসেন	কৃষি		
৮	শ্রী: মোঃ জাহাঙ্গীর হোসেন	কৃষি		
৯	শ্রী: মোঃ হোসেন হোসেন	কৃষি		
১০	শ্রী: মোঃ হোসেন হোসেন	কৃষি		
১১	শ্রী: মোঃ হোসেন হোসেন	কৃষি		
১২	শ্রী: মোঃ হোসেন হোসেন	কৃষি		
১৩	শ্রী: মোঃ হোসেন হোসেন	কৃষি		
১৪	শ্রী: মোঃ হোসেন হোসেন	কৃষি		
১৫	শ্রী: মোঃ হোসেন হোসেন	কৃষি		
১৬	শ্রী: মোঃ হোসেন হোসেন	কৃষি		
১৭	শ্রী: মোঃ হোসেন হোসেন	কৃষি		
১৮	শ্রী: মোঃ হোসেন হোসেন	কৃষি		
১৯	শ্রী: মোঃ হোসেন হোসেন	কৃষি		
২০	শ্রী: মোঃ হোসেন হোসেন	কৃষি		
২১	শ্রী: মোঃ হোসেন হোসেন	কৃষি		
২২	শ্রী: মোঃ হোসেন হোসেন	কৃষি		

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Jamuna River Economic Corridor Development Program (JARECDP) (Phase 1 Stage 1)

Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Gaibandha Upazila: Fulbari Union: Uria Vill: Uria Date: 26.07.22

Sl No.	Name	Occupation/Designation	Address	Signature
১৩	আফসানিয়া	মহিলা	উরিয়া	আফসানিয়া
১৪	জাহান্না	মহিলা	উরিয়া	জাহান্না
১৫	মুন্সুরা	মহিলা	উরিয়া	মুন্সুরা
১৬	ফুল ফুলী	মহিলা	উরিয়া	ফুল ফুলী
১৭	জাহান্না	মহিলা	উরিয়া	জাহান্না
১৮	নাজিউল	মহিলা	উরিয়া	নাজিউল
১৯	জাহান্না	মহিলা	উরিয়া	জাহান্না
২০	আফসানিয়া	মহিলা	উরিয়া	আফসানিয়া
২১	রাহুল মিয়া	কৃষি	উরিয়া	রাহুল মিয়া
২২	শ্রী: মুন্সুরা	কৃষি	উরিয়া	মুন্সুরা
২৩	শ্রী: মোঃ হোসেন	কৃষি	উরিয়া	শ্রী: মোঃ হোসেন
২৪	শ্রী: মোঃ হোসেন	কৃষি	উরিয়া	শ্রী: মোঃ হোসেন

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## Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Gaibandha Upazila: Fulchari Union: Usia Vill: Usia Date: 28.07.22

Sl No.	Name	Occupation/Designation	Address	Signature
২৫	বাহিনী উদ্দিন	কৃষক	উড়িয়া	বাহিনী উদ্দিন
২৬	মোঃ আলমাসরা হোসেন	কৃষক	উড়িয়া	মোঃ আলমাসরা হোসেন
২৭	মোঃ মোঃ বাহিনী	কৃষক	উড়িয়া	মোঃ মোঃ বাহিনী
২৮	মোঃ দুলাল মিয়া	কৃষি	উড়িয়া	মোঃ দুলাল মিয়া
২৯	মোঃ মোহাম্মদ মিয়া	কৃষি	উড়িয়া	মোঃ মোহাম্মদ
৩০	মোঃ মোঃ আলমাসরা হোসেন	কৃষক	উড়িয়া	
৩১	মোঃ মোঃ	কৃষি	উড়িয়া	মোঃ মোঃ
৩২	মোঃ মোঃ	কৃষি	উড়িয়া	মোঃ মোঃ
৩৩	মোঃ মোঃ	কৃষি	উড়িয়া	মোঃ মোঃ
৩৪	মোঃ মোঃ	কৃষি	উড়িয়া	মোঃ মোঃ
৩৫	মোঃ মোঃ	কৃষি	উড়িয়া	মোঃ মোঃ
৩৬	মোঃ মোঃ	কৃষি	উড়িয়া	মোঃ মোঃ

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