



Government of the People's Republic of Bangladesh



## Jamuna River Economic Corridor Development Program, Phase 1



## Environmental and Social Impact Assessment (Main Report)

April 2022

Prepared by:

**C<sub>3</sub>GIS**

Center for Environmental and Geographic Information Services

On behalf of

Bangladesh Water Development Board &  
Bangladesh Inland Water Transport Authority

**Jamuna River Economic Corridor Development Program, Project 1**

**Draft Environmental and Social Impact Assessment**

**(Annexes)**

**April 2022**

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## Annex 1.1: Team Composition

SI no	Designation for this Assignment
<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 Economic Corridor Development Program (JRECDP).

### 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, JRECDP 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 JRECDP 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 JRECDP 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 JRECDP project falls into the 'Red' category project, requiring EIA & and 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 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

#### *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 JRECDP, 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 to 200,000, 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, gaviel, 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 JRECDP.

## **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 JRECDP 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 JRECDP 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 JRECDP) 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 JRECDP 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 directions 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 JRECDP 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.

JRECDP 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 proportionate 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 6.1: Biodiversity Baseline Report**

## Executive Summary

This baseline biodiversity assessment is a part of the preparation of ESIA for Jamuna River Economic Corridor Development 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 reach 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, Fishing cat, and two fishes (*Bagarius bagarius* and *Chitala chitala*) are triggering critical habitat criteria.

# 1. Introduction

## 1.1 Study Area

The study area for biodiversity assessment was defined as the Biodiversity Area of Analysis (BAA) delineated through combining the Project AOI of both Pilot Site 1 and 2, extended upstream and downstream to include indirect impact area and up to the floodplain of the opposite bank, and including a control area. The BAA covers a total area of 17,584 ha. The following criteria were considered while delineating the BAA:

- Project Footprint (around 12 ha) and Project Influence Area (both direct and indirect, a total of 4645 ha)
- 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 BAA extended to 1.5 km upstream from the proposed revetment of the Bhuapur pilot site, and 3 km downstream of the Tangail Pilot site (covering the offtake area of Dhaleswari river). The direct footprint area was along the left bank, but the BAA extended up to the right bank and its floodplain.

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.



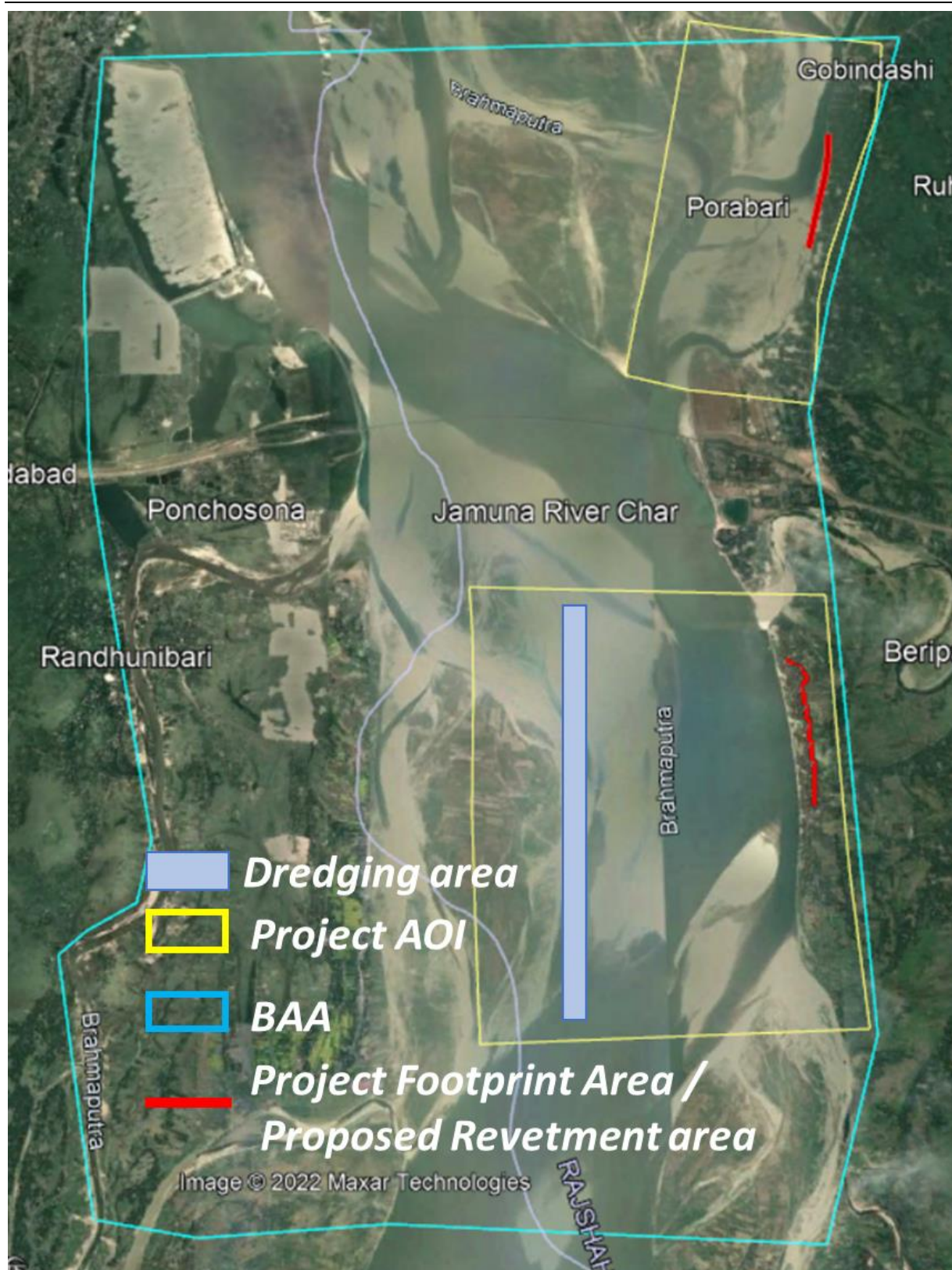


Figure 1.1: Map of the Study Area for Biodiversity Assessment

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## 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

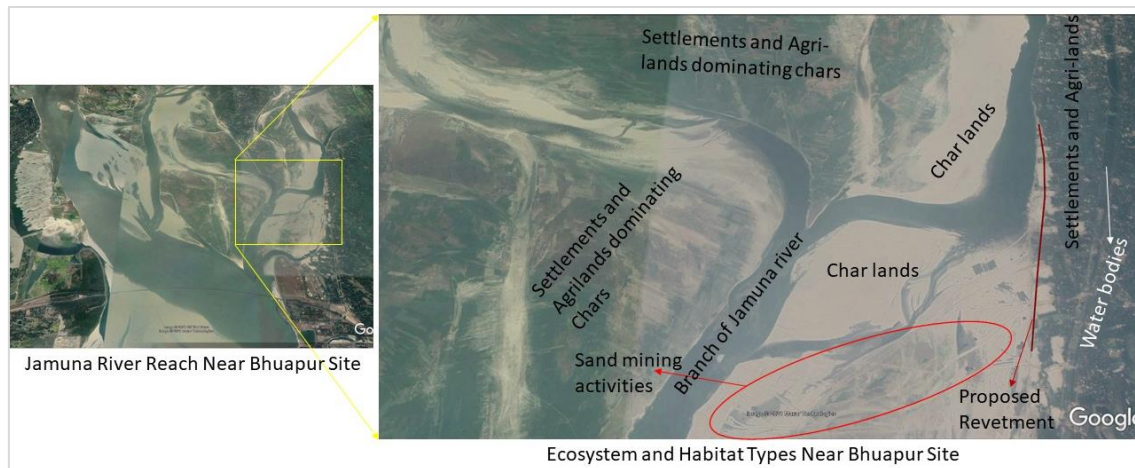
Charlands are newly accreted lands from river deposits. The Jamuna main channel is constantly shifting, eroding and depositing large areas of new charland in each flooding season. If new charlands do not erode quickly, they are colonized by pioneer vegetation (especially *Phragmites karka*, *Saccharum 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 Bhuapur Project AOI

The ecosystem of Bhuapur AOI consists of sand, grassland, cultivated land, wetlands, and homestead area (Figure 1.2). Numerous newly emerged Charlands were identified during the preliminary survey. As these are newly emerged, 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.

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 Bhuapur Project AOI**

### 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.



**Figure 1.3: Ecosystem Types and Features near Alipur Project AOI**



## 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 JRECDP. 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
- Dr. Kazi Md. Noor Newaz, Biodiversity Specialist, Ecology, Forestry and Biodiversity Division, CEGIS
- Md Mohammed Mukteruzzaman, Fisheries and Biodiversity Specialist, CEGIS
- Mr Roland 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.

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

Area Name	Distance from BAA	Status and Designation	IUCN Category	Alignment with ESS 6	Screening Results
Silanda Nagdemra 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
Nagarbari Mohonganj 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 management	Relevant to the project site, included in the Biodiversity Risk Assessment

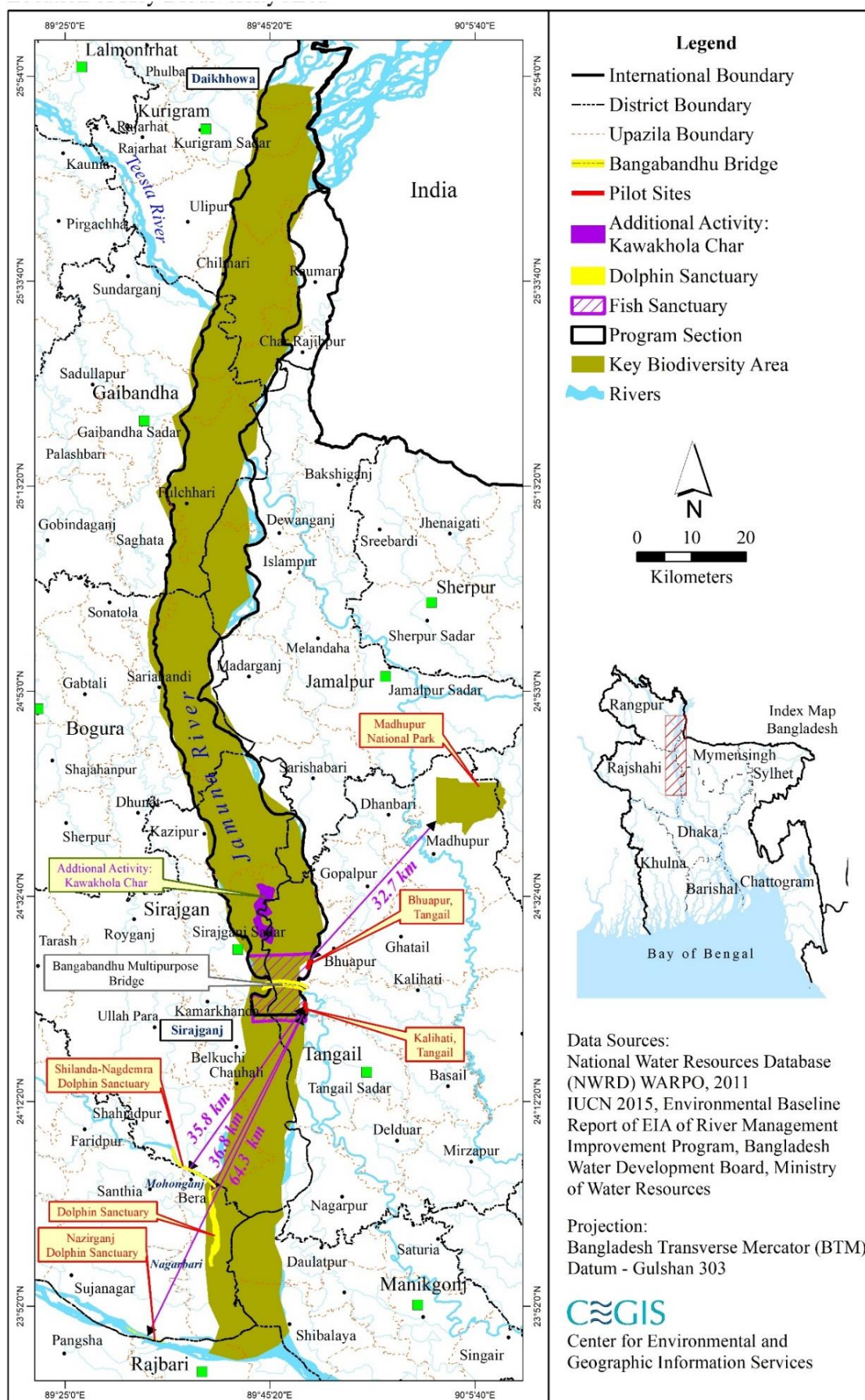


Figure 2.1: Location of Legally Protected Areas and KBAs around the BAA

## 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>Rynchops albicollis</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 Multipurpose 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 (*Swietenia mahagoni*), 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*), mukтажuhri (*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.

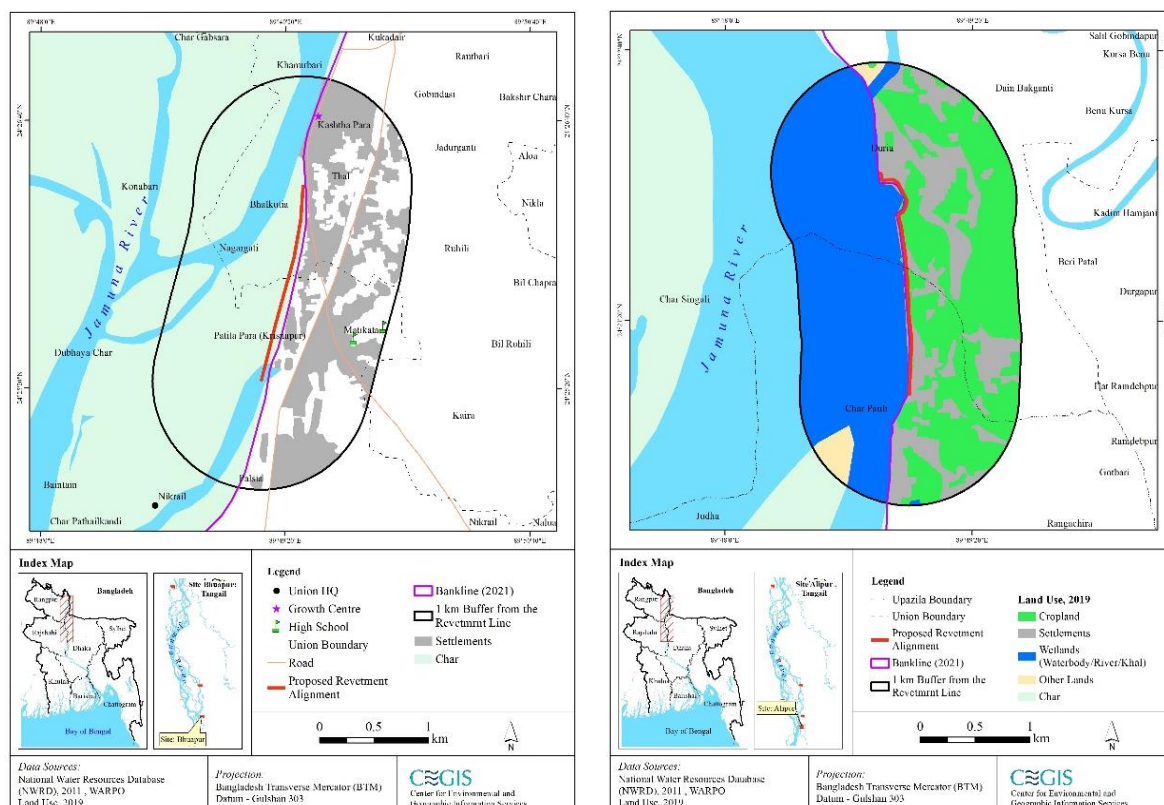


Figure 3.1: Land Use and Land Cover Classes in the Project AOI of the Two Pilot Sites

#### 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.

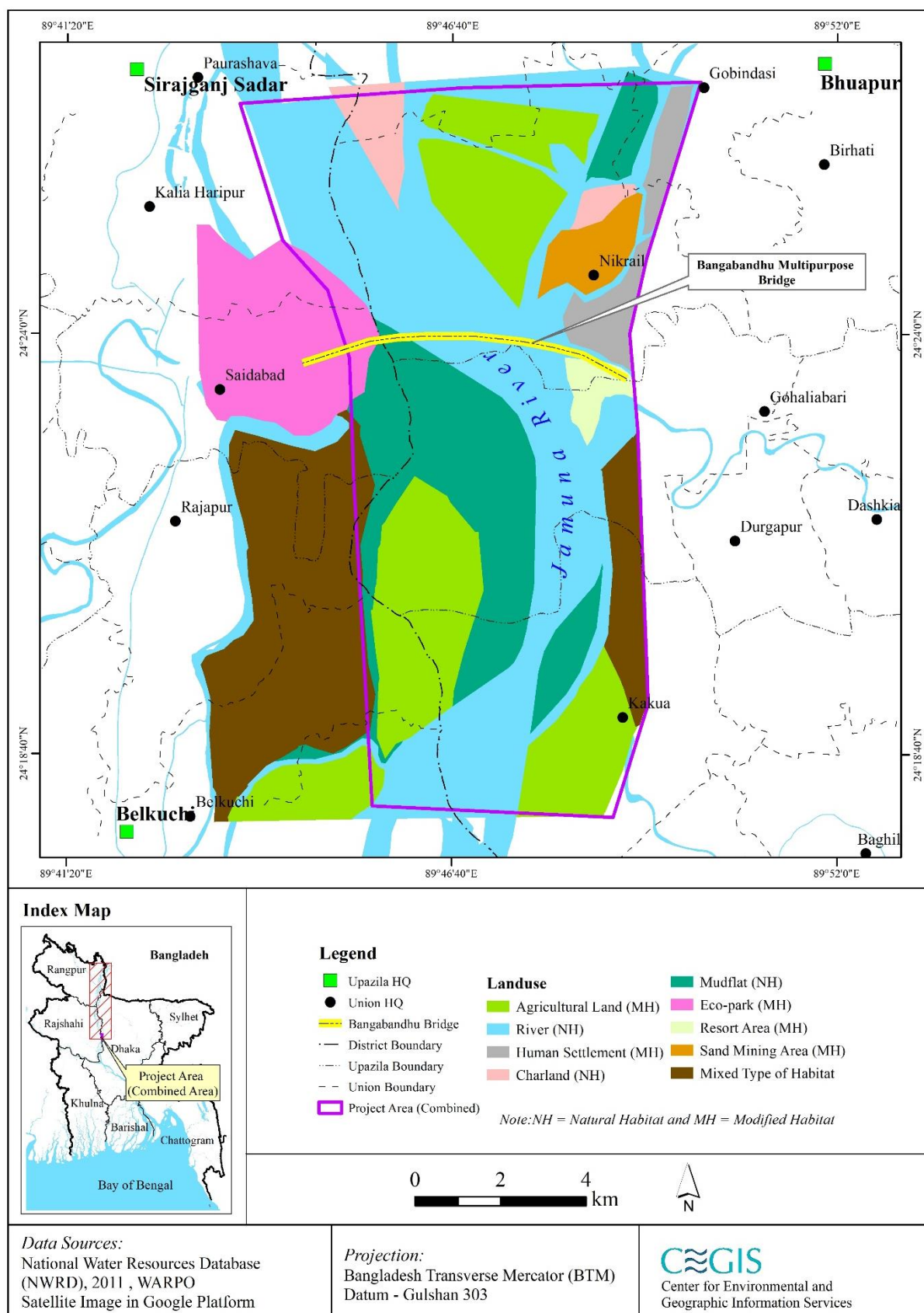


Figure 3.2: Land Use Occurring in the Biodiversity Assessment Area

**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 use 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 Paddy field 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*), Kolmi (*Ipomoea cornea*), 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 (*Trewia nudiflora*), shimul (*Bombax ceiba*), rain tree (*Albizia saman*), ban palang (*Rumex maritimus*), ghagra (*Xanthium indicum*), bankhira (*Croton bonplandianum*), amrul (*Oxalis corniculata*), durba (*Cynodon dactylon*),

Some commonly seen plant species are Aam (*Mangifera indica*), Kanthal (*Artocarpus heterophyllus*), Kalo Jam (*Syzygium cumini*), Litchi (*Litchi chinensis*), Pitali (*Trewia polycarpa*) 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 *Bambusa balcooa*, Mahagoni *Swietenia mahagoni*) are globally endangered (EN) and near threatened (NT) respectively (Table 1 of Annex 6.3).

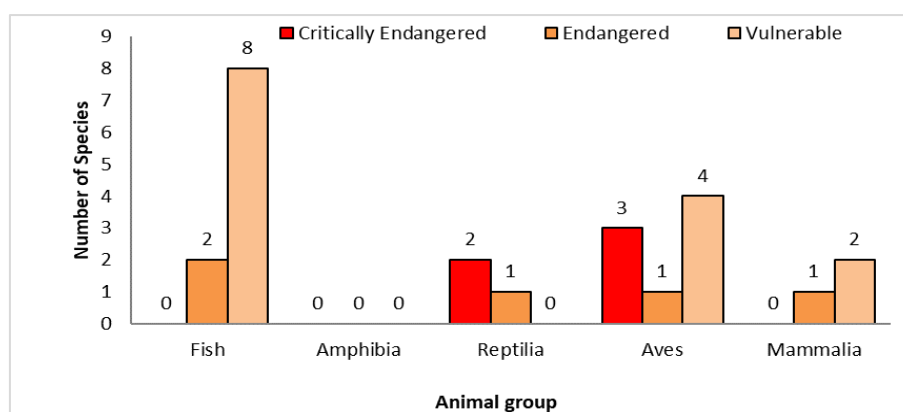
#### 4.1.2 Aquatic Flora

Aquatic flora usually found in river, khals, beels and in other water bodies. Common aquatic floras are Nal (*Phragmites karka*), Dhol Kolmi (*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
Mammals			
Ganges River Dolphin	Platanista gangetica	VU	EN
Hog Deer	Axis porcinus	CR	EN
Reptiles			
Gharial	Gavialis gangeticus	CR	CR
Black Softshell Turtle	Nilssonia nigricans	EN	CR
Red-crowned Roofed Turtle	Batagur kachuga	CR	CR
Assam Roofed Turtle	Pangshura sylhetensis	CR	CR
Three-striped Roofed Turtle	Batagur dhongoka	CR	CR
Northern River Terrapin	Batagur baska	CR	CR
Asian Giant Softshell Turtle	Pelochelys cantorii	CR	CR
Spotted Pond Turtle	Geoclemys hamiltonii	EN	EN
Crowned River Turtle	Hardella thurjii	EN	EN
Indian Eyed Turtle	Morenia petersi	NT	EN
Gangetic Softshell Turtle	Nilssonia gangetica	EN	EN
Indian Peacock Softshell Turtle	Nilssonia hurum	LC	EN
Keeled Box Turtle	Cuora mouhotii	CR	EN
Birds			
Baer's Pochard	Aythya baeri	CR	CR
Yellow-breasted Bunting	Emberiza aureola	VU	CR
Indian Skimmer	Rynchops albicollis	CR	EN
Black-bellied Tern	Sterna acuticauda	CR	EN
Pallas's Fish-eagle	Haliaeetus leucoryphus	EN	EN
Greater Adjutant	Leptoptilos dubius	RE	EN
Swamp Grass-babbler	Laticilla cinerascens	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>1</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
Birds			
Baer’s Pochard	<i>Aythya baeri</i>	CR	CR
Yellow-breasted Bunting	<i>Emberiza aureola</i>	VU	CR
Indian Skimmer	<i>Rynchops albicollis</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>Laticilla cinerascens</i>	Not assessed	EN
Painted Stork	<i>Mycteria leucocephala</i>	CR	NT
Indian Spotted Eagle	<i>Clanga hastata</i>	EN	VU

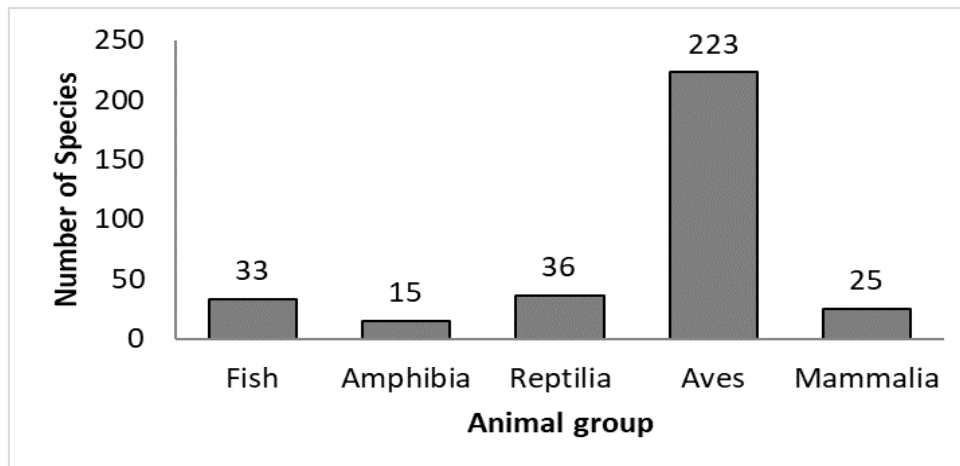
Source: Primary data collected in June 2021 and IUCN 2015<sup>2</sup> and IBAT; orange shaded cells – confirmed by consultation; green shaded cells – confirmed by direct sighting, no shade – identified from IBAT

#### Vertebrates in general

A total of 332 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>1</sup> IUCN 2015. Environmental Baseline (Revised) 2015. Environmental Assessment for River Management Improvement Program, Bangladesh Water Development Board

<sup>2</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 (*Herpestes auropunctatus*), 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



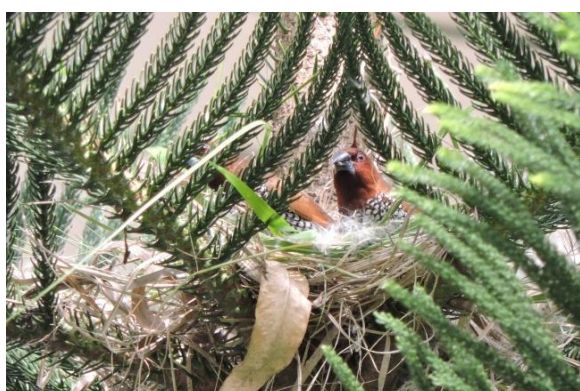
Lesser Whistling Duck *Dendrocygna javanica*  
Char Berkusa, Jamalpur



Paddyfield Pipit *Anthus rufulus*  
Chauhali Char, Sirajganj



Pied Kingfisher *Ceryle rudis*  
Jagtala Char, Sirajganj



Scaly-breasted Munia *Lonchura 40unctulate*  
Water Development Board, Jamalpur



Small Pratincole *Glareola lacteal*  
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 ichthyaeetus*) 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 rayta*), 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 *Hoplobatrachus tigerinus*  
Bangladesh Water Development Board, Jamalpur



Marbled Toad *Duttaphrynus stomaticus*  
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**

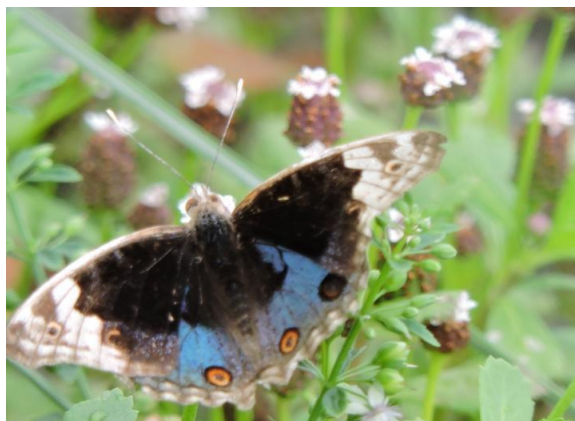
#### *Amphibians*

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 (*Euphlyctis cyanophlyctis*), Cricket Frog (*Fejervarya* spp.), Indian Bull Frog (*Hoplobatrachus tigerinus*), and Common Toad (*Duttaphrynus melanostictus*) (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.

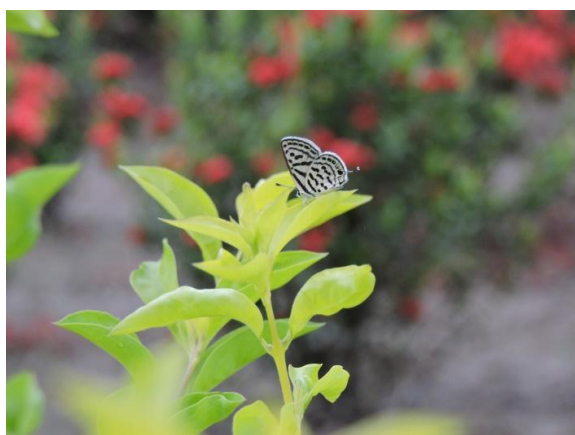




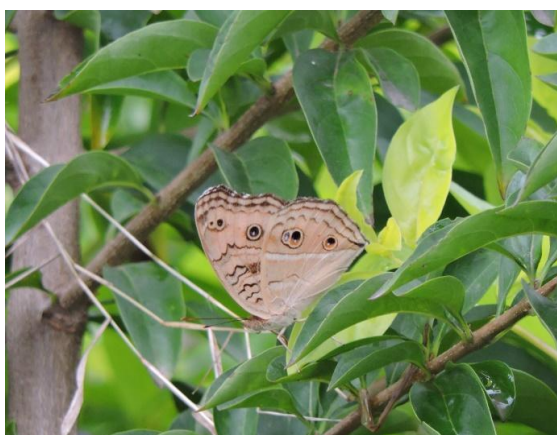
Blue Pansy *Junonia orithya*  
Pabna Char



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 *Appiasol ferna*  
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 unfavorable. *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 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 Alipur Site, 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.

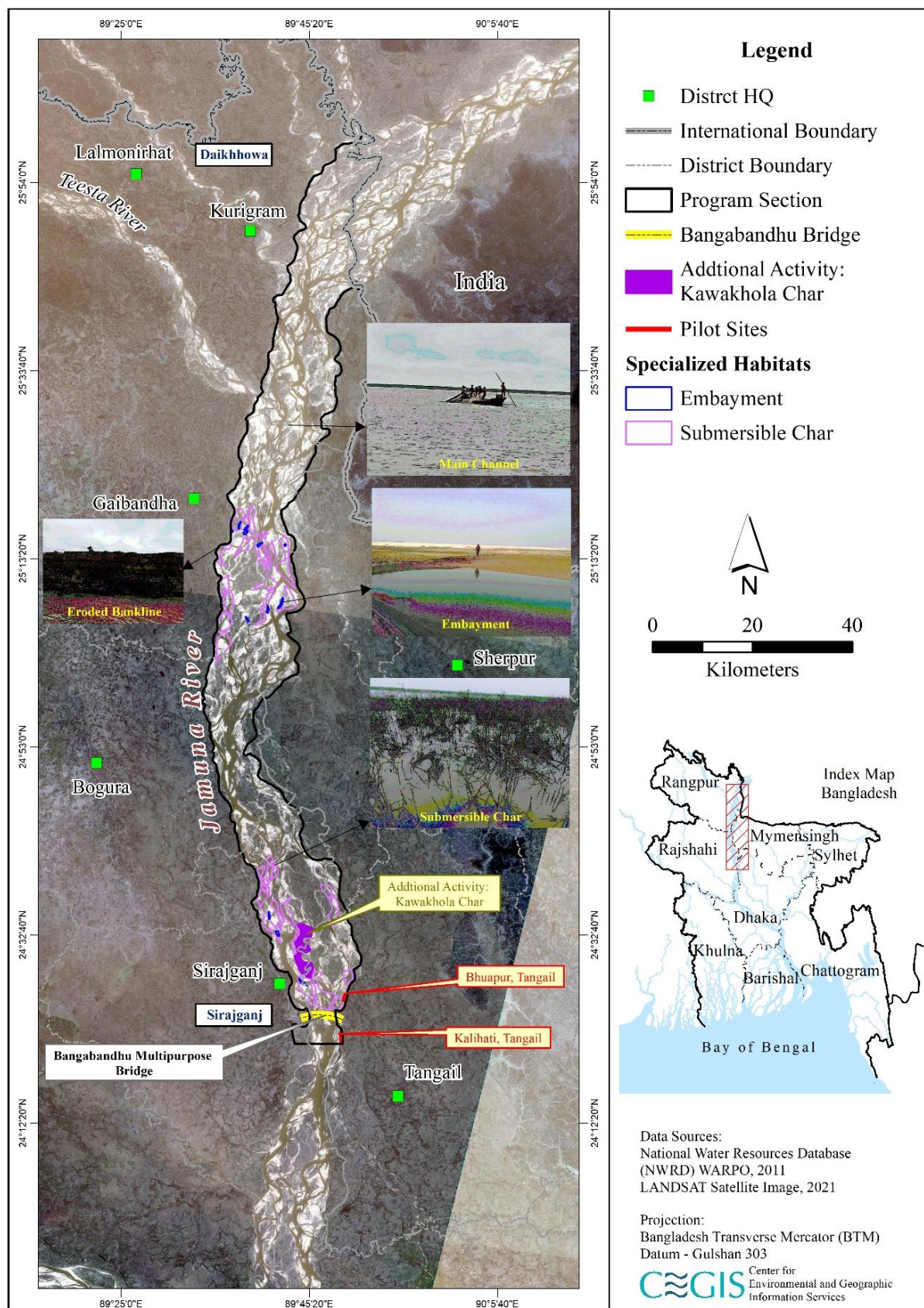
The embayments and the submergible chars (Figure 4.7 and 4.8) function as grazing and nursing ground for small indigenous species of fish, including *Cabdio morar* (Piyali), *Ailia punctata* (Banshpata), *Ailia coila* (Kajuli), *Eutropiichthys vacha* (Bacha), *Mystus cavasius* (Golsha), *Clupisoma garua* (Gharua), *Glossogobius giuris* (Baila), *Salmostoma acinaces* (Chela), *Gudusia chapra* (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- Bagarius bagarius and Chital- Chitala chitala). 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.

Estimated total fish habitat in the BAA is about 504 hectares (ha) of which capture and culture fishery share by 96 and 4% respectively. 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

**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)		
		Bhuapur	Alipur	Total
Capture	River	75	331	406
	Floodplain	-	76	76
<b>Sub-Total</b>		<b>75</b>	<b>407</b>	<b>482</b>
Culture	Pond	21	1	22
<b>Sub-Total</b>		<b>21</b>	<b>1</b>	<b>22</b>
<b>Grand Total</b>		<b>96</b>	<b>408</b>	<b>504</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.



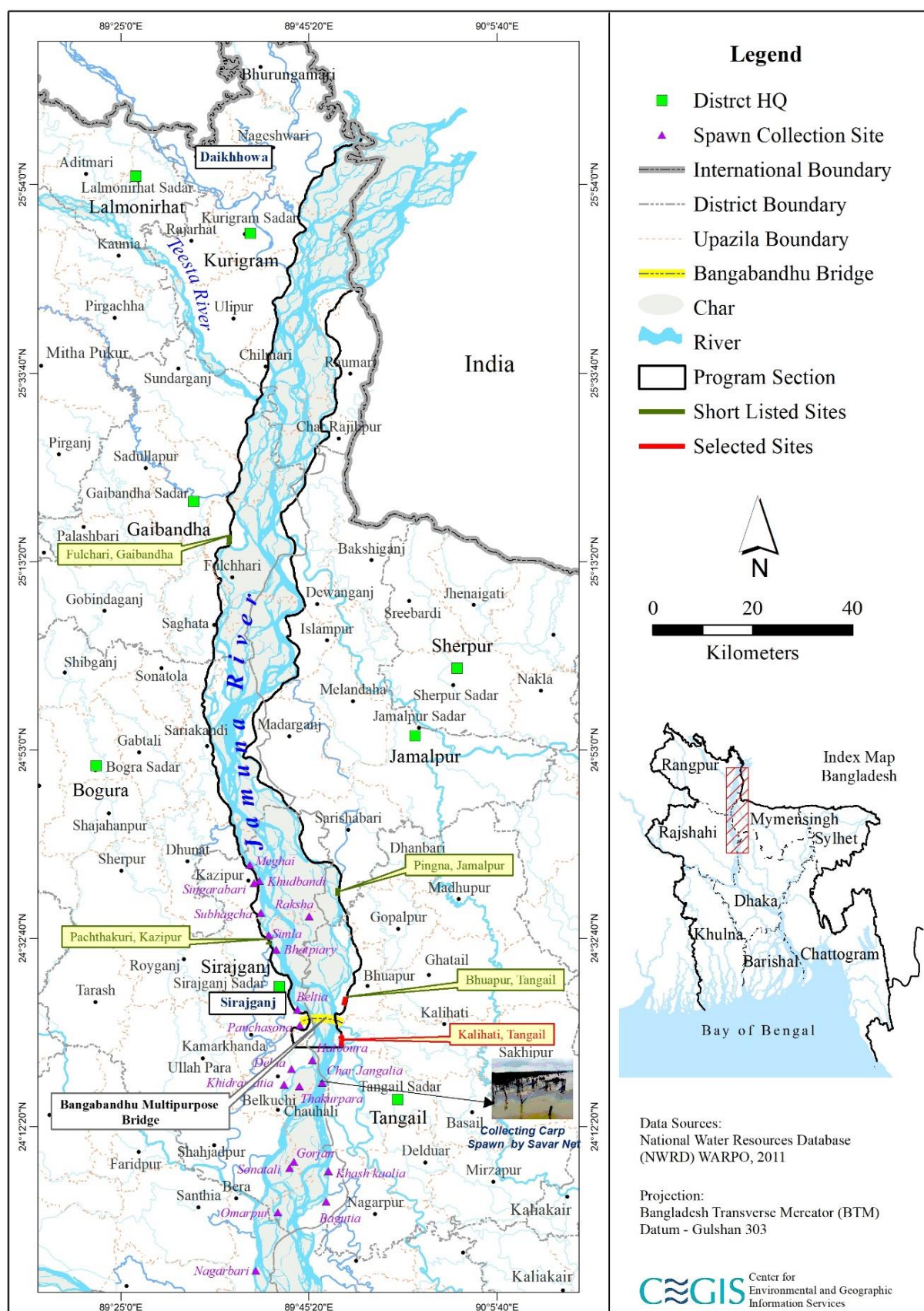


Figure 4.9: Major Carps Spawn Collection Sites in the BAA

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

District	Upazila	Collection Centre	Collection Period	Frequency of Spawning Time	Spawn Collected (kg)
Sirajganj	Sirajganj sadar	Vatpiary, Panchasona, Hatboyra, Shimla, Soyasekha	May to June	2	177
	Shahjampur	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>

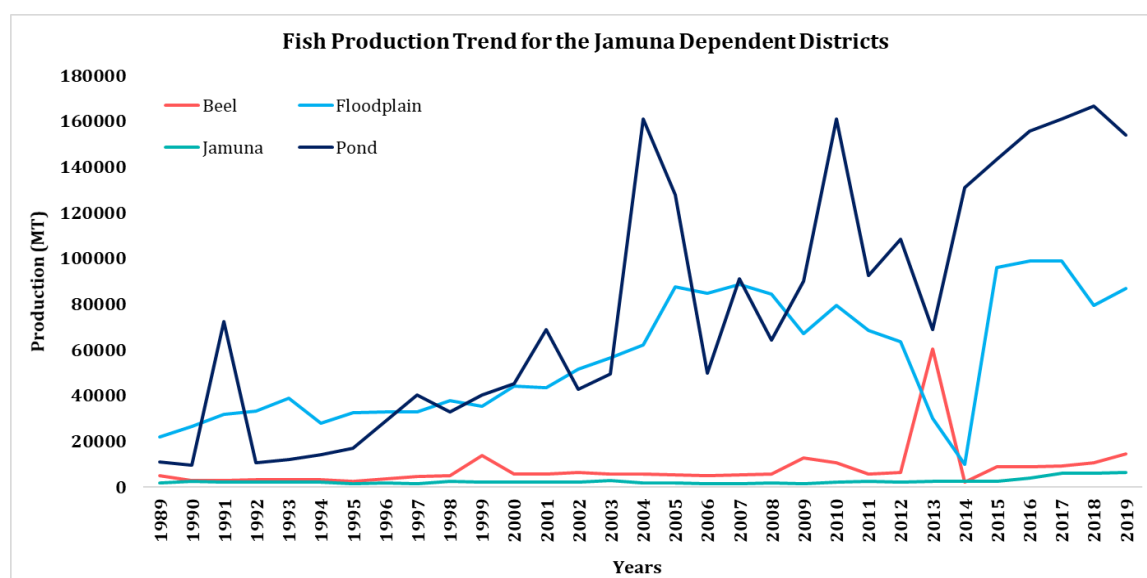
Source: DoF, 2020 (FRSS, 2019-20)

## 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*, *Sperata aor*, *Bagarius bagarius*, *Clupisoma garua*, *Eutropiichthys vacha*, *Chitala chitala* and *Mastacembelus armatus*. 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. Fish production for the project influence area, the

annual production is estimated 54 MT, which is contributed by capture fishery (36%) and culture fishery (64%). 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)		
		Bhuapur	Alipur	Total
Capture	River	2	8	10
	Floodplain	-	10	10
<b>Sub-Total</b>		<b>2</b>	<b>18</b>	<b>20</b>
Culture	Pond	32	2	34
<b>Sub-Total</b>		<b>32</b>	<b>20</b>	<b>34</b>
<b>Grand Total</b>				<b>54</b>

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

## 4.5 Fishing Effort

Both commercial and part time fishers are engaged in fishing activities in the Jamuna River. Local fishers reported that approximately 100 fishers in the selected pilot sites are engaged in fishing activity in the Jamuna River. Among the fishers, about 75% are engaged as commercial or full-time fishers and 25% are engaged as part-time fishers. 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

The fishers catch hilsa during the ban period because that time hilsa have available in the river as it migrates longitudinally towards upstream for breeding purposes. According to local fishers about 10% of commercial fishers engage in hilsa fishing during the ban period.

### 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, Dhura, Catol, Baim, Baila, Pabda
	Current Jal	Ashyin-Kartik (Ilish ban period)	Ilish
	Nagini Jal	Ashar-Kartik	Boiral/Chigasi, Kharsul, Rakla/Rayek



Gear Type	Gear name (local)	Seasonality	Target fish species
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**

Sl	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

Source: Catch Assessment Survey, June and November 2021

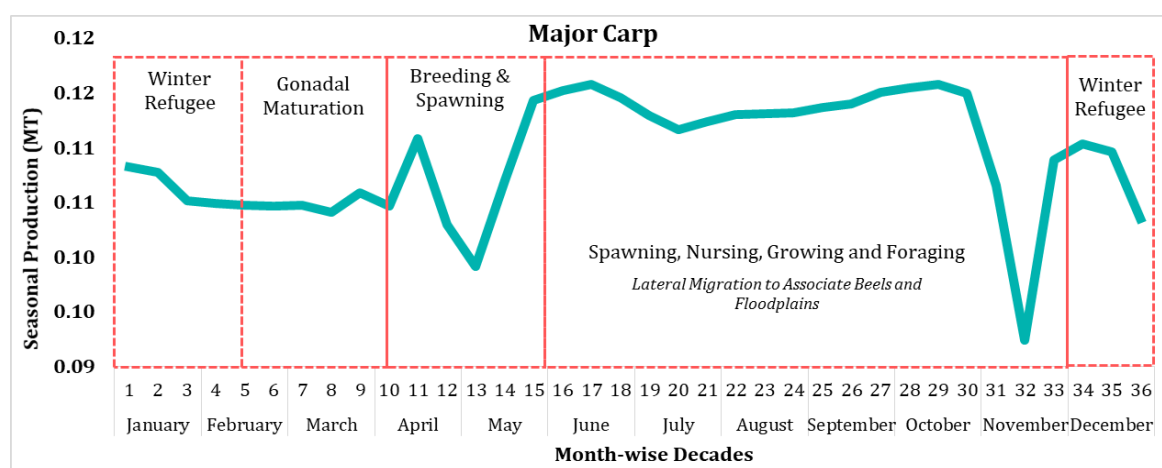
#### 4.6 Fish Biodiversity

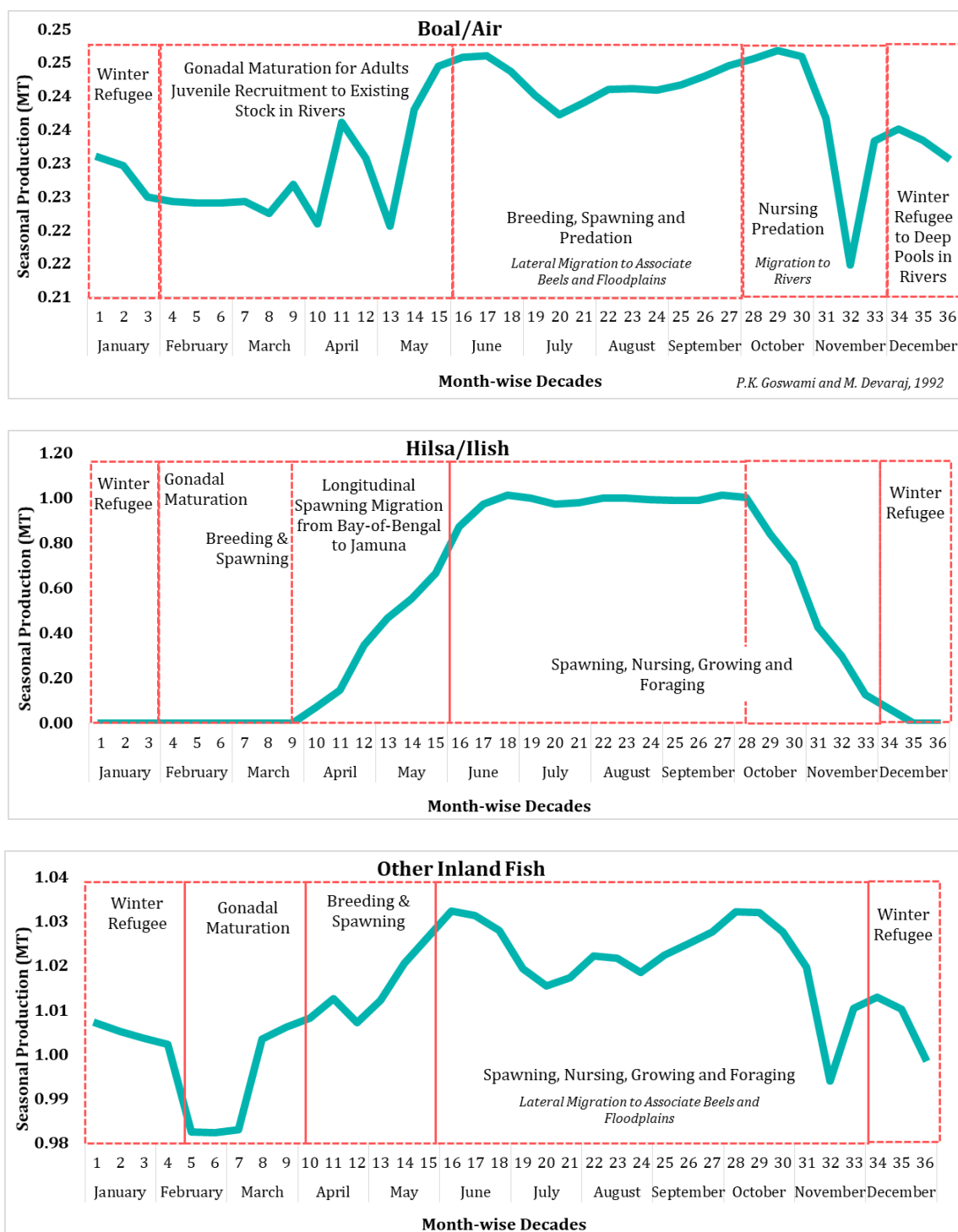
The present study has identified about 33 species of fishes in the study corridor of the Jamuna River. The species comprise 9 orders and 15 families. Among the observed fishes, 2 species are endangered, 7 vulnerable, 22 least concern and 1 data deficient according to IUCN Bangladesh 2015. A list of observed fishes and their conservation status is shown in 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 Alipur 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. Local fishermen informed that about 50cm-4kg Length/Weighted individual of Rui and Catla, 94cm-7kg Length/Weighted individual of Chital and 90cm-6kg Length/Weighted individual of Boal are caught in their catches of Pull Net along the erosion sites in Alipur. They also informed that 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 are, 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>Chitala chitala</i>	Clown Knife Fish	Chital	EN	NT
<i>Notopterus notopterus</i>	Bronge Feather-back	Foli	VU	LC
<i>Gudusia chapra</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>Cabdio morar</i>	Aspidopara	Morar, Morari	VU	NE
<i>Pethia ticto</i>	Two-spot Barb	Tit Punti	VU	LC
<i>Botia dario</i>	Bengal loach	Rani	EN	LC
<i>Botia lohachata</i>	Y-loach	Rani, Putul	EN	NE
<i>Neoeucirrhichthys maydelli</i>	Goalpara Loach	Gutum, Puiya	CR	LC
<i>Rita rita</i>	Rita	Rita	EN	LC
<i>Sperata aor</i>	Long-whiskered catfish	Ayre	VU	LC
<i>Sperata seenghala</i>	Giant River-catfish	Guijja, Guijja Ayre	VU	LC
<i>Ompok bimaculatus</i>	Butter Catfish	Kani Pabda	EN	NT
<i>Ompok pabda</i>	Pabdah Catfish	Madhu Pabda	EN	NT
<i>Wallago attu</i>	Freshwater shark	Boal	VU	NT
<i>Clupisoma garua</i>	Garua Bacha	Ghaura	EN	NE
<i>Monopterusuchia</i>	Gangatic mud eel	Kuchia	VU	VU
<i>Mastacembelus armatus</i>	Zig-Zag Eel	Baim, Sal Baim	EN	NE

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

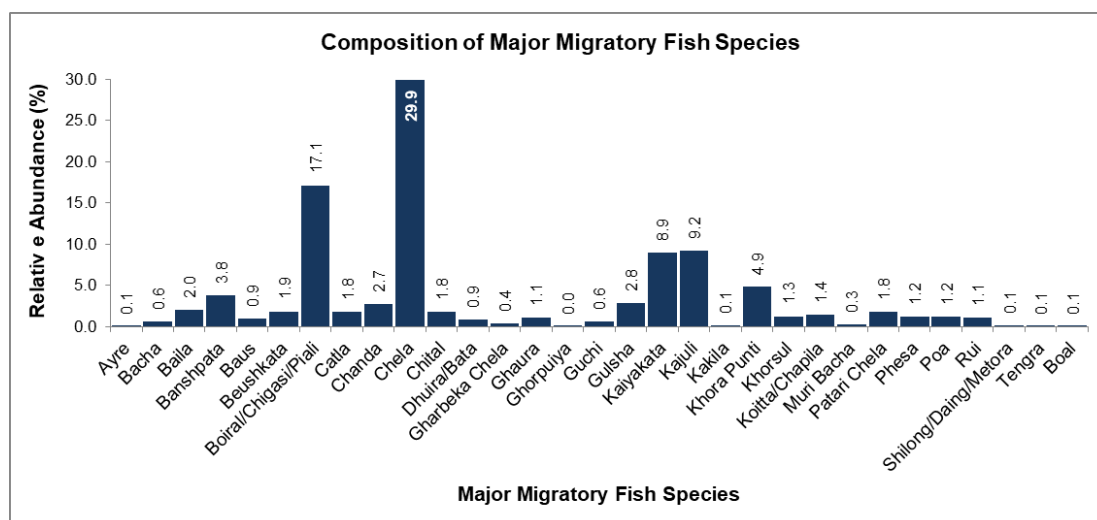
#### 4.8 Fish Migration

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 are 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*, *Sperata aor*, *Bagarius bagarius* and clupeid like *Tenuulosa ilisha* 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.

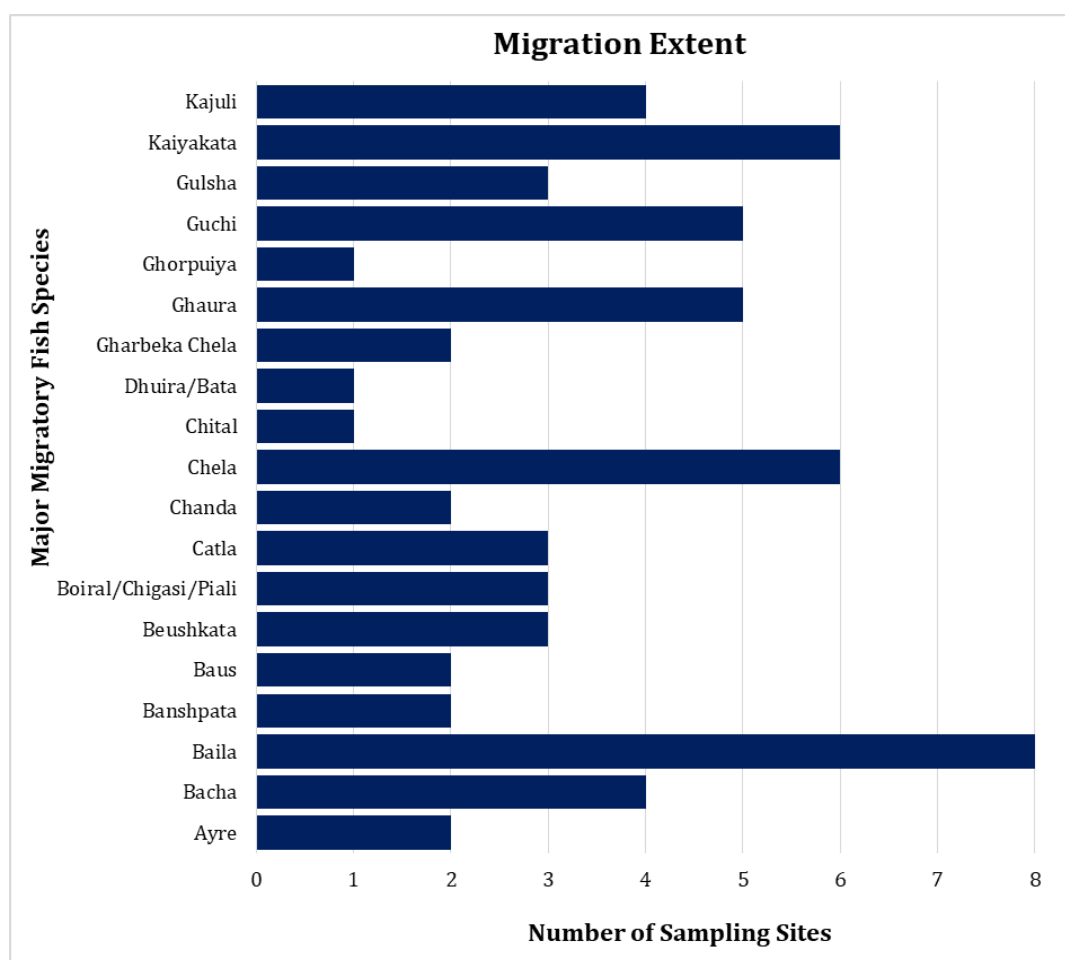
The Catch Assessment Survey, during the study period, found that two migratory fish species, including Chela and Piali, are relatively abundant among available migratory species in the sample catches (**Figure 4.12**). On the other hand, the relative abundance of Ayre, Kakila, Shilong, Tengra and Boal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



Source: CEGIS field investigation, June and November 2021

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

Furthermore, some fish species, including Baila, Chela, Kaiyakata, Guchi Baim and Ghaura, are widely distributed in maximum sites, and the others are restricted in few sampling sites (Figure 4.13).

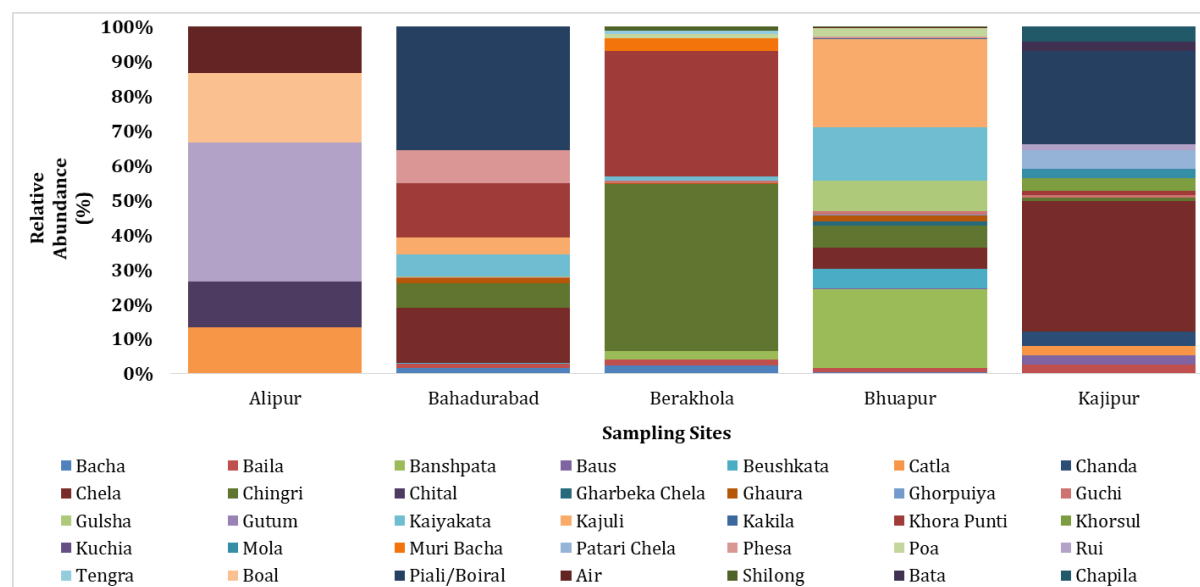


Source: CEGIS field investigation, June and November 2021

**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**). 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**).



Source: CEGIS field investigation, June and November 2021, 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

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:

- habitat of significant importance to Critically Endangered or Endangered species, as listed in the IUCN Red List of threatened species or equivalent national approaches;
- habitat of significant importance to endemic or restricted-range species;
- habitat supporting globally or nationally significant concentrations of migratory or congregatory species;
- highly threatened or unique ecosystems;
- 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.

Species were screened through excluding the species which were not relevant to the BAA (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 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 a around 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			
Mammals					
<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.
<i>Axis porcinus</i> Hog Deer	CR	EN	Hilly forest	South east hilly region (IUCN BD 2015b)	Out of Range
Reptiles					
<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
<i>Nilssononia 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
<i>Batagur kachuga</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>Pangshura sylhetensis</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>Batagur dhongoka</i>	CR	CR	Major River	Meghna, Jamuna, Padma (Khan 2018)	Possible

Scientific Name English Names	Threatened Status		Habitat Requirements	Distribution Data in Bangladesh	LOO and Reasons for Exclusion
	National	Global			
Three-striped Roofed Turtle					
<i>Batagur baska</i> Northern River Terrapin	CR	CR	Marine, Estuarine, Mangrove, Major Rivers	Sundarbans, Padma-Jamuna Confluence (Khan 2018)	Unlikely, Out of Range
<i>Pelochelys cantorii</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>Geoclemys hamiltonii</i> Spotted Pond Turtle	EN	EN	Inland wetlands	Widely distributed (Khan 2018)	Possible
<i>Hardella thurjii</i> Crowned River Turtle	EN	EN	Inland wetlands, Major Rivers	Widely distributed (Khan 2018)	Possible
<i>Morenia petersi</i> Indian Eyed Turtle	NT	EN	Inland wetlands, distributary and tributaries of rivers	Widely distributed (Khan 2018)	Possible
<i>Nilssonina gangetica</i> Gangetic Softshell Turtle	EN	EN	Major River System	Widely distributed (Khan 2018)	Possible
<i>Nilssonina hurum</i> Indian Peacock Softshell Turtle	LC	EN	Inland Wetlands, Major River System	Widely Distributed (Khan 2018)	Possible
<i>Cuora mouhotii</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> Baer's Pochard	CR	CR	Major Wetlands with dense aquatic vegetation	North Eastern Wetlands, Padma River (Khan 2018)	Unlikely
<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>Rynchops albicollis</i> Indian Skimmer	CR	EN	Large river, Coastal Wetland	Padma, Jamuna, Estuary, Coastal Islands (Khan 2018)	Possible

Scientific Name English Names	Threatened Status		Habitat Requirements	Distribution Data in Bangladesh	LOO and Reasons for Exclusion
	National	Global			
<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>Laticilla cinerascens</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
Fish					
<i>Schistura sijuensis</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>Chitala chitala</i> Chital/ Clown Knife Fish	NT	EN	Wetland, mainly in large river	The species is widely distributed throughout Bangladesh	Possible
<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

Scientific Name English Names	Threatened Status		Habitat Requirements	Distribution Data in Bangladesh	LOO and Reasons for Exclusion
	National	Global			
<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>Clupisoma garua</i> Ghaura	EN	NE	Wetland	Widely distributed	Possible
<i>Mastacembelus Armatus</i> Sal Baim	EN	NE	Wetland		Possible
Flora					
<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	
Mammals						
<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)
Reptiles						
<i>Gavialis gangeticus</i>	Gharial	CR	CR	Current population is unknown, expert opinion indicated only 3-4 population present. IUCN redlist (2015) reported 32 population during 1991-2000. Rashid et al (2014) reported 21 individuals were	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>3</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 there is no evidence of continued presence, the occurrence of one

<sup>3</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	
				captured/spotted during 2009 and 2012.		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>Batagur dhongoka</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>Geoclemys hamiltonii</i>	Spotted Pond Turtle	EN	EN	Not known/ Unspecified; 80% decrease	Unknown, abrupt decline since 1980 <sup>4</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>Hardella thurjii</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>
<i>Morenia petersi</i>	Indian Eyed Turtle	NT	EN	Unspecified, decreasing	Unspecified. Current population trend is Decreasing	This species has not been recorded during baseline surveys. There is no recent record of sightings in and

<sup>4</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	
				[Once it was considered common in all major rivers up to 1990, at present 60% population may have declined] (Rashind 2011)]		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>Nilssoniana gangetica</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>Nilssoniana hurum</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 International 2022a)	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	
<i>Rynchops albigollis</i>	Indian Skimmer	CR	EN	Unknown, a total of 3,108 individuals were counted at Nijhum Dwip 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>Bagarius bagarius</i>	Baghair	CR	NT	Not known, declining 30-50%	A considerable decline in the population in southern West Bengal of 29.2% over four decades from 1960 to 2000 has	Regularly captured by fishermen in the Jamuna River within and adjacent areas of the project site. Based on regular occurrence and a CR threatened status, <b>the BAA is considered to have significant importance for this species under ESS6 Criterion (a).</b>



Scientific Name	English Names	Threatened Status		Population Size		Assessment of Critical Habitat
		National	Global	National Population	Global Population	
					been reported (Mishra et al. 2009, Ng 2010).	(See Section 6.5 for additional data)
<i>Chitala chitala</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>Botia dario</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	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>Ompok bimaculatus</i>	Kani Pabda	NT	EN	Unknown and decreasing	Unknown	
<i>Ompok pabda</i>	Madhu Pabda/ Butter Catfish	NT	EN	Unknown and decreasing	Unknown	
<i>Clupisoma garua</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	Net Gain Requirements
	Nat.	IUCN			
Gharial <i>Gavialis gangeticus</i>	CR	CR	habitat destruction, upstream embankments, fishing net	There is a potential disturbance to Gharial through dredging, 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 will be applied to ensure there are no sensitive species prior to construction works, which is considered sufficient to avoid impacts to Gharial.	Impacts can be avoided, Net Gain is therefore not required
Ganges River Dolphin <i>Platanista gangetica</i>	VU	EN	Poaching, Collection of oil from dolphin	Dolphin are known to be present and might be disturbed by dredging operations and pile diving for groin construction.	Mitigation will be necessary and a residual impact needs to be determined, and net gain may therefore be required. Identifying opportunities for net gain is beyond the scope of this ESIA and further study is needed to explore the available options.
<i>Prionailurus viverrinus</i> Fishing Cat	EN	VU	Human wildlife conflict, Indiscriminate killing, Anthropogenic Threats	Was not found in survey period but the BAA has suitable habitat for this species. Fishing cats will not be impacted by dredging activities but construction works on the riverbank and the presence of workers may raise the levels of disturbance, although impacts will be minimal.	Mitigation is required to discourage construction workers from disturbing this species, indiscriminate killing and engaging in illegal wildlife trade. A residual impact needs to be assessed to determine if a minimal net gain is required.
Baghair <i>Bagarius bagarius</i>	CR	NT	Over fishing	Eroding riverbank is preferable habitat for feeding. The proposed intervention would alter its habitat by preventing the erosion, filling the scoured area by sand filled geobags.	No mitigation has yet been developed; however, a residual impact assessment will be constrained by the lack of data on these species. Consultation with the Dept of Fisheries will therefore be required to investigate opportunities for net gain.
Chital <i>Chitala chitala</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.

South Asian 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).

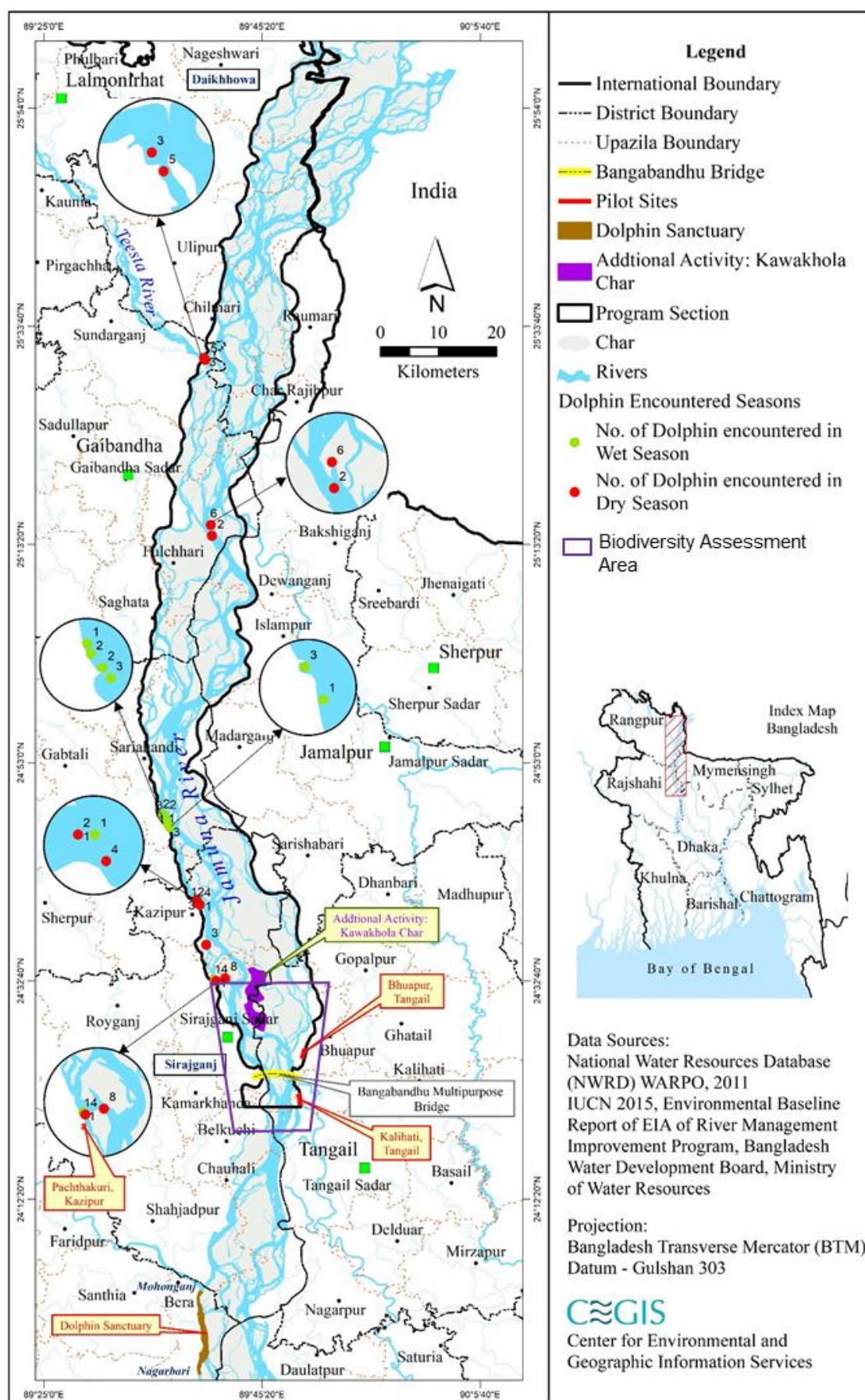


Figure 6.1: Dolphin Encounters in and around the Piloting Sites

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

The government has prepared a set of action plans<sup>5</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 JRECDP 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 dredging 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*)

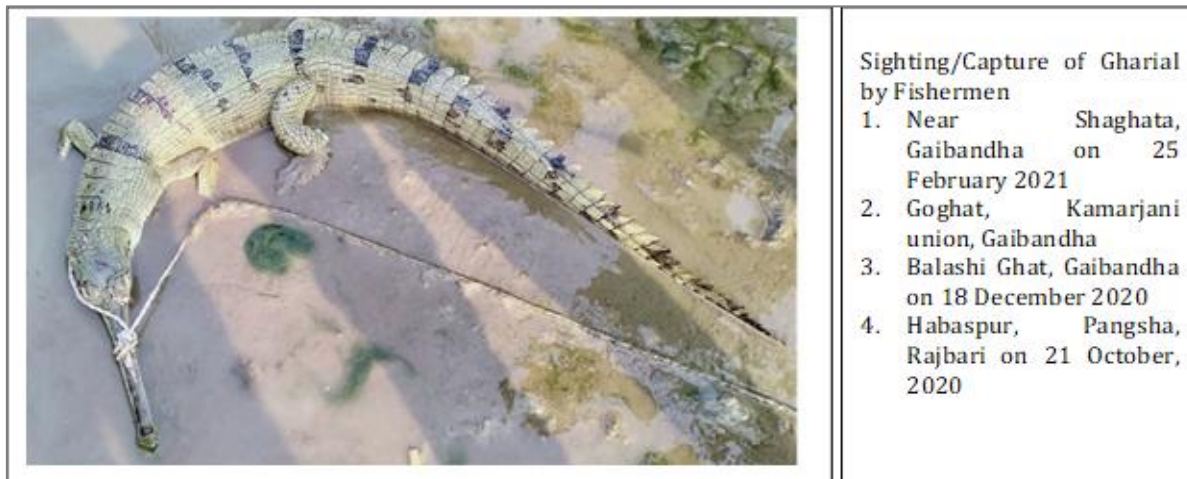
The only large reptile in the area is the crocodile (Gharial - *Gavialis gangeticus*) (Figure 6.2) which is extremely rare. It is a globally and nationally threatened species. Several decades ago, this species had wide distribution in the Ganges-Brahmaputra River System, but the population sharply declined 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

<sup>5</sup> Bangladesh Forest Department, 2019. CONSERVATION ACTION PLAN FOR GANGES RIVER DOLPHIN AND IRRRAWADDY 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)

found a total of 21 individuals from Padma-Brahmaputra and Jamuna River systems. At the time of 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 (*Nilssonia gangetica*)

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.



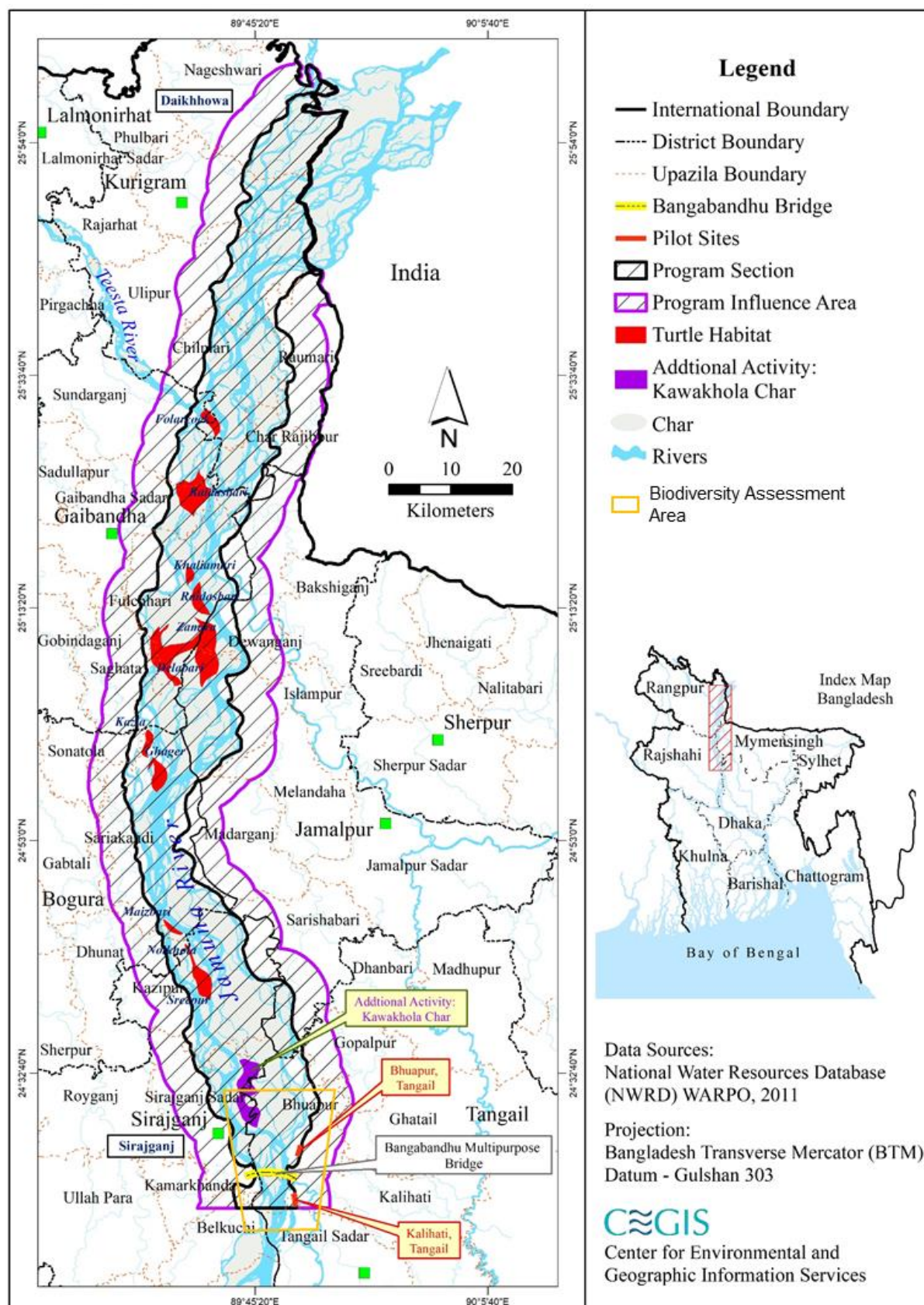


Figure 6.3: Turtle Habitat in the BAA

#### 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 (*Bagarius bagarius*)

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>6</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>7</sup>.



Source: Newzdevine Rp. 19 March 2021

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

<sup>6</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 *Bagarius bagarius* (Hamilton, 1822) from the Padma and Meghna river stretches of Bangladesh. Dhaka Univ. J. Biol. Sci. 28(1): 111-120, 2019 (January)

<sup>7</sup> <https://www.risingbd.com/english/country/news/80330>. 18 June 2021



## 6.6 Hilsa (*Tenualosa ilisha*)

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 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>8</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 Belkuchi Upazila 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 (*Prionailurus viverrinus*)

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>8</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 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
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

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

Conservation Action Needed	Definition	Key Species
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 redlist (<https://www.iucnredlist.org/>).

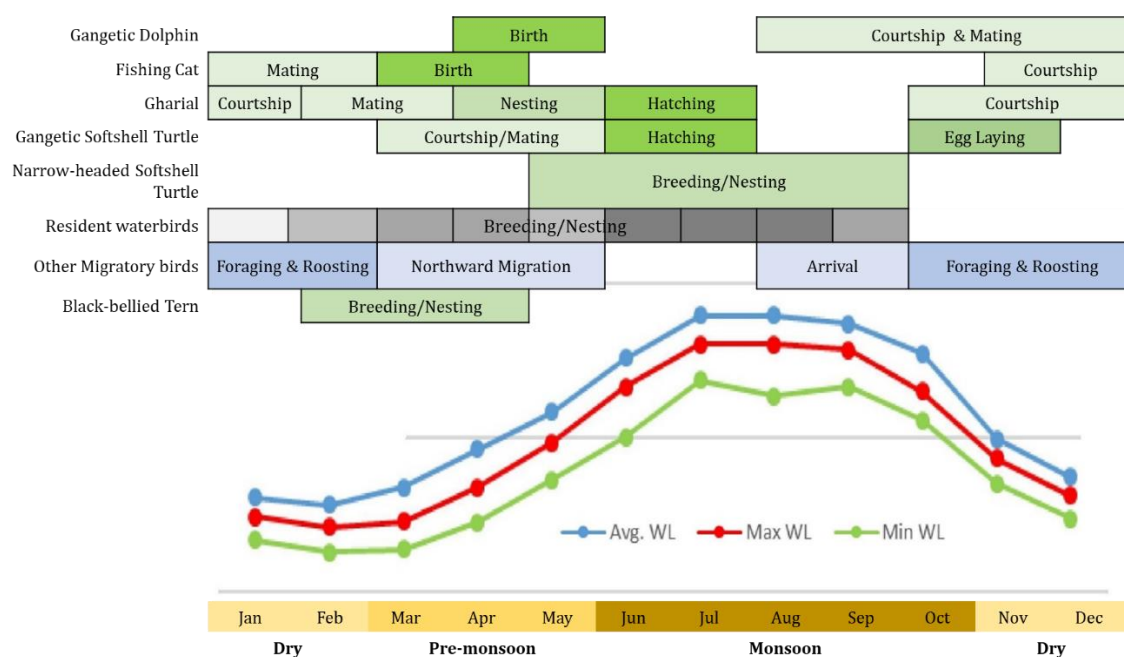
## 6.9 Bio-calendar of Key Species in Jamuna River

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 black-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 carefully on this time. Monsoon is the breeding and hatching season of Gharial, Gangetic Softshell Turtle and Narrow headed softshell turtle so proper maintenance and carefulness is essential in this period in construction work.

Winter is the important period for different group of migratory bird and mating period of Fishing Cat, Gharial, Gangetic Softshell turtle, and Black-bellied Tern. So for this region in the winter season it is important to take proper steps to do construction 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.



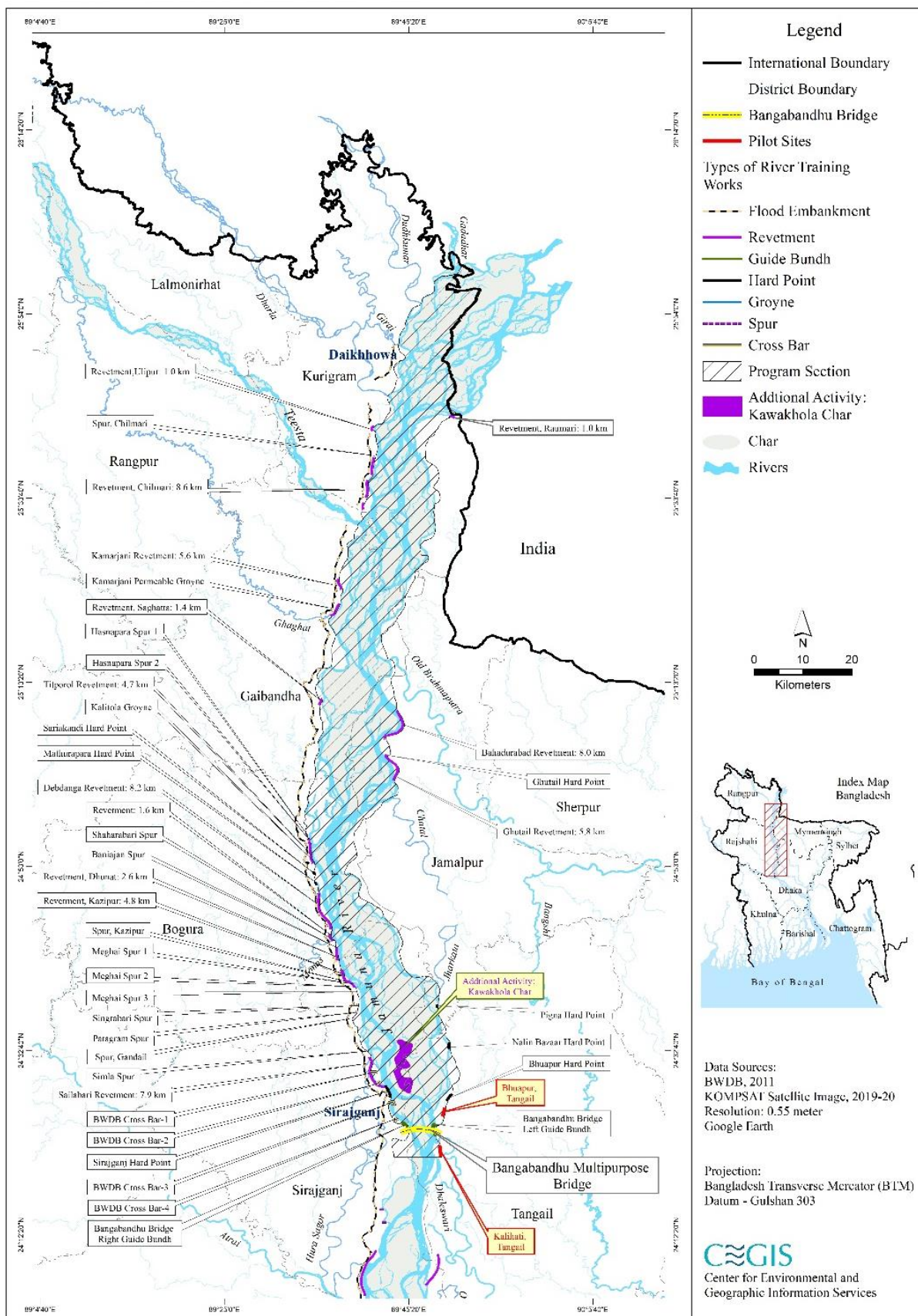


Figure 8.1: Water Management Intervention along the Jamuna River



## 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



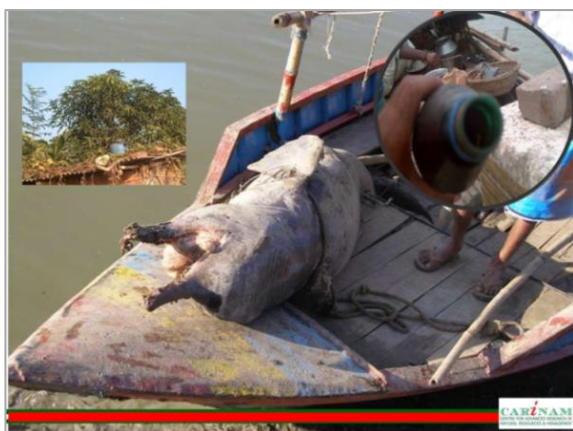
Bamboo barricade with nets

**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

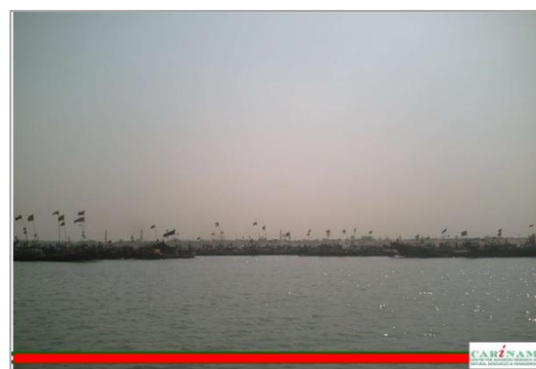
Every year natural habitats of both plants and animals have been reducing thus decrease biodiversity from the wilderness areas. Currently, due to the developmental activities, Bangladesh is losing large areas of habitats through degradation of terrestrial as well as aquatic habitats. There are many threats 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.



Riverbanks, chars, sandbanks under intensive cultivation



Pollution and Siltation

**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>Hoplobatrachus tigerinus</i>	II	1	<i>Tyto alba</i>	II	1	<i>Paguma larvata</i>	III
2	<i>Morenia petersi</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>Viverra zibetha</i>	III
4	<i>Pangshura tentoria</i>	II	4	<i>Ketupa zeylonensis</i>	II	4	<i>Viverricula indica</i>	III
5	<i>Nilssonia gangetica</i>	I	5	<i>Ninox scutulata</i>	II	5	<i>Felis chaus</i>	II
6	<i>Nilssonia hurum</i>	I	6	<i>Butastur teesa</i>	II	6	<i>Prionailurus viverrinus</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>Ichthyophaga ichthyaetus</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>Spilornis cheela</i>	II			
11	<i>Atretium schistosum</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>Hieraaetus pennatus</i>	II			
			19	<i>Pandion haliaetus</i>	II			
			20	<i>Falco peregrinus</i>	I			
			21	<i>Falco tinnunculus</i>	II			



## References

- Ahmed B. 2009. *Platinista gangetica*. In: Ahmed ATA, Kabir SMH, Ahmad M, Ahmed ZU, Begum ZNT, Hassan MA. And Khondker M. (eds.). 2009. Encyclopedia of Flora and Fauna of Bangladesh. Vol. 27. Mammals. Asiatic Society of Bangladesh, Dhaka. Pp. 204-206.
- Ahmed, M.F. & Singh, S. 2021. *Morenia petersi*. The IUCN Red List of Threatened Species 2021: e.T13874A544248. <https://dx.doi.org/10.2305/IUCN.UK.2021-1.RLTS.T13874A544248.en>. Accessed on 15 February 2022.
- Ahmed, M.F., Choudhury, B.C., Das, I. & Singh, S. 2021. *Nilssonina gangetica*. The IUCN Red List of Threatened Species 2021: e.T39618A2930943. <https://dx.doi.org/10.2305/IUCN.UK.2021-1.RLTS.T39618A2930943.en>. Accessed on 15 February 2022.
- Ahmed, M.F., Praschag, P. & Singh, S. 2021. *Hardella thurjii*. The IUCN Red List of Threatened Species 2021: e.T9696A3152073. <https://dx.doi.org/10.2305/IUCN.UK.2021-1.RLTS.T9696A3152073.en>. Accessed on 15 February 2022. <https://www.iucnredlist.org/species/13874/544248#population>
- Ahsan MF. 2015. *Python bivittatus*. In: IUCN Bangladesh. Red List of Bangladesh Volume 4: Reptiles and Amphibians. IUCN, International Union for Conservation of Nature, Bangladesh Country Office, Dhaka, Bangladesh. pp.80.
- Alom MZ. 2015. *Platanista gangetica*. In: IUCN Bangladesh. Red List of Bangladesh Volume 2: Mammals. IUCN, International Union for Conservation of Nature, Bangladesh Country Office, Dhaka, Bangladesh. pp.107.
- Anonymous 2020. BirdLife International. "Sites & Habitats (IBAs and KBAs)". BirdLife.
- Asian Turtle Trade Working Group. 2000. *Chitra indica* (errata version published in 2016). The IUCN Red List of Threatened Species 2000: e.T4696A97399400. <https://dx.doi.org/10.2305/IUCN.UK.2000.RLTS.T4696A11088615.en>. Accessed on 15 February 2022.
- Asian Waterbird Census. 2014. Riverine bird Census by Bangladesh Bird Club from 2013-2014.
- Aziz MA. 2019. Atlas on Ganges River Dolphin and Irrawaddy Dolphin of Bangladesh.
- BirdLife International (2022 c) Species factsheet: *Sterna acuticauda*. Downloaded from <http://www.birdlife.org> on 16/02/2022.
- BirdLife International (2022 d) Species factsheet: *Haliaeetus leucoryphus*. Downloaded from <http://www.birdlife.org> on 15/02/2022.
- BirdLife International (2022a) Species factsheet: *Emberiza aureola*. Downloaded from <http://www.birdlife.org> on 15/02/2022 <https://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T22720966A119335690.en>. Accessed on 15 February 2022; <https://www.iucnredlist.org/species/22720966/119335690#population>
- BirdLife International (2022b) Species factsheet: *Rynchops albicollis*. Downloaded from <http://www.birdlife.org> on 15/02/2022 <https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T22694268A178970109.en>. Accessed on 15 February 2022.
- BirdLife International (2022e) Species factsheet: *Mycteria leucocephala*. Downloaded from <http://www.birdlife.org> on 15/02/2022

- BirdLife International (2022f) Species factsheet: *Clanga hastata*. Downloaded from <http://www.birdlife.org> on 15/02/2022
- Brauneder KM, Montes C, Blyth S, Bennun L, Butchart SHM, Hoffmann M. 2018 Global screening for Critical Habitat in the terrestrial realm. PLoS ONE 13(3): e0193102. <https://doi.org/10.1371/journal.pone.0193102>
- CARINAM. 2010. Survey of the breeding population of gharials (*Gavialis gangeticus*) in Bangladesh. CARINAM Report No. 2010-MBZ/001. Interim project report submitted to The Mohamed bin Zayed Species Conservation Fund, Abu Dhabi. 23 pp.
- CARINAM. 2012. Gharial (*Gavialis gangeticus*) conservation in Bangladesh. A report produced by CARINAM in 2012.
- Chowdhury SU, Foysal M, Sharpe J, & Shahadat O. 2014. A survey for Black-bellied Tern *Sterna acuticauda* and other riverine birds on the Jamuna and Padma rivers in Bangladesh. Forktail, 30, 84-89.
- Chowdhury, S. U., Foysal, M. O. H. A. M. M. A. D., Sharpe, J., & Shahadat, O. M. A. R. (2014). A survey for Black-bellied Tern *Sterna acuticauda* and other riverine birds on the Jamuna and Padma rivers in Bangladesh. Forktail, 30, 84-89.
- Das, D. K. 2015. Breeding status of Indian Skimmer *Rynchops albicollis* in the National Chambal Sanctuary, India. Indian BIRDS 10(2): 53-54.
- Das, I., Choudhury, B.C., Ahmed, M.F., Praschag, P. & Singh, S. 2021. *Nilssonium hurum*. The IUCN Red List of Threatened Species 2021: e.T39619A2931203. <https://dx.doi.org/10.2305/IUCN.UK.2021-1.RLTS.T39619A2931203.en>. Accessed on 15 February 2022.
- Das, I., Choudhury, B.C., Praschag, P., Ahmed, M.F. & Singh, S. 2019. *Batagur dhongoka* (errata version published in 2019). The IUCN Red List of Threatened Species 2019: e.T10953A152042542. <https://dx.doi.org/10.2305/IUCN.UK.2019-1.RLTS.T10953A152042542.en>. Accessed on 15 February 2022; <https://www.iucnredlist.org/species/10953/152042542>
- DoF. 2019. Yearbook of Fisheries Statistics of Bangladesh, 2018-19. Fisheries Resources Survey System (FRSS), Department of Fisheries, Bangladesh: Ministry of Fisheries and Livestock, 2019. Volume 36: 135p.
- Gilbert, M., Tingay, R., Losolmaa, J., Sureda, N., Gilbert, C., Batmunkh, D. and Gombobaatar, S. 2014. Distribution and status of the Pallas's Fish Eagle *Haliaeetus leucoryphus* in Mongolia: a cause for conservation concern? Bird Conservation International 24: 379-388.
- <https://dainikbhorerbarta.com/দেশজুড়ে/সকল-জেলার-খবর/পাবনার-বেড়ায়-১১-ফুট-লম্বা/>
- [https://en.banglapedia.org/index.php/Jamuna\\_River](https://en.banglapedia.org/index.php/Jamuna_River). Jamuna River-Banglapedia, June 24, 2021
- [https://en.wikipedia.org/wiki/Jamuna\\_River\\_\(Bangladesh\)](https://en.wikipedia.org/wiki/Jamuna_River_(Bangladesh)). Jamuna River (Bangladesh), 24 June, 2021
- <https://prothomalo.com/bangladesh/যমুনা-নদীর-দুর্গম-চরে-অজগর>
- IUCN Bangladesh, 2015. Red List of Bangladesh Volume 5: Freshwater Fishes. IUCN, International Union for Conservation of Nature, Bangladesh Country Office, Dhaka, Bangladesh, pp xvi+360.
- IUCN Bangladesh. (2015). Red List of Bangladesh Volume 3: Birds. IUCN, International Union for Conservation of Nature, Bangladesh Country Office, Dhaka, Bangladesh, pp. xvi+676.



- 
- IUCN Bangladesh. 2015. Red List of Bangladesh Volume 4: Reptiles and Amphibians. IUCN, International Union for Conservation of Nature, Bangladesh, Country Office, Dhaka, Bangladesh, pp. xvi+320.
- IUCN Bangladesh. 2015b. Red List of Bangladesh Volume 2: Mammals. IUCN, International Union for Conservation of Nature, Bangladesh Country Office, Dhaka, Bangladesh, pp. xvi+232.
- IUCN, 2015. Environmental Baseline: Environmental Assessment for River Management Improvement Program. IUCN, International Union for Conservation of Nature and Natural Resources Bangladesh Country Office, Dhaka, Bangladesh.
- Khan, M. M. H. (2018). Photographic guide to the wildlife of Bangladesh. Arannayk Foundation, Dhaka, Bangladesh. 488 pp.
- Li, Z.W.D, A. Bloem, S. Delany, G. Martakis & J.O. Quintero. 2009. Status of Waterbirds in Asia - Results of the Asian Waterbird Census: 1987-2007. Wetlands International, Kuala Lumpur, Malaysia  
<https://www.iucnredlist.org/species/22694268/178970109#population>
- M. Shahjahan, M.I. Miah and M.M. Haque, 2000. Present status of fisheries in the Hamuna River; Pakistan Journal of Biological Science 4 (9): 1173-1176-2001.
- Monirujjaman and Khan (2018). Wildlife Diversity of Madhupur National Park, Bangladesh. Jahangirnagar University Journal of Biological Sciences, 7(1), 1-13.
- Mst. Nahida Easmin, AHM Shafiullah Habib, Shimu Akter and Keya Majumder, 2018. STATUS AND DIVERSITY OF ICHTHYOFAUNA OF JAMUNA RIVER, BANGLADESH. Jagannath University Journal of Life and Earth Sciences, 4(1): 12 – 24, 2018 ISSN 2414-1402.
- Mukul, S. A., Arfin-Khan, M. A. S., & Uddin, M. B. (2021). Invasive alien species of Bangladesh. In: Invasive Alien Species: Observations and Issues from Around the World, 2, 1-15.
- Pangare, G., Nishat, B., Liao, X., & Qaddumi, H. M. (2021). The Restless River. World Bank, Washington, DC. 428 pp.
- Praschag, P., Hundsdoerfer, A.K. and Fritz, U. 2007. Phylogeny and taxonomy of endangered South and South-east Asian freshwater turtles elucidated by mtDNA sequence variation (Testudines: Geoemydidae: Batagur, Callagur, Hardella, Kachuga, Pangshura). Zoologica Scripta 36: 429–442.
- Rahman, A.K.A. 2005. Freshwater Fishes of Bangladesh. 2nd edition, Zoological Society of Bangladesh, Department of Zoology, University of Dhaka-1000, 263p.
- Rahman, H., Jaman, M. F., & Rahman, M. S. (2013). Ecology and diversity of wildlife in the eco-park of the Jamuna bridge and its adjacent area, Sirajgonj, Bangladesh. Ecoprint: An International Journal of Ecology, 20, 27-36.
- Rashid SMA, Akonda AW. & Ahmed B. 2015. Ganges River Dolphin (Platanista gangeticaganetica) in the Padma, Jamuna and Hurasagar-Baral rivers of Pabna District, Bangladesh. Int. J. Curr. Sci, 14, 107-124.
- Rashid, S. M. A., Khan, A., & Alam, A. S. Trans-boundary Sanctuary between Bangladesh and India for Gharial (Gavialis gangeticus) Conservation. River for Life. Proceedings of the International Symposium on River Biodiversity: Ganges-Brahmaputra-Meghna River System. Pg-130-138.  
<https://portals.iucn.org/library/sites/library/files/documents/2016-090.pdf>;
- Rashid, S.M.A. & I. R. Swingland. 1990. Interim report on the freshwater turtle trades in Bangladesh. Asiatic Herpetological Research 3: 123-128.
- Rashid, S.M.A. and Khan, S.M.H. 2000. Trade and Conservation Status of Freshwater Turtles and Tortoises in Bangladesh. In: P.P. van Dijk, B.L. Stuart and A.G.J. Rhodin (eds), Asian Turtle Trade: Proceedings of
-

- 
- a Workshop on Conservation and Trade of Freshwater Turtles and Tortoises in Asia. Chelonian Research Monographs No. 2, pp. 77-85. Chelonian Research Foundation, Lunenburg, MA, USA .  
<https://iucn-tftsg.org/chitra-indica-027/>
- Rashid, S.M.A., Akonda, A.W., Ahmed, B., 2015. Ganges River Dolphin (*Platanista gangetica gangetica*) in the Padma, Jamuna and HurasagarBaral rivers of Pabna District, Bangladesh. *Int. J. Curr. Sci.* 14, 107–124.
- S.M.Majharul Islam, Md. Bokthier Rahman, Md. Rushna Alam, Biplob Dey Mithun, Anik Bal, Mehedi Azam, and Mst. Ruma, “A Case Study on Fishing Gears, Fish Species Composition and Fisher Folk Community at Jamuna River of Sirajganj Sadar Fish Landing Site, Bangladesh.” *Journal of Aquatic Science*, vol. 4, no. 1 (2016): 11-19. doi: 10.12691/jas-4-1-2.
- Sarker, N.J., Huda, S.M.Q., Khan, S.I. and Huq, N. 2008. Investigation on the status, distribution and conservation problems of the gtiarial (*Gavialis gangeticus*) in Bangladesh. *Bangladesh J. Zool.* 36(1): 1-9.
- Smith, B.D., Braulik, G.T. & Sinha, R. 2012. *Platanista gangetica ssp. gangetica*. The IUCN Red List of Threatened Species 2012: e.T41756A17627639.  
<https://dx.doi.org/10.2305/IUCN.UK.2012.RLTS.T41756A17627639.en>. Accessed on 15 February 2022.
- Sourav, M.S.H., Ahmed, B. & Thompson, P. 2011. Pallas’s Fish Eagle *Haliaeetus leucoryphus* in Bangladesh. *BirdingASIA* 16: 101-105.
- World Bank 2015. Environmental Impact Assessment (EIA) of River Bank Improvement Program (RBIP).
- Yadav, P.D., Raut, C. G., Shete, A. M., Mishra, A. C., Towner, J. S., Nichol, S. T. and Mourya, D. T. 2012. Detection of Nipah Virus RNA in Fruit Bat (*Pteropus giganteus*) from India. *Am J Trop Med Hyg.*; 87(3): 576–578.

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

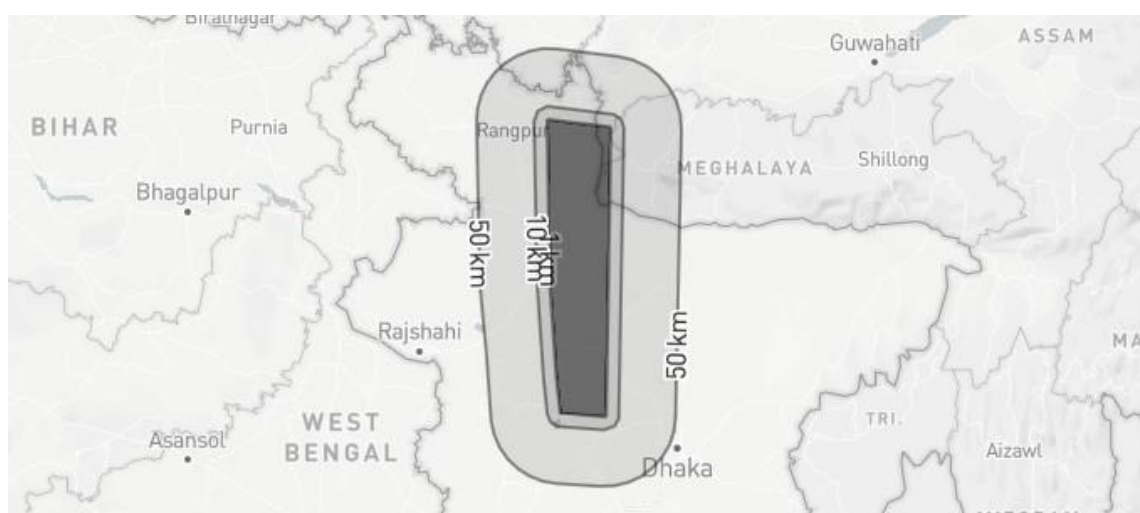


**World Bank Group Biodiversity Risk Screen**

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

**Overlaps with:**

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



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 significant 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>Nilssononia nigricans</i>	Black Softshell Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
<i>Gavialis gangeticus</i>	Gharial	REPTILIA	CR	Increasing	Terrestrial, Freshwater
<i>Batagur kachuga</i>	Red-crowned Roofed Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
<i>Pangshura sylhetensis</i>	Assam Roofed Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
<i>Batagur dhongoka</i>	Three-striped Roofed Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater



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

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Pelochelys cantorii</i>	Asian Giant Softshell Turtle	REPTILIA	CR	Decreasing	Terrestrial, Marine, Freshwater
<i>Geoclemys hamiltonii</i>	Spotted Pond Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
<i>Hardella thurjii</i>	Crowned River Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
<i>Morenia petersi</i>	Indian Eyed Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
<i>Schistura sijuensis</i>		ACTINOPTERYGII	EN	Unknown	Freshwater
<i>Nilssonia gangetica</i>	Indian Softshell Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
<i>Nilssonia hurum</i>	Indian Peacock Softshell Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
<i>Platanista gangetica</i>	South Asian River Dolphin	MAMMALIA	EN	Unknown	Freshwater
<i>Axis porcinus</i>	Hog Deer	MAMMALIA	EN	Decreasing	Terrestrial, Freshwater
<i>Cuora mouhotii</i>	Keeled Box Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
<i>Pillaia indica</i>		ACTINOPTERYGII	EN	Unknown	Freshwater
<i>Heritiera fomes</i>		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial, Marine, Freshwater
<i>Urogymnus polylepis</i>	Giant Freshwater Whipray	CHONDRICHTHYES	EN	Decreasing	Marine, Freshwater

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

**E. Restricted Range Species**

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Schistura sijuensis		ACTINOPTERYGII	EN	Unknown	Freshwater
Pillaia indica		ACTINOPTERYGII	EN	Unknown	Freshwater
Aborichthys garoensis		ACTINOPTERYGII	VU	Unknown	Freshwater
Schistura inglisi		ACTINOPTERYGII	VU	Unknown	Freshwater
Schistura reticulofasciata		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
Ophisternon bengalense	Bengal Mud Eel	ACTINOPTERYGII	LC OR LR/LC	Stable	Marine, Freshwater
Bengala elanga	Bengala Barb	ACTINOPTERYGII	LC OR LR/LC	Unknown	Freshwater
Aplocheilus lineatus	Striped panchax	ACTINOPTERYGII	LC OR LR/LC	Decreasing	Freshwater
Xenentodon cancila		ACTINOPTERYGII	LC OR LR/LC	Unknown	Freshwater
Batasio batasio		ACTINOPTERYGII	LC OR LR/LC	Unknown	Freshwater
Schistura multifasciata		ACTINOPTERYGII	LC OR LR/LC	Unknown	Freshwater
Badis blosyrus		ACTINOPTERYGII	LC OR LR/LC	Unknown	Freshwater
Psilorhynchus homaloptera	Homaloptera minnow	ACTINOPTERYGII	LC OR LR/LC	Unknown	Freshwater
Oreochthys cosuatis		ACTINOPTERYGII	LC OR LR/LC	Unknown	Freshwater
Oryzias dancena	Indian Rice sh	ACTINOPTERYGII	LC OR LR/LC	Stable	Marine, Freshwater
Pseudosphromenus cupanus	Spiketail Paradise Fish	ACTINOPTERYGII	LC OR LR/LC	Stable	Freshwater

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

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Macromia pallida		INSECTA	DD	Unknown	Terrestrial, Freshwater
Badis kanabos		ACTINOPTERYGII	DD	Unknown	Freshwater
Batasio merianiensis		ACTINOPTERYGII	DD	Unknown	Freshwater
Batasio spilurus		ACTINOPTERYGII	DD	Unknown	Freshwater
Nangra bucculenta		ACTINOPTERYGII	DD	Unknown	Freshwater
Pseudolaguvia ferruginea		ACTINOPTERYGII	DD	Unknown	Freshwater
Macrobrachium agwi		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
Sareshwar 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	Dhol Kolmi	<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>Mazu spumilus</i>	Medicinal	NE
8	Pygmy Groundcherry	Bon Tepari	<i>Physalis lagascae</i>	-	LC
9	Madras Carpet	Namuti ful	<i>Grangea maderaspatana</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 rutidosperma</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 merittimus</i>	Medicinal	NE
18	Turkey Tangle Frogfruit	Bhui Okra	<i>Phylla nodiflora</i>	Medicinal	LC
19	Cape Periwinkle	Nayantara	<i>Catharanthus roseus</i>	Ornamental and Medicinal	NE
20	Bermuda grass	Durba Grass	<i>Cynodon dactylon</i>	Medicinal	NE
21	Cupgrass	Nol Grass	<i>Eriochloa procer</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>Bambusa longispiculata</i>	Furniture, Construction	NE

SL	English Name	Common Name	Scientific name	Importance	IUCN Global Status
30	Female Bamboo	Bora Bash	<i>Bambusa balcooa</i>	Furniture, Construction	NE
<b>Shrub (Terrestrial)</b>					
31	Salt Cedar	Ban Jhau, Nona-Gach, Urichiya	<i>Tamarix dioica</i>	Medicinal	NE
32	Groundnut	Badam	<i>Arachis hypogaea</i>	Food, Fuel	NE
33	Caesarweed	Jongli Ghagra	<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>Aeglema melos</i>	Medicinal fruits	NE
39	White Marudah	Arjun	<i>Terminalia arjuna</i>	Timber and Medicinal	NE
40	Spanish Cherry	Bakul	<i>Minusops elengi</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	Chebulic 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>Lannea coromandelica</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>Spondia spinnata</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>Syzygium cumini</i>	Fruit	LC
59	Indian Jujube	Boroi	<i>Zizyphus mauritiana</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

SL	English Name	Common Name	Scientific name	Importance	IUCN Global Status
68	Trewia	Pitali	<i>Trewia polycarpa</i>	Timber and fuelwood	NE
69	Queen's Crape Myrtle	Jarul	<i>Lagerstroemia speciosa</i>	Timber	NE
70	Candahar Tree	Gamar	<i>Gmelina arborea</i>	Timber	LC
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>9</sup>

<sup>9</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 Kathbiral	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, Metho Nengti Idur	LC	LC
5	Eastern House Mouse	<i>Mus musculus</i>	Nengti Idur	LC	LC
6	House Rat	<i>Rattus rattus</i>	Indur	LC	LC
7	Asiatic Long-tailed Climbing Mouse	<i>Vandeleuria oleracea</i>	Gecho Idur, Gecho Nengti Idur	LC	LC
	<b>ORDER: CARNIVORA</b>				
	<b>Family: Viverridae</b>				
8	Masked Palm Civet	<i>Paguma larvata</i>	Boishne Ula	VU	LC
9	Asian Palm Civet	<i>Paradoxurus hermaphroditus</i>	Gandhagakul, Nongar, Shairel, Hailla	LC	LC
10	Large Indian Civet	<i>Viverra zibetha</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>Lutra perspicillata</i>	Wud Biral	CR	VU
	<b>ORDER: EULIPOTYPHILA</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>	Bhua Daini Badur	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>Scotophilus heathi</i>	Boro Rongila Chamchika	LC	LC
25	Lesser Asiatic Yellow Bat	<i>Scotophilus kuhlii</i>	Choto Holdey Chamchika	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>10</sup>]

<sup>10</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>Dendrocygna javanica</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>Nettapus coromandelianus</i>	Bali Hans	LC	LC
	<b>ORDER: PICIFORMES</b>				
	<b>Family: Picidae</b>				
4	Rufous Woodpecker	<i>Celeus brachyurus</i>	Lal Kaththokra	LC	LC
5	Fulvous-breasted Woodpecker	<i>Dendrocopos macei</i>	Jarad Kaththokra	LC	LC
6	Black-rumped Flameback	<i>Dinopium benghalense</i>	Sonali Kaththokra, Kathkhutalu, Kurailla	LC	LC
7	Eurasian Wryneck	<i>Jynx torquilla</i>	Eureshio Gharbetha	LC	LC
8	Streak-throated Woodpecker	<i>Picus xanthopygaeus</i>	Dagigola Kathkurali	LC	LC
	<b>Family: Megalaimidae</b>				
9	Blue-throated Barbet	<i>Psilopogon asiaticus</i>	Dhonia, Beghbou Basantabouri	LC	LC
10	Coppersmith Barbet	<i>Psilopogon haemacephala</i>	Choto Basantabouri	LC	LC
11	Lineated Barbet	<i>Psilopogon lineatus</i>	Gorkhod, Beghbou, Kutlush Basantabouri	LC	LC
	<b>ORDER: UPUIFORMES</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>	Dholagola Machranga	LC	LC
	<b>Family: Cerylidae</b>				
16	Pied Kingfisher	<i>Ceryle rudis</i>	Pakra Machranga	LC	LC
	<b>Family: Meropidae</b>				
17	Green Bee-eater	<i>Merops orientalis</i>	Suichora, Banshpati	LC	LC
18	Blue-tailed Bee- eater	<i>Merops philippinus</i>	Neel-lej Shuichora	LC	LC
	<b>ORDER: CUCULIFORMES</b>				
	<b>Family: Cuculidae</b>				
19	Plaintive Cuckoo	<i>Cacomantis merulinus</i>	Koroon Papia	LC	LC

SL	English Name	Scientific Name	Local Name	National Status	Global Status
20	Pied Cuckoo/Jacobin Cuckoo	<i>Clamator jacobinus</i>	Papiya, Pakra Papia	LC	LC
21	Indian Cuckoo	<i>Cuculus micropterus</i>	Bou-kotha- kou	LC	LC
22	Western Koel	<i>Eudynamys scolopacea</i>	Kokil, Kokil	LC	LC
23	Common Hawk Cuckoo	<i>Hierococcyx varius</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>Psittacula krameri</i>	Tiya	LC	LC
<b>ORDER: CAPRIMULGIFORMES</b>					
<b>Family: Apodidae</b>					
26	House Swift	<i>Apus nipalensis</i>	Ghor Batashi	LC	LC
27	Asian Palm Swift	<i>Cypsiurus balasiensis</i>	Asio Talbatashi, Nakkati	LC	LC
<b>ORDER: STRIGIFORMES</b>					
<b>Family: Tytonidae</b>					
28	Barn Owl	<i>Tyto alba</i>	Lakhi Pecha	LC	LC
	Family: Strigidae				
29	Spotted Owlet	<i>Athene brama</i>	Khuruley Pencha	LC	LC
30	Dusky Eagle Owl	<i>Bubo coromandus</i>	Metey Hutompecha	LC	LC
31	Brown Fish Owl	<i>Ketupa zeylonensis</i>	Bhutum Pecha, Khoira Mechopecha	LC	LC
32	Brown Hawk Owl	<i>Ninox scutulata</i>	Khoira Shikrepecha	LC	LC
33	Collared Scops Owl	<i>Otus lettia</i>	Konthi Nimpecha	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, Sabuj Ghughu	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>Streptopelia decaocto</i>	Eurashio Konthighughu	LC	LC
39	Oriental Turtle Dove	<i>Streptopelia orientalis</i>	Rajghughu	LC	LC
40	Red Turtle Dove	<i>Streptopelia tranquebarica</i>	Lal Rajghughu	LC	LC
41	Yellow-footed Green Pigeon	<i>Treron phoenicoptera</i>	Holdeypa Harial	LC	LC
<b>ORDER: GRUIFORMES</b>					
<b>Family: Rallidae</b>					
42	White-breasted Waterhen	<i>Amaurornis phoenicurus</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 Swampphen	<i>Porphyrio porphyrio</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>Rostratula benghalensis</i>	Rongila, Boiragi Chaga	LC	LC
<b>Family: Jacanidae</b>					
47	Pheasant-tailed Jacana	<i>Hydrophasianus chirurgus</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>Vanellus duvaucelii</i>	Nodi Titi	NT	NT
50	Red-wattled Lapwing	<i>Vanellus indicus</i>	Hot Titi	LC	LC
51	Yellow-wattled Lapwing	<i>Vanellus malarbaricus</i>	Holdegat Titi	NT	LC
<b>Family: Glareolidae</b>					
52	Little Pratincole	<i>Glareola lactea</i>	Babui Batan, Choto Babubatan	LC	LC
<b>Family: Laridae</b>					
53	Black-bellied Tern	<i>Sterna acuticauda</i>	Kalapet Panchil	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>Chlidonias hybrida</i>	Julphi Panchil	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>Butastur teesa</i>	Dholachokh Tishabaj	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>Ichthyophaga ichthyaetus</i>	Meteymatha Kura-eegol, Ukhosh	NT	NT
63	Black Kite	<i>Milvus migrans</i>	Bhuban Chil	LC	LC
64	Oriental Honey Buzzard	<i>Pernis ptilorhynchus</i>	Madhu Chil, Madhubaj	LC	LC
65	Crested Serpent Eagle	<i>Spilornis cheela</i>	Tila Nag-eegol, Teela Eagle	LC	LC
66	Changeable Hawk Eagle	<i>Nisaetus cirrhatus</i>	Bohurupi Shikrey-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>Ardeola grayii</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>	Shamukkhoh	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>Coracina macei</i>	Gudhuka, Boro Kabashi	LC	LC
90	Black-headed Cuckooshrike	<i>Coracina melanoptera</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 leuillantii</i>	Dar Kak	LC	LC
94	House Crow	<i>Corvus splendens</i>	Pati Kak	LC	LC

SL	English Name	Scientific Name	Local Name	National Status	Global Status
95	Rufous Treepie	<i>Dendrocitta vagabunda</i>	Kutum, Harichacha, Taira	LC	LC
	<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>Culicicapa ceylonensis</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>Zoothera citrina</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>	Metebook 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

SL	English Name	Scientific Name	Local Name	National Status	Global Status
122	Common Tailorbird	<i>Orthotomus sutorius</i>	Tuntuni	LC	LC
<b>Family: Timaliidae</b>					
123	Striated Babbler	<i>Turdoides earlei</i>	Dagi Satarey	LC	LC
124	Jungle Babbler	<i>Turdoides striatus</i>	Satbhaila, Satbhai, Bon Satarey	LC	LC
<b>Family: Alaudidae</b>					
125	Oriental Skylark	<i>Alauda gulgula</i>	Udoi Ovrobhorot	LC	LC
126	Indian Short-toed Lark	<i>Calandrella raytal</i>	Bali Bhorot	LC	LC
127	Ashy-crowned Sparrow Lark	<i>Eremopterix grisea</i>	Metechadi Choruivrot	LC	LC
128	Rufous-winged Bushlark	<i>Mirafra assamica</i>	Bangla Jharbhorot	LC	LC
<b>Family: Nectariniidae</b>					
129	Pale-billed Flowerpecker	<i>Dicaeum erythrorhynchos</i>	Metethot Fuljhuri	LC	LC
130	Purple Sunbird	<i>Nectarinia asiatica</i>	Beguni Moutushi	LC	LC
131	Purple-rumped Sunbird	<i>Nectarinia zeylonica</i>	Beguni-komor Moutushi	LC	LC
<b>Family: Motacillidae</b>					
132	Paddyfield Pipit	<i>Anthus rufulus</i>	Dhani Tulika	LC	LC
133	White-browed Wagtail	<i>Motacilla maderaspatensis</i>	Dholavru Khonjon	LC	LC
<b>Family: Estrildidae</b>					
134	White-throated Munia, Indian Silverbill	<i>Lonchura malabarica</i>	Deshi Chandithot	LC	LC
135	Tricolored Munia	<i>Lonchura malacca</i>	Khoyra Munia	LC	LC
136	Scaly-breasted Munia	<i>Lonchura punctulata</i>	Tila Munia	LC	LC
<b>Family: Ploceidae</b>					
137	Baya Weaver	<i>Ploceus philippinus</i>	Babui, Baoi, Baloi	LC	LC
138	Black-breasted Weaver	<i>Ploceus benghalensis</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>	Utturey Khunte-hansh, Khunte Hans	LC	LC
4	Common Teal	<i>Anas crecca</i>	Pati tilihash, Patari Hans	LC	LC
5	Eurasian Wigeon	<i>Mareca penelope</i>	Eureshio Shithihash, 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>Anser anser</i>	Metey Rajhash, 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>Tadorna ferruginea</i>	Khoira Chokachoki	LC	LC
15	Common Shelduck	<i>Tadorna tadorna</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>Fulica atra</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>	Chhoto Chapakhi, Choto Chaha	LC	LC
19	Temminck's Stint	<i>Calidris temminckii</i>	Temingker Chapaki, Teminker Chaha	LC	LC
20	Common Snipe	<i>Gallinago gallinago</i>	Pati Chega	LC	LC
21	Pintail Snipe	<i>Gallinago stenura</i>	Lenja Chega	LC	LC
22	Eurasian Curlew	<i>Numenius arquata</i>	Eureshio Gulinda, Boro Gulinda	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

SL	English Name	Scientific Name	Local Name	National Status	Global status
<b>Family: Charadriidae</b>					
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>	Proshanto Sonajiria	LC	LC
34	Gray-headed Lapwing	<i>Vanellus cinereus</i>	Metematha Titi	LC	LC
	White-tailed Lapwing	<i>Vanellus leucurus</i>			LC
<b>Family: Recurvirostridae</b>					
35	Black-winged Stilt	<i>Himantopus himantopus</i>	Kalapakh Thengi, Lal pa Dhenga	LC	LC
<b>Family: Laridae</b>					
37	Brown-headed Gull	<i>Larus brunnicephalus</i>	Khoiramatha Gangchil, Gonga Koitar	LC	LC
38	Pallas's Gull	<i>Larus ichthyaetus</i>	Baro Bodorkoitar, Palasi Gangchil	LC	LC
39	Black-headed Gull	<i>Larus ridibundus</i>	Gongakoitar, Kalamatha Gangchil	LC	LC
<b>ORDER: ACCIPITRIFORMES</b>					
<b>Family: Accipitridae</b>					
40	Greater Spotted Eagle	<i>Clanga clanga</i>	Boro Guti-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>	Lombapa Tishabaj, Idurmara Chil	LC	LC
43	Eurasian Marsh Harrier	<i>Circus aeruginosus</i>	Poschima Pankapashi, Kuria Chil	LC	LC
44	Pied Harrier	<i>Circus melanoleucos</i>	Dhola Kapashi, Rakhalbhulani	LC	LC
45	Booted Eagle	<i>Hieraaetus pennatus</i>	Bootpa Eegol	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>	Boro Khopaduburi	LC	LC
<b>ORDER: SULIFORMES</b>					
<b>Family: Phalacrocoracidae</b>					
50	Great Cormorant	<i>Phalacrocorax carbo</i>	Boro Pankouri	LC	LC
51	Indian Cormorant	<i>Phalacrocorax fuscicollis</i>	Deshi Pankouri	LC	LC
<b>ORDER: CICONIFORMES</b>					
<b>Family: Ciconiidae</b>					
52	Black Stork	<i>Ciconia nigra</i>	Kala Manikjor	VU	LC
53	Painted Stork	<i>Mycteria leucocephala</i>	Ranga Manikjor, Sonajongha	CR	NT

SL	English Name	Scientific Name	Local Name	National Status	Global status
54	Woolly-necked Stork	<i>Ciconia episcopus</i>	<a href="http://datazone.birdlife.org/species/factsheet/asian-woollyneck-ciconia-episcopus">http://datazone.birdlife.org/species/factsheet/asian-woollyneck-ciconia-episcopus</a>	CR	VU
<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>Coracina melaschistos</i>	Kalapakh Kabashi	LC	LC
<b>Family: Muscicapidae</b>					
57	Verditer Flycatcher	<i>Eumyias thalassina</i>	Ambar Chutki, Nil Katkatia	LC	LC
58	Taiga Flycatcher	<i>Ficedula albicilla</i>	Taiga Chutki, Lalbok Chotok	LC	LC
59	Siberian Rubythroat	<i>Luscinia calliope</i>	Siberio Chunikonhi	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>Phoenicurus ochruros</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>Hirundo daurica</i>	Lalkomor Ababil	LC	LC
65	Barn Swallow	<i>Hirundo rustica</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>	Blaither Nolfutki, Tikra	LC	LC
69	Clamorous Reed Warbler	<i>Acrocephalus stentoreus</i>	Bachal Nolfutki	LC	LC
70	Pallas's Grasshopper Warbler	<i>Locustella certhiola</i>	Palasi Foringfutki	LC	LC
71	Tickell's Warbler	<i>Phylloscopus affinis</i>	Tikeler Patafutki	LC	LC
72	Common Chiffchaff	<i>Phylloscopus collybita</i>	Pati Chifchaf	LC	LC
73	Dusky Warbler	<i>Phylloscopus fuscatus</i>	Kalchey Futki	LC	LC
74	Yellow-browed Warbler	<i>Phylloscopus inornatus</i>	Holdevru Futki	LC	LC
75	Blyth's Leaf Warbler	<i>Phylloscopus reguloides</i>	Blaither Patafutki	LC	LC
76	Greenish Warbler	<i>Phylloscopus trochiloides</i>	Shobje Futki	LC	LC
<b>Family: Motacillidae</b>					
77	Rosy Pipit	<i>Anthus roseatus</i>	Golapi Tulika	LC	LC
78	Olive-backed Pipit	<i>Anthus hodgsoni</i>	Jolpaipith Tulika, Muchassi	LC	LC
79	Richard's Pipit	<i>Anthus richardi</i>	Richarder Tulika	LC	LC
80	Forest Wagtail	<i>Dendronanthus indicus</i>	Bon Khonjon	LC	LC
81	White Wagtail	<i>Motacilla alba</i>	Dhola Khonjan	LC	LC
82	Gray Wagtail	<i>Motacilla cinerea</i>	Metey Khonjon	LC	LC
83	Citrine Wagtail	<i>Motacilla citreola</i>	Sitrin Khonjon	LC	LC
84	Yellow Wagtail	<i>Motacilla flava</i>	Holdey Khonjon	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>Morenia petersi</i>	Holdey Kachim	NT	VU
2	Indian Roofed Turtle	<i>Pangshura tecta</i>	Kori Kaitta	LC	LC
3	Median Roofed Turtle	<i>Pangshura tentoria</i>	Majhari Kachim	NT	LC
<b>Family: Trionychidae</b>					
4	Ganges Softshell Turtle	<i>Nilssonia gangetica</i>	Kuchrong, Khalua Kasim	EN	EN
5	Peacock-Softshell Turtle	<i>Nilssonia hurum</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>	Khoskhoshey Tiktiki	LC	NE
10	Yellow-bellied House Gecko	<i>Hemidactylus flaviviridis</i>	Goda Tiktiki	LC	NE
11	Common House Gecko	<i>Hemidactylus frenatus</i>	Mosrin Tiktiki	LC	LC
<b>Family: Scincidae</b>					
12	White-spotted Supple Skink	<i>Lygosoma albopunctata</i>	Sada Chiti Anjon	LC	NE
13	Bowring's Supple Skink	<i>Lygosoma bowringii</i>	Bowringer Anjan	LC	NE
14	Keeled Grass Skink	<i>Eutropis carinata</i>	Anjon	LC	LC
15	Bronze Grass Skink	<i>Eutropis macularia</i>	Tamatey Anjon	LC	NE
<b>Family: Varanidae</b>					
16	Bengal Monitor	<i>Varanus bengalensis</i>	Bangla Gui, Gui Shap	NT	NT
17	Yellow Monitor	<i>Varanus flavescens</i>	Sona Gui	NT	EN
<b>Family: Tylopidae</b>					
18	Common Blind Snake	<i>Indotyphlops braminus</i>	Dumukha Shap	LC	NE
19	Diard's Blind Snake	<i>Argyrophis diardii</i>	Baro Dumukha Shap	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>Amphiesma stolatum</i>	Chiru Shap, Dora Shap	LC	NE
22	Olive Keelback	<i>Atretium schistosum</i>	Maitta Shap	LC	LC
23	Checkered Keelback	<i>Xenochrophis piscator</i>	Dhora Shap	LC	NE

SL	English Name	Scientific Name	Local Name	National Status	Global Status
	Painted Keelback	<i>Xenochrophis cerasogaster</i>	Dhora Shap	LC	NE
24	Indian Rat Snake	<i>Ptyas mucosa</i>	Daraj, Dhaman Shap	LC	NE
	Indo-Chinese rat snake	<i>Ptyas korros</i>	Daraj Shap	NT	NE
<b>Family: Colubridae</b>					
25	Common Vine Snake	<i>Ahaetulla nasuta</i>	Laodoga Shap	LC	NE
26	Common Cat Snake	<i>Boiga trigonata</i>	Phonimonosha Shap	NE	LC
27	Ornate Flying Snake	<i>Chrysopelea ornata</i>	Kalnigini, Uranta Shap	LC	NE
28	Painted Bronzeback Tree Snake	<i>Dendrelaphis pictus</i>	Rangila Gecho Shap, Dora Bet Anchra	LC	NE
29	Common Wolf Snake	<i>Lycodon aulicus</i>	Gharginni Shap	LC	NE
<b>Family: Homalopsidae</b>					
30	Common Smooth Water Snake	<i>Enhydryis enhydryis</i>	Paina, Huria Shap	LC	LC
	Siebold's Water Snake	<i>Enhydryis sieboldii</i>	Paina Shap	NE	LC
<b>Family: Elapidae</b>					
31	Common Krait	<i>Bungarus caeruleus</i>	Kal-keutey Shap	LC	NE
32	Banded Krait	<i>Bungarus fasciatus</i>	Shakini, Shonkhini	LC	LC
	Wall's Krait/Sind Krait	<i>Bungarus walli</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>	Gokhra Shap	NT	LC
34	Spectacled Cobra	<i>Naja naja</i>	Khoia Gokhra Shap	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>Duttaphrynus stomaticus</i>	Khoskhosey Bang	LC	LC
2	Common Toad	<i>Duttaphrynus melanostictus</i>	Kuno Bang	LC	LC
<b>Family: Dicoglossidae</b>					
3	Skipper Frog	<i>Euphlyctis cyanophlyctis</i>	Mali Bang, Kotkoti Bang	LC	LC
4	Pierre's Cricket Frog	<i>Fejervarya pierrei</i>	Pierrerr Jhijhi Bang	LC	LC
5	Nepal Cricket Frog	<i>Fejervarya nepalensis</i>	Nepali Jhijhi Bang	LC	LC
6	Syhadra Cricket Frog	<i>Fejervarya syhadrensis</i>	Bon Jhijhi Bang	LC	LC
7	Teraier Cricket Frog	<i>Fejervarya teraiensis</i>	Teraier Jhijhi Bang	LC	LC
8	Asmat's Cricket Frog	<i>Fejervarya asmatai</i>	Asmater Jhijhi Bang	LC	NE
9	Indian Bull Frog	<i>Hoplobatrachus tigerinus</i>	Sona Bang, Kola Bang	LC	LC
	Jerdon's Bull Frog	<i>Hoplobatrachus crassus</i>	Kola Bang	NE	LC
<b>Family: Microhylidae</b>					
10	Ornate Microhylid Frog	<i>Microhyla ornata</i>	Choto Laubichi Bang	LC	LC
11	Mymensingh Microhylid Frog	<i>Microhyla mymensinghensis</i>	MymensingherLaubichi Bang	LC	NE
<b>Family: Ranidae</b>					
12	Leaping Frog/ Yellow-striped Frog	<i>Hylarana tytleri</i>	Pana Bang	LC	LC
13	Two-striped Grass Frog	<i>Hylarana taipehensis</i>	Sobuj Dhani Bang	DD	LC
<b>Family: Rhacophoridae</b>					
14	Common Tree Frog	<i>Polypedates leucomystax</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>Hypolimnas bolina</i>	Jamui	LC	NE
2	Common Leopard	<i>Phalanta phalantha</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>Nepts hylas</i>	Charbatashi	LC	NE
6	Common Sergeant	<i>Athyma perius</i>	Banrara	LC	NE
7	Grey Pansy	<i>Junonia atlites</i>	Chandnori	LC	NE
8	Peacock Pansy	<i>Junonia almana</i>	Noyan	LC	LC
9	Lemon Pansy	<i>Junonia lemonias</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>Elymnias hypermnestra</i>	Khairchak	LC	NE
15	Common Five-ring	<i>Ypthima baldus</i>	Panchbundi	VU	NE
16	Common Four-ring	<i>Ypthima huebneri</i>	Charbundi	LC	NE
17	Common Bushbrown	<i>Mycalesis perseus</i>	Janglabirha	VU	NE
18	Dark-branded Bushbrown	<i>Mycalesis sminesus</i>	Khairabirha	LC	NE
19	Common Evening Brown	<i>Melanitis leda</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>Pachliopta aristolochiae</i>	Alte	LC	NE
22	Common Mormon	<i>Papilio polytes</i>	Kalim	LC	NE
23	Common Jay	<i>Graphium doson</i>	Minji	LC	NE
24	Tailed jay	<i>Graphium gamemnon</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>Cepora nerissa</i>	Kuchila	LC	NE
27	Indian Cabbage White	<i>Pieris canidia</i>	Sarin	LC	NE
28	Psyche	<i>Leptosia nina</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>Catopsilia pyranthe</i>	Chitpaira	LC	NE

SL	English Name	Scientific Name	Local Name	National Status	Global Status
33	Common Emigrant	<i>Catopsilia pomona</i>	Pairachali	LC	NE
34	Three-Spot Grass Yellow	<i>Eurema blanda</i>	NA	LC	NE
35	Common Grass Yellow	<i>Eurema hecabe</i>	Holud	LC	NE
36	Striped Albatross	<i>Appias libythea</i>	DhulKapash	LC	NE
<b>Family: LYCAENIDAE</b>					
<b>Sub-family: Polyommatinae</b>					
37	Common Pierrot	<i>Castalius rosimon</i>	Tilaiya	LC	NE
38	Common Cerulean	<i>Jamides celeno</i>	Surul	LC	NE
39	Pale Grass Blue	<i>Pseudozizeeria maha</i>	Dhupi	LC	NE
40	Lesser Grass Blue	<i>Zizi naots</i>	Para	LC	NE
41	Tiny Grass Blue	<i>Zizula hylax</i>	Tinni	LC	NE
42	Dark Grass Blue	<i>Zizeeria karsandra</i>	Choy	LC	NE
43	Forget-me-not	<i>Catochrysops strabo</i>	Ringtam	VU	NE
44	Quaker	<i>Neopithecops zalmora</i>	Korhi	LC	NE
45	Slate Flash	<i>Rapa lamaanee</i>	Rimly	LC	NE
46	Indigo Flash	<i>Rapa lavaruna</i>	NA	VU	NE
47	Plains Cupid	<i>Chilades pandava</i>	Rulki	LC	NE
48	Gram Blue	<i>Euchrysops cnejus</i>	Joural	LC	NE
49	Lime Blue	<i>Chilades lajus</i>	Tura	LC	NE
50	Pea Blue	<i>Lampides boeticus</i>	Kharia	LC	NE
51	Common Lineblue	<i>Prosotas nora</i>	Chandandarhi	LC	NE
52	Tailless Lineblue	<i>Prosotas dubiosa</i>	NA	VU	NE
53	Common Ciliate Blue	<i>Anthene emolus</i>	Ayandarhi	VU	NE
54	Pointed Ciliate Blue	<i>Anthene lycaenina</i>	NA	EN	NE
55	Centaur Oakblue	<i>Arhopala centaurus</i>	NA	LC	NE
<b>Family: Theclinae</b>					
56	Yamfly	<i>Loxuraa tymnus</i>	Fitepalash	VU	NE
57	Monkey Puzzle	<i>Rathinda amor</i>	Chatul	VU	NE
58	Redspot	<i>Zesius chrysomallus</i>	Not Assessed by IUCN BD 2015		
59	Chocolate Royal	<i>Remelanajangala</i>	NA	VU	NE
60	Common Silverline	<i>Spindasis vulcanus</i>	Rupapatia	LC	NE
<b>Family: HESPERIIDAE</b>					
<b>Sub-family: Hesperinae</b>					
61	Straight Swift	<i>Parnara gutatus</i>	Nilbijuri	LC	NE
62	Dark Palm Dart	<i>Telicota bambusae</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>Tagia desjapetus</i>	Pollobini	VU	NE
<b>Sub-family: Coliadinae</b>					
67	Brown Awl	<i>Badamia exclamationis</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>Sperata aor</i>	Long-whiskered Catfish	Air	Demersal	Low
		<i>Sperata seenghala</i>	Giant River Catfish	Beushkata	Demersal	Low
		<i>Mystus cavasius</i>	Gangetic Mystus	Golsha	Demersal	Medium
		<i>Mystus bleekeri</i>	Bleeker's Mystus	Tengra	Demersal	Medium
	Schilbeidae	<i>Eutropiichthys vacha</i>	Bacha	Bacha	Pelagic	Low
		<i>Silonia silondia</i>	Silond Catfish	Shilong/ Daing/ Metora	Demersal	Low
		<i>Eutropiichthys murius</i>	Indus Garua	Muri Bacha	Demersal	Low
		<i>Ailia punctata</i>	Jamuna Ailia	Bashpata	Demersal	Medium
		<i>Clupisoma garua</i>	Garua Bacha	Gharua	Demersal	Low

Order	Family	Scientific name	English name	Local name	Environment	Local Abundance
		<i>Ailia coila</i>	Gangetic Ailia	Kajuli	Pelagic	Medium
Perciformes	Gobiidae	<i>Glossogobius giuris</i>	Fresh Water Goby	Baila	Benthopelagic	Low
	Ambassidae	<i>Chanda nama</i>	Asian Glass Fish	Chanda	Benthopelagic	Low
	Sciaenidae	<i>Otolithoides pama</i>	Pama Croaker	Poa	Benthopelagic	Medium
Cypriniformes	Cyprinidae	<i>Labeo calbasu</i>	Black Rohu	Baus	Demersal	Medium
		<i>Cabdio morar</i>	Aspidoparia	Piyali/ Boiral/ Chigasi	Benthopelagic	High
		<i>Catla catla</i>	Catla	Catla	Benthopelagic	Low
		<i>Amblypharyngo don microlepis</i>	Indian Carplet,	Mola	Benthopelagic	Medium
		<i>Salmostoma acinaces</i>	Silver Razorbelly Minnow	Chela	Benthopelagic	High
		<i>Puntius chola</i>	Chola Barb	Khora Punt	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>Lepidocephalich thys guntea</i>	Guntea Loach	Gorpuiya	Demersal	Low
		<i>Lepidocephalich thys berdmorei</i>	Burmese Loach	Gutum	Demersal	Low
Osteoglossiformes	Notopteridae	<i>Chitala chitala</i>	Humped Featherback	Chital	Demersal	Low
Synbranchiformes	Mastacembelidae	<i>Macrognathus pancalus</i>	Stripped Spiny eel	Guchi	Benthopelagic	Low
	Synbranchidae	<i>Monopterusuchia</i>	Gangetic Mufeel	Kuchia	Demersal	Low
Siluriformes	Sisoridae	<i>Gagata cenia</i>	Indian Gagata	Kaiya Kata	Demersal	High
Beloniformes	Belonidae	<i>Xenentodon cancila</i>	Needle Fish	Kakila	Pelagic-neritic	Low
Mugiliformes	Mugilidae	<i>Rhinomugil corsula</i>	Corsula	Khorsulla	Pelagic	medium
Clupeiformes	Clupeidae	<i>Gudusia chapra</i>	Indian river Shad	Koitta/Chapila	Pelagic	Medium
	Engraulidae	<i>Setipinna phasa</i>	Gangetic Hairfin Anchovy	Phasa	Pelagic	Low

Source: CEGIS field survey, June and November 2021

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 behaviour 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
Develop skill, capacity and governance for improved protection	Understand and reduce scale of traditional use of dolphin body parts	High
	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
Understand socio- economic dimensions about dolphins	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
	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
Understand and reduce dependency of local communities on dolphin habitats	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
	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 9.1: OHS Risk Matrix**



## 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		
Mobilization and Construction of Groins													
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
		Machine Failure	Due to poor maintenance and repair	3	5	15	Multiple	<ul style="list-style-type: none"><li>SOP07: Safe Driving</li><li>SOP22: Equipment Inspection and Maintenance</li></ul>	2	5	10	There is no guaranty the machine will not be failed after taking precaution	

Sl	Activity	Hazards	Reasons	Risk Ranking			Fatality Risk?	Control Measures	Risk Ranking			Residual justification	Responsibility
				Likelihood	Conseq.	Risk			Likelihood	Conseq.	Risk		
												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> <li>PR11: Personal Protective Equipment (PPE)</li> <li>Loud Whistle should be blown before starting the dredging activities</li> <li>Proper signage and signal can avoid collision</li> </ul>	1	3	3	Protective measures and proper awareness can eliminate this hazard mostly	Site engineer



Sl	Activity	Hazards	Reasons	Risk Ranking			Fatality Risk?	Control Measures	Risk Ranking			Residual justification	Responsibility
				Likelihood	Conseq.	Risk			Likelihood	Conseq.	Risk		
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 disaster event	<ul style="list-style-type: none"> <li>Working under direct rain</li> <li>Working near eroding river bank</li> <li>Working near high water level of river</li> </ul>	3	5	15	Multiple	<ul style="list-style-type: none"> <li>SOP11: Severe Weather</li> <li>SOP14: Working Near or Over Water</li> <li>SOP 23: First Aid</li> </ul>	3	3	9	Control measures can reduce the likelihood of the consequences	

Sl	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>Working near river</li> </ul>										
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 some fatal physical injuries	OHS Staff/ Supervisor
		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	OHS Staff/ Supervisor

Sl	Activity	Hazards	Reasons	Risk Ranking			Fatality Risk?	Control Measures	Risk Ranking			Residual justification	Responsibility
				Likelihood	Conseq.	Risk			Likelihood	Conseq.	Risk		
												implementation of working at height controls. Could still result in fatality.	
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 and permanent damage	<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
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</li> </ul>	2	3	6	Protective measures might reduce the likelihood	

Sl	Activity	Hazards	Reasons	Risk Ranking			Fatality Risk?	Control Measures	Risk Ranking			Residual justification	Responsibility
				Likelihood	Conseq.	Risk			Likelihood	Conseq.	Risk		
								<p>introduce the basics of these diseases, how they transmit and about the preventive measures.</p> <ul style="list-style-type: none"> <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 (e.g., point of contact, phone numbers) regarding COVID-19 issues.</li> <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>				but still the chance of fatalities or even death will be same	
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</li> </ul>	3	3	9	Control measures can reduce the likelihood of the consequences	OHS Staff/ Supervisor / Site supervisor

Sl	Activity	Hazards	Reasons	Risk Ranking			Fatality Risk?	Control Measures	Risk Ranking			Residual justification	Responsibility
				Likelihood	Conseq.	Risk			Likelihood	Conseq.	Risk		
								cyclone, take shelter in the nearest cyclone shelter • Follow the command and instruction of the respective site supervisor					
		High tide/flooding	Natural	3	4	12	Single/ Multiple	• SOP05: Barricading and Signage • SOP14: Work Near or Over Water • SOP 26: Emergency Response Plan • SOP 28: Contractor Security Management • SOP 29: Cofferdam Construction	2	3	6	Control measures can reduce the likelihood of the consequences	OHS Staff/ Supervisor / Site supervisor
12	Manual handling and material lifting	Ergonomic	• Lack of training of Heavy load lifting, • Repetitive work and so on	3	4	12	Single/ Multiple	• Proper training needs to be provided to use the right tool in a right way • Lifting capable weight in a right direction • Take break if there is any repeated works like hammering. • Switch the hand periodically	2	4	8	Likelihood would be reduced by proper implementation of measures and training but consequence might be still potential	OHS Staff/ Supervisor
13	Mobilization and dredging	Water Traffic causes collision with working boat and other regular ships or cargo	• Deployment of working vessels • Absence of navigational aid • Lack of light	4	3	12	Multiple	• SOP 06: Safe Driving • SOP 09: Material Transport (land and water) • SOP14: Working Near or Over Water • SOP 15: Illumination • SOP 26: Emergency Response Plan • SOP 28: Contractor Security Management • To alert other vessels in the area of the emergency situation in the dredge, a visual distress signaling device may be used in conjunction with alarms	2	3	6	Largely administration controls. Likelihood reduced due to lower potential of multiple fatalities	OHS Staff/ Supervisor

Sl	Activity	Hazards	Reasons	Risk Ranking			Fatality Risk?	Control Measures	Risk Ranking			Residual justification	Responsibility
				Likelihood	Conseq.	Risk			Likelihood	Conseq.	Risk		
14	Dredging activities	Over water operation may cause fall into water from dredger or working boat	<ul style="list-style-type: none"><li>Faulty railings</li><li>Unprotected vessel edge</li><li>Dirty floors</li></ul>	3	4	12	Single (multiple could occur but unlikely)	<ul style="list-style-type: none"><li>SOP 01: Dredging</li><li>SOP 03: Excavation</li><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	Foreman / OHS Staff/ Supervisor
		Noise pollution	Continuous engine sound	3	3	9	Unlikely cause any fatality	<ul style="list-style-type: none"><li>SOP 01: Dredging</li><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><li>SOP 26: Emergency Response Plan</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 /Site Supervisor
		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>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		
Construction of Mobile Barge Terminal and Jetty													

Sl	Activity	Hazards	Reasons	Risk Ranking			Fatality Risk?	Control Measures	Risk Ranking			Residual justification	Responsibility
				Likelihood	Conseq.	Risk			Likelihood	Conseq.	Risk		
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	Dredging/ Construction equipment	Noise exposure	Continuous noise exposure during dredging and other machinery sound	4	3	12	Multiple	<ul style="list-style-type: none"> <li>SOP 01: Dredging</li> <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
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 in the dredge, 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</li> </ul>	3	2	6	Although humans can do little or nothing to protect the	OHS Staff/ Supervisor

Sl	Activity	Hazards	Reasons	Risk Ranking			Fatality Risk?	Control Measures	Risk Ranking			Residual justification	Responsibility
				Likelihood	Conseq.	Risk			Likelihood	Conseq.	Risk		
								<u>Plan</u> <ul style="list-style-type: none"> <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>				incidence or intensity of most natural phenomena but the control measures can reduce the likelihood of the consequences	
<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> <li>SOP 15: Illumination</li> <li>SOP 26: Emergency Response Plan</li> <li>SOP 28: Contractor Security Management</li> </ul>	2	3	6	Largely administrative controls. Likelihood reduced due to <i>lower</i> potential of multiple fatalities	Site engineer
		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 <i>won't</i> 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> </ul>	3	2	6	Although humans can do little or nothing to protect the incidence or	OHS Staff/ Supervisor



Sl	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>Rescue team and boat should be ready for instant use</li> </ul>				intensity of most natural phenomena but the control measures can reduce the likelihood of the consequences	
<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. Slips, trips and falls are common in the construction industry	Site Supervisor
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> </ul>	2	3	6	If natural disaster occurs, it may still result the drowning ships and life loss. None of	OHS Staff/ Supervisor

Sl	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 26: Emergency Response Plan</li> <li>Rescue team and boat should be ready for instant use</li> </ul>				these controls will prevent this type of hazard but it will reduce the likelihood.	

## **Annex 10.1: Summary of the Community Health and Safety Impacts and Risks**



### 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 follow-up actions if health status is negatively affected by the	2	2	4	Medical Doctor/ Community Liaison Officer

Hazards	Reasons	Risk Ranking			Control Measures	Evaluation after measures			Responsibility
		Likelih.	Conseq.	Risk		Likelih.	Conseq.	Risk	
					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.				
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	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.  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.  Develop educational materials regarding vector-borne disease transmission to the communities  Evaluate supporting the community health authorities with lymphatic filariasis eradication programs to ensure adequate	2	3	6	Medical Doctor/OHS manager

Hazards	Reasons	Risk Ranking			Control Measures	Evaluation after measures			Responsibility
		Likelih.	Conseq.	Risk		Likelih.	Conseq.	Risk	
					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	<ul style="list-style-type: none"> <li>The influx of people may bring communicable diseases</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</li> </ul>	2	2	4	Medical Doctor/Gender

Hazards	Reasons	Risk Ranking			Control Measures	Evaluation after measures			Responsibility
		Likelih.	Conseq.	Risk		Likelih.	Conseq.	Risk	
diseases and substance use	<p>to the project 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>local communities in order to avoid project impacts from 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>				Specialist/ 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</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> </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>supervisory and preventative measures may increase 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>				<ul style="list-style-type: none"> <li>Extensive training for Awareness raising strategy which describes how workers and local communities will be sensitized to SEA and SH risks, and the worker's responsibilities under the CoC.</li> <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

Hazards	Reasons	Risk Ranking			Control Measures	Evaluation after measures			Responsibility
		Likelih.	Conseq.	Risk		Likelih.	Conseq.	Risk	
Use of security forces (e.g., police, Ansar, or private security personnel)	Project will engage security forces to ensure human and material security of project-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	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 ESS 2 (Labor conditions) and ESS4 (Community Health, Safety and Security).</li> <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>	2	3	6	OHS manager/ Community 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

Hazards	Reasons	Risk Ranking			Control Measures	Evaluation after measures			Responsibility
		Likelih.	Conseq.	Risk		Likelih.	Conseq.	Risk	
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 Interface in the project area.</li> <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>	2	2	4	OHS Manager/ Community Liaison Officer
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</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	
					<p>arrangements, the Contractor's security policies, and the expected conduct of security personnel.</p> <ul style="list-style-type: none"> <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>				
	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> </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	
	<ul style="list-style-type: none"> <li>Water and sanitation services, such as contaminated water or spread of disease.</li> <li>Electricity supply, which may result in electric shock from electrical cabinets or cables.</li> <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	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.	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



**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 Economic Corridor Development 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, JRECDP-ESIA
- Mr Fazle Rabbe, Biodiversity Specialist, JRECDP-ESIA
- Dr Masud Karim, TL, JRECDP-ESIA
- Dr Md Shibly Sadik, DTL, JRECDP-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 17: Construction and Operation Phase Security
- ESCOP 18: Operation of Heavy Equipment Management
- ESCOP 19: Excavation
- ESCOP 20: 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.

### **ESCOP 1: Waste Management**

<b>Project Activity/ Impact Source</b>	<b>Environmental Impacts</b>	<b>Mitigation Measures/ Management Guidelines</b>
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 bunded 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**

<b>Project Activity/ Impact Source</b>	<b>Environmental Impacts</b>	<b>Mitigation Measures/ Management Guidelines</b>
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 bunded areas (on top of concrete or other impermeable flooring) away from watercourses.</li> <li>• Refueling shall occur only within bunded 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 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 bunded 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 storages 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 waterwater management facilities in site.</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	<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> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	and other aquatic biology.	<ul style="list-style-type: none"> <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 not enter waterways or storm water systems.</li> <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 the 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 waters, 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> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<ul style="list-style-type: none"> <li>Discard all the storage containers that are capable of storing of water, after use or store them in inverted position.</li> </ul>

#### **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 area 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	<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> </ul>



Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	spawning grounds of fish	<ul style="list-style-type: none"> <li>• Install protective measures on site prior to construction, for example, sediment traps.</li> <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 top soil 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 top soil 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 explosive 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**

<b>Project Activity/ Impact Source</b>	<b>Environmental Impacts</b>	<b>Mitigation Measures/ Management Guidelines</b>
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 the residential areas.</li></ul>

**ESCOP 12: Protection of Flora**

<b>Project Activity/ Impact Source</b>	<b>Environmental Impacts</b>	<b>Mitigation Measures/ Management Guidelines</b>
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 need of tree 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 practically 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 of avoid felling trees during construction</li><li>• Supply appropriate fuel (bottled gas) in the work camps to prevent fuel wood collection.</li></ul>

**ESCAP 13: Protection of Fauna**

<b>Project Activity/ Impact Source</b>	<b>Environmental Impacts</b>	<b>Mitigation Measures/ Management Guidelines</b>
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 destruct 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 unremoved 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></ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<ul style="list-style-type: none"> <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 additional traffic plan, if any of his traffic routes are not covered in the Project's Traffic Management Plan, and requires 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	<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 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 in order to avoid social conflict in using the natural resources such as water or to avoid the possible adverse impacts of the construction camps on the surrounding communities.</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	of nearby communities.	<ul style="list-style-type: none"> <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 surveillance over public health, social and security matters.</li> </ul>
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 approval 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	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Provide first aid health care facilities within construction sites.</li> </ul>



Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	diseases and burden on local health services to be transmitted including malaria, exacerbated by inadequate health and safety practices.	<ul style="list-style-type: none"> <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 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.</li> <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	Inadequate 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 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> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<ul style="list-style-type: none"> <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 construction camps.	<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> <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 land-owner) 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>

#### **ESCAP 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 foot prints 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> </ul>

Project Activity/ Impact Source	Environmental Impacts/ risk	Mitigation Measures/ Management Guidelines
		<ul style="list-style-type: none"> <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 encountered in any form, the contractor shall follow the below procedure: <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> </li> <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</li> </ul>

Project Activity/ Impact Source	Environmental Impacts/ risk	Mitigation Measures/ Management Guidelines
		regards to this procedure during the Project implementation or any other stage during the entire project cycle

### **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 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>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 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.</li> <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 the PPE properly by cleaning dirty ones and replacing them with the damaged ones.</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>
	Child and pregnant labor	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• not hire children of less than 14 years of age and pregnant women or women who delivered a child within 8 preceding weeks.</li> </ul>
Accidents	Lack of first aid facilities and health care facilities in the immediate	The Contractor shall

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	vicinity will aggravate the health conditions of the victims	<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> <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 drivers 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>• 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</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<p>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 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 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	<p>Inadequate construction site security poses a significant risk to assets, construction materials and property. Theft/vandalism of assets, materials and property would increase construction costs and cause delays in project completion.</p>	<p>The Contractor shall:</p> <ul style="list-style-type: none"> <li>• Provide appropriate security personnel (i.e. security guards) to prevent unauthorized entry into the camp area. WBG's guideline must be met in this case.</li> <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 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> </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> </ul>

Project Activity/ Impact Source	Impacts /Concerns	Mitigation Measures/ Management Guidelines
		<ul style="list-style-type: none"> <li>• Ensure proper fencing: Fencing should be chain-link at least 2.4 m above high and secured with a steel chain and lock</li> <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>

#### **ESCAP 19: Operation of Heavy Equipment Management**

Project Activity/ Hazard Source	Hazard Risks	Preventive Measures
Grid station, tower erection	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>	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		<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> </ul>



Project Activity/ Hazard Source	Hazard Risks	Preventive Measures
		<ul style="list-style-type: none"> <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 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.</li> <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 in overloading 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> </ul>	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.

Project Activity/ Hazard Source	Hazard Risks	Preventive Measures
	<ul style="list-style-type: none"> <li>• Personal Falls, machinery falls into excavated area or trenches</li> <li>• Water accumulation</li> <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>• 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> <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: <ul 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> </ul> </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: <ul 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.</li> </ul> </li> </ul>

Project Activity/ Hazard Source	Hazard Risks	Preventive Measures
		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.
Selection of Materials and equipment.		<p>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 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> </ul>

Project Activity/ Hazard Source	Hazard Risks	Preventive Measures
		<ul style="list-style-type: none"> <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> <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>

## ESCOP 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 authorised 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>

**ESCOP 21: Dredging and Disposal**

Project Activity	Impacts/Concern	Preventive Measures
Dredging	<ul style="list-style-type: none"><li>• Turbidity Plumes and Sedimentation</li><li>• Water Pollution</li><li>• Disturbance to wildlife</li></ul>	<ul style="list-style-type: none"><li>• Design dredging alignment to reduce the need for capital and subsequent maintenance dredging.</li><li>• Ensuring that dredging and disposal activities are conducted at a time of the year to avoid impacts to sensitive species or critical life-cycle stages (e.g. Breeding of Dolphins).</li><li>• Detection and avoidance of aquatic mammals (Dolphin)</li><li>• Selection of dredge equipment specifically to reduce plume extent and the duration of dredging;</li><li>• Use of specialized equipment (e.g. turtle excluding devices, Pinger);</li><li>• limiting the speed of the cutter head to reduce the amount of material entering the water column</li><li>• Changing dredging schedules based on tide, wind, and background/natural turbidity to minimize effects due to increases in turbidity levels</li><li>• Additional techniques and equipment to minimize adverse impacts on aquatic life from dredging and the resuspension of sediments, include (where practicable) barriers/sheet piles, silt or bubble curtains/screens, and contained sediment transport systems (e.g., pipeline placement)</li><li>• Inspection and monitoring of dredging activities should be conducted regularly to evaluate the impact of operations, the effectiveness of mitigation measures, and the need for technical adjustments to avoid and minimize impacts</li></ul>
Disposal	<p>Land Intake Sedimentation Destruction of habitat</p>	<ul style="list-style-type: none"><li>• Minimization of dredging</li><li>• The maximization of beneficial re-use options for uncontaminated dredged material, such as for wetland creation or enhancements, habitat restoration, land reclamation, or creation of public access/recreational facilities, among other beneficial uses;</li><li>• In case of contaminated dredged materials, use of a comparative risk assessment to determine which final disposal option is optimal, including confined land-based disposal (e.g., in a confined disposal facility or landfill), and/or confined aquatic disposal (e.g., confinement in the aquatic environment beneath a cap of clean sediment), and/or use of open sea disposal.</li><li>• If reuse is not possible, disposal sites should be identified in consultation with local people</li><li>• Compensation, resettlement should be commenced in case of land acquisition as per ESS5.</li><li>• Treatment of contaminated dredged materials (e.g., using physical, chemical, and biological methods) should be evaluated as part of each management option to reduce/control impacts to human health and the environment based on the characterization of dredged materials and the comparative risk assessment</li><li>• the final disposal of contaminated dredged materials, should consider the waste management guidance for non-hazardous and hazardous waste in the General EHS Guidelines of World Bank Group</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>11</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.

- 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 JRECDP

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<sup>11</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>



- 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 JRECDP
- 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: 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				
Consultation conducted in June 2021.								
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>The river is silted up and require dredging</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></ul>	<ul style="list-style-type: none"><li>Sustainability and stabilization of char</li><li>Need regular basis dredging of the river and char protection work to stabilize the char</li><li>People are mainly agricultural farmer</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
		Total	Male	Female				
						<ul style="list-style-type: none"> <li>Stakeholder engagement process and World bank policies on disclosure</li> </ul>	<ul style="list-style-type: none"> <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>	
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>Maintenance dredging is mandatory to protect the river erosion</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,	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> </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> </ul>

Place	Date	Participants			Type of Consultation	Issue discussed	Key points raised	Action Taken
		Total	Male	Female				
Dewanganj, Jamalpur.							<ul style="list-style-type: none"> <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>SOP 2 might consider livelihood restoration for the erosion evicted people</li> </ul>
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>The river is silted up and require dredging</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,	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> </ul>	<ul style="list-style-type: none"> <li>River erosion accelerated after the construction of Banggabandhu bridge</li> </ul>	<ul style="list-style-type: none"> <li>SOP 2 might consider this area to be protected</li> </ul>

Place	Date	Participants			Type of Consultation	Issue discussed	Key points raised	Action Taken
		Total	Male	Female				
Bhuapur, Tangail						<ul style="list-style-type: none"> <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>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>The compensation for ladn acquisition has been duly considered under RPF</li> </ul>
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 ladn acquisition has been duly considered under RPF</li> </ul>
Gandhail Union Parishad,	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</li> </ul>	<ul style="list-style-type: none"> <li>The chars of under the union is under threat of erosion,</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
		Total	Male	Female				
Kazipur, Sirajganj						environment and social impacts <ul style="list-style-type: none"> <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>• 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>• The river is silted up and require dredging</li> <li>• People shows their positive attitude about the project</li> </ul>	
Purbo khuksia, 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>• Maintenance dredging is mandatory to protect the river erosion</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> <li>• Need livelihood assistance during river dredging</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>• Need regular basis dredging of the river and char protection work to stabilize the char</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
		Total	Male	Female				
							<ul style="list-style-type: none"> <li>• People are mainly agricultural farmer</li> <li>• Once a land goes into the river, it declared as <i>khash</i> 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>	
<b>Consultation meetings conducted in September and November 2021</b>								
Pingna, Sharishabari, Jamalpur	14 Sept. 2021	8	8	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>• 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>• 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>
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, Kazipur, Sirajganj	14 Sept. 2021	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> </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>• C 1 also considered flood proofing measures</li> </ul>



Place	Date	Participants			Type of Consultation	Issue discussed	Key points raised	Action Taken
		Total	Male	Female				
						<ul style="list-style-type: none"> <li>Stakeholder engagement process and World bank policies on disclosure</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 <i>Asroyon</i>/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>
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</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> </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>

[illegible]

Place	Date	Participants			Type of Consultation	Issue discussed	Key points raised	Action Taken
		Total	Male	Female				
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 Plan has been prepared</li> </ul>
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 benefitted 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</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
		Total	Male	Female				
							canal will be silted up again and erosion could take place <ul style="list-style-type: none"> <li>Working opportunity in the project</li> <li>Provide proper compensation for loss of land</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>

**Table 2: Details of the Information Stakeholder Consultation Conducted in Kaoakola Char**

Type of Discussion	Date	Place	Participants	Opinion
Informal FGD1	20/01/2022	Bonnir Char	Total 11 M 8 F 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>

<b>Informal FGD2</b>	20/01/2022	Baraitola ghat	Total 12 M 12	<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>
<b>Informal FGD3</b>	19/01/2022	Khijirpur / Mecchra	Total 8 M 6 F 2	<ul style="list-style-type: none"> <li>If the total khal is excavated from baraitola to Mechra 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, Kaoakola**

In Katanga Primary School, Kawakhola Char, Sirajganj, formal public consultation meeting was held on 21 January 2022, and totally 60 participate were attend the meeting and among them 20 were female and 40 were male.

<b>Sl no</b>	<b>Potential CDD Activity proposed by Feasibility Team</b>	<b>Findings from the Consultation</b>	<b>Opinion of the local people on E&amp;S Impacts and Risks</b>
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>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>

Sl no	Potential CDD Activity proposed by Feasibility Team	Findings from the Consultation	Opinion of the local people on E&S Impacts and Risks
		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.	
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.
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 dredged/ excavated materials</li> <li>• If the banks of the re-excavated canal are not protected, it would increase erosion risk significantly.</li> </ul>	In our opinion, this proposed activity is associated with high or substantial E&S risk and should be decided on the basis of hydro-dynamic modeling. Therefore, it may not comply with the CDD work criteria <sup>12</sup> . It can be included as an additional activity of C1 and in that case further E&S survey, RAP, stakeholder consultation etc. are needed to revise the current ESIA.
4	Construction of new rural roads to improve connectivity and resilience	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	Such activity involves land acquisition and substantial environmental and social risk.

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<sup>12</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
		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.	
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.
6	Construction of a flood shelter/raised platform in the village	Highly beneficial and support the concept of flood proofing strategy for char livelihood. Community can identify such area and donate lands for such development. Besides the implementing agency can find government land for such development as well.	The E&S risk associated with such activities is generally moderate to low. But source of earth/sand for construction is an issue.
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 Kaowakholi 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 Mechhra will also agree with the proposed activities. There is an opportunity to optimize the dredging in the section of the canal which flows across the Mechhra 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 dredged materials on unused land, schoolyard, hospital yard, marketplace, lowlands and other community facility areas.</li><li>• Local people, upon agreement of the fact that, if proper compensation is paid, they can allow constructing flood shelters on their currently occupied land as well.</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>• It was clearly explained to the local people that even though if they do not have legal proof of ownership of land, as per the requirement of WB, during construction of any raised platform/flood shelter, land occupants will be compensated.</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

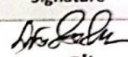
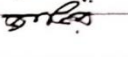
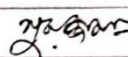
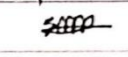
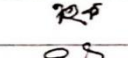
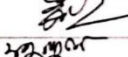
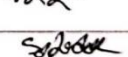
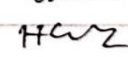
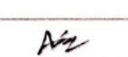
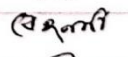
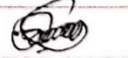

## Participants List

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: Chikarani Vill: Chikarani

Sl No.	Name	Occupation/Designation	Address	Signature
১	শ্রী: মতিউর রহমান	ইউনিয়ন পরিষদ	২৭৬ চও আমবা ইউনিয়ন	
২	শ্রী: রাসেল ইসলাম	ছাত্র	চিকারানী-১০ গ্রাম	
৩	শ্রী: মৃত্যুঞ্জয়	ইউ.পি. সদস্য	৩৭৬ চিকারানী গ্রাম	
৪	শ্রী: মোঃ মাসুদ	"	" " ২	
৫	শ্রী: মনোজ	"	" " ২	
৬	শ্রী: ইব্রাহিম খান	"	" " ০৬	
৭	শ্রী: মজিবুর রহমান	মেজর		
৮	মোহাম্মদ সাব্বাহ আলী	ইউনিয়ন পরিষদ	২৭৬ চও আমবা ইউনিয়ন	
৯	শ্রী: মাহবুবুল হক	ইউনিয়ন পরিষদ	২৭৬ চও আমবা ইউনিয়ন	
১০	শ্রী: মোহাম্মদ হুসেইন	ইউনিয়ন পরিষদ	২৭৬ চও আমবা ইউনিয়ন	
১১	মোহাম্মদ বেলাল হোসেন	ইউনিয়ন পরিষদ	২৭৬ চও আমবা ইউনিয়ন	
১২	শ্রী: মোহাম্মদ হুমায়ুন	মহাসচিব আমবা ইউনিয়ন	২৭৬ চও আমবা ইউনিয়ন চিকারানী	



Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Jamulpur Upazila: Dewanganj Union: Chikarjani Vill: Chikarjani

Sl No.	Name	Occupation/Designation	Address	Signature
১০	শ্রী: বসন্ত কামাল	শ্রী: বসন্ত	বাসন্ত কামাল বাড়ি, চিকারজাণী, চিকারজাণী ইউনিয়ন, দেওয়ানজি উপজেলা, জামালপুর জেলা	
১৪	শ্রী: আবদুল হাকিম	F.P.P. V.	চিকারজাণী	আবদুল হাকিম
১৫	শ্রী: বিলকিস আলী	F.P.P. V.	চিকারজাণী	বিলকিস আলী
১৬	শ্রী: জাহাঙ্গীর	চাকর -	11	জাহাঙ্গীর
১৭	শ্রী: বসন্ত কামাল	F.P.P. V.	"	বসন্ত কামাল
১৮	(এক)	F.P.P. V.	"	এক
১৯	বাসন্ত কামাল	F.P.P. V.	"	বাসন্ত কামাল
২০	Subir Kumar Datta	S.A.E P.O office	Dewanganj.	Subir Kumar Datta
২১	শ্রী: আবদুল হাকিম	u.p.m.	চিকারজাণী ইউনিয়ন	আবদুল হাকিম
২২	শ্রী: আবদুল হাকিম	Secretary	চিকারজাণী ইউনিয়ন	আবদুল হাকিম
২৬	শ্রী: আবদুল হাকিম	up secretary	চিকারজাণী ইউনিয়ন	আবদুল হাকিম
২৮	শ্রী: আবদুল হাকিম	UP, S.A.E	"	আবদুল হাকিম

Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

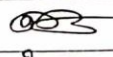
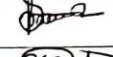
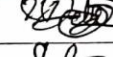

District: Jamalpur Upazila: Dewanganj Union: Chikazani Vill: Chikazani

Sl No.	Name	Occupation/Designation	Address	Signature
১৫	শ্রীমান মোহাম্মদ আলী	সকলিয়ার	সিদ্দিকী রোড/নতুন	
১৬	শ্রীমান মোহাম্মদ আলী	সকলিয়ার	সিদ্দিকী রোড/নতুন	
১৭	শ্রীমান মোহাম্মদ আলী	সকলিয়ার	সিদ্দিকী রোড/নতুন	
১৮	শ্রীমান মোহাম্মদ আলী	সকলিয়ার	সিদ্দিকী রোড/নতুন	
১৯	শ্রীমান মোহাম্মদ আলী	সকলিয়ার	সিদ্দিকী রোড/নতুন	
২০	শ্রীমান মোহাম্মদ আলী	সকলিয়ার	সিদ্দিকী রোড/নতুন	
২১	শ্রীমান মোহাম্মদ আলী	সকলিয়ার	সিদ্দিকী রোড/নতুন	
২২	শ্রীমান মোহাম্মদ আলী	সকলিয়ার	সিদ্দিকী রোড/নতুন	
২৩	শ্রীমান মোহাম্মদ আলী	সকলিয়ার	সিদ্দিকী রোড/নতুন	
২৪	শ্রীমান মোহাম্মদ আলী	সকলিয়ার	সিদ্দিকী রোড/নতুন	
২৫	শ্রীমান মোহাম্মদ আলী	সকলিয়ার	সিদ্দিকী রোড/নতুন	
২৬	শ্রীমান মোহাম্মদ আলী	সকলিয়ার	সিদ্দিকী রোড/নতুন	
২৭	শ্রীমান মোহাম্মদ আলী	সকলিয়ার	সিদ্দিকী রোড/নতুন	
২৮	শ্রীমান মোহাম্মদ আলী	সকলিয়ার	সিদ্দিকী রোড/নতুন	
২৯	শ্রীমান মোহাম্মদ আলী	সকলিয়ার	সিদ্দিকী রোড/নতুন	
৩০	শ্রীমান মোহাম্মদ আলী	সকলিয়ার	সিদ্দিকী রোড/নতুন	

Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Jamulpur Upazila: Dewanganj Union: Chikazani Vill: Chikaganj

Sl No.	Name	Occupation/Designation	Address	Signature
৩২	আব্দুল হামিদ	UP সদস্য	চিকাগনি	
৩২	আব্দুল কাদের	UP সদস্য	চিকাগনি	
৩৩	আব্দুল মালিক	বাসস	চিকাগনি	
৩৪	আব্দুল হান্নান	চিকাগনি	চিকাগনি	

Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: ভাগালপুর Upazila: পাটনামাছ Union: চুনিয়াড়ী Vill: চক্ৰবৰ্তী হাট

Sl No.	Name	Occupation/Designation	Address	Signature
১	শ্রী: রাজাশাহ	কিষক	চক্ৰবৰ্তী	
২	শ্রী: বাজুদা	কিষক	চক্ৰবৰ্তী	
৩	শ্রী: মুকুল হৈপলা	বাগীচ	চক্ৰবৰ্তী	
৪	শ্রী: মোহা আলম	কৃষি	চক্ৰবৰ্তী	
৫	শ্রী: সুব্রত খৈলি	কৃষি	চক্ৰবৰ্তী	
৬	শ্রী: মুজাফ্ফার (বাবা)	কৃষি	চক্ৰবৰ্তী	
৭	শ্রী: মুন্না	কৃষি	চক্ৰবৰ্তী	
৮	শ্রী: শমসুজ্জামান	কৃষি	চক্ৰবৰ্তী	
৯	শ্রী: আজিজুল	কৃষি	চক্ৰবৰ্তী	
১০	মুন্না	কৃষি	চক্ৰবৰ্তী	
১১	আবুল কালাম	ইউনিয়ন কর্মকর্তা	চক্ৰবৰ্তী	
১২	শ্রী: জামান	ইন্সপেক্টর	চক্ৰবৰ্তী	



Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: শ্রীহামানলুপ্ত Upazila: পেটপান চাও Union: চুখিইবাড়ী Vill: চক্ৰাবৰ্তী

SI No.	Name	Occupation/Designation	Address	Signature
২০	শ্রী প্রদীপ (স্বামী)	পূজি	চক্ৰাবৰ্তী	স্বামী
২৪	শ্রী অমল	পূজি	চক্ৰাবৰ্তী	অমল
২৫	শ্রী সুব্রত	পূজি	চক্ৰাবৰ্তী	স্বামী
২৬	শ্রী অমল কলম	পূজি/চিকিৎসক	চক্ৰাবৰ্তী	অমল

Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Jamalpur Upazila: Dewanganj Union: Chikaganj Vill: Kholabari

Sl No.	Name	Occupation/Designation	Address	Signature
১	Shohel	হাট/মসজিদ	খোলাবাড়ী	Shohel
২	আল-আমিন	হাট/মসজিদ	খোলাবাড়ী	Amr
৩	আজিম	হাট/মসজিদ	খোলাবাড়ী	Amr
৪	সো: অমিন ইসলাম	হাট/মসজিদ	খোলাবাড়ী	Amr
৫	সো: অমিন	হাট/মসজিদ	খোলাবাড়ী	Amr
৬	সো: দুলাল	হাট/মসজিদ	খোলাবাড়ী	Amr
৭	সো: অমিন/মসজিদ	হাট/মসজিদ	খোলাবাড়ী	Amr
৮	সো: দুলাল	হাট/মসজিদ	খোলাবাড়ী	Amr
৯	সো: অমিন/মসজিদ	হাট/মসজিদ	খোলাবাড়ী	Amr
১০	সো: অমিন	হাট/মসজিদ	খোলাবাড়ী	Amr
১১	সো: অমিন	হাট/মসজিদ	খোলাবাড়ী	Amr
১২	সো: অমিন	হাট/মসজিদ	খোলাবাড়ী	Amr
১৩	সো: অমিন	হাট/মসজিদ	খোলাবাড়ী	Amr
১৪	সো: অমিন	হাট/মসজিদ	খোলাবাড়ী	Amr
১৫	সো: অমিন	হাট/মসজিদ	খোলাবাড়ী	Amr
১৬	সো: অমিন	হাট/মসজিদ	খোলাবাড়ী	Amr
১৭	সো: অমিন	হাট/মসজিদ	খোলাবাড়ী	Amr
১৮	সো: অমিন	হাট/মসজিদ	খোলাবাড়ী	Amr
১৯	সো: অমিন	হাট/মসজিদ	খোলাবাড়ী	Amr
২০	সো: অমিন	হাট/মসজিদ	খোলাবাড়ী	Amr
২১	সো: অমিন	হাট/মসজিদ	খোলাবাড়ী	Amr
২২	সো: অমিন	হাট/মসজিদ	খোলাবাড়ী	Amr



Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Jamalpur Upazila: Dewanganj Union: Chukazari Vill: Kholabari

SI No.	Name	Occupation/Designation	Address	Signature
১০	শ্রী: মতিউজ্জামিন	কৃষি	চৌমালা বাড়ী	মতিউজ্জামিন
১১	শ্রী: মোহাম্মদ মিয়া	কৃষি	চৌমালা বাড়ী	মোহাম্মদ মিয়া
১২	শ্রী: মোহাম্মদ আলম	কৃষি	চৌমালা বাড়ী	মোহাম্মদ আলম
১৩	শ্রী: মোহাম্মদ মিয়া	কৃষি	চৌমালা বাড়ী	মোহাম্মদ মিয়া
১৪	শ্রী: মোহাম্মদ মিয়া	কৃষি	চৌমালা বাড়ী	মোহাম্মদ মিয়া
১৫	শ্রী: মোহাম্মদ মিয়া	কৃষি	চৌমালা বাড়ী	মোহাম্মদ মিয়া
১৬	শ্রী: মোহাম্মদ মিয়া	কৃষি	চৌমালা বাড়ী	মোহাম্মদ মিয়া
১৭	শ্রী: মোহাম্মদ মিয়া	কৃষি	চৌমালা বাড়ী	মোহাম্মদ মিয়া
১৮	শ্রী: মোহাম্মদ মিয়া	কৃষি	চৌমালা বাড়ী	মোহাম্মদ মিয়া
১৯	শ্রী: মোহাম্মদ মিয়া	কৃষি	চৌমালা বাড়ী	মোহাম্মদ মিয়া
২০	শ্রী: মোহাম্মদ মিয়া	কৃষি	চৌমালা বাড়ী	মোহাম্মদ মিয়া
২১	শ্রী: মোহাম্মদ মিয়া	কৃষি	চৌমালা বাড়ী	মোহাম্মদ মিয়া
২২	শ্রী: মোহাম্মদ মিয়া	কৃষি	চৌমালা বাড়ী	মোহাম্মদ মিয়া

Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Jamalpur Upazila: Dewanganj Union: Chikajuri Vill: Khatobaru

Sl No.	Name	Occupation/Designation	Address	Signature
১	ডিম্পল খান	কৃষি	(খোলাবাড়ী)-	ডিম্পল
২	শ্রী: আমজাদ হোসেন	কৃষি	(খোলাবাড়ী)	Amir
৩	শ্রী: শ্রী: রাসুল	১। কৃষি	১	রাসুল
৪	শ্রী: মুহাঃ আলম	" কৃষি	"	মুহাঃ আলম
৫	শ্রী: আব্দুল হুসেন	শ্রী: শিক্ষক	"	শ্রী: হুসেন
৬	শ্রী: মাহবুবুল হক	কৃষি	(খোলাবাড়ী)-	মাহবুব
৭	শ্রী: মাহবুবুল	কৃষি	(খোলাবাড়ী)-	মাহবুব
৮	শ্রী: মাহবুবুল	কৃষি	(খোলাবাড়ী)-	মাহবুব
৯	শ্রী: মাহবুবুল	কৃষি	(খোলাবাড়ী)-	মাহবুব
১০	শ্রী: মাহবুবুল	কৃষি	(খোলাবাড়ী)-	মাহবুব
১১	শ্রী: মাহবুবুল	কৃষি	(খোলাবাড়ী)-	মাহবুব
১২	শ্রী: মাহবুবুল	কৃষি	(খোলাবাড়ী)-	মাহবুব
১৩	শ্রী: মাহবুবুল	কৃষি	(খোলাবাড়ী)-	মাহবুব
১৪	শ্রী: মাহবুবুল	কৃষি	(খোলাবাড়ী)-	মাহবুব
১৫	শ্রী: মাহবুবুল	কৃষি	(খোলাবাড়ী)-	মাহবুব
১৬	শ্রী: মাহবুবুল	কৃষি	(খোলাবাড়ী)-	মাহবুব
১৭	শ্রী: মাহবুবুল	কৃষি	(খোলাবাড়ী)-	মাহবুব
১৮	শ্রী: মাহবুবুল	কৃষি	(খোলাবাড়ী)-	মাহবুব
১৯	শ্রী: মাহবুবুল	কৃষি	(খোলাবাড়ী)-	মাহবুব
২০	শ্রী: মাহবুবুল	কৃষি	(খোলাবাড়ী)-	মাহবুব
২১	শ্রী: মাহবুবুল	কৃষি	(খোলাবাড়ী)-	মাহবুব
২২	শ্রী: মাহবুবুল	কৃষি	(খোলাবাড়ী)-	মাহবুব

Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Jamulpur Upazila: Dewanganj Union: Chikarabari Vill: Kholabari Date: 22.06

Sl No.	Name	Occupation/Designation	Address	Signature
১৩	শ্রীঃ পূর্ণানন্দ	গ্রামাধ্যক্ষ	খোলাবাড়ী	পূর্ণানন্দ
১৪	শ্রীঃ আঃ খালেক	কৃষি	৫	খালেক
১৫	৫ বারিচন্দ্র	কৃষি	৫	বারিচন্দ্র
১৬	৫ (আন) মিয়া	কৃষি	৫	আন মিয়া
১৭	৫ আঃ বারি	গ্রামাধ্যক্ষ	খোলাবাড়ী	বারি
১৮	৫ মাহমুদুল আলম	কৃষি	খোলাবাড়ী	মাহমুদুল আলম

Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: ভাঙ্গালপুর Upazila: পেটয়ানগড় Union: চিলভানী Vill: ২নং খোলাবাড়ী

Sl No.	Name	Occupation/Designation	Address	Signature
১	মোঃ মোস্তাফিজ	কৃষি	২নং খোলাবাড়ী	মোঃ মোস্তাফিজ
২	জিয়াব আলী	কৃষি	২নং খোলাবাড়ী	জিয়াব আলী
৩	মোঃ বিজয় কুমার	কৃষি	২নং খোলাবাড়ী	বিজয় কুমার
৪	মোঃ আব্দুল হান্নান	কৃষি	২নং খোলাবাড়ী	আব্দুল হান্নান
৫	মোঃ হোসেন	কৃষি	২নং খোলাবাড়ী	হোসেন
৬	মোঃ বাবুল হোসেন	কৃষি	২নং খোলাবাড়ী	বাবুল হোসেন
৭	মোঃ হুমায়ুন	কৃষি	২নং খোলাবাড়ী	হুমায়ুন
৮	মোঃ আব্দুল	কৃষি	২নং খোলাবাড়ী	আব্দুল
৯	মোঃ মোস্তাফিজ হোসেন	কৃষি	২নং খোলাবাড়ী	মোস্তাফিজ হোসেন
১০	মোঃ রফিক	কৃষি	২নং খোলাবাড়ী	রফিক
১১	মোঃ আব্দুল আলী	কৃষি	২নং খোলাবাড়ী	আব্দুল আলী
১২	মোঃ	কৃষি	২নং খোলাবাড়ী	মোঃ
১৩	মোঃ মোঃ আলী	কৃষি	২নং খোলাবাড়ী	মোঃ মোঃ আলী





Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Tangail Upazila: Bhuapur Union: Gobindaski Vill: Gobindaski Date: 23.6

Sl No.	Name	Occupation/Designation	Address	Signature
1	শ্রী ব্রজেন্দ্র কুমার	কৃষক	গোবিন্দস্কি	
2	শ্রী ব্রজেন্দ্র কুমার	কৃষক	গোবিন্দস্কি	
3	শ্রী ব্রজেন্দ্র কুমার	SAAO	"	
4	শ্রী ব্রজেন্দ্র কুমার	SAAO	"	
5	শ্রী ব্রজেন্দ্র কুমার	SAAO	"	
6	শ্রী ব্রজেন্দ্র কুমার	সেবাসমিতি	গোবিন্দস্কি	
7	শ্রী ব্রজেন্দ্র কুমার	কৃষক	গোবিন্দস্কি	
8	শ্রী ব্রজেন্দ্র কুমার	জিকি	রাউৎ বাড়ি	ব্রজেন্দ্র
9	শ্রী ব্রজেন্দ্র কুমার	ইউ.পি. সদস্য	গোবিন্দস্কি	
20	শ্রী ব্রজেন্দ্র কুমার	ইউ.পি. সদস্য	গোবিন্দস্কি	গোবিন্দ
১১	শ্রী ব্রজেন্দ্র কুমার	ইউ.পি. সদস্য	গোবিন্দস্কি	
১২	শ্রী ব্রজেন্দ্র কুমার	ইউ.পি. সদস্য	গোবিন্দস্কি	

Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Tangail Upazila: Bhuapur Union: Grobindaski Vill: Grobindaski Date: 23.6

Sl No.	Name	Occupation/Designation	Address	Signature
1	শ্রীমতী সুলতানা হুসনা	কমিউনিটি	গোবিন্দস্কি	
২	শ্রীমতী সুলতানা হুসনা	কমিউনিটি	গোবিন্দস্কি	
৩	শ্রীমতী সুলতানা হুসনা	SAAO	"	
৪	শ্রীমতী সুলতানা হুসনা	SAAO	"	
৫	শ্রীমতী সুলতানা হুসনা	SAAO	"	
৬	শ্রীমতী সুলতানা হুসনা	ইউনিয়ন সচিব	গোবিন্দস্কি	
৭	শ্রীমতী সুলতানা হুসনা	কমিউনিটি	গোবিন্দস্কি	
৮	শ্রীমতী সুলতানা হুসনা	জিক্রী	রাউৎ বাড়ি	শ্রীমতী সুলতানা হুসনা
৯	শ্রীমতী সুলতানা হুসনা	ইউনিয়ন সচিব	গোবিন্দস্কি	
১০	শ্রীমতী সুলতানা হুসনা	ইউনিয়ন সচিব	গোবিন্দস্কি	শ্রীমতী সুলতানা হুসনা
১১	শ্রীমতী সুলতানা হুসনা	ইউনিয়ন সচিব	গোবিন্দস্কি	
১২	শ্রীমতী সুলতানা হুসনা	ইউনিয়ন সচিব	গোবিন্দস্কি	

Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Tangail Upazila: Bhuapur Union: Gobindashu Vill: Gobindashu Date: 23.06

Sl No.	Name	Occupation/Designation	Address	Signature
১৫	কামাল হোসেন	কৃষক	৩৩৩০০০০০০	কামাল
১৬	বিনয় কান্ত কামাল	কৃষক	কামাল	বিনয়
১৭	আবুল কালাম	কৃষক	কামাল	আবুল
১৮	আবুল কালাম	কৃষক	কামাল	আবুল
১৯	আবুল কালাম	কৃষক	কামাল	আবুল
২০	আবুল কালাম	কৃষক	কামাল	আবুল
২১	আবুল কালাম	কৃষক	কামাল	আবুল
২২	আবুল কালাম	কৃষক	কামাল	আবুল
২৩	আবুল কালাম	কৃষক	কামাল	আবুল
২৪	আবুল কালাম	কৃষক	কামাল	আবুল
২৫	আবুল কালাম	কৃষক	কামাল	আবুল
২৬	আবুল কালাম	কৃষক	কামাল	আবুল
২৭	আবুল কালাম	কৃষক	কামাল	আবুল
২৮	আবুল কালাম	কৃষক	কামাল	আবুল



Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Tangail Upazila: Bhupur Union: Gobindashi Vill: Gobindashi Date: 23.06

Sl No.	Name	Occupation/Designation	Address	Signature
২৫	ডেব্রুজ	স্বামী	দাম্রুজ বাড়ী	ডেব্রুজ
২৬	আমিনুল ইসলাম	সহকারী	কল্লি মাড়ি	আমিনুল
২৭	শেখ রুয়েল	সহকারী	বুঝা দাড়া	শেখ রুয়েল
২৮				
২৯				
৩০				

Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Tangail Upazila: Bhuapur Union: Nikrawul Vill: patilapara Date: 23.06

Sl No.	Name	Occupation/Designation	Address	Signature
১	হানুয়ার	ব্যবসায়ী	মারিচিলাপাড়া	হানুয়ার
২	মোঃ নকিবুল হক	কৃষক	মারিচিলাপাড়া	নকিবুল
৩	হুমায়ুন	কৃষিজাত	মারিচিলাপাড়া	হুমায়ুন
৪	মুজিবুল	কৃষিজাত	মারিচিলাপাড়া	মুজিবুল
৫	জুবাইর	কৃষিজাত	মারিচিলাপাড়া	জুবাইর
৬	মোঃ মাসুদ ২১২	কৃষিজাত	মারিচিলাপাড়া	২১২
৭	মোঃ মোস্তফিজুল হক	কৃষিজাত	মারিচিলাপাড়া	মোস্তফিজুল
৮	মোঃ মাহমুদুল হক	কৃষি	মারিচিলাপাড়া	মাহমুদুল
৯	সফাতুল	কৃষি	মারিচিলাপাড়া	সফাতুল
১০	আমির	কৃষি	মারিচিলাপাড়া	আমির
১১	আবদুল	কৃষি	মারিচিলাপাড়া	আবদুল
১২	আজিজুল	কৃষিজাত	মারিচিলাপাড়া	আজিজুল

Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Tongail Upazila: Bhuapur Union: Nikrail Vill: Petitapara Date: 23.0

Sl No.	Name	Occupation/Designation	Address	Signature
১৫	মোঃ আলী	কৃষক	পশ্চিম পাড়া	মোঃ আলী
১৬	মোঃ আলী	কৃষক	পশ্চিম পাড়া	মোঃ আলী
১৭	মোঃ আলী	কৃষক	পশ্চিম পাড়া	মোঃ আলী
১৮	মোঃ আলী	কৃষক	পশ্চিম পাড়া	মোঃ আলী
১৯	মোঃ আলী	কৃষক	পশ্চিম পাড়া	মোঃ আলী
২০	মোঃ আলী	কৃষক	পশ্চিম পাড়া	মোঃ আলী
২১	মোঃ আলী	কৃষক	পশ্চিম পাড়া	মোঃ আলী
২২	মোঃ আলী	কৃষক	পশ্চিম পাড়া	মোঃ আলী
২৩	মোঃ আলী	কৃষক	পশ্চিম পাড়া	মোঃ আলী
২৪	মোঃ আলী	কৃষক	পশ্চিম পাড়া	মোঃ আলী
২৫	মোঃ আলী	কৃষক	পশ্চিম পাড়া	মোঃ আলী

Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Tongail Upazila: Bhucpur Union: NIKRAUL Vill: Dhovaiya Date: 23.06

Sl 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 রশিদুল রহমান	কৃষক	দোভায়া	
৫	মোঃ এরশাদ মিয়া	ব্যবসা	পাড়িতাপাড়া	
৬	মোঃ মুজাফর প্রাঃ	কৃষক	বাহাদুর টুকনা	
৭	মোঃ ছুরামান আলী	ব্যবসা	পাড়িতাপাড়া	
৮	মোঃ জামাল প্রাঃ	কৃষক	বাহাদুর টুকনা	মোঃ নবাবজি
৯	মোঃ নবাব আলী	দ্রাষ্টব্য	পাড়িতাপাড়া	মোঃ নবাবজি
১০	মোঃ মোকাম্মদ প্রাঃ	১১	দোভায়া	মোঃ নবাবজি
১১	মোঃ খালিদ মোঃ	কৃষক	পাড়িতাপাড়া	খালিদ
১২	মোঃ আনজু প্রাঃ	দ্রাষ্টব্য	বাহাদুর টুকনা	আনজু



Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Tangail Upazila: Bhucapure Union: NIKRAUL Vill: Dhovaiya Date: 23.0

Sl No.	Name	Occupation/Designation	Address	Signature
১৬	সমঃ সারদুল হোসেন	ডাঃ	দোভায়া	সারদুল
১৮	সমঃ জামাল খান	কৃষি	দোভায়া	জামাল
১৯	আবদুল আলী	কৃষি	দোভায়া	আবদুল
২০	সমঃ দুসমান -	কৃষি	দোভায়া	দুসমান
২১	সমঃ বাবুল	কৃষি	দোভায়া	বাবুল
২২	<del>সমঃ বাবুল</del> সমঃ আবদুল	কৃষি	দোভায়া -	আবদুল
২৩	আবদুল হামিদ	কৃষি	দোভায়া	হামিদ
২৪	সমঃ নাজিমুল হোসেন	কৃষি	দোভায়া	নাজিম
২৫	সমঃ সারদুল হোসেন	কৃষি	দোভায়া	সারদুল

Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

Shiras jang  
District: ~~Bandar~~ Upazila: Kazipur Union: ~~Bandar~~ Vill: ~~Bandar~~ Date: 24.06

Sl No.	Name	Occupation/Designation	Address	Signature
১	মোঃ হুমায়ুন কবীর	ইউনিয়ন পরিষদ	মুন্সিগঞ্জ	
২	মোঃ আব্দুল হাফিজ	বাংলাদেশ বাণিজ্যিক	১১	মোঃ হাফিজ
৩	মোঃ রফিকুল আলম	ইউনিয়ন পরিষদ	১১	
৪	মোঃ হুমায়ুন কবীর	ইউনিয়ন পরিষদ	মুন্সিগঞ্জ	
৫	মোঃ আব্দুল হাফিজ	ইউনিয়ন পরিষদ	কানাইপুর	
৬	মোঃ হুমায়ুন কবীর	ইউনিয়ন পরিষদ	বঙ্গবাজার	মুন্সিগঞ্জ
৭	মোঃ হুমায়ুন কবীর	ইউনিয়ন পরিষদ	মুন্সিগঞ্জ	মুন্সিগঞ্জ
৮	মোঃ হুমায়ুন কবীর	ইউনিয়ন পরিষদ	বঙ্গবাজার	মুন্সিগঞ্জ
৯	মোঃ হুমায়ুন কবীর	ইউনিয়ন পরিষদ	মুন্সিগঞ্জ	মুন্সিগঞ্জ
১০	মোঃ হুমায়ুন কবীর	ইউনিয়ন পরিষদ	বঙ্গবাজার	মুন্সিগঞ্জ
১১	মোঃ হুমায়ুন কবীর	ইউনিয়ন পরিষদ	বঙ্গবাজার	মুন্সিগঞ্জ
১২	মোঃ হুমায়ুন কবীর	ইউনিয়ন পরিষদ	বঙ্গবাজার	মুন্সিগঞ্জ

Participant List  
Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Shirajganj Upazila: Kazipur Union: Gandaul Vill: Gandaul Date: 24.06

Sl No.	Name	Occupation/Designation	Address	Signature
২৬	শ্রী: হুমায়ুন হুসাইন	কৃষক	নাজির মুন্সিগঞ্জ	হুমায়ুন হুসাইন
২৮	শ্রী: মোঃ হুমায়ুন হুসাইন	কৃষক	নাজির মুন্সিগঞ্জ	হুমায়ুন হুসাইন
২৯	শ্রী: মোঃ হুমায়ুন হুসাইন	কৃষক	নাজির মুন্সিগঞ্জ	হুমায়ুন হুসাইন
৩০	শ্রী: মোঃ হুমায়ুন হুসাইন	কৃষক	নাজির মুন্সিগঞ্জ	হুমায়ুন হুসাইন
৩১	শ্রী: মোঃ হুমায়ুন হুসাইন	কৃষক	নাজির মুন্সিগঞ্জ	হুমায়ুন হুসাইন
৩২	শ্রী: মোঃ হুমায়ুন হুসাইন	কৃষক	নাজির মুন্সিগঞ্জ	হুমায়ুন হুসাইন
৩৩	শ্রী: মোঃ হুমায়ুন হুসাইন	কৃষক	নাজির মুন্সিগঞ্জ	হুমায়ুন হুসাইন
৩৪	শ্রী: মোঃ হুমায়ুন হুসাইন	কৃষক	নাজির মুন্সিগঞ্জ	হুমায়ুন হুসাইন
৩৫	শ্রী: মোঃ হুমায়ুন হুসাইন	কৃষক	নাজির মুন্সিগঞ্জ	হুমায়ুন হুসাইন
৩৬	শ্রী: মোঃ হুমায়ুন হুসাইন	কৃষক	নাজির মুন্সিগঞ্জ	হুমায়ুন হুসাইন
৩৭	শ্রী: মোঃ হুমায়ুন হুসাইন	কৃষক	নাজির মুন্সিগঞ্জ	হুমায়ুন হুসাইন
৩৮	শ্রী: মোঃ হুমায়ুন হুসাইন	কৃষক	নাজির মুন্সিগঞ্জ	হুমায়ুন হুসাইন
৩৯	শ্রী: মোঃ হুমায়ুন হুসাইন	কৃষক	নাজির মুন্সিগঞ্জ	হুমায়ুন হুসাইন
৪০	শ্রী: মোঃ হুমায়ুন হুসাইন	কৃষক	নাজির মুন্সিগঞ্জ	হুমায়ুন হুসাইন
৪১	শ্রী: মোঃ হুমায়ুন হুসাইন	কৃষক	নাজির মুন্সিগঞ্জ	হুমায়ুন হুসাইন
৪২	শ্রী: মোঃ হুমায়ুন হুসাইন	কৃষক	নাজির মুন্সিগঞ্জ	হুমায়ুন হুসাইন
৪৩	শ্রী: মোঃ হুমায়ুন হুসাইন	কৃষক	নাজির মুন্সিগঞ্জ	হুমায়ুন হুসাইন
৪৪	শ্রী: মোঃ হুমায়ুন হুসাইন	কৃষক	নাজির মুন্সিগঞ্জ	হুমায়ুন হুসাইন
৪৫	শ্রী: মোঃ হুমায়ুন হুসাইন	কৃষক	নাজির মুন্সিগঞ্জ	হুমায়ুন হুসাইন
৪৬	শ্রী: মোঃ হুমায়ুন হুসাইন	কৃষক	নাজির মুন্সিগঞ্জ	হুমায়ুন হুসাইন
৪৭	শ্রী: মোঃ হুমায়ুন হুসাইন	কৃষক	নাজির মুন্সিগঞ্জ	হুমায়ুন হুসাইন
৪৮	শ্রী: মোঃ হুমায়ুন হুসাইন	কৃষক	নাজির মুন্সিগঞ্জ	হুমায়ুন হুসাইন
৪৯	শ্রী: মোঃ হুমায়ুন হুসাইন	কৃষক	নাজির মুন্সিগঞ্জ	হুমায়ুন হুসাইন
৫০	শ্রী: মোঃ হুমায়ুন হুসাইন	কৃষক	নাজির মুন্সিগঞ্জ	হুমায়ুন হুসাইন



Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Shikaripur Upazila: Kazi pur Union: Gaudail Vill: Gaudail Date: 24.06.2020

Sl No.	Name	Occupation/Designation	Address	Signature
২৫	Md. Rashidul Hasan	Health Assistant	Gaudail-02	Hasan
২৬	মোঃ আরঃ আমিন	মিস্ত্রী	গোলাপী	আমিন
২৭	মোঃ আমিনুল ইসলাম	মিস্ত্রী	কুমকুনিয়া	আমিন
২৮	মোঃ আমা খান	উপসহকারী কৃষি কর্মকর্তা	ফুলকোচা	আম
২৯	মোঃ মুজলিম উদ্দিন	"	শিবলবাড়ীয়া	মুজলিম
৩০	মোঃ মোহাম্মদ হোসেন	সহকারী	শিবাব মার্গ	হোসেন
৩১	মোঃ জাঃ ওয়াহ	উদ্যোগ	গাঙ্গারি	ওয়াহ



Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Shirisajang Upazila: Kazipur Union: Gondaul Vill: Purba Khokshi

SI No.	Name	Occupation/Designation	Address	Signature
১	মো: মাহমুদুল	কৃষিজাত	পূর্ব-খুকশিয়া	মাহমুদুল
২	মো: মোহাম্মদ	কৃষিজাত	পূর্ব-খুকশিয়া	মোহাম্মদ
৩	মো: বোরহান	কৃষিজাত	পূর্ব-খুকশিয়া	বোরহান
৪	মো: মোহাম্মদ হোসেন	কৃষিজাত	পূর্ব-খুকশিয়া	মোহাম্মদ
৫	মো: মোহাম্মদ আলী	বেতকাষী	৫	মোহাম্মদ
৬	মো: মোহাম্মদ আলী	কৃষি	পূর্ব-খুকশিয়া	মোহাম্মদ
৭	মো: মোহাম্মদ আলী	কৃষি	পূর্ব-খুকশিয়া	মোহাম্মদ
৮	মো: মোহাম্মদ আলী	কৃষি	পূর্ব-খুকশিয়া	মোহাম্মদ
৯	মো: মোহাম্মদ আলী	কৃষি	পূর্ব-খুকশিয়া	মোহাম্মদ
১০	মো: মোহাম্মদ আলী	কৃষি	পূর্ব-খুকশিয়া	মোহাম্মদ
১১	মো: মোহাম্মদ আলী	কৃষি	পূর্ব-খুকশিয়া	মোহাম্মদ
১২	মো: মোহাম্মদ আলী	কৃষি	পূর্ব-খুকশিয়া	মোহাম্মদ

Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Shariatpur Upazila: Kaziipur Union: Gendaul Vill: Purbakhoksha Date: 24. ৫

Sl No.	Name	Occupation/Designation	Address	Signature
২০	মাস্তা চামল	চাষা	পূর্ব চুকাইয়া	মাস্তা চামল
২৪	আঃ আলী আমদ	কৃষি	পূর্ব চুকাইয়া	আঃ আলী আমদ
২৫	মাস্তা আলী মন্ডল	কৃষি	পূর্ব চুকাইয়া	মাস্তা আলী মন্ডল
২৬	আঃ আলী মন্ডল	কৃষি	পূর্ব চুকাইয়া	আঃ আলী মন্ডল
২৭	আঃ আলী মন্ডল	কৃষি	পূর্ব চুকাইয়া	আঃ আলী মন্ডল
২৮	আঃ আলী মন্ডল	কৃষি	পূর্ব চুকাইয়া	আঃ আলী মন্ডল
২৯	আঃ আলী মন্ডল	কৃষি	পূর্ব চুকাইয়া	আঃ আলী মন্ডল

Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Shikaripur Upazila: Kasipur Union: Kasipur Vill: Shingra bari

Sl No.	Name	Occupation/Designation	Address	Signature
১	হরি সতল	ভোলে	সিংড়া বাড়ী	হরি
২	বাবু দান	ভোলে	সিংড়া বাড়ী	বাবু দান
৩	তুলাস	ভোলে	সিংড়া বাড়ী	তুলাস
৪	বাবু হালদার	ভোলে	সিংড়া বাড়ী	বাবু
৫	দালি	ভোলে	সিংড়া বাড়ী	দালি
৬	মুনাম হালদার	ভোলে	সিংড়া বাড়ী	মুনাম
৭	নারায়ন	ভোলে	সিংড়া বাড়ী	নারায়ন
৮	মোঃ মাজিউল ইসলাম	ভোলে	সিংড়া বাড়ী	মোঃ মাজিউল ইসলাম
৯	মোঃ মাজিউল ইসলাম	ভোলে	সিংড়া বাড়ী	মোঃ মাজিউল ইসলাম
১০	মোঃ মাজিউল ইসলাম	ভোলে	সিংড়া বাড়ী	মোঃ মাজিউল ইসলাম
১১	মোঃ মাজিউল ইসলাম	ভোলে	সিংড়া বাড়ী	মোঃ মাজিউল ইসলাম
১২	শ্রী বিষ্ণু হাওদার	ভোলে	সিংড়া বাড়ী	বিষ্ণু
১৩	মোঃ মুসলিম রানা	ভোলে	সিংড়া বাড়ী	মুসলিম



Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

District: Shikaripour Upazila: Saharadpur Union: Sonatoni Vill: Baropkwa

Sl No.	Name	Occupation/Designation	Address	Signature
১	শ্রী: রাহুল ক	কল	বাবলাদিয়া	রাহুল ক
২	শ্রী: নওদার	কৃষি	বাবলাদিয়া	নওদার
৩	শ্রী: মাহমুদ আলী	কল	বাবলাদিয়া	আলী
৪	শ্রী: মাহমুদ আলী	কৃষি	বাবলাদিয়া	মাহমুদ
৫	শ্রী: মাহ; সানী	কৃষি	বাবলাদিয়া	সানী
৬	শ্রী: মাহমুদ	কৃষি	বাবলাদিয়া	-
৭	শ্রী: আব্দুল মিয়া	ইমাম	বাবলাদিয়া	আব্দুল
৮	শ্রী: আমদুল ইসলাম	কৃষি	বাবলাদিয়া	আমদুল
৯	শ্রী: বাহাদুর কামর	কৃষি	বাবলাদিয়া	বাহাদুর
১০	শ্রী: মিজানুর রহমান	কৃষি	বাবলাদিয়া	মিজানুর
১১	শ্রী: মাহমুদ আলী	কৃষি	বাবলাদিয়া	মাহমুদ
১২	শ্রী: মানিক মিয়া	কৃষি	বাবলাদিয়া	মানিক
১৩	শ্রী: বাবলা	কৃষি	বাবলাদিয়া	বাবলা

Participant List

Stakeholder Engagement: FGD/Consultation/Informal Meetings/.....

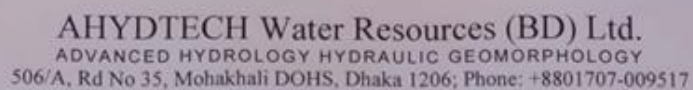
District: Shivarajpur Upazila: Sahazadpur Union: Sonatara Vill: Baropakhia

Sl No.	Name	Occupation/Designation	Address	Signature
১৪	হুসিলা	কৃষিকার	সাহাযদপুর	হুসিলা
১৫	মোঃ মোহাম্মদ আলী	কৃষক	মহা নাজির	মোহাম্মদ
১৬	মোঃ মোঃ মজিদুল আলী	কৃষি	মহা নাজির	মোহাম্মদ
১৭	মোঃ মোঃ আলী	কৃষক	মহা নাজির	মোহাম্মদ
১৮	মোঃ মোঃ আলী	কৃষক	মহা নাজির	মোহাম্মদ
১৯	মোঃ মোঃ আলী	কৃষক	মহা নাজির	মোহাম্মদ
২০	মোঃ মোঃ আলী	কৃষক	মহা নাজির	মোহাম্মদ



AHYDTECH Water Resources (BD) Ltd.  
ADVANCED HYDROLOGY HYDRAULIC GEOMORPHOLOGY  
506/A, Rd No 35, Mohakhali DOHS, Dhaka 1206; Phone: +8801707-009517

SL No.	Name	Occupation	Address	Mobile No.	Signature
১৭	আব্দুল মালিক	ফিল্ড	কাজলিয়া (মুন্সি)		আব্দুল মালিক
২১	আব্দুল হামিদ	ফিল্ড	হ		আব্দুল হামিদ
৩১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
৪১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
৫১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
৬১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
৭১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
৮১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
৯১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
১০১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
১১১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
১২১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
১৩১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
১৪১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
১৫১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
১৬১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
১৭১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
১৮১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
১৯১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
২০১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
২১১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
২২১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
২৩১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
২৪১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
২৫১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
২৬১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
২৭১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
২৮১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
২৯১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
৩০১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
৩১১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
৩২১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
৩৩১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
৩৪১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
৩৫১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
৩৬১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
৩৭১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
৩৮১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
৩৯১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
৪০১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ
৪১১	আব্দুল হামিদ	হ	হ		আব্দুল হামিদ

[illegible]

